RICARDO-AEA

A Comparative Review of Housing Energy Efficiency Interventions

Appendix to Main Report

Report for ClimateXChange

IQ13-2014

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1 Introduction

This project encompasses a comparative study of energy efficiency interventions to inform the Scottish Government and its work on energy efficiency in the housing sector. In its recent Heat Policy Statement (HPS) describing its priorities for low carbon heat, the Scottish Government announced that it is designating energy efficiency as a National Infrastructure Priority. The cornerstone of this will be Scotland's Energy Efficiency Programme (SEEP) which will provide an offer of support to all buildings in Scotland – domestic and non-domestic – to improve their energy efficiency rating. Understanding how energy efficiency interventions have worked in other countries will help inform this. This will enable the Government to target its efforts most effectively and minimise any negative unintended consequences.

The review includes energy efficiency regulations, schemes, support programmes, incentives and fiscal levers in other European countries, top performing American states and selected countries with relevant experience.

We have designed our methodology around two stages of research:

In Stage 1, we carried out a high level overview of energy efficiency initiatives in 20 countries/states. These were selected based on:

- their performance on energy efficiency; and
- previous experience with similar conditions and challenges to Scotland – for example GDP, climate, housing types and quality.

For each of the 20 cases we produced a summary table of the main interventions. This includes:

- Dates of the intervention;
- Type of intervention (e.g. regulation, financial incentives etc.);
- Scope – geographic coverage;
- Technologies supported;
- Cost of the intervention and
- Savings achieved and cost per tonne of CO_2, taking into account the cost effectiveness of both individual measures and the scheme as a whole (where data is available).

The outcome of this work was summarised in an interim report describing which interventions were put in place in each country, and giving the main characteristics of each.

Stage 2 involved a detailed assessment of individual energy efficiency interventions in the housing sector for 7 countries selected for further investigation. This considered the cost-effectiveness, marketing, communication/ public acceptability and unintended consequences. Another aim of the analysis was to assess 'whether and how the interventions work'. In many source references the definition of what is meant by 'work' is fairly narrow (does the intervention deliver the projected energy/ carbon savings). In some cases it is much broader and addresses whether the intervention delivers wider environmental, social and economic benefits, especially if community regeneration is the aim.

Our analysis drew on a number of sources including:

- evaluations of interventions (commissioned by programme administrators or independent);
- academic literature (e.g. conference papers presented at the eceee Summer Study); and
- grey literature (e.g. consultancy reports, working papers).

We also contacted individuals in each of the Stage 2 countries to make sure we captured all of the information available. In our experience, the quality and quantity of information available differs significantly by country and intervention.

This appendix includes the stage 2 case study reports for each country.

2 Phase 1 Summary Overviews

This covers the following countries and states:

Countries	US States
England	Massachusetts
Wales	California
Northern Ireland	Oregon
Austria	Rhode Island
Canada	Vermont
Denmark	
Finland	
France	
Germany	
Ireland	
Netherlands	
New Zealand	
Sweden	
Norway	
Switzerland	

2.1 Overall Summary Table

The table below summarises the interventions by country:

Countries or States	On-bill Finance Scheme	Energy Efficiency Obligation	Taxation or Tax Rebate	Other Rebate	Regulation or Standards	Grant or Subsidy	Loan	Voluntary Agreement	Rating Labelling	Information Education Advice & Support	Demo
England	✓	✓	✓		✓						
Wales	✓	✓	✓		✓	✓✓	✓				
Northern Ireland			✓		✓	✓✓✓		✓			
Austria					✓	✓✓	✓			✓	
Canada				✓	✓✓	✓✓		✓	✓	✓	
Denmark		✓	✓		✓					✓	
Finland			✓		✓✓	✓✓		✓✓✓		✓	
France			✓		✓		✓✓				
Germany					✓	✓	✓			✓✓	
Ireland		✓	✓		✓	✓✓✓					
Netherlands			✓✓✓✓		✓✓		✓	✓✓✓			✓
New Zealand					✓	✓✓	✓			✓	
Norway			✓		✓	✓✓✓	✓✓			✓	
Sweden			✓✓		✓	✓				✓✓✓	
Switzerland					✓✓	✓					
Massachusetts				✓	✓		✓				
California			✓	✓✓	✓	✓	✓✓				
Oregon	✓		✓	✓✓	✓		✓				
Rhode Island				✓✓	✓						
Vermont				✓✓✓✓ ✓✓✓✓	✓		✓✓				

Note 1: Some interventions assessed in stage 1 incorporate more than one intervention type, for example some schemes may offer grants, loans and information provision. Such interventions are represented by ticks in each of the relevant cells.

Note 2: Each ✓ refers to a type of intervention implemented in a given country as described in stage 1 of the project. So for example three voluntary agreements are described for Finland, so ✓✓✓ is shown above.

Note 3: As the focus of this project is on the refurbishment of existing homes, regulations or standards are only included if they apply to refurbishments.

2.2 England

Policy background

In 2007 the European Union set an ambitious primary energy saving target of 20% by 2020, against a 2007 business-as-usual projection. The UK's target was set at the level of 1502.6 TWh (actually specified as 129.2 million tonnes of oil equivalent (Mtoe)) for final energy consumption. This represents an 18% reduction in final energy consumption, relative to the 2007 business-as-usual projection. The UK Government set out its Energy Efficiency Strategy in 2012 (updated in 2013), and the UK National Energy Efficiency Action Plan (2014). Within the domestic sector, the key policies for delivering retrofit are the Energy Company Obligation and the Green Deal. The Government also consulted on a new 'Fuel Poverty Strategy' for England, which proposed a target to move 'as many fuel poor homes as is reasonably practicable' to a minimum energy efficiency standard of Band C by 2030.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Energy Company Obligation (ECO)	*Energy efficiency obligation*	*Cavity wall insulation, loft insulation, heating system upgrade, energy efficient appliances and lighting*	*1994*	*Ongoing; review in 2017*	*GB*	*At discretion of energy company*	*At discretion of energy company*	*£0.8 billion per year*	*Owner occupier and tenants*
Green Deal	*On-bill finance scheme* *Grant (Green Deal Home Improvement Fund)*	*45 different measures, including insulation, draught proofing, improved heating controls, double glazing, renewables*	*2013*	*2015* *2015*	*GB*	*Loan is determined by 'Golden Rule'. Interest rates range from 7.9% APR to 10.3% APR.* *Max £5,600 cashback incentive also available*	*Measures must be recommended in a Green Deal Advice Report* *Estimated savings must be greater than repayments*	*£30 million*	*Owner occupier and tenants*

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Landlord's Energy Savings Allowance	*Tax rebate*	*Insulation and draught proofing*	*2007*	*2015*	*UK*	*£1,500 per property*	*Only for properties that they let*	*NK*	*Landlords*
Private Rented Sector	*Regulation*		*2016*		*England and Wales*	*NA*	*From 2018 it will not be permissible to rent out a property with an EPC worse than E.* *At no upfront cost to the landlord*	*NK (was originally intended to be via Green Deal)*	*Tenants and landlords*

Summary of key interventions

Energy Company Obligation (ECO)

The Supplier Obligation began in 1994.The basic concept of the Supplier Obligation is that the government imposes an energy savings target on large energy suppliers (gas and electricity) that has to be achieved at the customer end, which may relate to energy consumption or carbon emissions. Businesses and industrial end-users are not covered by the scheme. The target is set by the Department of Energy and Climate Change (DECC) for a defined period of time. The energy regulator, the Office of Gas and Electricity Markets (OFGEM), administers and enforces the obligation.

The ECO replaces two previous schemes, the Carbon Emissions Reduction Target (CERT) and the Community Energy Saving programme (CESP). It is intended to operate alongside the Green Deal, and has a particular focus on vulnerable consumers and homes that are hard to treat.

Green Deal

The Green Deal is based on the idea of attaching loans from an accredited 'Green Deal provider' for low carbon refurbishment of buildings not to the owner, but to the property itself, technically the electricity meter in the property.

Repayment of the loan is then via a surcharge on the electricity bill, collected by the electricity supplier and paid on to the Green Deal provider. If the value of the energy savings triggered by the measures installed is greater than this surcharge, the occupant is better off financially. There may be instances where this is not the case, for example if the recipients use less energy than the average. If a lower than average energy user wishes to take out Green Deal finance, the Green Deal Provider had to obtain a written acknowledgement that they are aware that, based on their energy use, the Green Deal charge may not be fully offset by their energy savings. In July 2015, the UK Government ceased funding to the Green Deal Finance Company, effectively closing the scheme to new applications.

Landlord's Energy Savings Allowance

The Landlord's Energy Savings Allowance (LESA) allows landlords to claim up to £1,500 of tax allowance for each property they rent out (on a long-term basis) for which they have bought and installed energy efficiency measures. It only applies to cases where Green Deal financing has not been used. LESA can also be claimed on properties rented out abroad, so long as the landlord pays UK taxes on the profits from these properties.

Private Rented Sector Legislation

This legislation was enacted in the 2011 Energy Bill but the secondary legislation was only put in place in 2015. From 2016, it was intended that landlords in the Private Rented Sector (PRS) would not be able to refuse a tenant's request for energy efficiency improvement measures so long as they could be funded under the Green Deal. It is not yet clear how this will be affected in light of the Green Deal effectively being closed to new applications in July 2015. From 2018, it will not be permissible to rent out a property with an EPC rating worse than E. A regulatory "backstop" date has been set to 1 April 2020, whereby all landlords of properties within scope would be required to meet the standard.

Sources:

http://ec.europa.eu/energy/sites/ener/files/documents/2014_neeap_united-kingdom.pdf

https://www.ofgem.gov.uk/environmental-programmes/energy-companies-obligation-eco

http://www.greendealinitiative.co.uk/

https://www.gov.uk/government/policies/improving-the-rented-housing-sector--2/supporting-pages/private-rented-sector

https://www.gov.uk/government/consultations/cutting-the-cost-of-keeping-warm-a-new-fuel-poverty-strategy-for-england

2.3 Wales

Policy background

While included within the overall UK national energy saving target of 1502.6 TWh for final energy consumption, Wales also has its own distinct funding landscape. The main documents specifying measures to impact on domestic energy efficiency in Wales are the 2011 National Energy Efficiency and Savings Plan and the 2010 Fuel Poverty Strategy, which states a target of having no fuel poor households in Wales by 2018. Both of these contribute to the 2010 Climate Change Strategy for Wales which sets two main targets: reducing greenhouse gas emissions, against a baseline average from 2006-2010, in areas of devolved responsibility by 3% annually from 2011; and a reduction of Wales's total greenhouse gas emissions of 40% by 2020, against a 1990 baseline.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
UK Government Interventions which operate in Wales (Summaries available in England Section 2.1)									
Energy Company Obligation (ECO)	*Energy efficiency obligation*	*Cavity wall insulation, loft insulation, heating system upgrade, energy efficient appliances and lighting*	*1994*	*Ongoing; review in 2017*	*GB*	*At discretion of energy company*	*At discretion of energy company*	*£1.3 billion per year*	*Owner occupier and tenants*
Green Deal	*On-bill finance scheme* *Grant (Green Deal Home Improvement Fund)*	*45 different measures, including insulation, draught proofing, improved heating controls, double glazing, renewables*	*2013*	*2015* *2015*	*GB*	*Loan is determined by 'Golden Rule'. Interest rates range from 7.9% APR to 10.3% APR.* *Max £5,600 cashback incentive also available*	*Measures must be recommended in a Green Deal Advice Report* *Estimated savings must be greater than repayments*	*£30 million*	*Owner occupier and tenants*

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Landlord's Energy Savings Allowance	*Tax rebate*	*Insulation and draught proofing*	*2007*	*2015*	*UK*	*£1,500 per property*	*Only for properties that they let*	*NK*	*Landlords*
Private Rented Sector	*Regulation*		*2016*		*England and Wales*	*NA*	*From 2018 it will not be permissible to rent out a property with an EPC worse than E.* *At no upfront cost to the landlord*	*NK (was originally intended to be via Green Deal*	*Tenants and landlords*
Welsh Government Interventions									
Nest	*Grant*	*Heating and insulation measures, including micro-renewables*	*2011*	*Ongoing*	*Nationwide*	*Up to 100%*	*EPC level F or G*	*NK*	*Owner occupier*
Arbed	*Area Based energy efficiency and renewable energy grants*	*Solid wall insulation, micro-renewable heating technologies, boiler upgrade and heating controls, fuel switching*	*2010*	*2015*	*Nationwide – Area Based*	*Area based scheme specific.*		*£45m for phase 2 (2012 – 2015)*	*Low income, fuel poor households in deprived communities.*

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Home Improvement Loans	*Soft Loan*	*Wide range of measures to make the applicant's home "warm safe and secure"*	*2015*	*2030*	*Nationwide- delivered by Local Authorities*	*Up to £25,000 per unit of accommodation, to a maximum of £150,00 per applicant*	*Final eligibility requirements set by individual Local Authorities*	*£10 million over 15 years*	*Owner occupiers, landlords and third sector.*

Summary of key Welsh specific interventions

Nest

Nest is a Welsh Assembly Government funded programme managed by British Gas. The Energy Saving Trust is a material subcontractor of British Gas. Measures are recommended to qualifying households via a free whole-house assessment. As well as the physical grant scheme, Nest offers free advice and support such as benefit checks, debt advice and info on care and repair services. In 2013/14 Nest was successful in levering in some £3.9M from the UK Government Energy Commitment Obligation (ECO) scheme.

Arbed

As an area based scheme, Arbed looks to provide assistance on a street-by-street basis or community basis rather than for individual households. Local authorities submit bids annually for areas to be funded.

Home Improvement Loan Scheme

This is a Government funded national loan scheme, delivered by Local Authorities. Repayment terms and full eligibility criteria are at the discretion of the Local Authority but the scheme is aimed at owners of sub-standard properties who pass affordability criteria and are restricted by other sources of finance. Being a loan, the fund is 'recyclable', hence the long term nature of the scheme.

Sources:

http://ec.europa.eu/energy/sites/ener/files/documents/2014_neeap_united-kingdom.pdf

http://gov.wales/docs/desh/publications/110323energyplanen.pdf

http://gov.wales/docs/desh/publications/100723fuelpovertystrategyen.pdf

2.4 Northern Ireland

Policy background

While included within the overall UK national energy saving target of 1502.6 TWh for final energy consumption, Northern Ireland also has its own distinct funding landscape. The main UK retrofit policy instruments, the Green Deal and Energy Company Obligation (ECO), do not operate in Northern Ireland, but the Northern Ireland Assembly has implemented several interventions which make provision for domestic energy efficiency. While attempts are made to avoid overlap of the schemes operating, the Assembly themselves acknowledge the conclusion of a Consumer Council report of December 2013 that: "A wide range of government departments and agencies have responsibility for energy efficiency in Northern Ireland causing confusion and a disjointed approach to addressing energy efficiency" and "The evidence suggests that there are too many disparate grants and schemes without a single focus." Around 300,000 households in Northern Ireland cannot afford to heat their homes. A Northern Ireland Fuel Poverty Coalition was established to bring together organisations that wish to highlight the urgent action that is needed to eradicate Fuel Poverty in Northern Ireland.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
UK Government Interventions which operate in Northern Ireland (Summaries available in England Section 2.1)									
Landlord's Energy Savings Allowance	*Tax rebate*	*Insulation and draught proofing*	*2007*	*2015*	*UK*	*£1,500 per property*	*Only for properties that they let*	*NA*	*Landlords*
Private Rented Sector	*Regulation*	*All green deal measures*	*2016*	*2020*	*UK*	*NA*	*NA*	*(via Green Deal)*	*Tenants and owner occupiers*
Northern Ireland Government Interventions									
Northern Ireland Sustainable Energy Programme	*Voluntary agreement*	*Predominantly heating and insulation measures*	*2010*	*2016*	*NA*	*Specific to participating party*		*£7.94m p.a.*	*End-use customers of participating providers (predominantly fuel poor households)*

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Warm Homes Scheme (and Warm Homes Plus)	*Grant*	*Heating and insulation measures*	*2001*	*Ongoing*	*NA*	*100%*	*Qualifying benefits*	*£16.5m for 2015*	*Households on qualifying benefits*
Boiler Replacement Scheme	*Grant*	*Boilers*	*2012*	*2015*	*NA*	*Household income dependent – Max. £1,000*	*Boiler older than 15 yrs, gross household income below £40k p.a.*	*£4m p.a.*	*Owner occupiers*
Affordable Warmth Scheme	*Grant*	*Range prioritised as 1. Insulation, 2. Heating, 3. Windows, 4. Solid Wall*	*2014*	*2017*	*NA*	*£7,500, rising to £10,000 if solid wall insulation is applicable.* *Private landlords must contribute 50% of total works' cost.*	*Gross household income below £20k*	*NK*	*Owner occupier or householder of a privately rented property*

Summary of key interventions

Northern Ireland Sustainable Energy Programme

This is a continuation of the Energy Efficiency Levy Programme operated since 1997. A per-unit levy is paid by all electricity consumers (average of £9.07 per customer per year), with eligible organisations bidding for funding for specific programmes on an annual basis. Since 2002, 80% of the funding has been

targeted at vulnerable households, termed Priority households, with the other 20% going towards non priority households and sectors. Each specific programme has its own set of eligibility criteria, with the priority schemes predominantly aimed at low-income households.

Warm Homes Scheme

In place since 2001, Warm Homes and Warm Homes Plus offer grant assistance to households in receipt of certain benefits. In recent years the scheme has been developed to attempt to better target the alleviation of fuel poverty by specifically targeting areas of deprivation.

Affordable Warmth Scheme

This scheme is delivered by the Northern Ireland Housing Executive via Local Authorities. Council surveyors carry out an inspection and recommend measures based on the prioritisation regime:

1. Insulation
2. Heating
3. Windows
4. Solid Wall

If funding is taken up it must be in that order. If total cost of works recommended is greater than the grant limit the grant be still be taken up to the limit, with the remainder being privately funded. Private sector landlords must make a contribution of 50% of the total cost of energy efficient improvements to their property.

Sources:

http://fuelpovertyni.org/

[1] http://www.consumercouncil.org.uk/filestore/documents/29931_CC_Saving_Energy.pdf

http://ec.europa.eu/energy/sites/ener/files/documents/2014_neeap_united-kingdom.pdf

http://www.detini.gov.uk/03may.pdf

http://www.uregni.gov.uk/uploads/publications/NISEP_notification_paper_2.pdf

2.5 Austria

Policy background

Article 3 of the EU Energy Efficiency Directive required Member States to set national non-binding energy savings targets for 2020. Austria's target was set at the level of 305.5 TWh (actually specified as 1,100 PJ) of final energy consumption in 2020. This represents a stabilisation of energy consumption on 2005 levels and a 16 % reduction of GHG emissions in effort-sharing decision (EU-wide 10% reduction in non ETS-sectors) and 34% RES share. The Austrian government set out a National Energy Efficiency Action Plan in 2014. Most residential energy efficiency subsidy schemes in Austria are on the provincial rather than the national level. We have found no official definition of energy poverty in Austria and the national statistical agency does not provide specific data on this issue.

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Klima:aktiv	*Training Standards Consultancy Information Education Advice & Support*	*Direct grant support, information, and advice*	*2004*	*2012*	*Nationwide*	*Not known on individual basis*	*NK*	*€7 million per year*	*Owner Occupiers and tenants*
Residential building subsidy	*Soft loans, annuity and grants, housing allowances*	*Provided for measures improving thermal insulation (building shell, windows and doors).*	*1996*	*ongoing*	*Nationwide*	*Households, the maximum subsidy level amounts to 20% of the thermal renovation costs. Companies, subsidies cover 30% of the investment.*	*NK*	*Each providence has different available funding*	*Owner Occupiers Housing Corporations Landlords*
Article 15a	*Regulation*	*Minimum standards of energy efficiency*	*2009*	*ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*All renovations or refurbishments.*

Summary of key interventions

Klima:aktiv

The programme supported energy efficiency and renewables in all sectors through grants, information and advice. In the residential building space, the programme encourages energy savings in households through widespread campaigns.

Residential building subsidy in provinces

The housing support scheme is in quantitative terms the most important subsidy among the energy subsidies in Austria. Each year from 1996 to 2000 almost 1.8 billion € were transferred from the federation to the provincial states to provide direct support for residential building construction and refurbishment. Allocation of the grants is regulated by provincial law – so the amount, conditions and limits can differ between provinces. Subsidies can be given in as soft loans, annuities grants, housing allowances, securities and by direct funding. Applicants include individuals, non-profit making housing associations, municipalities and other organisations. The following energy- and climate relevant measures are supported in the framework of the housing support scheme:

- Measures to increase thermal insulation: e.g. thermal insulation of windows, outer walls, roofs and ceilings.
- Measures to improve the efficiency of space and water heating: Connection to the district heating, installation of central heating systems, solar thermal plants, heat pumps, biomass heating systems.

Article 15a

Due to the distribution of responsibilities among the nine federal states in Austria (the Länder), there has never been one single building law in Austria, but at least nine different systems. In 2009 there was an 'Agreement pursuant to Article 15a of the Austrian Federal Constitution' (a binding agreement between the federal government and the provinces as provided for by the Austrian constitution) to harmonise the previously very different regulations in the provinces. This has created a minimum standard for the energy quality of subsidised residential buildings.

Example of state initiative:
KLiP - The City of Vienna's Climate Protection Programme
As an example at the state level, Vienna has a wide ranging, climate protection programme for the city of Vienna (KLiP II) which started in 2010 and runs to 2020. This consists of 37 sets of measures with a total of 385 individual measures in the five categories, including use of energy. The latter includes promotion of thermal rehabilitation of residential buildings and increasing the share of district heating to 50%.

Sources:

http://www.klimaaktiv.at/english.html

http://ec.europa.eu/energy/sites/ener/files/documents/2014_neeap_en_austria_annexb.pdf

http://www.bpie.eu/uploads/lib/document/attachment/26/Boosting_building_renovation_-_Good_practices_BPIE_2013_small.pdf

2.6 Canada

Policy background

Canada does not have a quantitative energy efficiency target, although has taken action to reduce greenhouse gas emissions in what it describes as a sector by sector approach, with a particular focus on electricity generation and transportation. Canada boasts that 79 % of its electricity supply emits no greenhouse gases. To date the government has invested more than $10 billion in green infrastructure, energy efficiency, clean energy technologies, cleaner fuels and smarter grids. In 2007 Canada proposed a long term target of reducing emissions by 60 to 70% below 2006 levels by 2050. However, this is an aspirational target that is not legislated in any form. No useful information has been found on fuel poverty in Canada.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
ecoENERGY Retrofit	*Grant*	*Heating, cooling and ventilation systems, insulation and air sealing*	*2007*	*2012*	*Canada*	*$5000 (CAD)*	*NK*	*$1 billion (CAD)*	*Owner Occupiers*
ENERGY STAR rebates	*Rebate*	*Partial rebate depending on utility company*	*NK*	*ongoing*	*Customers of relevant utility*	*Determined by utility and product*	*Determined by utility and product*	*Determined by utility and product*	*Owner Occupiers and Tenants*
ecoENERGY for Buildings and Houses	*Information and Education*	*Promoting all types of energy efficiency*	*2007*	*2011*	*Nationwide*	*NA*	*NA*	*$61 million (CAD) over 4 years for the programme*	*Owner Occupiers, Landlords and tenants Building Companies*
ecoENERGY Efficiency for Housing	*Grants and Rebates*	*Promoting all types of energy efficiency.*	*2011*	*ongoing*	*Nationwide*	*Depends on the province or territory*	*NA*	*NA*	*Owner Occupiers, Landlords and tenants Building Companies*
EnerGuide Rating System	*Rating system*	*A standard measure of the energy performance of new and existing homes and appliances and vehicles*	*NK*	*ongoing*	*Nationwide*	*NA*	*NA*	*NA*	

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
R-2000 Home standard	*Voluntary standard*	*Energy efficiency, airtightness performance and the use of environmentally responsible products and materials.*	*1982*	*ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*Building Companies*
National Energy Code for Buildings 2011	*Regulation*	*Energy efficiency standard for renovation or refurbishment of existing buildings.*	*2011*	*ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*New build and renovations*
Building Codes and Regulations	*Regulation*	*Energy efficiency standard for renovation or refurbishment of existing buildings.*	*1941*	*ongoing*	*Provincial Responsibility – but draws on national standards*	*NA*	*NA*	*NA*	*New build and renovations*

Summary of key interventions

ecoENERGY Retrofit Program

Administered by Natural Resources Canada, the ecoENERGY programme provided grants to owner occupiers, SMEs, public institutions, and industrial facilities to help implement energy efficiency measures to reduce GHG emissions. For example owner occupiers can get up to $5,000 in home improvement grants. Among other eligibility criteria, participants needed to obtain a pre-retrofit evaluation by a certified energy advisor using the EnerGuide Rating System* before starting work and a post-retrofit evaluation within program deadlines.

** An EnerGuide rating shows a standard measure of a home's energy performance. It shows occupiers (and future buyers) exactly how energy efficient the home is. The rating is calculated based on standard operation assumptions so that occupiers can compare the energy performance of one house against another.*

ENERGY STAR rebates

Utilities across the country offer rebates on ENERGY STAR products. The various requirements and rebate amounts depend on the utility. A list of utilities offering rebates is available on Natural Resources Canada's website: http://www.energystar.gov/rebate-finder. Examples of the types of products include washing machines, refrigerators and residential water heaters. Dryers, ovens and microwaves are not part of the programme. The level of rebate varies depending on the utility and the type of products. For examples freezers are subject to rebates of $20 to $60, whereas GRU offers a $350 rebate to residential

customers to convert electric, oil or LP gas (liquefied petroleum) water heaters to a tankless natural gas model. This rebate does not apply for replacing an existing natural gas water heater with a new one.

ecoENERGY for Buildings and Houses

ecoENERGY for Buildings and Houses was aimed at houses and buildings (schools, hospitals, retail, hotels, offices, etc). ecoENERGY for Buildings and Houses had four main activities.

- Promoting more energy efficient, environmentally-responsible new and retrofitted buildings and housing.
- Working with all levels of government to support the development of a more stringent National Energy Code for Buildings and Houses,
- Other regulatory instruments to encourage their adoption and implementation by the authorities having jurisdiction (provinces and territories).
- Supporting provinces and territories in the adoption and implementation of mandatory energy efficiency requirements for all new housing using the EnerGuide for Houses rating tool.

ecoENERGY Efficiency for Housing

The ecoENERGY Efficiency for Housing programme is investing $195 million between 2011 and 2016 to maintain the Government of Canada's momentum to improve energy efficiency in Canada — at home, at work and on the road. The ecoENERGY Efficiency for Housing programme is part of the Government of Canada's strategy to advance clean energy solutions. This programme encourages the construction and retrofit of low-rise residential housing, making the stock more energy efficient. Funding will support and refine the EnerGuide Rating System as a standard measure of the energy performance of new and existing homes used in home energy labelling. Grants and financial incentives are given but depends on the measure and province or territory.

EnerGuide Rating System

EnerGuide is an energy rating and labelling system that certifies the energy efficiency of new and existing products and homes. The aim is that EnerGuide rating allows householders to compare the energy efficiency of major household appliances sold in Canada. EnerGuide also provides a standard measure of home's energy performance. Over one million homeowners in Canada have already obtained an EnerGuide evaluation.

R-2000 Home standard

The R-2000 Standard is a voluntary standard administered by Natural Resources Canada (NRCan) and is delivered through a network of service organisations and professionals across Canada. All R-2000 homes are constructed by licensed and trained builders, evaluated, inspected and tested by independent third-party inspectors, and are certified by the Government of Canada. R-2000 certified houses are significantly more energy efficient than those built to minimum building code requirements and have additional elements such as clean air features and high levels of insulation.

National Energy Code for Buildings 2011

Provincial governments have jurisdiction over building codes, the National Building Code is the model upon which the provinces base their codes. National model construction codes must be adopted by provincial or territorial authorities to become law. Enforcement of the Code is dependent on the province. For example the Province of Nova Scotia has adopted the National Energy Code for Buildings and enforcement of the Code will started on December 31, 2014. It provides minimum requirements for the design and construction of energy-efficient buildings and covers the building envelope, systems and equipment for heating, ventilating and air-conditioning, service water heating, lighting, and the provision of electrical power systems and motors. It applies to new buildings and additions.

In addition, there are municipal interventions, for example, the City of Edmonton is currently developing a New and Existing Home Energy Labelling Program which is outlined in its Green Building Plan. The goal is to develop a Voluntary Home Energy Labelling Program Plan and Implementation Plan. The Green Building Plan proposes the development of a voluntary program linking with real estate listings and also a voluntary program that would transition to mandatory labelling in the future.

Sources:

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2.7 Denmark

Policy background

Denmark's overall national energy efficiency target for primary energy for 2020 is 206.8 TWh (converted from 17.781 million tonnes of oil equivalent (Mtoe)). This represents a 12.6% reduction in primary energy consumption from the 2006 baseline. This corresponds to a target reduction of final energy consumption of 172.1 TWh by 2020, a 7.2% decrease from the 2006 baseline. Denmark's main target is a 40% reduction GHG emissions, compared to 1990 levels, by 2020. The country has already introduced measures that should reduce emissions by 37%, leading to a 2 $MtCO_2eq$ shortfall by this date. The country has an EU target to reduce GHG in the sectors not covered by quotas by 20% by 2020, compared with the 2005 level. Energy efficiency is seen as an important element in Denmark's long term objective of being fossil-fuel free by 2050. In the domestic sector, Denmark is solely using the energy efficiency obligations required under the 2012 Energy Efficiency Directive. Denmark is not commonly regarded as a country having issues with energy poverty. Indeed, European-wide studies have established that Danish households are relatively unlikely to have problems to afford adequate energy services. Both the concepts of 'energy poverty' and 'vulnerable customers' have not been defined in Danish law.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Energy Efficiency Obligation	*Energy Efficiency Obligation*	*A wide range of options is possible E.G. improved insulation, the installation of more energy-efficient windows, replacing old energy-efficient boilers with new high-efficiency boilers.*	*2006*	*2020*	*Nationwide*				*End users of: 70 electricity grid operators; 3 natural gas distributors; ~400 district heating companies The oil sector, operating on behalf of 6 oil companies.*
The Bolig Job Plan	*Tax deductions*	*Repair and replacement of windows and glazing, repair and replacement of oil-fired or gas-fired boilers and central heating systems,*	*2011*	*2013*	*Nationwide*	*One third of the wage costs for the repairs or replacements maximum of DKK 15 000 per person per year*	*NK*	*NK*	*Building Companies Owner Occupiers Tenants*

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
		roof and loft insulation, insulation of external walls and installation of solar panels and solar cells.							
Information effort for energy efficiency regarding end-users	*Education*	*All energy efficiency measure covered*	*2013*	*ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*Owner Occupiers Landlords and Tenants*
Building Regulations	*Regulation*	*Minimum energy efficiency requirement for all new builds*	*2010*	*Ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*All new builds and extensions*

Summary of key interventions

Energy Efficiency Obligations

Energy Efficiency Obligations have been in use in Denmark since 2006, with the current agreement dating from November 2012. The Minister for Energy, Climate and Building lays down the energy saving target for the individual sectors, and it is then up to the sectors to divide the target among individual companies. Savings are calculated either using standard values (deemed savings), by means of a specific calculation of the saving resulting from the activity (scaled savings), or according to the effect of a specific market impact (surveyed savings).

The Bolig Job Plan

The Danish government developed a financial scheme for supporting renovation of dwellings. The Bolig Job Plan, as it was called, was a research scheme which offered tax deductions on wage costs incurred for help and renovation work in dwellings. The scheme was in force from 1 June 2011 until 2013. The grant accounted for approximately one third of the wage costs and was applicable both inside and outside the dwelling. The deduction was available to persons aged over 18 years and could be up to a maximum of DKK 15 000 per person per year. The scheme was designed as an eligible deduction in the tax assessment

and offered a simple administrative solution that is no more difficult than an Internet transaction. The Bolig Job Plan agreement included, among other things, the following energy related improvements in the dwelling: repair and replacement of windows and glazing, repair and replacement of oil-fired or gas-fired boilers and central heating systems, roof and loft insulation, insulation of external walls and installation of solar panels and solar cells.

Information effort for energy efficiency regarding end users

The objective for the information effort is to promote energy efficient solutions and purchases and hereto an energy efficient behaviour among end-users. The information effort is deeply rooted on the Danish Energy Agency's website www.sparenergi.dk (saveenergy). The website contains amongst other things energy saving advices, check lists and tools, guides on energy labelling, opportunities for subsidies, renovation, heat, electricity etc.

Building Regulations

Mandatory requirements for buildings, including dwellings, are set out in the Danish Building Regulations 2010. These impose strict energy performance requirements in accordance with current Danish action plans and are in accordance with the EU Energy Performance of Buildings Directive (EPBD) 2002 (amended in 2010). The regulations that stipulate the building code's energy efficiency standards are to be regularly tightened with an increase of 25% in 2010, followed by an additional 25% in 2015 and another 25% in 2020. Under the Thermal Building Code Revision in 2006, new buildings are subject to thermal efficiency standards that are 25-30% more stringent than those already built. The EPBD has also been instrumental in the implementation of energy labelling for buildings and setting new standards for maximum heating energy consumption. Denmark has also set a target that all new housing should meet Passivhaus standards by 2020.

Sources:

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http://ec.europa.eu/energy/sites/ener/files/documents/2014_neeap_en_denmark.pdf

http://bolig-jobplan.dk/tilskud

2.8 Finland

Policy background

Finland's indicative national targets for final and primary energy consumption in 2020 are 310.1 TWh and 417 TWh respectively. The target for final energy consumption was originally set out in the 2008 Climate and Energy Strategy and was based on 10.7% reduction from the business-as-usual baseline. The strategy was updated in March 2013, with the stated long term goals of reducing oil dependence and achieving a carbon neutral society. Finland's prime targets for 2020 comprise a 38 % share of renewable energy sources in final energy consumption, a reduction of emissions outside the ETS by 16 %, and a 34 % reduction within the ETS compared with 2005. Several ministries of the Finnish Government engage a state owned organisation called Motiva Ltd, who co-ordinate a network or regional consultancy organisations to delivery advice on all areas of energy efficiency to consumers across all sectors. Motiva also support the implementation of several of Finland's energy efficiency interventions. No information statistics for fuel/energy poverty or specific polices could be located.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Energy Efficiency Agreement for the Real Estate Sector	*Voluntary agreement*	*Wide range of measures, divided into operational and technical.*	*2014*	*2020*	*Nationwide*	*NA*	*NA*	*NA*	*Residential housing associations.*
Energy Efficiency Agreement – Action Plan for Energy Services and Energy Efficiency	*Voluntary agreement*	*Promotion of customers' energy efficiency through: guidance; communications, consumption feedback and invoicing.*	*2014*	*2020*	*Nationwide*	*NA*	*NA*	*NA*	*End use customers of sales and distribution companies of power, and district heating and cooling.*

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Energy Efficiency Agreement for Heating Oils and Transportation Fuels (Hoyla III)	*Voluntary agreement*	*Promotion of customers' efficient use and maintenance of oil fired heating systems.*	*2014*	*2020*	*Nationwide*	*NA*	*NA*	*NA*	*End use customers of all major heating oil and transport fuel sales companies.*
Subsidies for Energy Audits and Energy Efficiency Improvements	*Subsidy*	*Audits and wide range of improvement measures for blocks of flats and terrace housing; heating system modifications in detached and semi-detached dwellings*	*2003*	*2020*	*Nationwide*	*40 % of audit cost and 15% of eligible improvement costs for flats and terraced; 25% of eligible costs for heating modifications in detached and semi-detached.*	*Subsidies for detached and semi-detached properties are subject to income related means testing.*	*NA*	*Domestic end users.*
Household Tax Deduction	*Tax break*	*Replacement, repair and upgrading of heating systems*	*2000*	*Ongoing*	*Nationwide*	*60% deduction from labour costs, up to maximum €3000 per household*	*NA*	*NA*	*Domestic end users.*

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Energy Efficiency Regulation for new construction	*Regulation*	*Minimum energy efficiency standard.*	*2012*	*Ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*All new buildings.*
Energy Efficiency Regulations for renovation	*Regulation*	*Energy efficiency standard for renovation or refurbishment of existing buildings.*	*2013*	*Ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*All renovations or refurbishments.*
Start-up assistance for building renovation	*Subsidy*	*Wide range of individual measures – those subject to EE Regulation for renovation.*	*2013*	*Ongoing*	*Nationwide*	*10% of total repair cost.*	*NA*	*€115M for 2013-2014*	*Housing Associations.*

Summary of key interventions

Energy Efficiency Agreements

A continuation of the *Energy Saving Agreements* policies dating from 1997, these voluntary agreements cover a range of sectors and therefore participating parties. In the real estate sector, the housing stock of rental housing associations participating in the agreement covers around 80 % of the total number of homes in all rental, right-of-residence and part-ownership housing addressed by the agreement. A web based monitoring system allows participating parties to report implemented energy saving measures, which can be recommended measures from energy audit processes, or any measures otherwise identified by the participating party. Signatories to the Action Plan for Energy Services and Energy Efficiency constitutes 90% of Finland's electricity, 86% of district heating and 100% of cooling provision.

Subsidies for Energy Audits and Energy Efficiency Improvements

Subsides are granted partially by the municipalities and partially by the Housing Finance and Development Centre of Finland (ARA). Levels of subsidy available differ for different housing types and different measures, but are generally set in the state budget on a yearly basis.

Energy Efficiency Regulations for Renovation, and start up assistance

Although the majority Finland's housing stock is relatively young, and therefore has been subject to an energy efficiency standard at time of build, this regulation covers all renovations and refurbishments which require permission, including change-of-use, and assumes that the renovated/refurbished elements will demonstrate at least a 50% improvement from the regulations in place at time of build.

The start-up assistance scheme was introduced in 2013 to expedite the refurbishment and maintenance of a large proportion of the county's rented housing stock. Measures for which subsidies can be granted include: plumbing refurbishment, replacement of windows and entrance doors, air conditioning system refurbishment, heating system refurbishment, foundations refurbishment, lift modernisation, roof refurbishment, and balcony refurbishment.

Sources:

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2.9 France

Policy background

Article 3 of the EU Energy Efficiency Directive required Member States to set national non-binding energy savings targets for 2020. France's target was set at the level of 1528.2 TWh (converted from 131.4 million tonnes of oil equivalent (Mtoe)) for final energy consumption. This represents roughly a 15% reduction in final energy consumption, relative to 2009 levels. The French government set out its Energy Efficiency Action Plan in 2012 (updated in 2014). Within the domestic sector the key policies for delivering retrofit are CITE, Eco-PTZ, and Eco-PLS.

As part of the EU Climate and Energy Package Effort Sharing Decision, France has an emissions target of 14% below 2005 levels by 2020.

There are estimated to be roughly 3.8 million households (14.4% of population) in France considered to be "fuel poor". The country therefore has a number of curative and preventative policies in place to combat fuel poverty. Aside from the loans and rebates listed below, the country has instituted affordable fuel tariffs for low-income households, as well as other fuel- and water-related housing assistance programs.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
CITE	*Tax rebate*	*Insulation, appliances, power generation equipment, EV charging stations*	*2005*	*NA*	*Nationwide*	*30%*	*Minimum technical performance criteria and measures must also be applied to a significant part of the property*	*NA*	*Owner occupiers*
Eco-PTZ	*Soft loan*	*Zero-energy wastewater treatment, thermal insulation, renewable systems*	*2009*	*2020*	*Nationwide*	*€30,000*	*Banks responsible for providing loans must ensure that measures have been implemented*	*NK*	*Owner occupiers*
Eco-PLS	*Soft loan*	*Thermal energy renovation*	*2009*	*2020*	*Nationwide*	*NK*	*NK*	*NK*	*Social housing organisations*

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Building codes	*Regulation*	*Minimum standards for thermal characteristics and energy performance of new buildings*	*1974*	*NA*	*Nationwide*	*NA*	*NA*	*NA*	*New Builds*

Summary of key interventions

CITE - Crédit d'Impôt Transition Energétique (Energy Transition Tax Credit) {Formerly known as CIDD}

The CIDD scheme was first introduced in 2005 as a way to diffuse new high-efficiency technologies into the market and to support intermediate refurbishment of households. In August 2009, France adopted the first Grenelle law, which set targets for energy reduction in the building sector. Specifically, a target was set for a minimum of 38% reduction in energy consumption in buildings by 2020. In order to achieve the aims set out by Grenelle, France extended the availability of tax credits to 2015 in addition to introducing a green loan scheme (éco-PTZ).

Eco-PTZ - Eco Prêt à taux zéro (Eco zero-interest loan)

The éco-PTZ loan targets owners of properties that have been built before 1990, whether they inhabit or rent their property. Through the programme, loans of up to €30,000 can be obtained, depending on the type of retrofit performed. The measures must be performed by a company certified *by Reconnu Garant de l'Environnement* (RGE), which proves expertise in energy performance and/or renewable energy installations.

21 banks have signed a government convention to provide the éco-PTZ loan. The loan can therefore be obtained through any of these banks.

The duration of the loan is fixed at 10 years, or 15 years for comprehensive retrofits or retrofit packages of 3 or more measures. The duration can be reduced to 3 years by the property owner.

Eco-PLS – Eco Prêt logement social (Eco loan for social housing)

Implemented from February 2009 to May 2011, Eco-PLS was a low-interest loan. For 15-year loans, the interest rate is 1.9%, and for 20-year loans the interest rate is 2.35%. The loan was open to public housing agencies, PPPs and municipalities owning or managing social housing for thermal renovations.

A second generation of loans has been in place since December 1, 2011. Distributed over a maximum period of 25 years, Eco-PLS is now issued at variable rates based on the duration of the loan. It is accessible to the most inefficient housing (energy performance categories E to G, and D under certain conditions), with a target of 70,000 social housing units renovated per year.

Building Codes

Since 1974, France has had minimum energy efficiency standards for buildings. The building codes have been amended regularly, with the most recent adopted in 2005. These address thermal characteristics and energy performance of new construction. The new regulation also introduces two new labels for “high energy performance”, which corresponds to an energy consumption that is 10% less than the standard, and “very high energy performance”, which corresponds to energy consumption 20% less than the standard.

Sources:

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http://www.developpement-durable.gouv.fr/L-eco-pret-logement-social-eco-PLS.html

2.10 Germany

Policy background

Article 3 of the EU Energy Efficiency Directive required Member States to set national non-binding energy savings targets for 2020. Germany's target was set at the level of 2259.7 TWh (converted from 194.3 million tonnes of oil equivalent (Mtoe)) for final energy consumption. This represents roughly a 12% reduction in final energy consumption, relative to 2008 levels. Germany's EU Climate and Energy Package Effort Sharing targets for 2013-2020 is 14% below the 2005 levels. The German government set out its National Energy Efficiency Action Plan in 2012 (updated in 2014). The German Federal Government's target for 2050 is to have a building stock that is almost climate-neutral. To achieve this target, the heating requirement is to be reduced by 20% by 2020, with primary energy demand dropping by 50% by 2050. Within the domestic sector the key policy for delivering retrofit is the CO2 Building Renovation Programme. During 2014 the German government reported that 6.9m households live in energy poverty, defined as spending more than 10 per cent of their income on energy. There are no figures on a reduction target.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
KfWEnergy-efficient Refurbishment	*Soft loan combined with repayment grants or investment grant*	*Insulation, window/door replacement, ventilation system, heating systems, heat distribution optimisation*	*2001*	*ongoing*	*Nationwide*	*€75,000 for whole house, €50,000 for combination of single measures*	*Grant of up to 30 per cent of the investment costs or a reduced-interest loan combined with repayment grant of up to 27.5 per cent*	*€2 billion per year*	*Owner Occupiers*
Electricity Saving Initiative	*Education and Information*	*Any that use electricity*	*2012*	*ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*Owner Occupiers, Tenants and Landlords Businesses*
Energy Consumer Advice Centre	*Education and Information*	*Energy advice checks for private households*	*1978*	*ongoing*	*Nationwide*	*NA*	*Charges are between €10 and €45*	*NA*	*Owner Occupiers*
Energy Conservation Regulations	*Regulation*	*Minimum energy efficiency standard.*	*2009*	*ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*NA*

Summary of key interventions

KfW Energy-efficient Refurbishment

The Federal Government funds the Energy-efficient Refurbishment and enables the German government-owned development bank Kreditanstalt für Wiederaufbau bank (KfW) to issue loans with an interest rate lower than the market rates – the subsidies provided essentially buy down the interest rates which are currently at 1%. In addition KfW provides grants.

