Water abstraction

Scottish Government
Riaghaltas na h-Alba
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Key message

The main use of water abstraction is for cooling, with the majority of abstractions, by volume, being for coastal power stations. Following the closure of two power stations, there has been a significant reduction in permitted extraction from 20.6 to 9.8 Million m³ per day since 2011.

Cooling water extraction at Torness power station, East Lothian © Martyn Cox

What, why and where?

Abstraction involves taking water, via pipe, from the sea, using it for an industrial process and then returning it to the sea. Most abstracted water is used for cooling (Figure 1). There is a limit placed on the temperature at which water can be returned. The majority of coastal water abstractions, by volume, recorded as 'Industrial or Commercial: Non-Evaporative Cooling' are for power stations (97% of all abstraction in Scotland at 9.5 million m³ per day, down from 98% or 20.2 M m³ per day reported in 2011 (Baxter *et al*., 2011). The remainder are for use in fish processing and for process water. Process water is water abstraction for use in the production process for industry sectors not covered in another category in table 1 (e.g. food and drink sector, paper industry, brick and cement production). There has been an overall reduction from 20.6 to 9.8 M m³ per day. Information on cooling water used by ships is not included as this is not regulated. There is also no information available on abstraction of seawater by offshore installations.

Other uses of abstracted water include the operation of fish farms and fish processing factories, manufacture of food, wood and chemical products, agriculture, marine animal sanctuaries and navigation abstractions to maintain water levels in impounded docks. Use is also made by the defence industry.

There are abstractions in all Scottish Marine Regions (SMRs) except the north coast (Figure 2), more details about the numbers of licences per SMR are given in the extended section. However these abstractions represent a very small amount of the water available in the sea. If industry could not abstract water from the sea the alternative would be to abstract water from rivers or land based groundwaters, if available, or use cooling towers.

For further information on this topic go to: https://marine.gov.scot/sma/assessment/water-abstraction

Table 1:
Number of licences for abstraction points (2018).
Source: SEPA.

Type of extraction activity	Capacity of permitted extraction (m^3/day)	Number of sites extracting	% of Scotland total
Non-Evaporative Cooling (more than 1M m^3/day)	9,073,155	3	92.3%
Non-Evaporative Cooling (less than 1M m^3/day)	477,147	17	4.9%
Fish Production	188,710	21	1.9%
Process Water	69,682	32	0.7%
Evaporate Cooling	15,000	1	0.2%
Other	4,661	15	<0.1%
Total	**9,828,354**	**89**	**100%**

Note: some licences more have more than one abstraction point at a given location.

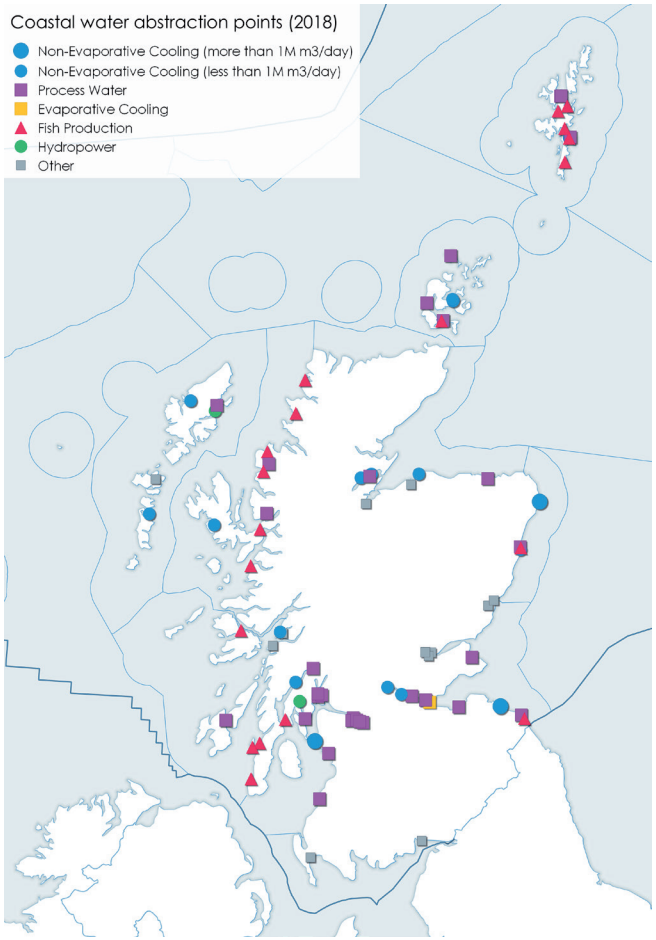


Figure 1:
Number of registered fishery product establishments by location, July 2019. Source: Marine Scotland and FSA, 2019.

