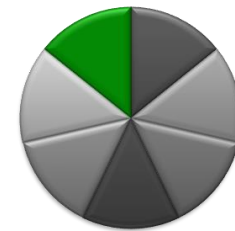


Environmental evidence base: Water



- Air quality
- Biodiversity
- Geodiversity
- Landscape
- Land use
- Soils
- **Water**

ofgem

- Introduction:
 - A systematic review has been undertaken to characterise the impacts of the GB regulated energy system (primarily transmission and distribution) on the natural environment
 - There are seven issues that are seen to be important to address: Air quality, Biodiversity, Geodiversity, Landscape, Land use, Soils, and Water.
- Purpose of the evidence bases:
 - The intended use of the evidence bases is: to inform development of regulatory policy proposals, support internal/external advocacy, and support internal implementation of Ofgem’s strategic and sustainability assessment framework
 - This evidence base describes: the current state of water in GB, wider pressures on water in GB, and potential impacts from any pressure on water, factors leading to such impacts and relevant statutory legislation/regulation
 - The evidence base provides an initial ranking of the impacts and also gives more detailed consideration to those individual elements of the GB regulated energy system likely to have greatest impact on water and/or to arise most frequently
 - The evidence base identifies: how the significance of impacts may be affected by climate change, existing statutory legislation/regulation intended to prevent or minimise impacts, and management actions that prevent or minimise impacts and can be undertaken by a range of actors
- How to use:
 1. The environmental evidence bases should be used to identify the impacts associated with the policy/project using the matrix, ‘flag’ those that are high impact with high/medium confidence and those that are medium impact with high confidence requiring scrutiny / additional analysis.
 2. Undertake more detailed consideration of the significance of these impacts
 3. Undertake more detailed analysis of the interactions with climate change
 4. Consider potential prevention and mitigation measures
 5. Undertake additional qualitative and quantitative analysis, as required
- Case study:
 - A worked step-by-step case study has been included, considering the pressure on water with the most significant impacts, in order to help you use this evidence base

Contents

Slide	Title
4	The state of water
6	Potential impacts on water
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11	Step 1: Initial rankings of impacts on water
15	Case study – Electricity storage – hydro
16	Step 2: Significance of impacts on water
20	Step 3: Interactions with climate change
24	Step 4: Preventing or minimising the impacts
28	Step 5: Qualitative/Quantitative Analysis
29	Conclusions
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31	Annex 1: Roles and responsibilities of regulators for water
32	Annex 2: Relevant legislation and regulation
35	Annex 3: Preventing or minimising the impacts

- Protection and improvement of the water environment has been largely driven by the EC Water Framework Directive(WFD; 2000). Article 4 requires that:
 - All surface water bodies are protected, enhanced and restored to achieve good status by 2015
 - All artificial and heavily modified bodies of water (including reservoirs used for energy generation and storage facilities) are protected and enhanced to achieve good ecological potential and surface-water chemical status by 2015
 - Necessary measures are implemented to reduce pollution of surface waters progressively from priority substances and cease or phase out emissions, discharges and losses of priority hazardous substances
 - Necessary measures are taken to prevent or limit the input of pollutants into groundwater and to prevent the deterioration of the status of all bodies of groundwater
 - All groundwater bodies are protected, enhanced and restored to ensure a balance between abstraction and recharge of groundwater, and to achieve good status by 2015
- In 2009, a report from the EC on implementation of the WFD identified that:
 - The most significant pressures on surface water bodies in the UK were: diffuse-source pollution (68.1%); water-flow regulation and morphological alterations (45.1%); point-source pollution 44.9%); river management (29.5%); and water abstraction (14.4%)
 - The status of water bodies varies across the UK with a substantially higher proportion of those in Scotland being of good status, as compared to England and Wales. Overall, the ecological and chemical status of 18.7% of surface-water bodies was good but is only projected to rise to 21.3% by 2015. The ecological potential of 26.4% of heavily modified and artificial water bodies was good (29% projected for 2015) and 23.2% achieved a good chemical status (rising to 23.7% in 2015). 73.7% of groundwater bodies were chemically of good status (expected to be 79.3% in 2015) and 79.2% had good quantitative status (anticipated to increase to 80.2% by 2015)

References

- [Water Framework Directive \(2000\)](#)
- [European Commission \(2012\) Report from the Commission to the European Parliament and the Council on the implementation of the Water Framework Directive \(2000/60/EC\). Vol. 13.](#)

