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Paper by: Director of Environment & Business

**Subject: Flow and water abstraction standards for
hydropower schemes**

FOR APPROVAL
Recommendations

The Board is asked to comment on and if appropriate:

1. Approve the revised approach to flow and abstraction guidance for hydropower schemes outlined in the paper.
2. Approve our recommendation that the new standards should come into effect 12 weeks after we publish the revised guidance.
3. Agree that we adopt an approach to permitting hydropower schemes similar to our approach for other industry sectors.

1.0 Introduction

- 1.1 Following discussions at the Board meeting in July and the informal Board meeting in September, with its associated visits to a number of hydropower schemes, we have developed revised proposals for flow and water abstraction guidance.
- 1.2 Our review of flow and abstraction guidance is part of a wider review of the first edition of the Environment Agency's Good Practice Guidelines (GPG) for hydropower published in 2009. Our guidance is non-statutory and is there to assist developers in designing their schemes. When we consider scheme applications, we assess each scheme on a case by case basis, taking into account a range of site specific and other factors to determine the appropriate level of site protection, including flows.

2.0 The case for change

- 2.1 In our first edition of the GPG, published in August 2009, we provided flow guidance for low head hydropower schemes. We recognised that we would need to provide further guidance to cover high head schemes in a future update of the guidance.
- 2.2 In 2011 we consulted on proposals for high head guidance. Almost everyone who responded either criticised the proposals or suggested

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variations/amendments. At the same time we asked for comments on our approach to flow management for low head hydropower schemes. The majority of those who responded suggested changes. Views were widely divergent between relaxation of the existing flow standards, retaining the existing standards with minor modifications or requiring greater safeguarding of river flows.

- 2.3 In addition to the formal consultation, we reviewed the available evidence on the potential for adverse environmental impacts caused by loss of natural flow variability. Although there is relatively little monitoring to provide evidence of the environmental effects of the type of small-scale hydropower schemes currently being installed in England, we used expert judgement to assess evidence across a wide range of research and information covering the environmental impacts of changes in flow regimes. In particular, we considered the results of a study by SNIFFER¹ which recommended that UK regulators review their hydropower guidance within a risk-based framework.
- 2.4 We modelled a range of hydropower flow scenarios which highlighted some risks from the loss of flow variability in depleted reaches. We also undertook a programme of engagement with the Hydropower Working Group (HWG) and its Technical Sub-Group. The HWG includes representatives of the industry and fisheries groups.
- 2.5 As a result of this review we decided that in our revised flow guidance we must be more explicit about the potential for adverse impacts on certain species and ecosystems resulting from loss of flow variability in depleted reaches of river, from which water has been diverted into the hydropower installations.
- 2.6 We published a supplementary consultation on revised flow proposals in January 2013, presenting four options (see below). All the options incorporated features that would provide greater protection for flow variability, if required, when hydropower schemes are operating.
- 2.7 To help inform our decision making, we developed a further set of flow models, based on typical flow scenarios. The modelling was based on data from Environment Agency river flow gauging stations which, for the purpose of the assessment, were regarded as reasonably representative of potential hydropower development sites. The results from this modelling highlighted that our general approach to abstraction provides very effective protection of flow variability. However, the option based on our current hydropower guidance can sometimes cause serious loss of flow variability if not supported by additional mitigation measures.
- 2.8 Our general approach to abstraction management is based on Catchment Abstraction Management Environmental Flow Indicators (CAMS/EFI), which incorporate the recommendations of the UK Technical Advisory Group for the Water Framework Directive (UKTAG).
- 2.9 Our conclusion from this work is that there is a strong case that our starting point for managing hydropower abstraction should be our general approach to

¹ Scotland and Northern Ireland Forum For Environmental Research, *WFD114 Phase 1 Literature review – Impact of run-of-river hydro-schemes on fish populations, April 2011*

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abstraction. However, we can consider departures from this approach where justified by site specific assessments.

3.0 Consultation on revised flow and abstraction guidance

- 3.1 As previously reported to the Board, we ran a supplementary consultation for 10 weeks in early 2013 on four possible options for flow standards:
- Option 1 – Development of our existing GPG standards and extension to high head schemes.
 - Option 2 – An ecological sensitivity scoring approach, as currently used in Wales for high head schemes (though see section 6).
 - Option 3 – Our general abstraction standards (CAMS/EFI).
 - Option 4 – A variant on the CAMS/EFI option.

