

Hexham River Hydro

1. The project

Hexham River Hydro (HRH) is a joint initiative by [Hexham Community Partnership](#) (HCP) and [Transition Tynedale](#) (TT), with the full support of Hexham Town Council. We aim to develop a 100 kW community run-of-the-river hydro power generation plant on the River Tyne. Our objective is not just to generate renewable electricity and reduce CO₂ emissions, but to use the generation facility as an education and awareness-raising tool for residents and visitors alike, and to use the income to secure long-term funding for community activities in and around Hexham and its environs.



The Tyne at Hexham Bridge (Google maps)

Our scheme will reduce Hexham's CO₂ emissions by up to 400 tonnes/year, will demonstrate that generating renewable electricity is compatible with protection and enhancement of the amenity value of a major river, and will serve as a key educational tool for schools, local groups, individuals and tourists alike. HRH is the first community hydro project in our region and means new generation on the Tyne in many ways: electricity generation; social regeneration; idea generation; economic development; education; and tangible inspiration for all generations in our region, young and old.

2. Specific objectives

- To develop a hydro-electric generation scheme thus securing long-term generation of renewable electricity from the River Tyne at Hexham.
- To utilise the resulting income to secure long-term funding for the low carbon and regenerative activities of HCP.
- To use the hydro-electric generation facility as an educational and an environmental awareness-raising tool, both for residents of the area and visitors to Hexham.
- To promote community engagement in securing a low carbon future.
- To demonstrate that generating renewable electricity is compatible with protection and even enhancement of the amenity value of a major river
- To attract more visitors to Hexham (hydro power schemes – even small ones – have proved to be popular visitor attractions elsewhere).

3. Background

It is now widely accepted that the empirical evidence of increasing global temperatures is the cumulative effect of anthropogenic greenhouse gas emissions (GHG). There is currently a global challenge to reduce GHG to mitigate against the effects of climate change and limit the temperature rise to 2°C, in line with the Copenhagen accord goal. In 2008 the UK Climate Change Act set legally binding targets for the UK to reduce greenhouse gas emissions by at least 80% by 2050, set against a 1990 baseline. To assist these reduction targets the Government has pledged to generate 15% of all energy consumed, by 2020, from renewable sources. Renewables currently supply only 6.7% of total UK electricity demand.

4. What we are planning and why

We plan to install a 100kW Archimedes screw turbine on the River Tyne, immediately downstream of Hexham Bridge on the south side (right bank) of the river. We have chosen to develop a hydro-electric project here because:

- The Tyne valley has a major watercourse running through it with significant hydro potential along its length, particularly at the point where it passes through Hexham, with the drop in level that takes place around Hexham Bridge;
- The Tyne flows through Hexham very close to its town centre, thus enabling us to develop a community hydro power scheme that can be physically very close to the heart of the residential and business community;
- Hydro power is a key part of our heritage in Northumberland: Cragside (now owned by the National Trust) at Rothbury was the first house in the world to be lit by hydro-electricity, over 130 years ago;
- Developments in the use of Archimedes screw technology for hydro power generation over recent years mean that we can install a fish-friendly hydro scheme on this important salmon fishing river;
- Hydro power is one of the least controversial forms of renewable energy in terms of visual intrusion in the landscape, which is an important factor locally.

We have chosen to develop hydro power rather than wind because we don't have access to a local site suitable for wind power, and because wind energy has a history of being a highly emotive issue in Northumberland. We've not chosen solar because we can generate more energy from hydro power (and hence more income to support community projects in Hexham) from the hydro Feed in Tariff (FiT) than would be possible for a solar photovoltaic system mounted on any building available to us.

