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Response of Mann Power Consulting Ltd to SEPA consultation, April 2010:

"Guidance for developers of run-of-river hydropower schemes"

Consultation questions

Question 1. *[Will sub-100kW schemes which are deemed "provisionally acceptable" because of their context cause no deterioration?]*

While all human developments involve change, inevitably involving some level of deviation from the status quo, SEPA's role lies in balancing socioeconomic uses of water with protection of the environment. SEPA's responsibility is therefore to control deterioration via the licensing process. In this consultation, it is therefore necessary to infer how SEPA interprets the government's stated commitment to "no deterioration". Ministers explicitly accept that deterioration may arise from >100kW schemes and that this will be managed via SEPA's licensing process. For sub-100kW schemes, SEPA clearly does not intend that absolutely "no deterioration" will be permitted, for this would mean that no schemes below 100kW could proceed, conflicting with government's reassurance that "such schemes will be welcomed".

Certainly, sub-100kW schemes deemed "provisionally acceptable" subject to mitigations would seem unlikely to risk deterioration from one WFD status to an inferior status. The same would apply to all schemes subject to SEPA's mitigation requirements at licensing, regardless of scheme size. For schemes of all sizes, localised "deterioration" is inevitable - e.g. in flows within the depleted reach – but it is precisely SEPA's mitigation requirements which determine how much deterioration is tolerable in the circumstances. Therefore any scheme which proposes to meet SEPA's mitigation requirements (as must all schemes) will satisfy SEPA's regulatory assessment of tolerable deterioration and is by definition acceptable to SEPA. Any judgement of whether deterioration will be acceptably controlled must therefore be based upon the detailed definition of the proposed mitigation measures and their application in determining licences.

Question 2. *[Other circumstances wherein sub-100kW schemes would "not pose a risk"?]*

Again, all developments may "pose a risk", but the question's intent in this consultation is whether there are "other circumstances" not already itemised which should allow a sub-100kW scheme to be considered "provisionally acceptable" by SEPA. The response must be that the Checklist criteria on degradation, HMWB, and engineering, must be phrased and applied in a way which adequately recognises sites with inherently low environmental cost - e.g. in-weir sites and water industry facilities where there is little or no depleted reach of river. As such sites are numerous it is particularly undesirable that the Checklist process might act to deprecate them and complicate their licensing disproportionately.

Also helpful in identifying "other circumstances" would be an explanation of SEPA's understanding of those "particularly significant benefits" which the government statement foresees might make even sub-100kW schemes more acceptable. The 100kW threshold implies that power production might not be acknowledged as a benefit here, but "other circumstances" might include benefits beyond those in guidance Checklist C.

Question 3. *[Is the checklist helpful and how could it be made clearer?]*

Checklists are helpful where the decision-making sequence is linear, which seems to be SEPA's intention in this case. The checklists could be improved as follows.

Checklist A: It would be more logical to begin by assessing the actual condition of the depleted reach (currently in criterion 2, dependent on criterion 1) along with any HWMB designation (correctly in criterion 1), and only then proceed to assess the land use context (currently in criterion 1). Otherwise, the sequence as proposed potentially reduces a site's acceptability on the grounds of adjacent land uses, even where water condition is unimprovable. This does not seem to be an intention described in SEPA's approach.

Checklists A, B & C: These checklists all feature a Note 1, which in fact is not an informational note but contains conditions material to the decision-making sequence. Transparent interpretation of each checklist could be made quicker and easier if the criteria in Note 1 were instead appended to the checklist itself. (Note 2, by contrast, is informational.)

All checklists: Subject to the above, a decision should be made to standardise on either footnotes or endnotes. As all other notes are of a purely informational nature, these would be best removed to footnotes to prevent interrupting sequential flow of the decision tree.

Question 4. *[Will efficiency criteria for >100kW help optimise resource use? Will deterioration be prevented by promoting "significantly better" renewable alternatives?]*

It is important to maximise efficiency, and extracting the maximum energy from water is the preserve of hydropower designers. However, any regulatory minimum standards for efficiency must be closely scrutinized to ensure that they do not create perverse outcomes by conflicting with other regulatory requirements, in schemes where efficiency is attenuated in favour of desirable mitigations (turbine choice, screening, permitted flow regime). Moreover, optimising use of the national resource relies on promptly enabling an uncontested development to proceed, by positive regulation when that opportunity arises, more often than on comparing competing projects for a given reach.