We received 752 responses, which were broadly split between favouring Option 1 and Option 3, each accounting for 45% of the total. We have published a summary of consultation responses on our website at <https://publications.environment-agency.gov.uk/ms/EO7LIS>.

- 3.2 To assess the options, we developed an options appraisal matrix, which allows us to determine how well each option would realise six key benefits:
- Maintaining 'no deterioration' in water body status nor preventing achievement of good ecological status or potential.
 - Maintaining, improving and developing fisheries, including fish migration and angling.
 - Maintaining rate of scheme development.
 - Minimising regulatory burden and cost to the industry.
 - Being responsive to stakeholders and achieving consensus.
 - Reducing the Environment Agency costs of permitting.
- 3.3 We used several sources of evidence to evaluate each option:
- Consultation responses (Appendix 1)
 - Modelling of flows
 - Economic assessment of the impact on regulated industry (Appendix 4)
 - Expert and professional judgement of the project team
- 3.4 The options appraisal showed that none of the options deliver all six benefits well (Appendix 2). Option 1 is unsuitable as generic guidance for all locations, as more sensitive sites are likely to need more protective measures. Option 3 would be unnecessarily restrictive for sites with low or medium environmental sensitivity.

4.0 Our proposal: principles for hydropower abstraction

- 4.1 Our proposed approach starts from our general approach to abstraction management (CAMS/EFI) but recognises that site specific features may justify departures. This more flexible approach recognises the diverse range of scheme types that we regulate in England.
- 4.2 We will use the CAMS/EFI standards as our default starting point for all developments, which was presented as Option 3 in the consultation. Applicants can then make the case to deviate from CAMS/EFI, within a range

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up to the levels presented in Option 1 in the consultation, if they can provide evidence that this will not harm the local environment. See Appendix 5 for further details.

- 4.3 This proposed approach improves our original guidance by bringing hydropower in line with other abstraction licensing and places the burden of proof for more water on the developer, as opposed to the Environment Agency. Importantly, while the starting point is more precautionary, there is sufficient flexibility to allow the developer to apply for more water, if they can demonstrate this will not affect the local environment.
- 4.4 This approach differs from our previous proposal to the Board in two key aspects. For low head schemes which create a depleted reach we will now consider allowing levels of abstraction higher than CAMS/EFI, subject to the tests set out in Section 4.5. For high head schemes, our approach is based on the specific flow characteristics of the watercourse (its 'flashiness'), as developed by the Scottish Environment Protection Agency (SEPA), rather than the single limit of allowing the scheme to take 75% of the flow above the "hands off flow" up to a maximum level. The hands off flow is the minimum flow that must be allowed over the weir and down the depleted stretch of river before any water can be diverted through the hydropower installation.
- 4.5 We will apply four key tests in assessing whether a scheme can deviate from the default flow values. The applicant's environmental assessment must demonstrate that the proposed scheme will not have unacceptable local impacts. In particular, it:
- Must not prevent the achievement of Water Framework Directive (WFD) objectives at water body level
 - Must maintain or improve fisheries and fish passage
 - Must not have unacceptable impacts on protected sites or species, including fish, at a population level
 - Must not have unacceptable impacts on the rights of other lawful water users, including anglers.
- 4.6 Where there are particular seasonal pressures on fish migration or the local ecology we may require seasonally adjusted flows. For example we may require a higher hands off flow to support an annual salmon run. We may, however, be able to allow greater flow abstraction during less sensitive periods.
- 4.7 It would, of course, be possible for the developer to make the case for higher levels of abstraction than those indicated in our guidance. Such applications would normally be refused and there would need to be exceptionally clear evidence that there would be no unacceptable impacts for such applications to be considered seriously.

5.0 Our hydropower permitting approach

- 5.1 After publishing the guidance we propose a move towards a sector based approach (see Appendix 5). A Hydropower Sector Group, sponsored by an Area Manager, will provide oversight and leadership, ensuring consistent and effective regulation. To strengthen the existing quality assurance process and

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ensure permitting officers are supported in proportionate decision-making, we will form a Hydropower Flows Panel within the National Permitting Service. Wherever possible the panel will advise on flow allocation at the pre-application stage, ensuring developers have a clear understanding of available flows early in the development of their schemes. The panel will also if necessary advise on flow allocations during licence determinations. The proposed approach is outlined in Appendix 5.

