

Hydropower

Zero-carbon generating

Despite the problems of the past, the generation of carbon-free electricity from hydropower now resonates with the global drive to reduce carbon emissions while higher hydrocarbon prices and the availability of carbon credits have transformed the attractiveness of some projects. As a result, the potential rewards for superior project design and mitigation to minimise environmental and social impacts have never been greater.

The news last month that the Austrian, German and Swiss export credit agencies have decided to pull out of the €2bn Ilisu dam project, a crucial part of Turkey's vast Southeastern Anatolia Project, because of non-compliance with as many as 150 environmental, social and cultural concerns has put the large dam project back under the spotlight for all the wrong reasons.

The proposed €2bn, 1,200MW project would affect 36,000 people, flooding 68 villages and the ancient Roman city of Hasankeyf. The sponsors and host government of a project with such profound environmental and social impacts needed to structure and implement a far-reaching mitigation plan and it appears that in the case of Ilisu this has not been carried out.

Indeed, the project has been dogged with controversy for many years. The World Bank declined to get involved more than a decade ago and UK construction company Balfour Beatty pulled out more than four years ago after a campaign against the dam by UK newspapers, backed by environmentalists and archaeologists. Nevertheless, the Turkish government intends to go ahead with the project using alternative sources of project debt.

The Three Gorges project in China still stands as the world's most controversial hydropower project. There is no doubt that it is an extraordinary engineering feat. Twenty-six of the planned 32 generators of 700MW each are already in commercial operation, representing a

For decades, project lenders and investors have been wary of the reputation of large hydro-electric projects for suffering from long development periods, insurmountable environmental and social issues, high risks and sub-optimal returns. By **Geoff Knox** of **Portland Advisers**, the London-based PF advisory boutique.

current generating capacity of 18,200MW that will increase to 22,400MW once the project is fully completed. That saves a lot of CO₂ emissions from thermal generation and it is claimed that the dam improves the Yangtze River's navigation capacity and reduces the risks of downstream flooding. According to the Chinese official news agency, the electricity generated to-date already represents 30% of the project's total capital cost, which suggests that the scheme's economics are robust.

But at what cost? More than 1.1m people have been displaced, important archaeological and cultural sites have been flooded and there are fears that significant ecological changes will take place. As a result, all of the world's major multilateral, bilateral and commercial banks declined to lend to the project and hence it was financed internally, although controversially some ECAs and banks lent to the related power transmission project.

However, Ilisu and Three Gorges are not representative of a number of hydropower projects, past and present, that have been, and are being, developed in the private sector in compliance with lenders' stringent environmental and social requirements. These requirements are broadly consistent across the spectrum of export credit agencies, international development finance institutions (such as World Bank/IFC and the Asian Development Bank) and commercial banks (through adherence to the Equator Principles) that typically finance large hydropower projects in the private sector.

Principle 2 of the Equator Principles mandates that sponsors complete an Environmental Assessment report for all medium or high-risk projects (Category A and B projects), the preparation of which must meet certain requirements and satisfactorily address key environmental and social issues. As they relate to hydropower, these reports must cover the protection of human health, cultural properties and biodiversity (including endangered species and sensitive ecosystems), socio-economic

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impacts, land acquisition and land use, involuntary resettlement, impacts on indigenous peoples and communities and the participation of affected parties in the design, review and implementation of the projects.

While the mechanisms exist to identify environmental and social concerns and assess appropriate mitigants, many institutions can be accused of taking a rigid, "box-ticking" approach. The reputational risk to a bank or financial institution of being targeted by hostile NGOs and the press can be a real impediment to taking a more balanced view on the overall economic and climate benefits of a hydropower project versus its environmental and social costs.

Reality versus reputation

Hydropower's bad reputation is not entirely justified. There have been several successful non-recourse project financings for major dam projects in recent years and these projects have been located in developing countries that present additional country risk and transparency challenges. Careful planning and execution of the environmental and social aspects of these projects by the sponsors have ensured that the concerns of multiple lenders have been satisfied.

Theun Hinboun Expansion Project, Laos – The original 220MW hydropower project began construction in 1995 and began commercial operation in March 1998. Most of its capacity is sold to Electricity Generating Authority of Thailand (EGAT) under a long-term power purchase agreement and over the past 10 years the project has been a stable source of revenue to the Government of Lao from taxes, royalties and dividends received from Electricite du Laos' ownership. The project is owned by Electricite du Laos (60%), Nordic Hydropower AB of Norway (20%) and GMS Lao Co Ltd of Thailand (20%).