Displacing development to "significantly better" non-hydropower alternatives is a difficult proposition. Developing renewables to meet their share of national energy demand is a challenge which hardly favours allowing a margin for substitutability between technologies. Developing distributed generation involves the initiative of individual site owners, often unable to influence substitution of sites/technologies. Therefore, while an efficiency standard might seem to help in this, care must be taken not to define or apply it in a simplistic manner which prejudices hydropower development which would otherwise be making a net contribution to carbon reduction.

It appears that SEPA's principle concern in assessing substitutability is to be able to obtain a positive valuation outcome from Cost-Benefit Analysis when faced with potential deterioration from one WFD status to an inferior status. While formal CBA may be applied only in a minority of cases, it is desirable to have full transparency on CBA exercises conducted by SEPA in order to validate or challenge the assumptions made in pursuit of its public regulatory role.

Criteria for assuming "significantly better" alternatives exist are that a hydropower proposal with a capacity of 100kW to 500kW has an efficiency below 783kWh to 2350kWh annual output per metre of river impacted, and has adverse effects of "reasonably high significance" as defined in SEPA guidance WAT-SG-68. The origins or calculation of these assumed kWh efficiency values should be published so that they may be validated against true outputs. The multiplier of 300% for high status waters should be justified, e.g. by CBA.

WAT-SG-68 states that alternatives must not be technically unfeasible or disproportionately costly, but that cost to the applicant is not in itself a decisive consideration. However, SEPA should clarify what if any role in the decision is played by the applicant having no access to sites where efficient alternatives might be pursued.

Table 1 in the Consultation document ('Tiered Approach') does not represent the criteria in the body of the Consultation document. If it is to be used elsewhere, this table should be thoroughly revised to reflect SEPA's intended criteria in each capacity range.

Question 5. *[Will the proposed mitigations help minimise adverse impacts?]*

Yes, though their application may result in disbenefits to the development of hydropower. It must therefore be monitored that the measures remain proportionate.

Question 6. *[Will these mitigations "in general" be practicable?]*

There are some specific points of contention:

1.1 Reserving an enhanced hands-off flow irrespective of abstraction and site characteristics. It is proposed to apply a Q90 HOF in the presence of all salmonids and in all <10km2 catchments without consideration of site conditions. This is not proportionate and is not based on evidence. Such decisions are properly made by officers' recommendations at the site level based on real-life considerations.

1.2 Flow variability, Again, generic ecosystem requirements are not established in this area. Evidence would need to be provided to justify a particular proposal, e.g. relating Qn30 to a residual Qn80. This would be far better articulated as an evidence-based decision at the site level based on the requirements of the river and its species. On the other hand, the proposal for an entirely artificial regime of fixed weekly freshets would seem the antithesis of nature-like management of variability in the depleted reach.

1.4 Applying "flow standards for good" during migration windows may be unnecessarily conservative in those schemes with minimal or no depleted reach (e.g. within weirs), and which incorporate effective continuous fish passage even when their abstraction exceeds "flow standards for good". If this exception is accepted it should be acknowledged in any generic guidance.

Question 5. *[Other practicable mitigation measures?]*

None proposed.

General observations

A significant aspect of SEPA's proposed approach is the intention to differentiate in licensing matters around a threshold value of 100kW scheme capacity. While this follows the Scottish Government policy statement of January 2010, clearly the ministers had taken regulators' advice in this matter; and it is inferred that the 100kW recommendation came to them via SEPA economists (cf. Badger 2010).

Identification of 100kW as a lower threshold for environmental-economic sustainability seems to have originated in studies based on 1990s German data and assumptions (Bunge et al, 2003). It need hardly be noted that the UK context in 2010 presents a very different milieu to pre-Euro Germany, in terms of:

- Types of hydropower in consideration (retreat from peaking/pulsing/large dams to run-of-river)
- Status of national hydropower development
- Governmental commitment to timetabled climate-change mitigation
- National renewable energy policy
- Monetary values and the economic investment climate
- Changed economics of mitigation (2010 UK Feed-In Tariff designed to internalise the costs of due environmental mitigation, with emphasis in favour of smaller schemes)
- Experience of WFD requirements and planning, and confidence in achieving compliance
- Experience among environmental regulators of licensing small hydropower
- Evidence of the actual impacts of run-of-river hydropower
- Legal challenge to unsubstantiated regulatory decisions

For contemporary UK developments, it appears questionable to proceed from dated and incongruent assumptions, derived from economic feasibility arguments under a long-superseded non-UK subsidy tariff.

