Forth Energy

1 Prince of Wales Dock
Edinburgh
EH6 7DX

Telephone 0131 555 8870
Facsimile 0131 555 8788

Our Ref: MAS/dmb

3rd November 2010

Ms Lesley McNeil
S36 Team Leader
The Energy Consents/Deployment Unit
The Scottish Government
5 Atlantic Quay
150 Broomielaw
GLASGOW
G2 8LU

Dear Lesley

Proposed Dundee Renewable Energy Plant: Application Under S36 of the Electricity Act 1989: A further point of clarification

Scottish Natural Heritage (SNH) have requested clarification on the potential entrainment or impingement of juvenile smelt and lamprey in relation to our aquatic assessment presented in Volume 2 Chapter 13 Aquatic Ecology of the Dundee Renewable Energy Plant Environmental Statement submitted in support our application dated August 2010.

SNH were seeking clarification on what data was used to demonstrate that smelt and lamprey juveniles could attain sufficient swimming speed so as to avoid entrainment or impingement on the proposed cooling water abstraction infrastructure. This was discussed and agreed with SNH by Dr Peter Henderson of Pisces Conservation, and this letter draws on the original ES to clarify the point raised.

1. **Smelt, Osmerus eperlangus**

The eggs and larvae of smelt, *Osmerus eperlangus*, will not be present in waters where the cooling water will be extracted however clarification is required in relation to Juvenile fish which live in estuaries.

A study of 90 smelt by Sprengel and Luchtenburg (1991)[1] found the maximum swimming speed that juvenile fish can achieve relates to their size (length) by the equation

$$v(l) = -0.16 + 0.24\, x \ln(l),$$

where $v(l)$ is speed in ms^{-1} at length l in centimetres.

If we assume that the smallest juveniles near the intake are 5 cm long their maximum swimming speed will be 0.226 ms^{-1} which is above the maximum proposed intake velocity of 0.2 ms^{-1}. It is concluded that even young smelt will be able to avoid impingement or entrainment on the filter screen.

2. Sea lamprey, Petromyzon marinus

As stated in Chapter 13 of the EIS sea lamprey leave the rivers to return to the sea when they reach about 20 cm in length. Transformed, sea lamprey can swim at in excess of 1.1 BLs^{-1} (body lengths) (Almeida et al 2007)[2] and have burst swimming speeds in excess of 1.5 ms^{-1}.

Newly transformed adults can sustain speeds of 30 cm s^{-1} (Beamish 1974)[3]. Therefore juvenile lamprey moving through the estuary to feeding grounds at sea are capable of swimming speeds in excess of 0.2 ms^{-1}. It is concluded that even juvenile sea lamprey will be able to avoid impingement or entrainment on the filter screen.

3. River lamprey, Lampetra fluviatilis

Juvenile river lamprey grow to about 10 cm in the rivers before they migrate to sea, where they spend one to three years feeding, adult river lamprey are about 30 cm in length.

We could not find any reliable data on river lamprey swimming performance, however, at transformation when they enter the estuary their swimming ability is similar to that of the sea lamprey for which newly transformed adults can sustain speeds of 30 cm s^{-1} (Beamish 1974). There is no doubt that juvenile river lamprey have a burst speed in excess of 0.2 ms^{-1}.

We have copied this letter to Dundee City Council, SEPA and SNH, and will also place it on our website www.forthenergy.co.uk

We have also attached an image of a typical water abstraction point with screen.

Yours sincerely

Michaela Sullivan
Head of Planning

cc: Charlie Walker, Dundee City Council
Ian Buchanan and Angela Burke, SEPA
Niall Corbett and Erica Knott, SNH

[1] Reference Sprengel, G. and Luchtenburg, H. (1991) Infection by endoparasites reduces maximum swimming speed of European smelt *Osmerus eperlanus* and European eel *Anguilla Anguilla*. Diseases of aquatic organisms, **11**, 31-35.

[2] Almeida, P., Póvoa, I. & Quintella, B. R. (2007) Laboratory protocol to calibrate sea lamprey EMG signal output with swimming. Hydrobiologia,582, 209-220. doi.org/10.1007/s10750-006-0539-8.

[3] Beamish F.W. 1974. Swimming performance of adult sea lamprey, *Petromyzon marinus*, in relation to weight and temperature. *Transactions of the American Fisheries Society*
103, 355-358.