

Where now for Norwegian small-scale hydropower?

Guy Harris, 6th November 2015

2 new plants, 38 service providers?

A quick look at the homepage of the Norwegian renewable energy lobby group 'Småkraftforeninga' reveals four important pieces of information: there are 3.1 TWh of licensed hydropower projects that aren't being built, that only 2 new-build projects totalling 10 GWh came online in the 3rd quarter of 2015, Norway has 105% renewable energy capacity, and that no less than 38 companies are vying to sell or provide services to this sector, by buying advertising space on this webpage.

Systemic Crisis

Small-scale hydropower in Norway is a sector in a deep, systemic crisis. Domestic supply outstrips domestic demand and yet cheap Scandinavian renewable electricity can't easily find its way to the hungrier European markets, where overall demand is far higher. For example, extremely low spare generating capacity margins of between 1 and 2% in the UK mean that the market is paying wholesale prices of €70 / MWh with [peak prices approaching £2,500 / MWh](#) last week, whilst [Scandinavian system prices were around €25 / MWh](#) for the same period. Ironically, this situation is actually worsened by the UK's renewables energy policy: reliance on wind power has left the country highly susceptible to good weather!

These macroeconomic factors mean that small-scale hydropower is only marginally profitable at best, and the investment market's perception of return on investment in SHP is low. This is in spite of the fact that SHP in Scandinavia is supported by the Norwegian and Swedish state-backed '[electricity certificate market](#)', which subsidises renewables developers by requiring end-users to buy renewable energy certificates. This subsidy is very important, currently trading at around €18 / MWh, which comprises almost half the present income for an SHP plant in Norway. The cost of Norwegian plant development is already high: typically more than kr 4.20 or €0.45 / kWh for those un-built plants with licenses. High equipment and labour costs in a fragmented construction and supplier market mean that it has proven impossible to reduce the build cost to a level acceptable to foreign and domestic institutional investors in the last year. The Norwegian regulator, '[NVE](#)', sticks to a highly questionable policy position, stating that plants should still be built at kr 6.00 or €0.65 / kWh, based on long-term price prognoses that are disputed, at best. The variations and periodic alterations in these prognoses, available at considerable cost from companies that supposedly provide market intelligence to the energy industry, do nothing to reassure potential investors.

Norwegian Conservatism

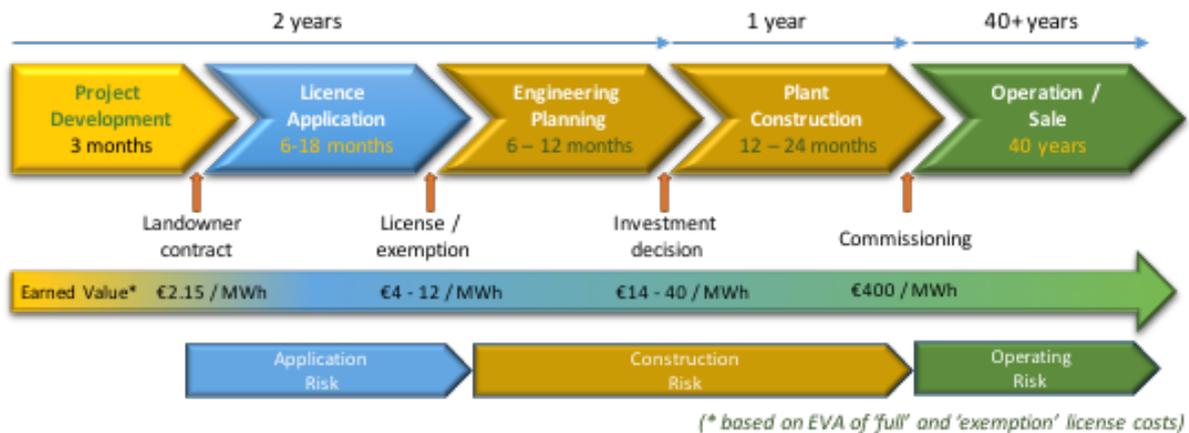
Norway has a reputation for progressive social democracy, but the SHP sector remains defiantly conservative. The electricity certificate market in Norway has a closing date, which means that any SHP plant wishing to receive the subsidy must be connected to the national grid by the end of 2020. While the regulator refused licence applications totalling half the total capacity applied for, the technical and environmental conditions set by the NVE for new licences grow more and more expensive to carry out. This partly to be expected, when the 'low hanging fruit' of easier plant construction has already been plucked, but this law of compounded, diminishing returns means that SHP developers face ever higher compliance costs and lower returns. The established supplier market actively resists the lower capital costs that could be achieved through the purchase of cheaper and simpler equipment from other, non-Nordic hydropower supplier markets. This element of competition would normally force existing suppliers to lower their prices. However, the arguments deployed appeal to the inherent conservatism of Norwegian hydropower mentality, by denigrating the quality of foreign suppliers, based on little other than ignorance fed by a near-total lack of knowledge. For example, Chinese hydropower produces more than 1,060 TWh of hydroelectric power, compared to Norway's 140 TWh, yet Chinese suppliers of electro-mechanical equipment are seen as low quality and unreliable. This is all the more remarkable, given the almost total lack of operational experience of their equipment. One is left wondering if this attitude is nothing more than a commercial defence built on latent xenophobia, when prices from China are typically 50-70% lower than Norwegian suppliers.

