EAST HERTS COUNCIL

EXECUTIVE - 10 JANUARY 2012

REPORT BY EXECUTIVE MEMBER FOR COMMUNITY SAFETY AND ENVIRONMENT

CASTLE WEIR MICRO HYDRO SCHEME - UPDATE

WARD(S) AFFECTED: Hertford Castle

Purpose/Summary of Report

- To present an update on the capital investment proposal for the installation of a micro hydro generation scheme at Castle Weir, Hertford.

RECOMMENDATION FOR EXECUTIVE: that:	
(A)	**the revised business case for the design and build of a micro hydro scheme at Castle Weir, Hertford, set out within the report be approved.**

1.0 Background

1.1 The Executive of 1 December 2010 considered and agreed a report on the business case for the installation of a micro hydro scheme at Castle Weir, Hertford, and delegated the way to proceed to the Director of Customer Services in consultation with the Executive Councillor for the Environment. A sum of £165,500 was agreed for inclusion in the Council's capital programme for 2011/12 on the basis of invest to save.

1.2 The report below aims to update the Executive on the scheme and sets out a revised business plan following delays in achieving agreement and additional specification requirements

principally from the Environment Agency in obtaining permission to undertake the works.

2.0 **Report**

2.1 As the Executive will be aware hydro power systems convert potential energy stored in water at height to kinetic energy through a turbine to produce electricity. A feasibility study was undertaken for the River Lea and specifically Castle Weir which is close to Hertford Theatre. This indicated that through the installation of a small scale micro hydro system a significant element of the electricity demand for Hertford Theatre can be generated.

2.2 There are two principal types of hydro system- Kaplan and Archimedes screw. Technically the Kaplan type remains the favoured option for this site and typical installation costs for a suitable basic system were estimated at £165,500 including basic construction works, with this sum being agreed within the Capital Programme.

2.3 At the current time certain renewable energy generation schemes attract what are known as 'Feed in Tariff payments'. Whilst these have been much in the press recently with regard to significant Government cuts to those payments to be made for solar PV renewable systems installed after mid December 2011, no such cuts have been announced for tariff payments relating to micro hydro systems. Indeed it is officers' understanding following consultation with DECC that no amendments to the hydro tariffs are planned with the exception that there may be a relaxation in the use of approved contractors. Therefore the tariffs will continue to make the installation of a Hydro scheme at Castle Weir significantly financially attractive and potentially indeed more so with ever increasing energy costs.

2.4 In summary Feed in Tariffs allow the generator, in this case East Herts Council, to be paid a set sum for every unit of energy generated for their own use (20.9p per kW), plus

receive an additional payment of 3.1p per unit exported to the grid (i.e. not used on site), and of course benefit from the saving in actual electricity not purchased from the national grid. The payments are on a set basis for a full term of 20 years and significantly continue to be linked to the Retail Price Index (RPI) and adjusted for inflation annually. The payment expected from the project is set out in **Essential Reference Paper "A"**.

2.5 The initial indicative timetable presented to Executive previously proposed that works for the installation of the hydro scheme would take place during summer 2011. However, serious delays have been experienced due to lengthy and protracted ongoing negotiations with the Environment Agency (EA), whose authority is formally required before works can start. Whilst it was appreciated that EA authority was required, officers had been advised that this should normally take a couple of months. However, the project has been caught by revised fish and eel regulations which came into force at the end of 2010, as well as a stringent approach to interpretation of the UK official guidance on hydro schemes by the EA regional office.

2.6 Over the last few months progress in negotiation has been made and numerous meetings and discussions held with various sections within the EA to expedite the process. However, the EA is continuing to make certain demands in relation to the design of the scheme which have an effect on the turbine specification. The procurement process has commenced with potential bidders selected through a pre-qualification process, in accordance with Council procurement rules. However, Environment Agency requirements have meant that the tendering process has had to be halted until the revised specification can be agreed.