- 5.2 We will explore further opportunities to increase our monitoring requirements on schemes which are permitted with flows above the CAMS/EFI starting point.
- 5.3 We will look for opportunities to work more closely with key regulatory partners, nationally and at a local level. Depending on the site, partners may include Natural England and local planning authorities. We will ensure that our partners are involved at the earliest opportunity when considering a hydropower scheme.

6.0 Comparison to Devolved Administrations

- 6.1 All UK hydropower regulators, including the Environment Agency, SEPA, Natural Resources Wales (NRW) and the Northern Ireland Environment Agency (NIEA) have adopted the principles of UK Technical Advisory Group (UKTAG) guidance in setting thresholds for hydropower abstraction that will protect low flows and high/spate flows.
- 6.2 SEPA's guidance covers high head hydropower schemes, which typically require the construction of new off-take structures (small weirs). In the context of the Scottish Government's renewable energy drive, SEPA also recognises that for larger schemes the strategic benefits of hydropower to Scotland may justify some environmental deterioration, provided that the tests of Article 4.7 of the Water Framework Directive are met. Where schemes cannot meet the Article 4.7 tests, or cannot incorporate effective mitigation measures, SEPA's normal river flow standards (similar to CAMS/EFI) apply.
- 6.3 Our proposals for high head schemes are broadly similar to SEPA's approach, except that we will evaluate acceptable abstraction for each scheme based on site specific assessments of environmental sensitivity, identifying the level of protection appropriate for the site rather than the more generic spatial and other criteria adopted by SEPA.
- 6.4 NRW has recently adopted new guidance for hydropower abstraction, reflecting the predominance of demand for small, high head schemes in Wales. NRW shares our approach to abstraction for low head, on weir schemes. Schemes with a depleted reach or protected sites/species may abstract a specified percentage ('take') of the flow that is available between a maximum abstraction level and the hands off flow, both set at the same levels we are proposing for high head schemes in England.

7.0 Transitional arrangements

- 7.1 In the consultation we asked for comments on our proposal to use the revised standards from 12 weeks after publication of the revised GPG. Consultees expressed various views: some supported our approach; some suggested

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immediate implementation; and others preferred deferring implementation for up to two years.

- 7.2 Our proposal is based on Cabinet Office guidance and, despite the mixed reaction to the consultation, we recommend that we should adopt the revised standards from 12 weeks after publication.

8.0 Impact on customers, skills and value for money

- 8.1 The consultation revealed strong opposing views (Appendix 1). We are unlikely to find a solution that fully reconciles these different views. Our starting point must be the protection of the environment, while still seeking to support a sustainable and viable hydropower industry. We believe this proposal provides sufficient protection and flexibility to do that.
- 8.2 We have shared our proposals with the Hydropower Working Group in meetings in June and October. This group includes representatives from the industry and from environmental groups. Representatives also attended the Open Board meeting in July and were invited to speak.
- 8.3 We employed economists at AMEC to carry out the Accounting for Regulatory Impact Assessment. The government requires that we address the potential burden that our revised guidance will place on regulated industry (the hydropower industry). Appendix 4 considers the impacts of our proposals for revised flows guidance on the hydropower industry. We presented the results of the assessment to industry representatives at a meeting in June 2013.
- 8.4 Our revised proposals provide greater flexibility to protect the environment, the rights of other water users and provide water for hydropower. Taken as a whole, we believe our proposals will have little overall impact on the economic value of the industry, though they will affect the economics of some individual schemes both positively and negatively according to site specific factors.
- 8.5 We also take the impact of our regulation seriously on other industries, for example the potential impact on fisheries. The scope of the ARI does not cover fisheries, but we explicitly included the potential impact on fisheries in the options appraisal we undertook to support our decision-making process.

9.0 Recommendations

- 9.1 The Board is asked to comment on and if appropriate:
1. Approve the revised approach to flow and abstraction guidance for hydropower outlined in the paper.
 2. Approve our recommendation that the new standards should come into effect 12 weeks after we publish the revised guidance.
 3. Agree that we adopt an approach to permitting hydropower schemes similar to our approach for other industry sectors.
- 9.2 Subject to its approval by the Board, and the necessary Defra publishing approvals, we will publish the revised guidance in late 2013/early 2014.

