

Workshop on data requirements for understanding the electricity (including renewables) sector in Scotland

University of Strathclyde, 23rd September 2013

Rationale for workshop

- The electricity sector will make a significant contribution to meeting the Scottish Government's economic and environmental goals.
- The FAI and ClimateXChange are holding a workshop on data availability for the electricity sector (including renewables) to support policy making in this important sector.
- Currently, data on the sector are held in different places, and are not shared effectively with all potential users.
- Further, there may be data that a number of users would find useful to support policy making but which are not currently available.

Objectives of workshop

1. To establish where relevant datasets sit and who has access to them
2. To agree a process for bringing relevant datasets together under one roof, for all potential users to have access
3. To identify data gaps and agree a way forward for closing those gaps.

Attendees

- Alan Ferrier – Scottish Government
- David McPhee – Scottish Government
- Joss Blamire – Scottish Renewables
- Stevan Croasdale – Scottish Government
- Deb Roberts – James Hutton Institute
- Darcy Pimblett - ClimateXChange
- Peter McGregor, Grant Allan, Stuart McIntyre,
Cathy Xin Cui, Patrizio Lecca – Fraser of Allander

Plan of workshop

- What do we know about renewable electricity in Scotland? Where do we get information from?
- Data held and data wanted
- Discussion around "gaps" in electricity and renewables data
 - Renewable sector and impact
 - Electricity generation disaggregation
 - Covered and Uncovered sectors
 - Emissions data at regional level
 - Others...

Exploration of the potential for identified gaps to be closed through, for example, increased sharing of data between data providers or extensions to existing economic and renewable databases

1. What do we know about electricity and renewables in Scotland?

- Electricity single sector in economic accounts
 - IO table and SIC2007 code 35.1
 - “Electricity; generation, transmissions, distribution and trade”
- Growth sector database for SIC 35 (above plus “Gas”).
- High level information about electricity production and use
 - by technology and between Scotland and UK
- Community benefit schemes for existing and proposed renewable schemes

Electricity sector in numbers

Growth Sector Database provides range of data on SIC35 “Electricity, gas, steam and air conditioning supply”

In 2012:

- Registered enterprises: 180 (95 with zero employees, 155 Scottish owned)
- Turnover/GVA/Labour costs: Disclosive
- Median weekly gross pay: £608.9 (Scotland = £497.6)

In 2011:

- Employment: 17,900

Sources:

Inter Departmental Business Register

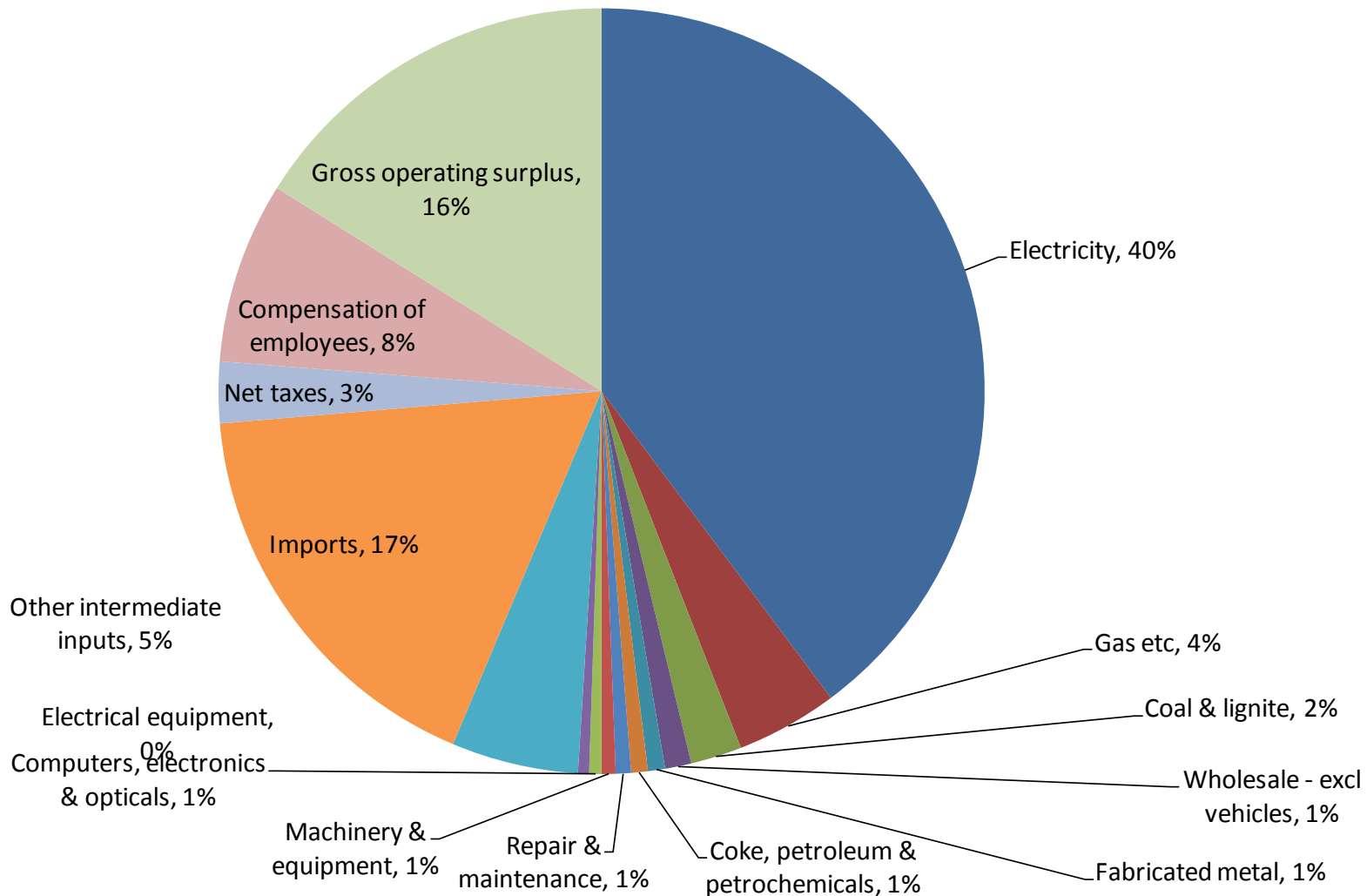
Scottish Annual Business Statistics

Business Register and Employment Survey

Annual survey of Hours and Earnings

Global Connection Survey

Inputs to electricity sector, 2009



Jobs in renewables (2011/12)

