

Challenges and opportunities in Asia

IWP&DC talked to key representatives from international companies involved in the hydropower sector in Asia, and discovered what they thought were the biggest opportunities, and challenges, to project development throughout the continent.

What are the biggest challenges to hydropower and dam development in Asia?

Didier Mallieu, Poyry: The biggest challenge in the region is financing and realizing investments in hydropower. This will bring wealth to the region and avoid dependence on fossil fuels for future generations. The most successful projects were developed when private investment was complemented by well targeted public funding. Bankability accompanied by public acceptance is key to the success of the dams and power plants.

To reach this goal a strong commitment is required from developers and governments to design and operate hydropower plants that are fully compliant with the highest international economic (including professional hydrological assessments), environmental and social standards. We see this trend in many Asian countries. Governments who are able to secure such commitments and consistency in policy will attract investors and create wealth for their population.

Grant Gillespie, MWH Global: This is a vast region and broadly defining the challenges is difficult. Overall a consistent issue is funding due to the significant capital requirements for dam projects. Governments are increasingly open to private sector investment which is driving increased activity.

Another is the potential environmental and social impacts of dam projects if not correctly considered and mitigated.

In certain areas cross border issues are likely

to become more prominent as large irrigated agricultural development are considered and implemented. This is less of a problem for hydropower which is non-consumptive.

Alexander Schwab and Josef Ullmer,

Andritz Hydro: The biggest challenge in Asia is to overcome the conflict between a tremendous need for electricity and high growth rates, a huge unexploited hydro potential and at the same time limited financial resources in most of the countries. Even though many incentives have been provided by the respective Governments, the overall permitting process is very cumbersome and time consuming for a streamlined implementation. Furthermore we have seen limited appetite and understanding from the local banking sector to assure long-term attractive financing schemes for hydro projects.

Fabio Nosses, Alstom Hydro: Keeping up with the pace of economic development is a major challenge. Despite the global economic downturn, Asian economies are still rapidly expanding which is driving the demand for more electricity, especially from carbon-free sources. There is also a need to develop more regional economic cooperation.

What do you see as the growth areas in the region?

Didier Mallieu: There is potential growth in hydropower in almost every SEA country. Large rivers create opportunities for carefully designed run-of-river plants. There is vast potential in unused catchment basins with higher head and for pumped storage plants in countries with many islands.

Grant Gillespie: Many areas are seeing demand growth in hydropower, issues such as the Fukushima nuclear event, increasing political support for carbon emission reductions and the many benefits hydropower provides in terms of a reliable energy network mean hydropower is an attractive option for addressing energy growth requirements.

MWH has a long history of working across the entire region with many projects within our portfolio. We continue to see potential for hydropower development across many countries and regions within Asia.

Alexander Schwab and Josef Ullmer: Beside the big players China and India, most of the smaller countries are developing hydropower at an interesting speed. Vietnam, Malaysia, Laos or still oil dominant countries like Indonesia have

programs for further exploitation of hydropower in place.

Fabio Nosses: Asia has the world's largest potential for hydro. According to the IEA, hydroelectricity generation is expected to almost triple over the next 30 years from about 2.5GW to 7GW. It is also a very diverse market with three key "sub-regions" so to speak – China, India/Pakistan/Nepal/Bhutan and Southeast Asia, especially Laos and Myanmar. Each of these sub-regions has its own specific needs:

- China is a large-sized Francis-driven machine market with a fair amount of bulb-driven hydro plants, as well. It is also the world's biggest user of pumped storage.

- India, Pakistan, Nepal and Bhutan are focused on Pelton and medium-sized Francis machines (around 50MW) and erosion protection is a key issue.

- Southeast Asia is a low head market with bulb, Kaplan and low head Francis driven hydro plants and environmental concerns are important to customers here.

What all of these regions have in common is that hydro offers one of the most competitive costs of electricity for their power needs.

Alstom can serve all of these markets from our site in Tianjin, our largest hydro facility in the world, and by leveraging resources from our global network of factories, including the state-of-the-art hydro factory in Vadodara, India.