There are two routes available to homeowners:

1) low-interest loans of up to €100,000 per property which are blended with a 'repayment bonus'' of up to €27,500 per property
2) investment grants of up to €30,000 per property

The two routes cannot be combined and homeowners have to decide for one or the other.

Loan route

The maximum loan size is currently €100,000 for a whole house retrofit and €50,000 for a combination of single measures. Repayment grants are provided if the refurbished home meets KfW Efficiency House standards, which set limits based on the energy consumption and heat loss values permitted for new buildings in accordance with the Energy Conservation Regulations:

- In the KfW Efficiency House 100, values cannot exceed those of the EnEv 2007 (the energy saving regulations for buildings) by more than 100%
- in the KfW Efficiency House 70 they cannot be exceeded by more than 70%.

Individual refurbishment measures or a combination of measures are also supported by the loan, as long as they meet minimum technical requirements.

The loan is offered with a maturity of up to 30 years, including up to 5 repayment-free start-up years and a fixed interest period of up to 10 years. When taking out a loan, a repayment bonus of 27.5% is offered if the refurbishment or rehabilitation is to KfW Efficiency House 55 standards, and a repayment grant of 12.5% for KfW Efficiency House 115. This repayment bonus is, in essence, a portion of the loan which does not need to be repaid, and is separate from the discrete grant route described below.

Grant rout

Under the grant variation, individual measures can receive grants for up to 10% of the investment cost, to a maximum of € 5,000. For refurbishment to a KfW Efficiency House 115, it covers 15.0% of the investment cost to a maximum of € 15,000.For refurbishment to KfW Efficiency House 55, the grant covers up to 30%, to a maximum of € 30,000.

Electricity Saving Initiative

The aim of the measure is to provide information to private households on how to reduce their electricity usage. The website has tips on reducing electricity costs, power-saving videos, and online tool for calculating power consumption and what you need to know when purchasing new white goods.

Energy Consumer Advice Centre

The Energy Consumer Advice Centre was setup in 1978 and is managed by a Consumer Federation and. It offers advice to private households about their potential for energy savings by providing three kinds of energy check: a basic check, a building check and a heating check. Advice is given by telephone, email or by a site visit. The service is subsidised by the Federal Ministry for Economic Affairs and Energy and charges for advice are between €5-45.

Energy Conservation Regulations

Germany's Energy Conservation Regulations (EnEV) sets out thermal insulation standards for residential and commercial buildings. With the amendment to the EnEV 2014, legislators are tightening the regulations for buildings. In principle, the values set out in the regulation must be observed during the refurbishment of existing buildings as well during the construction of new buildings. As proof of compliance with these regulations, the legislators require an Energy Performance Certificate to be issued for the new or refurbished building. There is regular strengthening of targets and obligations. A new regulation came into effect on 01 May 2014. The key changes in the new energy saving amendment relate to new building projects implemented after 2016.

In addition to the Federal initiatives, there are also initiatives carried out at the level of the Länder that focus their programs on specific regional housing market conditions.

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https://www.verbraucherzentrale-energieberatung.de/energiechecks.php

http://www.die-stromsparinitiative.de

2.11 Ireland

Policy background

Ireland's overall national energy efficiency target for primary energy for 2020 is 31.925 TWh). This represents a 20% reduction in primary energy consumption from the 2001-2005 average baseline. Ireland proposes to meet this target through their energy efficiency obligation and several alternative measures, 9 of which impact upon domestic energy use in some way. The major domestic energy efficiency retrofit schemes are brought together under the 'Better Energy' umbrella and delivered by the Sustainable Energy Authority of Ireland (SEAI).

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Energy Supplier Obligation Scheme	*Energy Efficiency Obligation*	*Wide range of domestic insulation, heating and other energy efficiency measures*	*2014*	*2020*	*Nationwide*	*Supplier specific*	*Supplier Specific*	*NA*	*End users of suppliers selling more than 600GWh in 2012. This means 16 suppliers across all sectors.*
Residential Retrofit – Better Energy Warmer Homes	*Grant Aid*	*Loft insulation Draught-proofing HWT Lagging Low energy lighting Cavity Wall Insulation Energy advice*	*2011*	*Ongoing*	*Nationwide*	*100%*	*Owner occupiers or private tenants. Home constructed before 2006 Receipt of qualifying benefit*	*€12M in 2015 for all Residential Retrofit streams.*	*Households in fuel poverty*
Residential Retrofit – Better Energy Areas	*Area-based grant programme*	*Wide range of thermal and electrical efficiency measures.*	*2011*	*Ongoing*	*Area based application*	*100% of project costs for energy poor private, housing association and*	*Project pre-approved by SEAI and subject to a post-works Building Energy Rating Certificate.*		*Households in fuel poverty*

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
						charitable ownership homes; *50% for energy poor local authority homes;* *30% for non-energy poor homes in target area.*			
Residential Retrofit – Better Energy Homes	*Grant Aid*	*Structural insulation, heating systems and controls, and solar thermal.*	*2011*	*Ongoing*	*Nationwide*	*Fixed maximum values based on 30% of average cost of works.*	*Must use registered contractor, and must have Building Energy Rating (BER) after works completed.*		*Domestic Energy Users*
Energy Efficient Boiler Regulation for Replacement Boilers	*Building Regulation*	*Minimum boiler efficiency of 90% for boilers installed or new or existing dwellings*	*2008*	*Ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*Domestic Energy Users*
Home Renovation Tax Incentive	*Tax Incentive*	*Tax credit for qualifying expenditure on repair, renovation*	*Oct 2013*	*Dec 2015*	*Nationwide*	*13.5% of qualifying expenditure*	*Given in relation to a maximum of €30,000 (before VAT) per property*	*NA*	*Domestic Energy Users*

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
		or improvement work.							

Summary of key interventions

Energy Supplier Obligation Scheme

This scheme is a migration form a previously existing voluntary programme of energy savings by suppliers. The 600GWh threshold for obligated parties leads to a smaller number of scheme participants than the voluntary programme, but the Department for Communications, Energy and Natural Resources are keen to enter into new voluntary agreements with suppliers falling below the threshold. Delivery of the scheme, including target setting for individual obligated parties is delegated to SEAI, but the Department remain actively involved in strategic decisions and chair a quarterly governance group.

Residential Retrofit

Three previously existing retrofit schemes were brought together under the "Better Energy" umbrella in 2011. Better Energy Homes, Better Energy Warmer Homes, and Better Energy Areas (run in conjunction with Better Energy Communities) offer funding for the retrofitting of energy efficiency measures to existing housing. The schemes are all delivered by SEAI. The total funding allocated to Better Energy in 2015 is significantly lower than in previous years, reflecting Ireland's stated aim to "move away from state supports in favour of more sustainable market-oriented financing models".

The Home Renovation Incentive (HRI) Scheme

The Home Renovation Incentive (HRI) Scheme provides for tax relief for owner occupiers and landlords by way of an Income Tax credit at 13.5% of qualifying expenditure on repair, renovation or improvement works carried out on a main home or rental property by qualifying Contractors. The amount of the HRI tax credit depends on the amount spent on qualifying works. Tax relief can be claimed on qualifying expenditure over €4,405 (before VAT at 13.5%) per property. This €4,405 (before VAT) can be the total from any number of jobs carried out and paid for from 25 October 2013 to 31 December 2015 for owner occupiers claiming on their main home and on or after 15 October 2014 and up to 31 December 2015 for Landlords claiming on their rental property. While there is no upper limit on expenditure on qualifying works, the tax credit will only be given in relation to a maximum of €30,000 (before VAT at 13.5%) per property.

Sources:

http://ec.europa.eu/energy/sites/ener/files/documents/article7_en_ireland.pdf

http://ec.europa.eu/energy/sites/ener/files/documents/2014_neeap_en_ireland.pdf

2.12 Netherlands

Policy background

The Netherlands indicative national energy efficiency target for 2020 of 133.9 TWh (converted from 482 PJ) final end-use efficiency improvements to be achieved in the period 2014-2020 (Daniëls et al 2013, p.11 ff); in primary terms this is 186.4 TWh. The Energy Agreement for Sustainable Growth was drafted at the end of 2013 and brings together the activities of over 40 organisations, including central, regional and local authorities, employers' and employees' organisations, nature conservation and environmental organisations, other social organisations and financial institutions, in fields such as energy efficiency. Its agreed objectives include an average final energy consumption saving of 1.5% a year and a final energy consumption saving of 27.8 TWh (converted from 100 PJ) in 2020 (Social and Economic Council of the Netherlands, Energy Agreement for Sustainable Growth, 2013). If the Netherlands does not appear to be on course to meet the agreed targets, additional measures will be taken. These could include more compulsory and/or fiscal measures or other voluntary or non-voluntary measures, which will increase the certainty of achieving the 100 PJ energy saving. The Netherlands EU Climate and Energy Package Effort Sharing targets for 2013-2020 is 16% below the 2005 levels. Information on fuel poverty in the Netherlands has proved elusive although a report by BPIE indicates only a small percentage of the total population is unable to have an adequately warm home.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Energy Tax	*Fiscal*	*Tax on energy consumption on electricity and natural gas.*	*1996*	*Ongoing*	*Nationwide*	*Fossil electricity for small consumers (<10 000 kWh) is 0.0639 €/kWh, with a partial exemption of 0.02 €/kWh for RES.*			*All end-users who fall within the scope of the EED*
Green Investment and Finance	*Tax Incentive*	*Tax rebate for saver and investors in investments in green projects High-efficiency boiler, cavity wall insulation, roof insulation, floor insulation, HE++ glass, heat pump, solar boiler and/or solar cells.*	*1995*	*Ongoing*	*Nationwide*	*Savers and investors tax advantage of 1.9%. Energy-saving measures up to a maximum amount of € 8 000.*	*Green statement' which shows that they meet certain criteria*		*All end-users that fall within the scope of the EED*

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Green Deal	*Voluntary agreements*	*Non-financial government support for environmentally friendly initiatives.*	*2011*	*Ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*All end-users*
Reduced VAT rate for insulation work	*Tax Incentive*	*For insulation of floors, walls and roofs.*	*2009*	*Dec 2013*	*Nationwide*	*VAT rate from 21% to 6% for insulation improvements in homes*			*Owner occupiers Housing Corporations*
Reduced VAT rate on the labour costs for maintenance and renovation of residential buildings	*Tax Incentive*	*Retrofit and repair activities.*	*March 2013*	*Dec 2014*	*Nationwide*				*Owner Occupiers Housing Corporations*
More with Less: Agreement for energy saving in existing residential and other buildings	*Voluntary Agreements with third party financing*	*Energy advice and audits. All measures to make homes more efficient.*	*2008*	*Dec 2020*	*Nationwide*	*Varies across measures and dependent on property location.*		*Subsidies and tax advantages for measures .*	*Owner-Occupiers Housing Corporations Building Companies Installation Sector*
Home Valuation System	*Legislation*	*Maximum rent depending on the characteristics of the home*	*2011*	*ongoing*	*Nationwide*				*Landlords and Tenants Housing Corporations*
Block-by- Block	*Demonstration projects*	*Retrofit*	*2011*	*2013*	*Nationwide*		*Total funding given by BZK € 5.75m*		*Owner Occupiers Housing Corporations Landlords and Tenants*

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Revolving fund for energy saving	*Loans*	*Retrofit*	*2014*	*ongoing*	*Nationwide*	*Low interest loans with a 12-year payback period*	*NK*	*€5550m*	*Owner Occupiers Housing Corporations Companies*
Energy-saving agreement for the rental sector	*Voluntary Agreements*	*Grants to fund energy-saving measures*	*July 2014*	*Dec 2020*	*Nationwide*	*NK*	*Rent for the property in question must not exceed €700*	*€400m*	*Landlords and Tenants Housing Corporations Building Companies*
Building Regulations	*Regulation*	*Minimum energy efficiency requirement for all new builds*	*1995*	*Ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*New residential buildings, major renovations*

Summary of key interventions

The Energy Tax

The Regulatory Energy Tax was introduced in 1996 for households and small or medium-sized enterprises to encourage energy conservation and renewable energy use by making fossil energy (gas and electricity) more expensive. Green energy has been exempted from tax since 1999. In 2003 the energy tax (REB) on fossil electricity for small consumers (<10 000 kWh) was further raised to 0.0639 €/kWh, with a partial exemption of 0.02 €/kWh for Renewable Energy Sources (RES). With this tax level, green electricity is on average as expensive as regular electricity. The energy tax exemption applies only to renewable electricity possessing a green certificate. The Dutch government applied an annual indexing (to inflation) to all energy taxes and excise duties from 1 January 1999. This tax was automatically levied via the fuel bill. The ecotax aimed to promote energy savings resulting in a reduction of greenhouse gas emissions. REB was levied on gas and electricity, and not on heat.

Green Investment

The umbrella term 'Green Investment' covers both green saving and investment and also green finance. To be eligible for green finance, projects must have a 'green statement' which shows that they meet certain criteria. Green Investment is made possible by two schemes: the Green Funds Scheme and the Green Projects Scheme. The Green Funds Scheme allows investors to invest in specific "green funds" at designated banks, which then finance environmental projects. The interest rate that investors receive is set lower than conventional rates to allow banks to offer cheaper loans to green projects. This lower interest rate is offset by a tax credit and waiver of taxes on dividend and interest payments. This program expands the availability of financing to projects that might not qualify under conventional lending standards. The Green Projects Scheme offers tax rebates for green investment, which covers investments in sustainable building and energy efficiency. As the government gives a tax rebate to savers and investors for investments in green projects, investors can settle for lower payment and banks can lend money for green projects at lower interest. Energy-saving measures can be co-financed and investments in energy efficiency up to a maximum amount of € 8 000 are still excluded from the income assessment. Energy-saving measures include: High-efficiency boiler, cavity wall insulation, roof insulation, floor insulation, HE++ glass, heat pump, solar boiler and/or solar cells.

Green Deal

The Green Deal programme provides non-financial government support for environmentally friendly initiatives with will have positive effects on the Netherlands economy but encounter barriers that threaten the initiative's feasibility. This scheme aims to save energy, materials and water as well as stimulate economic activity from the ground up. The programme is open to individuals and companies. Individual Green Deals are voluntary agreements between an initiator and the government. The government can give several types of support in order to alleviate barriers, such as:

- modifying legislation if possible
- access to relevant networks
- support creating the market for new products or services, e.g. by providing an initial demand for products/services or incorporating initiatives in trade missions
- sharing knowledge e.g. by providing insight into relevant legislation, the process for obtaining permits and possible subsidies.

Reduced VAT rate for insulation work

The reduced VAT rate for home insulation work was a scheme of the Ministry of Finance run by the Tax Office. It involves the reduction of VAT rate from 21% to 6% for insulation improvements in homes. The VAT reduction addresses both owners and tenants of homes older than 2 years. Insulation improvements involve floors, walls and roofs. Eligible insulation materials included glass wool, rock wool and polystyrene the thermal performance of which meets the requirements of the Building Regulations. Windows, doors, window frames and glazing are not included in the scheme. The low VAT rate applies to labour and material costs if the material costs are less than 50% of total costs. If material costs exceed 50% of total costs, then the 6% VAT rate applies only to labour costs.

Reduced VAT rate on the labour costs for maintenance and renovation of residential buildings

The VAT rate for renovation, repairs and garden maintenance of existing houses older than 2 years has since 1 March 2013 been lowered from 21% to 6%. The reduced rate only applies to labour costs and not to the materials used. It concerns a temporary measure until 1 July 2015.

More with Less

The "*More with less*" programme is a joint initiative of the Central Government (ministries of Housing, Spatial Planning and the Environment as well as Economic Affairs), housing corporations (Aedes), construction companies (Bouwend Nederland), the installation sector (UNETO-VNI) and the energy companies (EnergieNed and VME). They have a voluntary agreement for the period leading up to 2020, to make 3.2 million existing buildings 20 to 30% more energy efficient. The programme focuses on enabling building owners to conserve energy with the least possible effort. The entire process, from receiving a certified energy label, up to installing the required energy efficiency measures, is taken care of by the contact person of the building owner. If a building owner is considering making energy efficiency improvements they can search for their property on the *More with less* website to see their indicative energy. They can then select which measures they are interested in and perform calculations showing improvement to the energy label, the annual running cost and the savings. Personalised advice costs between € 200 and € 450 depending on the size of the property. The building owner can then go on to request quotes from registered installers. To overcome financial barriers the programme website acts as a search portal to any available funding for the selected measures (based on national, provincial and municipal offerings). There are varied options available, such as an offer of fixed monthly expenses, meaning the monthly repayments for energy efficiency investments will be at least off-set by the monthly benefit in terms of reduction of the energy bill. This is accompanied with education in cooperation with consumer organisations and feedback on energy use every two weeks. The website is currently also signposting to a grant of € 750.00 for private home owners in the municipality of Sluis for energy saving measures which lead to an improvement of at least 2 steps on the energy label. The website also advertises the two reduced VAT schemes above.

The Home Valuation System

The Home Valuation System sets the maximum rent on the basis of the characteristics of the home. Within this system, points are awarded for quality aspects of dwellings, such as location, floor surface and facilities. The rental prices depend on the total number of points. By including the energy label in the Home Valuation System the maximum rent of the home is linked to its energy label. From 1 January 2014 the Home Valuation System with an energy label applies to all rental homes. The system applies to landlords and housing corporations.

Block-by-Block

Municipalities and businesses are working together on 14 projects to make at least 33,500 homes more energy efficient. In order to reduce costs, the homes concerned are being upgraded block by block.. The aim is to encourage owner-occupiers and landlords to take energy-saving measures with an attractive range of measures and ultimately to encourage the market to operate independently. The pilot started in 2011 with 13 local and one regional project. The local projects are taken on and carried out by market participants in close cooperation with the municipal authorities. The local authority usually plays a directing role. The first 10 000 residential buildings were being prepared by the end of 2012. The measures were actually taken in these buildings in 2013. The pilot will run for a total of three years. In this period sufficient information must be obtained about the possibilities of market concepts which can be applied on a larger scale, particularly experience with the various financing structures, marketing models and forms of quality assurance. The State provides financial support for the additional process costs of the projects and takes care of the distribution of knowledge and experience. The projects received funding from the Ministry of the Interior and Kingdom Relations (BZK) with a project grant of € 350,000 to € 500,000 per project costs. A total of BZK contribution to the projects € 5,750,000. The Netherlands Enterprise Agency evaluated the approach in 2014 in its report 'Blok-voor-blok: de bevindingen' (Block-by-block: the findings).

Revolving funds for energy saving

The National Government uses revolving funds for energy-saving measures in the built environment (existing buildings). This measure promotes energy-saving and employment and ensures that housing remains affordable for Dutch households if energy prices rise. €185 million of central government funds is available for the three funds together (owners, occupiers, landlords and owners' associations). They are looking to find co-finance of € 555 million for the central government funds. The fund for owner-occupiers has now been launched with € 225 million of co-finance from banks. No detailed conditions of how to disburse the money or eligible for subsidy can be found about the National scheme on the Internet.

Information has been located about the Amsterdam Climate and Energy Fund was established in October of last year in the Amsterdam Arena. On market terms, it funds projects costing up to € 5 million that contribute demonstrably to energy conservation, sustainable energy generation and energy efficiency in Amsterdam. For example, it finances the 4,200 solar panels on the roof of the Amsterdam Arena – the second largest solar panel roof in the Netherlands – and invests in OrangeGas gas stations, where vehicles can be refuelled using gas made from biological waste and sewage sludge. Each invested must result in a minimum annual CO2 reduction of 2 kilos. The available sum is sufficient to reduce the total CO2 emissions in Amsterdam by 1.35 million tonnes. This is equal to the average annual emissions of approximately 550,000 cars. Furthermore, the objective is to ensure that the sums with a minimum yield of 7 per cent return to the fund, so that these sums can be invested again once or twice (a so-called revolving fund). There is also a revolving fund for the municipality of Delft – please see http://www.energy-cities.eu/IMG/pdf/infinite_solutions_delft.pdf.

Energy-saving agreement for the rental sector

Since 1 July 2014 it has been possible for landlords in the subsidised rental sector to apply for grants to fund energy-saving measures. The total budget available for the scheme is €400 million. The ministerial order and the conditions for eligibility were published in the Government Gazette. Grants are available to both housing associations and private landlords, and to qualify the monthly rent for the property in question must not exceed €700. Grant applications should be submitted to the Netherlands Enterprise Agency.

Energy Performance Standards for Buildings

Minimum energy efficiency standards for new residential and non-residential buildings have been in place in the Netherlands since 1995. There are separate standards for new residential buildings, major renovations and different types of non-residential buildings. Since 1995 the standards have been tightened several times, and further tightening is proposed for the near future. These set performance standards for energy efficiency of new buildings and under the Dutch Energy Performance Standard. Since the standard is performance-based, it allows flexibility in achieving compliance, as the focus is on total energy performance and not on stand-alone solutions.

Sources:

http://www.meermetminder.nl/

http://ec.pa.eu/energy/sites/ener/files/documents/2014_neeap_en_netherland.pdf

https://www.ecn.nl/news/item/ecn-evaluates-sustainable-projects-for-the-amsterdam-climate-and-energy-fund/

http://www.energy-cities.eu/IMG/pdf/infinite_solutions_delft.pdf

http://ec.pa.eu/energy/sites/ener/files/documents/2014_neeap_en_netherland.pdf

2.13 New Zealand

Policy background

Energy efficiency in New Zealand is set by the Energy Efficiency and Conservation Act (2000). The Act established the Energy Efficiency and Conservation Authority (EECA) as the entity to promote energy efficiency across all sectors of the economy. Energy intensity in New Zealand has declined on average by roughly 1% per year since 1990, in large part due to the country's long history of energy efficiency. In the country's energy efficiency strategy (2010), New Zealand set a target to deliver 15.3 TWh of energy saving across the economy by 2015. This equates to approximately 9% reduction in New Zealand's economy-wide energy intensity. New Zealand's government aims to cut carbon emissions 5% below 1990 levels by 2020. Fuel poverty is a significant public health problem currently estimated to affect 25% of households in New Zealand and the cost of electricity is a key driver.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Warm Up New Zealand: Heat Smart	*Education and Information, Soft loans and Subsidies*	*Ceiling/floor insulation, boiler insulation, pipe lagging, draught-stopping, ground moisture barrier, heating systems*	*2005*	*Ongoing*	*Nationwide*	*Varies*	*Approved service providers fit the measures,*	*Varies between council and bank*	*Owner Occupiers Landlords and Tenants*
Warm Up New Zealand: Healthy Homes	*Subsidies*	*Ceiling/floor insulation, boiler insulation, pipe lagging, draught-stopping, ground moisture barrier, heating systems*	*2009*	*Ongoing*	*Nationwide*	*$1,300*	*Use of approved service provider*	*, $100 million over 2013-2016*	*Owner Occupiers Landlords*
Building Regulations	*Regulation*	*Minimum energy efficiency requirement for all new builds and major extensions*	*2004*	*Ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*All new builds and extensions*

Summary of key interventions

Warm Up New Zealand: Heat Smart

The New Zealand Energy Efficiency and Conservation Strategy 2011-2016 (NZEECS) is specifically focused on the promotion of energy efficiency, energy conservation and renewable energy. This includes a goal for "Warm, dry and energy efficient homes with improved air quality to avoid ill-health and lost productivity".

Warm Up New Zealand: Heat Smart is a soft loan scheme with grants, promoting insulation and clean heating for owner occupier and landlords. The Government's Energy Efficiency and Conservation Authority (EECA) administers the programme, and the state provides funding for grants. The programme provides:

- General home energy efficiency information
- Information on government funding available for home insulation retrofits, clean heat and other energy efficiency solutions
- Information to help consumers improve their energy choices (for example, purchasing and running home appliances)
- Information on energy labeling schemes, such as ENERGY STAR®.

Warm Up New Zealand offers two routes for financing: The first is a loan from the local council to be paid back through an additional charge on the council tax. An example is Auckland Council who offer owner occupier with houses built before the year 2000, up to $5000 towards the cost of insulation and clean heating products. This is then paid back through Auckland Council rates over a nine year period at seven per cent interest. The second is for those homeowners with a mortgage they may be able to have the cost of insulating their home added to their mortgage. This would be paid back with interest over the term of their mortgage. There are currently six banks that offer this initiative.

On top of this national framework EECA will have obtained around $80 million in third party funding over the lifetime of the programme. This funding has been obtained from; private companies, electricity lines companies, charitable trusts, councils, banks, other government agencies, city and regional councils, health boards and other organisations.

Healthy Homes (part of the above scheme)

The Government has invested in a new three-year insulation programme delivering warmer, drier and healthier homes to communities in most need. Budget 2013 allocated $100 million of operating funding over three years to the Warm Up New Zealand: Healthy Homes programme, targeting low-income households for home insulation, particularly households occupied by children and/or the elderly. Warmer, drier homes provide real benefits to New Zealanders. As well as energy efficiency gains, insulating homes reduces health risks caused by cold, damp housing such as respiratory illnesses and serious diseases like rheumatic fever. It is free for eligible households as a result of the Government grants and the support of third-party funders. There may be a charge for landlords of eligible tenants.

Building Code

The current Building Act was passed in 2004 and it requires the efficient use of energy, including new principles to drive energy conservation and facilitate the use of renewable energy. New buildings are required to be designed, constructed and able to be used in ways that promote sustainable development. In response to the 2004 Act, a major review of the Building Code began in 2004, including a complete review of the energy efficiency requirements of the current Code and future energy needs. During 2004, the Energy Efficiency and Conservation Authority (EECA) and the Department of Building and Housing worked to further enhance energy in the Building Code.

The thermal properties of windows are now included in the Code for residential buildings so that most new residential construction in the cooler parts of the country are double-glazed. Various technical research reports have been completed to underpin the major review of the energy requirements of the New Zealand Building Code. To further improve the energy performance of residential buildings, the New Zealand Government amended the Building Code in 2007/08 so new homes require more insulation (in ceilings, walls and floors) and double glazed windows. These requirements apply to all new houses, major extensions to existing houses, to new multi-unit residential apartments, and to new small buildings with a floor area up to 300 square meters (e.g. small shops). It is estimated that houses built to the new Code requirements consume about 30% less energy than houses built to the old Code requirements.

Sources:

http://www.energywise.govt.nz/

http://www.eeca.govt.nz/eeca-programmes-and-funding/programmes/homes/insulation-programme

http://www.wec-policies.enerdata.eu/Documents/cases-studies/NZ_Financing_energy_efficiency_buildings.pdf

http://www.iea.org/policiesandmeasures/energyefficiency/

2.14 Norway

Policy background

Norway aspires to a carbon reduction of 40% from 1990 levels by 2030. While not part of the EU they have adopted several EU directives including, in the energy sector, the European Performance of Buildings Directive. The government owned body Enova SF deliver an energy efficiency information helpline and public campaigns, alongside the administration of several financial interventions.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Local Energy Efficiency Fund in Oslo	*Grant and/or loan*	*Insulation and heating measures (inc. renewables)*	*1981*	*Ongoing*	*Oslo*	*Up to 50 % grant* *Up to 100% soft loan*	*Full year occupation of building*	*NA*	*All buildings within the geographical are.*
Building Regulations 2010	*Regulation*	*Minimum energy efficiency requirement for all new builds*	*2010*	*Ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*All new builds*
Grants for energy measures in private dwellings	*Grant*	*Wide range of measures*	*2012*	*Ongoing*	*Nationwide*	*Dependant on measure and size of dwelling, maximum of 125,000 NOK*	*Measures recommended in building consultancy survey (also funded)*	*Funded through the Energy Fund and levels set by Enova.*	*Owner occupiers*
Grants for energy savings in the built environment	*Grant*	*Energy efficiency refurbishment projects*	*2005*	*Ongoing*	*Nationwide*	*0.2 – 0.5 NOK/kWh* *(0.025-0.06 €/kWh)*	*Projected 10% energy saving for project.*	*Funded through the Energy Fund and levels set by Enova.*	*Investors/developers in domestic housing.*

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Energy Saving Loans	*Soft loan*	*Insulation, heating and controls measures*	*1996*	*Ongoing*	*Nationwide*	*A basic loan is normally given for 60-70 % (maximum 80%) of building costs*(caveat: The most recent data was from 2008):*	*Minimum and maximum standard in terms of size, costs and certain architectural requirements (caveat:Data from 2008):*	*NA*	*Domestic new and existing dwellings.*
Information and advice on energy efficiency and renewable energy	*Advice*	*Advice and potential funding information on a wide range of energy efficiency measures*	*2002*	*Ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*All energy users*
Energy and Environmental Tax	*Taxation*	*Taxes on energy use and associated CO_2 emissions on most fuels*	*1975*	*Ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*All energy users*

Summary of key interventions

Grants for energy measures in private dwellings & Grants for energy savings in the built environment

These schemes are delivered by Enova SF, a Norwegian National Energy Agency owned by the Royal Norwegian Ministry of Petroleum and Energy. They are funded by the National Energy Efficiency Fund, the energy use tax in operation since 1975. A wide range of measures and projects are covered.

* Note – the most recent data found dates from 2008: http://www.measures-odyssee-mure.eu/public/mure_pdf/household/NOR12.PDF

Energy Saving Loans

The Norwegian State Housing Bank offers loans for energy conservation projects as part of its wider Renovation Loans scheme, which also covers funding for disadvantaged or vulnerable groups, and building with special cultural value. Loans are available with either fixed or floating interest rates, with a maximum repayment term of 30 years.

Sources:

http://www.measures-odyssee-mure.eu/topics_out.asp?tipo=Country&Cod_mr=Norway&stato=completed

http://www.iea.org/policiesandmeasures/energyefficiency/?country=Norway

2.15 Sweden

Policy background

Article 3 of the EU Energy Efficiency Directive required Member States to set national non-binding energy savings targets for 2020. Sweden's target was set at the level of 126 TWh of primary energy consumption in 2020. This represents a 20% reduction from 2008 levels. The Swedish government set out a National Energy Efficiency Action Plan in 2014. Sweden does not traditionally spend on energy efficiency financing policies. Rather, the state provides support to facilitate the implementation, such as hosting an online information platform.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Repair, maintenance, conversion or extension rebate	*Tax rebate*	*Wide range of repair, maintenance, conversion and extension measures*	*2008*	*Ongoing*	*Nationwide*	*SEK 50,000 p.a. per property*	*NA*	*NA*	*Owner occupier*
Energiaktiv.se (Energy efficiency online portal)	*Education*	*Advice on improving energy efficiency, from planning through to follow-up.*	*2011*	*Ongoing*	*Nationwide*	*NA*	*NA*	*N/A*	*Owner occupier, tenants and other property owners and managers*
Planning and Construction Act (PCA)	*Regulation*	*Minimum energy efficiency standards for new builds and renovations*	*2010*	*Ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*All new builds and renovation works*
Programme for Buildings with Very Low Energy Use (LAGAN)	*Grant*	*Demonstration projects and local/regional collaboration initiatives.*	*2010*	*2015*	*Nationwide*	*-*	*Energy use of project must be 50% lower than present building regulation requirements, and have significant demonstration value.*	*SEK 54 million*	*All new builds and renovation works*
Testing and Trial of Energy	*Information Dissemination*	*Tests on products consuming large*	*1995*	*Ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*Domestic Households*

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Intensive Products		*amounts of energy, and used in the home*							
Energy and Carbon Tax	*Taxation*	*All energy carriers used for engines and heating, except most biofuels*	*1991*	*Ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*All energy users*
State Aid for Municipal Energy and Climate Advice	*Advice and Information*	*Free, impartial and technology neutral advice and information on energy efficiency options*	*2008*	*Ongoing*	*Nationwide*	*NA*	*NA*	*NA*	*Municipial energy advisers for private individuals and enterprises*

Summary of key interventions

Repair, maintenance, conversion or extension rebate

In Sweden, property owners have the opportunity to receive a tax reduction of 50% of the costs of work to repair, maintain, convert or extend their property. The maximum rebate is SEK 50,000 per annum, and some of these measures are related to energy efficiency.

Energiaktiv.se (Energy efficiency online portal)

The Swedish National Board of Housing, Building and Planning, the Swedish Energy Agency and the Swedish Board of Agriculture host an online platform on energy efficiency improvements. The online portal provides support for energy efficiency in relation to buildings and transport, and includes information for the entire process, from planning to follow-up of measures.

Energy and Carbon Tax

Sweden introduced a general energy excise tax in the 1950's, and the system was significantly modified in 1991. It was at this point that a carbon tax was introduced, with a corresponding reduction in the energy tax, along with additional taxes on nitrous oxide and sulphur emissions. Certain industries and sectors are subject to reductions and special rules but the general domestic levy for electrical energy use is currently SEK 0.293 / kWh and the carbon tax is SEK 1.08 /kg CO2. The combined energy and carbon tax system contributes approximately 4% of Sweden's total government revenue.

State Aid for Municipal Energy and Climate Advice

The Swedish Energy Agency delivers State support, both financially and via training and information, to all of Sweden's 290 municipalities. The municipal energy advisors report on a monthly basis to the Swedish Energy Agency on the nature and number of advice interactions, and the resulting measures adopted.

Sources:

http://ec.europa.eu/energy/sites/ener/files/documents/2014_neeap_en_sweden.pdf

http://ec.europa.eu/energy/sites/ener/files/documents/article7_en_sweden.pdf

http://www.measures-odyssee-mure.eu/topics_out.asp?tipo=Country&Cod_mr=Sweden&stato=completed

http://www.iea.org/policiesandmeasures/energyefficiency/?country=Sweden

2.16 Switzerland

Policy background

In Switzerland's Action Plan for Energy Efficiency introduced in 2008, a target was set to reduce CO_2 emissions and consumption of fuels use by 20% by 2020, and to cap electricity demand growth at 5% between 2010 and 2020. In February 2015, Switzerland communicated its contribution to a UN climate change deal: 50% greenhouse gas cuts on 1990 levels by 2030. Switzerland is, however, a highly decentralised federal state, and energy efficiency efforts are a joint collaboration between the federal government, the 26 cantons, municipalities, industry and consumers.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
National building support programme of the Climate Cent Foundation	*Grant*	*Building envelope, guidance and communication*	*2008*	*2019*	*Switzerland*	*Partial coverage, the remaining can be covered by mortgage*	*Assessment of the property required beforehand*	*CHF 118 million by 2010*	*Owner occupier*
Energy efficiency improvements in rental dwellings	*Regulation*	*Energy efficient equipment, building envelope, renewable energy, appliances*	*2008*	*N/A*	*Switzerland*	*-*	*Estimate of potential gains in energy efficiency achievable needed*	*-*	*Owner occupier and tenants*
Refurbishment standards for heat demand	*Standard*	*Heating, building envelope*	*2008*	*N/A*	*Switzerland*	*NA*	*NA*	*NA*	*Owner occupier*

Summary of key interventions

National building support programme (Climate Cent Foundation)

The Climate Cent Foundation (now the Buildings Programme) is funded by a 1.5 cent per litre charge levied on all petrol and diesel imports. Revenue from the levy goes towards energy renovation of existing buildings envelopes, i.e. roofs, walls and windows.

Energy efficiency improvements in rental dwellings

60% of the Swiss population are private tenants, and Switzerland has aimed to introduce incentives to invest in renovation of rental dwellings. In 2008, the country made an amendment of the rental law to in theory make it easier for owners to pass on the costs from energy-related investments to the tenants. However, it is still not fully clear how the investments may be considered 'energy-saving'.

Refurbishment standards for heat demand

In 2008, the government amended the energy efficiency standards to limit the heat demand in of buildings to be refurbished to 90 kWh per square metre. This is a 30% reduction in the threshold from the previous standard.

Sources:

www.rtcc.org/2015/02/27/switzerland-issues-pledge-for-un-climate-change-pact/#sthash.yIrQfxou.dpuf

http://www.iea.org/policiesandmeasures/energyefficiency/?filter=masssave

http://www.dasgebaeudeprogramm.ch/index.php/fr

http://www.europeanclimate.org/documents/LR_%20CbC_study.pdf

2.17 Massachusetts

Policy background

The Global Warming Solutions Act (GWSA), signed in August of 2008, requires reductions from all sectors of the economy to reach a target of a 25% reduction of Greenhouse Gas (GHG) emissions by 2020, and an 80% reduction by 2050. In 2008, the state legislature passed The Green Communities Act (GCA), which mandated the acquisition of all cost-effective energy efficiency and stimulated Program Administrators (PAs) in Massachusetts to reconsider the design and delivery of energy efficiency programs. Five electricity PAs and six gas PAs have been implementing successful energy efficiency programs for more than 25 years and 15 years respectively. Though some PAs had collaborated on delivery, each program in each service territory was essentially unique. After the GCA was passed, a state-wide approach was taken and the MassSAVE brand was born. Largely due to the Mass Save program, Massachusetts has consistently been named #1 State in energy efficiency by the American Council for an Energy Efficient Economy (ACEEE).

Massachusetts passed the Global Warming Solutions Act in 2008, which requires an 80% reduction in greenhouse gas emissions below 1990 levels by 2050. An interim target was also set, whereby emissions must reduce 10-25% below 1990 levels by 2020. Interim targets will need to be set for 2030 and 2040 as well.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Mass Save	*Loans, rebates*	*Heating and cooling, lighting, appliances; guidance; communication*	*2008*	*Ongoing*	*Customers in Massachusetts of utilities such as Columbia Gas, Berkshire Gas, Cape Light Compact, Eversource, National Grid, Liberty Utilities and Unity*	*Up to $25,000 at 0% interest rate*	*Must obtain a Home Energy Assessment through Mass Save*	*NK*	*Owner occupier and tenants*
Massachusetts State Building Code	*Regulation*	*Minimum energy efficiency standards for new buildings*	*2008*	*NA*	*State-wide*	*NA*	*NA*	*NA*	*NA*

Summary of key interventions

MassSAVE

Mass Save is an initiative sponsored by Massachusetts' gas and electric utilities and energy efficiency service providers. In collaboration with the Massachusetts Department of Energy Resources, the program provides a wide range of services, incentives, trainings, and information which help residents and businesses manage energy use and related costs.

Massachusetts State Building Code

The state building code is set by the Massachusetts Board of Building Regulations and Standards. It is revised regularly and aligns with the IECC codes.

Sources:

http://www.masssave.com/

http://www.mass.gov/eea/air-water-climate-change/climate-change/massachusetts-global-warming-solutions-act/#1

2.18 California

Policy background

In 2004, the California Public Utilities Commission adopted aggressive ten-year energy savings goals. This included efficiency benchmarks for investor-owned utilities' energy efficiency programs. The CPUC allows utilities to develop their own programs, which are evaluated, measured and verified by the CPUC. In 2005, governor Arnold Schwarzenegger issued an executive order which established state-wide greenhouse gas emissions reduction targets to 2000 levels by 2010, 1990 levels by 2020 and 80% below 1990 levels by 2050. The governor also mandated a cap on emissions at 1990 levels by 2020, the first mandatory emissions cap in the US with enforceable penalties.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
City of San Francisco Residential Energy Efficiency Rebate	*Rebate*	*Insulation, air & duct sealing, improved heating and cooling*	*NK*	*Ongoing*	*San Francisco*	*$5000*	*Must use participating contractor*	*NK*	*Owner occupiers*
Municipal PACE financing	*PACE*[*]	*Locally determined*	*2008*	*NA*	*Municipalities across CA*	*Locally determined*	*Locally determined*	*Locally determined*	*Owner occupiers*
Energy Upgrade California	*Rebate*	*Equipment Insulation, Furnaces , Central Air conditioners, Duct/Air sealing, Building Insulation, Windows, Custom/Others pending approval*	*NK*	*Ongoing*	*California*	*$4500*	*Minimum required energy savings of 15% for Advanced Upgrade Package; must use participating contractor*	*NK*	*Owner occupiers*
Alameda Municipal Power Residential Energy	*Grant*	*Weatherproofing*	*NK*	*Ongoing*	*City of Alameda*	*$960 per unit*	*Pre-installation audit required*	*NK*	*Owner occupiers, tenants*

[*] Property Assessed Clean Energy (PACE) Funding is a way to finance renewable or energy efficiency retrofits, where a loan is offered and paid back through property tax bills over 15 to 20 years.

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Efficiency Grant Program									
SMUD Residential Energy Efficiency Loan	*Loan*	*Heating, cooling, duct/air sealing, insulation, windows, roofs*	*NK*	*Ongoing*	*City of Sacramento*	*$30,000 (secured)*	*Pre- and post-energy assessment required*	*NK*	*Owner occupiers*
Building Energy Efficiency Standards	*Regulation*	*Minimum energy efficiency standards for new construction or renovations*	*2013 (updated)*	*NA*	*State-wide*	*NA*	*NA*	*NA*	*NA*

Summary of key interventions

City of San Francisco Residential Energy Efficiency Rebate

Single family homeowners in San Francisco's PG&E territory can receive Green Home Assessments, which provide detailed reports showing energy loss, heat tests, and a list of improvements that will achieve the energy savings goals for San Francisco's Home Improvement & Performance Program. These potential improvements might include insulation, air & duct sealing, and heating and cooling systems. Approved contractors will help home owners complete the paperwork to receive the incentives for achieving at least 15% energy efficiency improvements based on "before and after" computer modelling.

Municipal PACE financing

California amended its state law in July 2008 to enable cities and counties to offer PACE financing programs to property owners. Financing may be used for improvements to developed property only if the property owner agrees to a contractual assessment on his/her property tax bill for up to 20 years. To be eligible, a property owner must have a clean property title and must be current on property taxes and mortgages.

Energy Upgrade California

The Energy Upgrade California program provides California homeowners with energy efficiency opportunities for their homes. The program connects homeowners with qualified contractors, who help them find all the available incentives from their local utilities and local governments. Homeowners can choose from two Energy Upgrade packages: the Basic Upgrade Package and the Advanced Upgrade Package. Note there are many more utility-funded rebate and loan programs, but these have been omitted to avoid duplication,

Alameda Municipal Power Residential Energy Efficiency Grant

Alameda Municipal Power (AMP) offers a grant to help residential customers with weatherproofing their homes. To participate in the weatherproofing program, customers must complete and send in a Weatherproofing Grant Application Form (if applicant is the tenant, landlord signature is required), then a pre-installation audit is required. Customers may use any contractor with a City of Alameda Business License to complete the work. The completed project must be inspected by AMP with a copy of the paid invoice. AMP will then pay the contractor 80% of the cost (up to $960 per single family unit or $480 per multifamily unit), after which the contractor will bill the customer for the remaining 20%. AMP will also cover up to 70% of the project cost for customers who personally weatherproof homes without the use of a contractor.