Contribution to the economy

Seawater abstraction does not generate a measurable economic value by itself. It is therefore not possible to report the value of abstraction in terms of Gross Value Added (GVA) or employee jobs. Water abstraction can create efficiency savings and it is clear that such abstractions are fundamental to sustaining certain key economic activities, for example the production of electricity.

The 2010 Environment Agency report (Environment Agency, 2010) estimated that cooling power stations using water abstraction provided between 0.5% and 3% more efficient generation than the use of cooling towers. This would translate into a significant economic benefit for a coastal location given the value of the electricity produced.

Since 2011 two large power stations closed reducing the need and therefore value of water abstraction for power generation.

Examples of socio-economic effects

- Water abstraction supports electricity generation which is important to the economy.
- Recreational angling may benefit from wild sea bass feeding in the plume of discharged waters (anecdotal evidence from Torness power station).

- Fish caught on intake grilles may reduce efficiency of industrial process.
- Possible restrictions on certain uses of the sea near large intakes.

Pressures on the environment

An OSPAR agreed list of marine pressures is used to help assessments of human activities in the marine environment. The marine pressure list has been adapted for use in Scotland via work on the Feature Activity Sensitivity Tool (FeAST). Water abstraction activities can be associated with 10 marine pressures – please read the pressure descriptions and benchmarks for further detail.

Forward look

Water abstraction is generally important for industry and for economic growth. Predictions about future developments cannot be made with any certainty so new water abstraction is led by the needs of industry and markets.

The third National Planning Framework (Scottish Government, 2014) (NPF3) emphasises 'generating the equivalent of at least 100% of gross electricity consumption from renewables' and has ruled out the building of new nuclear power stations. Both aspirations may well reduce demand for water abstraction for power stations. However NPF3 also reflects the need to provide thermal generation at a refurbished Peterhead power station and a new coal-fired power station with Carbon Capture Utilisation and Storage technology at Grangemouth. Both of those could see demand rise in their respective regions. Therefore the extent to which the current level of water abstraction for power generation may continue is unknown.

Locations of future water intakes will need careful consideration, particularly if proposed for narrow estuaries or firths that are important for protected habitats and species.

Economic trend assessment

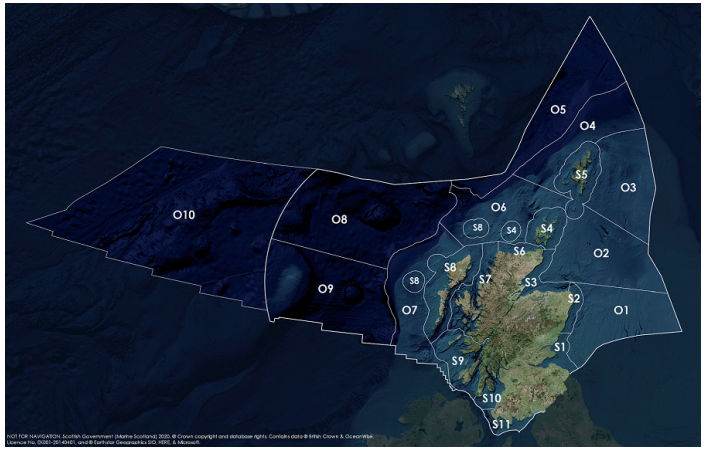
Economic trend assessment is not possible as seawater extraction does not generate GVA directly. While water abstraction can create efficiency savings, it does not generate a measurable economic value by itself.