2.7 Many of the EA requirements are very technical in nature and each variation has a potential knock on effect to another part of the specification. For example the scheme incorporates an auto trash screen cleaner, to remove debris before it reaches the turbine. The initial specification for the mesh size was

25mm. EA requirements mean that this has had to be halved, resulting in a reduced velocity trough the turbine, along with the potential likelihood of more debris being caught in the screen. This has required officers to consider up rating the turbine from that originally proposed of 12kW to 15kW in order to maintain the viability of the system. However, a larger turbine is more expensive, although it may have the advantage in generating slightly more electricity which will also give rise to increased tariff payments, as explained in **Essential Reference Paper "A"**. In addition it has also meant that the auto trash screen has had to be upgraded at additional cost and will operate at an increased rate. Following this, at the end of November the EA further requested (amongst other items) that the trash screen be oversized by 10% to accommodate any blockages and to permit increased escape velocities and an enhanced 'bywash' channel be incorporated rather than an 'eel pipe'. As each change impacts on other parts of the specification and as each piece of equipment is individually constructed any changes cause considerable difficulties in finalising costings. Officers believe that many of these requirements are not necessarily required given the location of Castle Weir and local knowledge of the site, however, it is emphasized that everything possible is being undertaken to achieve the correct balance in terms of negotiation relating to site design and specification.

2.8 Officers have also been in negotiation with the EA regarding flood risk modeling. It is the opinion of East Herts Engineering Section that the hydro design does not increase flood risk due to the chosen location and the large adjacent flood relief weir. However, after protracted discussions on this point it is officers' opinion that in order to expedite the matter of obtaining the necessary licence from the EA, that a Flood Relief assessment must be undertaken. This is in essence a study, involving a range of possible scenarios, with the objective of assessing whether the proposal impacts upon flood risk. Officers have reached a revised agreement with the EA that only 3 scenarios now need to be addressed and that East Herts will pay for the EA to undertake this work. We are currently waiting to hear the EA's timetable for this work, but in

theory it should be possible to complete this in the New Year.

2.9 Alongside permission from the EA, planning approval is also required and as Members will be aware the site is in a conservation area. Detailed discussion have been held with planning officers on the design of the plant room for the turbine, in order to ensure the least visual intrusion, as well as enhancing the aesthetic appeal of the existing weir flow. The current thinking is a small flat roofed structure incorporating a green roof. The footprint of the turbine has been moved slightly away from the bridge by Castle Weir by one metre to improve visual sightlines and meet EA requirements. One aspect that planning officers wished to be considered was whether audible noise would be generated by the turbine. Whilst no system can be totally silent, the Kaplan design is inherently quiet (much more so than an Archimedes screw system). The Executive Member for the Environment visited, along with officers, "The Mill at Sonning", near Reading which has a similar size and design of turbine as that proposed at Hertford. It was apparent from the site visit just how relatively quiet the system actually is – quieter than the existing water flow at the weir site adjacent to Hertford Theatre. Also as the turbine will be enclosed in a plant building this will afford further noise amelioration.

2.10 The visit to the "Mill at Sonning" was also useful in that it allowed discussion with the site's operator, who confirmed that the turbine, which has been in operation some 5 years, has worked much better than expected generating a very healthy financial return for their organisation, along with considerable and ongoing positive media interest. Officers have also discussed experience of turbine development at other lowland river sites that are in the process of installing a turbine and they are also experiencing lengthy delays in achieving formal consents.

2.11 The revised full payback of the planned system is explained in **Essential Reference Paper A**, but is estimated to be between 8.6 and 8.9 years in terms of simple payback. This is based on increased tariff payments of £24,600 due to the enhanced

turbine specification and electricity usage of Hertford Theatre. It is highly likely that over time energy costs will continue to rise, meaning that the return from the scheme will become greater. All costings are of course estimates and subject to final tender prices.

