



# Hydropower Market Report May 2016 Update

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These slides provide updates to some of the key metrics included in the [2014 Hydropower Market Report](#), which was published in April 2015. The Hydropower Market Report aims to fill the existing gap regarding publicly available, comprehensive information on the U.S. hydropower fleet and the industry that supports it and develops new projects.

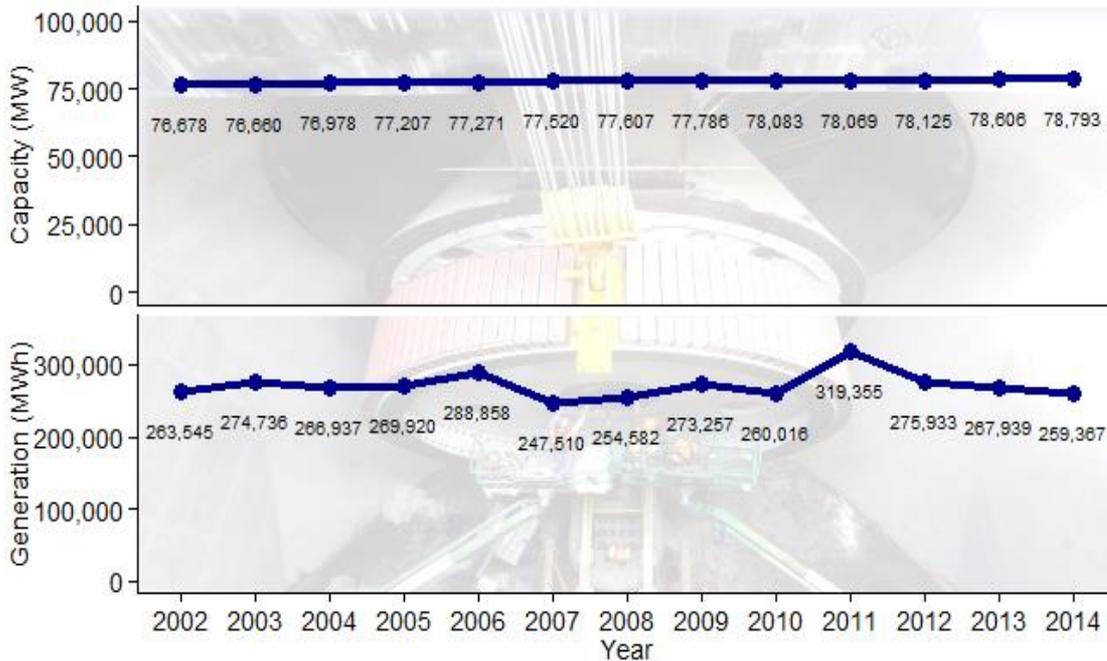
The updated content shown here covers the following topics:

- Installed capacity and generation trends
- Expenditures on rehabilitations and upgrades to existing hydropower fleet
- Dec 31, 2015 snapshots of the hydropower and pumped storage hydropower project development pipeline
- Hydraulic turbine imports and exports
- Policy drivers

The last year of data shown in each of the plots will be 2014 or 2015 depending on the calendar of data releases followed by the agencies and commercial providers used as sources.

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# Total U.S. installed hydropower capacity grew slightly from 2014 but generation declined 3.4%.



Sources: EIA Form 860 for capacity; EIA Form 923 for generation

- Net capacity increase in 2014 was less than 200 MW.
  - Added capacity in 2014 resulted from a combination of:
    - Capacity increases at existing turbine-generator units in existing facilities: 287.1 MW
    - Addition of new turbine-generator units at existing facilities: 27.1 MW
    - Repowerings: 2.5 MW
    - New hydropower facilities at non-powered dams : 7.5 MW
    - New hydropower facilities on conduits: 12.0 MW
  - Capacity decreases and unit retirements at existing facilities amounted to 140.3 MW
- Hydroelectric generation in 2014 was 259,367GWh (3.4% less than the previous year and 4.4% below the 2002-2014 average).
  - Hydropower generation accounted for 48.2% of renewable electricity generation and 6.3% of total electricity generation.