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E&B Manager

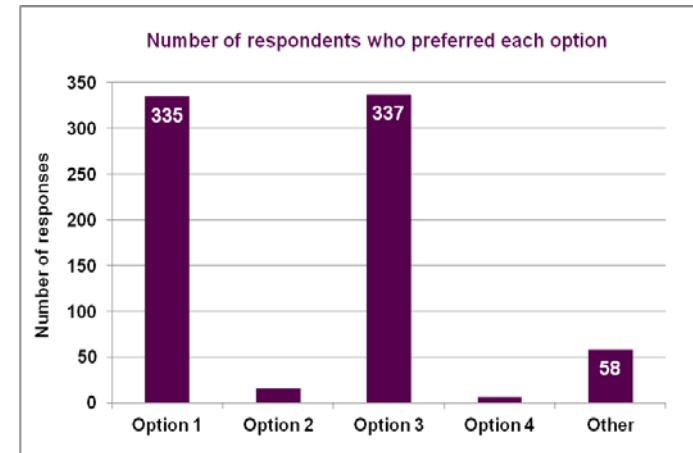
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APPENDIX 1
Summary of consultation responses

We received 752 consultation responses. Responses were broadly split between Option 1 (335 responses) and Option 3 (337 responses), each accounting for 45% of the total. The main stakeholder groups produced standard responses, which many consultees re-submitted.

The table below sets out the main reasons why consultees supported or challenged each of the options:



	Points in favour	Points against	Points to improve
Option 1	<ul style="list-style-type: none"> Site-specific assessment of environmental sensitivity. Clear requirements developers understand. SEPA approach has proven track record. High head has low environmental impact. Only economically viable option. 	<ul style="list-style-type: none"> Lack of evidence – this approach does not adequately protect the environment. Lack of evidence – there is no need to change the current guidance. 	<ul style="list-style-type: none"> Separate high head and low head guidance. Flexibility – allow more flow if developers provide evidence of no damage. Proportionate regulation –simplified process for the smallest schemes. Consider wider environmental benefits.
Option 2	<ul style="list-style-type: none"> Site-specific environmental assessment. 	<ul style="list-style-type: none"> Unfair and not scientific. Flow restrictions do not benefit the environment. Makes schemes unviable. 	<ul style="list-style-type: none"> More evidence and monitoring. Produce a guide for sensitive habitats. Scoring should take account of the WFD status upstream.
Option 3	<ul style="list-style-type: none"> Treats hydropower as a consumptive abstraction. Greatest environmental protection (of the options available). Precautionary approach. 	<ul style="list-style-type: none"> Does not adequately protect the environment. Too precautionary. Makes schemes unviable. 	<ul style="list-style-type: none"> Adopt precautionary approach until we have more evidence. 30% flow increase is unacceptable. Require monitoring on all schemes.
Option 4	<ul style="list-style-type: none"> Combines elements from other options. Site-specific assessment with more flexibility than set standards. 	<ul style="list-style-type: none"> As for Option 3. May not be applied consistently. 	

