
The River Thames at Abingdon in Oxfordshire, England.

The Abingdon Hydro story

Renewable energy was viewed as just one benefit to be derived from a proposed small hydro scheme in Oxfordshire. Richard Riggs gives a very honest account of how the Abingdon Hydro team tried, and failed, to develop a true community scheme which had a little something for everyone.

The Abingdon Hydro story started back in 2010. Abingdon on Thames is a fairly prosperous market town of about 35,000 people, near Oxford in England. We were a spin off from one of Oxfordshire's many Community Action Groups, trying to build awareness and action on climate change. In a fair sized town like ours, how do you make a difference? I don't remember where the idea of generating hydro power from the River Thames came from, but it fitted as a flagship project – something very visible in a public place.

At that time, opposition to action on climate change was still quite vocal but government had passed the Climate Change Act, and was introducing feed in tariffs to encourage investment in renewable energy. I started talking to people about the idea and gradually building interest. So in 2010 seven of us decided to try to make it happen.

We formed a community benefit society because it was important that it should be for the town rather than for ourselves. An early contact, Brendan Barrow from ewaterpower Company, a consultant who wanted to encourage community groups, helped us understand the options. Detailed long term flow and level records exist for the River Thames, so good estimates can be made of the expected output. The drop at Abingdon weir is about 1.8m, and the plan that emerged was three Archimedes screws (required by the Environment Agency for their fish friendliness) generating nearly 190kW, producing about 700MWh per year.

The EA would not permit the screws in the weir because they needed all the gates for flood control but they accepted a position next to the weir. This took water from a mill stream that starts by the weir and is in the corner of a public park owned by the District Council, close to town. The Thames Path runs over the weir and past the site. Many people pass by and stand on the weir and watch the water flowing through it – how much more if we provided a viewpoint over the screws, where they could watch them turning and look out over the river?


The Abingdon Hydro team after the planning committee meeting.

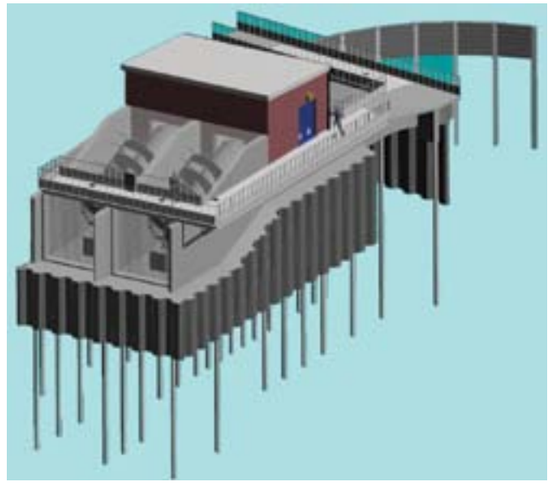
Early days

We made mistakes and learned as we went. There were two main pathways to follow. One was building up awareness and a mailing list, by taking part in all the local events we could. The other was the permitting, starting with the Environment Agency licence, and then the planning permission.

This needs money. Early projects had received grants to get started but grants were drying up, so we offered the mailing list 10% extra shares if the share offer went ahead. The money was totally at risk but it came in, and we stopped the offer at about £50,000. The project sold itself because it was about vision: not just a long term investment in green energy, but a close up view in an easily accessible public place, an educational resource, a tourist attraction, profit going back into community projects, and more.

Permissions

A project in a public place, occupying both land and water, involves many interested parties. In those early days hydropower was rather new to the Environment Agency. They were very cautious, and under pressure from the Angling Trust, who opposed all hydro projects. It made the EA very protective of the weir pool, so they



Above: **The proposed fish pass.**
Right: **3D view of the proposed housing and Archimedes screws.**

wanted the screws in an awkward position on land. However we were able to do a trade. If we went down to two screws, limited to 100kW, the loss of output would be almost made up by the higher feed in tariff, and the capital cost would be lower. So we offered one less screw, in exchange for a better position in the weir pool.

The EA's licensing system is now clearer but at the cost of a big increase in paperwork. The planning system is much better established, but every interested party you can think of has to be consulted. The application requires about 30 statements, addressing every aspect of a new development, and any one of them might require a consultant's report. The most important part for us was environmental. Although the screws would be in a public park, adjacent land was designated a Conservation Target Area and the best access route was through it. A full Environmental Impact Assessment could be very expensive. However local naturalists had studied the area in detail on behalf of the council. Being local ourselves we knew them and commissioned a member to do the report. He knew his way around the records and was familiar with the species that were present. His report satisfied the planners and the EA, so we did not need an EIA. The planners were more concerned about the trees that we would have to remove, although they were low value.

Further monitoring of water voles and otters was required but essentially the project was environmentally benign. The EA will always require a fish pass and they wanted it in the form of a meandering stream. This would provide a new habitat and greater biodiversity, add an attractive feature to the park and increase the educational value of the project.

The project's many benefits meant that the town and district councils supported it, and when it eventually came to the planning committee they approved it unanimously. That was a great encouragement.

Early engineering steps

It took time to realise that this was essentially an engineering project. For planning permission we went first to an architect, who produced the 'wow' factor that we wanted, but it probably influenced the engineering more than it should have.

It was important of course to find out how much it would cost, and that is difficult. We had gone to an engineering consultancy for basic drawings needed by planning, and their quantity surveyor produced a civils estimate. Contractors gave a few guidelines too, and putting it all together seemed to point to a figure of about £1.25M. That was the best we could do for the share offer. We commissioned a due diligence study, which accepted the figures but pointed out the risk of losing output when collaborating with the EA. They have control of the weir and although our licence gave a right to the water, if they left gates open too long and deprived us of water, there was nothing much we could do about it. We would have to learn to work together.