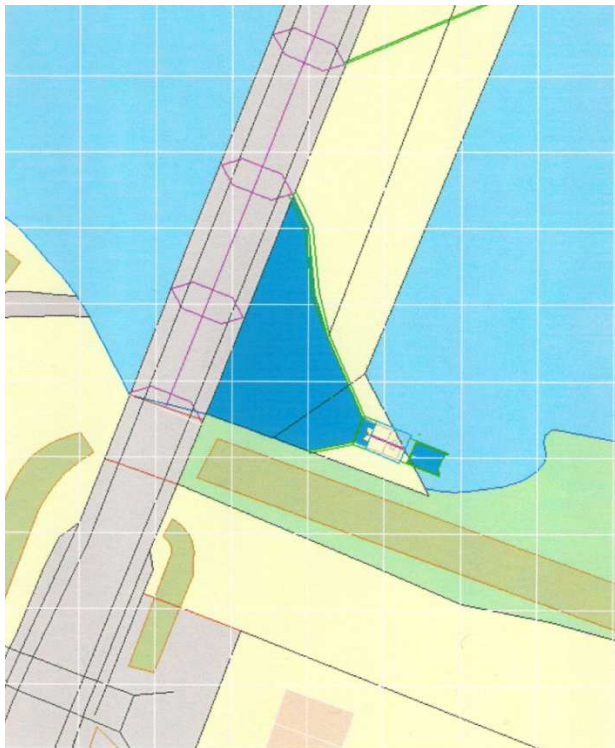
We have chosen to use an Archimedes screw turbine because this type of turbine is the most effective economic and technical solution for low-head sites, and is generally acknowledged to be more fish-friendly than other turbines – an important consideration on England's best salmon river

5. Design options

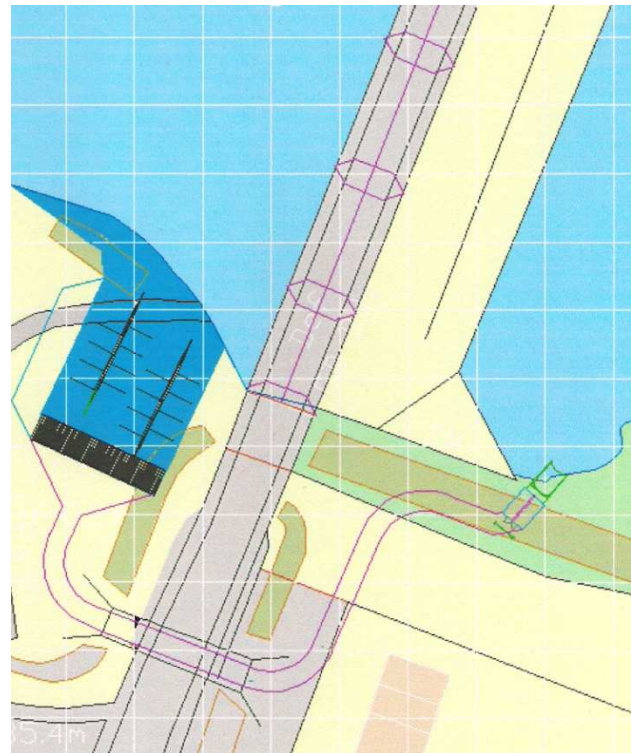
A feasibility study carried out for us by [Inter Hydro Technology](#) of Kendal, Cumbria concluded that, despite potential difficulties presented by the proximity of 'the ancient structure that is Hexham Bridge' and the fact that the Tyne is a major fishing river, there is the potential for a hydropower generation scheme at Hexham Bridge. The study identified two design options, both of which are technically and financially viable in outline.

The first option would capture flows from the Tyne that flow into the two southernmost arches of Hexham Bridge. The existing structure would not be altered on the upstream apron or within the arches. On the downstream apron a high 'crump' weir would be constructed on top of the apron; the

apron not being cut or otherwise damaged in any way. The crump weir was chosen because it presents a sloping wall on its upstream and downstream faces which reduces the overturning effect of increasing river flows. The weir would abut the bridge piers on their downstream face and have a horizontal top, creating a head pond tapering from approximately 30 m wide at the entrance to approximately 4 m wide at the tail where the water enters the turbine. Water discharged from the turbine would be co-located with the entrance to any fish pass installed by Tyne Rivers Trust (see below). This option could generate around 670 MWh renewable energy each year, equivalent to a CO₂ saving of 370 tonnes/year.



