

Global Hydropower Development

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Our mission advancing sustainable hydropower

Four strategic objectives:

- Advancing policies and strategies for the sector
- Building a vibrant community
- Creating a platform for knowledge
- Delivering value for members



Global Electricity Overview

Estimated Renewable Energy Share of Global Electricity Production, End-2014



Based on renewable generating capacity in operation at year-end 2014.

REN21 Renewables 2015 Global Status Report





Global installed capacity

Figure 2 - Global total of pure installed hydropower capacity (GW) by country in 2014. Figures do not include pumped storage.





Hydropower capacity added in 2014

Figure 1 - Distribution of new capacity added by region, including pure hydropower and pumped storage (PSP):









Hydropower, by major regions

Figure 4 - Global hydropower technical potential, generation and installed capacity by region. Pumped storage is shown in brackets.



Renewable systems; Regional development; Water-Energy Nexus



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Large range of capacity available

- From kWs to GWs of low-carbon electricity in a single project
- Potential to supply electricity at the regional level



Operational flexibility

- Fast start-up and shut-down
- Adjustable output depending on needs



Storage

- Rapid availability, can be used as a back-up
- Option to absorb surplus (pumped storage)



Multiple purposes

- Water supply, irrigation, navigation, tourism
- Climate-change adaptation (flood and drought mitigation)



Types of hydropower

Run-of-river hydro



Hydropower typology, covering all scales of development

Storage hydro





Technical (re)innovation



offshore water power



Less established versions of hydropower: 1 = tidal range; 2 = osmotic; 3 = hydrokinetic; 4 = wave power; 5 = tidal current



Hydropower balancing renewables



Weekly cycle (three weeks shown)

Schematic illustration



Challenge of variable feed-in to the grid and over/under supply.

Hydropower's ancillary services:

- Fast power control to meet load variations
- Electrical **frequency** and **voltage control**
- o Efficient storage facilities
- Guaranteed **power availability** for defined time frames
- Power reserves to balance peak load
- o Blackstart capacity on system interruption



Wind and hydro

Small scale El Hierro, Canary Islands (2014)



- 11.5MW wind turbine, 11.32MW pumped storage (generation mode)
- System powers domestic and industrial system, as well as desalination plant



Solar and hydro

Large scale Long Yang Xia, China (2013, 2015)



- Hydropower plant (1,280 MW) was built in 1992
- Solar PV plant (320 MW) commissioned in 2013. Phase 2 (+210 MW) in 2016
- PV station and hydro plant operate together to guarantee firm output

Solar and hydro











1. **Sector monitoring** (reporting on 2015 and monitoring new developments in 2016)

- 2. Climate mitigation (GHG status of freshwater reservoirs)
- 3. Climate resilience/adaptation
- 4. Water consumption (assessment of evaporative losses)
- 5. Hydropower's macroeconomic benefits
- 6. **Hydropower finance and investment** (including risk management)

7. **Regional cooperation** (river-basin development and grid interconnection)

8. **Clean energy systems** (hydro's role and energy storage/support for other renewables)





2016 Hydropower Status Report

- Overview of global trends
- New capacity added in 2015
- Detailed regional and country analysis
- Maps of generation, potentials and more
- Updates on key topics





Further information: www.hydropower.org