# Changes in hydropower generation in 2014 varied regionally due to year-to-year changes in runoff.

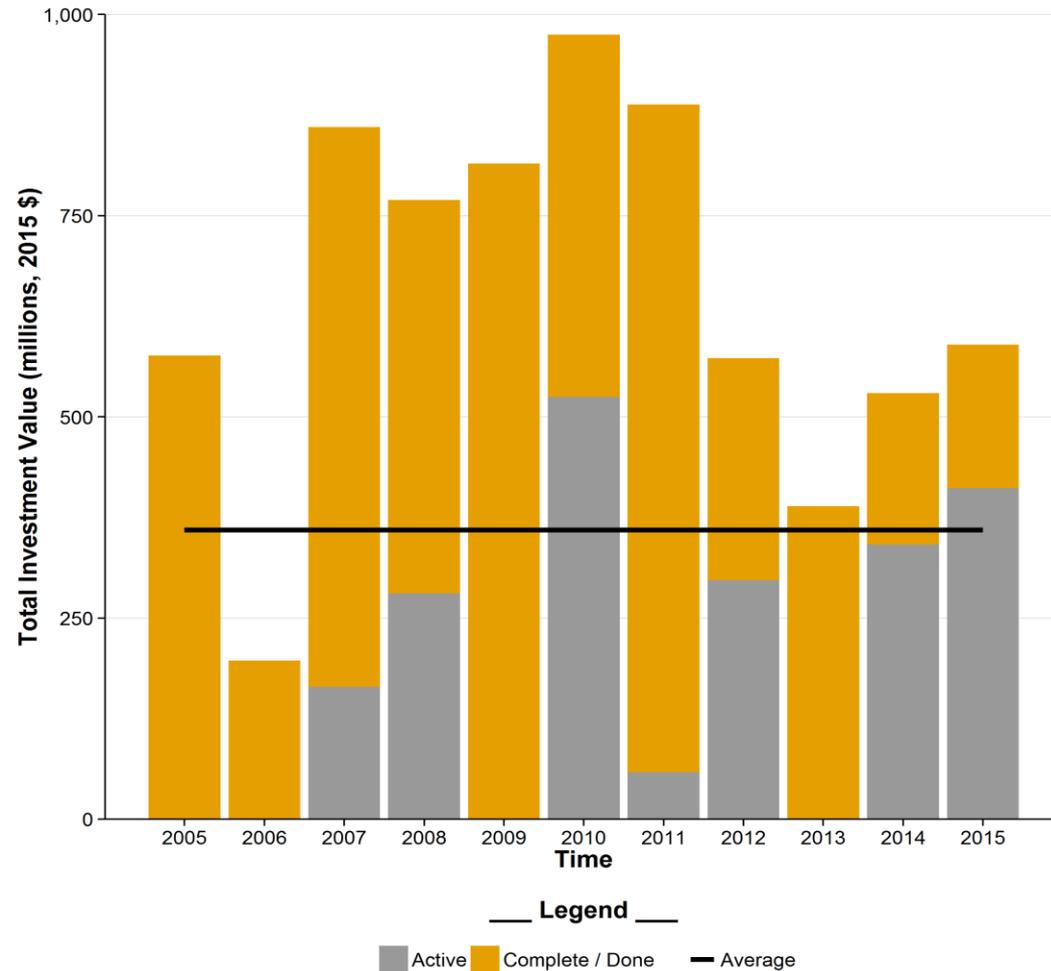
Regional hydropower generation volumes				
Region	2013 (GWh)	2014 (GWh)	2014 change relative to 2013	2002-2014 average (GWh)
Northwest	131,511	137,617	+ 4.64%	134,388
Southwest	34,239	27,634	-19.29%	43,233
Midwest	17,180	19,525	+13.65%	17,186
Northeast	38,653	39,123	+1.21%	39,747
Southeast	46,982	35,468	-24.51%	36,803
Total	268,565	259,367	-3.43%	271,357

Source: EIA Form 923



- Generation in the Southwest and Southeast decreased markedly in 2014 relative to the previous year.
  - The Southwest continued experiencing severe drought in 2014.
  - The Southeast returned to average conditions after “much above normal” precipitation in 2013.
- Generation increased slightly in the Northeast and Northwest regions and more than 13% in the Midwest where 2014 was a wet year (especially for Wisconsin and Michigan).

# At \$589M, new investment on rehabilitations and upgrades (R&U) is trending upwards but remains below the 2005-2015 average.