Sacramento Municipal Utility District (SMUD) Residential Energy Efficiency Loan

Sacramento Municipal Utility District offers financing to help residential customers finance energy efficient home improvements. SMUD offers two separate loan programs: an Equipment Efficiency Loan and a Home Performance Loan. For the Equipment Efficiency Loan, SMUD offers financing at an interest rate of 6.99% for secured loans or 10.75% for unsecured loans. Secured loans cover improvements related to Heating Ventilation and Air Conditioning (HVAC), cool roofing, insulated siding, windows and renewable energy projects. Unsecured loans include building insulation, duct testing, duct sealing and other envelope improvements. The installation must be performed by a SMUD approved participating contractor. For the Home Performance Loan, installations must comply with SMUD's Home Performance Program specifications and eligibility guidelines. In addition, participating homes must receive an energy assessment before and after the installation, which must achieve at least a 15% electricity savings.

Building Energy Efficiency Standards

California has enacted the 2013 Building Energy Efficiency Standards (BEES), which set mandatory state-wide building codes for both residential and non-residential buildings. The codes are meant to be updated regular to reflect technological improvements. The BEES focus on key areas for new construction and existing building renovations, such as windows, envelope insulation and HVAC system testing. The standards are expected to reduce state-wide annual electricity consumption by approximately 613 GWh annually.

Sources:

http://energy.gov/savings/city-san-francisco-residential-efficiency-rebates

http://www.pacenow.org/resources/all-programs/

http://www.energyupgradeca.org/en/

http://energy.gov/savings/alameda-municipal-power-residential-energy-efficiency-program

https://www.smud.org/en/residential/save-energy/rebates-incentives-financing/financing.htm

http://bcap-ocean.org/state-country/california

2.19 Oregon

Policy background

The state of Oregon is considered a leader in energy conservation, and has a long history of addressing environmental challenges. Nearly 40 years ago, Governor Tom McCall established a state emergency energy conservation program, and more than 30 years have passed since incentives and loan programs were created for residents and businesses to invest in renewable energy and energy efficiency. In 2007, the governor signed a bill which set state-wide greenhouse gas emission targets. After 2010 emissions cannot increase, and by 2020 emissions should be 10% below 1990 levels, ad 75% below 1990 levels by 2050.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Clean Energy Works	*On-bill finance scheme*	*High efficiency heating systems, air/duct sealing, attic/wall/floor insulation, water heating, windows, solar*	*2011*	*2015*	*State-wide (started as pilot in city of Portland)*	*Up to $30,000*	*NK*	*$10 million (2013-15)*	*Owner occupiers and tenants*
State Energy Loan Program	*Loan*	*Water heating, lighting, chillers, boilers, heat pumps, air conditioning, CHP, heat recovery, thermostats, BMS, Caulking/Weather-stripping, Duct/Air sealing, Building Insulation, Windows, Motors, Irrigation, Wastewater treatment*	*1981*	*Ongoing*	*State-wide*	*No legal maximum but loans range between $20,000 and $20 million (the latter to organisations, not individuals)*	*Loan term cannot exceed project life*	*NK*	*Individuals, businesses, schools, cities, counties, special districts, state and federal agencies, public corporations, cooperatives, and non-profits*
Residential Energy Tax Credit	*Tax rebate*	*Water heaters, Furnaces , Heat pumps, Heat recovery, Duct/Air sealing, heat recovery, natural gas or propane fireplaces*	*2006*	*2018*	*State-wide*	*$6000*	*NK*	*NA*	*Owner occupiers and tenants*

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Home Energy Solutions for Existing Homes	*Rebate*	*Equipment Insulation, Water Heaters, Furnaces, Boilers, Heat pumps, Duct/Air sealing, Building Insulation, Windows, etc.*	*NK*	*Ongoing*	*Within service territory of Portland General Electric, Pacific Power, NW Natural, Cascade Natural Gas*	*NK*	*Minimum efficiency levels for equipment*	*NK*	*Owners occupiers*
Residential Energy Star Appliance Rebate Program	*Rebate*	*Clothes Washers, Refrigerators/Freezers*	*NK*	*Ongoing*	*Electric service customers of Portland General Electric (PGE) and Pacific Power and to Oregon residential natural gas service customers of NW Natural and Cascade Natural Gas*	*$70*	*Clothes Washers: MEF of 2.4 or higher; Refrigerators must be 30% more efficient than federal standards*	*NK*	*Owner occupiers and tenants*
Oregon Residential Specialty Code	*Regulation*	*Minimum energy efficiency standards for new buildings*	*2011 (updated)*	*Ongoing*	*State-wide*	*NA*	*NA*	*NA*	*NA*

Summary of key interventions

Clean Energy Works

Clean Energy Works began as a pilot program in 2009 run by the City of Portland. In 2010, the U.S. Department of Energy awarded $20 million to expand the program beyond Portland and serve homeowners in Oregon. To facilitate this expansion, the non-profit organisation Clean Energy Works Oregon Inc (CEW) was created to deliver energy efficiency services to homeowners throughout Oregon. CEW subsequently received an $18 million sub-recipient award and Clean Energy Works Oregon programme (CEWO) was officially launched in March 2011.

The state-wide energy efficiency retrofitting program features low-interest financing and incentives for residential homes (owner-occupied and rental) by providing on-bill loan repayment through heating utilities. Though the primary focus of the CEWO is to transform the residential market for whole home energy retrofits, large and small commercial energy efficiency retrofits are also delivered.

There is no upfront costs and CEW's local lending partners offer attractive rates and terms specifically for this program. Credit requirements vary by lender and loan rates and length of terms vary on a project-by-project basis. CEWO initially required participant loan interest rates not exceed 5.99%; however with multiple lenders/loan options now available, interest rates and terms remain competitive. In general, loans are with around 6% interest rate with a 10- to 15-year term. Historic loan losses remain under 0.5%.

Loans are either paid on utility bills or directly to lenders. The local utility is compensated for being a conduit for repayment but does not take on the risk of non-payment. Loan can be transferred across homeowners for a fee.

State Energy Loan Program

Individuals, businesses, schools, cities, counties, special districts, state and federal agencies, public corporations, cooperatives, tribes and non-profits are able to acquire loans through the Energy Loan Program, which started in 1981. The program offers fixed rate loans for projects involving energy efficiency, renewable energy or material recycling. Due to the variety of types of borrowers, the loans can range anywhere from $20,000 to $20 million.

Residential Energy Tax Credit

Home owners and tenants who pay Oregon income taxes are able to claim Residential Energy Tax Credit (RETC) if they purchase qualified heating, efficiency, and renewable energy systems. The amount of the tax credit is based upon the first year energy savings of the eligible measure installed.

Home Energy Solutions for Existing Homes

Energy Trust of Oregon offers a variety of rebates through its Home Energy Solutions program. Participants are required to schedule a free home energy review with an Energy Trust home energy advisor, who will recommend energy-saving measures, install up to four free CFLs and advise the homeowner how to take advantage of the state's Residential Energy Tax Credit.

Residential Energy Star Appliance Rebate Program

Energy Trust of Oregon offers rebates for Energy Star refrigerators, freezers and clothes washers to residential customers of Portland General Electric (PGE) and Pacific Power, NW Natural and Cascade Natural Gas. Appliances are required to meet efficiency standards set by the program.

Oregon Residential Specialty Code

In 2011, the state updated the residential building code, which includes an energy efficiency section. The new code is expected to achieve 10-15% greater energy savings compared the 2008 specialty code.

Sources:

http://www.cleanenergyworksoregon.org

http://www.oregon.gov/energy/LOANS/pages/index.aspx

http://www.oregon.gov/energy/residential/pages/residential_energy_tax_credits.aspx

http://energy.gov/savings/home-energy-solutions-existing-homes

http://www.energystar.gov/ia/partners/manuf_res/downloads/Appliance_and_Recycling_Quick_Start_Guide.pdf

2.20 Rhode Island

Policy background

Rhode Island participates in the Regional Greenhouse Gas Initiative, an initiative by states in North eastern US and provinces and Eastern Canada to reduce greenhouse gas initiatives. Rhode Island directs revenues from this initiative to state energy efficiency programmes. In 2001, the governor signed onto the Climate Change Action Plan, an agreement between governors in New England and premiers in Eastern Canada. By signing the agreement, Rhode Island committed to reducing state-wide greenhouse gas emissions to 1990 levels by 2010, 10% below 1990 levels by 2020 and 75-85% below 2001 levels in the long-term.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
National Grid Electric EnergyWise	*Utility rebate*	*Appliances, lighting, heating, duct/air sealing, insulation, etc.*	*NK*	*2013*	*National Grid customers*	*NK*	*Appliances must be ENERGY STAR*	*NK*	*Owner occupiers and tenants*
National Grid Gas EnergyWise	*Utility rebate*	*Heating, weatherproofing, insulation, water heating*	*NK*	*2012*	*National Grid customers*	*$2000 (single family)*	*Post-installation audit*	*NK*	*Owners occupiers and tenants*
One and Two Family Dwelling Code	*Regulation*	*Minimum energy efficiency standards for single and two-family dwellings*	*2013 (updated)*	*NA*	*State-wide*	*NA*	*NA*	*NA*	New buildings – single and two family dwellings

Summary of key interventions

National Grid EnergyWise (Electric)

National Grid offers a variety of energy efficiency incentives for residential customers, who are interested in purchasing and implementing insulation upgrades, HVAC equipment, appliances, pool pumps, lighting fixtures and other measures. Certain measures are offered as a comprehensive package.

National Grid EnergyWise (Gas)

Interested customers who heat with gas, oil, or propane can schedule a free home energy audit through National Grid. Once the recommended measures have been installed and inspected, National Grid will provide a rebate of 75% up to $2000.

One and Two Family Dwelling Code

Rhode Island has adopted energy efficiency standards for new buildings for single and two-family homes. These are based on the 2012 IECC codes.

Sources:

http://energy.gov/savings/national-grid-gas-residential-energywise-rebate-programs

http://www.energy-grants.net/national-grid-residential-electric-energy-efficiency-incentive-programs/

2.21 Vermont

Policy background

As of 2007, Vermont introduced sector specific targets related to building energy efficiency, these include reducing both fuel use and energy bills by 25% in 60,000 homes by 2017, and 80,000 homes by 2020 and reducing fuel needs and fuel bills by an average of 25% in housing units served by energy utilities. Vermont's building requirements complement the reduction targets set and are more stringent than the standard US code of 2009, IECC. Funding is offered by utilities in Vermont to support energy efficient improvements to homes. In 2000, Efficiency Vermont, the state's provider of electric energy efficiency services, was created. It is funded by an "energy efficiency charge" that is included in customers' monthly electric bills. In 2009, the state allocated a $30 million budget for electric efficiency programs, which is equivalent to 4.4% of utility revenues; this share is more than any other state and roughly 5 times the national average. State gas efficiency programs also lead the nation, with the highest relative spending levels of any state. As well as setting energy efficiency targets Vermont has established utility performance incentives for Efficiency Vermont to encourage targets to be achieved. In 2006, the governor signed a bill which established state-wide greenhouse gas emissions targets. Emissions are to reduce by 25% below 1990 levels by 2012, 50% by 2028, and 75% by 2050.

Overview table of all energy efficiency interventions

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
District PACE financing	*PACE financing*	*Locally determined*	*2009*	*Ongoing*	*Individual districts*	*$30,000 or 15% of assessed property value (whichever is less)*	*Locally determined*	*Locally determined*	*Owner occupiers*
Home Performance with Energy Star	*Rebate*	*Comprehensive measures, whole building*	*NK*	*2013*	*State-wide*	*$2100*	*Must be performed by approved contractor*	*NK*	*Owner occupiers*
Vermont Residential Energy Efficiency Rebate Program	*Rebate*	*Washers, refrigerators/freezers, dehumidifiers, water heaters, lighting, pool pumps, LED lighting, other*	*NK*	*Ongoing*	*State-wide*	*NK*	*Energy Star rated appliances*	*NK*	*Owner occupiers and tenants*
Vermont Gas Residential Energy Efficiency Program	*Rebate*	*Water heaters, furnaces, boilers, heat recovery, duct/air sealing, building insulation,*	*NK*	*Ongoing*	*Vermont Gas customers*	*$600 (boiler)*	*For new construction rebates: Home Energy Rating*	*NK*	*Owner occupiers*

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
		comprehensive measures/whole building					*score of 75 points or less*		
Vermont Gas Rebate and Loan Program	*Loan/Rebate*	*Furnaces, boilers, duct/air sealing, insulation, etc.*	*NK*	*Ongoing*	*Vermont Gas customers*	*33.3% of cost (Rebate) or 66.7% of cost (Loan)*	*Must use at least 0.5 Ccf per square foot of natural gas in one year; landlord authorization required*	*NK*	*Owner occupiers and tenants*
Burlington Electric Residential Energy Efficiency Rebate Program	*Rebate*	*Appliances, water heater, lighting*	*NK*	*Ongoing*	*Burlington Electric customers*	*$2000*	*Subject to verification from Burlington Electric Department*	*NK*	*Owner occupiers and tenants*
HVAC Equipment Rebate Program	*Rebate*	*Air conditioning systems, central wood pellet boilers and furnaces*	*NK*	*2015*	*State-wide*	*Cannot exceed 100% of equipment purchase price*	*Must meet SEER, EER, ENERGY STAR and HSPF requirements*	*NK*	*Owner occupiers*
Residential Heating System Upgrade Program	*Rebate*	*Furnaces, boilers, heat pumps*	*NK*	*2015*	*State-wide*	*Cannot exceed 100% of the equipment purchase price*	*Minimum efficiency standards; must be installed by an Efficiency Excellence Network residential heating system contractor and per the VT Residential Building Energy Standards*	*NK*	*Owner occupiers*

Intervention	Type of policy	Measures or type of action covered	Timeframe		Geographical coverage	Subsidy			Target group
			Start	End		Level available	Specific requirements	Available Funding	
Residential Rental Property Rebate Program	*Rebate*	*Refrigerators/freezers, lighting, furnaces, boilers, etc.*	*NK*	*Ongoing*	*State-wide*	*Total may not exceed 100% of the equipment purchase price; more than 15 CFLs per apartment, or 100 CFLs per project should be pre-approved*	*Equipment must be new, refrigerators and ventilation fans must meet ENERGY STAR criteria; CFLs are for tenant apartments only*	*NK*	*Owner occupiers`*
Residential Building Energy Standards	*Regulation*	*Minimum energy efficiency standards for new residential construction and renovations*	*2014 (updated)*	*NA*	*State-wide*	*NA*	*NA*	*NA*	*NA*

Summary of key interventions

District PACE Financing

Local governments in Vermont are able to create PACE Districts to provide financing to residential property owners for renewable energy and energy efficiency projects. Eligible energy efficiency projects include measures that are permanently attached to the property and reduce the net energy demand of the building. Participants will need to conduct an energy audit to quantify project costs, energy savings and carbon impacts.

Home Performance with Energy Star

Efficiency Vermont offers homeowners several incentives to pursue comprehensive energy efficiency projects. The first step is to conduct an audit by a certified contractor. If efficiency upgrades meet the minimum requirement, a $250 rebate is available. Additional incentives (up to $2100) are also available for additional measures. The contractor will provide the homeowner with rebate application materials once the improvements have been completed and improvements have been made.

Vermont Residential Energy Efficiency Rebate Program

Efficiency Vermont provides incentives for residential customers to install Energy star equipment. Customers must visit a participating store (Efficiency Vermont Retail Partner Store) and complete the rebate forms provided by the store.

Vermont Gas Residential Energy Efficiency Program

The program offers rebates for residential customers who replace existing heating equipment or water heater with more energy efficient equivalents. The rebate can vary depending on the technology, with water heaters qualifying for $100 and hot water boilers $600. All equipment must meet program efficiency requirements, and customers can choose any contractor that is natural gas certified. For new construction, rebates are given for homeowners and builders, including no-cost technical assistance and home energy ratings.

Vermont Gas Rebate and Loan Program

Vermont Gas customers who consume at least 0.5 Ccf of natural gas per square foot over the past year can receive a rebate up to one third of the installed cost of approved measures They can also receive reduced interest loan through the Green Mountain Credit Union for the remaining balance (0% for up to 3 years, 2% for up to 5 years, 4% for up to 10 years). Low income customers are eligible for enhanced incentives.

Burlington Electric Residential Energy Efficiency Rebate Program

Burlington Electric Department offers rebates to encourage customers to upgrade to energy efficient equipment in their homes. All installations are subject to verification from BED.

HVAC Equipment rebate Program

Efficiency Vermont offers rebates for residential installations of certain air conditioning systems and central wood pellet boilers and furnaces.

Residential Heating System Upgrade Program

Efficiency Vermont offers $500 rebates to homeowners for the installation of energy efficient propane and oil furnaces and boilers. The program also offers $300 discounts for cold climate heat pumps if purchased from a participating distributor.

Residential Building Energy Standards

These mandatory building energy standards, updated in 2014, apply to all new homes and renovations covering over 500 ft^2 for buildings built after 1998. The codes are based on the 2015 IECC codes.

Residential Rental Property Rebate Program

Efficiency Vermont offers rebates to rental property owners for the installation of energy efficient equipment in existing multifamily apartments. Managers of multifamily apartments may apply for rebates for new and efficient equipment, and custom rebates are also available.

Sources:

https://www.efficiencyvermont.com/For-My-Home/ways-to-save-and-rebates

http://publicservice.vermont.gov/topics/energy_efficiency

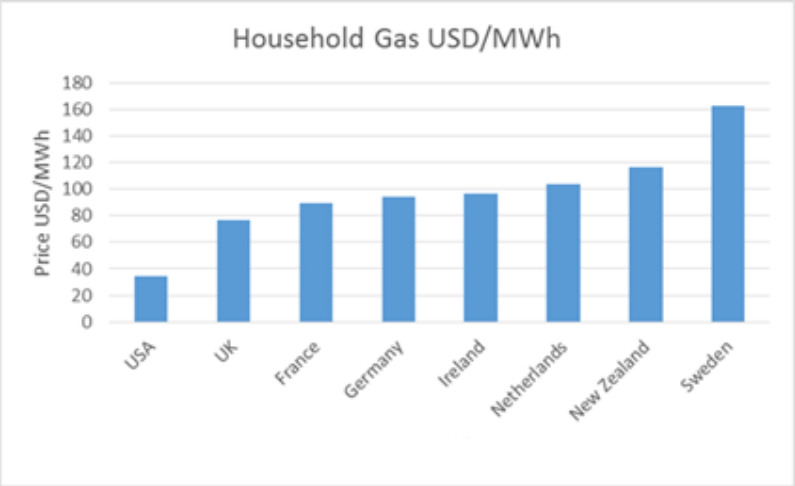
http://energy.gov/savings/vermont-gas-residential-energy-efficiency-loan-and-rebate-program

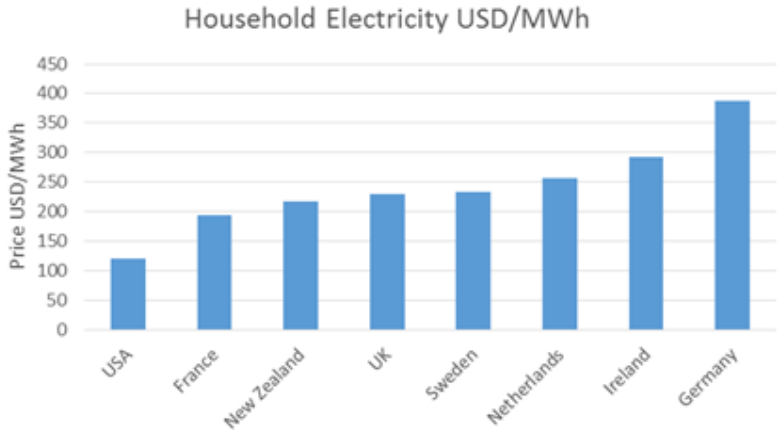
https://www.efficiencyvermont.com/docs/for_partners/eehc/evt-eehc-heating-system-rebate-form.pdf

3 Phase 2 Case Studies

3.1 Domestic Energy Prices

To avoid repetition in the case studies below the following charts compare household energy prices in the countries selected for this study [1].





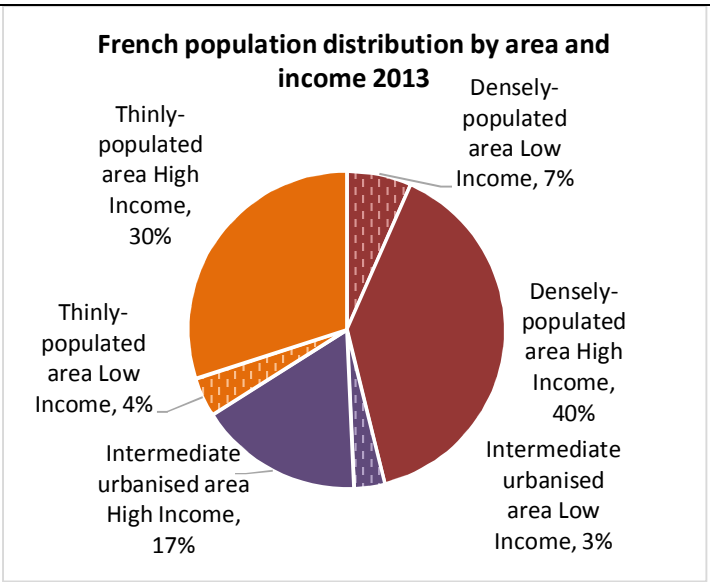
Nb. Tax component includes all taxes where not refundable on purchase.

Source:

[1] UK Department for Energy and Climate Change, Domestic electricity prices in the IEA, March 2015, https://www.gov.uk/government/statistical-data-sets/international-domestic-energy-prices

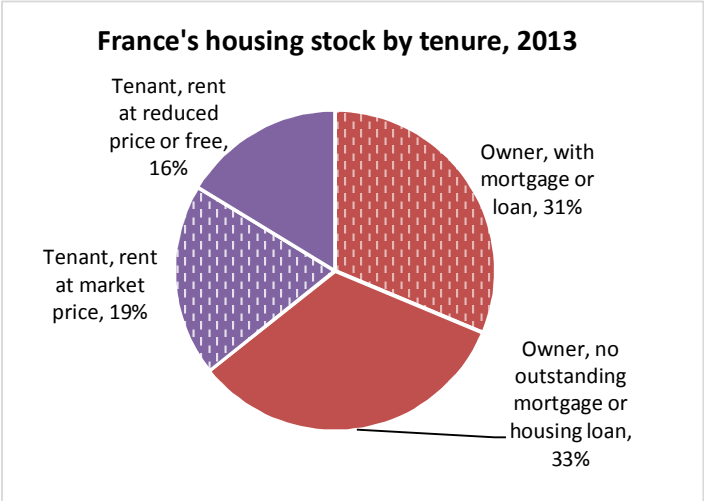
3.2 France

Country	France
Country Context	***France Policy Background*** Article 3 of the EU Energy Efficiency Directive required Member States to set national non-binding energy savings targets for 2020. France's target was set at the level of 1528 TWh for final energy consumption. This represents roughly a 15% reduction in final energy consumption, relative to 2009 levels. The French government set out its Energy Efficiency Action Plan in 2012 (updated in 2014). Within the domestic sector the key policies for delivering retrofit are CITE, Eco-PTZ, and Eco-PLS. New builds are also targeted with stringent building codes (RT2012). As part of the EU Climate and Energy Package Effort Sharing Decision, France has an emissions target of 14% below 2005 levels by 2020. There are an estimated 3.8 million households (14.4% of population) in France in which people are considered to live in "fuel poverty" ("pauvreté et precarité énergétique" [1, 2]). To combat this, France has put in place a number of curative and preventative policies. Aside from the loans and rebates listed below, they have instituted affordable fuel tariffs for low-income households, and other fuel- and water-related housing assistance programs. **Key demographics** The chart below [3] shows the distribution of French population by living area and income. Population can be split by densely, intermediate and thinly populated areas (proxy for rural and urban distribution), with nearly half living in densely populated zones. Note that high income is defined as above 60% of the median equivalised income, as per the Eurostat data. Equivalised income is defined as household net income, divided by the number of equivalised adults in the household. (http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Equivalised_disposable_income) In terms of age profile, France has a somewhat ageing population [4]. The distribution in 2014 was: • 0-14 years: 18.7% • 15-24 years: 11.9% • 25-54 years: 38.6% • 55-64 years: 12.5% • 65 years and over: 21.1%

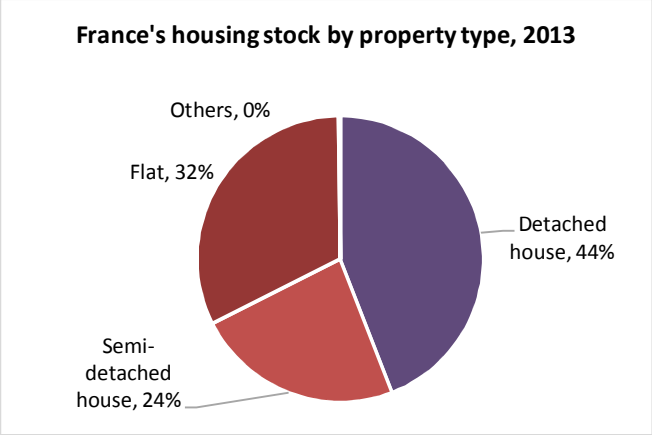


Housing Stock

The charts below shows the French housing stock data [5] by tenure and property type. Approximately two-thirds are owners and one-third renters. 16% of the population are tenants who benefit from reduced price or free rent.



Property types are also approximately evenly distributed between flats, detached and semi-detached houses.



Domestic Energy Prices

Domestic energy prices are shown in Section 3.1. France's electricity prices are the second least expensive. While French electricity prices after tax are in line with those in several other countries, the tax component is significantly larger, making up approximately 31% of the cost. Domestic gas prices in France are the second least expensive for countries in this study.

Selected Interventions

1. Energy Transition Tax Credit (*Crédit d'Impôt Transition Energétique – CITE*)
2. Eco zero-interest loan (*Eco Prêt à taux zéro – Eco-PTZ*)
3. Eco loan for social housing (*Eco Prêt logement social – Eco-PLS*)
4. White certificates (Certificats d'économies d'énergie)

Linkages between schemes

The white certificates scheme (certificats d'économies d'énergie – CEE) was first introduced in 2005. It is the main policy instrument in France for delivering buildings retrofits and requires energy providers to meet the set targets for triannual energy savings. The CIDD scheme (precursor of CITE) was first introduced in 2005 as a way to diffuse new high-efficiency technologies into the market and to support renovation works in households. In August 2009, France adopted the first Grenelle law, which set targets for energy reduction in the building sector. These targets were reinforced by a second Grenelle law, adopted in July 2010. Specifically, a target was set for a minimum of 38% reduction in energy consumption of the building sector by 2020. In order to achieve the aims set out by Grenelle,

France raised amount of benefits that could be claimed for renovation works (CITE tax credits) in addition to introducing green loan schemes (éco-PTZ, éco-PLS). These schemes benefit the housing sector only; other schemes have been introduced for non-domestic buildings (e.g. green loans for companies, "prêts verts").

It is worth noting that the Eco-PTZ can be cumulated with the CITE (and other benefits), as long as the income of the household in the year n-2 does not exceed €25,000 for a single person or €35,000 for a couple, with €750 extra per dependent.

<table>
<tr><td colspan="2">Country</td><td>France</td></tr>
<tr><td colspan="2">Intervention</td><td>1. Energy Transition Tax Credit (Crédit d'Impôt Transition Energétique – CITE)</td></tr>
<tr><td colspan="2">Timeframe</td><td>Started in 2005 (as the CIDD). Runs yearly; current scheme from Sept 2014 – Dec 2015. Conditions are re-voted every year in the government's financial budget ("la loi de finance"). No end date envisaged as 2020 and 2030 EU climate goals need to be met.</td></tr>
<tr><td colspan="2">Geographical Coverage</td><td>Nationwide</td></tr>
<tr><td colspan="2">Target group</td><td>Owners and tenants (main residences only; domestic buildings must be at least 2 years old)</td></tr>
<tr><td>1</td><td>Intervention architecture and logic</td><td>In an interview conducted for this study, Elodie Trauchessec of ADEME, explained that in order to increase the likelihood of meeting the targets set out by the Grenelle laws (minimum of 38% reduction in energy consumption in buildings by 2020), the French government replaced the CIDD with the Energy Transition Tax Credit (CITE) in Sept 2014. Just like its predecessor, the CITE scheme aims to improve the energy efficiency of households by refurbishing them. Renovation works and renewable energy installations undertaken between Sept 2014 and Dec 2015 are eligible to CITE, as long as they can be found in the list below. It is worth noting that the CITE is voted every year in government and thus terms and conditions fluctuate year by year. This has led to conflict with industry as certain markets may become heavily subsidised and others not [7].

Table: Works eligible to the CITE [8]
<table>
<tr><td colspan="2">Eligible works (for CITE in the metropole)</td></tr>
<tr><td>Type of work</td><td>Eligible equipment</td></tr>
<tr><td rowspan="3">Energy savings</td><td>Condensation boilers</td></tr>
<tr><td>Gas fired micro-CHP</td></tr>
<tr><td>Heat regulating devices</td></tr>
<tr><td rowspan="5">Thermal insulation</td><td>Thermal insulation materials for opaque partitions (floor, roof, wall, ceiling)</td></tr>
<tr><td>Thermal insulation materials for partitions with glazing (windows, door-windows, etc.)</td></tr>
<tr><td>Insulating shutters</td></tr>
<tr><td>Front doors</td></tr>
<tr><td>Insulation materials</td></tr>
<tr><td rowspan="3">Renewable heating equipment</td><td>Heating equipment for space heating or domestic hot water</td></tr>
<tr><td>Electricity generating systems (excluding PV panels)</td></tr>
<tr><td>Heat pumps (excluding air/air) producing heat for space heating or domestic hot water</td></tr>
<tr><td>Other expenses</td><td>Connecting to a district heating network</td></tr>
</table>
</td></tr>
</table>

		<table><tr><td></td><td>Energy performance evaluation (certification no more than once every five years)</td></tr><tr><td></td><td>Charging station for electric vehicles</td></tr><tr><td></td><td>Individual meters for space heating and domestic hot water</td></tr></table> Note: In the Dom (French overseas departments), additional equipment is eligible for CITE: protection of opaque and glazed partitions, ventilation systems. The aforementioned works must be undertaken by the company which provides the materials and as of 2015, the company in question must be "RGE" certified [9]. RGE certification is a sign of quality allowing people to identify a qualified energy renovation worker and is distributed by independent organisations on behalf of the government. The organisations must be accredited by Cofrac (Comité français d'accréditation), France's unique national accreditation body, and conform to other strict criteria. A professional wishing to become RGE certified must also meet certain criteria [10]: - Employ a RGE trained technical manager; - Outsource work to RGE certified professionals; - Carry out RGE certified works on at least 2 sites every 2 years. The subsidy covers 30% of the refurbishment costs (excluding labour costs, subject to exceptions), with an upper limit of €8,000 for a single person, or €16,000 for a couple under joint taxation ("imposition commune"). These upper limits are increased by €400 per dependent (€200 per child under shared custody) [8]. Once the eligible work is complete, individuals recover their tax credit in the following year as a lump sum tax credit. They are required to keep all receipts which may be inspected. The receipts prove that the installation has been paid for (companies can be identified with their Siren number and/or VAT number featuring on the receipt); however, no audits are performed to inspect the installation itself. In the case of large works which are spread over two years, the tax credit will be returned to the individual in the year following completion of the work. Even if an individual does not pay income tax they can benefit by applying to CITE when carrying out eligible renovation works.
2	**Impact**	No data was found on energy savings achieved so far. €23.6 billion in refurbishment works were declared between 2005 and 2008, encompassing 4.2 million households (main residences). The CIDD scheme became increasingly popular with one million new households opting in per year. One in ten main residences benefitted from works on energy consumption control, of which two-thirds were built before 1975. One in twenty main residences equipped themselves with renewable energy systems. In all, one in seven main residences benefitted from the CIDD. Consequently, the installation of solar panels, heat pumps and wood burning stoves more than doubled in those four years. Most of the buildings covered by this scheme were built before 1975 and little correlation was found between the level of income and the amount of benefits received per m^2. On average, €50 per m^2 was spent on works dedicated to energy consumption control, and €60/m^2 for installing renewable energy systems [11].

<table>
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<td>
The table below shows that it was mostly detached houses that benefitted from the CIDD, especially in the case of renewable energy installations.

Table: Distribution of modernised households which have benefitted from the sustainable development tax credit (CIDD) between 2005 and 2008 [11].

<table>
<tr><th></th><th colspan="3">Distribution of main residences</th></tr>
<tr><th></th><th>Share of the French housing stock</th><th>Where equipment enabling the use of renewable energy sources have been installed</th><th>Where works on energy consumption control have been undertaken</th></tr>
<tr><td>Year of housing completion</td><td></td><td></td><td></td></tr>
<tr><td>Before 1948</td><td>30.4%</td><td>31.6%</td><td>33.6%</td></tr>
<tr><td>1948 - 1974</td><td>26.5%</td><td>17.6%</td><td>32.8%</td></tr>
<tr><td>1975 -1987</td><td>17.3%</td><td>20.6%</td><td>23.2%</td></tr>
<tr><td>1988 - 1999</td><td>12.2%</td><td>12.2%</td><td>6.8%</td></tr>
<tr><td>2000 -2004</td><td>8.7%</td><td>7.5%</td><td>2.4%</td></tr>
<tr><td>After 2004</td><td>4.9%</td><td>10.5%</td><td>1.2%</td></tr>
<tr><td>Type of build</td><td></td><td></td><td></td></tr>
<tr><td>Not detached</td><td>43.3%</td><td>8.1%</td><td>19.2%</td></tr>
<tr><td>Detached</td><td>56.7%</td><td>91.9%</td><td>80.8%</td></tr>
</table>

With simplifications made to the Energy Transition Tax Credit (in comparison to the CIDD), the French government hopes to encourage more home owners and tenants to opt into the scheme.
</td>
</tr>
<tr>
<td>3</td>
<td>Cost-effectiveness</td>
<td>
For the beneficiary, an estimated €637/year can be saved under this scheme [13]. However no data has been found on cost per kWh.

In total, €23.6 billion in renovation works were declared between 2005 and 2008 (under the CIDD scheme). 32% of the declared expenses were returned, amounting to €7.8 billion (rising from €1.0 billion in 2005 to €2.8 billion in 2008).
</td>
</tr>
<tr>
<td>4</td>
<td>Critical success factors</td>
<td>
Communication was obviously very effective, as millions of individuals opted in to the CITE (and CIDD) over the years. As both renovation workers and individuals benefitted from this, communication was greatly facilitated.

Another success factor was that the programme did not consist in a tax rebate but rather a tax credit, meaning that the individuals renovating their homes received equal benefits irrespective of their income.
</td>
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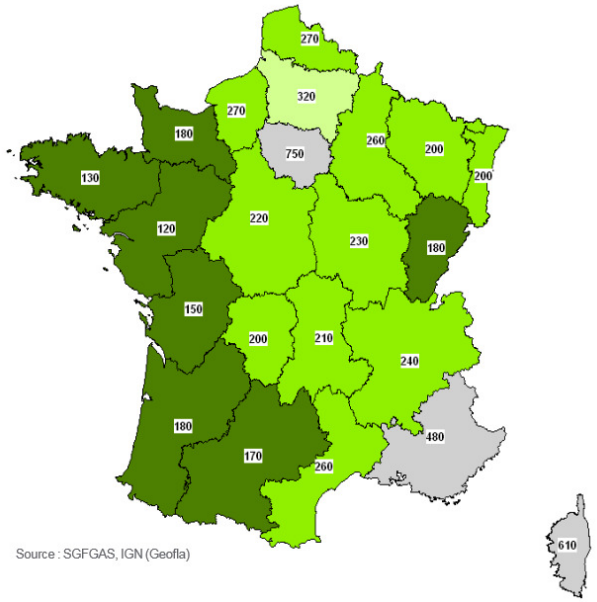
</table>

		Allowing for extensive renovation works to take place over two years also helped to draw more attention the scheme.
5	**Marketing and communication**	Elodie Trauchessec of ADEME reported that news of the scheme spread quickly by word of mouth via the renovation workers and home owners who could benefit from the CIDD/CITE. Elodie did not know how the initial marketing took place (whether on the radio or TV) and no information has been found regarding means of communication, e.g. TV, radio.
6	**'Softer' behaviour change**	Elodie Trauchessec of ADEME was of the view that some behaviour change may have occurred in homes where individuals have recently been pulled out from fuel poverty, if awareness of good energy usage has not been provided [7]. However this was more likely to relate to a rebound effect than improvements in energy behaviour.
7	**Barriers to delivery**	The scheme's high cost (€1.2 billion/year) is a barrier in itself. Indeed, it was launched before the 2007-2008 financial crisis and as a result it now puts pressure government spending. The launch was also difficult in the sense that it greatly benefits the construction and renovation sectors. The CIDD thus allowed the renovation sector to stay afloat by helping the associated work force at stake. In a way, the CIDD/CITE has an enormous impact in shaping the market. To limit this, it was established as a yearly programme to be re-voted in government at each financial budget. The CITE thus also evolves according the political choices made each year. Requirements are strict and if a particular market branch is stable, the CIDE will pull-out as it no longer requires subsidies. Repercussions are therefore very important. For instance, if the CITE halves its support for a given technology such as heat pumps of solar PV from one year to the next, many companies may go bankrupt. Companies cannot always respond as fast to changes in the CITE. This means that there is a risk of a start-stop cycle and a lack of long-term certainty for investors and the energy efficiency industry.
8	**Wider benefits and unintended consequences**	Elodie Trauchessec of ADEME commented that it has been noticed that some professionals inflate their prices when they notice that their clients are recovering costs from the CITE. In such instances, professionals artificially inflate the cost of the equipment and deflate the installation costs to the detriment of the state (installation costs are not covered by the CITE). However the CITE supports technologies only, it does not support brands or countries of origin. Also, the CITE never supports a technology if it has only one or a limited number of distributors. Another unintended consequence is that the CITE mostly benefits the wealthy because they are more likely to renovate and take advantage of the scheme. Also, more cash was spent on renewable energy installations than on insulating households [7]. As a result of the CITE, an expected 100 000 workers will be trained by 2017. In June 2014, 20,000 professionals were already RGE certified, with an additional 1,000 to 1,500 being trained each month [12]

Country		France
Intervention		2. Eco zero-interest loan (*Eco Prêt à taux zéro – Eco-PTZ*)
Timeframe		Jan 2009 - Dec 2015
Geographical Coverage		Nationwide
Target group		- Home owners of dwellings built before 1990 and occupied as a main residence (by the owner or a tenant). - Syndicates of co-owners for works on common equipment (e.g. communal boiler); also applicable to other equipment if the works are done collectively (windows for example).
1	**Intervention architecture and logic**	To qualify for the Eco zero-interest loan (Eco-PTZ), refurbishment works must be undertaken by an "RGE" certified company (see *Intervention 1 - CITE* for details). Only works listed below are eligible for this loan. - Either works comprising at least two types of work listed below: o Thermally insulating roofs; o Thermally insulating external walls; o Thermally insulating windows and doors leading to exterior; o Installation, fine tuning or replacement of systems for heating, which may be associated with ventilation, or for the production of domestic hot water; o Installation of equipment for producing domestic hot water from a renewable heat source. - Or works allowing a household to reach a minimal global energy performance level, to be confirmed with a thermal analysis carried out by specialised assessors. The threshold is 150 kWh/m²/year if the energy consumption of the household prior to the refurbishment works was greater or equal to 180 kWh/m²/year (80 kWh/m²/year if the consumption was less than 180 kWh/m²/year). - Or restoration works for sanitation systems in detached properties that do not consume any energy. Once the works have been completed, the beneficiary has a maximum of two years to submit an application to a bank issuing Eco-PTZ loans (most banks in France).
2	**Impact**	After its first year, an assessment of the Eco-PTZ was carried out in various regions in France. The map below shows the number of main residences for every Eco-PTZ granted in each region [14]. The darker the colour the better the take up. As it can be seen, the Eco-PTZ take up was not evenly distributed.

		 Between 1st April 2009 and 31st March 2010, approximately 90 000 Eco-PTZ loans were granted in metropolitan France, representing 1 in 380 eligible households. 9 in 10 Eco-PTZ loans were granted to home owners of detached houses.
3	**Cost-effectiveness**	The maximum loan is €30,000/household and as its name indicates is interest free (only one loan can be granted per dwelling and one loan granted per building). The Eco-PTZ can be cumulated with the CITE (and other benefits), as long as the income of the household in the year n-2 does not exceed: - €25,000 for a single person - €35,000 for a couple, with €750 extra per dependent. The maximum reimbursement period is 10 years, but can be extended to 15 for important renovation works (e.g. a package of 3 or more types of work) [15].
4	**Critical success factors**	The Eco-PTZ was not very successful. See point 8 (unintended consequences) for details. Elodie Trauchessec of ADEME commented that in order to boost the programme, a new approach has been undertaken since September 2014. From this date onwards, renovation works must be carried out by RGE certified workers (see *Intervention 1 - CITE* for details), thereby providing confidence to the banks to distribute Eco-PTZ loans by shifting the responsibility over to the professionals. Results have yet to be published to show how effective this policy change has been [7].
5	**Marketing and communication**	No information was found regarding marketing/communication for Eco-PTZ, and the contact we interviewed didn't know about this part of the scheme.
6	**'Softer' behaviour change**	No evidence found.
7	**Barriers to delivery**	The Eco-PTZ loan was introduced as a measure to increase the energy performance of France's housing stock. Sanitation was later added to the project, partially explaining why it was not as popular a job [16].

		All in all, the Eco-PTZ was not very successful. Targets were ambitious, and during its first two years the scheme attracted sufficient attention. However with a tighter budget in 2011 as a consequence of the economic crisis, the terms changed: the CITE and Eco-PTZ could no longer be cumulated. Moreover, as a consequence of the crisis, loans decreased in popularity and individuals preferred to use their savings (if sufficient) to carry out renovation works. As the banks decided on the eligibility of Eco-PTZ loans, many saw their applications being refused. In 2014, the application procedure was simplified in the hope of attracting more applicants: in order to do so, the eligibility was no longer decided by the banks but by "RGE" certified technicians [17]. Future evaluations will tell whether or not this change in the scheme's architecture leads to a higher acceptance rate.
8	**Wider benefits and unintended consequences**	As the Eco-PTZ is distributed by the banks (as agreed with the State), this has created unforeseen problems. In effect, bankers managed the loans, and were thus responsible for distributing public funds, even though no training on their behalf was required (i.e. knowledge of how effective efficient heating systems and renovation works can be at reducing long term energy costs). The State agreed to reimburse the banks at a fixed rate for their losses. However, with extensive paperwork involved (banks are reimbursed by the State via tax rebates on VAT in an indirect fashion) and low returns, banks were reluctant to advertise and distribute these loans. A solution to this has since been put in place (see point 4 *Critical success factors* for details). Another reason why the Eco-PTZ was a failure is that the banks needed to decide if the individual is financially in order to grant the loan. Since the crisis, not many individuals are 'solvent', meaning that only a minor portion of the population can access this incentive. Moreover, the banks do not currently take into account the reduced energy costs associated with the eligible works. Elodie Trauchessec of ADEME said that the government is currently looking into a solution. For instance, if the individual does not reimburse the payments, the responsibility would be shifted to a separate body, thus alleviating pressure on the banks [7]. Also, a few months after its launch in 2009, it was observed that only a minute fraction of applications concerned non-collective wastewater sanitation works [16].