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APPENDIX 2

Options appraisal summary tables

a) Appraisal of consultation options

Benefit	Option 1 (Amended GPG1 + SEPA)			Option 2 (WALES)			Option 3 (CAMS/EFI)			Option 4 (CAMS/EFI Plus)		
	Likelihood	Confidence	Performance	L'hood	Conf	Performance	L'hood	Conf	Performance	L'hood	Conf	Performance
Water Framework Directive 'no deterioration'	Likely	Medium	+ Modelling shows 'flatlining', if delivered without mitigating actions at schemes.	Likely	Medium	+ Delivering this benefit in Wales but methodology needs updating.	Highly Likely	High	++ Flow variability maintained and mirroring natural flow.	Highly Likely	High	++ Flow variability maintained and mirroring natural flow.
Fisheries – maintain and improve	Likely	Medium	+ Modelling shows 'flatlining', if delivered without mitigating actions at schemes.	Likely	Medium	+ Designed for high head in Wales. Not been applied to low head in England.	Likely	Medium	+ Expert judgement is that CAMS/EFI doesn't always deliver for fisheries benefits.	Likely	Medium	+ Expert judgement is that CAMS/EFI doesn't always deliver for fisheries benefits.
Maintain rate of scheme development	Likely	Medium	+ May not give schemes as much water as in the options table due to mitigating actions.	Unlikely	Medium	- Designed for high head. Does not deliver well for low head schemes.	Unlikely	Medium	- Would reduce scheme viability considerably.	Unlikely	Medium	- Would reduce scheme viability considerably.
Reduce regulatory burden	Unlikely	Medium	- Would require more site specific assessments.	Very Unlikely	Medium	-- Requires detailed site specific assessments.	Likely	Medium	+ Set standards with limited flexibility. But industry may routinely challenge us.	As likely as not	Medium	+ / - In most cases likely to require the same level of assessments as current practice.
Achieve stakeholder consensus	Very Unlikely	High	-- Fisheries stakeholders would not be able to support this option.	Unlikely	High	-- Very few consultees favoured this and it would not serve as a 'bridging' option.	Very Unlikely	High	-- Industry would not be able to support this option.	Unlikely	High	-- Industry would not be able to support this option.
Reduce Environment Agency costs	Unlikely	Medium	- Would require checking more site specific assessments.	Unlikely	Medium	- Requires detailed site specific assessments.	Likely	Medium	+ Set standards with limited flexibility. But we may be challenged more often.	As likely as not	Medium	+ / - Added flexibility may increase costs and challenge by industry.

Very Poor	Poor	Neutral	Good	Very Good
--	-	+ / -	+	++

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b) Appraisal of the three components of the revised flows proposal

	High head			On or around weir			Lowland depleted reach		
Benefit	Likelihood	Confidence	Performance	Likelihood	Confidence	Performance	Likelihood	Confidence	Performance
Water Framework Directive 'no deterioration'	Likely	High	++ Flow variability maintained and mirroring natural flow.	Highly Likely	High	++ Not affecting natural flow and discharging into weir pool.	Highly Likely	High	++ Compliance with WFD objectives at water body level as core element of site assessment
Fisheries – maintain and improve	Likely	High	++ No migratory fish present in these locations. Some brown trout populations may require additional protection.	Highly Likely	Medium	++ Not affecting natural flow plus other mitigating actions (e.g. fish passes)	Likely	High	++ Test of 'maintaining and improving fisheries' is core element of site assessment
Maintain rate of scheme development	Likely	Medium	+ Provides scope for development of high head schemes, particularly small schemes in upland areas	Highly Likely	High	++ This was in Option 1, so favoured by the industry	Likely	Medium	+ Provides scope for continuing development of low head schemes with depleted reaches
Reduce regulatory burden	As likely as not	Medium	+ / - In most cases likely to require the same level of assessments as current practice	As likely as not	Medium	+ / - In most cases likely to require the same level of assessments as current practice.	Unlikely	Medium	- Requires more detailed site specific assessments
Achieve stakeholder consensus	As likely as not	Medium	+ / - May be supported by industry and NGOs, as delivers well for both the environment and power	Likely	Medium	+ In both Options 1 & 3, so favoured by both industry and NGOs. The increase to 1.3xQmean on weirs has been questioned by some NGO stakeholders but our guidance will provide protection for specific site features (for example, weir pools)	Unlikely	Medium	- Both industry and NGOs may have concerns about our approach to assessing acceptability of departures from CAMS/EFI

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Reduce Environment Agency costs	As likely as not	Medium	+ / - In most cases likely to require the same level of assessments as current practice	As likely as not	Medium	+ / - In most cases likely to require the same level of assessments as current practice.	Unlikely	Medium	- Requires detailed site specific assessments.
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Very Poor	Poor	Neutral	Good	Very Good
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APPENDIX 3

Revised proposal for hydropower flow and abstraction guidance

Starting Point

We base our abstraction licensing procedures on Catchment Abstraction Management Strategies Environmental Flow Indicators (CAMS/EFI). We use these to evaluate abstraction licence applications where additional flow pressure may compromise Water Framework Directive (WFD) objectives.

The EFIs incorporate the recommendations of the UK Technical Advisory Group for the Water Framework Directive (UK TAG)². Those recommendations were developed from work by SNIFFER³. The UK TAG flow standards have recently been reviewed with only minor changes.

We set our flow parameters according to the Abstraction Sensitivity Bands (ASB) – High (ASB3), Medium (ASB2) and Low (ASB1). All three types contain biological and physical elements that require protection.