TABLE 1 TOTAL EMPLOYMENT IN RENEWABLE ENERGY IN DEVELOPMENT AND SUPPLY CHAIN

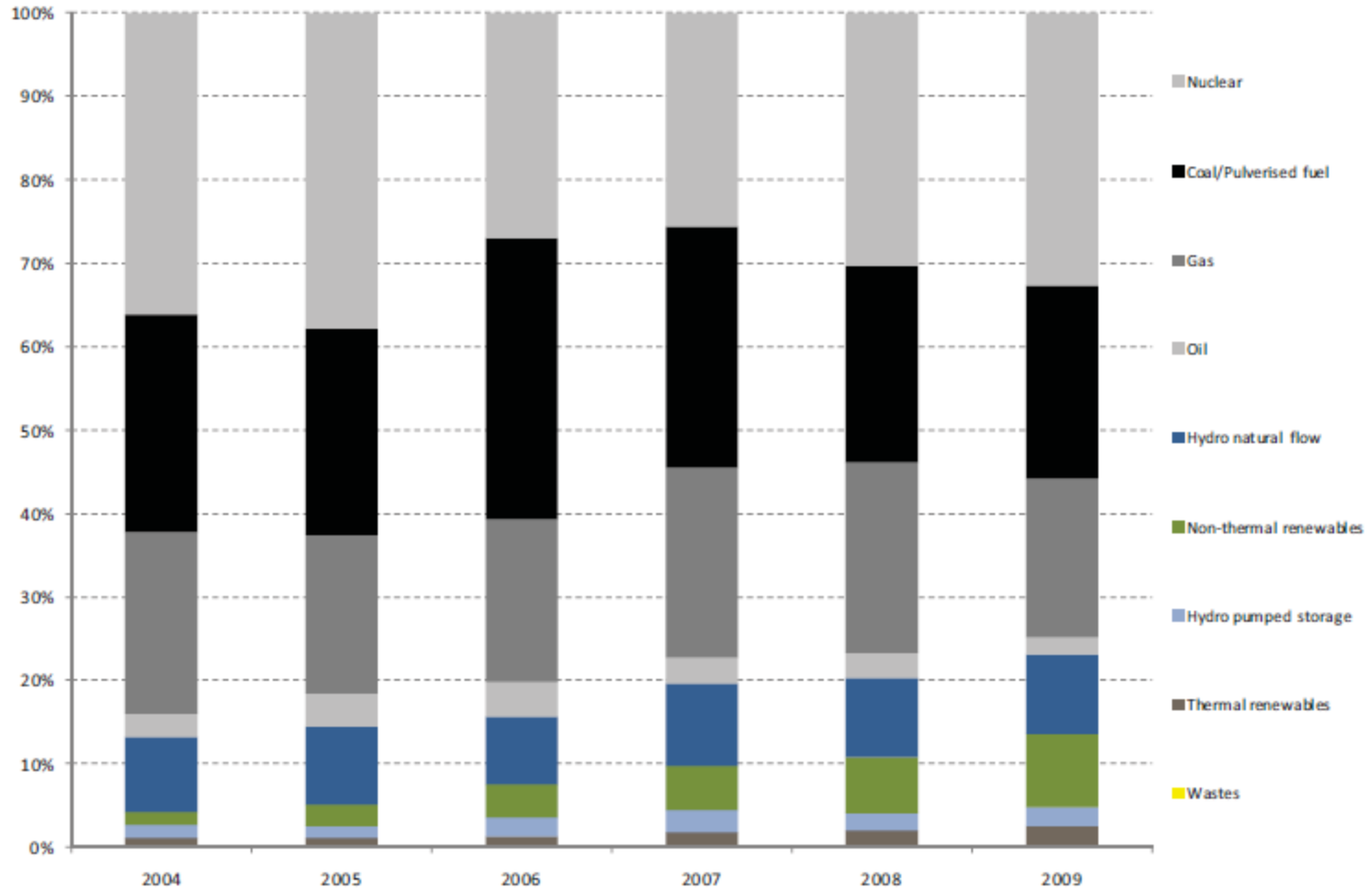
	EMPLOYEES
Development	1,526
Supply Chain	8,701
TOTAL	10,227

TABLE 2 TOTAL EMPLOYMENT IN RENEWABLE ENERGY DEVELOPMENT AND SUPPLY CHAIN IN SCOTLAND BY TECHNOLOGY

TECHNOLOGY	EMPLOYEES
Bioenergy	1410
Grid	3223
Solar and Heat Pumps	161
Hydro	503
Onshore Wind	2235
Offshore Wind	943
Wave and Tidal	521
Working across Multiple Sectors	1231
Higher and Further Education	757
Public Sector	152
TOTAL	11,136

Source: “*Delivering the ambition: employment in renewable energy in Scotland*”, Scottish Renewables

The Scottish electricity generation mix



Source: DECC Energy Trends, various issues.

Production and use in UK regions

Table 4: Production and consumption of electricity by region of UK, 2009, GWh

		UK region of generation				ROE imports	Total consumption
		England	Scotland	Northern Ireland	Wales		
A	Generators own use	12578	3792	119	4828		21317
B	England	249051	10209		8287	3228	270775
C	Scotland		33010				33010
D	Northern Ireland		1937	6836			8773
E	Wales				17740		17740
F	ROE exports			367			367
G	Transmission losses	4838	584	156	315		5893
H	Distribution losses	17615	1793	548	1061		21017
A+B+C+	Total generation						
D+E+F+							
G+H		284082	51325	8026	32231	3228	378892

Source: DECC Energy Trends, December 2010, and authors calculations. Totals may not sum due to rounding.

Net exports by region

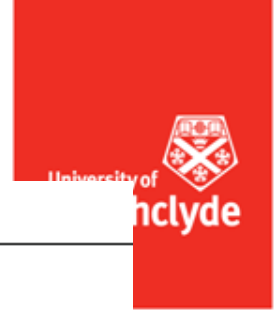
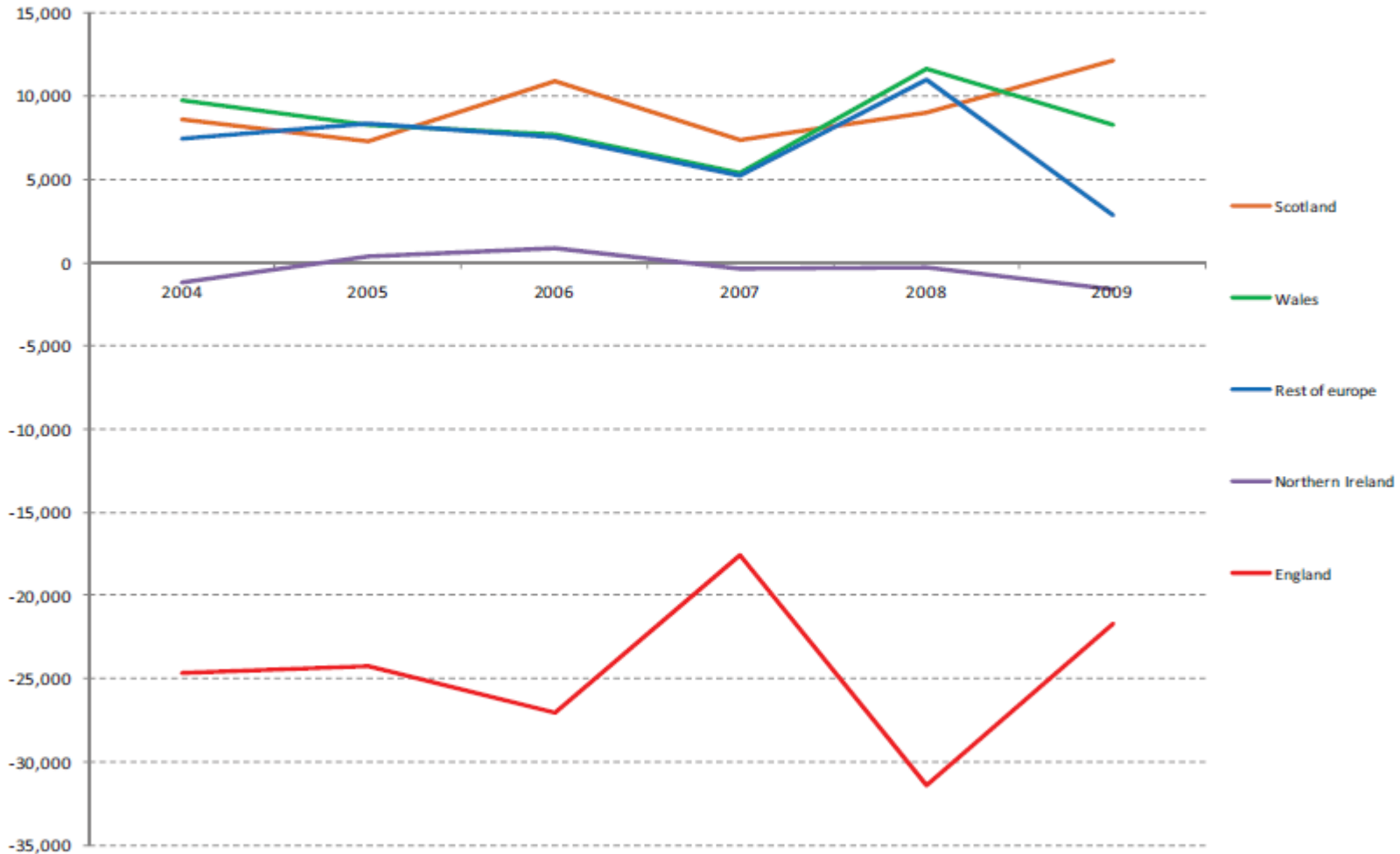


Figure 2: Net exports of electricity by region of UK, 2004 to 2009, GWh



Source: DECC Energy Trends, various years.