Looking back, it is disappointing that it took four years to reach this point but community groups have limited resources and knowledge, and go down blind alleys. Everything needed chasing, and many of those we had to deal with probably saw us as a bunch of amateurs (well I

Adingdon Hydro – The technicalities

The median flow (Q50) in the Thames through Abingdon is about 14m³/sec, but some of the flow bypasses the weir. So Q50 for the available flow is about 11m³/sec. Generating 100kW would need a flow of about 9m³/sec, depending on the downstream level.

The screws, from Spaans Babcock, have a diameter of 3.3m, with a shipping weight of 8 tons plus 2 tons for the trough. They turn quite slowly, around 20rev/min, with regenerative drives so the speed can vary according to the flow. Fish going downstream go straight through without damage, and the EA set a speed limit of 32rev/min to protect them. The equipment would have condition monitoring, so that servicing could be done as needed rather than on a regular schedule, as this would save money in the long term. And we are talking long term, many decades.

The variation in output to be expected over different time periods, from daily to decades, was modelled using detailed records from the EA, some of which go back 70 years, and more recently there are telemetry records. Flow into the screws was modelled using an open source package called SSIIM, to minimise the loss of head.

For fish migrating upstream, the fish pass had to be at least 30m long. It had 10 groups of inverted brushes, which appear to the fish like reeds. Most were near the top and bottom, with a few in the middle. Looking down at the stream they are like small rapids. Each bunch would be mounted in a prefabricated concrete U section, so that the fish pass could be assembled after the screws had been installed. That would save space on the site, and save time for generating the power needed to secure the feed in tariff.

The site is quite restricted in area and access is difficult. The plan was to go through the day centre car park to the north, then to share the public footpath, then cross the stream using a Bailey bridge next to the footbridge. The contractor's compound would be in Barton Fields, next to the footpath.

The electrical connection would be to a substation about 250m away on the other side of the road, using a low voltage cable. An attractive alternative, if we had started searching sooner and found a suitable customer, might have been a high voltage connection to an industrial estate about 700m away.

Proposed view of the scheme.

The architect's view.

suppose we were), so it took time. But eventually the end of the preliminary work seemed to be in sight.

In September 2014, we received Ofgem's preliminary accreditation of the Feed-in-Tariff, at a rate of 19.2p/kWh. That started the clock ticking, giving us two years to generate power, or we would lose that tariff and get a rate that could be much reduced by then – as indeed it is, now down to 8.5p. It was time to raise serious money and get moving on the engineering.

One positive result of the long time it took was that the mailing list was up to around 700 people, nearly all local. The shares were launched in November. The prospectus was based on a conservative output of 400 MWh and a capital cost of £1.25M. It went well, and when we closed the offer the following March (before the new tax year), investment was about £870,000 from 425 members. The rest could come from a bank loan, then we would expect to sell more shares when it was operational.

Design and tendering

We had an AGM in January 2015 to meet our many new members. Among them were two recently retired engineers, one who specialised in civils and the other in mechanical and electrical. They knew each other and recognised that we needed help with the engineering. Under their guidance an engineering panel was formed and an experienced consultancy was chosen (GHD Livigunn), and work started.

The contracting was done in two parts. First the screws were specified and selected. The suppliers produced drawings showing all the detail required around the fitting of the screws, for their guarantee to be valid. They would become subcontractors, and their drawings went to the consultancy, to design the civil engineering around the screws. The consultancy also handled the tendering.

The estimated cost had gone up to £1.4M, but the performance figures for the screws made our estimate of the output look unnecessarily low: 500MWh would be more realistic. That would allow a capital cost of £1.5M to £1.6M. Then when the civil engineering drawings were done, the quantity surveyor estimated £1.7M. This was worrying, but we could not really give up at that point before the competitive tender. Perhaps more worrying was the weeks ticking by towards the summer holidays, and key people being away at awkward times. This caused delays, and the tender documents finally went out in September. The build time would be about eight months, so with matters such as the remaining legalities and discharging of the planning conditions still to be done, the deadline a year away was uncomfortably close.

The figure that matters is not the quantity surveyor's but the one in the tender. The tender documents went to four contractors. One by one they dropped out, and in November 2015 we finished up with two alternative bids from just one contractor. Contracting is a sellers' market, and both bids were over £3M. At least there was no agonising decision over whether or not we could afford it.

Winding up

We had another AGM in February 2016 and our members were understanding and supportive. They voted to go ahead with a dissolution. They had sent many emails, full of sympathy, appreciation and thanks for our efforts, with not one word of criticism. That is the sort of thing that makes a community project special.

We then found that although it is quite easy to start a community enterprise, stopping it and returning the investments is another story. We were in unknown territory. An accountancy saw it as a specialised job which would take about nine months and cost about £10,000. So after a close look at the Act under which we were registered, we are doing it ourselves, and the Financial Conduct Authority can tell us if they are not satisfied. We may not be legally bulletproof but the members trust us and just want their refund. We expect to return 87% of their investment.

So was it all a waste of time? One way of looking at it is that renewable energy was just a small part of the project, and the important part was all the other community benefits, seen and unseen. Over the years we have talked to thousands of people and found overwhelming approval. Many seeds have been sown, and who knows what fruit they might bear? ■

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The Thames Path at Abingdon.