



SNH / SSE JOINT SEMINAR

Hydro Developments and the Environment

Thursday 2nd May 2002 Battleby, Redgorton, Perth

The seminar brought together delegates from SNH, SSE, the British Hydro Association, SEPA, the SE Fisheries (Electricity) Committee and the Association of Scottish Salmon Boards to discuss the contribution of hydroelectric generation to the Government's renewable energy strategy; to develop awareness of the technical and operational requirements of hydroelectric generation; highlight issues and opportunities; outline SNH's and SEPA's approach to hydro developments, and to inform participants of the implications of the Water Framework Directive.

The seminar concluded that there was now a common agenda and purpose and that legitimate commercial interests and environmental concerns should work together within the positive framework of climate change aspirations. Participants recognised that different roles, differences of approach and detail would still remain but that there was much common ground on which to build mutual understanding and trust. Delegates expressed the wish to build on the joint work of the seminar which they recognised as an important step in encouraging effective working in the future.

The seminar highlighted the need for:

- more guidance on scoping and construction phases and consideration of the desirability of indicative guidance on potential hydro locations;
- better links between Energy and Environmental policies at the national level, including more informed discussion of the differing roles and emphasis on renewables, nuclear, thermal generation and energy conservation and the need for guidance from the Scottish Executive on how to give weight to climate change impacts in local planning decisions; and
- good, early and open communication on developments among the SE, statutory consultees, developers and local councillors, to ensure the early identification of major constraints, encourage a willingness to compromise and achieve mutual understanding of the different timescales to which different interests worked.

SEMINAR PRESENTATIONS

Introduction to basics of hydro-electric generation development

(Kieron Hanson/ David Williams, Hydroplan)

This presentation introduced and explained technical aspects of hydropower. A number of concepts were explained to the audience (rather colourfully at times). Audience participation ensured better understanding of the fundamental technical requirements for successful hydro generation and of the implications for the design and function of individual schemes. A number of concepts were explained, including:

- Units of measurement for flow- $1\text{m}^3/\text{s} = 1 \text{ CUMEC}$;
- Pipe sizes - restricted by 'headloss' considerations resulting from resistance; the usual guide is to keep headloss < 10%;
- Different types of turbines, their design and location;
- Generators- their operation and load requirements;
- Storage schemes- control flows and energy production; illustrating how hydro schemes could be operated either for security of supply or for maximum energy production and the implications for drawdown schemes adopted;
- Reservoirs/Dams- *'Never mind the height; feel the width!'*.

The network perspective of Hydro generation

(Iain Tait, Transmission System Manager, SSE)

This presentation outlined the challenges of meeting the government's renewables targets, the possible future role of Scotland in UK and European energy generation, the role and benefits of hydro versus other forms of energy generation, the implications of renewables developments for network upgrade and for future marketing arrangements. A number of issues were addressed:

- the implications of increased demand which is expected to increase at 1-2% per annum and of the renewables targets for Scotland which will require new build (estimates of 2-6 GW to 2010) and which will require a major network upgrade;
- the role of Scotland as the 'power house' of the UK and Europe. The completion of the Scotland-England grid connection is targeted for next year (6GW)- and there is potential for a Trans-European network within the next 10 years;
- the development of renewables and their locations will have a significant impact on the distribution network- 2GW additional power is expected in the North and South of Scotland
- future provision should take into account the need to balance generation and demand and to consider the degree of flexibility to instruction of different forms of generation for both primary (stable supply of electricity to the system) and secondary (e.g. frequency responses, reactive capability) functions. Steam and hydro are recognised as the most flexible whilst wind power and nuclear had lowest flexibility to changes in instructions;

- hydro-generation has advantages in being reliable; predictable (operating experience); responsive; robust; flexible;
- Current work by DTI/OFGEM is examining the operation of the distribution network and the ways in which a large number of small generators may be incorporated into the system.

Hydro developments and the Water Framework Directive: implications and implementation

(David Crookall, SEPA)

This presentation outlined the implications of the Water Framework Directive (WFD), the UK implementation process, the role of SEPA, and the regulatory implications. The main points were:

- The WFD aims to restore all waters to 'good ecological status'- 'good' to be defined at the EU level and will be the subject of consultation;
- Clauses in WFD allow for flexibility and recognition of use of 'heavily modified' waters for public utility schemes of water supply and energy generation. The Environment/ Water Services Bill (s) should ensure that the benefits of hydro power are achieved without undue environmental harm
- Current environmental assessments for hydro are mainly based on hydrological regimes. Impacts from hydro include- catchment transfer, diurnal variations, disruption of sediment flow, barriers to flow, variations in water courses below developments and engineering works;
- The WFD will have particular implications for schemes with storage facilities. These are likely to be defined as heavily modified. Implications for run-of-river schemes will depend on the size of the scheme in relation to flow. Mitigation measures might include setting high flow thresholds to take into account river processes downstream;
- WFD controls will be fully implemented by 2013 with compliance controls introduced for new schemes by 2005. All existing schemes will be assessed between 2005-09. In the meantime, SEPA is developing an interim abstraction policy over the next few years. Interim engineering guidance will be out for consultation later this year;
- SEPA will establish a Scottish Monitoring Strategy with other agency involvement and a SEPA-led consultation on Annexes 2 & 5 of the Directive is expected shortly;
- SEPA is likely to be the lead authority for new control regimes and river basin systems

CASE STUDIES

This section of the seminar involved a number of case studies on operational catchment management.