We license hydropower schemes according to:

- a maximum flow (Qmax)
- a minimum flow, the Hands Off Flow (HOF)
- the volume of water allowed for diversion to a turbine is based on a percentage of the naturalised flow (the flow unaffected by abstractions) above the HOF.

The HOF is set at Q95, which is the flow likely to be exceeded on 95% of the time each year based on hydrograph evidence, or Q97 for rivers with high baseflows, which is the flow likely to be exceeded for 97% of the year.

Table A sets out our proposed default guidance and starting point for hydropower schemes.

Our approach to departures

We will consider higher levels of abstraction for hydropower installations, provided that certain criteria are met and that any necessary mitigation measures are included.

Before we can accept a departure from the starting point any applicant must provide sufficient information and evidence, through an environmental assessment, that the proposed scheme will satisfy the following four tests:

- Must not prevent the achievement of Water Framework Directive (WFD) objectives at water body level
- Must maintain or improve fisheries and fish passage
- Must not have unacceptable impacts on protected sites or species, including fish, at a population level
- Must not have unacceptable impacts on the rights of other water users, including anglers.

The scale of any departure from the starting point will depend on the level of risk identified in the assessment and the type and extent of any mitigation measures proposed. Mitigation might include increases in the HOF, reductions in the maximum abstraction level or the

² [Recommendations on Surface Water Classification Schemes for the purposes of the Water Framework Directive](#)

³ Scotland and Northern Ireland Forum for Environmental Research (SNIFFER), *WFD48 Development of Environmental Standards (Water Resources)*. The reports from the project can be found at <http://www.sniffer.org.uk/search?q=WFD48>.

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percentage abstraction above the HOF, seasonal variations in permitted abstractions or active management of the abstraction to maintain flow variability.

The categories of scheme where we may consider departures from Table A are:

On or around weir

These are schemes with turbines sited at or alongside an existing weir where there will be no significant flow depletion within the natural watercourse. The water is discharged back into the river at, or very close to, the toe of the weir.

Subject to the environmental assessment and any mitigation measures that are identified and agreed, we may allow departures as shown in Table B.

Low head with depleted reach

These schemes are based on an existing weir and divert water into a leat or channel to nearby turbines. They are typically the sites of former mills. Diversion of water away from the natural river channel may introduce risks for fish passage and ecological connectivity. There may also be changes in sediment transport. The level of risk is dependent on the ecological and environmental sensitivities of the features in the depleted reach, together with the scale and duration of any flow reduction in the depleted river channel. The risks will need to be addressed in the applicant's environmental assessment.

We propose that, subject to the results of that assessment, we may accept abstraction of up to 100% of the available flow up to Q_{mean} (the annual average flow). The HOF will depend on the base flow index (BFI) and the site sensitivity. BFI is a measure of the 'flashiness' of the river. This is broadly similar to the guidance in our first edition of the GPG but with the difference that, in future, we will consider the local sensitivity of the depleted reach, rather than merely its length.

Subject to the environmental assessment and any mitigation measures that are identified and agreed, we may allow departures as shown in Table C.

High head

High head schemes were not covered in our first edition of the GPG. These schemes can create long depleted reaches. Where the depleted reach is very long, any local deterioration may become significant at water body level. These schemes are common in Scotland where SEPA has a clear and well-established approach to managing abstraction for hydropower.

We propose that, provided we are satisfied by site assessment that our four tests are met, abstraction up to levels similar to those recommended by SEPA may be permitted. This will include maximum abstraction of $1.3 \times Q_{\text{mean}}$ and a HOF of Q_{95} (or Q_{90} for more flow sensitive sites, which is the flow likely to be exceeded for 90% of the year). Where flow variability must be protected at flows above the HOF, we will normally limit abstraction to a level that maintains flow in the depleted reach at a fixed proportion of the upstream, unaffected channel. The proportion is derived from the ratio of $Q_{\text{mean}}:Q_{80}$ for the site. Q_{80} is the flow likely to be exceeded for 80% of the year.

We have modelled a range of potential hydropower scenarios, and have calculated levels of abstraction under this approach in the range of 65% to 80% of available flow above HOF. The greatest potential for abstraction is likely to be in steep, upland tributaries of low ecological sensitivity with no migratory fish. In practice, the flow characteristics of some watercourses, beyond those of our modelling, may provide greater scope for abstraction, subject to a specific site assessment. In less steep or more ecologically sensitive rivers we expect lower levels of abstraction.