Option 1



Option 2

The second option would involve the creation of a riverside intake upstream of Hexham Bridge, with a bay being created to house screens to lead the water into a buried pipeline to be laid from the intake chamber to the turbine. Water would be conducted via a large diameter buried pipeline passing under the A6079 making use of the flood relief arch, currently a little used walkway under the road, always maintaining a slope sufficient to deliver the design flow to the turbine on the downstream side of the bridge. On the downstream side of the bridge a powerhouse would be built into the flood bank before being partially buried in order to repair the flood bank. Water abstracted upstream would be discharged on the downstream side adjacent to the proposed fish pass entrance. This option could generate around 720 MWh renewable energy each year, equivalent to a CO₂ saving of 400 tonnes/year.

The relative merits of the two options can be summed up as follows:

Option 1 (fed by weir on bridge apron)	Option 2 (fed by intake above bridge)
<p>Advantages: Simpler design, cheaper to construct Slightly shorter payback time</p>	<p>Advantages: Generates more power from same specification turbine Overall environmental impact likely to be lower Intake pond could provide extra amenities for Tyne Green</p>

<p>Disadvantages:</p> <p>May not be able to operate at full capacity during fish migration season</p> <p>Greater risk of flood damage, both during construction and during operation</p> <p>Construction work mostly in-river, so limited to summer months</p>	<p>Disadvantages:</p> <p>Construction involves tunnelling, so would cost more and probably take longer</p> <p>Mature trees might need to be felled to make way for intake pond</p>
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6. Benefits of the scheme

For the first 20 years of the scheme we expect to receive the appropriate Feed In Tariff for a hydro scheme of this size. For the remainder of the life of the scheme we expect to receive income from the sale of the electricity we generate. We expect the scheme to generate an annual surplus of *at least* £30,000 per annum, to be spent on community projects in and around Hexham. This will be primarily by helping to secure HCP's long term future, enabling it to continue and expand the programme of activities and projects that it delivers in the town. These activities include the promotion of environmental awareness and the environmental sustainability of the town, as well as continuation of projects supporting tourism, arts and culture. The income received will allow the partnership to continue its work with partners in areas of the town experiencing high levels of social and economic deprivation.

An example of the work of HCP in this area is the Hexham East Regeneration project. Based in a community house in the east of the town this was launched in July 2008 with funding from the social housing landlord and the local authority. Aiming to increase community engagement and empowerment, this has led to a wide range of initiatives in the area. It has enabled the opening of a branch of the Northumberland Credit Union manned by volunteers which has quickly achieved high levels of membership. An Electricity Monitor Library (developed in collaboration with TT) has helped to address the issue of fuel poverty in the town. Work on green spaces and community gardens in Hexham East – including the garden of the community house itself – was recognised as the Regional winner of the Social and Community section of the Action for Market Towns Awards.

Another service offered from the community house in Hexham East in 2010 has been an employability advisor. The experience of this project has confirmed that the population of these areas in the town are extremely hard to reach and resistant to traditional and mainstream forms of support. More personal approaches, aimed at increasing local residents' self-esteem and confidence by helping them to succeed in delivering small projects, have met with more success. After an interim evaluation of the Hexham East project in 2010, a further 2 years of funding have been secured. By providing greater financial security for HCP, the hydro scheme will enable the Hexham East project to continue beyond 2013 and expand so that it can deliver similar support to other deprived areas of the town.

HCP is also active in developing the cultural and artistic life of the town for the benefit of its residents and as means of welcoming more visitors and supporting the economy of the town. It runs the local cinema as a social enterprise, providing employment and making a major contribution to the cultural and social life of the town. It works closely with the other organisers of festivals and events and attractions in the town, as well as organizing a programme of town centre events throughout the year – for example the Hexham Eating Festival in September, which (in partnership with the Hexham Farmers' Market) provides a show case for local producers. The Partnership is currently exploring the potential to develop one of the former district council office buildings in the centre of the town as a community arts facility and budget hostel accommodation – identified as a gap in current provision.