Project-community linkages



Scottish Government Register of Community Benefits from Renewables



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Administration

Keywords:

Local Authority: Benefit Structure:

Technology: Areas of Spend:

Show: Providers Recipients

Please note each development may have multiple providers and/or recipients

Type	Development Name	Group	Date	Technology	Local Authority
Provider	Achany	SSE		Onshore Wi...	Highland C...
Provider	Allt Dearg Community Wind Farm	Allt Dearg Wind Farmers LLP	24/12/2012	Onshore Wind	Argyll and Bute Council
Provider	An Suidhe Wind Farm	RWE npower...	01/01/2011	Onshore Wi...	Argyll and...
Recipient	An Suidhe Wind Farm	Scottish C...	01/01/2011	Onshore Wi...	Argyll and...
Provider	Arecleoch Windfarm	ScottishPo...	01/06/2011	Onshore Wi...	South Ayrs...
Recipient	Arecleoch Windfarm	Carrick Futures	01/06/2011	Onshore Wind	South Ayrshire Council
Provider	Artfield Fell	SSE		Onshore Wi...	Dumfries a...

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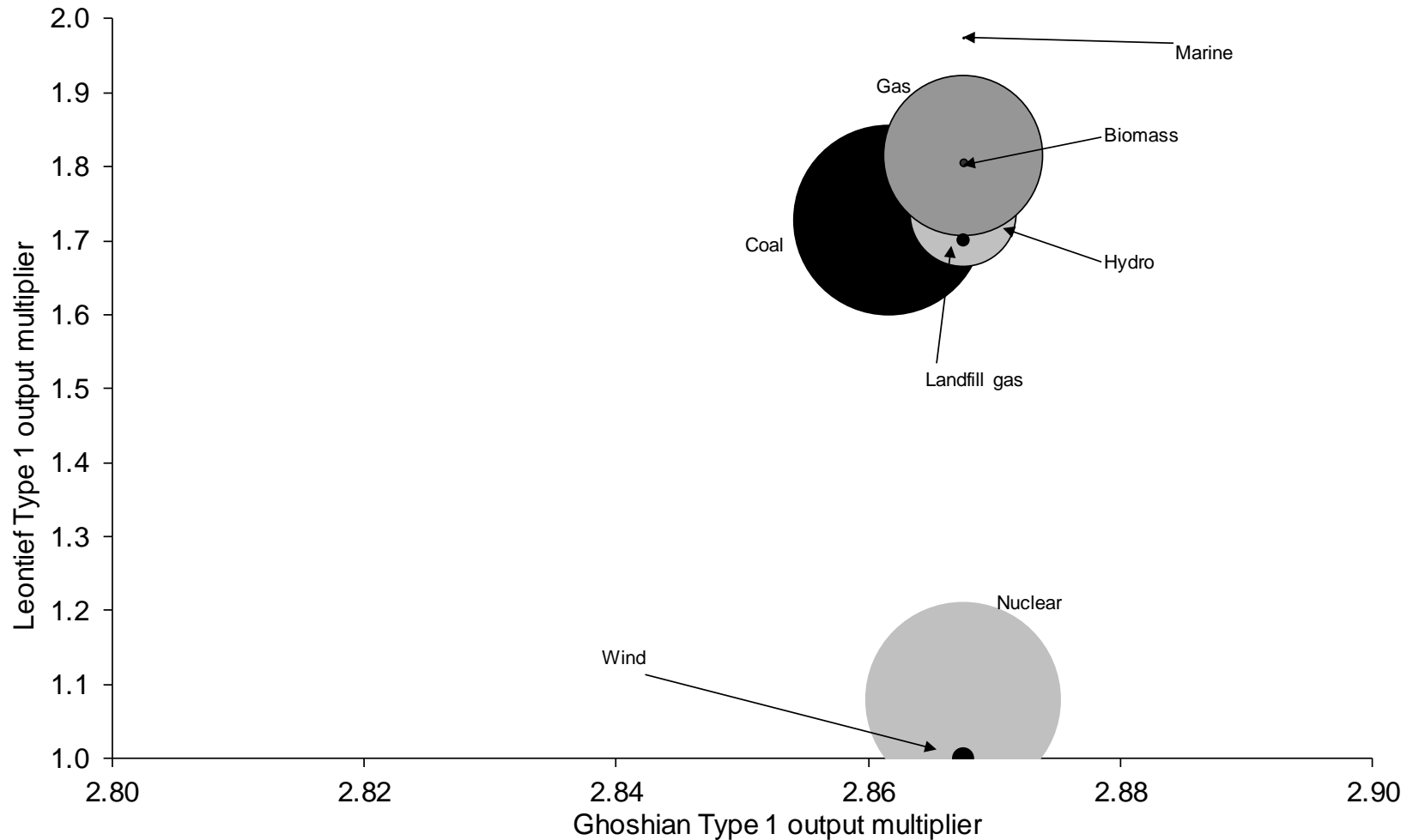
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2. FAI research on electricity and renewables

1. Sector in economy
 - a. Disaggregation by technology
 - b. Disaggregation of peak and off-peak
2. Impact of new capacity
 - a. Mega-projects
 - b. Community linkages
 - c. Supply-side impacts
3. Emissions

1a. Generation sector and operating linkages (2000)