What is needed to deliver the continent's long-term objectives for growth?

Didier Mallieu: Cheap electricity is the basis for developing mining, industry, transportation, services and education. Harnessing potential from renewable power allows independence from fuel importing or exporting excess fuel. Hydropower doesn't require subsidies, and due to the very long lifetime of assets is a very profitable source of green energy. In addition, long term investments require a stable political system which has been instituted in many countries and is emerging in others.

Grant Gillespie: Coordinated, actionable plans are required at Governmental level to develop the most beneficial multipurpose dam and hydropower projects. In some cases cross border agreements will be required that allow projects to be developed for entire regions rather than specific countries or developer interests.

It is also necessary to ensure responsible development of hydropower providing social, environmental and economic sustainability. This can only be achieved by industry adherence to robust international standards.

Overall a diversified energy portfolio is required to meet growing demands.

Alexander Schwab and Josef Ullmer:

After coverage of the immediate needs, like food, water, and health, electricity is a must for

poverty reduction. Hydropower is providing environmentally friendly, centralized and decentralized long lasting secured supplies of electrical energy at competitive costs.

Fabio Nosses: There is no one answer for this. Long-term energy growth objectives in Asia are national and they vary from country to country. Hydropower provides a very competitive cost of electricity. For example, China is looking to hydro to fill domestic energy demands with a carbon-free fuel source. Laos and Myanmar meanwhile see their vast hydro potential as a means to not only meet domestic energy needs but also as a potential export. To achieve these ambitions, Laos and Myanmar will likely need the support of international institutions such as the World Bank.

Do you see further small hydro development in the region?

Didier Mallieu: Scale effect matters in hydropower. Due to high needs linked to population growth and growth in electricity intensity, we see medium to large scale hydropower as the most efficient way to produce energy. Mini-hydro is a tradition in many countries where small turbines are used by households or villages to produce power, but that doesn't supply the stable and reliable power needed for development.

GG: Yes, small hydropower has a place particularly in remote areas where relatively cost effective run-of-river schemes can provide a local sustainable energy source with low environmental footprint.

Alexander Schwab and Josef Ullmer: Nearly all countries are pushing programs to support private investments in small hydro. It is a perfect solution for decentralized or island operations and a clean, reliable and the most economic substitute for diesel generation.

Is there scope for pumped storage?

Didier Mallieu: Pumped storage is a natural complement to intermittent renewables like solar, whose potential is huge in the region. Especially on islands (geographical and electrical island), it is the cheapest way to store energy and we see many requests for feasibility studies in the region.

Grant Gillespie: Currently MWH is working on a number pumped storage projects. Pumped storage is a net user of electricity so does not address overall demand growth. However, it is increasingly playing an important role in managing demand peaks and providing grid stabilization.

We imagine opportunities like this will continue to present themselves, as the region increasingly sees hydropower as a clean, reliable and often cost effective source of energy.

Alexander Schwab and Josef Ullmer: With the extension of the grids, the integration of volatile

energy resources and more and more people getting access to electricity the capability to store high amounts of energy, to supply when needed, to stabilize the grid and to avoid black-outs, is a growing necessity in Asia. Pumped storage is an ideal solution to cover such demands. Therefore a lot of countries in this region have installed, or are developing pumped storage schemes.

Fabio Nosses: China is the largest market for new power plants of any type in the world. As such, it is also the largest market for pumped storage in the world. China's pumped storage plants are owned by the grid operator and are used to provide load following near the large cities. Japan has a weak grid and it uses pumped storage extensively to provide balancing services. India is currently developing a state-of-the-art variable speed pumped storage plant at Tehri. As China brings more intermittent renewable energy sources online, variable speed pumped storage will become an attractive technology in this market. Alstom is very active in this market. We are currently working on Qiongzong pumped storage plant and are in the final stages of the Hohhot pumped storage plant. In addition to these two plants, Alstom has seven other pumped storage plant references in China in since 2000.

Aside from China, which other countries will lead hydropower development?