The state of water

- The GB regulated energy system contributes to wider pressures on water.
- The most significant pressures on surface-water bodies in the UK, highlighted by the EC's report in 2009 on implementation of the WFD, are:
 - Diffuse-source pollution (68.1% of surface-water bodies)
 - Water-flow regulation and morphological alterations (45.1%)
 - Point-source pollution (44.9%)
 - River management (29.5%)
 - Water abstraction (14.4%)
- The main pollutants causing failure of good status are:
 - In England and Wales, copper, zinc, ammonia, cypermethrin and total phosphate
 - In Scotland, phosphorus and ammonia, which are causing failures in rivers and lakes
- Although associated uncertainties are large, climate change projections suggest rainfall patterns will change resulting in:
 - Impacts on river flows and groundwater recharge, with recent modelling indicating a decrease in river flows in the summer across most of GB
 - Frequent short-duration droughts (12-18 months), similar to 1976
 - More intense rainfall that increases likelihood of surface water flooding, polluting water bodies
 - Implications for our natural environment, society and economy.

- The following slides:
 - Identify and broadly categorise potential impacts arising from any pressure on water
 - Identify factors that lead to such impacts
 - Highlight relevant statutory legislation or regulation intended to prevent or minimise such impacts
- This information is then used specifically to consider impacts on water arising from individual elements of the GB regulated energy system.

For more information on roles and responsibilities of regulators for water, please refer to Annex 1.

For more information on relevant legislation, please refer to Annex 2

Potential impacts on water

Context

Impacts

Analysis

Annex

Impact	Factor	Relevant legislation and regulation
Surface-water flows and availability	<p>Construction activities can impact on surface water flows and availability. Changes to permeability of surfaces can increase flows or redirect flows or obstruct flows into rivers. Abstraction of water for construction or maintenance activities can impact on water available for the environment.</p> <p>Water abstraction or use of the public water supply may also be undertaken as part of cooling and other industrial processes associated with the regulated energy system (e.g. water-cooled gas compressors, cooling underground electricity cables).</p>	<ul style="list-style-type: none"> • Water Framework Directive 2000/60/EC (WFD) • Water Resources Act 2003 • Water Act 1991 • Draft Water Bill 2012 • Water Environment (Controlled Activities) (Scotland) Regulations 2011 • Water Environment and Water Services (Scotland) Act 2003
Groundwater abstraction and recharge	<p>Groundwater recharge can be impacted by changes to permeability of surfaces, as well as barriers placed in the landscape arising from construction. Groundwater provides over 75% of the potable water supply in some regions. Many important rivers and ecosystems in the UK are groundwater dependant (e.g. chalk streams) and can be easily impacted by over-abstraction from aquifers or changes to recharge.</p>	<ul style="list-style-type: none"> • Water Framework Directive 2000/60/EC (WFD) • Groundwater Daughter Directive 2006 (2006/118/EC) • Water Resources Act 2003 • Water Act 1991 • Draft Water Bill 2012 • Water Environment and Water Services (Scotland) Act 2003
Flood frequency, intensity, risk	<p>Changes to land use (e.g. through land clearing, construction or other development) can also have significant impacts by increasing the risk and intensity of flooding.</p>	<ul style="list-style-type: none"> • Water Framework Directive 2000/60/EC (WFD) • EU Flood Directive 2007/60/EC • Flood and Water Management Act 2010 • Flood Risk Management (Scotland) Act 2009 • Reservoirs Act 1975 • Welsh Government, Technical Advice Note (TAN) 15: Development and Flood Risk • Communities and Local Government, Technical Guidance to the National Planning Policy Framework • The Water Environment (Controlled Activities) (Scotland) Regulations 2011