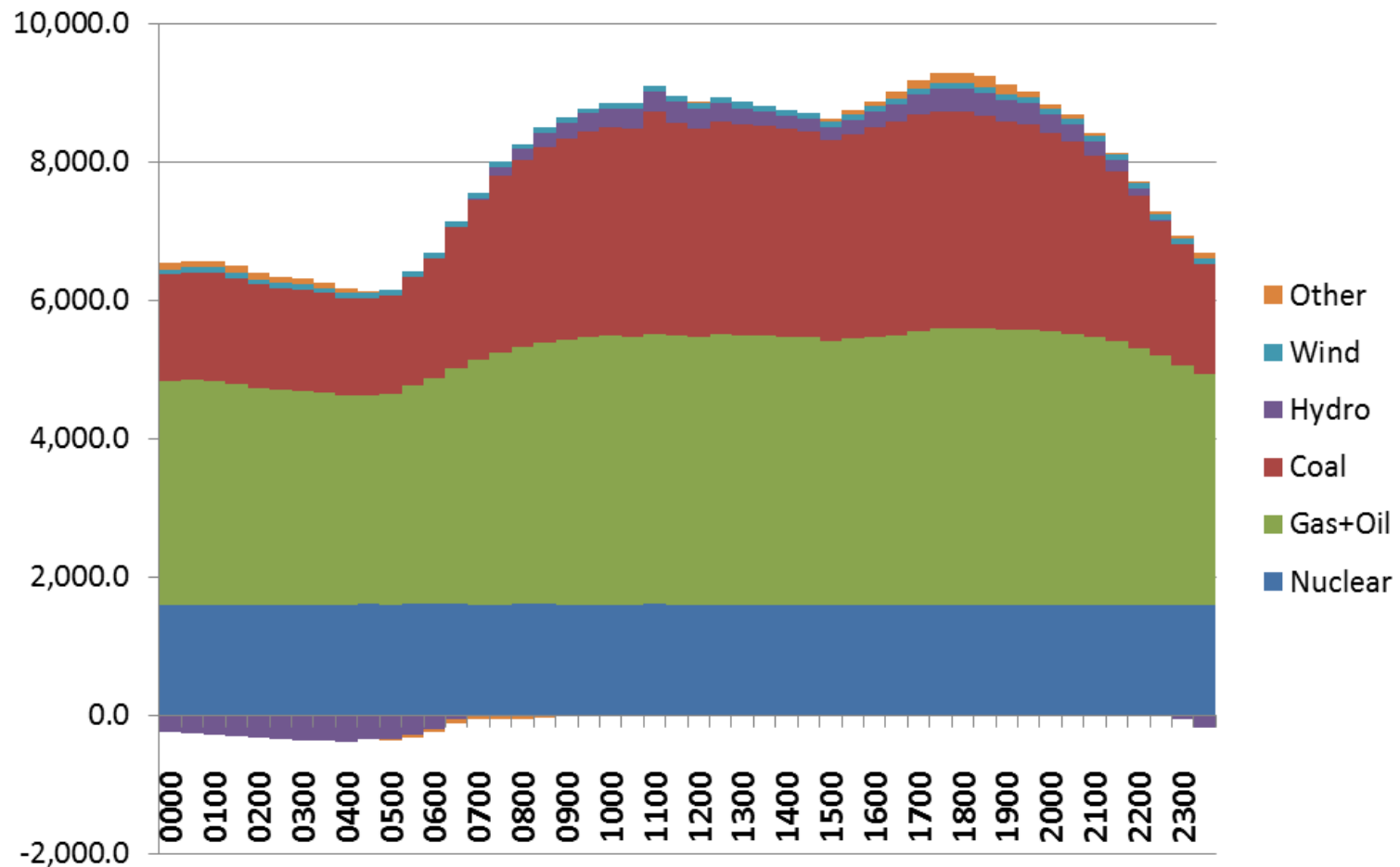


1b. Peak and Off-peak disaggregation

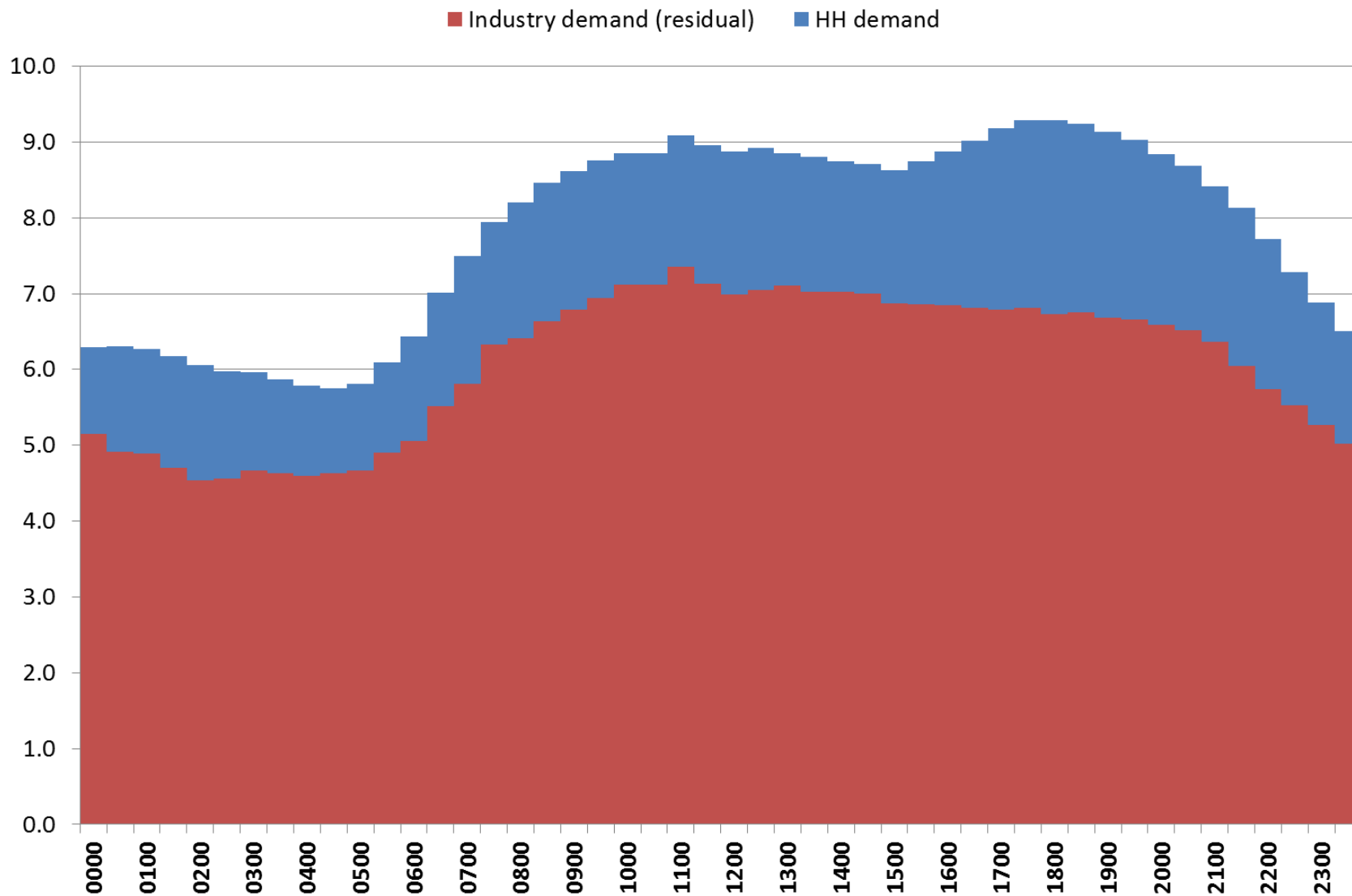
IO construction

1. Identification of intraday cycles in electricity generation
2. Identification of intraday household electricity demand and identification of intraday electricity demand by production sectors
3. Re-aggregation of sectors to match IO sectors with generation and demand data
4. Disaggregation of IO electricity sectors by peak and off-peak demand

Average generation based on intra-daily data (GWh)



Average intra-daily household and industrial demand (TWh)



Matching of sectors between data sources

UK IO table (Winning 2012)	Generation data	Peak/Off-peak IO-table
Nuclear	Nuclear	Nuclear
Coal	Coal	Coal
Gas+Oil	Oil	Gas+Oil
	Open Cycle Gas Turbines	
	Combined Cycle Gas Turbines	
Hydro	Pumped storage hydro	Hydro
	Non pump storage hydro	
Wind	Wind	Wind
Wind Offshore		
Marine/solar	Other	Other
Biomass		
Other		
	Interconnector France	

Peak/Off-peak generation by type (TWh, % of total)

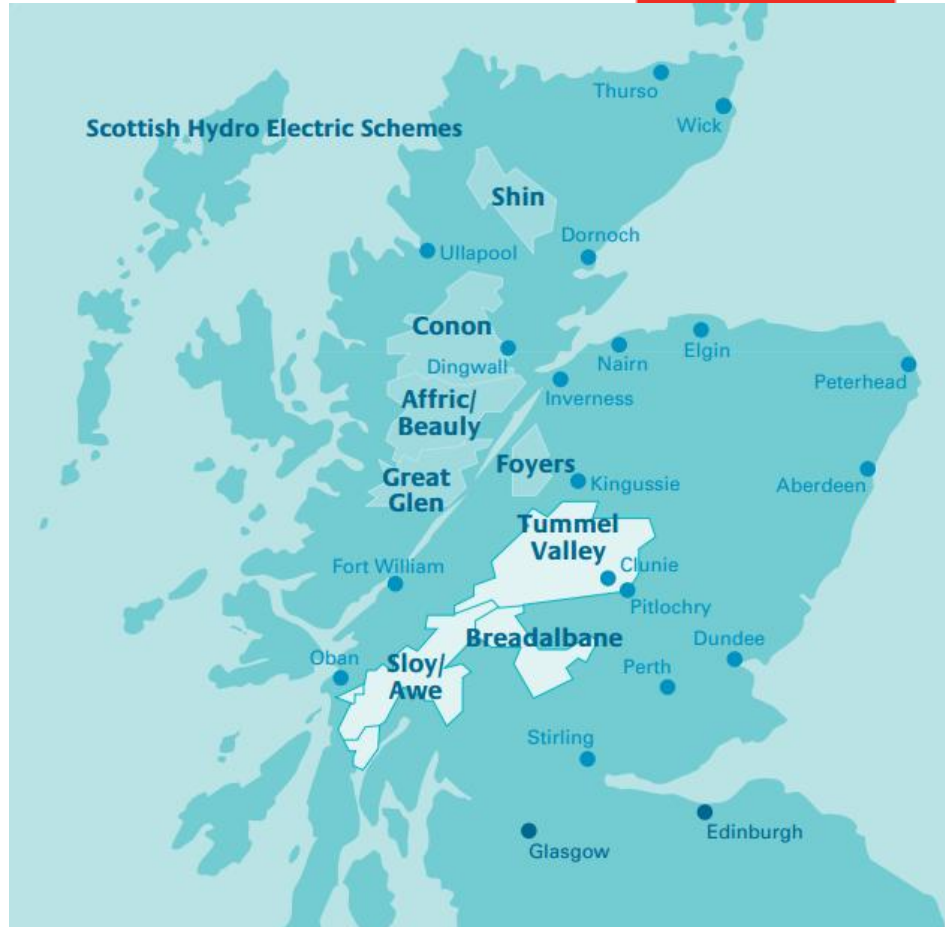


	Generation	HH demand	Sector Demand
Peak	214.0	48.4	165.6
	56.8%	57.2%	56.7%
Off-Peak	162.8	36.3	126.6
	43.2%	42.8%	43.3%
Total	376.8	84.6	292.1
	100%	100%	100%