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Subject to the environmental assessment and any mitigation measures that are identified and agreed, we may allow departures as shown in Table D.

Designated nature conservations sites

We take a precautionary approach in permitting sites in or adjacent to designated conservation sites, such as Special Areas of Conservation (SAC) and Sites of Special Scientific Interest (SSSI). We will assess flow criteria according to the features of each designated site.

TABLE A – STARTING POINT						
	High sensitivity ASB3		Medium sensitivity ASB2		Low sensitivity ASB1	
	<i>Low & medium base flow Below 0.2</i>	<i>High base flow 0.2 & above</i>	<i>Low & medium base flow Below 0.2</i>	<i>High base flow 0.2 & above</i>	<i>Low & medium base flow Below 0.2</i>	<i>High base flow 0.2 & above</i>
River type Q95 / Qmean						
Hands off flow (HOF)	Q95	Q97	Q95	Q97	Q95	Q97
Maximum take	1.3 x Qmean	Qmean	1.3 x Qmean		1.3 x Qmean	
% take above HOF	35%		40%		45%	
Notes: More protective allocation of flow distribution will be required if:						
<ul style="list-style-type: none"> • A weir pool is of high importance to the water body status or wider catchment; or • Fish passage is likely to be reduced by a reduction in flow 						

TABLE B – HYDROPOWER SCHEMES AT AN EXISTING WEIR Indicative departures from Table A	
Hands-off flow (HOF)	Q95 (Q97 for Very high base flow)
Maximum abstraction	1.3 x Qmean
% take above HOF	100%

TABLE C – LOW HEAD WITH DEPLETED REACH Indicative departures from Table A				
Baseflow type Baseflow index (Q95/Qmean)	River flow regime type			
	Flashy river Less than 0.1		Medium / low Between 0.1 & 0.2	High/very high From 0.2 upward
	Fish migration issues	No fish migration issues		
Hands-off flow	Q90	Q90	Q95	Q95
Maximum abstraction	Q40	Qmean	Qmean	Qmean
% take above HOF	100%	100%	100%	100%

TABLE D – HIGH HEAD SCHEMES Indicative departures from Table A

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Hands-off flow (HOF)	Q95 (Q90 for sites where wetted area significantly reduced at flows below Q90)
Maximum abstraction	1.3 x Qmean
Protection of flow variability	Where necessary, the ratio of the upstream to the downstream (depleted reach) flows to be maintained at the ratio of at least Qmean to Q80

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APPENDIX 4
Accountability for Regulator Impact (ARI) Assessment

We commissioned Amec to carry out an Accountability for Regulator Impact Assessment (ARI) that considers the impacts of our proposals for revised flows guidance on the hydropower industry. We presented the results of the assessment to industry representatives at meetings held in June and July 2013. The results from this ARI assessment were fed back into our assessment process (see Appendix 2).

The assessment used an estimate for the annual rate of development of schemes derived from Environment Agency historical permitting data and British Hydropower Association/Micro-Hydro Association data. The value of the total hydropower resource (future development opportunities) in England is difficult to estimate as there are no good current assessments of the number of feasible schemes. Moreover, the rate at which these schemes will be developed each year is also subject to doubt. The total value and the rate of development will both be affected by changes to the feasibility of schemes under our consultation options.

The assessment identified that by using the historical mix of schemes applied to an identical future scenario, option 1 potentially gives an increase in energy generating potential against our existing guidance. However, this figure is likely to be overly optimistic as a developer would not always get the maximum abstraction levels set out in the table. This is because flow levels may be reduced after the application of criteria to meet local environmental standards. Results for options 2 and 3 potentially reduce the value of the industry by up to £46.1m from the base estimate for our current guidance (£168.3m) and reinforce the message that both of these options potentially reduce the financial viability of some types of schemes (particularly low head with depleted reach in an area of high sensitivity) compared with the existing GPG1 (see table 1 below).