Country		France
Intervention		3. Eco loan for social housing (*Eco Prêt logement social – Eco-PLS*)
Timeframe		2009 - 2017
Geographical Coverage		Nationwide
Target group		Social housing organisations, PPPs and municipalities owning or managing social housing for thermal renovations.
1	**Intervention architecture and logic**	First implemented from February 2009 to June 2011, the Eco-PLS was a low-interest loan, provided by the French Government. For 15-year loans, the interest rate was 1.9%, and for 20-year loans the interest rate was 2.35%. The loan was open to social housing agencies, PPPs and municipalities owning or managing social housing for thermal renovations. A second generation of Eco-PLS loans was in place between January 2012 and July 2013, and a third generation has been in place since August 2013 [18]. Distributed over a maximum period of 25 years, Eco-PLS is now issued at variable rates based on the duration of the loan. It is accessible to the most inefficient housing (energy performance categories E to G, and D under certain conditions), with a target of 70,000 social housing units renovated per year [19]. The objective is to renovate the most energy consuming dwellings in order to reduce energy costs for tenants. For buildings with energy consumption greater than 230 kWh/m²/year, energy consumption after renovation must be less than 150 kWh/m²/year with exceptions made according to the altitude and the climatic zone. For buildings with energy consumption between 151 and 230 kWh/m²/year, the consumption after renovations must be reduced to below 80 kWh/m²/year [20]. 100,000 households (social housing) were expected to be renovated between 2009 and 2010, as defined by Grenelle I. This target was achieved in June 2011. The Eco-PLS consists of a low interest rate loan, based on the interest rate of the "livret A" (a type of savings account [22]) and on the chosen payback period [23]. Initially, the rate was defined as follows: The interest rate of the livret A, over a 5 to 15 year period the interest rate of the livret A + 0.15%, over a 16 to 20 year period the interest rate of the livret A + 0.25%, over a 21 to 25 year period. In order to meet its annual target (70 000 renovations, of which 14 000 are energy class D units), a more attractive interest rate has been put in place. Since 2013, the rate is now defined as follows: • the interest rate of the livret A cut back by 75 basis points for a duration less than or equal to 15 years, (where a basis point is one hundredth of a percentage point). • the interest rate of the livret A cut back by 45 basis points for a duration of 16 to 20 years. • the interest rate of the livret A cut back by 25 basis points for a duration of 21 to 25 years. Moreover, the quota for D rated homes has been raised from 14 000 to 50 000 units [23].

<table>
<tr><td></td><td></td><td>For energy class E, F and G units, the extent of the loan varies between €9,000 and €16,000, according to the gains in kWh/m^2/year (primary energy) as a result of the refurbishment (defined in the table below [18]):

<table>
<tr><td>Gain (kWh/m^2/year)</td><td><80</td><td>80 - 89</td><td>90 - 99</td><td>100 - 109</td><td>110-129</td></tr>
<tr><td>Loan per unit (€)</td><td>0</td><td>9000</td><td>10000</td><td>11000</td><td>12000</td></tr>
</table>

<table>
<tr><td>Gain (kWh/m^2/year)</td><td>150 - 169</td><td>170 - 189</td><td>190 - 209</td><td>210 - 229</td><td>230 - 249</td><td>250 - 270</td><td>> 270</td></tr>
<tr><td>Loan per unit (€)</td><td>13000</td><td>13500</td><td>14000</td><td>14500</td><td>15000</td><td>15500</td><td>16000</td></tr>
</table>

For D class units, a loan of €12,000 /unit can be granted, or €14,000 /unit if the energy rating of the building after refurbishment is less than 80 kWh/m^2/year in primary energy (subject to variation depending on altitude and climatic zone).

For each social housing unit (energy class D to G), the loan can be extended by €2,000 if they become ‘HPE rénovation’ (High Energy Performance renovation, certified by the government) or ‘BBC rénovation’ (Low energy consumption renovated building, certified by the government) certified.</td></tr>
<tr><td>2</td><td>Impact</td><td>Elodie Trauchessec of ADEME said in an interview that currently, approximately 120,000 renovations backed by the Eco-PLS are undertaken by social housing organisations each year [7].</td></tr>
<tr><td>3</td><td>Cost-effectiveness</td><td>The Eco-PLS loan for renovation works equates to 0.86 €/kWh/year. This is based on the following analysis:

In primary energy savings In 2012, 25,000 social housing units benefitted from the EEco-PLS loan.

The final cost to the government has been estimated as follows:

First generation EEco-PLS: €1,200 per unit

Second generation EEco-PLS: €530 per unit

Third generation Eco-PLS: €1000 per unit.

On average, the total investment per social housing unit including tax (and Eco-PLS loan) was €27,000 (of which €11,700 was in Eco-PLS) in the first generation, €38,000 (of which €12,400 was in Eco-PLS) in the second and €36,000 (of which €12,200 was in Eco-PLS) in the third. This amounted to €1.43 billion of Eco-PLS loans, which allowed 151,000 social housing units to carry out renovation works.

As a result, the energy performance of the average household more than halved: from 274 kWh/m^2/year before the works to 117 kWh/m^2/year (primary energy) [18]. Assuming an average area of 70 m^2 per social housing unit, the Eco-PLS loan for renovation works equates to 0.86 €/kWh/year in primary energy savings. It is not clear what the lifetime of the measures is but if they were assumed to be 30 years, this would give savings of 0.03 €/kWh saved.

On a regional scale (Lorraine), €99 million were granted in Eco-PLS loans between 2009 and March 2015, resulting in €202 million in renovation works spread over 10727 households. The number of social housing in France in 2013 was 4.6 million, 3.5% of which were found in the Lorraine region [17].</td></tr>
</table>

4	**Critical success factors**	Unlike the private sector, social housing organisations have to maintain low levels of rent (which include heating bills), meaning that it is in their interest to reduce long term energy costs for their occupants. As a result, the social housing stock has a better energy performance rating (on average) than the national housing stock. We note that uptake has not been higher than in other schemes (CIDE for example is far more popular). However for social housing organisations it may be more attractive.
5	**Marketing and communication**	As it is in the national interest to improve the energy rating of France's housing stock and reduce public expenditure, communication to social housing organisations was prioritised. No further information was found on this.
6	**'Softer' behaviour change**	Individuals living in social housing are not all in precarious situations. It is mostly important for those who are to be aware of behavioural change necessary for sound energy consumption after renovation works have taken place. Awareness is raised by social housing organisations, as it is in their direct interest to reduce their occupants' heating bills.
7	**Barriers to delivery**	The scheme was a success and did not face any major barriers.
8	**Wider benefits and unintended consequences**	No evidence found.

Country		France
Intervention		4. White certificates (*Certificats d'économies d'énergie)*
Timeframe		Started in 2005, runs for periods of three years. Currently in its third period (2015-2017).
Geographical Coverage		Nationwide
Target group		Energy providers ("obligated parties").
1	**Intervention architecture and logic**	The white certificates scheme (certificats d'économies d'énergie – CEE) was first introduced in articles 14 to 17 of the French law for energy policy number 2005-781 (loi POPE), dated 13th July 2005. The scheme imposes energy providers to meet the set targets for triannual energy savings in CEE (1 CEE = 1 kWh cumac* in final energy), [23]. White certificates are allocated to hard investments in energy-efficient equipment or materials. The scheme promotes the deployment of best available technologies and favours those measures that yield the highest energy savings [24]: For households: Attic or Roof Insulation, Wall insulation, Condensing Boiler and wood-burning heating devices For the industry: Variable Speed Drives for electric motors (e.g. pumps); For the agriculture sector: Open-buffer Hot-water Storage Tank For the transport sector: Intermodal Transport Unit (ITU). It is up to the obligated parties to promote energy efficiency to their customers, who encompass each of the sectors mentioned above. If obligated parties do not meet their targets, a penalty of 0.02 €/kWh will be imposed. Obligated parties are allowed to buy and sell CEE certificates between them as they please (at negotiable prices, thus fluctuating between 0 and 0.02 €/kWh). The white certificate scheme is currently running in its third triannual period. For the first triannual period (1st July 2006 to 30th June 2009), the national objective was set to 54 TWh cumac in savings (i.e. 54 billion CEE). The necessary savings were first divided into various energy groups depending on the country's energy mix and energy prices (incl. tax), and second between energy suppliers on a pro-rata basis depending the volume of their respective sales between 2004 and 2006. The second period (1st January 2011 to 31st December 2014) was extended by a year and the target was set to 255 TWh cumac for electricity, gas, heating oil, LPG and district heating/cooling providers. In addition, providers of motor fuel for automobiles had to make 90 TWh cumac in savings. It should be noted that the surplus savings achieved by the obligated parties during the first period (i.e. savings made beyond their assigned objectives) are deducted from their targets in the second period. In its third period (1st January 2015 – 31st December 2017), the scheme doubled its previous energy savings target to 700 TWh cumac. The necessary savings are to be equally divided between obligated parties, based on an energy (incl. tax) price and sales' volume basis.

* Cumac means "cumulated" and "updated" ('cumulés' and 'actualisés'). For example, the amount of kWh cumac saved from the installation of an energy efficient device corresponds to the cumulated yearly energy savings over the total duration of the device's life. Moreover, energy savings made each year following the first are updated by dividing the savings made in the preceding year by 1.04 (rate of 4%).

<table>
<tr><td></td><td></td><td>Calculation methods used to establish CEEs have been slightly modified over the periods. Each eligible equipment, device and renovation work has been assigned a number of kWh cumac, which depend on:
The device/equipment/work itself
The climatic zone of the building.
For the residential sector: the type of dwelling (flat or house); if house, the surface area is a variable;

The life expectancy for each equipment, device and renovation work is also estimated. All calculations can be viewed on the government's website.</td></tr>
<tr><td>2</td><td>Impact</td><td>In the first period, energy savings were higher than expected: 65.3 TWh cumac of CEE were produced, with a target of 54 TWh. The energy breakdown was as follows: 86.7% from the residential sector, 4.3% from the tertiary sector, 7.4% from the industrial sector, 1.3% from heating/cooling networks and 0.5% from transport [23]. In the second period, the target was also met as 390 TWh cumac were saved [24].

A breakdown of the standard operations as of July 2014 is presented in the table below [24]. Note that standard operations made up 95% of the white certificates, and the following 10 contributed to 69% of these.

<table>
<tr><th>Sector</th><th>Reference</th><th>Standard Operation</th><th>% of attributed kWh cumac</th></tr>
<tr><td>Residential</td><td>BAR-TH-06</td><td>Individual-Unit condensing boiler</td><td>15.29%</td></tr>
<tr><td>Residential</td><td>BAR-EN-01</td><td>Attic or roof insulation</td><td>9.63%</td></tr>
<tr><td>Residential</td><td>BAR-EN-02</td><td>Wall insulation</td><td>7.21%</td></tr>
<tr><td>Residential</td><td>BAR-TH-07</td><td>Collective-unit condensing boiler</td><td>6.28%</td></tr>
<tr><td>Residential</td><td>BAR-TH-12</td><td>Independent wood-burning heating devices</td><td>5.87%</td></tr>
<tr><td>Tertiary</td><td>BAT-EN-01</td><td>Attic or roof insulation</td><td>4.88%</td></tr>
<tr><td>Residential</td><td>BAR-TH-08</td><td>Individual low temperature boiler</td><td>4.57%</td></tr>
<tr><td>Residential</td><td>BAR-EN-04</td><td>Window with insulating glass</td><td>4.33%</td></tr>
<tr><td>Residential</td><td>BAR-TH-07-SE</td><td>Collective-unit condensing boiler with a contract guarantying the energy efficiency</td><td>3.84%</td></tr>
<tr><td>Tertiary</td><td>IND-UT-02</td><td>Variable frequency drive for electric motors</td><td>3.81%</td></tr>
</table>

According to the Enspol study [24], the white certificates in the second period (2011-2014) represented:
Residential sector:
1 million individual unit condensing boiler;
480,000 wood-burning heating device installed
116,000 heat pumps
260,000 m² / 50,000 dwellings equipped with solar panels in overseas French territory</td></tr>
</table>

		○ 45 million m² insulated (300,000 dwelling with either the roof or attic insulated and 125,000 with walls insulated) ○ 3 million windows with insulating glass ○ 25 million A class light bulbs. • Tertiary sector : ○ 20 million m² of roof insulated ○ 87 kilometres of hot water pipes insulated. • Industry sector : ○ 950,000 kW of engine power equipped with variable speed ○ 330,000 kW of compressor power equipped with heat recovery. • Agriculture : 2,5 million m² of greenhouses equipped with efficient heating systems and 6 million m² of greenhouses equipped with climate computers. • Public lighting: 250,000 lamps refurbished.
3	**Cost-effectiveness**	In the first period, ADEME estimated costs for "obligated parties" at €210 million, corresponding to €0.0039/kWh cumac. Of the €210 million, €74 million have been estimated to be direct costs (premiums and low interest loans to beneficiaries of energy saving operations) and €136 million in indirect costs (training, administration, marketing) [23]. The first period resulted in €1.8 billion in customer investments (of which €1.3 billion were reimbursed through the sustainable development tax credit), representing an energy bill reduction of €4.3 billion over the lifetime of the measures [24]. There is no public evaluation available on the total expenditures for the second period, however the kWh cumac has been estimated at €0.00372 [24]. The scheme is currently in its third period and no results are yet available.
4	**Critical success factors**	As energy savings were imposed on "obligated parties" by the French government, it was in the target groups' interests to achieve the set objectives. This could be done directly by encouraging end-users to opt for more energy efficient solutions, and/or indirectly by offsetting their excess through the purchase of CEEs from other well-doing companies. The penalty of €0.02 for every missing CEE certificate (1 per kWh cumac) was sufficiently high to get obligated parties to promote energy efficiency in all sectors. The price of exchanged CEE certificates was 6 times lower that the penalty fee, however it remained stable and final objectives were met (periods 1 and 2).
5	**Marketing and communication**	The white certificate scheme became effective after the law "loi POPE" was introduced in 2005.
6	**'Softer' behaviour change**	According to the Enspol study [24], the only data available so far regarding the evaluation of the windfall effect come from a qualitative study launched by ADEME in 2013. It covered 4,400 households that benefited from the scheme for their refurbishment projects, with the following results: • 75% consider that the white certificate scheme has had an incentivising effect • 95% think their energy bill went down, The study showed that the white certificate scheme had an active role in multiplying the number of implemented energy efficiency operations and in redirecting the market towards more efficient works for energy refurbishment.
7	**Barriers to delivery**	No evidence found.

8	**Wider benefits and unintended consequences**	No evidence found

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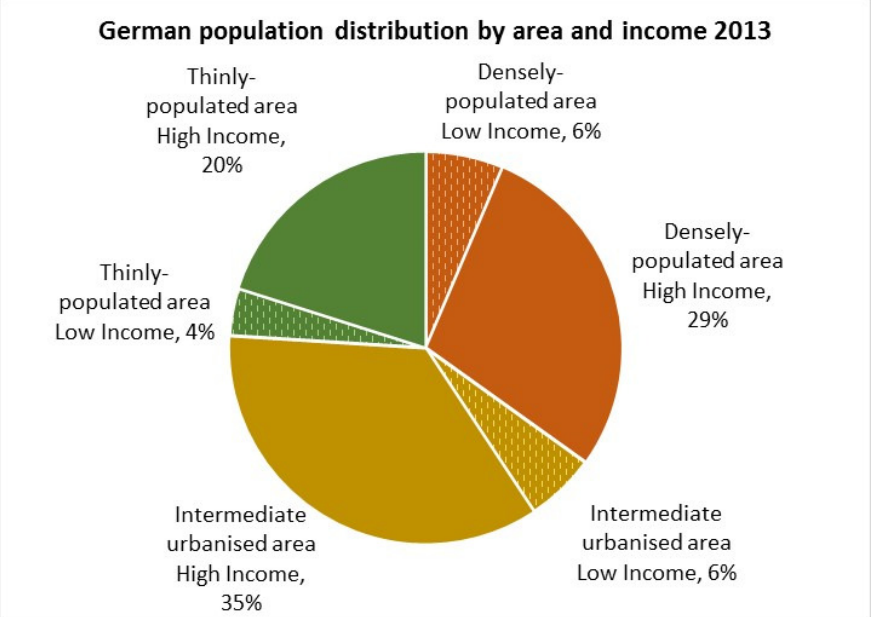
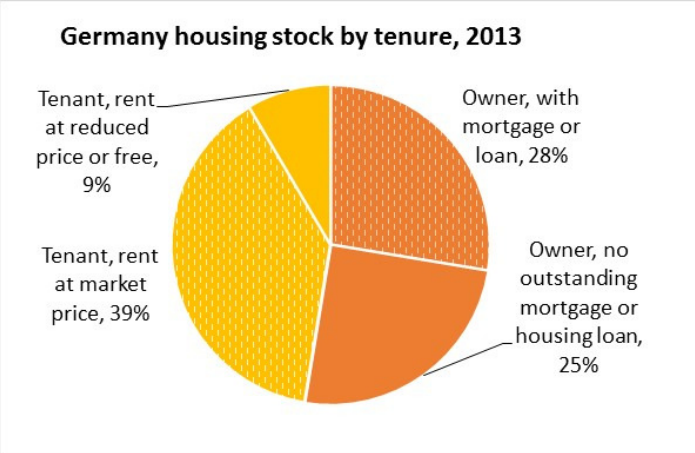
3.3 Germany

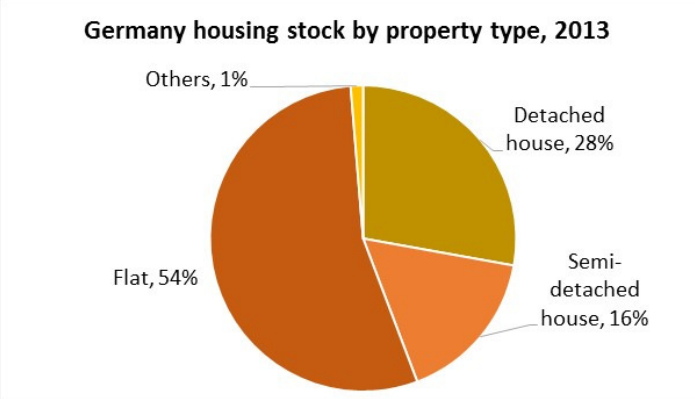
Country	Germany
Country Context	***Germany Policy Background*** Article 3 of the EU Energy Efficiency Directive required Member States to set national non-binding energy savings targets for 2020. Germany's target was set at the level of 2260 TWh for final energy consumption. Representing a 12% reduction in final energy consumption, relative to 2008 levels. Germany's EU Climate and Energy Package Effort Sharing target for 2013-2020 is 14% below the 2005 levels. The German government set out its National Energy Efficiency Action Plan in 2012 (updated in 2014) and in addition a National Action Plan on Energy Efficiency. The target for 2050 is to have a building stock that is almost climate-neutral. To achieve this, the heating requirement is to be reduced by 20% by 2020, with primary energy demand dropping by 50% by 2050. Within the domestic sector the key policy for delivering retrofit is the CO_2 Building Renovation Programme. During 2014 the German government reported that 6.9m households live in energy poverty, defined as spending more than 10% of their income on energy. There are no figures on a reduction target, and low income groups are not explicitly mentioned in the NEEAP. The only exception is a measure to encourage low income groups to exchange old refrigerators in exchange for cash vouchers. **Key demographics** In terms of age profile, Germany has an ageing population [20]. The distribution in 2014 was: • 0-14 years: 13% • 15-24 years: 10.6% • 25-54 years: 41.7% • 55-64 years: 13.6% • 65 years and over: 21.1% The chart below [19] shows the distribution of German population by living area, and income. Population is relatively evenly split by dense, intermediate and thinly populated areas (proxy for rural and urban distribution). Note that high income is defined as above 60% of median equivalised income, as per the Eurostat data. [25]. Equivalised income is defined as household net income, divided by the number of equivalised adults in the household. (http://ec.europa.eu/Eurostat/statistics-explained/index.php/Glossary:Equivalised_disposable_income)



Housing Stock

The charts below shows the German housing stock data by tenure and property type. Tenure is split approximately half and half between owners and renters. 9% of the population are tenants who benefit from reduced price or free rent. Property types are also approximately evenly distributed between flats, and housing (detached and semi-detached).





[Both charts: Source 19]

	Domestic Energy Prices Domestic energy prices are shown in Section 3.1. Germany has the highest Electricity Prices. While German electricity prices are in line with the other countries in this study, it is the tax component which is significantly above the rest, making up approximately 52% of this cost. Domestic gas prices in Germany are more in line with remaining countries, both energy and tax components.
Selected Interventions	1. Energy-efficient Refurbishment. KfW funding programmes for energy-efficient construction and renovation. 2. Energy Conservation (Saving) Ordinance. Regulation providing minimum requirements for the energy quality of the building envelope and energy systems engineering for new buildings and major renovations of existing buildings. *3.* Electricity Saving Initiative. Measure targets softer behavioural change through a website with information on electrical energy efficiency for households. 4. Energy Consumer Advice Centre. To promote rational energy use, provision of independent and provider-neutral energy checks for private consumers.
Linkages between schemes	The KfW's (German development bank) energy-efficient building and refurbishment funding programmes comes under the German government's CO_2 Building Renovation Programme, and is financed by the resources under this programme providing low-interest loans and grants to households. This programme is considered the government's most important instrument for energy conservation and climate protection in the buildings sector [24], alongside the Energy Saving Ordinance (EnEV) regulation which provides the minimum requirements for the energy quality of building envelope and systems engineering, which must be met by new builds or renovations. Homeowners have access to the funds under the Building Renovation Programme, to support energy efficient renovations and new builds. The Energy Consumer Advice centres provide the link between such programmes and homeowners, by providing information on how to increase energy efficiency, increasing awareness of requirements (such as the EnEV) and support available (funding programme). The former includes signposting toward the Stromsparinitiative website, containing information and advice on energy saving measures for the home.

Country		Germany
Intervention		1. *Energy Efficient Refurbishment* - KfW funding programmes for energy-efficient construction and renovation
Timeframe		Ongoing from 2001
Geographical Coverage		Nationwide
Target group		Building owners
1	**Intervention architecture and logic**	This intervention comes under the Kreditanstalt für Wiederaufbau bank's (KfW) CO_2 Building Renovation Funding programme. KfW funding programmes for energy-efficient construction and renovation support comprehensive renovation work within the existing stock and new builds to 'KfW-Effizienzhaus' standards and energy-efficient individual measures to increase energy efficiency and savings. This intervention covers only the programme Energy Efficient Refurbishment, there is also a programme Energy Efficient Construction. There are two routes available to homeowners: 1) low-interest loans of up to €100,000 per property which are blended with 'repayment grants' of up to €27,500 per property 2) investment grants of up to €30,000 per property. The two routes cannot be combined and homeowners have to decide for one or the other. As the government owned development bank, KfW is able to issue loans with an interest rate lower than the market rates – the subsidies provided essentially buy down the interest rates which are currently at 0.75%. Currently the German government funds the scheme with €2 billion every year. The exact amount of funding varies depending on demand in a given year. **Energy Standards** Energy standards applying to new building are laid out in the Energy Conservation Ordinance (see below). KfW supports the refurbishment of houses if after refurbishment they meet a specific energy requirement for a comparable new house according to the Energy Conservation Ordinance. KfW has defined five levels of support for a "KfW Efficiency House". The best standard receives the highest support, in this case the KfW Efficiency House 55. The numbers in the naming convention of the standard are the percentage of the maximum primary energy requirement specified by the EnEV which the specified house consumes. **Support for complete refurbishments establishing a "KfW Efficiency House"** In order to meet the high energy standard of a KfW Efficiency House, extensive investments such as the renewal of heating systems, thermal insulation and replacement of windows, are usually required. An individual housing unit can apply a) for an investment grant or b) a loan blended with repayment grants – the two support mechanisms cannot be combined. Loans are up to a maximum of €100,000 for a complete household refurbishment, plus a repayment bonus calculated on the loan amount. The grant is transferred to their account after completion of the refurbishment measures. Applications for grants are made through KfW, and the loan is supplied by local banks. The application can be submitted by owner-occupiers, social housing companies, public bodies such as local authorities owning domestic buildings and energy service companies working on behalf of the building owner.

Grant and bonuses vary with the final standard of the refurbishment, as below:

Housing Standard	Grant Funding	Loan repayment Bonus
KfW Efficiency House 55	30.0%, maximum of €30,000	27.5%
KfW Efficiency House 70	25.0% , maximum of €25,000	22.5%
KfW Efficiency House 85	20.0% maximum of €20,000	17.5%
KfW Efficiency House 100	17.5%, maximum of €17,500	15.0%
KfW Efficiency House 115	15.0%, maximum of €15,000	12.5%
KfW Efficiency House Monument	10.0%, maximum of €10,000	12.5%
Single measures	10.0%, maximum of €5,000	7.5%

The loan repayment bonus is essentially a specified proportion of the loan that does not need to be repaid.

Individual Measures
If a full refurbishment is too expensive, support can also be given for the following individual measures [23]:

- Thermal insulation of walls, roof and floor space
- Renewal of windows and exterior doors
- Installation/renewal of a ventilation system
- Renewal of the heating system (including connection to district heating and certain biomass heating systems)
- Optimisation of heat distribution for existing heating systems.

A loan of up to €50,000 is available for individual measures. Through the grant route homeowners can receive up to 10% of the cost, to a maximum of €5,000 per property. Single measures have been by far the most important – whole house retrofits to Efficiency House standards are only a small proportion.

Energy Consultants
A prerequisite to apply for a promotional loan or grant is the involvement of an approved energy consultant listed on the government website https://www.energie-effizienz-experten.de/energieeffizienz-experten-fuer-foerderprogramme-des-bundes/. The list of experts has been established by the German Energy Agency on behalf of the Federal Minister for Economic Affairs and Energy, the Federal Office for Economic Affairs and Export Control and KfW. Only persons with the qualifications laid out in the Energy Conservation Ordinance can apply to be listed on the website as experts. It is the experts' responsibility to check whether the construction or refurbishment project is properly designed to achieve the targeted efficiency level by using an internet-based tool to compare the technical details of the project with the targeted efficiency level. The promotional effects are measured year by year by an independent scientific research institute [1, 2, 11].

2 Impact

According to the BMWi [3], the CO_2 Building Renovation Programme has been an important element of the energy transition. 1/3 refurbishments in Germany are supported financially under the programme. In addition, half of all new builds are funded by the KfW, and therefore to higher standards than prescribed by the Energy Saving Ordinance.
As seen in the table above, both the loan and grant routes of the programme are structured to provide an incentive for renovating to higher efficiency standards. This is achieved through a higher grant level, and higher repayment bonus for houses

refurbished to higher levels (i.e. terms for the KfW Efficiency House 55 are more attractive than for 70).

Key programme figures from 2006 to 2014:

- The funding has helped to support the energy-efficient refurbishment and construction of more than 3.8 million homes
- In addition, since 2007, funding has been provided for the energy-efficient refurbishment of more than 2,100 buildings that form part of the social and municipal infrastructure
- The total sum invested in the energy efficiency of buildings is therefore more than €187 billion
- The investments made with the funding reduce CO_2 emissions by more than 7.6 million tonnes each year, and this over the 30-year useful life of the measures
- The vast majority of refurbishments are now single measures, rather than whole house retrofits. Single measures which were not eligible for a long time. From 2001 to 2007, loans provided by the CBRP only funded packages of measures—single measures were explicitly not supported. Including single measures was largely a result of discussions around opening the programme to more households and properties where a whole house retrofit would be unlikely to happen (for example in case of low-income households or the elderly). Overall, the inclusion of single measures probably increased the cost-effectiveness of the programme.

Focusing on the Energy Efficient refurbishment element of the programme, the table below summarises the impact of this intervention since 2005, using key indicators for energy and CO_2e saved, and jobs created. This is taken from the 2014 monitoring report commissioned by KfW [7]. Note that this information relates to both the loan and the grant component and it is not possible to derive separate figures for the two schemes easily.

	Impact of EE Refurbishment: Subsidy cases by year								
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**Total**
Affected housing units [000s]	70	89	155	134	363	344	181	242	1,578
CO_2e Reductions [kt/yr]	340	700	330	546	955	847	457	576	4,751
Final energy savings * [TWh]	0.67	0.94	1.52	1.53	2.68	2.45	1.25	1.72	13
Total employment effects [k Person-yr]	27	65	35	51	111	92.5	52	69	503

* District heating, electricity, fossil fuels, and biomass [7].

In 2012, nearly 88,000 grant approvals granted for measures in more than 242,000 homes. The officially reported final energy savings were 1722 GWh (2190 GWh in primary) energy. This corresponds to about a 31% reduction in the final energy consumption in refurbished buildings compared to their consumption prior to modernisation. Note that official data can be optimistic, and may not take into account of rebound effects or free-riders. It is largely based on building engineering models and these can overestimate the savings significantly.

		Over 90% of the savings relate to fossil fuels. Due to the high import share for these fuels, this contributes to the reduction of Germany's dependency on imports. The greenhouse gas reduction of subsidised in 2012, building renovations amount to a value of about 576,000 t CO_2e/yr, including direct and indirect (upstream) emissions. If only the building itself were accounted for, this falls to 406,000 t CO_2 in 2012. Since 2005, the refurbishment projects are estimated to have saved 4.75 Mt CO_2e. In addition the employments effects were as follows: • 2012 investment of €5.4 billion resulted employment effects in the amount of 69,000 person-years (PY), and around 82% of the employment effects save or create jobs in SMEs • The direct employment effect on the construction industry and related services such as building design and construction management has an even larger proportion coming from SMEs, at 90%. Overall, the ODYSSEE-MURE platform [6] rates this measure 5/5 in terms of impact and number of applicants. The high rating for impact is provided if the savings of the measure are higher than 0.5% of the final energy consumption of the entire sector which is the case for the KfW programme. Going forwards, Germany's 3rd NEEAP 2014 [1] estimates the final (primary) energy savings of the KfW Energy efficiency renovation intervention between 2014-2020, to be 48.6 TWh (converted from 175 PJ)(199). In terms of CO_2 emissions, a study in 2009 by the Umweltbundesamt UBA [4] estimated the intervention would contribute to CO_2 emissions savings of about 7.1 Mt in 2020 and 11.1 Mt in 2030.
3	**Cost-effectiveness**	The intervention combines grant and loans with subsidised interest rates and repayment bonus. Compared to ordinary loans, the grant, subsidy and bonus elements may be seen as less cost effective for the government, indeed ODYSSEE-MURE scores this measure 3/5 for cost efficiency for implementer. This measures energy savings achieved / necessary costs and admin support [6]. Using the high-level programme figures from 2001-2007 based on official evaluations carried out on behalf of KfW by the Bremer Energie Institut the programme appears to be cost-effective at a cost of about €0.02/kWh (the cost of heating fuels and electricity is significantly above this) [22]. However, detailed academic studies have called into question the cost effectiveness of the programme but because existing ex-post evaluations do not include many factors such as free-riders and the rebound effect and also use modelled savings based on theoretical energy consumption pre-retrofit, it is difficult to judge the cost-effectiveness more precisely [21].
4	**Critical success factors**	• The CO_2 Building Renovation Programme relieves the burden on both tenants and landlords by cushioning the additional costs incurred through investments in the energy efficiency of buildings • Clients benefit from very attractive loan conditions. Funding ensures that operating costs remain permanently low. Rising energy prices have less of an impact upon owners and tenants • The professional energy consultant connected with the funding reduces information deficits and makes it easier for owners to decide on a comprehensive refurbishment concept for their buildings • The mandatory involvement of an energy expert from the beginning of the application process until completion of the construction or refurbishment project is very important, for both the investor's comfort, and to ensure the best cost effectiveness for the funds

		• Commercial banks benefit from enhanced product spectrum for their clients which improves cross-selling potential as well as from additional liquidity without refinancing cost and from an attractive margin • Transparent and attractive scheme for customers (high and increasing level of demand). [5, 11] Overall, the ODYSSEE-MURE platform rates this 5/5 for ease of acceptance by relevant stakeholders [6].
5	**Marketing and comms**	The "KfW Efficiency House" standard has become a market wide brand for energy efficiency in buildings (both new and retrofit). The measure features prominently in the BMWi (energy ministry) and KfW website. The Energy Consumer Advice Centres played a key role in signposting homeowners and tenants toward this scheme. Finally, the mandatory involvement of an energy consultant ensures that full information on the scheme is disseminated, including most appropriate measures for a particular housing unit.
6	**Softer behaviour change**	Energy Consumer advice centres play a key role in advising homeowners and tenants on energy efficiency actions (softer behavioural measures), as well as signposting them toward these kinds of interventions which can have a more long lasting impact (detailed in intervention 4 below). Another key element of the scheme was the involvement of an Energy Consultant. These government recognised service providers were able not only to carry out qualified assessment of the households, but also give advice and knowledge on immediate energy efficiency actions homeowners and tenants could undertake.
7	**Barriers to delivery**	The key barriers are dissemination and the upfront cost of the scheme. These have been dealt with by involving consultants, who play an informational role (explaining the breadth of the scheme), subsidising loan rates and providing grants. ODYSSEE-MURE platform rates this 4/5 for suitability to overcome barriers for energy efficiency [6]. This takes into account the following barriers: information and knowledge deficits; capital constraints both including external and internal funds; risk and uncertainties, often leading to very short pay-back times for an energy efficiency investment; or split incentives when the costs and benefits of an energy efficiency investment decision fall on different actors. There were also barriers to delivering the programme – initially the banks did not promote the loans because they did not benefit sufficiently from doing so. However, after the first phase of the programme this problem was eventually resolved and the programme is now well known and promoted.
8	**Wider benefits and Unintended consequences**	KfW's 2012 monitoring report [7] for this intervention highlights these consequences: • In the urban-rural distribution of employment effects, shows the majority of jobs supported are urban, whereas of the semi-urban and rural areas have much fewer numbers - 39,000/yr, 21,000/yr, and 9,000/yr respectively. • From the total investment volume of €5.4 billion, around €0.9 billion flowed back to the state in the form of VAT, so the net revenue effect was €4.5 billion. • In examining generation energy savings by fuel type resulting from this intervention, it is important to note that in the case of biomass generation, there is actually a negative saving, i.e., over-spending. The reason for this is a fuel switch away from fossil to renewable energy sources. ODYSSEE-MURE platform ratings [6]: • 4/5 for Avoidance of negative side-effects. This takes into account distributional effects as e.g. an "unfair" burdening of the measure costs or relatively high burden for low-income households, direct rebound effects, i.e. negligent handling of energy due to cost saving induced by the measure (e.g. more lighting, higher room temperature) and indirect rebound effects due to economic interrelations.

		• 4/5 for Support of positive side-effects. Accounting for e.g. higher economic growth, improved competitiveness and productivity, creation of new jobs, improved work environment -Improvement of energy security, health etc. Unintended consequences • More recently a debate around the potential negative consequences of building insulation started in Germany. The negative consequences in retrofitted properties discussed include mould problems, condensation, mites, and woodpeckers using insulation as a nesting site creating potential habitats for squirrels and other animals. KfW disputes many of those issues as myths and it is not clear to what extent those consequences occur.

Country		Germany
Intervention		2. Energy Conservation (Saving) Ordinance. Regulation providing minimum requirements for the energy quality of building envelope and systems engineering for new buildings and major renovations of existing buildings.
Timeframe		Reviewed bi-annually (dates from 1970s)
Geographical Coverage		Nationwide
Target group		n/a
1	**Intervention architecture and logic**	Germany's Energy Conservation Regulations (EnEV) provides minimum requirements for the energy quality of the building envelope and systems engineering for new buildings and major renovations of existing buildings. **The targets** The targets are being constantly updated. Since 2007, the 2009 Ordinance and the 2013 Ordinance have both reduced building energy requirements by 30% each time. The values set out in the regulation must be observed during the refurbishment of existing buildings as well during the construction of new buildings. In addition, the 2013 Ordinance introduced a further tightening of requirements regarding yearly primary energy consumption of new buildings by 25% and by 20% regarding the requirements for building insulation from January 2016 onwards. **Certificates** As proof of compliance with these regulations, the legislators require an Energy Performance Certificate to be issued for the new or refurbished building, which is enhancing the importance of the energy performance certificate as a source of information for consumers. Energy efficiency classes for buildings have been introduced into energy performance certificates and property ads to improve transparency in the real estate market further (previously the EPC only stated the energy use in kWh on a sliding scale without classes). **Types of measures** In the 2009 ordinance the Energy Conservation Ordinance allows a wide choice of energy saving measures to reach the given limits, e.g. better thermal insulation of the building, more efficient heating installations, use of renewable energies, or concepts for heat recovery. To encourage energy efficiency improvements in existing buildings, in some specific cases of substantial retrofitting measures (e.g. replacement of windows, new plaster) the Ordinance requires improvement of insulation of floors, ceilings and piping. In addition, boilers installed before 1 October 1978 (in 2001 these were about 2 million) were required to be renewed or replaced by the end of 2006, and renewed boilers were further required to be replaced by 2008. The 2013 Ordinance (enacted as of 1st May 2014), and has the following aspects [8]: • No additional requirements for modernisation of existing buildings due to low energy saving potential • Introduction of an obligation to hand out the Energy Pass to a buyer or new tenant of a building (since January 1 2009, any house that is sold or let in Germany must under new legislation have an Energy Pass) • Extension of obligatory replacement of old heating boilers • Heating boilers built before 1985 have to be replaced. From 2015, 'constant temperature' boilers (standard boilers that, unlike newer boilers, cannot adjust their temperature to the required heat output) will be decommissioned

		after 30 years' use. Some owner-occupied single and two-family houses will continue to be exempted from the decommissioning requirement [1].

2	**Impact**	According to the 3rd NEEAP [1] the final (primary) energy savings and projections under this measure were as given below. The date allows the impacts of the 2009 Ordinance (2009-2013) and the estimated impact of the 2013 Ordinance (2014-2020) to be split
		• New builds
		  ○ 2009-2013: 43 TWh (154 PJ)
		  ○ 2014-2020: 13 TWh (47 PJ)
		• Existing buildings:
		  ○ 2009-2013: 100 Twh (363 PJ)
		  ○ 2014-2020: 80 TWh (290 PJ)
		
		An ex-ante evaluation of the additional CO_2 savings of the 2013 Ordinance, in comparison to the 2009 ordinance, is shown below [8]. Note however, that this does not segregate between the impact on residential and non-residential buildings. Direct CO_2 cumulative savings (2013 compared to 2009):
		• 2015 – 1400 kt
		• 2020 – 1800 kt
		• 2030 – 3700 kt
		
		• The ODYSSEE-MURE platform rates this measure highly at 4/5 in terms of impact and number of applicants [6].

3	**Cost-effectiveness**	• In the rationale for the new Energy Savings Ordinance, additional building costs of 1-1.5% are estimated for multi-family houses and of 1.5-2% for single/two-family houses, based on expert opinion [9] • The ODYSSEE-MURE platform rates the measure 4/5 for cost efficiency for the implementer, and necessary administrative support [6] • However the findings of a recent policy evaluation [21] are important and state that the cost effectiveness of the lowest standards achieved is significantly higher than of the highest standards.
4	**Critical success factors**	• In setting the new targets for building energy requirement, the cost of measures to owner-occupiers, landlords and tenants is taken into account, ensuring the measures as within the bounds of cost-effectiveness [9] • The Energy Savings Ordinance demands an overall energetic consideration of the building in planning, construction and operation, and an intelligent exploitation of all profitable energy saving potentials, e.g. by avoidance of heat bridges in the building shell [9] • An attempt is made to account for personal circumstances, by allowing exemptions from the scheme. In the example of owner occupied houses, if the owner has two houses, the boiler measures are only applicable in the 2nd house if the ownership changes.
5	**Marketing and comms**	As a regulation, this measure is required by law. Licence conditions for construction or renovations of these buildings will depend on compliance with this measure. In this way, it is self-disseminating, and the Electricity Savings Initiative Website (Intervention 3), as well as Energy Advisors (Intervention 4) providing further information for consumers on why those requirements are in place and practical implications.
6	**'Softer' behaviour change**	As a regulating ordinance, the focus of this intervention is not on soft behavioural change, but instead, setting the hard energy efficiency targets which will allow energy efficient new builds and retrofits. This can be seen as the foundation for energy efficiency, which will compliment softer behavioural change of household dwellers, boosting the impact on energy saving.
7	**Barriers to delivery**	As a regulation, implementation is required and enforced by law. Although cost barriers may exist, these have been designed in such a way that costs are minimised. In addition, the grants and loan schemes of the KfW (above) help to reduce these cost barriers.

		In practice there is an enforcement gap and the level of compliance with the regulation is not clear.
8	**Wider benefits and Unintended consequences**	The ODYSSEE-MURE platform ratings [6] are: • 2/5 for Avoidance of negative side-effects. This takes into account distributional effects as e.g. an "unfair" burdening of the measure costs or relatively high burden for low-income households, direct rebound effects, i.e. negligent handling of energy due to cost saving induced by the measure (e.g. more lighting, higher room temperature) and indirect rebound effects due to economic interrelations • 3/5 for Support of positive side-effects. Accounting for e.g. higher economic growth, improved competitiveness and productivity, creation of new jobs, improved work environment -Improvement of energy security, health etc.

Country		Germany
Intervention		*3.* Electricity Saving Initiative. Measure targets softer behavioural change through a website with information on electrical energy efficiency for households.
Timeframe		Ongoing from 2012
Geographical Coverage		Nationwide
Target group		Households
1	**Intervention architecture and logic**	The German Federal Government's long term energy strategy views significant energy efficiency improvement potentials in electrical devices and has set a target of reducing gross electricity consumption by 10% by 2020 and 25% by 2050 over 2008 levels. As a measure for reducing household electricity consumption in 2012 the Environment Ministry (BMU) commissioned the development of a website with information on electrical energy efficiency (www.die-stromsparinitiative.de). The objective was to provide consumers within depth and independent information on individual energy consumption and possible energy savings. The website was launched in January 2013. The website has tips on reducing electricity costs, power-saving videos, and online tool for calculating power consumption and what you need to know when purchasing new white goods. The website and tool complement previously existing resources such as an electricity efficiency campaign by the German Energy Agency (DENA), financially supported by the Ministry for Economic Affairs (BMWi) (www.stromeffizienz.de). In Germany, BMWi is in charge of energy policy while BMU (now BMUB) is in charge of climate policy. This overlap of competences sometimes leads to struggles and duplications of effort between the two ministries.
2	**Impact**	A readily available metric is the number of online electricity reduction checks undertaken. Thus far (April 2015) around 185,000 online audits have been undertaken. A parliamentary question from the Green Party revealed that by June 2013 some €600,000 had been spent on the programme. This led to several news articles critical of the programme. Firstly, they argued that the website was rather obscure (at the time the site had only had 80,000 visits and 30,000 online audits, compared to a total of 40 million German households). Secondly, they pointed out that the Minister at the time had stated in November 2012 that the Government was planning to invest an additional €50-€100 million in electricity savings measures in 2013, suggesting that actual spending on electricity savings measures was vastly below target [12]. Moreover, in late 2013 an evaluation of the programme was undertaken. It consisted of an online questionnaire completely answered by some 70 people who had previously undertaken an online audit. It was estimated that respondents who reported a large impact of using the free online energy counselling saved some 1 million kWh/year of electricity saved through behavioural change and 500,000 kWh/yr saved through the replacement of white goods, leading to total CO_2 savings of some 850 t/year. If respondents who reported 'some impact' are also included, total CO_2 savings from the tool increase to 3,600 t/year. The evaluation was conducted by co2online, the organisation which had initially developed the online tool [13,14].
3	**Cost-effectiveness**	No formal analysis of cost effectiveness has been undertaken in the evaluation. However, a rough estimate of cost effectiveness can be undertaken using some of the figures from the evaluation summarised above. Given the quoted expenditure figure of June 2013 and the CO_2 savings from the evaluation, it is conceivable that the programme costs some €500,000/year and helps save around 850 t CO_2/year.