Potential impacts on water

Context

Impacts

Analysis

Annex

Impact	Factor	Relevant legislation and regulation
Point-source pollution	<p>Pollution that originates from one place or an easily identifiable source. This aspect of water quality has traditionally been regulated (e.g. a leak from an oil storage tank or pipe discharging from a sewerage treatment works).</p> <p>Pollutants include:</p> <ul style="list-style-type: none"> • Microbiological • Nutrients • Pesticides • Fuel related chemicals • Industrial chemicals • Heavy metals • Novel pollutants 	<ul style="list-style-type: none"> • Water Framework Directive 2000/60/EC (WFD) [also replaces Shellfish Directive] • Bathing Waters Directive 2006 • The Water Environment (Controlled Activities) (Scotland) Regulations 2011 • Integrated Pollution Prevention and Control Directive • Pollution Prevention and Control (Scotland) Regulations 2000 • The Environmental Permitting (England and Wales) Regulations 2010
Diffuse pollution	<p>Factors that lead to unplanned and unlicensed pollution, e.g. from farming, old mine workings, homes and roads. Accounts for 49% of the pollution resulting in failing WFD water bodies. Non-agricultural diffuse pollution accounts for 14% of WFD failures, mainly in towns and cities. Diffuse urban pollution also resulted in 23 bathing water failures in 2011.</p> <p>Pollutants include:</p> <ul style="list-style-type: none"> • Microbiological • Nutrients • Pesticides • Fuel related chemicals • Industrial chemicals • Heavy metals • Novel pollutants 	<ul style="list-style-type: none"> • Water Framework Directive 2000/60/EC (WFD) • Defra Strategy to address diffuse pollution from the built environment • Bathing Water Directive (2006/7/EC) • Nitrates Directive (91/676/EEC) • The Water Environment (Controlled Activities) (Scotland) Regulations 2011 • European Community Regulation on Registration, Evaluation and Authorisation of Chemicals (REACH) (EC 1907/2006)

Impact	Factor	Relevant legislation and regulation
Groundwater contamination	<p>Factors that cause point-source pollution (e.g. oil storage tank leak) or diffuse pollution (e.g. fertilisers leaching from land). Most point-source pollution can be prevented by operators following good practice or can be controlled by permits. Diffuse pollution is much harder to tackle and is the most widespread cause of groundwater pollution. Pollutants include:</p> <ul style="list-style-type: none"> • Microbiological • Nutrients • Pesticides • Fuel related chemicals • Industrial chemicals • Heavy metals • Novel pollutants. <p>Construction and maintenance activities can also expose existing groundwater contamination.</p>	<ul style="list-style-type: none"> • Water Framework Directive 2000/60/EC (WFD) [replacing Groundwater Directive (80/68/EEC) in 2013] • Groundwater Daughter Directive 2006 (2006/118/EC) • Pollution Prevention and Control (Scotland) Regulations 2000 • The Environmental Permitting (England and Wales) Regulations 2010
Marine pollution and impacts	<p>Construction, and use of geological features, within the marine environment can result in point-source pollution (e.g. emission of hypersaline brine from creation of gas storage caverns). The placement of structures (e.g. for interconnectors) often involves physical disturbance.</p> <p>There are 232 shellfish waters in the GB (98 in England; 108 in Scotland, and 26 in Wales). The Shellfish Waters Directive sets environmental standards to promote healthy shellfish growth. The quality of commercially harvested shellfish intended for human consumption must comply with the EU Food Hygiene Regulations.</p>	<ul style="list-style-type: none"> • Marine and Coastal Access Act (2009) • UK Marine Policy Statement (2011) – sets out environmental, economic and social considerations to take into account for marine planning. Provides guidance on pressures and impacts. • Bathing Water Directive (2006/7/EC) • EC Shellfish Waters Directive (2006/113/EC) [to be superseded by Water Framework Directive in 2013] • EU Food Hygiene Regulations (2006; 852/853 /854)

Instructions

- **Case Study:**
 - The steps are illustrated using a ‘real-life’ case study.
 - This considers the pressures: new/extended substations, electricity storage – hydro, new marine interconnection, sub-sea stations, and sub-sea lines (electricity) and marine interconnection (gas)
 - Steps 2 to 5 have been applied to this case study. For general use, you will need to tailor these steps to your own policy/project
- **Step 1: Initial rankings of impacts**
 - This step applies to all policies/projects
 - The matrices illustrate the severity of each pressure on the various impacts and so can be used to highlight areas for additional scrutiny
- **Step 2: Significance of rankings**
 - In this step you develop a matrix specific to your given policy/project
 - This allows you to consider the significance of the identified impacts
- **Step 3: Interactions with climate change**
 - Another case-specific matrix is developed here analysing the interactions with climate change
- **Step 4: Preventing or minimising the impacts**
 - A final case-specific matrix is developed in order to consider potential prevention and mitigation measures
- **Step 5: Qualitative/quantitative analysis**
 - Within your policy/project development, you should undertake further analysis of the relevant impacts and mitigation measures

Step 1: Initial ranking of impacts on water

- Having identified and broadly categorised potential impacts arising from any pressure on water, the following tables provide an expert initial ranking of each of the individual elements of the GB regulated energy system:
 - Independent of other energy system-environment interactions
 - At the likely scale of an individual pressure (e.g. an individual transmission line or sub-station)
 - Irrespective of existing statutory legislation and regulation, and
 - Irrespective of potential timing
- Cumulative effects are considered in the same way in relation to each individual element of the GB regulated energy system
- The matrices should be used to ‘flag up’ significant impacts. This will allow you to conduct further investigation on those significant impacts, for which we have a high degree of confidence in the evidence available
- Impact is defined as:

 - High: national, permanent, irreversible
 - Medium: regional, semi-permanent, difficult to reverse
 - Low: local, temporary, reversible
- Confidence in evidence of such impacts is defined as:

H
M
L

 - High: robust evidence, high agreement
 - Medium: medium evidence, medium agreement
 - Low: limited evidence, low agreement

Initial ranking of impacts on water (electricity transmission)

Context

Impacts

Analysis

Annex

Driver: Electricity transmission	Impact								
Issue: Water	Surface-water flows and availability	Groundwater abstraction and recharge	Flood frequency, intensity, risk	Point-source pollution	Diffuse pollution	Groundwater contamination	Marine pollution and impacts	Cumulative effects	
Pressures									
New transmission lines – Overhead	M	M	H	H	H	H		H	
New transmission lines – underground	H	H	M	M	M	M	M	H	
New distribution lines				L	L	L		H	
New/extended substations*	H	L	H	H	H	H		M	
New marine interconnection*							M		
Marine interconnection – land base connection	L	L	L	L	L	L	L	L	
Marine sub-sea lines*							M		
Marine sub-stations*							M		
Series compensation installations									
Electricity storage – hydro*	H	M	H	L				H	
Electricity storage – compressed air		L					L	L	
Electricity storage – batteries	L		L	L	L	L		L	
Electricity storage – cryogenic systems	L		L	L	L	L		L	
Smart grids	M +ve	M +ve						L	

* These are the pressures that are considered in the case study

Initial ranking of impacts on water (gas transmission)

Context

Impacts

Analysis

Annex

Driver: Gas transmission	Impact								
Issue: Water	Surface-water flows and availability	Groundwater abstraction and recharge	Flood frequency, intensity, risk	Point-source pollution	Diffuse pollution	Groundwater contamination	Marine pollution and impacts	Cumulative impacts	
Pressures									
New gas transmission network	H	M	H	H	H	H		H	
New compressors	M	M	M	M	M	M	M	H	
New distribution network					L	L		L	
New port infrastructure – gas reception facilities				H	H	H	M	H	
New port infrastructure – LNG import				H	H	H	M	H	
Marine interconnection*							H		
Biogas upgrading for injection to grid	H	H	L	L	L	L		H	
Gas storage – underground storage in caverns or gas and oil fields	M	M	M	M	M	M	H		
Gas storage – above ground connection	L		L		L	L		L	
CCGT – district heating	L	L			L	L		L	
Biomethane injection to grid	L	L	L	L	L	L		L	
Shale gas – connection to grid	L	L	L	L	L	L		L	

* This is the pressure that is considered in the case study

Initial ranking of impacts on water (carbon capture and storage)

Context

Impacts

Analysis

Annex

Driver: CCS	Impact							
Issue: Water	Surface-water flows and availability	Groundwater abstraction and recharge	Flood frequency, intensity, risk	Point-source pollution	Diffuse pollution	Groundwater contamination	Marine pollution and impacts	Cumulative impacts
Pressures								
Redeployment of gas pipelines for CO ₂	L		L	L	L	L		L
New CO ₂ pipelines	L	H	L	L	L	L		M
CCS process	H	H	L	M	M	M	H	H

Case study – Electricity storage – hydro

Context

Impacts

Analysis

Annex

- The pressures with the most significant impacts, identified in the previous matrix are:
 - New/extended substations
 - New marine interconnection
 - Marine sub-sea lines
 - Marine sub-stations
 - Electricity storage – hydro
 - Marine interconnection (gas)
- The case study hence considers an example of those pressures.
- Dinorwig pump-storage power station is the largest of its kind in Europe, built in an abandoned quarry located in Snowdonia between 1974-1984.
- In 2006, First Hydro proposed to raise the level of the upper reservoir, Marchlyn Mawr, by 3.3m to produce 1160MWh extra electricity for every operational cycle.
- First Hydro voluntarily submitted an environmental assessment in association with 4 separate planning applications. Snowdonia National Park and Gwynedd Council were responsible for granting permission and the Environment Agency was amongst the many bodies consulted.
- Local concerns were raised about increased risk of flooding, which were addressed by First Hydro strictly limiting the percentage of water discharged to the needs of generating hydro-electricity. Existing alarms and warning systems already ensured that the lower reservoir, Llyn Peris, did not flood during normal use.