To meet increasing demand for power in Laos and Thailand, in 2007 the project company announced a 280MW expansion project relating to the construction of an upstream dam to create a storage reservoir to allow the project to utilise the significant water resources that are currently being spilled by the existing project facilities, together with new diversion tunnels and new turbines. Total project cost is US\$665m.

The project achieved financial close in October 2008 with US\$585m of project loans split between a US\$187m syndicated loan from international banks and a Thai baht loan syndicated among Thai commercial banks.

The expansion project successfully negotiated NGO criticism surrounding environmental and social issues. At the financing stage, a Norwegian environmental group claimed that the original project had already damaged river ecology and fisheries, had failed to pay adequate compensation to those affected, and that the expansion project would result in further downstream river damage and population displacement.

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Lead sponsor Statkraft robustly defended its position, stating that US\$45m had been set aside in the project to fund mitigation measures such as building houses, schools, infrastructure and health stations. A Statkraft spokesman was quoted as saying "we think this is a sustainable and a right project in a region experiencing strong growth and strong demand for energy". Statkraft firmly believed that it had been able to use its sponsorship position to make the project better.

Bujagali, Uganda – The 250MW hydropower project at Bujagali Falls, Uganda re-uses water flowing from two existing upstream hydropower facilities on the River Nile just below Lake Victoria. The project is the critical element of an energy sector strategy developed by the World Bank and other development partners to address an acute energy shortage in Uganda – as little as 5% of the country has regular access to electricity, one of the lowest rates of electrification in the world.

Bujagali will generate electricity at a significantly lower cost than alternative thermal units fuelled from liquid fuels imported by road from the east coast of Africa. This energy strategy also includes the unbundling of the state electricity utility and private sector participation in the electricity distribution sector to ensure the commercial viability and sustainability of the overall electricity industry.

After an abortive attempt to develop the project by AES Corporation, the 250MW Bujagali Falls Project achieved financial close in December 2007 sponsored by the Aga Khan Fund for Economic Development (AKFED) and Site of Blackstone, USA.

The total funding requirement of the project, inclusive of financing costs, of US\$800m was financed with debt and equity in a ratio of 80:20. Project loans were provided from the IFC, the EIB, the African Development Bank (AfDB), Proparco and Agence Francaise de Developpement (AFD), DEG, KfW, FMO and commercial banks funding under a partial risk guarantee from the World Bank. MIGA provided political risk insurance to the sponsors. The project is scheduled to be commissioned in 2011.

Nam Theun 2, Laos – A landmark project financing for hydropower IPPs was the financing for the US\$1,450m, 1,070MW Nam Theun 2 project in Laos sponsored by EDF, which closed in 2005. Financed with debt and equity in a ratio of 70:30, US dollar project loans were provided by AFD, Proparco, Nordic Investment Bank, and EXIM Thailand and a syndicate of commercial banks supported by risk guarantees from ADB, the World Bank, COFACE, EKN and GIEK of Norway. A syndicate of Thai commercial banks provided Thai baht project loans.

Throughout construction, a comprehensive environmental and social impact mitigation plan was implemented and documented. For example, prior to opening the diversion tunnel in April 2008, a number of social and environmental actions relating to the physical relocation of affected persons had to be completed.

There have been several successful non-recourse project financings

The project is currently being commissioned on schedule and is believed to be only slightly over its original cost budget and well within its US\$200m contingency funding.

Khimti, Nepal – The 60MW Khimti I project sponsored by Statkraft was one of the forerunners for private sector hydropower IPPs. The US\$140m project was financed in 1996 by the IFC, the ADB, Eksportfinans, the Norwegian Agency for Development Co-operation (NORAD) and the Nordic Development Fund. At the time of commissioning in 2000, the tariff was regarded as high but in today's energy price environment, and with debt substantially amortised, the cost of electricity is attractive. Long development periods can be avoided if the correct ground work has been carried out

The development period for hydropower projects can be lengthy – several decades in some cases. However, this can be misleading since the early period of development, before lenders become involved, can be taken up in establishing such underlying fundamental issues as land ownership, water rights and the collection of reliable hydrology data.

From the perspective of lenders, timing need not be unreasonably long. Once the project agreements were substantially in place, the Nam Theun 2 project in Laos reached financial close in only 15 months from lenders being first approached. This is a typical period for thermal IPPs in developing counties.