2.12 A summary of the costs and income from the scheme is shown at **Essential Reference Paper 'B'**. In addition the Director of Internal Services has undertaken a net present value (NPV) and 'sensitivity analysis for the project using a range of scenarios based on extreme, if unlikely variances. This type of analysis produces slightly different (yet similar) results. This is appended at **Essential Reference Paper 'C'**. The NPV analysis including maintenance costs indicates a payback after year 9. Event in a (highly unlikely) worst case scenario (such as a 50% contract payment reduction or a 20% overspend in capital and much higher maintenance costs) the project would still recover all its costs and generate surplus income from year 13.

2.13 If the Executive is minded to accept this revised business case then, it is anticipated that in terms of the *best possible* timeframe the planning and final tender stage could start in March 2012 (if final specification agreements and licences are in place with the EA), with the intention to commence on site in September/October 2012 assuming all the necessary steps progress smoothly. However, the EA has indicated that river works should generally be undertaken during the low flow periods of the late summer/early autumn. Clearly if this window is missed then it may not be possible to undertake full installation works until the following year, though this may be negotiable.
At the time of writing clarification is awaited from the EA on their timetable for the Flood Risk Assessment and also their agreement to the various formal consents which are still being negotiated. Any update will be reported at the meeting.

Activity	Best Possible Indicative Date
Environment Agency Consents received	Early March 2012
Planning application submitted	March 2012
Out to tender	March 2012
Planning Consent Granted	June 2012
Tender Award (subject to Planning approval)	Mid June 2012
Start on site –assuming 8 week average lead in for turbine	Early September 2012
Works period	September/October 2012
Commissioning	Late October/November 2012

Background Papers
None

Contact Member: Councillor Malcolm Alexander, Executive Member for Community Safety and the Environment

Contact Officers: Cliff Cardoza, Head of Environmental Services, ext 1698

Report Author: David Thorogood, Environmental Coordinator

ESSENTIAL REFERENCE PAPER 'A'

Contribution to the Council's Corporate Priorities/ Objectives *(delete as appropriate):*	**Pride in East Herts** *Improving standards of the built neighbourhood and environmental management in our towns and villages.* **Shaping now, shaping the future** *Safeguard and enhance our unique mix of rural and urban communities, ensuring sustainable, economic and social opportunities including the continuation of effective development control and other measures.* **Leading the way, working together** *Deliver responsible community leadership that engages with our partners and the public.*
Consultation:	Consultation with the Environment Agency is underway. Local residents will be consulted through the usual planning processes.
Legal:	No specific implications
Financial:	• *Estimated costs are based on the installation of a 15kW Kaplan turbine system producing 85,000kW per year (based on current EA reduced flow specification).* • *In the 12 month period September 2010 to August 2011 Hertford Theatre had an annual electricity consumption of 286,000kWhrs at a cost of £31,000 including supply charges.* • *Current unit rates for electricity are 7.895p day and 5.212p night.* • *Electricity consumption at the Hertford Theatre will vary significantly both seasonally and across the day. The Castle Weir hydro will generate electricity continuously (subject to river levels). At off-peak times the hydro may well generate more electricity than Hertford Theatre can use, and this will be fed*

	into the Grid for which an additional payment of 3.1p per unit will be received, although this has been excluded from the tariff calculations. On average, it will deliver approximately 30% of the annual electricity demand of Hertford Theatre based on recent usage. • *The annual value of electricity produced by the turbine would be approximately **£24,600**, dependant on negotiation with the utility company partner through whom tariff payments are accessed, with <u>possibly</u> an additional £1200 including any export tariff payment. Note this additional payment has been <u>excluded</u> from the payback assumptions below.* • *Total value of tariff plus estimated electricity saved over 20 years is **£492,000*** • *Annual maintenance is currently estimated at £800, although this will be funded from existing budgets, as trash screen cleaning is already carried out at the site.* • *Capital costs of the turbine and plant are now estimated at £184,000 (including £15,000 contingency) due to the enhanced specification. In addition an estimated £27,000 to £35,000 is required for civil works namely the plant house and associated infrastructure giving an estimated total capital cost of £211,000 to £219,000. This equates to an approximate payback of 8.6 to 8.9 years using simple payback <u>excluding</u> any potential benefit from the export tariff.* • *Other project costs include £320 for Environment Agency Licences plus local newspaper advertising, £2500 EA Flood Risk Modelling and costs of the initial planning application. Licences may need to be renewed after 12 years, but officers intend to seek life time consent as a matter of course. A provision for these is <u>included</u> in the capital costs shown* • *Sensitivity Analysis*