Marchlyn Mawr

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References

<http://www.fhc.co.uk/dinorwig.htm>

http://www.gwynedd.gov.uk/ADNPwyllgorau/2006/Ardal%20Arfon/Pwyllgor%20Ardal%20Arfon%20-%20Cynllunio/2006-12-06/english/13_01_Project%20to%20Provide%20Additional%20Stored%20Energy%20for%20Dinorwig%20Power%20Station%20.pdf

Step 2: Significance of impacts on water

- Now you will need to undertake further analysis, which is illustrated here utilising the case study on the previous slide
- The following tables go on to provide more detailed consideration of the significance of impacts from those individual elements of the GB regulated energy system initially ranked highest and/or that are likely to arise most frequently
- To do this you use a case-specific matrix. An example is shown on the next slide.
 - This allows you to see which impacts should be given priority in your analysis
 - In this case, surface water flows and availability and flood frequency, intensity, risk are the main impacts to be considered
- Ranking of magnitude is based on extent, duration, reversibility and frequency of impact
- Confidence in the evidence is defined in the same way as for the initial ranking

- A combined ranking of the significance of impacts is based on magnitude x confidence:

Magnitude	High	Yellow	Red	Red
	Medium	Green	Yellow	Red
	Low	Green	Green	Yellow
		Low	Medium	High
		Confidence		

- Significance:

Red	High
Yellow	Medium
Green	Low

Significance of impacts on water

Issue: Water	Impact							
Pressure: New/extended substations	Surface water flows and availability	Groundwater abstraction and recharge	Flood frequency, intensity, risk	Point source pollution	Diffuse pollution	Groundwater contamination	Marine pollution and impacts	Cumulative effects
Positive or negative	-	-	-	-	-	-	-	-
Extent	Local	Local	Local	Local	Local	Local	N/A	Regional
Duration	Permanent	Permanent	Permanent	Temporary	Temporary	Temporary	N/A	Permanent
Reversibility	Difficult to reverse	Difficult to reverse	Difficult to reverse	Reversible	Reversible	Difficult to reverse	N/A	Reversible
Frequency	Construction and operation	Construction and operation	Construction and operation	Construction and operation	Construction	Construction and operation	N/A	Operation
Magnitude	Low	Low	Low	Low	Low	Low	N/A	Medium
Confidence	Medium	Low	Medium	Medium	Medium	Medium	N/A	Medium
Significance							N/A	

Significance of impacts on water

Context

Impacts

Analysis

Annex

Issue: Water	Impact							
	Surface water flows and availability	Groundwater abstraction and recharge	Flood frequency, intensity, risk	Point source pollution	Diffuse pollution	Groundwater contamination	Marine pollution and impacts	Cumulative effects
Pressure: Electricity storage – hydro								
Positive or negative	-	-	-/+	-	-	-		-
Extent	Regional	Regional	Regional	Local	Local	Local	N/A	Regional
Duration	Permanent	Permanent	Permanent	Temporary	Temporary	Temporary	N/A	Permanent
Reversibility	Difficult to reverse	Difficult to reverse	Difficult to reverse	Reversible	Reversible	Reversible	N/A	Difficult to reverse
Frequency	Construction and operation	Construction and operation	Construction and operation	Construction	Construction	Construction	N/A	Construction and operation
Magnitude	H	M	H	L	L	L	N/A	M
Confidence	H	L	H	L	L	L	N/A	M
Significance							N/A	

References

Wänn, A. *et al.* (2012) Environmental performance of existing energy storage Installations. World Congress on Water, Climate and Energy, Dublin. International Water Association. http://keynote.conference-services.net/resources/444/2653/pdf/IWAWCE2012_0212.pdf.

Significance of impacts on water

Issue: Water	
Pressure: New marine interconnection, sub-sea stations, and sub-sea lines (electricity) and marine interconnection (gas)	Marine pollution and impacts
Positive or negative	-
Extent	Local
Duration	Semi-permanent
Reversibility	Reversible
Frequency	During construction
Magnitude	M
Confidence	M
Significance	

References

International Cable Protection Committee Ltd. (2011) About Submarine Cables.

http://www.iscpc.org/publications/About_SubPower_Cables_2011.pdf.

Impacts of Cables (OSPAR Commission, 2009),

http://qsr2010.ospar.org/media/assessments/p00437_Cables.pdf.