Tummel Valley (Peter Donaldson, SSE)

This presentation highlighted the differences between individual hydro schemes and emphasised the need to consider management issues on a case by case basis; and to take into consideration the need for schemes to be designed to fit a particular location and appropriate type of generation e.g. high or low head, run of river, storage capacity required and their role within the generating system.

Run of River (Bill Langley, Innogy)

This case study focused on a small hydro river scheme in the Snowdonia National Park. Examples were shown of the mitigation measures which had been used in the design and construction of the scheme to minimise environmental impacts. Measures included: underground pipelines (and overground restoration work); no storage facility; small/low impact powerhouses; and residue flow.

Fish Management (Alastair Stephen, SSE)

This presentation focussed on approaches to fisheries management at a number of hydro schemes. It emphasised the need to base measures on a sound understanding of salmon populations and life-cycle (spawning-hatching-adolescence-adulthood). Separate measures to mitigate risks both upstream (adult salmon) and downstream (adolescents/smolts) were discussed. Mitigation measures which have been used by SSE include fish ladders (Pitlochry), fish paths (e.g. modified waterfalls); monitoring through fish counters and radio-tracking (to prove effectiveness of measures); screening at dams/weirs (pilot scheme to consider effectiveness of bar screens); smolt traps (ensuring safe passage through turbines); and compensation flows. The importance of management strategies for other species, e.g. sea trout was also referred to.

The Fisheries (Electricity) Committee (Bob Williamson)

The Fisheries Committee was established in 1943 to consider hydro scheme proposals, to advise on the effects on fish/fisheries and on ways of minimising or preventing damage. Developers are obliged to provide information to the Committee and to consult the Committee before making applications to develop hydro stations with a capacity of more than one megawatt. The structure of the Committee is currently under review although the functions of the Committee will be retained. The Committee also advises on the effects on fish of the water systems of thermal generating stations.

Hydro-electric developments and natural heritage issues

(Bill Band, Kath Leys, Scottish Natural Heritage (SNH))

This presentation outlined SNH's policy on renewable energy, the process within SNH for consideration of proposed schemes and the requirements for environmental statements submitted as part of the planning process. SNH's policy on renewable energy fully supports the climate change agenda but emphasises the importance of energy conservation and the need to maintain the quality of the natural heritage particularly in relation to designated sites, wildness, landscape, tracks and access, and benefits to rural communities. The importance of the pre-application discussion, and the critical issues to be addressed in the environmental statement were identified. These included the advantage of providing as much information (collectively) as possible at the beginning of the process, and that developers should aim to clearly address any concerns expressed by SNH prior to the formal submission of the statement to the Scottish Executive.

The second half of the presentation outlined the freshwater impacts of hydro schemes. This focused on the issues of sediment continuity, morphological changes, water quality/quantity; designated sites and species. The need for baseline data was

highlighted e.g. fish/ invertebrate species surveys, hydrological data on current regime, and river habitat survey tools. Participants were reminded that SNH has a remit for the conservation of landforms and active processes as well as species, habitats, landscape and recreation issues.

Three types of impacts from hydro schemes could be recognised:

- Direct/ Immediate- changes to hydrology, load, and water quality;
- Indirect/ delayed- changes to channels, standing water, sediment load
- Resultant impacts e.g. on birds-and on the wider terrestrial habitat.

Schemes impacting on Special Areas of Conservation were of particular concern. In considering impacts on the natural heritage, issues of concern are sediment continuity, water quality, water quantity, water temperature, morphological changes due for instance to drawdown effects and impacts on species particularly migratory fish. Baseline data needs cover fish species, hydrological data, geomorphological / bathymetric survey, invertebrate survey, and mammal survey. Information from RHS or SERCON should also be used to identify general characteristics of the water body. More imaginative approach could be adopted to compensation flows as ecological flows to mimic the natural hydrograph.

Six discussion groups examined issues relating to climate change and natural heritage impacts, features of good hydro-electric schemes, the contribution of statutory consultees and developers in achieving good development, ways of making the planning process more efficient and the impacts of large and small hydro schemes. Reports on these discussions noted the need:

- to consider Scotland's role as the powerhouse of the UK and Europe;
- for a balanced approach and for closer integration of energy and environmental policies;
- for the planning system to reflect national objectives;
- for open and honest working relationships to achieve better understanding of differing driving principles and timescales, technical and economic limitations and to identify opportunities for compromise;
- for getting the right scheme in the right place and of addressing aspects of design, site selection, construction methods, methods of mitigation and visual impacts;
- to consider cumulative impacts of small schemes; to develop new design technology to reduce impacts e.g. of storage schemes; to encourage more creative design to reflect local conditions; to encourage developments to be positive features in the landscape and to look for associated opportunities of habitat restoration and recreation provision; and to seek the integration of different types of renewable energy e.g. wind and hydro on the same site;
- to encourage wider networking and communication between parties outside the confines and specific tensions of individual casework.