Indicators and trends

Monitoring climate change adaptation

climate change
Scotland's centre of expertise connecting climate change research and policy

Indicator name				Version
BE1 Major power stations in areas at flood risk **BE2 Energy capacity of power stations in areas at flood risk** **BE3 Power stations in areas at flood risk with flood protection**				**31/03/16**
Indicator type:	**Risk/opportunity**	**Impact**	**Action**	
	X		**X**	

SCCAP Theme	SCCAP Objective	CCRA risk/opportunity
Buildings and infrastructure networks (Energy)	B1, B2, B3	FL11a/ENr2 Power Stations at significant risk of flooding

At a glance

- Scotland's energy infrastructure may be vulnerable to climate change due to the risk of flooding, damage to power lines and disruption to power stations
- Disruption to one of Scotland's major power stations would decrease generating capacity by over 10%
- Whilst some of Scotland's major power stations lie within areas at risk of flooding, all power stations in the UK are required to be built to withstand major flooding events
- There have been no recorded power outages due to flooding of power stations in Scotland, and as the proportion of energy generated from renewable sources is increasing, reliance on these major installations is decreasing

Latest Figure	Trend
This document is intended to provide a summary of information currently available. No appropriate data currently available to provide quantitative indicators.	N/A

Why is this indicator important?

Electrical power is essential for functioning of modern society. The physical infrastructure for generation may be vulnerable to flooding, the frequency and intensity of which is likely to be increased by climate change (Scottish Government, 2011).

As of 2014, more than 60% of Scotland's energy generating capacity was provided by four major power stations (each of them with a capacity above 1,000MW) (Scottish Government, 2014; DECC,

2014a): Hunterston B, Torness, Peterhead and Longannet[1]. Hunterston B and Torness are nuclear power plants, Peterhead is gas-fired, and Longannet a coal-fired power station which has subsequently closed (March 2016).

Calculations based on current figures suggest that if operation were interrupted at any one of these power stations, Scotland's generation capacity would decrease by more than 10% (Scottish Government, 2014; DECC, 2014a). However, the actual felt impact of a power outage at one of these major power stations would depend on a range of factors, such as whether the outage occurred during a period of peak demand, the effect of any maintenance work on the network, the state of renewable generation and the option of supply from interconnectors.

BE1 and BE2 are risk indicators that cover the risk to major power stations, and thus to energy supply, posed by flooding, and of the resulting societal impact due to the energy generation that could be lost. BE3 is an action indicator, covering action taken to mitigate the risks.

Related Indicators
BE5 Major electricity substations at risk of flooding
BE4/BE14 Electricity supply disruption due to flooding

What is happening now?

According to the Scottish Environmental Protection Agency's indicative flood maps (SEPA, 2015) there is a medium risk of fluvial flooding (1 in 200 year flood) for Peterhead Power Station and it is bordered by areas at risk of surface water flooding. Hunterston B is at low risk of coastal flooding, and high risk of surface water flooding. Torness does not appear to be located in an area at risk of flooding.

Both Peterhead and Hunterston B are located in areas designated as Potentially Vulnerable Areas (PVAs), which indicate where the risk of flooding is significant enough to justify further assessment of flood risk and further identification of necessary protection measures. All power stations in the UK at risk of flooding have additional flood protection measures (Indicator BE3). Power stations are built to withstand extreme flood events as required by the planning system (Andy Limbrick, Energy UK, Personal Communication). However, attempts to obtain more detailed information on the safety standards have thus far been unsuccessful[2].

There have been no recorded power outages due to flooding of power stations in Scotland. Moreover, because the share of electricity generation supplied by renewable energy sources is increasing (32% in Scotland in 2013) (DECC, 2014b) generation is becoming more decentralised and thus less susceptible to disruptions as a result of outages at major power stations.

What has happened in the past?

What is projected to happen in the future?

Scotland is covered by the National Grid, so it is expected that if there were a failure, back-up power would be provided by other sources. The trend towards a more distributed generation capacity (through renewable energy) is increasing this security. Likewise, the grid interconnectors between

[1] Scottish Power closed Longannet in spring 2016

[2] Future enquiries about this could be directed to Ofgem and the Office for Nuclear Regulation

Scotland and England also increase supply security. Additional interconnector capacity is being developed on the west coast, and while this is aimed at the export of renewable energy from Scotland to England, it also provides the option of energy import, in the event of a major generation outage in Scotland.

Patterns of change

Interpretation of indicator trends

Limitations

This document is indicative only and should not be viewed in the same way as other indicator templates for which information and data have been more accessible. This is because:

a) The assessment of power stations at risk of flooding was conducted using the SEPA flood map website, by entering postcodes for each of the four, and examining whether they fell within flood risk areas. It is recognised that this assessment method is not robust.
b) The conclusions that can be drawn are further limited by the absence of detailed information regarding flood defences at each site. This makes it difficult to assess the vulnerability of these power stations to flood events.

References

Department of Energy & Climate Change (DECC) (2014a). *The Digest of UK Energy Statistics: Electricity.* Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/337649/chapter_5.pdf

Department of Energy & Climate Change (DECC) (2014b). Special Feature-sub-national electricity figures: *Electricity generation and supply figures for Scotland, Wales, Northern Ireland and England, 2010 to 2013.* Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/386870/Electricity_generation_and_supply.pdf

The Scottish Government. (2011). *Scotland's Climate Change Adaptation Framework (SCCAF)*: *Energy Sector Action Plan.* The Scottish Government. Available at: http://www.gov.scot/Resource/Doc/175776/0114907.pdf

The Scottish Government (2014). *Expert Commission on Energy Regulations – Main Report*. Available at: http://www.gov.scot/resource/0045/00455402.pdf

SEPA (2015) Flood Extent Maps. [online]. Available from: http://map.sepa.org.uk/floodmap/map.htm [accessed March 2015].

Further information

Acknowledgements

Lead author: Katherine Beckmann (Heriot-Watt University)

Contribution to content from Darcy Pimblett (CXC)

Appendix One: Indicator metadata and methodology

Table 1: Indicator metadata

	Metadata
Title of the indicator	BE1 Major power stations in areas at flood risk BE2 Energy capacity of power stations in areas at flood risk BE3 Power stations in areas at flood risk with flood protection
Indicator contact: Organisation or individual/s responsible for the indicator	ClimateXChange
Indicator data source	N/A
Data link: URL for retrieving the indicator primary indicator data.	N/A

Table 2: Indicator data

	Indicator data
Temporal coverage: Start and end dates, identifying any significant data gaps.	N/A
Frequency of updates: Planned or potential updates	N/A
Spatial coverage: Maximum area for which data is available	N/A
Uncertainties: Uncertainty issues arising from e.g. data collection, aggregation of data, data gaps	N/A
Spatial resolution: Scale/unit for which data is collected	Scotland wide
Categorical resolution: Potential for disaggregation of data into categories	N/A
Data accessibility: Restrictions on usage, relevant terms & conditions	N/A

Table 3 Contributing data sources

Contributing data sources

Data sets used to create the indicator data, the organisation responsible for them and any URLs which provide access to the data.
N/A

Table 4 Indicator methodology

Indicator methodology The methodology used to create the indicator data
N/A