Fragmented Development Processes

The lessons taught by Adam Smith have yet to reach Norwegian SHP, in spite of nearly 250 years of Western industrial experience in the 'division of labour'. The construction of an SHP plant divides neatly into 4 reasonably distinct sections: intake or dam, pipeline, electro-mechanical and basic civil engineering. Current practice in Norway is still to use the same type of generalist constructor for as much as possible in each building project, as opposed to assigning specialists to each task, and to treat every installation as a separate, one-off project. This removes the ability to develop economies of scale or to shorten construction time, to reduce the known, extremely high costs of Norwegian labour as a proportion of total building costs. Professional construction environments, such as domestic housing and commercial building, have taken into practice such advanced elements as [Product](#) and [Work Breakdown](#) Structures, not to mention detailed Project Management methodologies, but SHP continues to re-invent the wheel at every opportunity. The effect of this is to maintain a level of inefficiency that would leave a North Korean factory manager weeping with frustration, or simply laughing in amusement at the amateurism.

Is That a Light at the End of the Tunnel?

No, it's a train. Norwegian SHP takes a minimum of 2.5 years to take a project from initial feasibility to electricity production, and the mean is closer to 5.



Even without another licence being granted (and there are [hundreds of projects in the licensing queue](#)), new plants need to come online at a frequency of 25 per quarter from now until 2020, to clear the current backlog. The largest owner of licensed projects, Småkraft AS, is sitting on 80 licensed projects (or around 15% of the total), representing almost 1 TWh of production. At today's building tempo, the sector would fail to clear half of this backlog, for just one company. Even if the construction tempo is increased to 5 completed projects per quarter between now and the end of 2020, it will not clear more than a quarter of the existing stock of licensed projects. This means that at least two thirds of existing licences have absolutely no real value, and are therefore 'sunk cost' for SHP developers, because it's difficult to see how an SHP installation could achieve profitability without the subsidy system, which closes in 2020. Commercial actors are capable of taking responsibility for their own decisions. When they fail, they can move onto new projects. This is not true of the ultimate customer in SHP, the Norwegian landowner; very often, this is a family with long ties to the land in question, often in farming. Even at this stage, many of these landowners have yet to realise that their perfectly feasible water source can not be converted into a long-term, stable income for their family and descendants, due to the conspiracy of ineptitude at all points in the SHP value chain.

Shall We Just Give Up Then?