SEPA's work in this area has reviewed evidence for monetising the utility of watercourses using techniques of contingent valuation (CV), revealing the wide divergence in some initial attempts to place monetary values on surface waters (Badger 2010). CV is a notoriously tendentious methodology, and that study acknowledges (in citing Hanley & Black 2006) that such valuation may be more reliably applied as a deliberative exercise than as a mechanism to quantify meaningful economic prices. However, the speculative valuation derived from one such attempt - £25,000/km - is subsequently employed as a mathematical constant to assess the cost of hydropower impacts on any Scottish river (Badger 2010). (This figure in fact originates not in CV research, but is drawn informally from "Ministers' willingness to pay" revealed in the bills for general enhancement works by Scottish Water.) Upon this foundation is built a model of hydropower's environmental costs and benefits, with a hypothetical 100kW scheme imputed to produce environmental benefits of £213K±50% (40-year NPV of 350MWh/a displacing carbon at tradable prices).

The model calculates high environmental costs by assuming >300m depleted reach, when in real low-head schemes it is frequently far shorter (in accordance with sound regulatory argument). Modelled impacts are price-banded according to degradation to a lower WFD status - but in reality such an outcome is entirely site-specific and is in no way predicted by the 100kW or any other capacity designation. By the same token, the actual output of real 100kW schemes could vary widely from that assumed above (even before ±50% variation is applied for future carbon prices).

Although that SEPA economic paper predicts that "100kw hydro schemes are not cost beneficial" in some circumstances, its matrix of scenarios in fact shows the converse to be true in 27 of the 36 scenarios modelled (Badger 2010). Most striking is the study's omission to note that the decisive variable here is depleted reach. All negative scenarios are those with unusually long (>760m) depleted reaches - while all scenarios with a shorter, more realistic, depleted reach show 100kW schemes to return positive net benefit.

It is all the more remarkable that regulatory attention is focussed on a capacity threshold when the impact costing for that threshold places the greatest significance on depleted reach and site-specific WFD status – neither of which are determined by capacity.

Using capacity itself to measure impacts is fundamentally illogical. Scotland abounds in sites where a smaller-capacity scheme could abstract less water, achieve greater efficiency for the flow regime, and generate more kWh per year than a larger-capacity scheme. In these cases, inserting a capacity threshold incentivises the uprating of schemes to enhance their regulatory acceptability. This outcome is clearly perverse.

An example noted recently by the present author is a low-head scheme proposal likely to develop 91kW from a design flow of 1.3cumecs leaving a Q90 residual flow. If the developer were to uprate to 101kW, designing for 1.44cumecs and leaving a lower residual flow, this site is predicted to yield around 20% less output. But the 100kW threshold acts to promote this less-efficient use of the water resource.

Nor is it credible to assert that this example represents an isolated case. The 100kW limit curve potentially represents widely divergent environmental impacts, even within low head – anything between, say:

0.6cumecs falling 20m at 85% peak efficiency, and
26cumecs falling 1m at 40% peak efficiency

All observations here re 100kW apply similarly to any capacity rating – the flaw is in applying a synchronous measure to a diachronous cost/benefit. There is no defence that all will be fair on balance, as the noted heterogeneity of the sector means that no “typical scheme” exists. The potential result is that schemes rated below 100kW will be licensed in no proportion to evidence-based assessment of their impacts, and will often be inequitably penalised. This both contravenes SEPA’s commitment to proportionate regulation and discriminates especially against smaller applicants wishing to make a legitimate social use of water.

An evaluatory tool developed via SEPA’s research above was not released for use, as further analysis was awaited to legitimate its methodology and numerous assumptions (Badger 2010). Nonetheless, the same research appears to form the basis for the (interim?) regulatory approach which is the subject of this consultation, and with which SEPA will shortly be assessing applications for hydropower CAR licences. If this is the case, the limitations described above cast grave doubt on the fitness of the approach intended to discriminate around 100kW.

A final pertinent concern is the wider implication for the role of the environmental regulator. SEPA’s purpose is to protect the environment and to advise government on so doing. There appears to be an increasing trend for SEPA to assume the evaluation of wider socioeconomic benefits beyond its advisory and regulatory remit. In introducing the SEPA paper discussed above, DEFRA’s Chief Economist recently cautioned that “sloppy pseudo-economics risks bringing us all into disrepute” (Price 2010). Nor does SEPA’s role seem to encompass the authority or expertise to prescribe the operational efficiencies of engineering infrastructure, particularly by imposing questionable generic assumptions which may artificially distort technical and economic choices. Especially in straitened times, and with the prospect of political reductions in public expenditure, it is important for a regulator to focus on its strengths in merit-based decision-making. Simplifying procedures to reduce costs should not introduce disproportionate and perverse outcomes which treat socioenvironmental stewardship as secondary to administrative process.

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