Table 1: Calculations using BHA/MHA data (net present value £m, 3.5% discount rate, 2.5% Feed in Tariff depression)

Scenario	GPG1	Option1	Option2	Option3
Future scenario '25 schemes per year' using BHA and MHA mix of schemes.	168.3	207.6	143.6	122.2
Difference from GPG1	-	+39.3	-24.7	-46.1

The basis of our revised proposal is to fix the starting point for assessment of hydropower abstraction on our normal abstraction standards (CAMS/EFI - option 3) but recognises that site specific features may justify departures (up to the levels indicated in option 1).

Our ARI assessment has not attempted to quantify the potential impact on the environment and fisheries, as it is out of scope under the Better Regulation Executive's guidance. However, we do know that the economic contribution that angling makes to the UK economy is in the region of £1 billion per year and the value of 1km of good status river is estimated at £100,000 per annum. It is therefore important that we also consider and protect these benefits.

Taking the proposals as a whole, there should be sufficient flexibility in our proposed approach for there to be little economic impact on the industry whilst properly protecting the environment, including fisheries.

Not Protectively Marked
Ref: OB/1310-5

APPENDIX 5

Revised proposed hydropower permitting process

A Hydropower Sector Group will be established to provide oversight and leadership, ensuring consistent and effective regulation across the Environment Agency. It will oversee both permitting and compliance, and will have representatives from Operations (National Permitting Service (NPS) and Area teams), Environment and Business, Legal and Evidence.

We already have in place a robust mechanism - supported by the non-financial scheme of delegation - for determining hydropower applications. Water Resources applications for hydropower schemes are issued by our National Permitting Service, where we have re-structured to provide specialist hydropower teams concentrated in 4 centres. Each hydropower team has a Senior Permitting Officer who provides technical support and licences are peer reviewed before issue.

As the proposed flows guidance offers considerable flexibility, we think it is important to ensure that we further support consistent decision making on flows across England. Therefore we propose that the Hydropower Sector Group would oversee two approaches:

- (1) Strengthening the existing quality assurance process to ensure permitting officers are supported in proportionate decision making by forming a Hydropower Flows Panel chaired by the National Permitting Services Hydropower Sector Lead. It will
 - advise customers on likely flow allocation at pre-application
 - draw on expert advice from NPS, legal and technical experts where necessary
 - support officers to take a 'yes, if' approach
 - make recommendations for permitting, with Areas having the final decision
 - advise the Hydropower Sector Group of emerging issues
 - seek Area Manager ownership of particularly contentious decisions
- (2) Periodically reviewing the effectiveness of the new arrangements in enabling a consistent and co-ordinated approach across England.

These governance measures will reduce the overall resource required to provide leadership on hydropower issues as the following structures will cease after implementation of the guidance:

- Hydropower Programme Board (internal Executive Manager led board)
- Hydropower Project Team (responsible for GPG delivery)
- Hydropower Working Group (external stakeholder group with angling and industry representation)
- Hydropower in Ops Group (Operational forum for NPS, regional and area staff)

The Hydropower Working Group was established to support the review of the Good Practice Guidelines. Once the revised GPG has been published, we believe it is appropriate that the management of stakeholder relations is normalised. The hydropower sector group will engage with the industry while the England Fisheries Group will continue to engage with fisheries interests.

**Not Protectively Marked
Ref: OB/1310-5**

Hydropower Sector Group (monthly initially, then quarterly)

<p>Membership: Area Manager (Sponsor) Operations Sector chair (Area Environment Manager) Environment and Business (E&B) Head of Business National Permitting Service (NPS) Hydropower Lead Area representatives E&B Water Resources Abstractors E&B Water Resources Tech Services E&B Climate Change E&B Fisheries & Biodiversity Legal Evidence</p>	<p>Key Responsibilities:</p> <ul style="list-style-type: none"> • ensure consistency • provide quality assurance of flows decisions • drive improvement in performance of sector • monitor resources and capability gaps • deliver corporate plan outcomes
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Hydropower Flows Panel (teleconferences weekly/as required)

<p>Membership: National Permitting Service (NPS) Hydropower Sector Lead (chair) Hydropower Senior Permitting Officers NPS Legal (as required) E&B Technical Advisors (as required) Area Technical Officers (as required)</p>	<p>Key Responsibilities:</p> <ul style="list-style-type: none"> • provide flow advice to permitting officers • ensure flows guidance is consistently applied • ensure decisions withstand legal challenge • report to Hydropower Sector Group • ensure a “yes, if” approach • where necessary, engage area management to ensure ownership of flows decisions
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