2a. Scotland's renewable ambitions (1940s)

Tom Johnston MP (1943)

- We believe the application of the [The Hydro Electric Development (Scotland) Act 1943] is the **first step in planning for the regeneration of the Highlands of Scotland**. The Bill will give considerable employment, direct and indirect, in coal, iron, steel, cable-making, electrical engineering, cement, house and civil building works, and contracting. On the basis of the experience of the Central Electricity Board the operations of the Board on an expenditure of £30,000,000 should give employment, direct and indirect, of the order of 10,000 men for a number of years. In its train the Bill will bring a better placing and location of industry. It will provide amenities for the Highland population which will otherwise be denied them.” (Hansard, 24th February 1943)



Impacts of changes in capacity

- Large expenditures “mega-projects”
 - but measurement, e.g. “displacement” of other activity
- But , measuring supply chain for new investments?

Examples:

- PFOW area, £5.1bn by 2020
- Offshore wind investments
- Models used matter for results

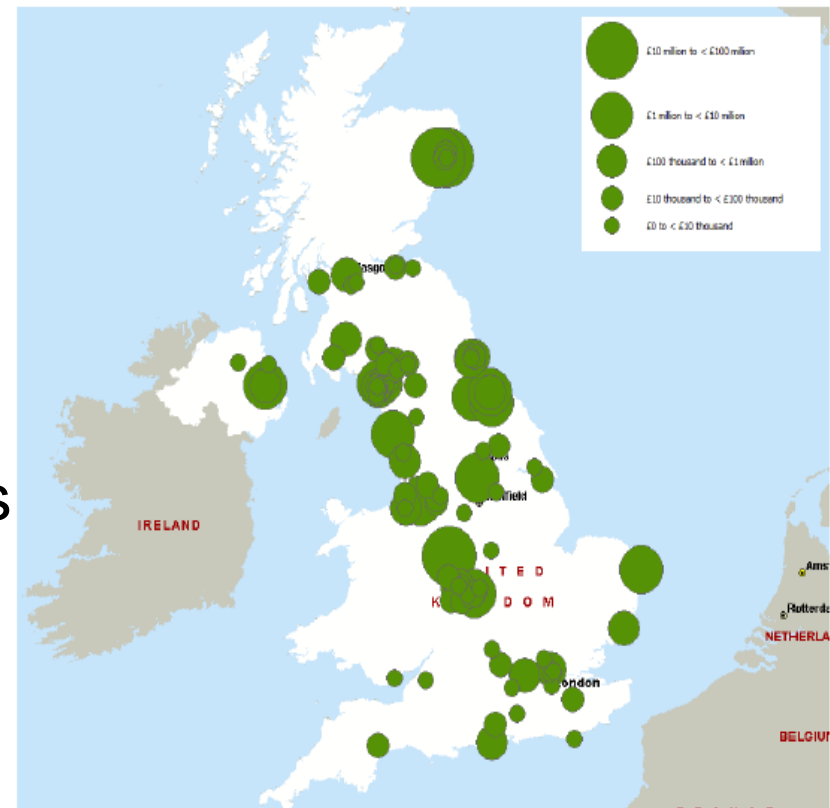
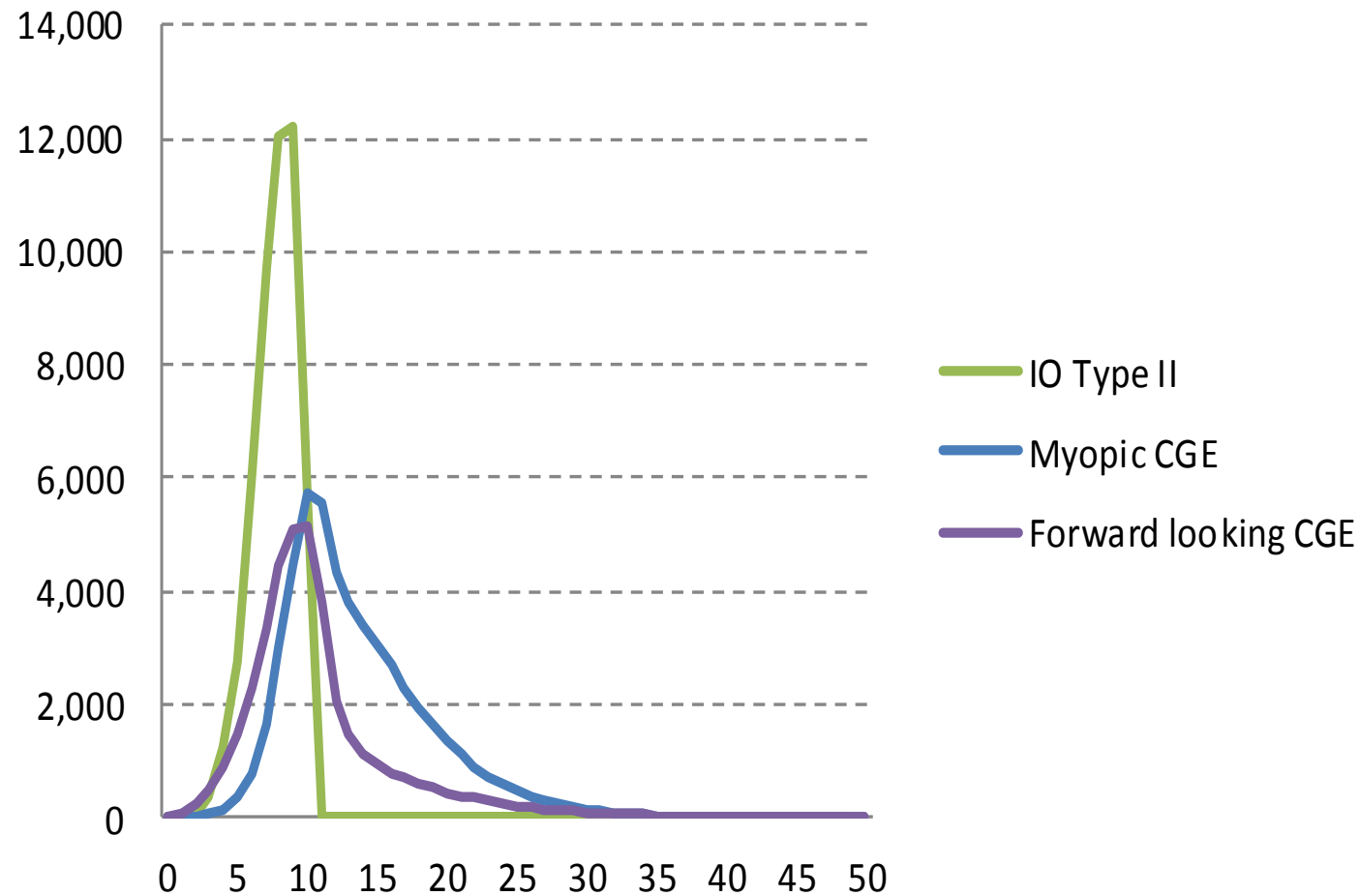
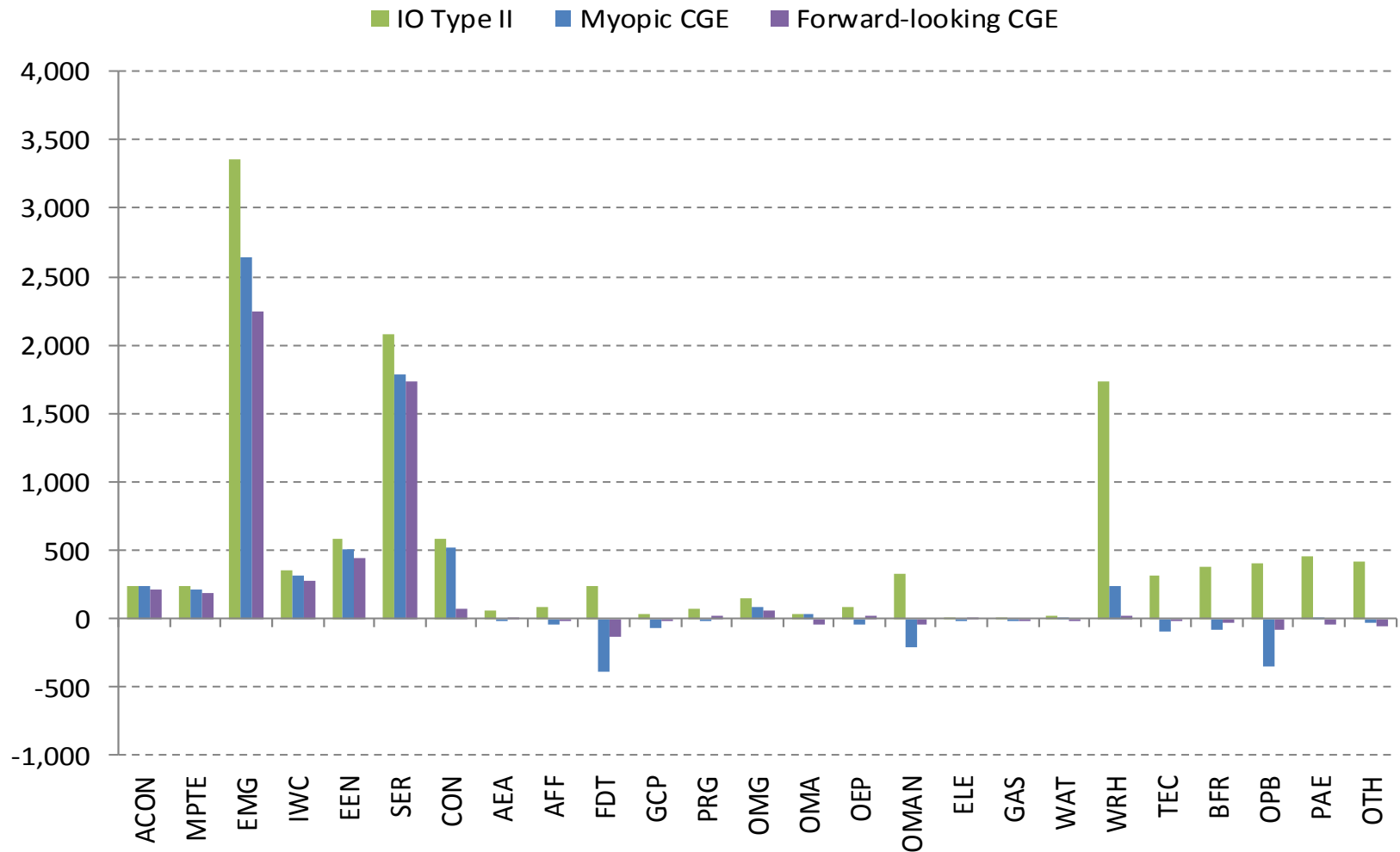