Retrofitting existing dams

Retrofitting existing dams with hydropower plants provides the benefits of new hydropower capacity without many of the environmental impacts of constructing new dams. Hydropower can be installed on existing storage, flood control dams and irrigation dams.

This has been an increasing practice in the US and there is much more to come – according to the US National Hydropower Association, less than 3% of the US's 80,000 dams currently feature hydro capabilities. Environmental lobby groups such as American Rivers in the US support retrofitting as a means of reducing greenhouse emissions in an environmentally sensitive way.

A good example of retrofitting is the 290MW scheme at the Almatti Dam, part of the Upper Krishna irrigation project in India. The project was constructed by a unit of the local electric utility in 40 months at a reputed cost of only US\$130m. But the rate of water discharge remains a controversial subject since three Indian states – Karnataka, Maharashtra and Andhra Pradesh – all lay claim to the water from the Khrishna River.

Project economics transformed

In developing countries where most hydropower projects are located, wholesale electricity tariffs are increasingly reflecting higher world hydrocarbon prices because the host governments are unable to sustain the high level of

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price subsidies historically embedded in electricity generation in these countries. While the unit cost of electricity that is necessary to make a typical hydropower scheme viable is dependent on the project's capital cost and load factor (which is determined by seasonal hydrology factors), hydropower tariffs are competitive because they enjoy zero or nominal (in the form of water charges) fuel costs. An additional revenue stream is also available in developing countries in the form of carbon credits.

Carbon credits boost returns

Most developing country hydropower projects should be eligible for carbon credits. The monetisation process can be lengthy because it is a sequential process. Hence, it is best started at an early stage, in parallel with the overall project development process. Eligibility as a qualifying project under the UN Kyoto Protocol's Clean Development Mechanism (CDM) is first established by the preparation of a detailed report, followed by host country approval, project validation and project registration. Not all projects are eligible since so-called "additionality" must be demonstrated.

Once registered, the Certified Emission Reductions (CERs) are "commercialised" through sale and purchase agreements with creditworthy entities. Contractual cash-flow from this source can then be recognised as part of the project's base case economics. An alternative approach is to access the unregulated voluntary carbon market, where over-the-counter CERs are sold at lower prices.

According to publicly available information, the Lairab Energy project in Pakistan, which was registered as a CDM project earlier this year, quantifies the sale of annual carbon credits at about 12% of annual electricity sales assuming a CO₂ price of US\$5/t. The contribution of carbon revenues to overall project economics will vary according to the CO₂ price obtained and the electricity tariff. However, carbon revenues flow directly to the bottom line and thus can enhance shareholder returns appreciably – by more than three percentage points on equity IRR in the case of Laraib.

Future projects

A notable up-tick in non-recourse financing activity in the private hydropower sector has been witnessed over the past 18 months covering a diverse range of countries.

Portland Advisers is expecting more projects in Laos, Uganda and Nepal to follow the projects profiled above. A number of other African hydropower IPPs are in the pipeline, such as those in Zambia and Cameroon. In South America, a number of other countries are seeking to follow Brazil into the hydropower sector, including projects in Chile, Peru and Columbia. Despite the controversy surrounding Ilisu, Turkey has huge hydropower potential. We see India emerging as a major opportunity for private hydropower projects with north-

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ern states such as Himachal Pradesh bordering the western Himalayas and an attractive federal tariff regime.

Pakistan also represents major opportunities with the added advantage that the mountainous region in the north is little more than 100 miles north of Islamabad and the state of Punjab, which is a large load centre. We see significant developments now that the political, security and economic situation is stabilising and the US and multilateral agencies are supportive.

The first hydropower IPP in Pakistan is believed to be close to financial close. The US\$217m, 84MW run-of-river scheme is majority owned by Hubco, a Pakistan-listed company in which International Power PLC holds 17%. Original project lenders Asian Development Bank, Islamic Development Bank and two Pakistani commercial banks are being joined by the IFC and Proparco.

Known as the New Bong Escape Hydropower Power Project or Laraib Energy (the name of the project company), the sponsors have overcome the difficulty of the project being located in the Pakistan-administered portion of Azad Jammu and Kashmir, the area over which Pakistan and India have been in dispute since 1947. Environmental and social impacts are limited since the project does not involve the construction of a new dam – the scheme is fed from an existing upstream irrigation dam. The project was registered as a CDM project under the United Nations Framework Convention on Climate Change earlier this year.

The carbon-neutral aspects of electricity generation from hydropower projects, together with improved economics relative to thermal alternatives, appears to be behind the renaissance of the sector.

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