Step 3: Interactions with climate change

- Having provided more detailed consideration of the significance of impacts from those individual elements of the GB regulated energy system initially ranked highest and/or that are likely to arise most frequently, the evidence base goes on to review their potential interactions with climate change.
- This is done through developing another case-specific matrix
 - This allows you to see how the impacts of your policy/project relate to climate change and whether they are going to be amplified, remain neutral or reduce with climate change
 - In the case that is being considered here, it is shown in the matrix on the next slide that climate change is likely to amplify the water impacts
- The following tables identify how the significance of impacts may change as a result of:
 - Direct impacts of climate change on water
 - Climate change adaptation actions identified by key energy infrastructure providers under the Climate Change Act 2008 adaptation reporting power

Interactions with climate change

Issue: Water	Impact							
Pressure: New/extended substations	Surface-water flows and availability	Groundwater abstraction and recharge	Flood frequency, intensity, risk	Point-source pollution	Diffuse pollution	Groundwater contamination	Marine pollution and impacts	Cumulative effects
Significance							N/A	
Climate change	>	>	>	=	>	=	N/A	=

Further details:

- Direct impacts of climate change
 - Increased extreme rainfall events leading to surface-water flooding from impermeable surfaces during construction and operation. Impacts on surface-water drainage and subsequent combined sewer overflows and river pollution.
<http://climatelondon.org.uk/climate-change/climate-change-sectors/built-environment/>
- Climate change adaptation actions
 - Sustainable drainage systems - Scottish Hydro-Electric Transmission Limited (2005) Environmental appraisal of Fort Augustus substation
<http://www.scotland.gov.uk/Resource/Doc/917/0091388.pdf>.

Interactions with climate change

Issue: Water	Impact							
	Surface-water flows and availability	Groundwater abstraction and recharge	Flood frequency, intensity, risk	Point-source pollution	Diffuse pollution	Groundwater contamination	Marine pollution and impacts	Cumulative effects
Pressure: Electricity storage – hydro								
Significance							N/A	
Climate change	>	>	>	=	>	=	N/A	>

Further details:

- Direct impacts of climate change
 - Increased flooding events impacting reservoir safety
 - Climate change adaptation actions
 - Considering emergency draw-down for reservoir safety in terms of risk to developments within the flood plain
- https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/7772/pps25guidupdate.pdf (7.21)

Interactions with climate change

Issue: Water	
Pressure: New marine interconnection, sub-sea stations, and sub-sea lines (electricity) and marine interconnection (gas)	Marine pollution and impacts
Significance	
Climate change	

Further details:

- Direct impacts of climate change
 - Sea level rise
 - Changes in ocean circulation increase scour around legs of any installations
http://randd.defra.gov.uk/Document.aspx?Document=10074_CCRAfortheEnergySector16July2012.pdf
- Climate change adaptation actions
 - Change design specification of marine renewables installations and linked interconnections
http://randd.defra.gov.uk/Document.aspx?Document=10074_CCRAfortheEnergySector16July2012.pdf

Step 4: Preventing or minimising the impacts

- Finally, the evidence base considers prevention of impacts from those individual elements of the GB regulated energy system initially ranked highest and/or that are likely to arise most frequently, and whose significance and interactions with climate change have been reviewed
- The following tables identify:
 - Relevant existing legislation or regulation
 - Management actions that prevent or minimise impacts and can be undertaken by a range of actors
- The prevention and mitigation measures should be considered in any analysis undertaken in your policy/project development

Preventing or minimising the impacts

Issue: Water	Impact							
	Surface-water flows and availability	Groundwater abstraction and recharge	Flood frequency, intensity, risk	Point-source pollution	Diffuse pollution	Groundwater contamination	Marine pollution and impacts	Cumulative effects
Pressure: New/extended substations								
Significance							N/A	
Climate change	>	>	>	=	>	=	N/A	=
Legislation/regulation	1.	1.	2, 3, 4.	5, 6, 7.	8, 9.	10.	N/A	
Management	Sustainable Drainage Systems Site selection 11.	Sustainable Drainage Systems Site selection 11.	Site specific assessments Sustainable Drainage Systems Site selection 11, 12.	Consider appropriate on site water pollution prevention measures. (bundling for transformers) 11, 13.	Sustainable Drainage Systems Site selection Develop EMS for works. 11.	Consider appropriate on site water pollution prevention measures. (bundling for transformers) 11, 13.	N/A	Site specific assessments. 11.