Figure 3.3 Location of UK suppliers contracted by E.ON Climate & Renewables according to contract value

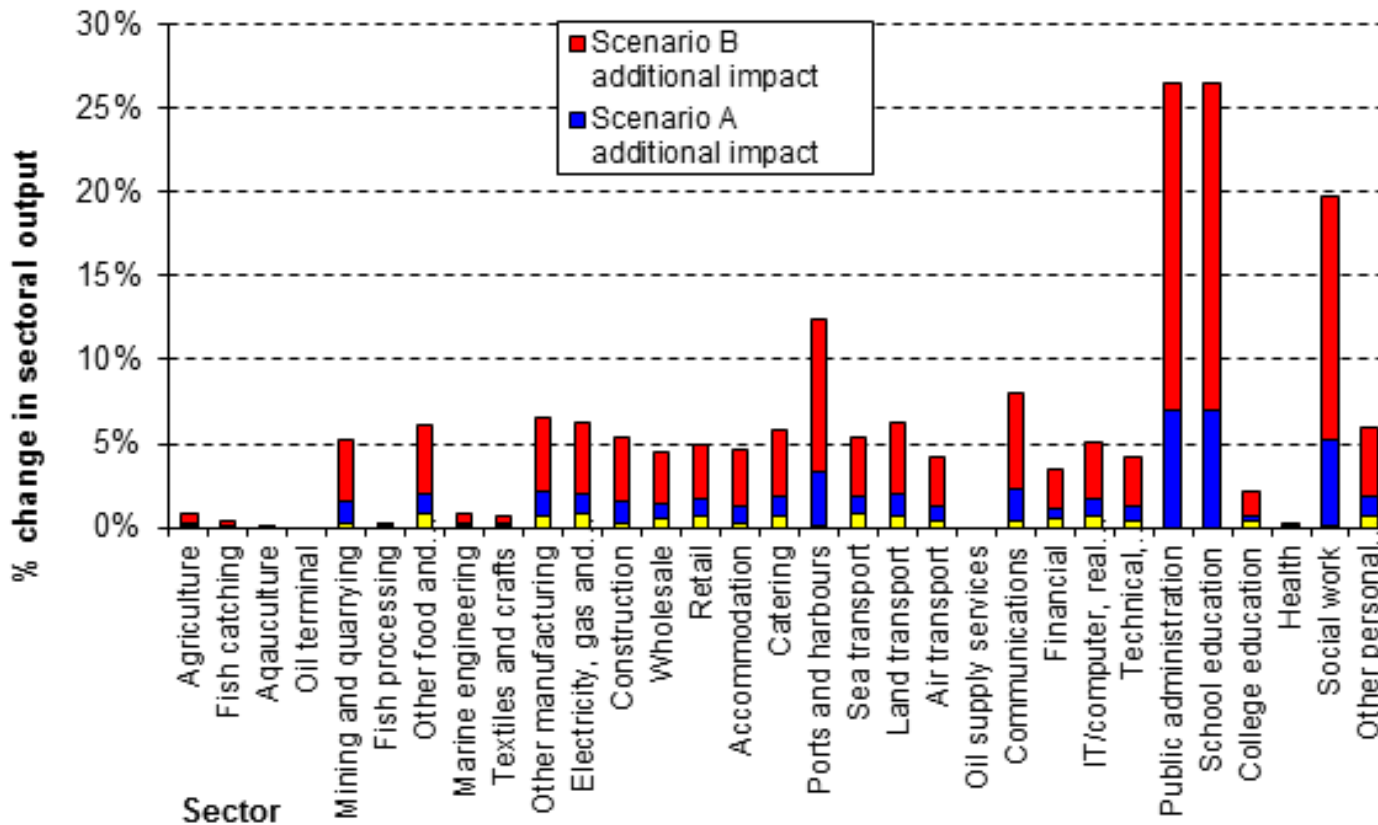
Results from temporary expenditures to 2020: employment



Sectoral employment change at peak



2b. Community benefits and economic impact (IO/SAM)