Didier Mallieu: In the coming years a number of countries will see large developments in hydropower. Lao PDR's target is to become the battery of southeast Asia with renewable energy and has over 20GW of additional capacities. Myanmar is beginning hydro development and has the largest untapped capacity in SE Asia with around 100GW. It will need to supply electricity over the next 10 to 20 years. India and Nepal are considered the largest hydropower markets outside of China but the legal framework and economic conditions have not yet allowed large scale development of the big five rivers to reach their full potential. However the potential of the big five rivers in the Eastern Himalayans, Brahmaputra, Irrawaddy, Salavin, Mekong and Red River of serval hundred GW have been barely scratched.

Grant Gillespie: Our company has been working throughout Asia in countries like Pakistan for over 50 years; we continue to see this and the overall Himalayan region as having huge hydropower potential.

Alexander Schwab and Josef Ullmer: We see India and Indonesia driving hydro development forward, while Vietnam, Laos, Malaysia, the Philippines and partly Thailand are also encouraging further development.

Fabio Nosses: In Southeast Asia Myanmar and Laos have the most potential, although, Indonesia, Malaysia, Vietnam, Cambodia and Thailand have



Who's who – industry representatives

Didier Mallieu: Vice President of Hydro and Renewables at Poyry

Grant Gillespie: Asia Hydropower Sector Leader, MWH Global

Alexander Schwab: Senior Vice President Market Management and Corporate Communications, and **Josef Ullmer,** President Director and Regional Executive South East Asia, Australia & NZL, Andritz Hydro

Fabio Nosses: Alstom Hydro China General Manager

significant potential as well. The Himalayan countries of India, Pakistan, Nepal and Bhutan have significant opportunity too. Asia, overall, holds tremendous opportunity for hydro.

Do you see further cross border development?

Didier Mallieu: Yes, distances between hydropower sites and centres make it necessary, and a strong driver for balancing wealth. We see increased connection between Myanmar and its neighbours as well as the continuing role of Laos to be central to the region. Hydropower is leading a more general trend towards greater interconnection in southeast Asia.

Most SE Asian countries are working hard on an interconnected grid. Lao PDR is currently discussing the possibilities of energy transfers as far as Singapore. Nepal and Bhutan are already exporting energy from hydropower stations to India but due to legal problems the full potential can't be used.

Grant Gillespie: It is likely that certain countries will export power to other areas as the regional benefits of hydropower are more widely recognized and as certain governments are more open to private sector investment.

Alexander Schwab and Josef Ullmer: Creating ASEAN, installing crossborder agreements with China and India are the measures to create the largest economic zone in the world. With the countries in different development stages this will still take some time, but the train is on the track.

Fabio Nosses: Bhutan and Nepal have surplus resources which can help meet India's power demands. Similarly, Myanmar, Laos and Cambodia can help meet China's power demands. Laos and Myanmar are also helping to meet Thailand's power demands.

How do you think the future energy mix will influence the region's hydro development?

Didier Mallieu: The strongest driver for hydropower is its cost efficiency and independence from fossil fuel. This is particularly true in southeast Asia where allocation of resources is close to optimum, due to arbitration between developing investments. Consolidation and professionalization of the banking sector in Asia also contributes to the success of hydropower. Subsidized renewable energy would cost too much for the states to support. Hydropower is a good complement to decentralized PV, close to grid parity. Arbitration with nuclear and coal should be done in favour of hydro, as long as hydropower potential exists. Local governments are also sensitive to the fact that large hydropower represents a boost for employment in the construction sector, and an opportunity to build national champions, due to high capex and long construction time.

Compared to developed markets the volume of hydropower use in most SE Asian countries still remains far behind the actual potential and we expect to see a shift from fossil fuel fired plants to renewable resources of which hydropower will cover about 80% of the new capacity.

Grant Gillespie: A diversified energy portfolio is essential. I think hydropower will continue to play a significant role in the future and the benefits of hydropower to be an integrated part in any energy portfolio is important. Hydro and pumped storage enables the further development of wind, solar and other intermittent renewable energy sources.