*Numbers are referenced in annex 3

Preventing or minimising the impacts

Context

Impacts

Analysis

Annex

Issue: Water	Impact							
	Surface-water flows and availability	Groundwater abstraction and recharge	Flood frequency, intensity, risk	Point-source pollution	Diffuse pollution	Groundwater contamination	Marine pollution and impacts	Cumulative effects
Pressure: Electricity storage – hydro								
Significance							N/A	
Climate change	>	>	>	=	>	=	N/A	>
Legislation/regulation	1, 2.	1, 2.	3, 4, 5, 6.	7, 8, 9, 10.	7, 8, 9, 10.	7, 8, 9, 10.	N/A	11, 12.
Management	S20 Agreements with the Environment Agency to support river flows	Hydroecology assessments	Panel Engineer inspections; Operational procedures and guidance. 13.	Consider appropriate on site water pollution prevention measures.	Consider appropriate on site water pollution prevention measures.	Consider appropriate on site water pollution prevention measures.	N/A	Choice of technology (closed/ semi-open vs open). EIA if in sensitive area. 14.

**Numbers are referenced in annex 3*

Preventing or minimising the impacts

Context

Impacts

Issue: Water	
Pressure: New marine interconnection, sub-sea stations, and sub-sea lines (electricity) and marine interconnection (gas)	Marine pollution and impacts
Significance	
Legislation/regulation	
Management	

Analysis

References

Legislation/regulation

1. Marine and Coastal Access Act (2009)
2. UK Marine Policy Statement (2011)
3. Bathing Water Directive (2006/7/EC)
4. EC Shellfish Waters Directive (2006/113/EC) [to be superseded by Water Framework Directive in 2013]

5.

Management.

5. Merck, T. and Wasserthal, R. (2009) Assessment of the environmental impacts of cables. OSPAR Commission.
http://qsr2010.ospar.org/media/assessments/p00437_Cables.pdf

Annex

Step 5: Qualitative/Quantitative Analysis

- After using the matrices to identify relevant impacts for your policy/project, identifying their significance, considering their interactions with climate change and potential prevention and mitigation measures, you should undertake further analysis to feed into any Impact Assessment being developed
- The analysis can be either qualitative or quantitative (if available)
- For the case study we are considering, further analysis should be given to the following impacts:
 - Surface-water flows and availability
 - Flood frequency, intensity, risk
 - Marine pollution and impacts
 - Cumulative effects

Conclusions

- Individual elements of the GB regulated energy system likely to have the greatest impact on water and/or to arise most frequently are:
 - Electricity transmission: new/extended sub-stations; marine electricity sub-sea lines; electricity storage – hydro
 - Gas transmission: new gas transmission network; new gas compressors; marine gas interconnectors; upgrading biogas for grid injection; gas storage – underground storage in caverns or gas and oil fields
 - Carbon Capture and Storage (CCS): new CO₂ pipeline; CCS process
- Their most significant potential impacts relate to:
 - Surface water flows and availability
 - Groundwater abstraction and recharge
 - Cumulative effects
- Climate change is likely to amplify many of these impacts
- Existing statutory legislation or regulation preventing or minimising such impacts includes:
 - Water Resources Act 2003
 - Flood and Water Management Act 2010
 - Flood Risk Management (Scotland) Act 2009
 - The Water Environment (Controlled Activities) (Scotland) Regulations 2011
 - Pollution Prevention and Control (Scotland) Regulations 2000
 - The Environmental Permitting (England and Wales) Regulations 2010
 - Water Framework Directive 2000/60/EC (WFD)
- Management actions to prevent or minimise impacts that can be undertaken by a range of actors can be identified as follows:
 - Sustainable Drainage Systems
http://www.ciria.org/service/free_publications/AM/ContentManagerNet/ContentDisplay.aspx?Section=free_publications&NoTemplate=1&ContentID=19321
 - Inspections relating to the Reservoirs Act 1974
<http://www.environment-agency.gov.uk/business/sectors/118421.aspx>
 - Water pollution prevention measures
http://www.nationalgrid.com/NR/rdonlyres/7D8E698F-BD30-47AF-BEE6-BE3CD67512BE/2923/NGTS_201_Issue2.pdf
 - Choice of technology for pumped storage hydro
http://keynote.conference-services.net/resources/444/2653/pdf/IWAWCE2012_0212.pdf

Annexes

Roles and responsibilities of regulators for water

- Environment Agency/ Scottish Environment Protection Agency/ Natural Resources Wales
 - Responsible for water resources, water quality, flood risk, reservoir safety and climate change
- Local Authorities
 - Responsible for planning linked to flood risk management and surface-water flooding