Status and trend assessment legend

Status assessment (for Clean and safe, Healthy and biologically diverse assessments)		Trend assessment (for Clean and safe, Healthy and biologically diverse and Productive assessments)	
	Many concerns		No / little change
	Some concerns		Increasing
	Few or no concerns		Decreasing
	Few or no concerns, but some local concerns		No trend discernible
	Few or no concerns, but many local concerns		All trends
	Some concerns, but many local concerns	**Confidence assessment**	
	Lack of evidence / robust assessment criteria	**Symbol**	**Confidence rating**
	Lack of regional evidence / robust assessment criteria, but no or few concerns for some local areas		Low
	Lack of regional evidence / robust assessment criteria, but some concerns for some local areas		Medium
	Lack of regional evidence / robust assessment criteria, but many concerns for some local areas		High

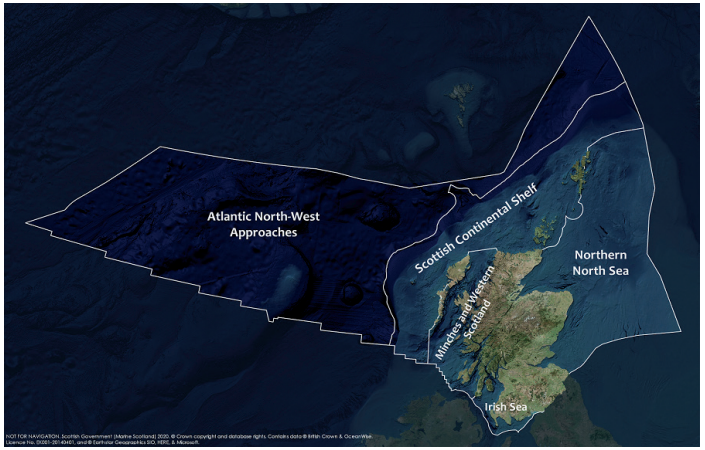
Overal confidence

Assessment regions

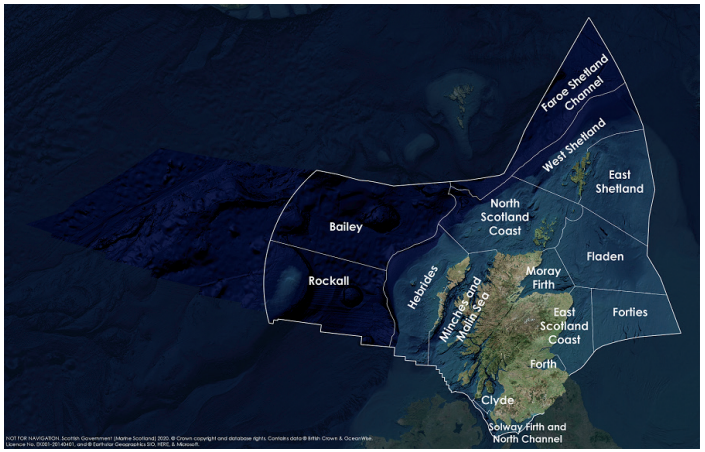


The Scottish Marine Regions (SMRs; S1 – S11) and the Scottish Offshore Marine Regions (OMRs, O1 – O10)

Key: S1, Forth and Tay; S2, North East; S3, Moray Firth; S4 Orkney Islands, S5, Shetland Isles; S6, North Coast; S7, West Highlands; S8, Outer Hebrides; S9, Argyll; S10, Clyde; S11, Solway; O1, Long Forties, O2, Fladen and Moray Firth Offshore; O3, East Shetland Shelf; O4, North and West Shetland Shelf; O5, Faroe-Shetland Channel; O6, North Scotland Shelf; O7, Hebrides Shelf; O8, Bailey; O9, Rockall; O10, Hatton.



Biogeographic, Charting Progress 2 (CP2) Regions. These have been used as the assessment areas for hazardous substances.



Scottish Sea Areas as used in Scotland's Marine Atlas 2011. These are sub divisions of the biogeographic, or Charting Progress 2 (CP2), Regions.

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NatureScot
Scotland's Nature Agency
Buidheann Nàdair na h-Alba

JNCC
Joint Nature Conservation Committee

SEPA
Scottish Environment Protection Agency

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