Alexander Schwab and Josef Ullmer: When we compare the utilization of hydro resources between the established economies and the emerging ones, we are quite sure that hydropower has always played an important role in the energy matrix of most countries and with the long term need of having a secured, environmental friendly and sustainable electricity source hydropower will increase its position.

Fabio Nosses: Hydro is the ideal complement to inflexible generation, such as intermittent renewable energies, or baseload generation such as nuclear. Asia, like the rest of the world is looking to decrease the amount of carbon produced by the production of electricity. Furthermore, there are pressing needs to urgently improve the quality of air in China and India's largest cities and decreasing the reliance on coal is one action that will help.

As an international company, do you work with local companies in the region? Is it important to establish such partnerships?

Didier Mallieu: Yes, we work with local investors, local family businesses or international developers who see our name as a good safeguard for best international standards and project acceptance. They don't want to compromise in quality. They also appreciate our drive to keep costs and time under control.

We also cooperate closely with contractors and contribute to their growth. We are impressed by their capacity of reaction, willingness to improve and performances in general.

Regarding design and project management, we consider ourselves as local, having grown our local base with a compound growth rate of about 25% per year in the last five years. We believe that the best way is to gradually integrate and train local colleagues into our international network. It is extremely important in hydropower to rely on a tradition and on proven methods, in order to adequately manage all projects, design risks and produce designs which are extremely safe and socio-environmentally friendly.

Alexander Schwab and Josef Ullmer: Being a global company for so many years, we have already supplied turbines to Asia for more than 100 years,

we know the need to be local. You may partner, you may cooperate, you may direct invest, but you should be where the music is playing. We have our own structures in nearly all of the region's countries, and follow up new opportunities. As an example, immediately after the lift of the ban on Myanmar, we established a representation in this highly interesting market.

Fabio Nosses: Alstom has a very strong local presence in India and China, including the full value chain of R&D, engineering, project management, sales and R&D. Tianjin, China is Alstom's largest hydro site in the world. Alstom has a joint venture with Druk Green in Bhutan and we work with local companies to support assembly, erection and commissioning.

Can you give some examples of hydropower and dam projects your company is currently working on?

Didier Mallieu: Pöyry is currently the design engineer in a number of hydropower projects which range from full implementation through to study phases. These projects total more than 6000MW. Pöyry has been continuously involved for the last 20 to 40 years in the SE Asian hydropower development and have built over the years many ground breaking projects, e.g. the first CFRD dam in 1985, the first high head scheme with Pelton turbines in 1995 and many more.

Alexander Schwab and Josef Ullmer: We are a system and equipment supplier of all kinds and types and sizes of hydropower plants. Being active on small, very small, refurbishment and modernization of existing plants, as well as on the very big ones, there would be a lot of examples in all the countries. So the range goes from small hydro applications in Indonesia, the Philippines or Malaysia up to the big projects like Xayaburi in Laos or Teesta Urja in India, from Upper Tamakoshi in Nepal to the refurbishment of the Whakamaru power plant in New Zealand.

Fabio Nosses: Projects in Asia that Alstom is currently equipping include: In China - Guan Yinyan (3 x 600MW Francis), Hohhot (4 x 306MW pumped storage: pump turbines and motor generators), Jing Ping II (8 x 667MVA generators), Qiongzong (3 x 200MW pumped storage: pump turbines, motor generators, BOP), Xiajiang (5 x 40MW Bulb: turbines, generators, auxiliary equipment); In India - Ratle (4 x 212MW Francis, 1 x 31MW Francis), Tehri (4 x 250 MW Variable Speed pumped storage: pump turbines, variable speed motor generators, control system, BOP), Tidong (2 x 50 MW Pelton: turbines, generators, auxiliaries); In Malaysia - Hulu Terengganu, (2 x 128 MW Francis); and in Vietnam - Huoi Quang (2 x 260MW Francis: turbines, generator, control system), Lai Chau (3 x 400MW Francis: turbines, generators, mechanical and electrical auxiliaries); Thac Mo (1 x 75MW Francis: turbine, generator, control system, BOP). ■