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The table below details the impact upon the payback period in the event of a 10%, or 20% variation in costs in either direction.
<table>
<tr><td></td><td>0%</td><td>-10%</td><td>+10%</td><td>+20%</td></tr>
<tr><td>Basic Construction Works</td><td>£211,000
8.6 yrs</td><td>£189,900
7.7 yrs</td><td>£232,100
9.4yrs</td><td>£253,200
10.2yrs</td></tr>
<tr><td>Enhanced</td><td>£219,000
8.9yrs</td><td>£197,100
8.0yrs</td><td>£240,900
9.7yrs</td><td>£262,800
10.6yrs</td></tr>
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A more detailed Net Present Value calculation (Essential Reference Paper ‘C’ refers) indicates a base case payback which includes additional maintenance, after year 9, and a worst case extreme scenario, which includes a 50% reduction in feed in payments, of 13 years. Note if energy prices continue to rise, as would seem likely then clearly the value of electricity generated by the turbine and which is used to offset grid electricity will assist with reducing the payback period.

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<tr><td>Human Resources</td><td>None</td></tr>
<tr><td>Risk Management:</td><td>No specific implications</td></tr>
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ESSENTIAL REFERENCE PAPER 'B'

Summary of Financial Implications and Payback Period

Capital

Cost of scheme (including £15,000 contingency)	£211,000

Revenue

Income from Feed In Tariff (Note the tariff will be adjusted for RPI annually)	£17,800
Electricity Generated and offset	£6,800
Total Annual Income	£24,600

Payback Period	**8.6 years**

Additional income generated after full payback over the 20 year tariff period = £280,500

ESSENTIAL REFERENCE PAPER 'C1'

Hertford Theatre Hydro Electricity Scheme NPV and sensitivity analysis

Base Case

The base case uses current prices for all costs and income assuming that future maintenance costs and income from feed in tariff and electricity increase in line with inflation at an assumed 2.5%.

Existing projects have incurred virtually nil maintenance costs in the first 5 years. However, the analysis below assumes some level of maintenance at 10 year intervals.

NPV turns positive at the start of year 10 and returns £150k over a 25 year period.

Scenarios considered for sensitivity testing

The following illustrates the implications of some extreme if unlikely variances. Less extreme variances would produce outcomes some where between the base case and the illustrative case.

1. The first scenario considers the implications should the capacity to generate electricity be 20% below forecast.

   NPV turns positive mid way through year 13 and returns £84k over 25 years.

2. The second scenario considers the implications of electricity prices increasing at a constant 3% in real terms.

   NPV turns positive in the latter half of year 8 and returns £282k over 25 years.

3. The third scenario considers the implications of a world wide depression such that feed in tariffs were renegotiated or a 50% reduction in value imposed contrary to contract. This change to take effect from year 4.

   NPV turns positive in the latter half of year 13 and a return of £66k is

made over 25 year.

4. The fourth scenario considers more significant maintenance escalating at 5 yearly intervals and equivalent to 50% of the capital costs over the 25 years. NPV turns positive in year 10 and returns £95k over 25 years.

   In these circumstances a 20% cost over run on capital would defer to year 13 the time to reach a positive NPV.