		This suggests a cost €600/t carbon saved. This is around one to two orders of magnitude higher than estimates of current average abatement costs. If the more optimistic savings value of €3,600 t is used abatement cost would still be around €140 /t [15].
4	**Critical success factors**	No specific success factors have been identified in the documents reviewed.
5	**Marketing and comms**	There has been some marketing and communication activity, including a print campaign in 2012 and a social media campaign in 2014. There is no public information on the success of these campaigns [16, 17].
6	**'Softer' behaviour change**	Stromsparinitiative, a consumer information scheme, is exclusively about 'soft measures', namely the provision of a free online energy assessment, online provision of information on efficient appliances and contact information for local energy advisors.
7	**Barriers to delivery**	Given the fairly small size of the scheme, evaluation activity has been limited and has not specifically identified any barriers to delivery. As a general note, the 3rd NEEAP made in 2014 notes that despite various efforts at different levels and among various players to provide information and so raise awareness of energy efficiency, there is still a lack of knowledge among end-consumers of the (economic) potential for energy savings available to them, of possible improvements to their energy consumption and products available to exploit this potential. In the context of the Stromsparinitiative, the Green Party's criticism that the website remains obscure and unknown is significant. Because they lack information on their energy consumption and the complex relationships involved, many homeowners find it difficult to recognise opportunities for energy savings or the need to increase energy efficiency at all [1].
8	**Wider benefits and Unintended consequences**	No unintended consequences have been identified in the documents reviewed.

Country		Germany
Intervention		4. Energy Consumer Advice Centre. To promote rational energy use, provision of independent and provider-neutral energy checks for private consumers.
Timeframe		Ongoing from 2012
Geographical Coverage		Nationwide
Target group		Owner – occupier
1	**Intervention architecture and logic**	To promote rational energy use, the Federal Ministry for Economic Affairs and Energy and the Federal Office for Economic Affairs and Export Control (BAFA) support the cooperation and implementation of independent and provider-neutral energy checks for private consumers by the Federation of German Consumer Organisations (vzbv) which is a non-governmental organisation acting as an umbrella for 41 German consumer associations The offer was introduced across the country in September 2012. The objectives are to raise awareness of energy efficiency measures amongst consumers as well as to inform them of further advice and subsidy measures to increase energy efficiency, if applicable. The energy checks do not compete with offers from engineers and trade businesses. Also, the advice service is not part of the KfW Energy Efficient Construction programme (although experts may work for both programmes). It offers advice for private households about potential energy savings by providing three kinds of energy checks: • Basic check focused on tenants, the onsite energy check aims to encourage tenants to take energy saving measures through qualified advice: the savings potentials of heating energy (incl. hot water) and power are reviewed and recommendations for action are provided • Building checks focus on raising awareness among house and apartment owners as well as private landlords. In this case, advisers check the consumption of heating energy and power as well as the hot water system, the building envelope and the opportunity to use renewable energies. They encourage individuals to make appropriate and corresponding investments • Efficiency technology checks are offered for operators of condensing boilers. This takes place by making the relevant measurements on-site solution approaches and additional consulting services as well as potential subsidies. The consulting service for the energy efficiency checks is expected to be extended in the future: the "heating check" will then not just focus on condensing boilers, but on heating systems in general. It is expected that, from 2015, the energy efficiency checks will also include checks for solar thermal systems ("solar checks"). Advice is given as a short telephone call, email or a site visit. The service is subsidised by the Federal Ministry for Economic Affairs and Energy and the charge for advice is between €5-45. The planning, coordination and organisation, as well as the technical supervision of the energy checks are performed by the vzbv energy team. It is implemented by the regional consumer organisations and experts, who also provide other consulting services for the consumer organisations [1, 5].
2	**Impact**	Evaluations of the intervention show that those seeking advice are highly satisfied with the energy checks. This has lead in particular to the implementation of power sector energy efficiency measures (e.g. to save electricity with household appliances and building services) as well as energy efficiency measures in relation to heating systems. A total of 23,617 energy checks (as at May 2014) were performed in the previous eligibility period. The number is lower than that initially expected by the vzbv. Lower demand may be due to relatively warm winters in 2013/2014.

		Regarding energy consulting services in Germany more broadly, the NEEAP estimates that between 12,500 to 14,000 consultants exist in Germany, and this number is quickly growing. However, this covers the full range of energy consulting services, which is not restricted to savings advice given to household under the vzbv programme. The NEEAP further estimates the following impacts for energy consultations at the premises of the consumer, in terms of final (primary) energy savings [1, 5]: • 2009-2013: 1.1 TWh (converted from 4PJ) (5) • 2014-2020: 0.8 TWh (converted from 3PJ) (4)
3	**Cost-effectiveness**	The cost-benefit ratio per energy check is still within the framework estimated in the vzbv's project application [5].
4	**Critical success factors**	• The energy checks are intended to encourage demand for energy advice based on a low-threshold, but independent, competent and comprehensive offer • Energy checks provide provider- and product-neutral information on energy efficiency measures. A wide range of topics are considered, including reference to other consulting and subsidy offers • The energy consultants and services do not compete with offers from engineers and trade businesses.
5	**Marketing and comms**	The vzbv energy team has representative at regional levels to disseminate and organise activities under this programme. In addition, all providers of energy services, energy audits and other energy efficiency measures can also go on the list of providers from the BfEE and so advertise their services and present their qualifications [1].
6	**'Softer' behaviour change**	The nature of these energy checks is both to create "soft" behavioural change, and possibly lead to other more significant interventions. The objectives are to raise awareness of energy efficiency measures amongst consumers as well as to inform them of further advice and subsidy measures to increase energy efficiency, if applicable and in a technology neutral manner.
7	**Barriers to delivery**	**Cost**: Although the energy checks are subsidised, the cost may still be a barrier for lower income householders. **Geographical resources:** Noted that in some regions, advisors are not yet available for all consumers.
8	**Wider benefits and Unintended consequences**	No formal studies on unintended consequences were found, however, there are likely to be significant employment benefits.

Sources:

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[15] UK Government, Carbon Valuation, https://www.gov.uk/government/collections/carbon-valuation--2

[16] http://www.xad.de/ad/bundesministerium-fuer-umwelt-naturschutz-und-reaktorsicherheit-bmu-die-stromsparinitiative-229387

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[18] Source: DECC, Domestic electricity prices in the IEA, March 2015 https://www.gov.uk/government/statistical-data-sets/international-domestic-energy-prices

[19] Eurostat data sets:

- Distribution of population by degree of urbanisation, dwelling type and income group (source: SILC) [ilc_lvho01] - http://appsso.eurostat.ec.europa.eu/nui/show.do
- Distribution of population by tenure status, type of household and income group (source: SILC) [ilc_lvho02] - http://appsso.Eurostat.ec.Europa.eu/nui/show.do

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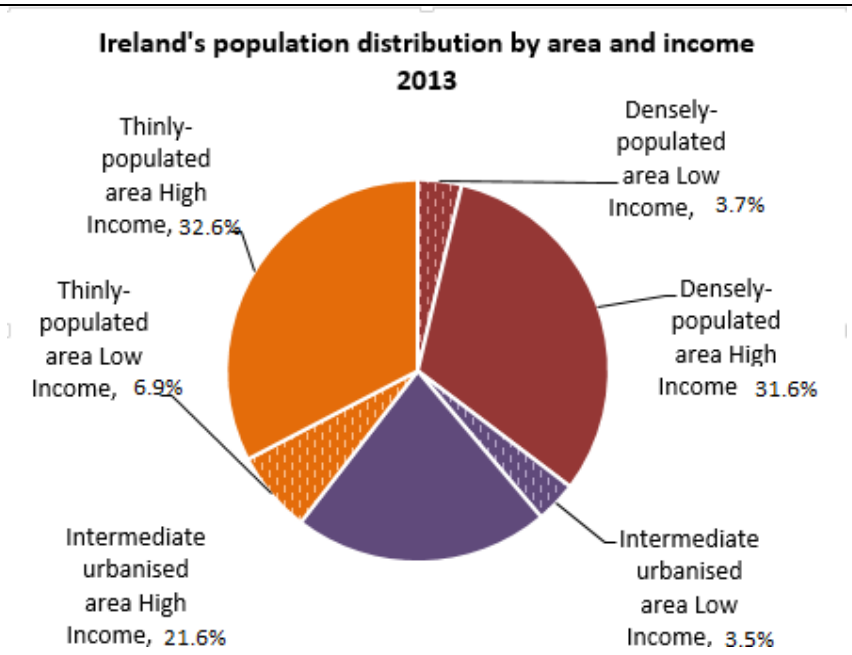
3.4 Ireland

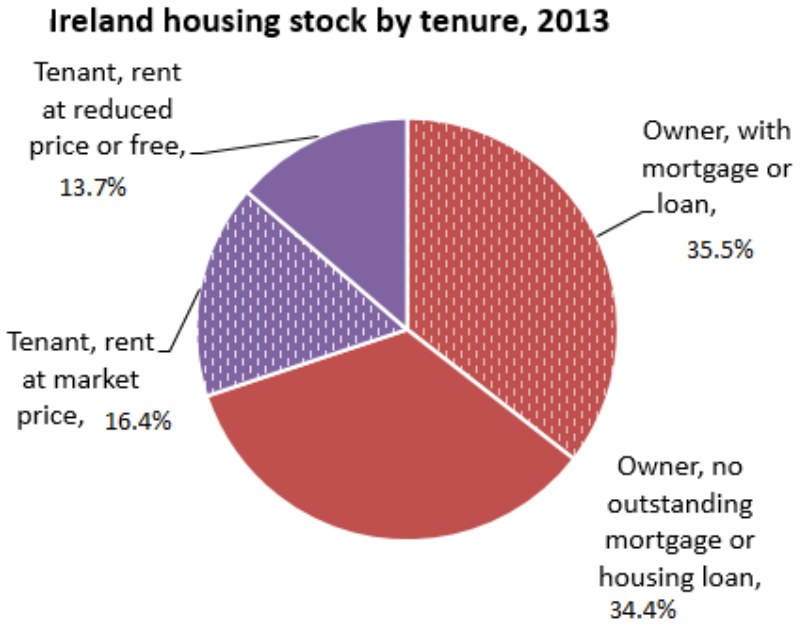
Country	Ireland
Country Context	*Ireland Policy Background* Ireland's overall national energy efficiency target for primary energy for 2020 is 31.9 TWh. This represents a 20% reduction in primary energy consumption from the 2001-2005 average baseline. This target, along with a commitment to a 33% reduction in public sector energy use, constitutes the central pillar of Ireland's national energy efficiency policy [1]. **Key Demographics** The CIA World Factbook (https://www.cia.gov/library/publications/the-world-factbook/geos/ei.html) estimates that in 2014 Ireland's age profile was as follows: • 0-14 years: 21.4% • 15-24 years: 11.9% • 25-54 years: 44.1% • 55-64 years: 10.1% • 65 years and over: 12.4% The chart below from the European Commission's Eurostat data [2] shows the population distribution by area classification and income. High income here is classed as over 60% of median equivalised income. Equivalised income is defined as household net income, divided by the number of equivalised adults in the household. (see http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Equivalised_disposable_income) There is a relatively even split between the totals in thinly and densely populated areas. It is worth noting that the proportion of lower income residents in rural areas is around twice that in dense urban and intermediate areas. This can present supply-chain challenges when attempting to tackle causes of fuel poverty through energy efficiency installations.

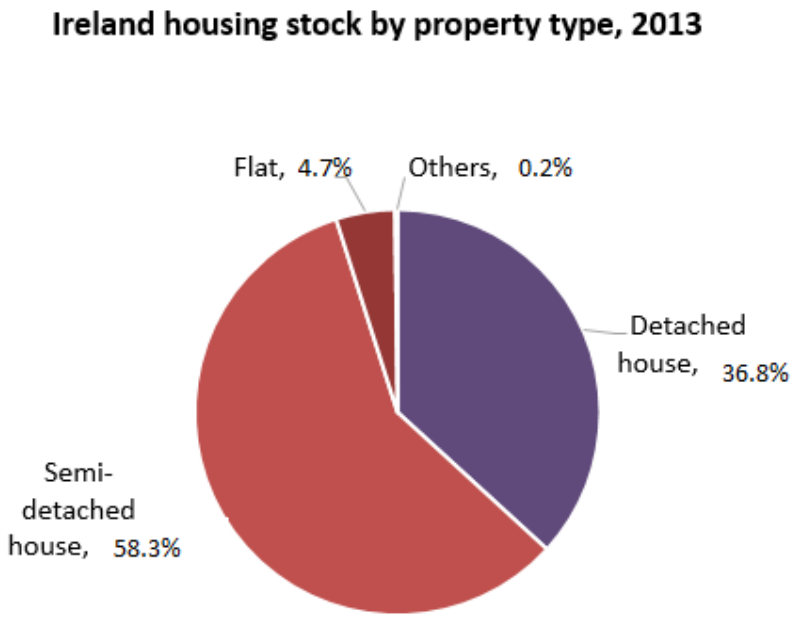


Housing Stock

The following charts, also based on Eurostat data, show the Irish housing stock by tenure and property type. A considerable majority of people (69.9%) own their home as opposed to renting. Within the rental market, almost half (46%) benefit from reduced price or free rent.

Ireland has a very small proportion (4.7%) of flats, with the majority of houses (61%) being semi-detached.





Domestic Energy Prices

Domestic energy prices are shown in Section 3.1. Ireland's electricity prices pre-tax are the highest of all 8 countries, with only the relatively low tax component keeping the overall price below that of Germany. Domestic gas prices are in line with the other nations in the study.

Fuel Poverty

In February 2015 the Irish Government published a white paper to launch a public consultation on the development of a new Energy Affordability Strategy [4]. The aim is to build upon and develop the approach taken under the first Affordable Energy Strategy of 2011. The white paper postulates that energy poverty "occurs at the nexus of three factors: a person's income, the cost of energy and the energy efficiency of their home." It seeks responses on the proposal to move away from the traditional classification of energy poverty in terms of proportion of household income spent on energy, considering a range of different approaches such as:

- The subjective method based on consumers' own judgements of their ability to heat their home
- An indicator based on a review commissioned by the UK Government, by Professor John Hills of the London School of Economics [5]. The Hills indicator finds a household to be fuel poor if:
  - Their income is below the poverty line
  - Their energy costs are higher than is typical for their household type.

The white paper aims to address fuel poverty through three channels: energy efficiency; supporting the income of those in energy poverty, and ensuring energy markets work for consumers.

The main tool to deliver the energy efficiency arm of this approach is the Better Energy Warmer Homes scheme, which is the first policy intervention studied in-depth in this report.

Selected Interventions	1. Better Energy Warmer Homes 2. Better Energy Homes 3. Energy Efficiency Obligation Scheme 4. Home Renovation Incentive

Linkages between schemes	The Better Energy Warmer Homes scheme constitutes a major part of Ireland's Affordable Energy Strategy, alongside other interventions such as Housing Aid grants, Better Energy Communities and Area based schemes, and the Energy Efficiency Obligation Scheme (5% of obligated savings must be delivered in the energy poverty sector) [4]. Better Energy Warmer Homes' qualification criteria also link it with Department of Social Protection benefit payments. Better Energy Warmer Homes and Better Energy Homes are both part of the Residential Retrofit suite of schemes, under the Better Energy Brand. Better Energy Homes is available to all domestic energy customers, but only covers up to 30% of eligible improvement costs, whereas Better Energy Warmer Homes can cover 100% of costs for eligible applicants. The Better Energy Communities and Area Based Schemes complete the suite, and all are delivered in most part by the Sustainable Energy Authority of Ireland (SEAI), with some provision being presented in partnership with community based organisations. The SEAI is a government body established as Ireland's national energy authority under the Sustainable Energy Act 2002. SEAI's mission is to play a leading role in transforming Ireland into a society based on sustainable energy structures, technologies and practices. SEAI also administer and report on progress for Intervention 3 - the Energy Efficiency Obligation Scheme. This forms the main part of Ireland's approach to meeting the requirements of Article 7 of the European Union Energy Efficiency Directive (EED), expected to deliver 50% of the annual savings target. The remainder of the target is to be met via a range of alternative measures including business and industry targeting programmes, building regulation improvements and Intervention 4, the Home Renovation Incentive [6]. The Better Energy Homes grant can be combined with grants available through the Energy Efficiency Obligation Scheme.

Country		Ireland
Intervention		1. Better Energy Warmer Homes
Timeframe		2011 – Present (successor of a scheme running from 2000)
Geographical Coverage		Nationwide
Target group		Homes of the elderly and vulnerable
1	**Intervention architecture and logic**	Better Energy Warmer Homes is the successor of the Warmer Homes Scheme, which ran from 2000 to 2011. In 2011 it was incorporated into the Residential Retrofit suite of programmes under the Better Energy umbrella brand, administered by the SEAI on behalf of the Department of Communications, Energy and Natural Resources (DCENR). Its major aim is to tackle energy poverty in Ireland, as a part of the 2011 national strategy document, "Warmer Homes: A Strategy for Affordable Energy in Ireland" http://www.dcenr.gov.ie/NR/rdonlyres/53F3AC25-22F8-4E94-AB73-352F417971D7/0/AffordableEnergyStrategyFINAL.pdf The scheme offers fully government funded installation of the following measures and services: 1. Attic insulation 2. Draught proofing 3. Lagging jackets 4. Low energy light bulbs 5. Cavity wall insulation 6. Energy advice To qualify, applicants must meet the following criteria: • Owner occupied non-Local Authority homes • Constructed before 2006 • The owner is in receipt of one of the following: o Fuel Allowance as part of the National Fuel Scheme o Job Seekers Allowance for over six months and with children under 7 years of age o Family Income Supplement Successful applicants will receive a free survey of their home to identify any eligible works, which will then be carried out subject to available budget. Surveyors and installers are appointed by SEAI, from an approved panel of private contractors and non-profit Community Based Organisations (CBOs). The CBO pool also promotes the scheme and can facilitate referrals to SEAI. Once the works are completed, a free Building Energy Rating (BER) survey and report is arranged by the contractor as proof of completion to facilitate grant payment.
2	**Impact**	By the end of 2014, the scheme had upgraded more than 112,000 energy poor homes since its commencement in 2000, with an overall spend of almost €137 million [4]. The International Energy Agency's *Energy Policies of IEA Countries* review for Ireland, of 2012 states figures of 80,000 homes treated at a total spend of €80 million, and estimated related energy savings to be 171 GWh [7]. Applying the same proportionality to the DCENR's figures for the end of 2014 would give an estimated energy savings in the range 239 - 293 GWh.

3	**Cost-effectiveness**	112,000 homes upgraded at a cost to Government of €137 million gives a cost of €1,223/home treated (£905/home at May 2015 exchange rate). The latest National Energy Efficiency Action Plan (NEEAP) states that the €20 million committed to the scheme for 2014 would result in energy savings of 23 GWh, corresponding to 6kt CO_2 and monetary savings of €1.5 million/year [1] These savings are for every future year (post installation) over the lifetime of the measures installed. Using an estimated average measure lifetime of 30 years, this gives a cost ratio of public expense to lifetime savings from bills of 0.4 and an expense of €0.02/kWh which is very cost-effective for a scheme targeting the reduction of fuel poverty. The €1.5 million figure is a first-year saving. This annual savings will accumulate over the lifetime of the measures installed, as will the total energy saving. In UK energy efficiency schemes, the lifetimes of both loft and cavity wall insulation are estimated at 42 years, with hot water tank lagging and draught-proofing assigned lifetime values of 10 years. Depending, on the distribution of measures within those installed through the Better Energy Warmer Homes Scheme, the lifetime savings and therefore ultimate cost effectiveness will exceed the first year figures in the paragraphs above by between 10-40 fold.
4	**Critical success factors**	As per **Section 2** The scheme has upgraded over 112,000 energy poor homes. In a telephone interview on 9th June 2015, Ruth Buggie of the SEAI opined that one of the major factors in the success of the scheme is its clarity and the simplicity of its 'one-pager' application process [18]. The combination of delivery through trusted intermediaries, effective oversight of the scheme by SEAI, and a clear, well defined process, have led to very high levels of interest. At time of writing, a waiting time of around 9 months is publicised between the measure identification survey and actual installation. Ruth Buggie, in the 9th June interview, says that the 9 month figure is an outlier and typical waiting times are around 3 months [18]. This obviously shows that there is a high demand for this attractive grant scheme, but also highlights its restrictions, brought about mainly by supply chain limitation and requirement for economies of scale, as discussed in **Section 7**.
5	**Marketing and communication**	The scheme is promoted by SEAI and the delivery partner pool of CBOs, through their individual websites and community engagement strategies. This approach can be very effective in reaching the target audience, as many elderly and otherwise vulnerable people are more inclined to trust and engage with a 'local' presence than larger government affiliated bodies. The SEAI also runs regular targeted marketing campaigns in conjunction with the Department of Social Protection to ensure that those in receipt of qualifying benefits are aware of the scheme.
6	**'Softer' behaviour change**	A free energy advice service is one of the main aspects of the scheme delivered by SEAI over the phone and the allocated surveyors in the home. The advice covers general guidance on how heating systems work and effective control practices, and is accompanied by an information pack containing generic leaflets and flyers.
7	**Barriers to delivery**	The overall Better Energy scheme budget is inconsistent year-on-year and is significantly lower for 2015 than in previous years (€12 million for 2015, compared to an average of €65 million per year for 2011 – 2014) [1]. **2011 €m** | **2012 €m** | **2013 €m** | **2014 €m** | **2015 €m** | **2016 €m** | **Total €m** 97 | 71 | 35 | 57 | 12 | 12 | 284

		The overall budget is demand based. SEAI are asked to model budget requirements based on scheme performance trends, and submit this to DCENR for budget allocation. The apportionment of the overall Better Energy budget to the individual schemes within the umbrella is not strictly fixed, there are internal distribution levels but these are subject to reactive change between the schemes if required, subject to final Department approval [18]. This uncertainty makes effective long-term planning difficult for the scheme, and introduces commercial risks for the delivery partner panels of private contractors and CBOs. The limited budget also leads to a necessary trade-off between the number of properties accepted onto the scheme, and the level of work which can be done per property. A trade-off which may result in fewer homes actually being removed from energy poverty than desired. The waiting time resulting from large demand as described in **Section 5**, points to a supply-chain gap. A shortfall in the depth of the installer pool, which potentially reflects the commercial risks inherent in the inconsistent budgetary commitment to the scheme.
8	**Wider benefits and unintended consequences**	The energy saving estimate of all of the Better Energy schemes has had a 70% tempering factor applied to it due to the 'rebound effect [1]'. This is due to the theory that expected gains through resource efficiency improvements are reduced due to end-user behavioural responses. In terms of thermal energy efficiency improvements this is often called the 'comfort factor'; if a homeowner knows their home is more efficient and therefore cheaper to heat, they will increase the temperature. This obviously can have massive health benefits and addresses one of the major problems caused by energy poverty. The delivery of the scheme via local community organisations and private contractors brings local employment and other economic benefits. This though does need to be tempered by the uncertainty resulting from budget inconsistency discussed in **Section 7**. The NEEAP estimates that the €20 million committed to the scheme for 2014 would support 417 jobs [1].

<table>
<tr><td colspan="2">Country</td><td>Ireland</td></tr>
<tr><td colspan="2">Intervention</td><td>2. Better Energy Homes</td></tr>
<tr><td colspan="2">Timeframe</td><td>2011 – Present (Previous incarnation, Home Energy Saving Scheme, ran from 2009)</td></tr>
<tr><td colspan="2">Geographical Coverage</td><td>Nationwide</td></tr>
<tr><td colspan="2">Target group</td><td>Domestic energy users</td></tr>
<tr><td>1</td><td>Intervention architecture and logic</td><td>As with Better Energy Warmer Homes, Better Energy Homes is an evolution of a previous scheme, brought under the Better Energy banner in 2011. Its core aim is to stimulate the installation of energy efficiency measures to reduce domestic energy usage.

Delivered by SEAI, the scheme gives fixed amount cash grants for qualifying energy efficiency improvements to owners of homes built after 2006.

The current list, as updated in March 2015, of qualifying works and grant amount is as follows [8]:

Grants are available for the following works that must be completed by a registered SEAI contractor.

<table>
<tr><th></th><th>Energy Efficient Works</th><th>Increased Grant Value</th></tr>
<tr><td>Insulation</td><td>Attic</td><td>€300</td></tr>
<tr><td></td><td>Wall-Cavity</td><td>€300</td></tr>
<tr><td></td><td>Wall – Internal Dry Lining</td><td></td></tr>
<tr><td></td><td>Apartment (any) or Mid-terrace House</td><td>€1,200</td></tr>
<tr><td></td><td>Semi-detached OR End of Terrace</td><td>€1,800</td></tr>
<tr><td></td><td>Detached House</td><td>€2,400</td></tr>
<tr><td></td><td>Wall - External</td><td></td></tr>
<tr><td></td><td>Apartment (any) or Mid-terrace House</td><td>€2,250</td></tr>
<tr><td></td><td>Semi-detached OR End of Terrace</td><td>€3,400</td></tr>
<tr><td></td><td>Detached House</td><td>€4,500</td></tr>
<tr><td>Heating System</td><td>Heating Controls with Boiler (Oil or Gas) Upgrade</td><td>€700</td></tr>
<tr><td></td><td>Heating Controls Upgrade Only</td><td>€600</td></tr>
<tr><td></td><td>Solar Heating</td><td>€1,200</td></tr>
<tr><td>Bonus</td><td>For 3rd Measure</td><td>€300</td></tr>
<tr><td></td><td>For 4th Measure</td><td>€100</td></tr>
<tr><td colspan="2">Building Energy Rating (BER)</td><td>€50</td></tr>
</table>

The grant values are based on 30% of the average cost of works.

The claimant must engage an SEAI registered contractor from a list available online, and then apply for the grant. Once a grant has been approved the claimant has 6 months to claim. Before claiming the grant the works must be complete and a Building Energy Rating (BER) survey completed by a registered BER assessor. As per the table above, €50 can be claimed towards the cost of the BER, but there is no fixed fee for the survey.

Changes to the scheme in 2015 have seen the grant levels increase align them with market performance, and to allow previous applicants to obtain grants for further improvement measures.</td></tr>
<tr><td>2</td><td>Impact</td><td>The SEAI website provides statistics on the productivity of the scheme from the start of the Home Energy Saving Scheme in 2009, up to 1st March 2015 [9]:</td></tr>
</table>

Measures	Approved	Completed	Grant value
Roof Insulation	164,491	112,992	€26,242,978
Cavity	135,608	99,753	€35,828,529
Dry-lining Insulation	20,233	9,865	€21,646,605
External Insulation	18,535	12,170	€44,076,542
Heating Controls Upgrade only	15,241	7,534	€3,506,281
High Efficiency Gas Boiler with Heating Controlls Upgrade	37,638	24,832	€15,821,731
High Efficiency Oil Boiler with Heating Controls Upgrade	32,233	15,216	€10,042,921
Solar Heating	11,959	6,662	€5,331,913
Integral BER	162,901	116,262	€8,719,785
Before/After BER	19,107	8,367	€1,669,060
Total	617,946	413,653	€172,886,346

Some of the statistical data show a breakdown of the above measures by year:

Measures Approved 25/7/14	Roof insulation	Cavity	Dry lining	External insulation	High Efficiency Gas Boiler with Heating	High Efficiency Oil Boiler with Heating	Heating Control upgrad e only	Solar Heating	Total
2009	32,410	25,812	5,275	1,737	3,854	7,382	9,332		85,802
2010	57,675	49,326	6,230	3,365	5,051	10,446	10,713		142,806
2011	43,567	36,331	4,910	6,927	3,181	7,538	6,096	3,768	112,336
2012	15,466	12,813	1,558	2,920	1,139	3,802	2,126	3,189	43,013
2013	8,837	6,660	1,158	1,881	1,036	3,993	2,046	2,506	28,117
2014	5,612	3,976	953	1,459	848	3,808	1,662	2,190	20,508
2015	924	690	149	246	132	669	258	288	3,356
Grand Total	164,491	135,608	20,233	18,535	15,241	37,638	32,233	11,959	435,938

In September 2011, SEAI published an analysis of two Government programmes, one being the Home Energy Savings Scheme. It used data from a pilot scheme of 2008 to estimate the energy savings in kWh per measure installed as follows [10]:

	Apartment	3 bed semi detached	3 or 4 bed detached
Roof insulation	800	1,300	1,655
Cavity insulation	2,050	3,250	4,136
Dry-lining insulation	3,200	5,000	6,364
External insulation	3,750	5,900	7,509
Heating controls upgrade only	2,350	3,700	4,709
High efficiency gas or oil boiler with heating controls and hot water cylinder upgrade	4,900	7,700	9,800

The SEAI scheme statistics do not give a breakdown of property type for the measures installed, but applying the Eurostat data on housing stock distribution of Ireland having 4.7% flats, 58.3% semi-detached and 36.8% detached homes [2i] allows us to estimate the energy savings to date from the scheme as:

Measures	Approved	Completed	Grant value	Estimated Energy Saving (kWh)
Roof Insulation	164,491	112,992	€26,242,978	158,701,784
Cavity	135,608	99,753	€35,828,529	350,447,052
Dry-lining Insulation	20,233	9,865	€21,646,605	53,339,897
External Insulation	18,535	12,170	€44,076,542	77,635,619
Heating Controls Upgrade only	15,241	7,534	€3,506,281	30,139,481
High Efficiency Gas Boiler with Heating Controlls Upgrade	37,638	24,832	€15,821,731	206,746,266
High Efficiency Oil Boiler with Heating Controls Upgrade	32,233	15,216	€10,042,921	126,685,373
Total	423,979	282,362	€157,165,587	1,003,695,471

This gives an estimated energy saving, not including solar thermal installations, of just over 1000 GWh. Note that this calculation does not include interaction effects between the different measures installed.

3 Cost-effectiveness

The scheme is given a score of 4/5 for cost efficiency on the ODYSSEE-MURE measures database [19]:

In an e-mail of 1st July 2015, Jim Sheer of SAEI provided the following data on scheme performance:

	2009	2010	2011	2012	2013	2014
SEAI Spend €m	16.3	45.3	56.7	29	17.5	10.2
Total Spend €m	47.2	129.3	162	85.3	54.7	31.9
Number of homes/projects	16,344	45,990	47,594	26,426	13,710	9,500
Energy Savings GWh	89.9	252.9	261.8	145.3	68.6	47.5
Value of Energy Savings €m	5.8	16.6	17.5	9.9	4.7	3.2
CO_2 saving kt	22.3	62.7	64.9	36	17	11.8

This gives a total grant spend of €175 million with a total annual energy saving of 866 GWh. This data is not broken down across measure type, but applying the same proportional split as with the downloaded figures in Section 2 and an average lifetime of 30 years for insulation measures and 15 years for heating measures, the cost effectiveness of the scheme works out to be €0.006/kWh.

The SEAI 2011 economic analysis of the scheme10 carried out a Net Present Value exploration for a range of possible future energy and carbon dioxide price scenarios. It found that, on average, households participating in the scheme would see an annual energy saving of €450, and a 1.5 t reduction in CO_2 emissions. The report concluded that every € spent on the grant scheme delivered a net benefit of €5 to society.

<table>
<tr><td>4</td><td>Critical success factors</td><td>Being part of the Better Energy Residential Retrofit suite of schemes, Better Energy Homes shares several success factors and barriers/challenges with Better Energy Warmer Homes.

Effective delivery and clear guidance from the recognised and well regarded SEAI have allowed the scheme to run successfully thus far, as is borne out by installation rates noted in Section 2, and the Government's backing of the scheme by increasing grant rates and allowing homeowners to apply for further measures.

Also as with the Better Energy Warmer Homes Scheme, in an interview carried out for this study, Ruth Buggie, Sustainable Energy Communities Programme Manager at SEAI said that she believes that the ease of application is a large factor in the scheme's success [18]. Better Energy Homes is accessed via a simple online application which aims to provide confirmation of approval within 2 minutes.

The final clear success factor for both Better Energy Homes and Better Energy Warmer Homes is that they are grant schemes, as opposed to loans or other repayment financing options. Free subsidies with effective promotion and user-friendly delivery are obviously very appealing to consumers.</td></tr>
<tr><td>5</td><td>Marketing and communication</td><td>SEAI market the scheme through existing networks and issue regular press releases about scheme performance and changes. This approach ensures high-profile national coverage and gets the message to large numbers of the target audience.

In the telephone interview of June 2015, Ruth Buggie stated that there had been nationwide TV and radio advertisements of the scheme when first launched but, as they did not have much impact compared to the cost and time commitment involved, it was decided not to continue with these media [18].

SEAI also run occasional roadshows and other public events to advise the public on energy efficiency in general and highlight the availability of grant schemes.</td></tr>
<tr><td>6</td><td>'Softer' behaviour change</td><td>There are no specific behaviour change aspects to Better Energy Homes, but anyone contacting SEAI or visiting the website can access arrange of advice and tools through their Power of One programme. The programme offerings include general energy saving tips, an online home energy survey and a downloadable home energy management app.

http://www.seai.ie/Power_of_One/

Having the grant schemes delivered by the same body delivering this major advice and support service obviously allows the two to operate in close conjunction.</td></tr>
<tr><td>7</td><td>Barriers to delivery</td><td>As with Better Energy Warmer Homes, the major challenge facing Better Energy Homes is the inconsistency in funding for the overall Better Energy suite of programmes [1].

<table>
<tr><th>2011 €m</th><th>2012 €m</th><th>2013 €m</th><th>2014 €m</th><th>2015 €m</th><th>2016 €m</th><th>Total €m</th></tr>
<tr><td>97</td><td>71</td><td>35</td><td>57</td><td>12</td><td>12</td><td>284</td></tr>
</table>

The continuing reduction in budget from 2011 to 2013 is clearly reflected in the decrease in total measures installed across that period, as discussed in Section 2. The 2014 budget allocation saw an increase but the installation rate continued to fall. The NEEAP [1] states that of the 2014 total, €20 million is allocated to Better Energy Homes, but without a breakdown of the distribution in previous years it is difficult to pinpoint the source of this discrepancy. It is clear however that the much reduced budget for 2015, and going forward, will present a challenge in maintaining the momentum of the programme. Again, as with Better Energy Warmer Homes, the uncertainty that this budget fluctuation creates can introduce some commercial risk for contractors registered, or considering registering, for the scheme.

Ruth Buggie believes that one of the biggest lessons to be learned from the Better Energy Homes Scheme, and it predecessor, is to "bring the installers along with you." [18]. By this, she means to make sure that clear expectations are set on the contractors registered to the scheme, and adhered to as tightly as possible. As an organisation with</td></tr>
</table>

		50 employees, the SEAI face a challenge in engaging with a construction sector almost 6,000 strong, and lost an amount of installer 'buy-in' when tightening the QA process once already into the delivery of the scheme. Careful consideration and clear communication of QA expectations and procedures at the outset of any scheme would go a long way to avoiding this 'buy-in' barrier.
8	**Wider benefits and unintended consequences**	The 'comfort factor' is once again a benefit of this energy efficiency programme. More efficient homes empower people to heat them more fully, increase health and comfort levels. The NEEAP estimates that the €20 million allocated to the scheme for 2014 would support 928 jobs, although this is a fairly optimistic estimate (a review of international studies on energy efficiency programmes and jobs suggests the average job creation per million € is around 17 and 19 net jobs) [1]. Expanding on this, an SEAI press release of March 2015 states: "*The Better Energy Homes Scheme has supported an average of 2,120 jobs (direct and indirect) each year since the scheme was launched in 2009 and has delivered CO_2 emissions savings of 214.7kt*." [11] Industry insiders have informally told the SEAI that there are "less than 18,000 cavity wall insulation jobs left in the country" [18]. If energy savings momentum is to continue, there is a need to consider and shape schemes to tackle the insulation of other construction types. By their nature, cavity walls are easier and cheaper to retrospectively insulate than solid walls, and even older timber frame constructions. Any attempt to cost-effectively tackle this less simple building stock must be very carefully planned and effectively supported.

Country		Ireland
Intervention		3. Energy Efficiency Obligation Scheme
Timeframe		2014 - 2020
Geographical Coverage		Nationwide
Target group		End users of suppliers selling more than 600GWh in 2012.
1	**Intervention architecture and logic**	The Energy Efficiency Obligation Scheme (hereafter referred to as EEOS) is part of Ireland's approach to meeting their obligations under Article 7 of the EU Energy Efficiency Directive 2012. Ireland has chosen to follow the route of an obligation scheme in conjunction with alternative measures, with the EEOS contributing 50% of the overall targeted energy savings (550 GWh out of 1,102 GWh of primary energy equivalent per annum) [6]. Ireland had run a voluntary agreement scheme from 2011 – 2013 which achieved a saving of 454GWh in 2013 [1]. EEOS replaced this as a compulsory obligation scheme for all energy distributors and retail energy sales companies that have market sales of over 600GWh/year [12]. There are currently 11 obligated parties and they can choose to achieve targeted saving either independently or in partnership with energy service providers in the market. Individual targets for obligated parties are calculated as a proportion of the total 550GWh annual target, equal to that party's proportion share of the total eligible supplier sales volume. Of the target, 25% must be in the residential sector, with 5% of that going towards alleviating energy poverty. Within these criteria, obligated parties can design and deliver their own schemes, and the targeted promotion of these, usually area based, projects is how consumers gain access to the funding available. The domestic proportion of target is generally met using 'deemed' savings figures, as published by SEAI in the *Energy Saving Credits Table* [13]. The latest table, from January 2015, lists 40 material measures, ranging from CFL lightbulbs at a deemed saving of 80 kWh/yr per set of 5, up to the installation of a water-to-water heat pump with integrated controls at 12,740 kWh/yr. The deemed energy credits for each measure are determined by the standard decrease in energy usage for that measure, as modelled by Ireland's Building Energy Rating (BER) methodology, which is comparable to a full SAP survey [14]. Homeowners can access supplier funding and Better Energy Homes funding together, and obligated parties generally try to match the SEAI grant funding levels for each measure [14]. Obligated parties can exchange credits with other parties at any time of the year, and can buyout (at a price of roughly €0.20/credit) up to 30% of its assigned annual savings target if that has not been achieved at the end of the accounting year Any remaining unachieved target is subject to a penalty payment of around €0.80/credit [14]. The funds raised through buy-out and penalty payments will go towards the administrative cost of the scheme, which has initially been met with an internal SEAI budget. The scheme rules are set by the Minister for Communications, Energy and Natural Resources, who also assign the annual energy savings target to each obligated party, and chair the Energy Supplier Governance Group. The scheme is administered by SEAI who facilitate, monitor and report on all aspects of the scheme.

		There are no restrictions on a householder combining the Energy Efficiency Obligation Scheme with other government grant funding towards energy efficiency measures. Indeed, SEAI encourage this combination approach, as long as obligated parties can satisfactorily demonstrte their 'materiality and additionality' to the works involved [14].
2	**Impact**	With the scheme being relatively young, there is no overall data on the performance of the scheme available yet. Programme Manager Joe Durkan states: *"2014 was the first year of the obligation scheme (a voluntary arrangement was in place before that). And we have only just finalised the analysis of the data. Unfortunately it is not yet ready for public consumption as we need to submit it to government and the commission respectively."* [14].
3	**Cost-effectiveness**	As mentioned in **Section 2,** there is no robust data available on scheme performance thus far, and therefore assessment of its cost-effectiveness is not possible.
4	**Critical success factors**	SEAI are very happy with the progress of the scheme so far. There is an official marker target of 75% progress towards overall target by the end of 2015, with an internal interim aim of 60% by the end of 2014. Early results from the scheme assessment currently underway indicate that the 2014 marker has been met [14]. It appears that none of the obligated parties have attempted to pass the cost of delivering the scheme onto their customers as yet, with funding coming directly from the obligated parties. It is felt that the good work invested in building and maintaining relationships with the obligated parties is the major factor in this and the overall pleasing performance of the scheme thus far [14]. The running of the voluntary scheme as a precursor to the obligation is likely to have had a positive impact in this respect, as discussed in **Section 7.**
5	**Marketing and communication**	No central marketing by SEAI or the Irish Government is carried out for EEOS. As the obligated parties are permitted to design their own schemes within the overarching guidelines, marketing is also done on an individual basis. This is mostly done through parties' websites and other existing lines of communication with their customers.
6	**'Softer' behaviour change**	As well as the material measures listed in the Energy Saving Credits Table [13], obligated parties can also gain credits to apply towards their target by install electricity or shower energy monitors, and by carrying out a series of "Home Energy Reports for Behavioural Energy Efficiency". To achieve the credits, the reports must meet the following critera [13]: • Reports must include personalised comparison, comparing a customer's energy use (based on electrical or natural gas consumption as dictated on the dwelling's bi-monthly energy bill) against a group of no more than 200 similar households (e.g. by location, size, etc) • A minimum of 6 energy reports shall be issued per year to the occupants of the dwelling. The energy reports should follow the issuing of an energy bill and reference the energy usage during that period. • Reports include advice for saving energy. • Advice for saving energy is personalised to the recipient. • Contact information for final customers' organisations, energy agencies or similar bodies, including website addresses, from which information may be obtained on available energy efficiency improvement measures e.g. SEAI's 'Power of Once' campaign end user profiles and objective technical specifications for energy-using equipment.
7	**Barriers to delivery**	Joe Durkan, EEOS Programme Manager describes the main challenges facing the scheme as [14]: • Implementation of a robust quality management system, to handle potentially thousands of individual projects. This is an ongoing task, SEAI visit the obligated parties to check progress, they are required to have a documented QA process, but there may be a benefit in requiring a full Quality Management System such as ISO9001.

		• Buy-in from the obligated parties. Relationship management is the key here, the very term 'obligated' can be problematic. Ireland ran the voluntary scheme as a precursor to the obligation scheme which helped to iron out a lot of snags and cement trust and good-will between them. • Interpretation of the EU Energy Efficiency Directive "*E.g. Determining additionally and materiality is largely an exercise that is left up to the MS with little clarity from the commission, but with the danger that the commission might determine that the MS interpretation is incorrect, thereby voiding a large number of savings.*" • *The early stages of the scheme have largely focussed on easier, cheaper measures. More expensive measures will need to be tackled going forward, so the smooth progress so far may become difficult to maintain. There is an argument to 'go-deep' and tackle the more problematic measures from the outset, but that can be a tough-sell politically.*
8	**Wider benefits and unintended consequences**	Once knowledge of the buyout price became known, there has developed a potential for customers (end users) trying to get a better deal from suppliers on the basis of the value of the credits they might have. This 'credit exchange' practice hasn't taken off in a massive way but there have been a few websites setup to potentially facilitate it, predominantly in larger scale sectors, rather than domestic [14].