No – there is a lot of value in the yet-to-be built project base to write it off, in spite of the seemingly bleak outlook. There are numerous [foreign institutional investors](#) happy to purchase any number of operational SHP plants with a long-term yield of 5% for 40 years, at a price of greater than kr 5 or €0.54 / kWh. With the 'sunk cost' of licensing taken care of, the only remaining challenge is convincing investors to finance construction. There have been excellent initiatives, such as the '[Kraftlosen](#)' planned maintenance system sponsored by the SHP lobby group, to help convince long-term investors that the plants themselves will have a very high level of operational availability once built. But the inability of various SHP developers to obtain mezzanine finance leads us to the inescapable conclusion that investors consider the long-term revenue reward to be outweighed by the twin risks of project development (time and cost taken to bring a project to building permit status) and actual plan construction.

Aggregation

To achieve the economies of scale that the SHP sector requires to build a decent volume of plants by 2020, one company or collaborative organisation needs to collect a sufficient

number of projects and have a phased construction plan. The first phase has to be a smaller number of representative projects, built in 2016, to test innovative supplier and technical solutions, and to gain knowledge that can be evaluated, refined and codified, even if it means little or no long-term profit on these individual installations. The second phase must then run for the 4 building seasons from 2017 until the closing date in 2020, with sets of specialised, regional construction teams building quickly and with increasing efficiency, to ensure a good return on the investment required.

Deep Pockets

In order to build just 2/3rds of the existing licensed project portfolio, requires a building tempo as follows:

	2016	2017	2018	2019	2020
New Build (GWh)	75	410	700	750	0
Investment	NOK 239m	NOK 1,283m	NOK 2,147m	NOK 2.255m	0
Production (GWh)	0	75	485	1,485	2,235

NOK 2.2bn is a large sum of money. But Norwegian banks are willing to finance up to NOK 2.80 or 80% of a NOK 3.50 building cost requirement, at very reasonable interest rates that indicate they do not consider SHP building projects to be inherently high risk. Put differently: Norwegian banks are willing to take 4/5ths of the risk of SHP plant construction, but can't sell these services, because the sector can't get its act together.

Political Will

On top of the financial firepower necessary to build the capacity, the Norwegian political system needs to back up its many words with actions. Speak to any SHP developer, and in addition to the slowness of the regulator in handling permits, you'll hear repeatedly that the next biggest challenge is gaining reasonable access to the national grid. It is commercially understandable that local power infrastructure companies might not want to help competition from the SHP sector more than they absolutely have to. However, the Norwegian state has encouraged many small businesses to invest in the expensive and administratively demanding SHP licensing process, but has not ensured that the regional power companies play their part in granting access to the grid. These companies will undoubtedly attempt to cloud the argument by pointing to their own problems, but they are in possession of a monopoly state warrant to operate, and should not be allowed to hinder or slow SHP developers who need a grid connection agreement to obtain a final building permit. This kind of passive constraint can only be cleared by heavyweight action at the Energy Department level in the Norwegian government. In addition, while the regulator will also point to their own guidelines as an excuse for [unacceptably slow clearing of the caseload backlog](#), the developers and landowners who reach 2020 and must write off their considerable investments in the licensing process will have been disenfranchised in an unacceptable manner, sold a false promise of economic development by successive administrations. It would be interesting to have a frank and open discussion with the regulator, where a defence was made of a system that [refused licences to 50% of all cases in the first 3 quarters of 2015](#). Surely their taxpayer-funded guides and advice must be able to help the same taxpayers achieve a higher success rate than that?

At The End of the Day ...

Electricity prices will rise from their current lows, and [new markets will open for renewables from Scandinavia](#). Norwegian SHP can still represent both a solid financial and ecological investment, but time is running out. Rein Husebø, the highly experienced MD of Småkraft AS, said in 2013 that 700 new SHP plants would be built by his company before the cut-off in 2020. Either he is very bad at mathematics, or he knows something we don't, or he's too optimistic. In any case, we don't see how that can be achieved by Småkraft, or anyone else, given today's conditions.

Key Data

Links are provided where appropriate in this article, but further information for Q3-2015 is available from NVE [here](#).