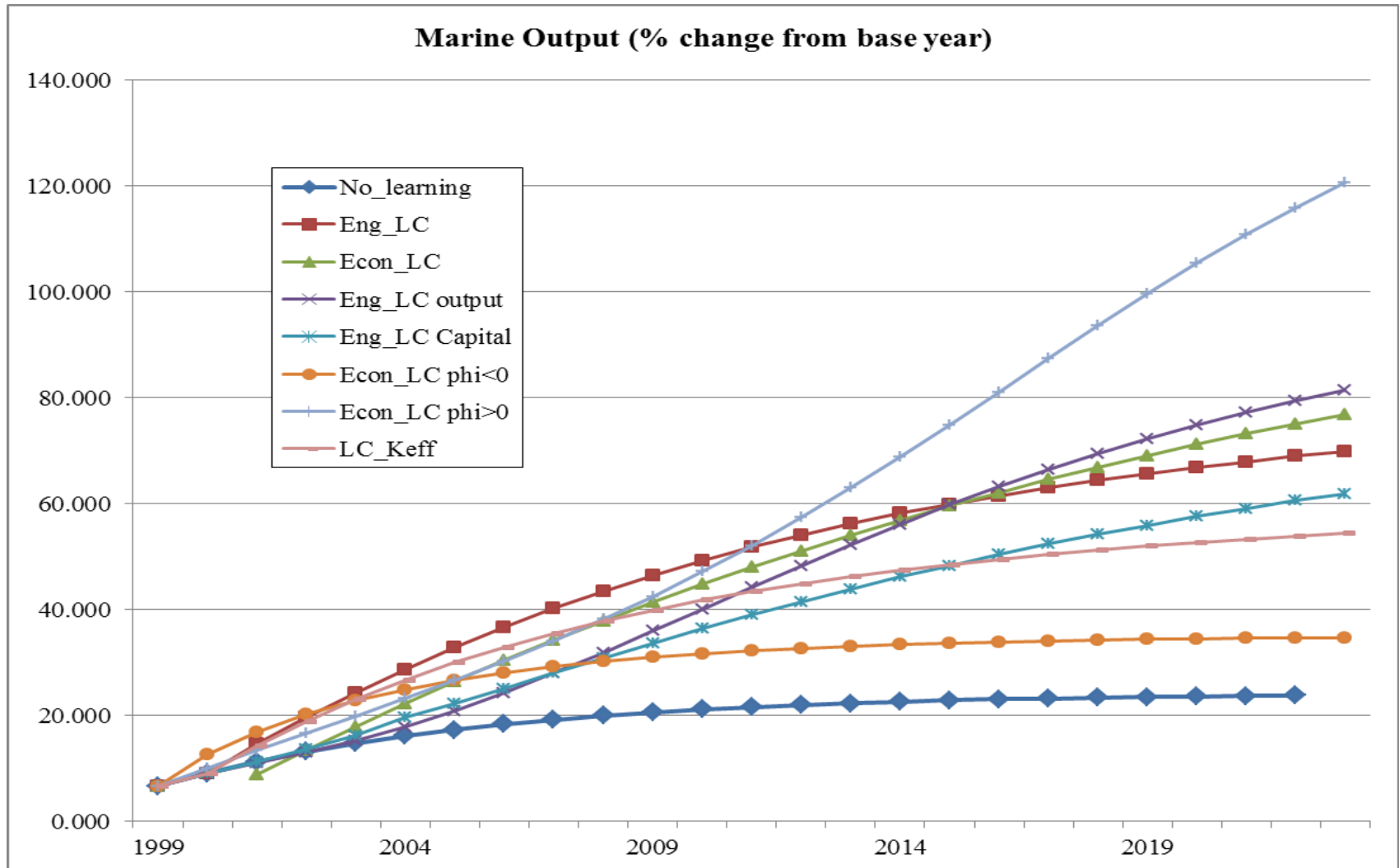


Also, wide heterogeneity in onshore and offshore CB programmes currently operational and proposed, from full ownership, to (one-off) transfer

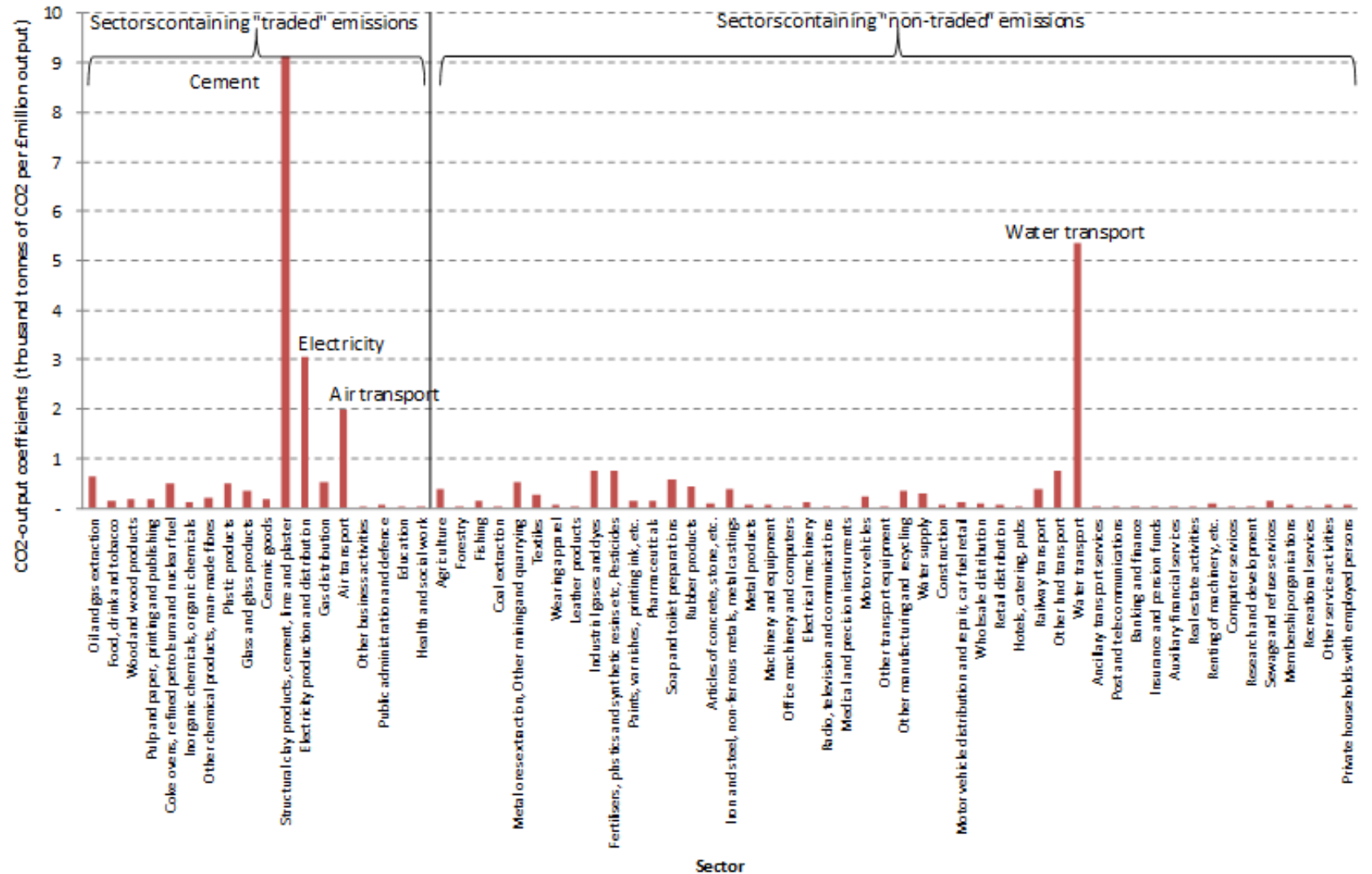
2c. Supply-side routes

- Innovation and “spillovers” externality from new renewable technologies a motivation for subsidies to low carbon technologies
- Innovation a direct supply-side impact that motivates policy interventions through support mechanisms: often endogenous technical change through “learning by doing”
- Does learning by doing matter? Potentially crucial: we have explored this, for example, for marine energy technologies

Marine sector output



3. EU ETS work



- Identified issues in reconciling “traded” and “non-traded” sectors in economic accounts.

