In 2014, hydropower development continued its strong growth trend, with an estimated 39 GW (Figure 1) of pure hydropower capacity put into operation – bringing the world’s total installed capacity to 1,055 GW\(^1\) (Figure 2). Pumped storage capacity added in 2014 was 1.46 GW, with significant additional capacity under construction or in the planning stages. Total hydropower generation for the year is estimated at 3,900 TWh\(^2\).

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\(^1\) Does not include pumped storage. IHA estimates for newly added and total installed capacity are based on the IHA statistics database and published sources. Data for Mexico, Turkey and India require further validation. IHA estimates total installed pumped storage capacity at 139 GW.

\(^2\) IHA estimate
As in years past, China dominated the market for new development and total installed capacity, adding 21.85 GW of new capacity within its borders. Other countries leading in new deployments include Malaysia (3.34 GW), Canada (1.72 GW), India (1.20 GW), Turkey (1.35 GW), Brazil (3.31 GW) and Russia (1.06 GW)\(^3\).

Globally, drivers for hydropower’s strong showing include a general increase in demand not just for electricity, but also for particular qualities such as reliable, local, clean and affordable power. Looking forward, there remains significant undeveloped potential across all world regions, particularly in Asia, Africa and Latin America. Demand for electricity and other related reservoir services is also high in these areas, forming a strong foundation for continued growth in hydropower.

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\(^3\) Includes pumped storage
The International Hydropower Association gathers statistics and monitors deployment and use throughout the year, and has identified the following highlights for hydropower in 2014.

**Key trends and noteworthy developments in 2014**

- **Regional hydropower development and increasing interconnection**
  
  While regional hydropower development is not new, we are seeing further interest in regional approaches. In 2014, Norway’s role as a green battery for Europe took major steps forward with the announcement of plans for a direct transmission line with the UK, adding to the planned Norway-Germany link and the existing Norway-Denmark link. Iceland is also pursuing a strategy to export hydropower to the UK via a proposed direct transmission line. All of these initiatives will involve sub-marine transmission, a technology which has moved forward dramatically over the past decade. In other regions, Kenya and Ethiopia are progressing work on the project implementation phase of a 1,000 km high voltage transmission line between the two countries, which will further enable Ethiopia to become a hub for hydropower in eastern Africa. Nepal and Bhutan are also pursuing hydropower hub strategies, where India is investing in hydropower development in these countries in return for a portion of the produced power.

- **Shake-up in manufacturing**

  In 2014, General Electric signalled a move which would see it re-enter the world of hydropower turbine manufacturing by making a bid to acquire Alstom, one of the major manufacturers of hydropower turbine equipment. While the bid has met with some resistance within France and is still under review by the European Commission, this marks a period of uncertainty in the make-up of the global hydropower industry. Chinese manufacturers, particularly Harbin and Dongfang, continue to gather market share worldwide. There is also a resurgence of equipment suppliers in Japan, in particular in relation to variable speed technology.

- **Renewables synergies**

  Deployments of renewable energy systems at varying scales have also taken a step forward beyond the concept stage and into the mainstream. In 2014, the world’s largest solar-hydro hybrid station was connected to the grid in China. The Longyangxia station includes a 320 MW solar park linked up to 1,280 MW hydropower station (four turbines of 320 MW each). The hybrid project is expected to last 25 years and to deliver 498 GWh/y of solar PV, complementing the output of the existing hydropower peaking station. Costa Rica announced that it operated on 100% renewable electricity for a period of 75 days in late 2014/early 2015, using hydropower as the main source of electricity. On a smaller scale, El Hierro in the Canary Islands commissioned an ~11 MW wind-hydro hybrid project, bringing the island significantly closer to its goal to be 100% renewable and entirely energy self-sufficient.

- **More activity in ‘mature’ markets**

  North America and Europe are typically considered ‘mature’ markets, but they are by no means stagnating. In 2014, the United States announced a new price premium for hydropower when added to existing non-powered reservoirs. The US also extended its production tax credit, which provides tax incentives for manufacturing of hydropower technology. In Canada, new greenfield projects continue to be developed, including Romaine-2 (640 MW) and Forrest Kerr (195 MW), both completed in 2015, and the 695 MW Keeyask project now under construction. Meanwhile in Europe, pump storage continues to be a focus of activity. Reflecting a greater need for balancing and ancillary services to support large influxes of variable wind and solar power, hydropower developers...
are pressing forward with new pumped storage facilities, with 8,600 MW in the planning and construction stages. New developments in variable speed technology are expected to be a key component of this new capacity.

• **Rethinking approaches to private sector development**

We have long been aware of an increasing role for the private sector in hydropower, and the evidence continues to mount in support of this trend. For example, there some 19 GW of hydro projects moving forward in Bhutan, India and Nepal. Many of these projects are being realised under the independent power producer model, and based on long-term power-purchase agreements. In the case of Bhutan and Nepal, these include cross-border trade with India. Within India, a few developers are currently considering the business model of operating as merchant plants, depending on confidence in market price projections.

• **Offshore hydro takes a step forward**

In late 2014, the UK government included the long-studied Swansea Bay tidal lagoon scheme in its official National Infrastructure Plan, and more recently new investors have been secured and contract negotiations begun with the government, indicating a greater likelihood that this project will move forward. If built, the 320 MW project would become the largest tidal project in the world, ahead of South Korea’s Sihwa Lake (254 MW) and France’s La Rance (240 MW) projects. Contracts were also awarded in 2014 for the supply of turbines at the MeyGen tidal stream project (398 MW) off the coast of Scotland, which will be the largest tidal array project worldwide.

• **New sources of finance and investment**

While the past few years have seen a shift toward more private sector involvement in hydropower investment, 2014 brought forward further new approaches and sources of funding. This includes the announcement in July 2014 of a ‘New Development Bank’ which will be funded by the BRICS countries of Brazil, Russia, India, China and South Africa. Several key countries have now also signed on to the China-led Asian Infrastructure Investment Bank, which has signalled its intent to include hydropower in its investment portfolio. On the private sector side, green bonds are on the rise, while new vehicles such as the IFC’s InfraVentures are offering innovative solutions for hydropower financing.

• **Hydropower providing climate services and incorporating climate resilience**

While it has long been the case that hydropower can offer a range of services, we are seeing increasing awareness of its potential to offer ‘climate services’, especially projects which include storage. In addition to providing a carbon offset when developed in place of fossil fuel technology, we see a greater recognition of hydropower’s ability to provide flood protection and mitigate drought impacts in the face of increasing extreme hydrological events. While climate change brings potential vulnerabilities and risks to hydropower, it also brings opportunities that developers and operators are increasingly exploring. On the issue of vulnerabilities, financial institutions are seeking more assurances of hydropower’s climate resilience before lending, highlighting the need for more robust analysis at the company and individual station level.