Relevant legislation and regulation

- [Water Framework Directive 2000/60/EC \(WFD\)](#) - The new European Water Policy will get polluted waters clean again, and ensure clean waters are kept clean. In achieving these objectives, the roles of citizens and citizens' groups will be crucial. This is why a new European Water Policy has to get citizens more involved.
- [Water Resources Act 2003](#) – makes significant changes to the licensing system from the 1990 act
- [Water Act 1991](#) - regulates water resources, water quality and pollution, and flood defence
- [Draft Water Bill 2012](#) – improves the licensing conditions
- [Water Environment \(Controlled Activities\) \(Scotland\) Regulations 2011](#) - If you intend to carry out any activity which may affect Scotland's water environment, you must be authorised to do so.
- [Water Environment and Water Services \(Scotland\) Act 2003](#) - the enabling act for the European Water Framework Directive, which introduced a new integrated approach to the protection, improvement and sustainable use of the water environment
- [EU Flood Directive 2007/60/EC](#) - now requires Member States to assess if all water courses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk
- [Flood and Water Management Act 2010](#) - places new responsibilities on the Environment Agency, local authorities and property developers (among others) to manage the risk of flooding
- [Flood Risk Management \(Scotland\) Act 2009](#) - introduce a more sustainable and modern approach to flood risk management, suited to the needs of the 21st century and to the impact of climate change
- [Reservoirs Act 1975](#) – further provision against escapes of water from large reservoirs or from lakes or lochs artificially created or enlarged

Relevant legislation and regulation

- [Welsh Government, Technical Advice Note \(TAN\) 15: Development and Flood Risk](#) - provides technical guidance which supplements the policy set out in Planning Policy Wales in relation to development and flooding
- [Communities and Local Government, Technical Guidance to the National Planning Policy Framework](#)
- [Groundwater Daughter Directive 2006 \(2006/118/EC\)](#) – protects groundwater from deterioration and pollution
- [Bathing Waters Directive 2006](#) - purpose to preserve, protect and improve the quality of the environment and to protect human health
- [Integrated Pollution Prevention and Control Directive](#) - applies an integrated environmental approach to the regulation of certain industrial activities
- [Pollution Prevention and Control \(Scotland\) Regulations 2000](#) - permit and regulate many industrial activities that may pollute our environment
- [The Environmental Permitting \(England and Wales\) Regulations 2010](#) - provide a risk-based, streamlined framework, drawing together a number of formerly separate consenting regimes
- [Evaluation and Authorisation of Chemicals \(REACH\) \(EC 1907/2006\)](#) - ensure a high level of protection of human health and the environment from the risks that can be posed by chemicals, the promotion of alternative test methods, the free circulation of substances on the internal market and enhancing competitiveness and innovation

Relevant legislation and regulation

- [Nitrates Directive \(91/676/EEC\)](#) - reducing water pollution caused or induced by nitrates from agricultural sources and preventing further such pollution
- [Defra Strategy to address diffuse pollution from the built environment](#) - management of urban diffuse water
- [Marine and Coastal Access Act \(2009\)](#) - to make provision in relation to marine functions and activities; to make provision about migratory and freshwater fish; to make provision for and in connection with the establishment of an English coastal walking route and of rights of access to land near the English coast
- [UK Marine Policy Statement \(2011\)](#) – sets out environmental, economic and social considerations to take into account for marine planning. Provides guidance on pressures and impacts.
- [EC Shellfish Waters Directive \(2006/113/EC\)](#) [to be superseded by Water Framework Directive in 2013] - to protect or improve shellfish waters in order to support shellfish life and growth
- [EU Food Hygiene Regulations \(2006; 852/853 /854\)](#)

References

Legislation/regulation

1. Water Resources Act 2003
2. Water Act 1991
3. EU Flood Directive 2007/60/EC
4. Flood and Water Management Act 2010
5. Flood Risk Management (Scotland) Act 2009
6. Reservoirs Act 1975
7. Water Framework Directive 2000/60/EC
8. The Water Environment (Controlled Activities) (Scotland) Regulations 2011
9. Pollution Prevention and Control (Scotland) Regulations 2000
10. The Environmental Permitting (England and Wales) Regulations 2010
11. Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999
12. Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011

Management

13. Environment Agency (2013) Environment Agency - Reservoirs Act 1975
<http://www.environment-agency.gov.uk/business/sectors/64246.aspx>
14. SEPA - other relevant consents, 2013
http://www.sepa.org.uk/water/hydropower/applying_for_a_licence/other_relevant_consents.aspx

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