B. Data: Sources

- BRES/ABI
- ASHE
- Living costs and food survey
- GCS
- IO tables (Purchase Inquiry + others)
- DECC
 - DUKES
 - Energy Trends
 - REStats
 - Quarterly energy prices
- Scottish Renewables
- NETA
- Argos catalogues
- Others?

Data needs and availability



		Need non-public data						
		Access	Electricity output prices and intermediate consumption patterns by generation type (SC)	Emissions factors of part loading plant (AF)	Social and psychological studies of adoption of renewables by land owners (DR)	Supply (production) and (sectoral and household) Use of sub-national level (DR)	Quarterly thermal generation in Scotland (AF)	Accurate breakdown of energy bills (JB)
Possess non-public data	Output (MWh) quarterly of gas, coal, hydro and nuclear stations (SC)	SG (OCEA) statisticians						
	Agricultural census (DR)	Approved applicants to Scottish Government						
	SNH onshore windfarm proposals (DR)	Registered users of SNHi						
	GILDED Aberdeenshire Survey (DR)	Hutton and GILDED project partners						
	NESEMP (DR)	Hutton and NESEMP project partners						

C. Discussion of data requirements

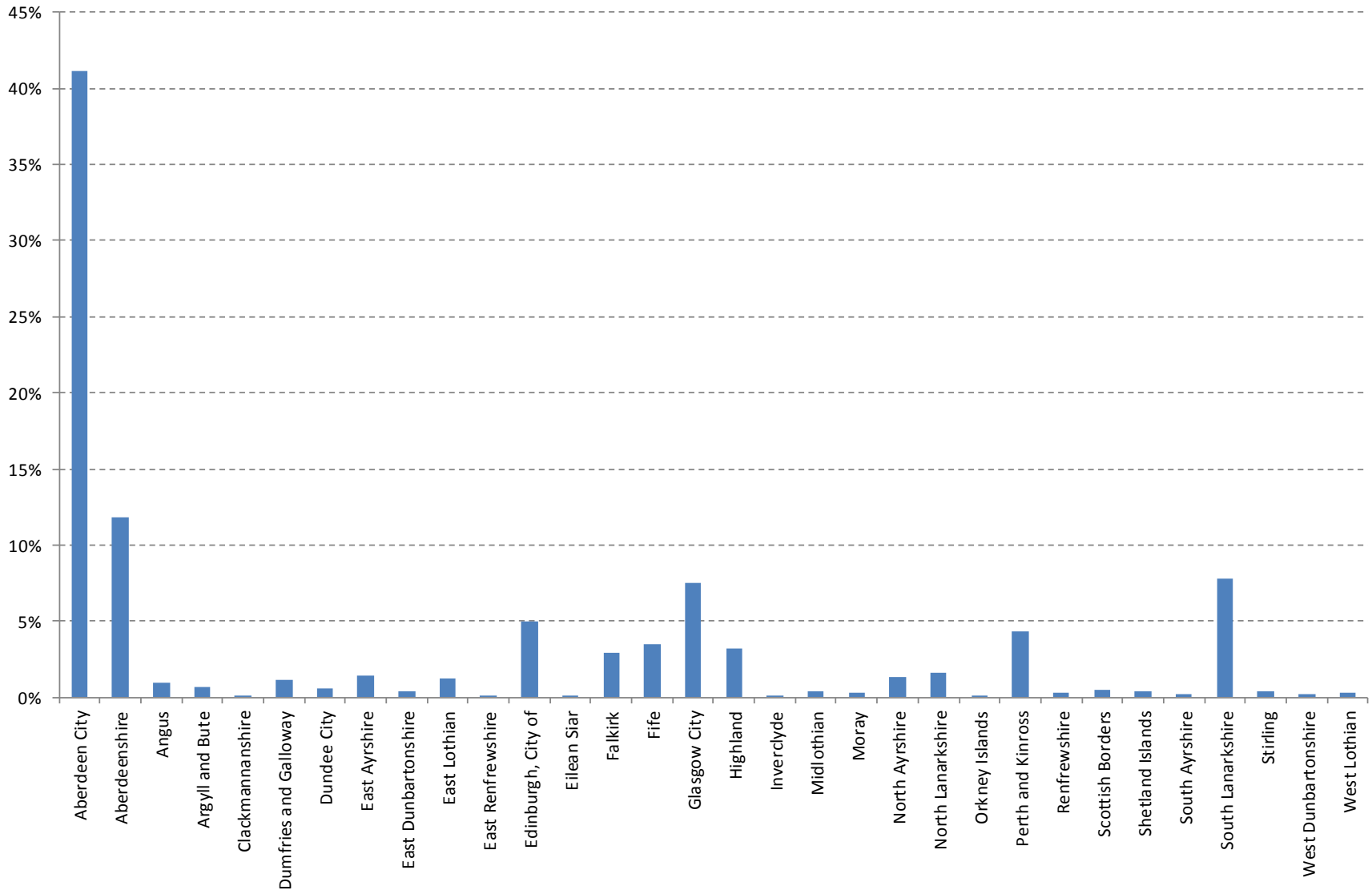
1. Defining the renewables sector and jobs
2. Disaggregating electricity generation and renewables in economic accounts
 - a. Technology
 - b. Time
3. Traded and non-traded disaggregation
4. Emissions in Scotland

1. Renewable sector

- Growth sector statistics collect on classification of industries (“Energy (including renewables)”)
 - SIC 2007: 5, 6, 9, 19, 20.14, 35, 36, 38.22, 71.12/2, 74.90/1

employment	2009	2010	2011	2009-2011 absolute	% growth 2009-2011
SIC 05: Mining of coal and lignite	1,200	1,500	1,300	100	8.3%
SIC 06: Extraction of crude petroleum and natural gas	7,800	7,400	7,900	100	1.3%
SIC 09: Mining support service activities	18,000	18,700	17,900	-100	-0.6%
SIC 19: Manufacture of coke and refined petroleum products	100	100	200	100	100.0%
SIC 20.14: Manufacture of other organic based chemicals	1,800	1800	1800	0	0.0%
SIC 35: Electricity, gas, steam and air conditioning supply	16,500	19,100	17,900	1,400	8.5%
SIC 36: Water collection, treatment and supply	3,700	3,600	3,400	-300	-8.1%
SIC 38.22: Treatment and disposal of hazardous waste	1,700	1,400	1,500	-200	-11.8%
SIC 71.12/2 Engineering related scientific and technical consulting activities	10,400	11,200	12,500	2,100	20.2%
SIC 74.90/1 Environmental consulting activities	300	500	500	200	66.7%
Total	61,500	65,300	64,900	3,400	5.5%

Regional distribution of “E(in.R)” employment (2011)



Is this appropriate?

- Overlap between industrial activity and renewable/energy not perhaps adequate?
 - Construction firms working on renewable projects?
 - All activity in other categories assumed renewable?
- Do not capture link between activity in Scotland and domestic or external (RUK, ROW?) renewable activity
- Latest SG Growth Sector work discusses “working with ONS to undertake a more fundamental review of how to estimate renewable and low carbon jobs”.

Additional data requirements?

2. Electricity sector disaggregation

- Single treatment of electricity sector not helpful for analysis of change in size and mix of electricity generation in Scotland
 - Only part of 35 is generation and no technology breakdown
 - Heterogenous technologies – linkages and (direct) emissions
- Useful disaggregations of sector?
 - Generation vs. non-generation
 - By technology (broad or narrow?)
 - By time period, e.g. peak-, off-peak? Quarterly?

2. Electricity sector disaggregation

- Data availability
 - BRES
 - DUKES
 - Energy Trends
 - Others?
- Additional data requirements?

3. Covered and uncovered sectors

- Database of economic accounts doesn't match easily with EU ETS
- Activities “covered” a sub-set of activities/industries
 - Implications for meeting targets and unknowable consequences for policy of interventions, e.g. carbon tax, system-wide policy
- Additional data requirements?

4. Regional emissions data

- AEA produce national, top-down estimates
- Squaring with “bottom-up” regional estimates?
- Additional data requirements?



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