Country		Ireland
Intervention		4. Home Renovation Incentive
Timeframe		October 2013 – December 2015
Geographical Coverage		Nationwide
Target group		Domestic energy users
1	**Intervention architecture and logic**	Introduced in October 2013, the Home Renovation Incentive (HRI) has two stated aims [15]: To boost activity in the legitimate construction sector. To give an income tax credit to homeowners for home renovation and similar work. A tax credit of 13.5% can be claimed on any qualifying works carried out after 25th October 2013 for homeowners, or 25th October 2014 for landlords, effectively removing the VAT on those works. The scheme is delivered by The Office of Revenue Commissioners. Tax relief can be claimed on qualifying expenditure over €4,405 (before VAT at 13.5%) per property. This can be the total from any number of jobs carried out and paid for within the qualifying period. While there is no upper limit on expenditure on qualifying works, the tax credit will only be given in relation to a maximum of €30,000 per property. To qualify, the applicant must pay income tax via P.A.Y.E or self-assessment, and they must ensure that they use a contractor who is HRI qualifying. To be HRI qualifying, the contractor must be VAT registered with the Revenue, Relevant Contracts Tax (RCT) and the Revenue On-Line Service (ROS). The contractor records the qualifying work on the Revenue's online HRI portal before commencement. The applicant can then access the portal via their personal account to ensure that the correct details have been entered, and once the work is completed and paid for, claim their tax credit. Qualifying works can be any building repair, renovation or improvement work which attracts the 13.5% rate of VAT, including boiler and central heating repair and replacement, insulation of all sorts, work to improve windows and doors. The credit is applied over 2 years; if the applicant pays income tax via P.A.Y.E. then the total credit amount is divided evenly across each payment; if tax is paid via self-assessment then the credit is split across the 2 years following the claim. If qualifying works have been part funded by any grant (such as Better Energy Homes), the grant amount is multiplied by 3 and the result deducted from the qualifying amount. There is no tax relief available if there has been no applicant contribution to the installation cost.
2	**Impact**	Up to April 2015, The HRI had received registrations for over 20,000 qualifying works from 4,700 contractors, with a value in excess value in excess of €385 million [15]. In his financial statement to accompany the Budget 2015, the Minister of Finance, Mr Micheal Noonan, states that *"The Incentive is generating employment in the tax compliant construction sector and increasing sales in building supplies, hardware and related businesses."* [16]. In a telephone interview on 9th June 2015, Sean Nolan of the Revenue Commissioners stated:

<table>
<tr><td></td><td></td><td>“The revenue are very happy with the performance of the scheme so far, but recognise that the number of insulation works is still relatively low and more work may need to be done in that respect.”</td></tr>
<tr><td>3</td><td>Cost-effectiveness</td><td>Formal cost benefit analysis of the scheme is difficult as cost and/or energy savings figures from installed measures are not reported.

When applying the credit award figure of 13.5%, the qualifying works value of €385 million (section 2 above) translates to a cost to exchequer of €51.975 million in tax forgone for the scheme up to April 2015. With 20,000 qualifying works registered on the online scheme, this leads to a figure of €2598 forgone/individual job.

The counter point to this cost is the extra tax revenue collected from encouraging consumers to use legitimate contractors, rather than the ‘shadow’ economy [15]. Explicit data on this increase is not available but an indicator towards it is the increase of revenue collected via the Relevant Contracts Tax (RCT). The RCT is another measure run vie the Revenue’s on-line service, and requires contractors to register all contracts with, and payments made to, subcontractors. The Office of Revenue Commissioners, Annual Report 2014 [15] presents that:

<table>
<tr><th>Contracts/Payments Notified to Revenue</th><th>No./Value</th><th>% Change 2014 v 2013</th></tr>
<tr><td>No. of Contracts</td><td>319,114</td><td>21%</td></tr>
<tr><td>Value of Contracts</td><td>€28,739 million</td><td>25%</td></tr>
<tr><td>No. of Payments</td><td>804,165</td><td>18%</td></tr>
<tr><td>Value of Payments</td><td>€10,135 million</td><td>22%</td></tr>
</table>
An average increase of 21.5% across these four datasets points to a very healthy growth of the industry. Clearly, not all of this increase is attributable to the HRI but a 21% increase to the number of contracts equates to a value of 55,384 contracts. The 20,000 registered works on the HRI on-line system could be seen to constitute a significant proportion of that increase.

It is also worth noting that the boost to the legitimate industry, and therefore tax revenues is immediate, whereas as the cost of forgone tax is spread over 2 years following the claim.

As the scheme will only begin to pay out the incentive funds in tax year 2015/16, The Revenue intend to reconcile their figures with tax returns from that year to develop the full performance picture [19].</td></tr>
<tr><td>4</td><td>Critical success factors</td><td>The HRI has gone a long way to meeting its twin objectives. One of the major factors in this is the Revenue’s approach to making it as simple as possible a system for both claimants and contractors. The Revenue On-Line Service (ROS) was already well known to contractors, with the HRI system an intuitive extension to it. This was not originally the case, as described in Section 7 below.

The revenue provides clear guidance to both potential claimants and contractors on their website, as well as instructional videos in the use of the online systems. (http://www.revenue.ie/en/tax/it/reliefs/hri/video.html).</td></tr>
<tr><td>5</td><td>Marketing and communication</td><td>The HRI scheme was not advertised conventionally and was what could be described as “self-marketed”. Periodic press releases were issued and a number of radio interviews were carried out to highlight the scheme. Officials from the Office of the Revenue Commissioners also attended trade shows in late 2013 and 2014 to discuss the scheme with those in attendance. Furthermore, a number of leaflets and guides were published with information on how to use the scheme, how it operates, criteria for eligibility, etc. Industry contractors were informed of</td></tr>
</table>

		the scheme and its operation via existing supply chain networks within the public sector, such as the Revenue's own ROS system and SEAI's networks. Homeowners and landlords who have had qualifying works on their property registered on the HRI system by contractors, but not yet claimed the credit are regularly notified by the Revenue to boost uptake of the opportunity.
6	**'Softer' behaviour change**	There are no 'softer' elements to the HRI other than general scheme guidance encouraging consumers to get quotes from several contractors before deciding on who should do the work.
7	**Barriers to delivery**	The scheme was originally perceived as over-complicated and placing too much onus onto homeowners to ensure that contractors were qualified to use the system [17]. This was before the full on-line functionality was available and claimants were required to obtain copies of compliance certificates. The Revenue acted quickly to roll-out the on-line HRI system and made sure to highlight the guidance documents and videos available.
8	**Wider benefits and unintended consequences**	As well as boosting employment in the tax compliant construction/renovation sector, it is believed that the extension of the scheme in its 2nd year to include landlords will drive down rent levels.

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ii. Distribution of population by tenure status, type of household and income group (source: SILC) [ilc_lvho02]
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3.5 The Netherlands

Country	Netherlands
Country Context	*Netherlands Policy Background* Article 3 of the EU Energy Efficiency Directive required Member States to set national non-binding energy savings targets for 2020. The Dutch government set out its National Energy Efficiency Action Plan (NEEAP) in 2011 (updated in 2014[1]). The indicative national energy efficiency target for 2020 of 133.8 TWh (converted from 482 PJ) final end-use efficiency improvements to be achieved in the period 2014-2020; in primary terms this is 186.4 TWh. The basic principle in the Netherlands is that individuals and businesses have an interest themselves in saving energy, through the cost savings that result and, in the latter case, improvements in competitiveness, and should therefore take responsibility for doing so. This approach has been formalised in an "Energy Agreement" between the government at national and regional levels and organisations representing employers, citizens, environmental interests and other stakeholders. The Government's aim is to create the conditions for economically rational investments to be undertaken and its policies facilitate and encourage third party investment and provide financial and subsidy support where necessary. Measures include information provision/awareness raising, the reduction in regulatory burden and fund based financing, especially for the residential sector and municipal councils. **Key demographics** The Netherlands had a population of about 16.9 million in July 2014, with 89.9% living in urban areas [2]. The population is ageing rapidly. As in other OECD countries, the main causes are the decline in fertility rates since the 1970s and rising life expectancy, especially for the elderly. **Age structure:** 0-14 years: 16.9% 15-24 years: 12.2% 25-54 years: 40.4% 55-64 years: 12.9% 65 years and over: 17.6% (2014 estimate) **Housing stock** There are 926 million m² of building floor area in Netherlands, of which 88% are located in residential buildings. Directorate-General for Economic and Financial Affairs reported in 2011 that: • the Netherlands housing market consistent of 7.4 million dwellings • half of the country's housing stock was built after 1960 • In 2012 around 60% of the dwellings were owner-occupied • Social housing represents 33% of total dwellings • Private renting accounts for 7% of the total housing stock • Approximately 75% of the 3 million rental homes in the Netherlands belong to housing associations [3]. Since 1995 the Building Decree contains minimum standards for new buildings. They are based on a standardised method for the calculation of an Energy Performance Coefficient (EPC) which is related to the size of the building. The standards were strengthened multiple times, which according to the ODYSSEE-

	MURE database led for example to a 50% energy efficiency gain [4] for new dwellings since 1995. **Domestic Energy Prices** Domestic energy prices are shown in Section 3.1.The Dutch energy market is privatised, thus enabling consumers to choose or change supplier. There are 10 main suppliers in the Netherlands and most offer a number of fixed and variable tariff options although prices are quite similar across the board. Many suppliers offer customers the opportunity to select a fixed energy rate of 1, 2 or 3 years. Gas and electricity are both supplied by the same provider and regulatory authorities ensure fair practices and tariffs. The average price, excluding taxes, for electricity [5] was €0.13/kWh and for gas was €0.05/kWh in the second half of 2014. There are dual tariffs available with slightly cheaper rates during weekday nights 23:00-07:00 and at weekends. Depending on usage, a combined monthly bill is typically around €120 for a standard apartment, and up to €200 for a larger dwelling. Electric meter readings are done on an annual basis. The energy company will estimate a monthly payment to take by direct debit and it can take up to 1 year to adjust the payments to fit with actual usage pattern. Users can price compare suppliers using a website [6]. **Low income groups/fuel poverty** The Netherlands is in the top 5 of countries in Europe with the lowest income inequality [7] level. According to the figures from the Association for Conservation for Energy and the Energy Bill Revolution [8], the Netherlands has amongst the lowest levels of energy poverty in Europe with only 8.1% of households falling into that category.
Selected Interventions	1. More with Less: Agreement for energy saving in existing residential and other buildings 2. Home Valuation System 3. Energy Tax 4. Reduced VAT rate for insulation materials and labour costs for maintenance and renovation of residential buildings
Linkages between schemes	The Energy Agreement for Sustainable Growth was signed in September 2013 and brings together the activities of over 40 organisations, including central, regional and local authorities, employers' and employees' organisations, nature conservation and environmental organisations, other social organisations and financial institutions, in fields such as energy efficiency. Its agreed objectives include an average final energy consumption saving of 1.5% a year and a final energy consumption saving of 27.8 TWh (converted from 100 PJ) in 2020 (Social and Economic Council of the Netherlands, Energy Agreement for Sustainable Growth, 2013). If the Netherlands does not appear to be on course to meet the agreed targets, additional measures will be taken. These could include more compulsory and/or fiscal measures or other voluntary or non-voluntary measures, which will increase the certainty of achieving the 100 PJ energy saving. The agreement will be evaluated in 2016. In recent years the majority of policy measures in the Netherlands residential sector are cooperative rather than legislative. Several of the measures examined in this paper are related to the housing energy label, namely the More with Less initiative and the Home Valuation Scheme. The label rating is from A to G, A being the most efficient and G the least. The labels were introduced in 2008 with homeowners obliged to show an energy label to the buyer or new tenant of their property. In practice, however, this obligation is rarely observed due to a lack of enforcement. In a bid to change this, the government sent provisional energy labels to all homeowners (approx. five million households) in January and February 2015. These provisional labels are based on public information, such as construction year, type of property and

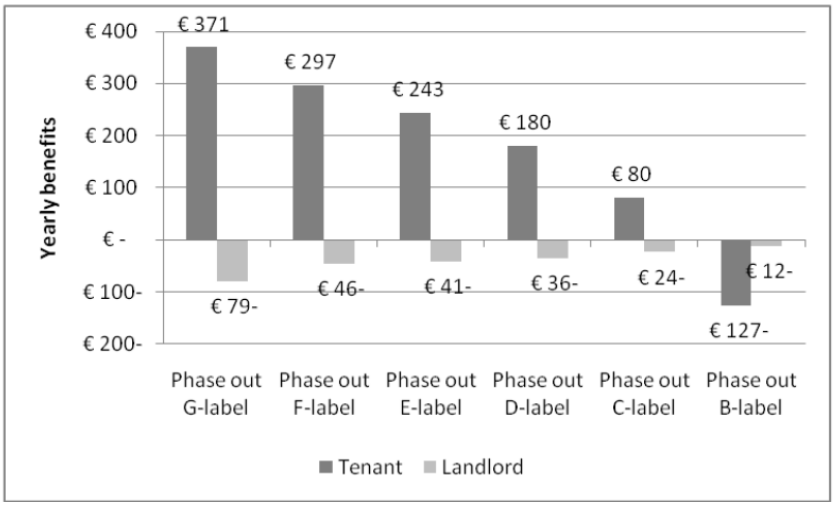
	surface area. Homeowners can go online [9] to change the data if necessary. If the householder states that their home is more energy efficient than official estimates suggest – e.g. because they've upgraded loft insulation or fitted solar panels - they need to provide evidence that that is the case, certified by an independent energy assessor. A seller who upgrades the label with false data will be charged with fraud.

Country		Netherlands
Intervention		1. More with Less: Agreement for energy saving in existing residential and other buildings
Timeframe		2008 – Dec 2020
Geographical Coverage		Nationwide
Target group		Owner-Occupiers Housing Corporations Building Companies Installation Sector
1	**Intervention architecture and logic**	The More with Less programme is a joint initiative of the National Government, housing corporations, building companies, the installation sector and the energy companies for energy saving in existing buildings. It takes the form of a voluntary agreement (covenant). The More with Less programme, Meer met Minder in Dutch, means **more** quality of living with **less** energy and housing costs. The initiative centres on an action plan to promote energy efficiency and key to its implementation is a website which aims to provide information on how to conserve energy, targeting 3 groups: 1. Home owners and tenants 2. Professional Installers 3. Municipalities The initiative has been revised since it was first introduced in 2008. It initially aimed that 500,000 existing buildings would become 20-30% more efficient by 2011 and following revision to the agreement in 2012 the aim of the scheme is to improve the annual energy performance of at least 300,000 existing residential and other buildings by at least 2 energy label classes. Contacts interviewed (one government, anonymously, and one research) suggested that the initiative has finished or at least faded in significance, being superseded by the Energy Agreement, although the NEEAP states it to be ongoing and the websites and associated documents are still live. The More with Less initiative focusses on a website that provides supporting information and tools for householders and access to services. It comprises the following elements: **Identification of savings measures and savings potential** Building owners considering making energy efficiency improvements can search for their property on the More with Less website [10] to see its indicative energy performance. They can then select which measures they are considering implementing and perform calculations to indicate the potential improvement to the energy label, the annual running cost and the energy savings. Further customised advice provides a tailor-made report of the energy-saving measures that can be implemented in the home, how much they cost and what they will deliver. The advice is based on an onsite inspection of the house and results in an official energy label. The price of the customised advice is in the range €200-450 (depending on the size of the house) and is paid by the householder. Reference [11] gives a sample report (in Dutch). During the early part of the agreement a total of around €13 million was available for the scheme, which was fully allocated by the end of 2010 [12]. **Identification of service providers** Building owners can also request quotes for installers and be informed of any available funding for the selected measures (based on national, provincial and municipal offerings). Installers can register themselves as a More for Less supplier via the website. The criteria to register is:

		• Must meet the quality standards and comply with the checklist [13] • Be a member of the Chamber of Commerce • Have business or professional liability insurance • Have a complaints procedure • Must communicate to clients that you are a More with Less approved supplier, for example by placing the logo on your website. As of January 1st 2012 there is a fixed participation fee of €200/yr (exc VAT). Installers must attend a compulsory meeting to hear about what opportunities participation offers and how to utilise the scheme. More for Less offers training courses which are not compulsory but are strongly recommended. More for Less can help installers build local networks for example glaziers work with insulation companies and installers work with contractors. Using the Search & Find feature on the website helps installers find providers in the same area. **Financial Support** During the early phase of the initiative (2010-11) a National Grant Scheme formed part of the More with Less initiative [14]. A total of €15 million was allocated in tranches to home owners that implemented energy saving measures and improved their home's energy efficiency label band, with each receiving a grant of €300-750. This assistance ended in 2011. To help overcome financial barriers of installing measures the initiative also signposts to external financing support that is available to householders, such as grant options, the reduced VAT rate on labour in renovation and repair of dwellings and energy saving credit and load facilities. Examples of the varied support which has been promoted through the scheme are: • A grant of €750 for private home owners in the municipality of Sluis for energy saving measures take which lead to an improvement at least 2 steps on the energy label. • Fixed monthly expenses, similarly to the UK Green Deal's 'Golden Rule' energy efficiency investment repayments must at least be off-set by the resultant bill savings. **Tools for Municipalities** More with Less have developed a number of tools that can assist municipalities in designing and implementing energy conservation programmes and projects involving local partners and residents [15]. These tools include a 5-step plan, brochures and videos. They have experienced communications consultants in house, and can provide advice on communication campaigns and projects aimed at encouraging residents to take energy saving measures in their homes. The More with Less team collaborate with a number of experienced consultants in the field of energy conservation policies and pathways in municipalities. The website includes contact details of these organisations.
2	**Impact**	The conclusions of the ex-post monitoring reports carried out in 2010 and 2012 are summarised in the ODYSSEE-MURE measure summary for the More with Less action plan [16]. It describes the number of houses for which at least one measure was implemented during the period 2008-2012 and also the number for which 2 or more measures were implemented. Taken together it concludes that the measures improved the efficiency of about 1.2 million homes by 20-30% over 2008-2012, which is in line with the target. The results show a dominance of measures for owner-occupied properties but also a significant proportion in the social rented sector.

		With regard the initiative subsidised home surveys, a total of 53,000 home owners received this customised advice [17].
3	**Cost-effectiveness**	The overall cost effectiveness of the initiative is difficult to judge as there is no direct evaluation available. It principally seeks to facilitate the market for cost effective energy saving interventions that are paid for by the householders, in line with Dutch policy for energy efficiency. Where it also facilitates access to external financial assistance the cost-effectiveness of the overall approach will depend on the combined effectiveness with those other finance measures. Nevertheless, the initiative has itself provided 2 direct means of financial assistance: • The initial grant supported householders in implementing energy savings measures, with a total fund of €15 million, in the range of €300-750/household. • For the customised (home visit) advice service around €13 million was used to support 53,000 home owners. At an average of €245/home this is in line with the lower end of the €200-450 price that is charged for that service. Whether these amounts represent good cost effectiveness is difficult to estimate. Its notable though that the Dutch government provided this direct financial support for only a few years at the beginning of the system, so was presumably deemed necessary to support the set-up of the agreement and stimulate activity, but not needed on an ongoing basis.
4	**Critical success factors**	Critical success factors for an information/education policy intervention: • Clear, accurate, credible and comparable communication to give consumers confidence in messages from the delivery body. • A range of initiatives to exemplify, engage, enable and encourage action. • Delivering quality services from day one. The experience of early adopters is critical in delivering positive word-of-mouth. • Clearly indicating the costs and savings of measures, the level of guarantee provided to consumers, the use of accredited products and installers and access to redress.
5	**Marketing and communication**	The website http://www.meermetminder.nl offers the ability to search for providers by postcode. This website also provides information on the scheme, questions and answers and energy saving information. More with Less also created a Twitter account to provide information and promote the scheme. To date the account has 2,793 tweets and 6,282 followers.
6	**'Softer' behaviour change**	At the highest level, the whole programme is concerned with behaviour change, in that it is intended to raise awareness of energy saving measures and encourage householders to change their attitudes towards energy saving and investment. However, with regard behaviours associated with energy use, these are not emphasised through the initiative, which focusses on building fabric and energy system investments.
7	**Barriers to delivery**	No scheme specific barriers have been identified in any of the reports reviewed on More with Less. It has been commented that there have been a number of changes to the goals set, as the system has been revised and this has perhaps led to more uncertainty as to whether the agreed goals will be achieved. [16].
8	**Unintended consequences and co-benefits**	There are no unintended consequences identified. A potential co-benefit is the improved communication and coordination between the parties of the initiative, which could support future cooperation in the field.

Country		Netherlands
Intervention		2. Home Valuation System
Timeframe		2011 – Ongoing
Geographical Coverage		Nationwide
Target group		Landlords and Tenants Housing Corporations
1	**Intervention architecture and logic**	The Netherlands has a strict rent regulation system that covers both the social rental and the private rental sector. Rented dwellings are subject to the Home Valuation System, under which points are awarded for quality aspects of dwellings, such as location, floor surface and facilities. The number of points awarded determines both whether or not the dwelling is subject to rent price regulation and, if it is, what rental prices can be charged. The Home valuation system is 'woningwaarderingsstelsel' in Dutch. The rent regulation system has wider aims including the promotion of affordable housing and to provide longer term investment stability. However, it is also focussed on the energy efficiency characteristics of the property, such that more efficient properties can command higher rents. This is intended to reward and stimulate landlord investment in energy efficiency measures. In its original form, points were awarded according to particular heating and thermal insulation characteristics (e.g. the presence of condensing boilers, thermostatically controlled radiators, and wall, floor and roof insulation) [10]. However, this approach of using input parameters as a proxy for energy efficiency performance was changed to instead use energy labelling, starting on 1st July 2011 and being phased in to 1st January 2014. This was for two reasons: First, energy labels were becoming more widespread as the requirements of the EPBD were implemented, and second, other Dutch support measures use energy labels and an alignment of rent controls with this was desire [10]. Under the revised system the number of points awarded under the valuation system (and hence the maximum rent that can be charged) depends directly on the energy label rating. The revised system relates to the actual energy performance of the building so provides landlords with a clear incentive to invest in improvements, through higher and stable rent returns. From the tenant perspective, the use of energy labels in this way provides additional confidence that the energy costs for higher rated properties will be lower, set against the higher rents changed. Two complimentary support measures should be highlighted: Since July 2014 it has been possible for landlords in the subsidised rental sector to apply for grants to fund energy-saving measures. The total budget available for the scheme is €400 million, associated with energy efficiency measures, for the period 2014-2017. The programme is called Aanvragen Stimuleringsregeling energieprestatie huursector (STEP) in Dutch. Grants are available to both housing associations and private landlords, and to qualify the monthly rent for the property in question must not exceed €700. Grant applications are submitted to the Netherlands Enterprise Agency. An Energy Saving Fund for the rented sector (total €75 million) was launched in October 2014. This fund is available until September 2019 for housing associations and private landlords. Under the scheme up to a quarter of the costs to improve at least five rental housing to an A + energy can be borrowed at favourable rates. The Energy Saving Fund loans can be combined with the above STEP grant. The loans must be at least €75,000, with a maximum of €15,000/house.

2	**Impact**	ODYSSEE-MURE [18] states in its report dated 25th September 2014 that no evaluation has been conducted yet. There are a number of factors that make impact evaluation difficult: • The scheme itself and the revisions related to energy labels are very recent. • The rent control system is not aimed solely at improving energy efficiency and landlord investments are encouraged with regards other property characteristics. • Energy labels are being rolled out for wider policy reasons and supported by other measures (it is part of the More with Less initiative discussed above), so would be difficult to attribute changes to the rent control incentive. Nevertheless, the underlying economics of the measure are transparent to landlords through the published point system and its relationship to rent levels. On this basis it should provide a clear incentive for investment. The cost effectiveness of the incentive for landlords and tenants is considered in the following section.
3	**Cost-effectiveness**	ECN analyses[19] have shown that landlords who currently invest in energy saving do benefit financially under the system compared with a situation in which rents were not adjusted. The figure below shows the results of the analysis and the report gives an example in which the landlord increases the energy label rating from G to F. This action is estimated to cost €525 annually over the life of the investment, but the annual rent increase is €446, meaning that the net annual cost is reduced to only €79 (the figure indicated in the graph). Therefore overall the landlord receives a significant additional incentive to invest, but it is not enough to break even. The tenant receives a net benefit in all scenarios except upgrading the relatively efficient B-label. The benefits to the tenant are clearly greatest for upgrade of less efficient dwellings. 
4	**Critical success factors**	No specific critical success factors have been identified in the documents reviewed.
5	**Marketing and communication**	There is a page on the Rijksoverheid website [20] that gives points scoring advice for landlords and details how energy labels affect the rental scoring. There appears to be a lot coverage of the energy label and the changes to the Home Valuation scheme. One report published by the Ministry of the Interior[21] commented that the marketing campaign consisted of short commercials on radio and television and advertisements in nation newspapers. The energielabel.nl website advises housing associations and other landlords that they are required to make available a copy of the energy label to lease to a new tenant. In the absence of a valid energy label the home owner faces a fine of up to

		about €405. The site also gives advice [22] on how to apply for an energy index for the property. A website has been set up which explains the process of getting a home certified [23].
6	**'Softer' behaviour change**	No specific softer behaviour change has been identified in the documents reviewed. The mechanism is intended to incentivise investment in the fabric and services within a building that improve its energy rating, but not to affect the behaviour of the occupants of the building in how they consume energy.
7	**Barriers to delivery**	Experience with the measure to date suggests a number of barriers to delivery: • The measure is implemented through a points system for rent control, and it has been argued that this involves too much detail [24] to determine the points score for each property. This criticism may have been applicable to the energy aspects under the original system of awarding points for the heating and insulation characteristics, but would be less so when related to mandatory energy labelling. • The dependency on energy labelling, however, means that any barriers to the adoption of labelling affect the delivery of the rent control system. In the early stages a study by Mourik and Rotmann [25] states that the Dutch system suffered from negative publicity and poor take-up. • The measure is intended to solve the split incentive problem, in which landlords bear the cost for the energy efficiency investment and tenants receive the benefit in terms of reduced energy bills. As described above, analysis by ECN indicates that tenants do indeed benefit. Landlords still incur a net cost, although much less than in the absence of the associated rent increase benefit. This, as noted by ECN, means that the split incentive problem has not disappeared altogether, and presumably therefore this remains a barrier to delivery. However it's important to note that this characteristic of the net costs to landlords and persistence of split incentives is a result of the scoring system and rent benefits defined within the Dutch system, and does not necessary reflect an unavoidable problem with the idea in principle.
8	**Unintended consequences and co-benefits**	As mentioned above there is no evaluation of the effects of the energy efficiency aspects of the rent control/housing valuation system. However, the more general criticisms of rent control need to be stated, since in principle this could impact energy efficiency investment. The foregoing description of the rent control mechanisms, and the emphasis put on it was cited in much of the literature, with investment in more efficient properties allowing landlords to charge more rent (within the rent pricing framework). The broader picture however is that rent controls constrain rents. This is in line with the Dutch government's emphasis on rent ceilings and the need for affordable housing. Research by Scanlon and Whitehead [26] suggests that constraints applied to rents also constrain investment where rent regulation is aimed at helping tenants, the corollary of which is that careful construction of rent pricing can help address investment constraints. Regarding co-benefits, the wider rent control mechanism supports affordable housing and the alleviation of poverty (including fuel poverty).

Country		Netherlands
Intervention		3. Energy Tax
Timeframe		1996 - ongoing
Geographical Coverage		Nationwide
Target group		All end-users who fall within the scope of the EED
1	**Intervention architecture and logic**	The Regulating Energy Tax was introduced in 1996 and according to the latest NEEAPs is a measure by the Dutch Ministry of Finance. It is called 'energiebelasting' in the Netherlands and the aim of the tax is to encourage the efficient use of energy. It is applied as a levy on the use of electricity and gas for household use and also in certain commercial sectors. The energy tax is be charged by the energy supplier via the energy bill and the suppliers transfer the tax to the Dutch Tax and Customs Administration. The revenue generated is channelled back to the taxpayers through a lower tax on income (households) or wages (companies). The intervention logic is simple; increasing the price of energy makes investment in energy saving measures and behaviour changes to reduce demand more attractive. The levy amounts are divided into tiers. For example in 2014 the tax for most households was €0.1185 /unit of electricity (usage between 0 - 10 000 kWh) and €0.1894 /unit of gas (up to 170,000m^3) [1]. If a household invests in energy consuming measures or consumes a comparatively low amount of energy, they might be eligible for a tax refund. Information on this is available in an article [27] published in the 2010 and also the information about green projects scheme. There is a reduced energy tax for local renewable electricity. If a co-operative or an association of owners generates sustainable electricity supplies for its members, the members can take advantage of this lower rate.
2	**Impact**	No recent evaluation or documentation on the results of the Energy Tax on the energy use of households can be located.
3	**Cost-effectiveness**	There seems to be no formal evaluation of the cost effectiveness of the tax. However, the NEEAP identifies that the price elasticity of demand for the energy tax is low, varying between -0.1 and -0.25, meaning, and the lower end of this range, a given percentage increase in energy prices could only lead to a reduction in demand of one tenth of that percentage change. In terms of costs to government, the collection of revenues through the energy suppliers helps to minimise administrative costs.
4	**Marketing and communication**	There are 10 main energy suppliers in the Netherlands and the majority seem to provide information on "energiebelasting" on their website. There appears to be no active marketing or communication about the tax although there may have been when the scheme was introduced in 1996.
5	**Critical success factors**	We could not find any reports or documents assessing the critical success factors.

6	**Barriers to delivery**	The system is mandatory and we are not aware of any concerns regarding compliance.
7	**Unintended consequences and co-benefits**	There is no direct evidence of unintended consequences of the tax. However, challenges due to the design of the tax in particular, and environmental taxes in general, have been examined [28] by Vollebergh of the Netherland Environmental Assessment Agency: • The energy tax structure includes only electricity and gas, which are relatively clean fuels (although other duties apply to mineral fuels). Thus, from a wider environmental perspective the tax can increase rather than decrease the environmental impact, by encouraging shifts to unregulated or less regulated fuels that have higher per unit impacts. • The revenues from taxes aimed at achieving an environmental result will naturally erode as the policy succeeds in that aim. This is inconsistent with the Treasury's desire for stable tax revenues, leading to a challenge to balance environmental and revenue objectives. Regarding co-benefits, the system allows a reduction in income and labour taxes (offset by the revenue from the energy tax). However, this is more a distributional impact than a net benefit.

Country		Netherlands
Intervention		4. Reduced VAT rate for insulation materials and labour costs for maintenance and renovation of residential buildings
Timeframe		2009 –July 2015 (New information found indicates that the end date is July 2015).
Geographical Coverage		Nationwide
Target group		Owner occupiers Housing Corporations
1	**Intervention architecture and logic**	The reduced VAT rate for home insulation materials and labour is a scheme initiated by the Ministry of Finance run by the Tax Office. It involves the reduction of VAT rate from around 20%* to 6% and applies to renovation and refurbishment of residential buildings, the fitting of insulating material and the labour component for the fitting of glass. ** Literature varies on the starting rate, between 19% and 21%, which is likely to do with this base rate varying over the period of the measure.* This is a temporary measure which started in 2009 and has undergone a series of expansions and extensions [4].The logic behind the measure is that it reduces the cost to households for undertaking home improvements that improve energy efficiency. It seems likely that the system also aimed to support the building industry during a period of economic downturn (it was introduced as temporary shortly after the 2008 financial crash and successively extended during the period of slow recovery). The VAT reduction benefits both owners and tenants of homes older than 2 years. Insulation improvements involve floors, walls and roofs. Eligible insulation materials include glass wool, rock wool and polystyrene; the thermal performance of which meets the requirements of the Building Regulations [29]. Windows, doors, window frames and glazing are not included in the scheme. The floor, roof and facade insulation should have an Rc value >= 2.5 m^2K/W; in case of insulation of the floor, the insulation should have an Rc value >= 1.1 m^2K/W. The More with Less website,http://www.meermetminder.nl/btw-verlaging states this includes renewal and maintenance of heating systems, solar water heaters and solar panels. The low VAT rate applies to labour and material costs if the material costs are less than 50% of total costs. If material costs exceed 50% of total costs, then the 6% VAT rate applies only to labour costs. More information about the scheme is given at the Ministry of Finance website [30]. The remodelling and repair (including maintenance and construction of gardens) is defined as insulation, painting, plastering and decorating of homes that are older than 2 years is subject to the 6% rate.
2	**Impact**	There has been no evaluation of the effects of the measure. However, the Netherlands experimented with VAT reductions for labour intensive services in the early 2000's, with the aims of stimulating economic activity and employment in selected test sectors. The most relevant to the building sector is a reduction in VAT for painting and plastering of houses older than 15 years, for which the rate was reduced from 19% to 6%. This therefore forms a good analogy for the reductions more recently. The results of the earlier test were examined in some detail, including through the use of surveys, and the following findings were made: • Prices: The VAT reduction was passed on to consumers – the expected fall in prices was 6.2% after inflation is taken into account, and actual falls were 6.0-7.1%.

		• Demand: There was an increase in demand for services, although it was not possible to attribute this to the change in VAT. • Employment: There was only modest increases in employment in the sector (52000 to 54000), in line with expected growth.
3	**Cost-effectiveness**	No information could be found. Based on the experimental scheme described above then pass-through of cost savings to consumers might be expected, but its not clear whether this stimulates additional activity (that would not otherwise be economic) or just windfalls for the consumer.
4	**Marketing and communication**	Appears to be limited on the Government website and advertised through More with Less.
5	**Critical success factors**	No information could be found.
6	**Barriers to delivery**	No information could be found. The system involves modification to the existing tax regime and therefore may be less difficult to implement than an entirely new initiative. The experimental scheme described above was analysed for take-up rates (i.e. those that did or didn't utilise the lower rate on offer). The level of non-take-up for the paint and plastering sector was estimated as 25% by the Treasury and 9% according to employers surveyed. No reasons we given for non-take-up, or to explain this difference in estimates (which presumably carry high uncertainty).
7	**Unintended consequences and co-benefits**	No information could be found. With regards co-benefits, however, the system is also designed to stimulate economic activity and jobs.

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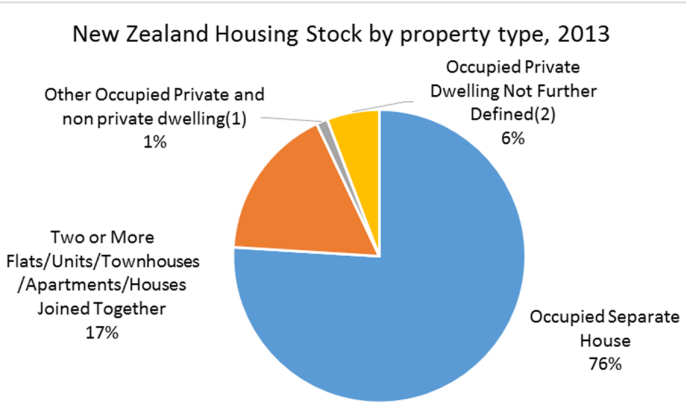
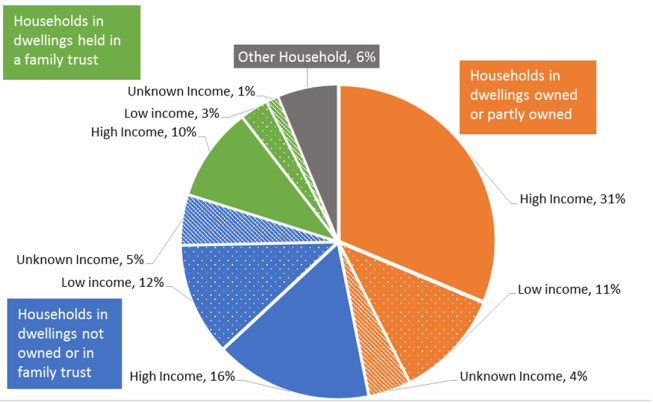
3.6 New Zealand

Country	New Zealand
Country Context	*New Zealand Policy Background* Energy efficiency in New Zealand is set by the Energy Efficiency and Conservation Act (2000). The Act established the Energy Efficiency and Conservation Authority (EECA) as the entity to promote energy efficiency across all sectors of the economy. Energy intensity in New Zealand has declined on average by roughly 1%/year since 1990, in large part due to the country's long history of energy efficiency. In the country's energy efficiency strategy (2010), New Zealand set a target to deliver 15.3 TWh of energy saving across the economy by 2015, compared to 2010. This equates to approximately 9% reduction in New Zealand's economy-wide energy intensity. New Zealand's government aims to cut carbon emissions 5% below 1990 levels by 2020. The New Zealand Energy Efficiency and Conservation Strategy 2011-2016 (NZEECS) is focuses on the promotion of energy efficiency, energy conservation and renewable energy [7]. Fuel poverty is a significant public health problem currently estimated to affect 25% of households in New Zealand and the cost of electricity is a key driver. Although Fuel Poverty appears to not have been defined by the New Zealand government, Source 4 cites the international definition "the inability to acquire adequate household energy services for 10% of household income". **Key Demographics** Regarding the rural/urban split, 86.3% of New Zealanders live in urban areas and this proportion has been growing at a 1.05% rate per year between 2010-15 (estimated). New Zealand has an ageing population (estimate for 2014): • 0-14 years: 20% • 15-24 years: 13.9% • 25-54 years: 40.4% • 55-64 years: 11.4% • 65 years and over: 14.3% [14] **Housing Stock by property type** The majority of New Zealand housing is occupied separate housing (76%), followed by 17% of housing which is two or more housing joined together (flats/apartments/townhouses). The remainder of the housing stock (7%) comprises mostly informal or improvised dwellings. 

	(1):Consists of mobile and improvised dwellings, roofless or rough sleepers, and dwellings in a motorcamp. Non private dwellings include institutions, communes. (2): Consists of mobile and improvised dwellings, roofless or rough sleepers, and dwellings in a motorcamp. Source: Occupied Dwelling Type, Statistics New Zealand, 2013 Census. **Distribution of Housing Stock by Tenure and Household Income** The chart below shows the distribution of New Zealand's housing by tenure and household income levels. Note that low household income is classified as households earning <63% of median household income in 2013 [18]. In terms of tenure, the majority of housing is wholly or partly owned (46%), followed by 33% of housing not owned or family trust [19] (tenants in rental arrangement), followed by 14% of housing held in family trusts (6% other tenure arrangements). Among low income households, the majority (12% of total houses) are tenants (housing not owned or in family trust),followed by ownership or part ownership of housing (11% of total housing), and households held in family trusts (3% of total housing). Higher income households mainly own or part own their houses (31% of total houses in New Zealand), followed by tenancy, and houses in a family trust. New Zealand Housing Stock by Tenure and Household Income, 2013  Source: Statistics New Zealand, 2013 Census, Tenure of Household by total income **Domestic Energy Prices** Domestic energy prices are shown in Section 3.1. New Zealand's Electricity Prices are just below average in this context at 14.4p/kWh. New Zealand also has a relatively low tax component at 1.88p/kWh (13% of price). Domestic gas prices in New Zealand are the second highest of these peers, at 7.47p/kWh. This is due mainly to above average gas prices at 6.41p/kWh.
Selected Interventions	1. Improved Energy Awareness: ENERGYWISE Information Campaigns and Website. A softer, behavioural intervention, provides independent and authoritative information for households. 2. Improving efficiency of Residential Products: Minimum Energy Performance Standards, regulation of household products. 3. Warm Up New Zealand: Heat Smart. Improving the thermal envelope of Homes through a national residential insulation programme, targeted particularly at housing built pre 2000. 4. Warm Up New Zealand: Healthy Homes. Successor to Heat Smart, with a more explicit focus on disadvantaged communities.
Linkages between schemes	The Energy Efficiency and Conservation Authority (EECA) as the entity to promote energy efficiency across all sectors of the economy. Under the NZEECS 2011-16, the EECA's goal is for New Zealanders to have warm, dry and more energy efficient homes.

	The EECA has focused on three outcomes (impact areas): 1. Improved energy awareness (Impact 1) 2. Improved efficiency of residential products (Impact 2) 3. Improved thermal envelope of homes (Impact 3). In order to achieve this, the EECA seeks to influence the energy choices of people in their homes (what we do, how we use appliances and how we choose the homes we rent or buy) using a combination of: • information campaigns (ENERGY SPOT and ENERGYWISE) • promoting the most energy efficient products (ENERGY STAR) • regulatory measures to remove the least efficient products and provide consumers with information on how much energy products use (Minimum Energy Performance Standards (MEPS) and Mandatory Energy Performance Labels (MEPL)) • funding to overcome the financial barrier in the form of our residential insulation retrofit programmes (Warm Up New Zealand). Not only are the measures all part of the same strategy and managed by the same entity (EECA) they are interconnected e.g. the ENERGYWISE website is the gateway for householders to access some key government energy efficiency programmes such as the Healthy Homes funding for home insulation, and the practical advice given through the Energy Spot television campaign [8]. Retrofitting measures are particularly targeted at older housing, since new build homes built after 2000 will have high levels of insulation (due to building codes). The Warm Up New Zealand measures target in particular the approximately 1 million uninsulated homes built pre 2000. In addition, with the second programme (Healthy Homes) focuses particularly on low income groups. Approximately half of the 270,000 homes insulated under the ENERGYWISE programme have been low income.