Finally, HCP has for many years played an important role in the town as a first point of community consultation on major development and regeneration projects in the public realm, for example the

redevelopment of the Bus Station and regeneration of Tyne Green Country Park. Although historically this role has been funded and supported by the local authorities themselves as finances become more stretched it is likely that this work will cease unless the Partnership itself is able to support this function through projects such as HRH.

A much smaller portion of income from the scheme will fund Transition Tynedale projects, particularly those run by the Transition Tynedale Energy Working Group. This group drives both energy saving and energy generation projects, including the running of two Green Energy Fairs in Hexham, establishing mobile Electricity Monitor Libraries, and gaining funding for a wind turbine feasibility assessment for a sports group in North Northumberland. HRH is now the single biggest focus for TT's Energy Working Group.

A new project that the income will fund will be to join up our Electricity Monitor Libraries with the hydro scheme. We plan to run 'electricity weight watchers' groups to further raise awareness about ways to reduce consumption and see how many households the hydro scheme could power if local households can further reduce electricity consumption. Households will be encouraged to borrow monitors and experiment with these to see how they can reduce their household electricity consumption. Community evenings will be held for people to share the ways they have reduced consumption. Technical enhancements can then be made e.g. wifi-ing the consumption information and using the results to tell people 'how much of the hydro electricity you have benefitted from' (acknowledging that this is theoretical, not necessarily a direct link: the hydro scheme will feed into the grid, and householders' electricity will continue to come from the grid).

The hydro scheme itself is likely to become a new visitor attraction for the town, with knock-on benefits to local businesses. The combination of the hydro scheme and the new [fish pass](#) planned by [Tyne Rivers Trust](#) are likely to be of great interest to many visitors and river users.

Other community groups will benefit from the skills and experience gained from creating Tynedale's first successful community renewable energy project. The core team are already sharing learning and providing advice and guidance to other groups e.g. in Haydon Bridge and the West FoNDT renewables network. If design option 2 is chosen, the local canoe and rowing clubs could benefit from new facilities for canoe portage and static in-river rowing training.

Finally, by helping to reduce the UK's CO₂ emissions and dependence on imported fossil fuels, our hydro scheme will make a small but measurable contribution towards improving the environment, as well as meeting future renewable energy targets.

7. Environmental considerations

We plan to commission detailed environmental impact assessment work as a key part of the detailed design phase. From work completed to date, we expect the environmental impacts the project will need to address will include the following:

- Passage of fish (coarse and game), in conjunction with the new fish pass being constructed by Tyne Rivers Trust and their contractors
- Protection of other species including bats and otters
- (Potentially) Protection of certain tree roots and/or replacement of any trees that could be cut down
- Avoidance of any disturbance or impact on any Japanese knotweed that may be in the construction zone
- Visual impact (e.g. the power house structure will likely need to be clad in material appropriate to the setting of Hexham Bridge)
- Any potential noise pollution
- Temporary water or land pollution that could be caused during construction.

We will commission an appropriately qualified body or bodies to conduct a formal environmental impact assessment and related surveys. The findings from these will be incorporated into the detailed

design, construction management and in-life management plans. Particular emphasis will be given to the construction method statement to ensure no impact on the historically important Hexham Bridge.

8. Community support

Hexham is a small market town with a population of about 11,000. The initiators of this project – HCP and TT – represent over a dozen major community groups within the town, with over 350 members between them. Hexham Town Council have pledged their full support. We've had messages of support from Hexham MP Guy Opperman, North-East MEP Fiona Hall and several Northumberland county councillors. And we're working closely with local stakeholders (see below) to make sure that all interested parties' views are taken into account in the development.

The project has received considerable and positive coverage both in the regional (*The Journal*) and local press (*The Hexham Courant*). We regularly receive positive feedback from local residents at the TT stall in the farmers' market, and at TT open meetings. In the first round of the energys^hare competition for grant funding in June, HRH received more votes than any other community group in the entire country.