Country		New Zealand
Intervention		1. Improved Energy Awareness: ENERGYWISE Information Campaigns and Website. A softer, behavioural intervention, provides independent and authoritative information for households.
Timeframe		Ongoing from 2009
Geographical Coverage		Nationwide
Target group		Owner occupiers, land lords and tenants (and vehicle owners/ drivers).
1	**Intervention architecture and logic**	**A strategy for improved energy awareness** Government's Energy Efficiency and Conservation Authority (EECA) research showed a lack of information for the public on energy efficiency, energy conservation and renewable energy. This lack of information is a major barrier to the uptake of energy efficiency measures. To improve energy awareness, EECA implemented the following measures: • ENERGYWISE Information Campaigns and Websites • ENERGY SPOT television series • ENERGY STAR appliance endorsement mark • RightLight consumer efficient lighting campaign • EECA corporate and business websites. This assessment will focus on the ENERGYWISE website and campaign, and the Energy Spot Campaign. ENERGYWISE was established in 2009 is the EECA consumer programme that provides independent and authoritative information for households so they can make the most of energy efficiency, energy conservation and renewable energy. ENERGYWISE aims to: • Explain the benefits of energy efficiency, energy conservation and renewable energy • Motivate people to take action • Show households and consumers how to take action easily. **Information campaign and website** The ENERGYWISE information campaign and website provide: • General home energy efficiency information • Information on government funding available for home insulation retrofits, clean heat and other energy efficiency solutions • Information to help consumers improve their energy choices (for example, purchasing and running home appliances) • Information on energy labeling schemes, such as ENERGY STAR This includes everything from home building and renovations to how to choose and use appliances, lighting, cars, and so on. The ENERGYWISE website provides information and advice about all the energy used in homes and vehicles. ECCA uses the ENERGYWISE website and other channels such as brochures, advertising and media releases to provide independent, reliable information about their energy choices. **The Energy Spot TV Campaign** *The Energy Spot* is a short television segment (approximately 1 minute) that brings the energy efficiency message to the mainstream audience. It has been on air since 2009, with episodes covering a range of consumer topics including

		power saving, water heating, appliances, vehicles, efficient driving and tyre pressure [1, 2, 10].
2	**Impact**	Although energy savings have not been explicitly estimated, the EECA has provided the following assessment of the measure. **ENERGYWISE Website** According to the EECA's Annual Report for 2013/14, ENERGYWISE is EECA's most popular website. All three websites (a corporate, a consumer and a business targeted website) had a total 1.5 million visits 2013/14, and availability of 99% (vs. targets of 1.35 million and 97%). Awareness of the ENERGYWISE brand is relatively high, although EECA explains the failure to meet the 2013/14 target of 69% with the fact that Energy Spot was taken off air for six months, and awareness was measured at 65% instead. Awareness in previous years was recorded as follows: • 2010/11 61% • 2011/12 66% • 2012/13 70% • 2013/14 65% [10] In 2010, the ENERGYWISE™ website won the 2010 Internet Industry Awards in New Zealand, as the website was recognised for having the most 'Positive Societal Impact' for its work providing practical information to inspire New Zealanders to be more efficient with the way they use energy in their home and on the road. This award is run by the Liz Dengate Thrush Foundation, which comments that the "ENERGYWISE website succeeds in providing a massive amount of information to an extensive audience with different motivations while at the same time supporting the government's high profile energy efficiency and renewable energy initiatives." [8, 9]. **The Energy Spot** The Energy Spot has been on air since 2009 and has been viewed by around 2.4 million New Zealanders, with a 41% saying they have taken action to reduce energy use as a result [2]. EECA's 2013/14 Annual Report state that the ENERGY SPOT television series is EECA's most effective awareness raising tool. In 2013/14, the campaign exceeded it's the target (30) by delivering 33 energy spot episodes. The target for number of New Zealanders reached (18 and over) was 65%, and this was not achieved, (62%), with the EECA explaining that it was impacted by ENERGY SPOT being off air for six months. As a result of this experience the ENERGY SPOT will be spread over a broader timeframe in 2014/15. In 2012/13, the proportion of over 18 year olds reached was 68%. In 2013/14 39% of viewers took action as a result of seeing the episodes, practically achieving the EECA target of 40%. Actions taken ranged from turning off appliances and lights when not in use, to installing energy efficient light bulbs or draught stopping in winter. The figures for previous years are as follows: • 2010/11 - 37% • 2011/12 - 40% • 2012/13 - 41%

3	**Cost-effectiveness**	Cost effectiveness estimates have not been found for the ENERGYWISE Website and campaigns in isolation. However, in a report to the Local Government and Environment Select Committee, the costs of all four EECA Websites in 2012/13 was NZ$665,783 as they share a content management system (in addition to the corporate, business, residential and ECCA website) [11]. In addition, the EECA's 2013/14 annual report includes the costs and funding information. In the 2013/14 financial year (ending June 30th), a total of NZ$160.3 million was spent on all of the EECA's residential programmes. These costs are not broken down further, but cover these three areas of activity: • Improved energy awareness: the five campaigns (section 1 of this intervention) and four websites specified above • Improved efficiency of residential products: cost of implementing minimum energy performance standards (more below) • Improved thermal envelopes of homes: costs of the Warm Up New Zealand: Heat Smart and Healthy Homes programmes (more below). Costs for 2013/14 were NZ$15.9 million, and NZ$33.1 million, respectively. Finally, In 2013/14 the combined programmes in the residential sector delivered over NZ$432 million in energy cost savings and health benefits. This is based on avoided consumer costs of (1.4 TWh), plus NZ$300 million in national benefits of insulation [10].
4	**Critical success factors**	• The use of TV media allowed the Energy Spot to reach a very large proportion of New Zealanders. As demonstrated by the drop in Energy Spot recall rates as a result of a 6 month gap in screening, a key learning was the necessity to spread the adds over a longer timeframe, rather than concentrate them over one period of the year. • The information is delivered in an engaging and interactive way [20] that makes it easier for New Zealanders to make energy efficiency and renewable energy choices at home and on the road [9]. • EECA's objective to provide independent and authoritative information to the public. • Partnerships were important for the delivery of nearly all of EECA's programmes, including the enhancement of our websites. In 2013/14 EECA developed a tyre pressure web tool in conjunction with NZTA and Z Energy. This enables car owners to easily find the correct pressure for their tyres – removing a key information barrier to improved fuel efficiency [10]. • Partnering with popular TV shows: high-profile promotion of the ENERGYWISE™ public campaign occurred through a popular New Zealand reality television screened from 1999 to 2009, and again in 2013. Being one of the most widely watched shows, the show features two families renovating. EECA is a key sponsor of the 2013 series (as it was in 2009) and key messages on energy efficiency are included in the series. On-screen graphics show energy efficiency information, and the weekly judging of each team includes a score for energy efficiency [11].
5	**Marketing and communication**	See above.
6	**'Softer' behaviour change**	One of the main focuses of this intervention is on softer behavioural changes in the home, as well as being a gateway to other measures such as purchasing energy efficient appliances, accessing refurbishment loans, etc. As a result of the TV campaigns, 39% of viewers took "soft" actions in 2013/14, which had ranged from 37-41% of viewers over the past four programme years.
7	**Barriers to delivery**	• Cost: Campaigns can be costly, particularly where TV media are involved (But they are also effective). • The 6 month hiatus in screening of Energy Spot, resulted in a drop in recall rates.

8	**Wider benefits and Unintended consequences**	Not specified.

Country		New Zealand
Intervention		2. Improving efficiency of Residential Products: Minimum Energy Performance Standards, regulation of household products.
Timeframe		Ongoing from 2002
Geographical Coverage		Nationwide
Target group		All new builds and extensions
1	**Intervention architecture and logic**	As the second of the three key objectives for EECA, Improved energy efficiency of residential products is sought to be delivered through informing consumer choice (see first intervention above) and Minimum Energy Performance Standards (MEPS). This is a regulatory measure, which sets the energy efficiency levels that products must meet or exceed to access the NZ market, and creates Mandatory Energy Performance Labels (MEPL). **MEPS** Provides a benchmark for acceptable levels of energy performance, for both the residential and business sectors since 2002. Currently, products representing 60% of household energy use are subject to standards and labelling. EECA also focuses on revising and upgrading standards, in order to keep up with technological improvements. The standard development is done in collaboration with Industry, and goes through a formal consultation process. EECA is part of the trans-Tasman Equipment Energy Efficiency (E3) programme, which develops joint MEPS and labelling measures for the Australian and New Zealand markets, for both residential and industrial products. In 2013/14, a five-year work plan for the trans-Tasman E3 programme was agreed. **MEPL** The MEPL was introduced in 2012, and the energy rating label provides the consumer with information about the comparable energy efficiency of an appliance at point of sale, allowing them to factor the running costs into their purchase decision. This allows consumers to make more informed choices at point of purchase, for more energy efficient produces. **Product Classes** As of October 2013, the following product classes existed: televisions; external power supplies; set top boxes; domestic fridges and freezers; gas water heaters; computer room air conditioners; air conditioners / heat pumps; commercial chillers; distribution transformers; electric hot-water cylinders; compact fluorescent lamps; ballasts for fluorescent lamps; linear fluorescent lamps; three-phase electric motors; and computers and monitors. **Energy Star Endorsement Mark** To complement the MEPL, the voluntary Energy Star mark helps consumers identify the most energy efficient models available for different products. The mark shows the product is one of the most energy efficient in its class [10, 12].
2	**Impact**	According to the EECA annual report, the residential products the programme is estimated to have saved 2.4 TWh of energy since it started in 2002, worth NZ$230 million. In 2013/14 Residential products standards resulted in 0.5 TWh of energy savings. The target for 2011/12 was to have 24 products or product groups subject to labelling and minimum standards. This was achieved, with 25 groups, as of June

		2014. This represents two new and one revised product classes subject to labelling or minimum standards were added in 2013/14. These standards are forecast to save over NZ$151 million in avoided electricity costs over the next decade. Regarding the Energy Star Mark, 77% of consumers were aware of the mark in 2013/14, however only 51% understood what the mark represented. This fell short of the EECA's target for this year of 58% understanding. In addition, in 2013/14 the market share of energy star products increased to 38% from 31% the year before. Overall, the 6th national communication to the UNFCCC for New Zealand estimates that these efficient products programme are projected to save 10 PJ of energy and avoid 1400 Mt of carbon dioxide emissions.(although it is unclear whether savings are for both residential and industrial sector) [10,12].
3	**Cost-effectiveness**	The EECA leverages Australian investment in the development of standards, costing around 70% less than if New Zealand did this work on a standalone basis. Information has not been found on costs to enable the cost effectiveness to be estimated. Although no specific information was found on the costs of this intervention, please see the commentary in intervention 1 (above) which also applies to this intervention.
4	**Critical success factors**	According to EECA, they work closely with industry to ensure the labelling programme adds value rather than compliance costs. Industry consultation occurs before new products are added to the MEPS and labelling programme, and their involvement is important for ensuring success. The collaboration on standard development with the Australian government via the trans-Tasman Equipment Energy Efficiency programme, allows the sharing of best practice, and cost reduction. (These measures are set by the intervention)
5	**Marketing and communication**	Energy labels are included on the product at point of purchase, in order to provide the consumer with information to inform their purchase decisions. This includes both the MEPL, and the Energy Star mark.
6	**'Softer' behaviour change**	Purchasing decisions enhanced by providing consumers with an easy comparison between products, including information about the cost of running the appliances over its lifetime.
7	**Barriers to delivery**	• Collaboration with the industry requires a robust consultation process which may take time and resources. • Pressure to keep up to date with new technological developments. Standards may become inappropriate as new generations of products are developed. • Provision of accurate information: cost to consumers will vary with usage of the appliance, and therefore the information provided will only represent an average consumers' behavior. • Balancing clarity with the right detail of information for consumers. • Understanding of the meaning of the Energy Star Mark, is low at 51%. A targeted work programme was in place in 2014/15 to address this.
8	**Wider benefits and Unintended consequences**	None specified.

Country		New Zealand
Intervention		3. Warm Up New Zealand: Heat Smart. Improving the thermal envelope of Homes through a national residential insulation programme, targeted particularly at housing built pre 2000.
Timeframe		Ongoing from 2009-2013
Geographical Coverage		Nationwide
Target group		Owner occupiers, land lords and tenants.
1	**Intervention architecture and logic**	Under the ENERGYWISE programme umbrella, the Warm Up New Zealand programme targeted improving the thermal envelopes of homes. Warm Up New Zealand: Heat Smart lasted for four years and ended in 2013, and was main energy efficiency programme in the residential sector during that period, administered by the EECA. It has now been replaced by the Warm Up New Zealand: Healthy Homes programme (see below). Although this was an energy efficiency intervention, an equally important driver was the expected health benefits (See "Wider benefits and Unintended consequences" section for more details). The programme had two main aspects to it: • Provide consumers with information on home insulation (this aspect is considered separately above, under the Intervention 1) • Grants and soft loans for the installation of energy efficiency measures and clean heating devices in homes built prior to 2000. Targeted at both owner occupiers, and landlords. State Grant Funding The level of Government grant funding received depended on the income of the household, and the kind of efficiency measure implemented: • **All income levels**: 33% of the costs of installing ceiling and under-floor insulation up to a maximum of NZ$1,300 were covered • **Low income levels**: Up to 60% of the total cost of insulation and NZ$1,200 towards a clean heating appliance, provided the home was first insulated. The definition of Clean heating appliance may vary by location, but generally applied to replacing solid fuel burners for approved lower emissions upgrades. Landlords whose tenants were low-income earners could also receive the 60% subsidy, however only NZ$500 was supplied towards a clean heating. Third Party Funding To cover the remaining costs, owner occupiers and landlords could be eligible for third party funding, whether grants or soft loans. NZ$80 million in third party funding was obtained over the lifetime of the programme, from private companies, electricity lines companies, community and charitable trusts, councils, banks, other government agencies, city and regional councils, health boards and other organisations. Preference was given to low income housing for the third party funding to cover the remaining 40% of the cost. With regards to loans, two routes for financing were offered: • Council funding. A loan from the local council to be paid back through an additional charge on the council tax. An example is Auckland Council

<table>
<tr><td></td><td></td><td>who offer owner occupier with houses built before the year 2000, up to NZ$5000 towards the cost of insulation and clean heating products. This is then paid back through Auckland Council rates over 9 years at 7% interest.
• Bank funding. For those homeowners with a mortgage they may be able to have the cost of insulating their home added to their mortgage. This would be paid back with interest over the term of their mortgage. There are currently 6 banks that offer this initiative. [2, 3, 7]</td></tr>
<tr><td>2</td><td>Impact</td><td>From an initial target of 188,500 homes, 235,000 were able to be insulated under the programme.

Although the energy savings were substantial (below) these were dwarfed by the health benefits (and consequently savings) of the programme. A cost benefit analysis of the programme found that 99% of the benefits were health related. This is expanded upon in the unintended consequences sections, which also describes the significant employment impacts.

The cost benefit analysis of the programme reveals these electricity and other savings:

Net Present Value (NZ$ million) of Electricity and Other Energy Savings
<table>
<tr><td></td><td colspan="3">Insulation</td><td colspan="3">Clean Heat</td><td rowspan="2">Total</td></tr>
<tr><td></td><td>Energy</td><td>CO_2</td><td>Total</td><td>Energy</td><td>CO_2</td><td>Total</td></tr>
<tr><td>Electricity</td><td>24.4</td><td>0.2</td><td>24.6</td><td>-7.0</td><td>-0.1</td><td>-7.1</td><td>17.5</td></tr>
<tr><td>Other Energy</td><td>-1.3</td><td>-0.2</td><td>-1.5</td><td>0.9</td><td>0.1</td><td>1.0</td><td>-0.5</td></tr>
<tr><td>Total</td><td>23.1</td><td>0.0</td><td>23.1</td><td>-6.1</td><td>0.0</td><td>-6.1</td><td>17.0</td></tr>
</table>
[5]

These savings were found by comparing effects of the intervention in households which had had the intervention, against control groups which had not.

Other key findings of the evaluation study [4] were:
• A 0.96% reduction in average annual household electricity use as a result of receiving an insulation retrofit under the programme and 0.66% reduction in annual total metered energy used. This is a relatively poor result.
• Other key findings included a 1.92% increase in electricity use as a result of heat pump installation and a 0.75% increase in total metered energy used.
Further, the 6th National Communication of New Zealand to the UNFCCC estimates that the ENERGYWISE Home insulation programmes will deliver 20Mt CO_2e reduction in 2020 [2, 4, 5, 12].</td></tr>
<tr><td>3</td><td>Cost-effectiveness</td><td>Ensuring cost effectiveness was a key objective of the scheme. In order to achieve this, the following action was taken:

Houses built before 2000 were targeted – around 900,000 homes which had little or inadequate insulation and/or clean heating.

Focus on areas where the greatest heat loss occurred, which would give best value for money for the limited funds available. This meant targeting a combination of ceiling or loft insulation and under floor insulation, which was the most effective use of resources.

In addition, results of the CBA analysis [5] in 2012 allowed the programme targets to be further adjusted to ensure greatest value for money:
• Energy benefits were greatest for houses in cooler regions</td></tr>
</table>

<table>
<tr>
<td></td>
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<td>

Health benefits were greatest for lower income earners.

Initially, the government allocated the programme NZ$323 million over 4 years, but this was increased to NZ$347 million within the first year of the programme. The additional funding would specifically target low income family homes. With the same budget which targeted retrofitting 188,500 homes, 235,000 were successfully retrofitted by the end of the project.

Programme Costs

A Cost Benefit Analysis [5] of the programme considers the following costs:

Administrative: EECA staff, marketing audits and other.
Deadweight taxation costs: accounts for the distortionary effects of tax that must be raised to pay for the subsidy
Installation costs: resource and labour costs

Annual Costs of the Programme (NZ$ million)
<table>
<tr><td>Item</td><td>2009-10</td><td>2010-11</td><td>2011-12</td><td>2012-13</td></tr>
<tr><td>Administration</td><td>6.8 – 8.0</td><td>6.6 - 7.6</td><td>6.0 – 7.0</td><td>3.2 - 3.7</td></tr>
<tr><td>Deadweight costs of taxation</td><td>16.9</td><td>16.9</td><td>4.8</td><td>14.9</td></tr>
<tr><td>Costs of Insulation + installation</td><td>52.5</td><td>49.9</td><td>64.1</td><td>14.7</td></tr>
<tr><td>Costs of Clean heaters + installation</td><td>18.9</td><td>16.9</td><td>42.5</td><td>12.1</td></tr>
<tr><td>Total(*)</td><td>95.7</td><td>90.8</td><td>117.8</td><td>45.2</td></tr>
</table>
(*) Using the mid-point of the range of administration costs. [5]

The largest component of costs is the costs of the installations themselves, i.e. the direct costs of insulation materials, clean heaters, and the labour costs for installations.

Net Benefits

The cost benefit analysis resulted in a positive present value over the expected lifetime of measures delivered under the programme. The net benefit range was estimated of NZ$411-1492 million.

Under the preferred scenario, (additionality assumption of 85%, 4% discount rate) it was estimated that the programme will have a net benefit of NZ$951 million, and a highly favourable benefit cost ratio of 3.9:1. This takes into account the total costs and benefits of the programme over its lifetime, including administrative costs, and health, employment and energy benefits. Health benefits represent about 99% of the total benefits [3, 4, 5 & 7].
</td>
</tr>
<tr>
<td>4</td>
<td>Critical success factors</td>
<td>
EECA designed this programme to be based on partnerships with the private sector, which was key to addressing financial, implementation, and communication barriers. One of the narratives of the programme was “businesses in the private sector helping NZ households”. This partnership had resulted in:

Unlocked third party funding - funding resources were pooled from a network of private actors – such as service providers and energy retailers. Additionally, initial household assessments were free, and costs absorbed by the service provider.
Gave the programme –and energy efficiency -higher profile.
Contracted service providers enabled EECA to ensure installations were done to the required standards.
Marketing of the scheme has been a significant strength; as well as television and print media and the EECA Website, materials have been made available to Citizens Advice Bureaux, doctors’ surgeries, Service Providers and installers and retail outlets.

</td>
</tr>
</table>

		• The engagement of low income households. The more generous subsidies for low-income households and their landlords resulted in particularly high demand from low-income households. [6, 7]
5	**Marketing and communication**	The programme was accompanied by a sophisticated marketing strategy and multi-media campaign. The key characteristics are presented here: • **Evolving focus**: First year focused on building awareness of the programme and funding availability; the second year was about demonstrating benefits through testimonial experiences; year three focused on converting willingness into action through addressing affordability (with testimonials). In year four existing demand enabled EECA to reduce its programme marketing spend (leaving it to programme Service Providers). • **Multiple engagement points**: The open framework of the scheme allowed multiple points for engagement, and interested households could find information about the programme from their local council, high street bank or national energy agency website. Approved insulation providers carry an ENERGYWISE mark. • **Timing**: In years 1-3, to extend the peak winter period by running two major campaigns either side of winter – a spring campaign (August to October) and an autumn campaign (February to April), creating a marketing footprint over an extended 9-month period. • **TV Campaign**: Another key part of this strategy is using EECA's TV campaign, "the Energy Spot". • **Service providers**: providers were encouraged to tell house owners about other energy efficiency measures that might suit their lifestyles – Energy Star ® appliances, solar water heating, double glazing… Impact of the campaign: • Market research suggests the programme has increased the profile of energy efficiency overall. • Evaluation of marketing campaign May-August 2009 ○ 20,000+ calls to call centre ○ 244,000+ visits to ENERGYWISE website ○ Awareness of funding 48% ○ Leads provided via website 6,600+ ○ 8,260 retrofits within first two months ○ 37,000 retrofits by March 2010 [6, 7]
6	**'Softer' behaviour change**	The programme also had a significant informational component, which is expanded upon above as a separate intervention (Improved Energy Awareness). In addition, only government accredited service providers can participate in the scheme. These were encouraged to tell house owners about other energy efficiency measures that might suit their lifestyles.
7	**Barriers to delivery**	EECA [6] identified the barriers to insulation below. Where a measure to address this barrier was introduced, it has been detailed: • Financial ○ The program was expanded ○ Expansion of the grants to cover all pre-2000 houses -regardless of income of the owner ○ The sources of funding were expanded. Partnering with the private sector gave access to innovative funding pool ○ Innovative modes of operating. Service Providers would provide full assessments free when preparing quotes. The cost of these assessments is then absorbed into the Service Providers'. This has removed a barrier to engagement. • Implementation ○ Adding heating and other energy efficiency measures to the general insulation measures to increase efficiency of delivery

		○ Contracted service allows EECA to control standard of installations • Knowledge ○ Significant emphasis on communication (see above) to overcome this barrier through targeted measures (ENERGYWISE information programme). • Regulation and Compliance ○ Strict requirements for insulation products ○ Championed Insulation Installation Standards and assisted on strengthening Building Code ○ EECA stimulated formation of the industry body (IAoNZ) that is now leading the development of the installer training scheme ○ Contractual obligations, audits and 3-strikes policy ○ Continual research ○ Monitoring and Evaluation of the Programme KPIs and co-benefits[6,7]
8	**Wider benefits and Unintended consequences**	**Energy Impacts** The analysis suggests that there is a reduction in energy consumption in winter but an increase in summer, it does not suggest why [5]. **Health Impacts** Although primarily motivated by Energy Efficiency goals, the health benefits of improved insulation and heating, were a significant driver for the programme. And indeed, the impacts were significant: 99% of the benefits of this programme were health related. The impacts on human health were studied by Health academics of the Healthy Housing association [4]. Some of the key results are as follows: • No statistically significant change in hospitalisation rates as a result of participating in the programme but that there was a statistically significant 27% reduction in mortality for participants aged 65 and over who had recently undergone a cardiovascular hospitalisation. Estimated that this ongoing benefit could be valued at NZ$439.95 /year/treated household. • Was a statistically significant saving of approximately NZ$64.44 in total hospitalisation costs/year for a household that received some combination of ceiling or floor insulation under the programme; a NZ$67.44 yearly saving in circulatory illness related hospitalisation costs, a NZ$98.88 reduction in respiratory illness related hospitalisation costs and for asthma-related hospitalisation costs (a subset of respiratory illness) a higher saving at NZ$107.52 • Pharmaceutical savings were small but highly statistically significant for insulation, and not statistically significant for heating. **Employment Impacts** The net employment impacts of the programme, i.e. additional jobs that would not exist in the absence of the programme, are estimated to be approximately 71-424 full time equivalents (FTEs) in the first year and peaked at 94-560 FTEs in 2001/12. **Weaknesses** The key weakness is that the scope of the works is limited to small number of measures; the scheme could be widened to include a broader range of technologies including wall insulation products. Efficient heating grants have been limited and have run out; the EECA states that this is because the programme is mainly about insulation [4 & 7].

Country		New Zealand
Intervention		4. Warm Up New Zealand: Healthy Homes. Successor to Heat Smart, with a more explicit focus on disadvantaged communities.
Timeframe		Ongoing from 2013
Geographical Coverage		Nationwide
Target group		Owner occupiers, landlords.
1	**Intervention architecture and logic**	This intervention falls under the EECA's ENERGYWISE programmes, with the objective of improving the thermal envelope of homes through a residential insulation programme. The first part of the programme was the Warm Up New Zealand: Heat Smart programme, which lasted from 2009 to 2013. Following on from the Heat Smart programme, the Healthy Homes insulation programme has a different focus, explicitly targeting low income households, particularly those with elderly and children. The government aims to spend NZ$100 million over 2013-2016, and insulate 46,000 homes. Aside from energy efficiency, this is also an explicit health intervention. As well energy savings, insulating homes reduces health risks caused by cold, damp housing such as respiratory illnesses and serious diseases like rheumatic fever. **Eligible Households** The programme is targeted at households (including renters) that have a community services card and are at high health risk. It is nationwide, rather than region specific. Priority will be given to households with children (under 17) and elderly people (over 65). EECA is working closely with government and health agencies to develop referral systems to reach targeted communities, working closely with the Ministry of Social Development. In Auckland, the EECA is working with the Ministry of Health's rheumatic fever unit and with the Auckland Social Sector Leaders' Group. **Measures** The grant covers: ceiling and under floor insulation, boiler insulation, pipe lagging, draught-stopping, ground moisture barrier, heating systems and must be performed by one of the approved service providers. Unlike the Heat Smart programme, insulation is prioritized over clean heating measures as these are considered more cost effective. **Funding** The government's investment of up to 60% of the cost of a home's insulation is augmented by significant levels of funding from trusts and other third parties. The remainder is covered by third party funders the same as those under the previous Heat Smart programme (district health boards, community trusts and iwi trusts (iwi form the largest social units in Maori culture)). These groups invest the additional funding (40%) for targeted households. Although the insulation will be free for eligible homeowners and tenants, landlords of eligible tenants may be asked to make a contribution. For homeowners and tenants not eligible for insulation grant under the Healthy Homes, there may still be payment options with local councils and banks to help with the cost. • **Banks**: certain banks will add the cost of the insulation to a homeowners' mortgage, to be paid back with interest. Associated fees have been waved.

		• **Councils**: costs can be added to the council rates, and paid back over a period with interest applied. 10 local councils, representing 56% of the population, have committed to offering households low-cost finance options. Through 'voluntary targeted rates' (VTR), local councils can fund insulation retrofits and progressively recover the cost from the property through rates over a 9- or 10-year period (e.g. in Auckland, costs are paid by via council rates over 9 years, at 7% interest). [10, 13]
2	**Impact**	Starting in September 2013, EECA's Annual Report states that the intervention has exceeded its target 2013/14 target (16,000) delivering over 19,000 fully funded. In 2013/14, the government invested NZ$33.1 million in the Healthy Homes programme. Third party funders invested around NZ$28mn in this period, however this includes both the Healthy Homes and the precursor Heat Smart programmes [10]. Further, the 6th National Communication of New Zealand to the UNFCCC estimates that the ENERGYWISE Home insulation programmes will deliver 20 Mt CO_2-e reduction annually in 2020 [12].
3	**Cost-effectiveness**	The government cost of the programme is NZ$100 million, expected to be split 35:35:30 across the 3 years of the programme for low income households. Government spending only covers 60% of grant costs, with the remainder coming from 3rd party funding, and landlords in some cases. The Healthy Homes programme deliberately targets low-income households, who are at a higher risk of health issues. This is as a result of an independent study carried evaluating the preceding Heat Smart Programme, which highlighted that the greatest benefits from insulation are for people on low-incomes and facing a higher risk of health issues. Avoided health costs to the Government from insulating a house average NZ$854 a year for Community Services Card (CSC) holders (the low income communities) compared to only NZ$336 a year for non-CSC holders [13]. In addition, the same study recommended that the insulation component of the programme be prioritized over the clean heating component, as this also has greater benefits. Robert Linterman, (EECA) [17] stated that the cost-effectiveness of the Warm Up New Zealand: Heat Smart and Healthy Homes programme is generally measured in terms of the average contribution the Government makes to each insulated house over time. This cost has decreased under the Healthy Homes programme with the Government paying on average of 50% of the average cost of install (NZ$3,300), instead of 60%. There is no information available on the cost effectiveness of the loan options, mostly due to the service providers managing this aspect of the programme, which reduced costs to the New Zealand government.
4	**Critical success factors**	• Focus on low income communities is more cost-effective, as more benefit accrue to intervening in low income households than higher income households. • The partnership with third parties funders significantly augmented government funding, and allows more households to be reached.
5	**Marketing and communication**	This Residential Insulation programme aims to achieve one of the three key outcomes of the ENERGYWISE programmes – providing warm, healthy homes to New Zealanders. Another key outcome is improved energy awareness, which is carried out by numerous campaigns and informational resources (websites and ratings) which are explained more thoroughly in the first and second intervention.
6	**'Softer' behaviour change**	As above in intervention 3.

7	**Barriers to delivery**	While the delivery of the programme to low income groups via grant funding exceeded expectations, the delivery to higher income groups via council and bank low interest loans (VTR), had lower than expected delivery. EECA explains this is because the VTR programme took longer than expected to introduce into councils and service providers. EECA expects the uptake of retrofits supported by VTR to grow strongly in 2014/15 as the Heat Smart programme is exited, and more resource become available to promote the VTR scheme [10].
8	**Wider benefits and Unintended consequences**	None specified, however it is expected that employment and health benefits have accrued, in line with those of the Heat Smart programme.

Sources:

[1] Energy Efficiency and Conservation Authority – Energywise http://www.energywise.govt.nz/about-energywise

[2] Energy Efficiency and Conservation Authority – Residential programmes

[3] IEA – Policies and Measures Energy Efficiency – Warm Up New Zealand: Heat Smart and Warm Up New Zealand: Healthy Homes, http://www.iea.org/policiesandmeasures/energyefficiency/

[4] Healthy Housing – He Kainga Oranga – "Evaluation of Warm Up New Zealand: Heat Smart", http://www.healthyhousing.org.nz/research/current-research/evaluation-of-warm-up-new-zealand-heat-smart/

[5] Grimes et al, "Cost Benefit Analysis of the Warm Up New Zealand: Heat Smart Programme – Prepared for the Ministry of Economic Development", Revised v. June 2012,

[6] Dr Sean Rotmann, EECA, "Warm Up New Zealand: Heat Smart - Lessons in large scale implementation of a residential energy efficiency grant programme", https://www.iea.org/media/workshops/2010/transforminginnovation/rotmann.pdf

[7] Association for the conservation of energy, "Financing energy efficiency in buildings: an international review of best practice and innovation", June 2013 http://www.wec-policies.enerdata.eu/Documents/cases-studies/Financing_energy_efficiency_buildings.pdf

[8] EECA, "ENERGYWISE™ website wins award for its positive impact on New Zealand society", 28 July 2010, http://www.eeca.govt.nz/news/energywise%E2%84%A2-website-wins-award-its-positive-impact-new-zealand-society

[9] Internet Industry Awards, 2010 Winners – EECA, http://internetindustryawards.co.nz/alumni/2010-award-winners/ http://www.eeca.govt.nz/eeca-programmes-and-funding/programmes/homes

[10] EECA 2013/14 Annual Report, www.eeca.govt.nz/resource/eeca-annual-report-2013-14

[11] Energy Efficiency and Conservation Authority (EECA) STANDARD FINANCIAL REVIEW QUESTIONS – 2012/13, For the Local Government and Environment Select Committee

[12] New Zealand, 6th National Communication to the UNFCCC and Kyoto Protocol

[13] EECA, Residential programs: Warm Up New Zealand: Healthy Homes, http://www.eeca.govt.nz/eeca-programmes-and-funding/programmes/homes/insulation-programme

[14] CIA Factbook, New Zealand https://www.cia.gov/library/publications/the-world-factbook/geos/gm.html

[15] New Zealand Statistics, 2013 Census. Tenure of Household by total income and Occupied Dwelling Type.

[16] Source: DECC, Domestic electricity prices in the IEA, March 2015 https://www.gov.uk/government/statistical-data-sets/international-domestic-energy-prices

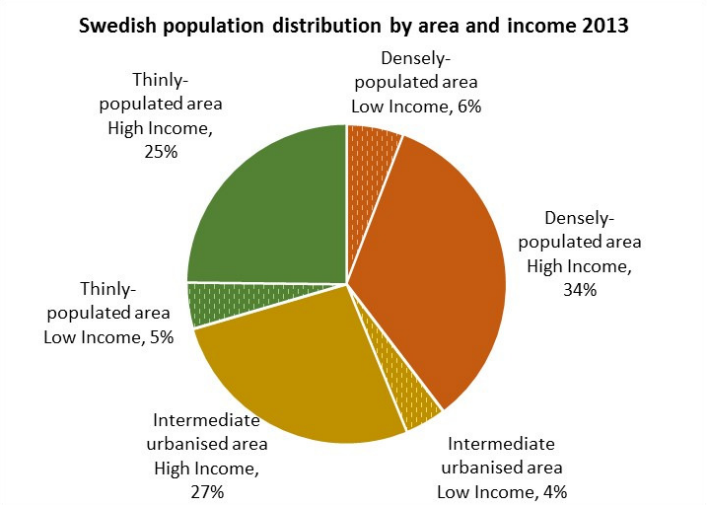
[17] Response from Robert Lindemann, General Manager Residential Team, Energy Efficiency and Conservation Authority to email enquiry

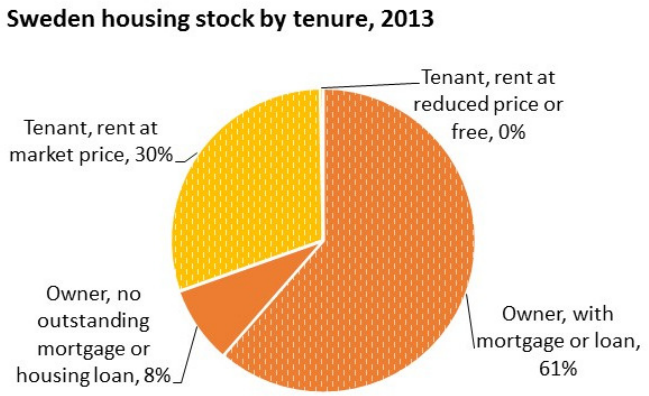
[18] The median household income from all sources was $63,800 in 2013 (http://www.stats.govt.nz/Census/2013-census/profile-and-summary-reports/quickstats-income.aspx). 63% of this level is approximately $40,000.

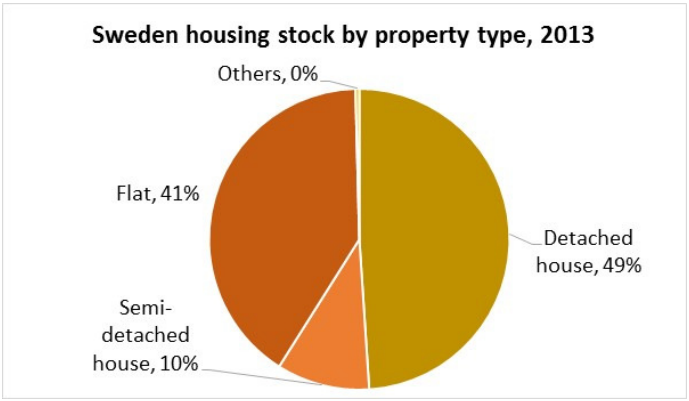
[19] A family trust legally protects the assets of a person and/or family, and holds them for the future. The assets are put into the control of nominated trustees, who may or may not be family members. The trustees' aim is to preserve the assets in the interests of nominated beneficiaries who may be living, and/or future family members.
http://www.stats.govt.nz/Census/2013-census/info-about-2013-census-data/2013-census-definitions-forms/definitions/household.aspx
Dwelling owned or partly owned are a category of statistics containing these subcategories:
10 Dwelling owned or partly owned, mortgage arrangements not further defined
11 Dwelling owned or partly owned, mortgage payments made
12 Dwelling owned or partly owned, mortgage payments not made
http://www.stats.govt.nz/Census/2013-census/info-about-2013-census-data/information-by-variable/tenure-of-household.aspx

[20] See the videos here: http://www.energywise.govt.nz/how-to-be-energy-efficient/energyspot

3.7 Sweden

Country	Sweden
Country Context	*Sweden Policy Background* Article 3 of the EU Energy Efficiency Directive required Member States to set national non-binding energy savings targets for 2020. Sweden's target was set at the level of 126 TWh of primary energy consumption in 2020. This represents a 20% reduction from 2008 levels. The Swedish government set out a National Energy Efficiency Action Plan in 2014. **Key Demographics** The chart below shows the distribution of the Swedish population by living area and income. While only 20% of the Swedish population lives in rural areas, approximately 40% of the population live in densely populated (urban) areas, and an additional 30% in intermediate urbanised areas [20]. Low income population is relatively evenly split between all three areas types. Note that high income is defined as above 60% of median equivalised income, as per data from Eurostat [15] Equivalised income is defined as household net income, divided by the number of equivalised adults in the household. (http://ec.europa.eu/Eurostat/statistics-explained/index.php/Glossary:Equivalised_disposable_income):  Regarding the age profile, Sweden has an ageing population [13]: - 0-14 years: 16.9% - 15-24 years: 12.3% - 25-54 years: 39.2% - 55-64 years: 11.7% - 65 years and over: 19.8% **Housing Stock** Charts below show the Swedish housing stock data by tenure and property type. Most of the Swedish population own their house (70%) with a small fraction (8%) having no outstanding loan or mortgage. The remainder of the population rents at market prices, and less than 1% have reduced or free rents. In terms of property types, half of Swedish properties are detached houses, 41% are flats, and 10% semi-detached.

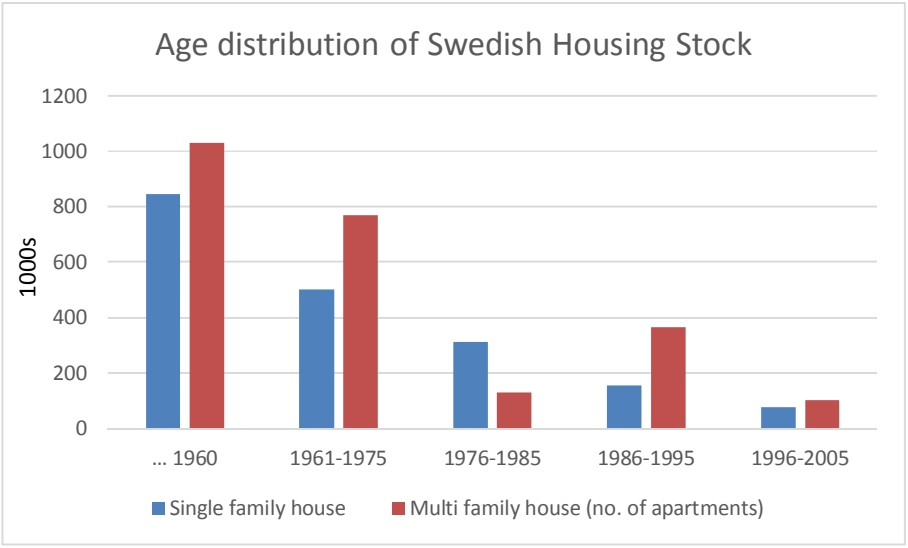




[Both charts: 15]

Age of Swedish Housing

Swedish housing is categorised as either a single family home (SFH), or a multi-family house (apartments: MFH). The majority of Swedish housing was built before 1975 (71% of SFH and 75% of MFH). While there has been a decreasing trend of building SFH, MFH increased in the 1986-1995 period, and subsequently decreased.



[16]

	Domestic Energy Prices Domestic energy prices are shown in Section 3.1. Sweden's Electricity Prices are just above average in this context at 14.95p/ kWh. However, Sweden has the second highest tax component of its peers, both relatively (38% of price) and in absolute terms. Electricity prices are just below the average. Domestic gas prices in Sweden are the highest of these peers, which is due to both to above average gas prices, and a significant component of tax, comprising 44% of the overall price. Regarding heating, the majority of multifamily houses in Sweden are heated with District heating, and the majority of the single family houses are heated with electricity (mostly heat pumps). Very few houses are gas heated [17].
Selected Interventions	1. Repair, maintenance, conversion or extension rebate (RCE Allowance). Tax reduction on refurbishments which improve the energy efficiency households. 2. The Planning and Construction Act (PCA), including energy requirements for buildings (Building Code). Regulation setting out minimum requirements for buildings energy management. 3. Programme for Buildings with Very Low Energy Use (LAGAN), supporting and stimulating energy efficiency builds/ conversions and associated supply chain through demonstration projects, collaborative network initiatives. 4. State Aid for Municipal Energy and Climate Advice. Advisors provide homeowners with impartial advice regarding their heating systems.
Linkages between schemes	According to the third Swedish NEEAP [1], the guiding principles for the existing energy efficiency schemes are the following: • instruments should be general and not tied to specific technologies • prices must give correct (or desired) information • search costs are reduced by developing and disseminating information and • barriers should be removed, for example by adapting existing rules. National measures are aimed at both the use of energy and energy efficiency, and the state sees its role as the identification of market failures, for example the lack of information facing consumers. The current portfolio of instruments is very broad, including general economic instruments (e.g. taxes), targeted administrative instruments (building codes). In addition, numerous supplementary measures are designed to target a lack of information in the market, and to raise awareness of measures. Examples include the state aid for municipal energy and climate advice, energy audits for SMEs and regional climate strategies. While the interventions 1 and 2 (building codes, and tax rebates on refurbishments) can be seen as targeted administrative instruments, interventions 3 and 4 are examples of the supplementary measures, targeting lack of knowledge and awareness in the market. Climate advisors to some extent provide a link between the owners/occupiers and the existing regulations (such as the building codes), measures they may take to increase energy efficiency, and the incentives for doing so (e.g. the tax rebate). In this sense, they are the interface between the schemes and the targeted actors. The LAGAN scheme is also very information-based. It targets the construction sector, and seeks to showcase demonstration houses at a national (and international) scale, disseminate best building practice in the industry, and stimulate the national supply chain for such houses in Sweden. Although considered a "softer" or supplementary measure, it is vital for fostering the environment for building ambitiously low energy housing.

Country		Sweden
Intervention		1. Repair, maintenance, conversion or extension rebate (RCE Allowance). Tax reduction on refurbishments which improve the energy efficiency households. The tax relief on home repair and maintenance (ROT)
Timeframe		First introduced from 1st December 1994, periodically removed and ongoing since 2008.
Geographical Coverage		Nationwide
Target group		Owner occupier
1	**Intervention architecture and logic**	In Sweden, property owners have the opportunity to receive a tax reduction of 50% of the costs of work to repair, maintain, convert or extend their property for single family houses (houses, condominiums and privately owned flats). The maximum rebate is SEK 50,000/owner/yr, and some of these measures are related to energy efficiency (e.g. a property with two owners could have up to SEK 100,000, capped by the amount paid in taxes). Renovations (including energy efficiency measures) may be total or partial renovations of a block of flats or a single house. It may be needed on the grounds of a component having reached the end of its lifecycle or being damaged, or because improvement are required to the indoor environment. There are also renovations for climate reasons, including insulation, sealing and window replacement, and installation upgrades. In March 2015 the new Swedish Government has proposed to reduce the percentage level from 50% to 30%. The objective of this reduction is for the Government to utilise the additional funds that will be raised for building new homes [2]. One of the objectives of ROT has been to increase job creation through tax incentives and also to encourage work to be declared so as to reduce 'moonlighting' in the building sector.
2	**Impact**	It must be noted that this measure was not singularly aimed at incentivising energy efficiency retrofits. For this reason, no specific evaluation of the energy impacts were made. It has been calculated that during 2009 the impact of this policy was to create 12,000-35,000 jobs moving work away from casual undeclared work [9]. Another article claims it has created over 20,000 jobs [10]. It is worth noting taxes on employment are relatively high in Sweden on in a European context. The Swedish National Board of Housing, Building and Planning and the Swedish Energy Agency's prepared a report in 2014 on the national strategy for investment in renovations to improve energy efficiency, in which they estimate the impact of such energy efficiency renovation measures. From 1995-2011, it is estimated that existing instruments have contributed to a reduction in average energy consumption of 11% of the Swedish Building stock, and that, from the European perspective, Sweden has an energy-efficient building stock. Between 2011 and 2050, if current instruments were maintained, the energy purchased for all buildings /km^2 for heating and hot water is expected to fall by 12–25%, while the buildings' energy needs for heating and hot water are estimated to fall by 2–17% per km^2. Note that current instruments include carbon and energy taxes, rebates, building regulation, and informational incentives. Although measures such as the RCE will have contributed to this saving, their exact contribution has not been specified [1].

3	**Cost-effectiveness**	Lack of ex-post evaluations that would allow for an estimate of cost-effectiveness.
4	**Critical success factors**	Lack of evaluations with which to identify critical success factors.
5	**Marketing and communication**	There is quite a lot of information about ROT on the Swedish Tax Authority's (Skatteverket) website. This provides information on how you can declare, what information you need to provide for example. Because the programme provides a tax rebate that is available to all taxpayers there are public debates about this policy instrument particularly when an amendment is proposed. This raises awareness of the programme in general.
6	**'Softer' behaviour change**	This programme does not contain any incentives for softer behavioural measures.
7	**Barriers to delivery**	Barriers within municipal housing companies include several financial aspects such as financial risk-taking, tenants' ability to pay, and interpretation of the concept of profitability. Specifically with respect to renovations, a considerable barrier is the lack of willingness or ability among tenants to pay for increases in rent, which is a great challenge for renovating homes [1]. Rents for apartments in Sweden are normally set through negotiations between landlords and tenant representatives. In an interview with an employee of the National Board of Housing, Building and Planning [21], Mr. Hjorth described it as a weakness of the regulation that the amount of incentive was not specifically linked to the energy efficiency savings. The new government is now planning subsidies for retrofits in multifamily homes, and the suggestion has been made to link these incentives to kWhs saved. Example: If 100,000 kWh is saved they can get SEK50,000 for the energy measures and up to SEK50,000 for other measures like fixing the waterproofing in the bathrooms or renovating the plumbing, fixing the ventilation and so on from a given list. This measure has just been suggested, and is awaiting discussion by the government [17].
7	**Wider benefits and Unintended consequences**	The tax rebates have resulted in perverse incentives as they encourage contractors to artificially inflate the labour cost when costing the works. This is because the tax rebate applies to labour and not materials i.e. the higher the share of labour cost of the total cost the higher the tax rebate. There are fears that reducing the tax incentive to 30% will encourage more people to switch to illegally hiring contractors without declaring this to tax authorities in order not to pay VAT [11].

Country		Sweden
Intervention		2. The Planning and Construction Act (PCA), including energy requirements for buildings (Building Code). Regulation setting out minimum requirements for buildings energy management.
Timeframe		Ongoing from 2010
Geographical Coverage		Nationwide
Target group		All new builds and renovation works
1	**Intervention architecture and logic**	The 2010 Planning and Construction Act sets out the minimum requirements for buildings' energy management. Regulation states that the building is to be constructed in order to limit energy use through low heat losses, low need for cooling, efficient heating and cooling and efficient use of electricity. The building's energy use is defined as the energy that in a normal year is supplied for heating, cooling, hot tap water, operation of installations such as pumps and fans, as well as other electricity to run the property. Household electricity and process electricity are not included. Among others, energy requirements were made 20% more stringent on average. The requirements are differentiated by zone (and climate) and heating method, with electric heating having more stringent targets. In 2012 regulations were introduced for modifications to buildings, making energy performance requirements the same as for new builds. Modifications (including energy efficiency measures) include total or partial renovation of a block of flats or a single house. They may be needed on the grounds of a component having reached the end of its lifecycle or being damaged, or because improvements to the indoor environment are required. There are also renovations for climate reasons, including insulation, sealing and window replacement, and installation upgrades. The Swedish National Board of Housing, Building and Planning is responsible for reviewing and adjusting the stringency of the energy management levels in the regulations, and are required to report on this. New provisions were expected on the 1st January 2015, and these were considered integral to Sweden's target for "nearly-zero energy" (NZE) building stock, by progressive increases in energy-management requirements. Guidelines for the energy-management requirements of NZE buildings are expected by June 2015 [1]. **Triggers for enforcing the regulation** There are distinctions made between, "maintenance", "alterations" and "remodeling" of the building, which gives the extent to which building regulations must be followed. Maintenance currently has no detailed requirements, other than maintaining building and its installations in good condition. For "alterations", there are more detailed requirements which depend on the size of the alteration and capability of the building. Finally, when it comes to remodeling the building regulations applies fully. For example a building needs to be painted to protect it from moisture, which is required every e.g. 7th year. An alteration may be changing a window, and in that case the replacement must be as energy efficient as those required for new buildings, except if the building has cultural value, when replacement must be made in the same style. And finally for major renovations it is necessary to fulfill the whole building regulation fully [17].

2	**Impact**	No specific review of this intervention has been found. The impact of energy efficiency renovation measures overall has been discussed under 'impact' for intervention 1. Although measures such as the PCA will have contributed to this saving, the exact contribution has not been specified. [1]
3	**Cost-effectiveness**	Detailed economic analysis has been undertaken as part of the impact assessment of this policy. This covers components such as the district heating and heat pumps on a 40 year life cycle analysis basis [12]. These have not been expanded upon because the analysis does not consider in isolation the impact of this specific intervention, as implemented from 2010.
4	**Critical success factors**	No specific information on this. However, as a form of regulation, this can work very effectively in setting a standard which all new builds and refurbishments have to comply with. It is relatively efficient and direct.
5	**Marketing and communication**	Limited information identified. Each local authority is responsible for implementing the national legislation on planning. Therefore each local authority website has a summary surrounding the new points in the planning regulations.
6	**'Softer' behaviour change**	Given this intervention sets standards which must be followed by construction sector and home owners for new builds and refurbishment, the intervention is not targeted as softer behavioural change. Other measures, such as the Advisors (below) fulfil this role.
7	**Barriers to delivery**	With regards to the section of the PCA covering modifications, barriers to investments for improving the energy performance of existing buildings relate to the division of incentives between property owners and tenants. Investments may not be made on the grounds that one of the parties is liable for the investment costs while the other party benefits from the cost savings. In Sweden, divided incentives is not so important, because tenancy agreements based on rent including heating are predominant in Sweden. This solves the investment problem, with owners generally incentivised to invest to improve energy efficiency, although the "consumption problem" still exists, where consumers (tenants) may not have incentives to consumer less. Barriers within municipal housing companies include several financial aspects such as financial risk-taking, tenants' ability to pay, and interpretation of the concept of profitability. Specifically with respect to renovations, a considerable barrier is the lack of willingness or ability among tenants to pay for increases in rent, which is a great challenge for renovating homes [1].
8	**Wider benefits and Unintended consequences**	None identified.

Country		Sweden
Intervention		3. Programme for Buildings with Very Low Energy Use (LAGAN), supporting and stimulating energy efficiency builds/ conversions and associated supply chain through demonstration projects, collaborative network initiatives.
Timeframe		2010 to 2015
Geographical Coverage		Nationwide
Target group		All new builds and renovation works
1	**Intervention architecture and logic**	In 2010, the Swedish Construction Federation received a grant worth SEK 54 million over 5 years for stimulating energy-efficient new buildings and conversions (40% funded by the Swedish Energy Agency). The focus is on buildings with very low energy consumption (passive houses, green buildings etc.), using less energy than current practices, or requirements by building codes. Specifically, projects must achieve (or aid achievement) of at least 50% better energy performance than the Building Code (BBR) in the case of new buildings. For retrofits, the energy consumption must fall by at least 50% whilst achieving energy consumption that is 40% lower than the requirement in the BBR. The program activities supports these buildings projects indirectly through dissemination, and supply chain stimulus. This kind of approach called fostering of "Technology Procurement Groups" has been in place in Sweden since the 1980s, and has been applied to numerous sectors, including the housing sector. Emphasis is on information exchange among those involved in the sector (project developers) and publicising the latest practices and achievements in highly efficient housing. Three main kinds of action are supported: • **Demonstration projects:** selected building projects will benefit from grants for evaluation/monitoring and information dissemination of the project, e.g. publicising on the SEA's website. • **Implementation projects:** support development of the supply chain of demonstration projects, by developing tools and providing financial resources for builders, contractors and manufacturers. Examples include in-depth studies (e.g. development of standards for passive housing) or projects to develop aids and tools in energy efficient construction. • **Collaborative/Network Initiatives:** financial support (up to 25%) for established regional/local collaborations energy efficiency building initiatives. Aim is to provide and enhance platforms for cooperation and communication linking actors across the construction supply chain. The aim is to create favourable business opportunities and incentives for companies to engage and developing in this space. In addition, very strong focus is place on communication and dissemination. (See below) [1, 5, 6, 7] This means that none of the grant funding goes to the project development costs itself (i.e. hard measures). Rather, the funding is used to support demonstration projects through publicity activities (e.g. maintaining an online database of such projects), and knowledge exchange initiatives, (e.g. providing networking opportunities and workshops among those involved in the industry), to share best practice [17]. Some of the funding also goes to financing the delivery agency, Swedish Energy Authorities' direct costs. **Programme Financing and Management** The Energy Agency pays the grants to the Swedish Construction Federation, who is the main partner in this program, and responsible for ensuring that enough co-

		financing are made by the building industry, i.e. involved partners in the different projects. The grants are paid out to the projects (i.e. the organisation who is project manager). The grants are not subsidies for actual energy efficiency measures or construction. The Swedish Construction Federation is responsible for coordinating the program, webpage, seminars, PR activities etc, which they receive a small budget for. The program has a board who decides how the program develops, which projects will get grants etc. The board consists of 6 organisations (including the Swedish Energy Agency) representing market actors and public agencies [19].
2	**Impact**	By the end of 2013, 26 projects were still ongoing and 15 projects were already finished [6]. An Interim project evaluation performed by Technopolis in January 2013, had the following findings [7]: • The demonstration projects are highlighted as very important. Although LAGAN support in not determinant to the viability of the project, LAGAN support enables focus and achievement of a level of ambition which would otherwise not have been possible. • The implementation project fills a gap which individual companies would struggle to cover individually, by funding for the research and development of tools and aids for energy efficient construction. Evaluation found that LAGAN funding was instrumental for the quality of the projects, and indeed, some projects would not have gone ahead otherwise. • Collaboration Initiatives were found to provide a good platform for cooperation and communication between local and regional actors, and LAGAN financing was being seen to have a positive effect. • Dissemination allows for effective monitoring and an overview of what is going on in the market (more detail below). • 44% of the budget went to demonstration projects. However, although economically LAGAN financial support does not affect project viability, impact on information dissemination, monitoring and evaluation of builds is seen by participants as crucial for enabling higher levels of ambition in terms of energy efficiency. LAGAN support is an important brand distinguishing a developer when interacting with customers and suppliers. • 34% of the budget was spent on Implementation projects, and 21% on Collaboration Initiatives • An evaluation which is to be released in fall of 2015 [19] states that most grants have not enabled new or “unplanned” projects (even without the grant many projects would probably still have been completed). However grants have enabled projects to increase their ambitions, deepen their analyses, increase their scope of the project or increase their dissemination of the project’s results. The grants have had a good added-value to the projects and their completion.
3	**Cost-effectiveness**	According to an upcoming evaluation, the program has the potential to be cost-effective. However it is hard to determine since it is too early to evaluate the real impacts on energy efficiency in Sweden (It will probably take some time to identify any impacts, and connect those directly to this program). The evaluation of the program showed that most grants have not enabled “totally new and unplanned” projects, even without the grant many projects would still have been completed. Rather grants have enabled projects to increase their ambitions, deepen their analyses, increase their scope of the project and increase their dissemination of the project’s results [19]. In an interview with Mr. Holmberg of the SEA, he noted that relatively little input was required in order to publicise the demonstration projects (maintaining an online database) and stimulate information sharing (e.g. booking meeting rooms and publicising this to relevant stakeholders). In the case of the latter, the SEA has found

		that those involved in the industry are highly motivated and willing to learn and share experiences. Thus, providing a location in which this can occur is usually enough [7].

4	**Critical success factors**	• According to both program management and project participants, the program is in line with the needs of the industry – it is the only program for energy efficiency in buildings that caters specifically to the construction industry
		• In the evaluation of the program, LAGAN was considered a much needed program, and the only one of its kind because it caters to both the construction and housing industry. In comparison with other Energy Agency programs, this is open to several different types of stakeholders.
		• The LAGAN program crosses over and complements many other initiatives of the Swedish Energy Agency. Examples include:
		  ○ Networks within the construction and property sectors, aiming to promote demonstration projects and energy efficiency measures in apartment buildings. Networks include owners and managers of commercial and residential properties, government authorities, and residential tenants.
		  ○ LAGAN can is also contributing to disseminating the near-zero energy buildings work at a national scale. Several of the LAGAN projects in the flame can match almost zero requirements and thus become reference projects for the government.
		• Implementation programmes allow initiatives to immerse themselves in focused questions in a way that it is difficult to get funding for elsewhere.
		• Networks create a forum for knowledge sharing, hosted by a neutral and independent party, where everyone is equal, and the objective is simply shared learning [7].
		• The program have also been very open to different types of actors to receive grants, and it has been positive that the program has been able to give grants to organisations that are rather inexperienced in applying for these kinds of grants (or working with energy efficiency), including much smaller projects.
		• One of the lessons learned is that many organisations who have project ideas need help to fully develop their idea.

5	**Marketing and communication**	A key lesson learnt was the important of dissemination this grant support in order to ensure the success of the programme. It is advised to develop clear plan for this at the start of the program- although this was done by the SEA, it was de-prioritised and may have affected the outreach of the programme. In addition, it takes some time for programs like these to become known for market actors and many times bigger organisations take the lead [19]. Communication and dissemination of the demonstration projects is one of the key focuses of the LAGAN program. This is achieved through: • The program website which performs a central role. • Deliberate effort to organise media activities and seminars. Multiple seminars, with broad scope of actors and locations, were organised to collect participants' views on the gaps and barriers to future development of energy-efficient construction. • Using and enhancing communication channels with regional networks connected to the program. • A publically available “market review” database of demonstration projects, conducted within and out the Lagan program. The evaluation of the program performed in 2013 [7] had the following findings: • The website is generally up to date, and a good source. The value will increase as more projects are completed and added. • The marketing of projects is often cited as valuable. The collaboration initiatives provide an important network through which to market projects regionally and locally.

		LAGAN has the potential to reach a wider audience, both geographically and to a diversity of actors. The program is still primarily known among people working in the energy sector, and those participating in any of the program's intervention forms are often unaware of other activities within the program. One example is the market review database of demonstration projects is relatively unfamiliar to participants.
6	**'Softer' behaviour change**	As an intervention focused on the construction industry, incentivising softer behavioural change by home dwellers was not an aim.
7	**Barriers to delivery**	• Unclear templates for project applications. • Lack of awareness of the scope of the LAGAN project, even among the participants of the project, who may only be involved with one of the three action areas. • Uncertainty about the economic viability of some of the demonstration buildings, particularly the near zero housing. • Lack of program focus on renovations, preferring new builds. • Time limited (5 years) will be a barrier for the continued accumulation and sharing of knowledge. • Despite the programme management's attention to this issue, the independent policy evaluation [7] identifies a lack of geographical spread of implementation projects, which seem to be concentrated in the west coast. Demonstration projects on the other hand, are more evenly spread throughout the country.
8	**Wider benefits and Unintended consequences**	This intervention interestingly did not focus on hard measures of financing efficient new builds or implementing building codes. The focus was on "soft" measures: • Marketing and disseminating demonstration projects to a national audience • Supplying the resources and tools for knowledge and best practice sharing among members of the construction industry • Creating platforms and connections between members of the industry engaged in building energy efficient housing • Providing the environment and resources to foster ambitious approach to increasing energy efficient in housing Therefore the actual building of ambitiously energy efficient housing will be a side effect of this intervention.

Country		Sweden
Intervention		4. State Aid for Municipal Energy and Climate Advice. Advisors provide homeowners with impartial advice regarding their heating systems.
Timeframe		From 2008
Geographical Coverage		Nationwide
Target group		Private individuals and enterprises
1	**Intervention architecture and logic**	The Swedish Energy Agency delivers State support, both financially and via training and information, to all of Sweden's 290 municipalities. This is considered an information dissemination mechanism. The Swedish Government has decided to continue funding energy and climate advisers up to and including 2017. There are 250 advisors (approximately) for 290 municipalities. Some advisors cover more than one municipality The purpose of the energy and climate advice is to provide impartial, free and technology-neutral information and advice concerning energy efficiency options. There are a total of 14 energy agencies distributed across the country. The energy and climate advice is targeted at a number of target groups and areas: Industry, transport and homeowners. For the latter, advisors may provide homeowners with information regarding investments in heating systems. Advisors can be contacted by phone or in person, but are themselves also increasingly proactive in engaging with the community. This includes attending key municipal events, and announcing their services in the local media [17]. Since last year, municipal energy advisors report on a monthly basis to the Swedish Energy Agency on the nature and number of advice interactions, and the resulting measures adopted. The advice offered includes technology neutral advising on "energy" issues – e.g. energy efficiency interventions to the home, for example, or which kind of heat pump to use, or insulation to adopt. It also includes "climate" advice, to support the decreased use of fossil fuels. [2, 17]
2	**Impact**	The Swedish Energy Agency [3] estimated that the overall effect of the Swedish advisers' activities aimed at households is 0.48-1.04 TWh / year. There is significant uncertainty, however, and the authors acknowledge that it is very difficult to express the impact of advisors' activities on energy savings on a TWh basis. 30% of homeowners in Sweden say they have contacted energy advisors. Of these, 70% state that the advice had an impact on their actions. Those who approach advisors are usually already engaged in the subject, having done some preliminary research and requiring impartial advise as to which technology (for instance) to choose. Advice is usually sought from middle class, single family home owners [17]. Going forward, the estimated contribution to the cumulative energy-saving during the period 2014-2020 is estimated to amount to 0.5 TWh from the support for energy audits and almost 14 TWh from the municipal energy and climate advice [2]. Advice and information cannot be considered as stand-alone interventions, but their primary purpose is to support other instruments. For example, advisors can support other interventions, such as the Swedish energy audit scheme. They can also influence investments homeowners make in heating systems, steering them away from fossil fuels to electric heating via advice on energy taxes.

3	**Cost-effectiveness**	Reported to cost SEK 140 million/year [8]
4	**Critical success factors**	• Information programmes generally are an important measure to address the "divided incentives" which creates barriers to the uptake of other measures, such as the tax rebate for renovations. • The requirement for advisors to report interactions and the measures adopted on a monthly basis to the Swedish Energy Agency, creates an important mechanism for tracking effectiveness of interventions, including barriers to adoption. • It is critical that people see the advisors as knowledgeable and trustworthy. For this reason, maintaining reputation high is a critical success factor [17].
5	**Marketing and communication**	Dissemination of information and advice is the very focus of this intervention. This is achieved through the 14 energy agencies distributed throughout the country, providing training and information on, energy efficiency issues as well as other services. The training and advice is provided to municipalities who then in turn provide advice to individuals and local businesses. For example the Stockholm region project had support via telephone, web, and workshops for students at the technical museum, sector focused workshops and attendance at trade fairs.
6	**'Softer' behaviour change**	The aim of the advisors is to aid home dwellers to implementing "softer" change, as well as pointing towards other "harder" interventions (building codes) and incentives (rebates) which they are required to comply with, or can benefit from.
6	**Barriers to delivery**	• Since last year, a number of changes were introduced to the measures. The first was to proactively engage people rather than awaiting contact. This was because usually people only ask for advice once they are already interested in the subject. In addition, communities which have not traditionally used the advisory service, e.g. lower social classes will also be directly targeted [17]. • Ensuring high quality of staff is essential. However, there are occasional difficulties with recruiting qualified staff, particularly in smaller municipalities., Tasks are demanding, while the job is not perceived to be with high enough status. There has been increased emphasis on training of advisors in order to tackle this issue (via annual workshops and period information packs) [8]. In addition, greater quality control by the SEA is now in place, with advisors having to report on the kind and quantity of advice given [17]. • Lack of public knowledge about this free and impartial advice . • Further, a lack of a direct link to the energy companies which may provide the energy efficiency services and products which are advised upon, as advisers cannot recommend specific products [17]. • Companies are interested in saving energy but do not want to commit to undertaking any activities.
7	**Wider benefits and Unintended consequences**	None specified.

Sources:

[1] Sweden's Third National Energy Efficiency Action Plan, 24th April 2014

[2] Sweden's plan for implementing Article 7 of the EED, 5th December 2013, file no N/2013/5035/E.

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[13] CIA World Factbook, Sweden - https://www.cia.gov/library/publications/the-worldfactbook/geos/sw.html

[14] Source: DECC, Domestic electricity prices in the IEA, March 2015 https://www.gov.uk/government/statistical-data-sets/international-domestic-energy-prices

[15] Eurostat data sets:

Distribution of population by degree of urbanisation, dwelling type and income group (source: SILC) [ilc_lvho01] - http://appsso.Eurostat.ec.europa.eu/nui/show.do

Distribution of population by tenure status, type of household and income group (source: SILC) [ilc_lvho02] - http://appsso.Eurostat.ec.europa.eu/nui/show.do

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[18] Rurik Holmberg PhD, Energy Analysis Department, Swedish Energy Agency, e-mail: rurik.holmberg@energimyndigheten.se, phone +46-(0)16-544 22 87. Phone interview 22nd June 2015.

[19] Roger Eriksson, Swedish Energy Agency, roger.eriksson@energimyndigheten.se, Tel. +46 (0)16 544 24 05

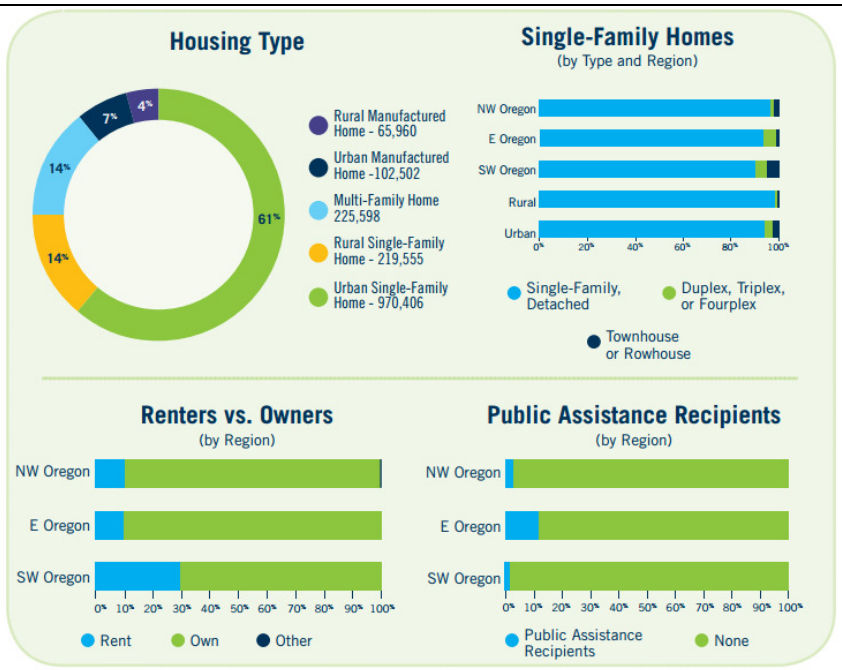
[20] For definition of area classification: http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Revision_of_the_degree_of_urbanisation

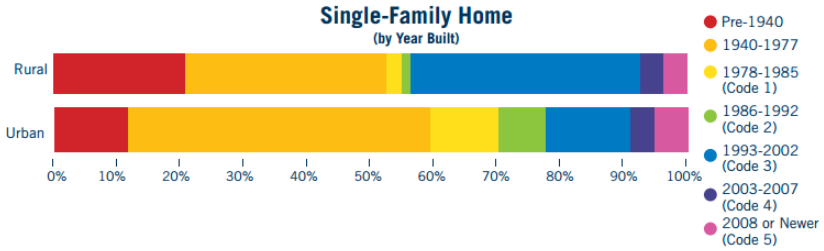
[21] Boverket, http://www.cebc.eu/sweden-boverket/

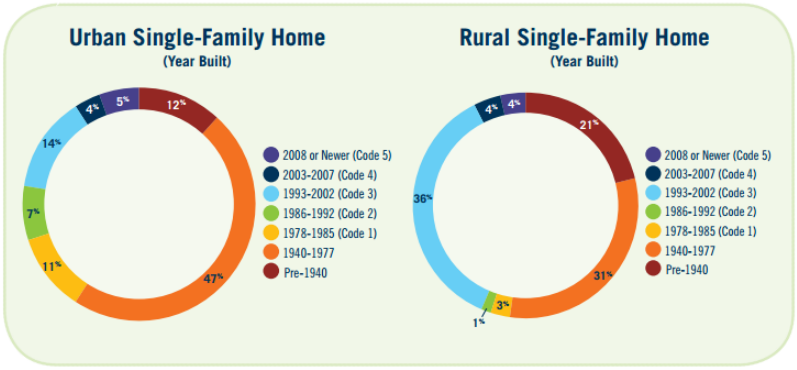
3.8 USA (Oregon)

Country	US - Oregon
Country Context	*Oregon Policy Background* Nearly a century ago, Oregon and other states across the Pacific Northwest began installing hydroelectric dams, which are now very important electricity sources for the region. However, due to the rising energy demand and the resource being an important natural habitat, energy efficiency has historically been a priority for Oregon. Energy efficiency programmes and plans in Oregon have therefore always considered hydroelectricity loads. While Oregon does not have state-wide energy targets, the Energy Trust of Oregon, which is an independent not-for-profit organisation focussed on energy efficiency and renewable energy, sets strategic plans. In 2009, it established its strategic plan for 2010-2014, which included the following goals for energy efficiency: • Between 2010 and 2014, save 256 average megawatts (aMW)* of electricity, contingent on adequate funding, through efficiency and conservation. • Save 22.5 million therms of natural gas annually, through efficiency and conservation. Similarly, the Energy Trust of Oregon has set out its 2015-2019 strategic plan, of which the energy efficiency goals are: • Save 240 average megawatts (aMW) of electricity. • Save 24 million therms of natural gas annually. • Roughly 75% of housing units in Oregon are single-family homes, 81% of which are in urban counties [1]. Housing in 'rural' counties tend to be older than in urban counties, with close to half being built before 1969.

* Average megawatts relates to the average number of megawatt-hours, over a specified time period.







Source: NEEA (2014) Oregon Single-Family Homes: State Summary Statistics

The most common heating fuel in Oregon is gas (~50%), followed by electric heat (~33%). Gas is slightly more common in urban counties (57%). Rural homes have a more diverse heating fuel split, with electric being most common (39%) and wood being more common than gas (24% vs. 21%).

Electricity prices in Oregon were $0.1044/kWh (~£0.07/kWh) in February 2015. For reference, the US average price was $0.1229/kWh.

In 2013, the natural gas price in Oregon for residential customers was $10.84 /1000 cubic feet. For reference, the US average price was $10.32.

	Oregon does not provide many incentives for those in the low-income track, but rather focuses most of its efforts on those in the moderate income track.
Selected Interventions	1. Clean Energy Works Oregon (CEWO), an end-to-end energy efficiency service provider and programme for all residential customers, providing the initial review of the home's energy efficiency, to finding the right contractors, to securing financing through local utilities, financial institutions, governments and the Energy Trust of Oregon. 2. Residential Energy Tax Credit (RETC), a tax credit provided to owner occupiers and tenants for installing approved energy efficiency measures. 3. Home Energy Solutions for Existing Homes (HES), administered by the Energy Trust of Oregon, provides rebates for owner occupiers for installing approved energy efficiency measures.
Linkages between schemes	All the schemes are quite complementary. In particular, the Energy Trust of Oregon (administrator of Home Energy Solutions for Existing Buildings) and the Oregon Department of Energy (administrator of the Residential Energy Tax Credit) work together to set similar standards and ensure that their offerings are complementary and can be utilised jointly. The Residential Energy Tax Credit and the Home Energy Solutions for Existing Buildings can be used in conjunction.

Country		US – Oregon
Intervention		1. Clean Energy Works (CEWO)
Timeframe		2009 – ongoing
Geographical Coverage		State-wide (started as a pilot programme in city of Portland)
Target group		Owner occupiers and tenants
1	**Intervention architecture and logic**	CEWO is a not-for-profit home performance provider, and was developed as a result of Oregon's desire to insulate over 500,000 homes while transforming the state's home performance industry by creating jobs with economic and benefits and health benefits too. The programme began with a pilot in the city of Portland (Clean Energy Works Portland), which was supported by a $20 million grant from the US Department of Energy's Better Buildings Neighbourhood Program through the American Recovery and Reinvestment Act. Following this pilot programme's success, the state-wide programme was developed with additional funding from the Oregon Department of Energy (ODOE). The programme is an end-to-end service providing: • free energy assessments • assistance from energy advisors and contractors certified by the programme and • financing options such as low-interest financing, rebates and on-bill loan repayment, through local utilities, governments, financial institutions, and other organisations. During the home energy assessment, the CEWO-certified contractor performs a series of tests to evaluate the home's energy usage and assigns an Energy Performance Score (EPS) out of 100. Following this the contractor identifies where the greatest opportunities for improvement are. Once upgrades are complete, CEWO will also perform a Quality Review to ensure the home is performing as planned. **Financing options** Depending on their location, homeowners are able to take advantage of numerous financing options. CEWO partners with local lending partners to offer low-interest loans for energy efficiency retrofits, as well as with utilities to offer utility rebates. CEWO streamlines the financing process by presenting customers with bunded financing options from a variety of sources, from local credit unions to utilities and organisations such as Energy Trust of Oregon. One defining characteristic of CEWO is that it offers comprehensive energy efficiency packages, thereby encouraging more homeowners to carry out complete home energy upgrades. During the pilot, CEWO partnered with Craft3, a nonprofit community development financing institution, to provide low-interest, long-term financing that participants could repay through their heating utility bill. Following this, CEWO simplified the loan application process and made more homeowners eligible for loans by using bill payment history as a proxy for credit. In addition, effective January 1st 2013, CEWO eliminated all credit enhancements to lenders, so the program is no longer paying fees for loan origination or funding loan loss reserves. With lenders becoming increasingly comfortable lending for energy efficiency projects, CEWO found that these incentives were no longer necessary to convince lenders to participate in the program.

2	**Impact**	For every 100 CEWO projects, approximately 260 tonnes of CO_2 emissions are avoided [2]. By 2012, there were about 1,700 completed projects. CEWO launched at the height of the unemployment crisis in Oregon and workforce development and job creation have been a focus. More than a 1,000 workers have been paid through a CEWO project, including more than 342 new construction workers. There are currently 56 contractors approved to work on CEWO projects, and it's estimated that their businesses have grown five times faster than other businesses in the Portland region. This business has led to $25 million in total revenue for CEWO contractors. The program has reported an additional 236,000 hours of non-construction work performed to deliver on the grant objectives. This is equivalent to about 39 FTE each year over the grant period.
3	**Cost-effectiveness**	In 2014, the Energy Trust of Oregon released a controversial report, which indicated that CEWO was the least cost-effective vehicle for delivering residential energy savings. For example, the study found that for air sealing, the Home Energy Solutions programme was 67% less costly to install than through CEWO. The study assessed the impact of the programme from 2010 to 2011. The average claimed electric savings over these two years were roughly 2,000 kWh and gas savings 29-36 kWh.[3] In the funder's final report on the project [2], they acknowledge that although the program delivered its reported savings, "total resource cost effectiveness continues to be an issue".
4	**Critical success factors**	The programme also simplified the loan application process by using bill payment history as a proxy for credit, allowing more homeowners to be eligible for the loans due to their timely bill payments. Furthermore, as of 1st January 2013, CEWO has eliminated all credit enhancements to lenders, which allows the programme to avoid paying fees for loan origination or funding loan loss reserves. This was possible due to the increasing interest among lenders to finance energy efficiency projects. In terms of marketing, the programme found that an emphasis on comfort was the most effective in increasing demand for home energy improvements. The free home energy assessments were also effective in expanding community awareness and word-of-mouth referrals. Moreover, using contractors as programme promoters proved to be valuable, particularly by reducing the programme's spend on other marketing. The programme had marketing materials (e.g. brochures, fact sheets, etc.) that contractors could access freely. The close coordination with a trade association of contractors was also beneficial in that it allowed the contractors to learn from one another and speak with one voice. Finally, CEWO found that the investment in good working conditions, training programmes, family-supporting wages, etc. helped in increasing the quality of work and business stability.
5	**Marketing and communication**	Marketing materials for CEWO focused on four key priorities: comfort, qualified contractors, one-stop-shop service, and a wide range of financing options through various providers. The programme's most successful marketing strategy was direct mail campaigns using utility or municipal logos to imply endorsement of the programme. Another successful strategy was marketing conducted by contractors, which was encouraged through the programme's sales and business skills training [4].
6	**'Softer' behaviour change**	The scheme focused on hard measures, but did work with the Nest smart thermostat. While the programme recognises that learning thermostats help people understand and measure energy savings that can ultimately help change behaviour, the collaboration with Nest had low uptake.

7	**Barriers to delivery**	Oregon has about 40 utilities across the state, which made it challenging for CEWO to ensure utility participation. Utilities' engagement is quite varied, hindering the programme's state-wide presence. It does not help that the state's regulatory framework is slow to react to the interest of both the public and private sector in energy efficiency [2]. Furthermore, the cost-effectiveness formulas used by utilities have been problematic, in that because of plummeting natural gas prices due to fracking, measures that looked like good investments in the past no longer seem cost-effective. Utilities are therefore putting less money into the programme which has exacerbated the problem. Additionally, given the number of institutions and people involved in the programme, from homeowners to contractors to lenders and local governments, coordination has been a challenge. In particular, the programme has found it challenging to continue to improve while consistently delivering. Finally, while the programme has received an additional $10 million from the 2015-2017 ODOE budget, now that funding from the federal and state governments have expired, the programme is now having to shift its business model towards a path that can ensure self-sufficiency. In recent years, the programme has started to collect payment from contractors for lead generation, and is now considering asking customers to partially or fully pay for their energy assessments or energy advisor services. Some lenders have also committed to providing loan capital to the programme.
8	**Unintended consequences**	None identified

Country		US – Oregon
Intervention		2. Residential Energy Tax Credit (RETC)
Timeframe		2006 – 2018
Geographical Coverage		State-wide
Target group		Owner occupiers and tenants
1	**Intervention architecture and logic**	Through the Residential Energy Tax Credit (RETC), Oregon residents who invest in energy efficiency or renewable energy are able to claim personal income tax credit. For energy efficiency specifically, residents are able to claim a maximum credit of $1,000 annually. The types of energy efficiency technologies eligible for the tax credit are appliances (e.g. dishwashers, refrigerators), heating and air conditioning systems and water heaters. The programme is administered by the Oregon Department of Energy (ODOE). Funding for the staff typically comes from the US Department of Energy and some additional funding from key stakeholders
2	**Impact**	A study was conducted on the economic impacts of the RETC programme in 2008. This does not provide data on energy saved but instead on the economic impact of the energy cost savings. The programme was estimated to have created 103 jobs (net), and over $3 million in business income. Sectors affected by the increase in jobs were construction, manufacturing, and retail and wholesale trade, due to the increased demand for energy efficiency products and installations and through the benefits of lower energy costs on operations for businesses. The net energy cost savings for the programme were estimated to be $2,507,556 in 2006.
3	**Cost-effectiveness**	The administrative costs of the programme remain relatively low—there are only a handful of staff working on RETC, so this aspect of the programme has been very cost-effective. However in addition, the cost of the tax rebate needs to be taken into account.
4	**Critical success factors**	The Oregon Department of Energy works closely with other relevant stakeholders, such as trade allies, consumer-owned utilities, the Energy Trust of Oregon, etc. to ensure that the market conditions are understood. This guarantees that incentives are always provided at the right level (i.e. they do not over-incentivise or under-incentivise) across various programmes, such as CEWO and Home Energy Solutions for Existing Buildings. Examples of over-incentivisation would be to provide support for devices such as efficient clothes washing machines that are already commonplace and so do not need subsidy to promote their purchase. Under-incentivisation would happen if there was insufficient reward to encourage consumers to take action.
5	**Marketing and communication**	The Oregon Department of Energy spends very little on marketing and communication, as their key stakeholders (trade allies, consumer-owned utilities, Energy Trust of Oregon, etc.) are able to market the RETC on their behalf.
6	**'Softer' behaviour change**	The programme does not provide any behavioural incentives.
7	**Barriers to delivery**	There have been very few challenges or barriers to date. The only challenge has been staying constantly up-to-date on the energy efficiency market. For example, while high efficiency clothes washers were incentivised previously, this is no

		longer necessary as most washers available in stores are high efficiency and there is sufficient demand for these products.
8	**Unintended consequences**	None identified

<table>
<tr><td colspan="2">Country</td><td>US – Oregon</td></tr>
<tr><td colspan="2">Intervention</td><td>3. Home Energy Solutions for Existing Homes (HES)</td></tr>
<tr><td colspan="2">Timeframe</td><td>2002 – ongoing</td></tr>
<tr><td colspan="2">Geographical Coverage</td><td>Within service territory of Portland General Electric, Pacific Power, NW Natural, Cascade Natural Gas</td></tr>
<tr><td colspan="2">Target group</td><td>Owner occupiers</td></tr>
<tr><td>1</td><td>Intervention architecture and logic</td><td>The Home Energy Solutions programme is offered by the Energy Trust of Oregon and is financed by public funds.

For single family homes, the programme provides cash incentives for energy efficiency and renewable energy measures approved by the programme. It also previously offered a free Home Energy Review (HER) with an Energy Trust home energy advisor, who would analyse the home's energy use, recommend efficiency measures, install CFL bulbs, and advise the homeowner on the Residential Energy Tax Credit. Currently, instead, the programme offers a free online Home Energy Review which consists of a 5 minute questionnaire. Finally, there is also a Home Performance (HP) with ENERGY STAR programme which consists of an extensive audit (roughly 3-4 hour audit compared with the 1 hour HER audit).

The Energy Trust of Oregon also has registered trade allies (i.e. contractors) who receive training and support from the Energy Trust. These contractors can help owner occupiers complete the cash incentive applications.

In 2008, Energy Trust of Oregon also added Energy Saver Kits to the programme (but only for customers of Portland General Electric, Pacific Power, NW Natural & Cascade Natural Gas). The kits are delivered upon request and contain free and easily installable energy efficiency measures, such as four CFLs, showerheads and aerators. The kits also contain a checklist of low-cost actions that can be taken around the house to save energy.</td></tr>
<tr><td>2</td><td>Impact</td><td>An impact assessment for 2007 found that the HES programme had net energy savings that were 39% lower than the expected savings for electricity and 33% lower than that of natural gas [5].

Table 15. 2007 HES Program Energy Impacts
<table><tr><th></th><th colspan="2">Gross Impacts</th><th colspan="2">Free Ridership Rate</th><th colspan="2">Net Impacts</th></tr><tr><th></th><th>kWh</th><th>Therm</th><th>kWh</th><th>Therm</th><th>kWh</th><th>Therms</th></tr><tr><td>Ex Ante</td><td>16,555,777</td><td>800,564</td><td>0</td><td>0</td><td>16,555,777</td><td>800,564</td></tr><tr><td>Ex Post</td><td>14,792,298</td><td>1,098,922</td><td>0.31</td><td>0.52</td><td>10,165,209</td><td>526,782</td></tr><tr><td>Realization Rate</td><td>0.89</td><td>1.37</td><td></td><td></td><td>0.61</td><td>0.66</td></tr></table>
The same study stated that the programme provided services to over 450,000 sites, and had a participation breakdown as follows:</td></tr>
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<tr><td></td><td></td><td>
Table 1. Total Participation in the Program
<table>
<tr><th></th><th>2007</th><th>2008</th><th>Total</th></tr>
<tr><td>Single Family</td><td>13,955</td><td>16,931</td><td>30,886</td></tr>
<tr><td>Cash Incentives</td><td>8,581</td><td>10,811</td><td>19,392</td></tr>
<tr><td>Home Energy Review (HER)</td><td>5,191</td><td>5,964</td><td>11,155</td></tr>
<tr><td>Home Performance with ENERGY STAR (HP)</td><td>183</td><td>156</td><td>339</td></tr>
<tr><td>Multi-family</td><td>127</td><td>182</td><td>309</td></tr>
<tr><td>Manufactured Homes</td><td>1,112</td><td>557</td><td>1,669</td></tr>
<tr><td>Energy Saver Kits</td><td>NA</td><td>12,812</td><td>12,812</td></tr>
<tr><td>Total</td><td>15,234</td><td>30,482</td><td>45,716</td></tr>
</table>
Note: This table removes duplicates within the single family program; HER or HP participants who also received rebates are only counted once in this table. However, all relevant measures are counted in the next section and table.
HER participants who also received HP are counted in this table as HP. This totals 207 participants, or approximately 2% of total HER participation.

Note that the HER referred to in this table is the in-person energy assessment which is no longer offered. Home Performance with ENERGY STAR refers to a comprehensive home energy audit (3-4 hours compared to the one hour for the HER) that is also offered by the Energy Trust of Oregon.
</td></tr>
<tr><td>3</td><td>Cost-effectiveness</td><td>The programme has evolved since its inception, and has recently been facing challenges regarding cost-effectiveness. Due to the availability of more efficient technology and therefore stricter codes and standards, savings are simply not as high as expected, or as they were previously. The lower savings can also be attributed to a rebound effect due to greater comfort. The programmes now trying to develop ways to ensure that cost-effective savings are delivered, but there are simply fewer cost-effective opportunities available. Ultimately, this is a positive problem to have, however, as it means that homes are, in general, more efficient.

The Energy Trust found that the home energy review was not that cost-effective, though it was valuable for direct install (light bulb switch). Therefore, they no longer offer this to their customers.</td></tr>
<tr><td>4</td><td>Critical success factors</td><td>The most critical success factor for HES was performing an analysis of the housing stock, residential heating sources (electricity vs. natural gas), market projections, etc. before designing the programme. This helped to understand the market and what can feasibly be transformed.</td></tr>
<tr><td>5</td><td>Marketing and communication</td><td>Based on an impact evaluation done for the programme over 2007-2008, only 36% of the general population had heard of Energy Trust, and of that share, only roughly 60% were aware of their programme offerings. Marketing efforts have been limited due to budget constraints. However, they have primarily relied on trade allies and joint marketing with utilities.

The target market for the programme is all customers in areas served by the Energy Trust of Oregon (i.e. the four utilities covered by ETO). Energy Trust carried out targeted marketing based on customers' heating source and their likelihood of installing energy efficiency (e.g. based on their level of income). The point of this "targeted marketing" was that all customers were targeted in different ways depending on their demographics.

Energy Trust also hosts an Online Home Energy Review engagement tool on their website, which assesses energy consumption and efficiency potential based on habits, insulation type, heating source, etc. This has also contributed to the targeted marketing.

Marketing efforts have attempted to highlight non-energy benefits of energy efficiency as well (e.g. comfort value of insulation). The programme has conducted studies and</td></tr>
</table>

		has found that the benefits are dependent on geographical areas and income, which has determined how the programme focuses its marketing efforts.
6	**'Softer' behaviour change**	The programme has offered behaviour change advice through Opower, a customer-engagement software platform that works with utilities to provide customers with personalised, simplified and engaging energy consumption and savings information. However, this was not as successful as expected, particularly for high-energy users. The programme finds that controls (e.g. smart thermostats) are much more cost-effective than behaviour change programmes, based on their pilot programme with Nest. Nest is particularly attractive because they are well-designed, user-friendly, and popular to begin with.
7	**Barriers to delivery**	Some participants were dissatisfied by the quality of contractors, indicating that there is a need for the Energy Trust to provide additional training or contractor screening. The impact assessment from 2007 also recommended that the Energy Trust streamline the application process to reduce confusion [5].
8	**Unintended consequences**	None identified

Sources:

[1] Urban/Rural is based on the 2013 USDA Rural-Urban Continuum Codes with those counties in codes 1-3 considered to be urban and all others considered to be rural. http://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx

[2] http://www.osti.gov/scitech/biblio/1117211

[3] http://energytrust.org/library/forms/CEWO_2010_2011.pdf

[4] http://energy.gov/eere/better-buildings-neighborhood-program/portland-shows-how-clean-energy-works

[5] http://energytrust.org/library/reports/ETO_HES_Process_and_Impact_Report_Volume_1.pdf

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- Elaine Prause (Senior Utility Analyst, Oregon Public Utility Commission) – emprause@puc.state.or.us
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