HRH supporters near the site of the proposed hydro scheme

Stakeholder consultation was carried out in July and August 2011 on the two alternative design options. Letters were sent to around 35 stakeholder organizations, summarizing of the two design options and inviting feedback. In addition, two public drop-in sessions were held in August 2011 at the Queen's Hall in Hexham. The sessions were attended by approximately 50 members of the public and stakeholders. Of those who expressed a firm opinion on the two options (several organizations felt they needed more detailed information before they could comment), 2 were in favour of the first option, 8 were in favour of the second option, 9 were happy with either approach, and 3 were unhappy with both options. Points made by individual respondents included:

- The scheme has the potential to demonstrate the benefits of renewable energy;
- Its visual impact appears to be minimal;
- It raises the possibility of improving facilities for canoeists;
- More information is needed on its potential environmental impact;
- It's important to ensure compatibility with Tyne Rivers Trust fish passage proposals;
- We have concerns about the potential impact on river flows and fish migration;
- Local contractors should be used to carry out the work.

9. Sources of finance

We aim to fund the development of our hydro scheme from three main sources:

Grants – we’re planning to raise as much money as we can through grants, though obtaining grant funding for renewable energy schemes in the UK is becoming increasingly difficult. We’ve already attracted funding from the renewable energy company Vattenfall, and (as of November 2011) are currently in the final round of British Gas’ [energyshare](#) competition for renewable energy projects. Hexham River Hydro is now in the [Carbon Leapfrog](#) project portfolio, which means we will receive substantial amounts of professional support for free from top class professional firms. Further grant applications are planned in the near future.

Shares – TT, as one of the founding partners of HRH, has consistently advocated the use of a share issue to enable members of the local community in Hexham, Tynedale and West Northumberland to invest in this ground-breaking renewable energy project in the heart of their community. The purpose of enabling local share ownership is far broader than raising financial investment. In attracting community investors, incentives other than individuals’ own financial return come into force. These incentives include doing good for the community and sharing ownership of a community asset. Our share issue is likely to be through a Community Benefit Society structure, which prevents commercial enterprises from taking over the society, and enables individual shareholders to exercise real power in the way the scheme is run. Use of share issue funding within a Community Benefit Society structure therefore has financial as well as social advantages for the project.

Loans – although we plan to minimize the amount of loan funding required, because this is the most expensive way to raise capital, we shall inevitably need some loan funding to ensure that we can meet all our development costs. A number of ‘green banks’ and similar lending schemes have been set up in the UK to reflect the opportunities now available with financially viable renewable energy projects because of the implementation of FiTs. A number of potential lenders have already been identified.

10. Partner organizations

[Hexham Community Partnership](#)

HCP is a development trust established in 1998 to support the physical, social and economic regeneration of the town. It is currently applying for charitable status. One of the principles underlying its work is partnership development within and beyond Hexham – working with local individuals, voluntary and statutory organisations and businesses to help further its aims. Principal objectives include:

- the promotion and organization of cooperation for physical and social regeneration;
- the promotion and support of economic and employment activity;
- the provision, maintenance and improvement of public and recreational amenities and sites of historical or architectural importance;
- the promotion and development of environmental sustainability

Current activities include:

- operating a full time community cinema as a social enterprise;
- managing a community regeneration project in an area of town which suffers from high indices of multiple deprivation;
- working with a range of community organisations to develop and promote the town as a visitor destination, and delivering a programme of public events in the town centre, to support the economy of the town and engage the whole community.

[Transition Tynedale](#)

TT is a local not-for-profit group that is a part of the national [Transition Towns](#) network. It aims to raise awareness of peak oil and climate change in an era of economic contraction and to encourage and support individuals and communities to respond to these three challenges with inspiration, creativity and an awareness that a lifestyle based on using less fossil fuel can actually be better, more fulfilling and more resilient.

TT has been delivering projects in Hexham and the surrounding area since 2008. Our delivered projects have included:

- two Green Energy Fairs;
- three Electricity Monitor Libraries in the Tyne Valley, at Hexham, Prudhoe and Ovingham;
- a 'Rubbish Event', making art from rubbish;
- a TT film;
- two community gardens;
- more than ten events raising awareness about peak oil and climate change.

Previous joint initiatives with HCP have included the introduction of an Electricity Monitor Library in Hexham and development of community gardens.

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