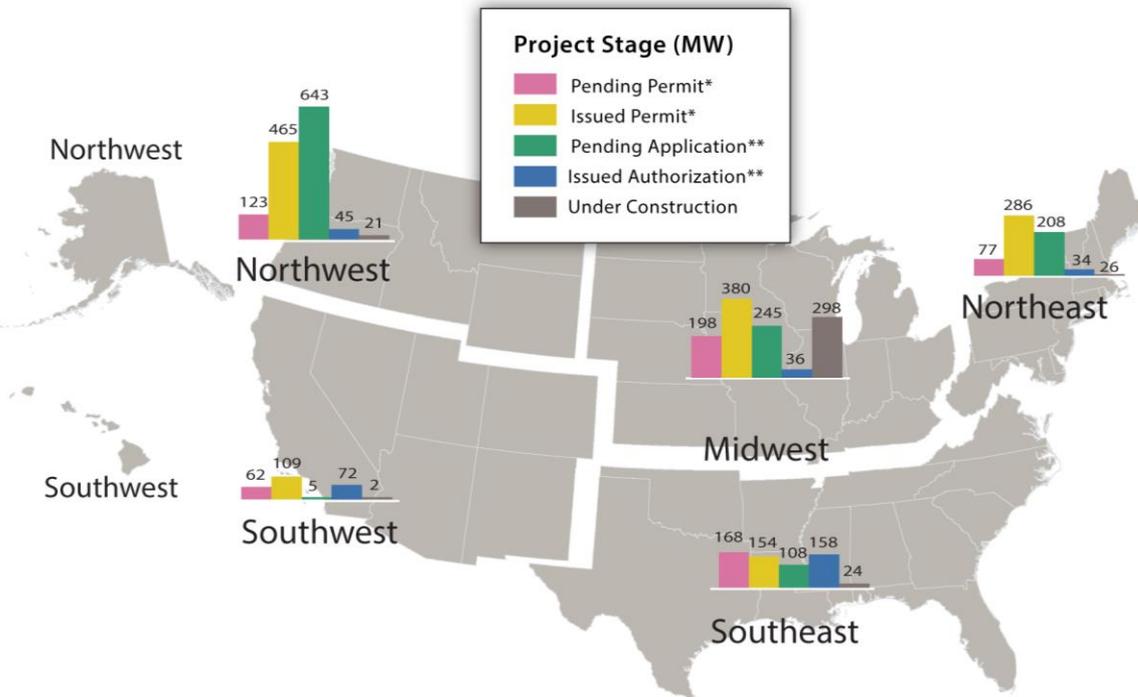


Source: PECWeb Dashboard data from Industrial Info Resources

Note: This plot provides a snapshot of the status of all tracked R&U activities that started construction between 2005 and 2015

- 24% of 2015 tracked R&U investment goes toward hydropower facilities owned by federal agencies.
- The value of tracked R&U investment initiated since 2005 and not completed as of December 31, 2015 is close to \$2 billion.
  - 28% of that ongoing investment corresponds to pumped storage hydropower facilities.
  - The median tracked R&U investment value is \$10 million.
- The most common tracked activities in the R&U database are:
  - Turbine runner replacement
  - Generator rewind
  - Transformer replacement/upgrade
  - Spillway gate refurbishment

# 332 new hydropower projects with a capacity of 3.95 GW are currently proposed remaining largely unchanged relative to December 2014.



\*Projects in the *Pending Permit* and *Issued Permit* stages have high attrition rates. *Pending permit* includes projects pending a preliminary lease in the LOPP process and projects pending issuance of a preliminary permit. *Issued permit* includes projects that have received a preliminary lease in the LOPP process and projects that have obtained a FERC preliminary permit.

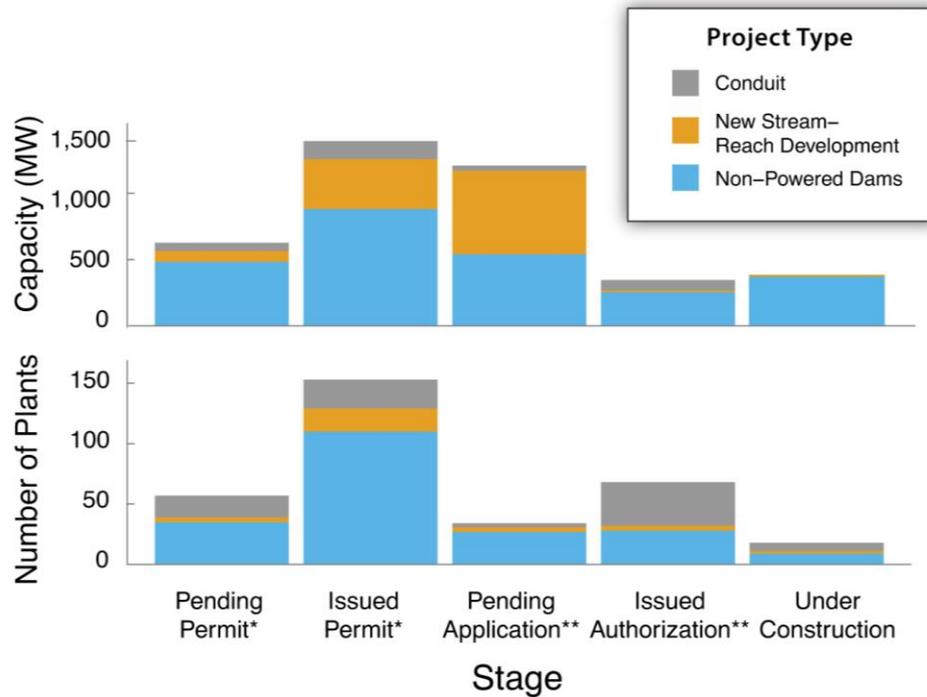
\*\**Pending Application* includes projects that have applied for an original FERC license, a FERC exemption, or have requested FERC to be considered "qualifying conduit hydropower facility". *Issued Authorization* includes projects that have been issued an original FERC license or a FERC exemption, projects that have been approved by FERC for "qualifying conduit hydropower facility" status, or projects that have a final lease contract under the LOPP process.

Source: FERC, Reclamation LOPP database, HydroWorld, and web searches

Hydropower project development pipeline by region, status, and project type (as of December 31, 2015)

- Projects pursuing "qualifying conduit" determination from FERC were included in the 2015 snapshot.
- Every region has at least one project at each development stage.
  - The Northwest and Midwest regions have the most proposed capacity.
  - The Southwest has the largest number of proposed projects (86) but 57 of them are conduit projects which tend to be small.
- Only 17% of proposed capacity has reached the *Issued Authorization* or *Construction* stages.

# The powering of non-powered dams and conduits dominate the development pipeline.



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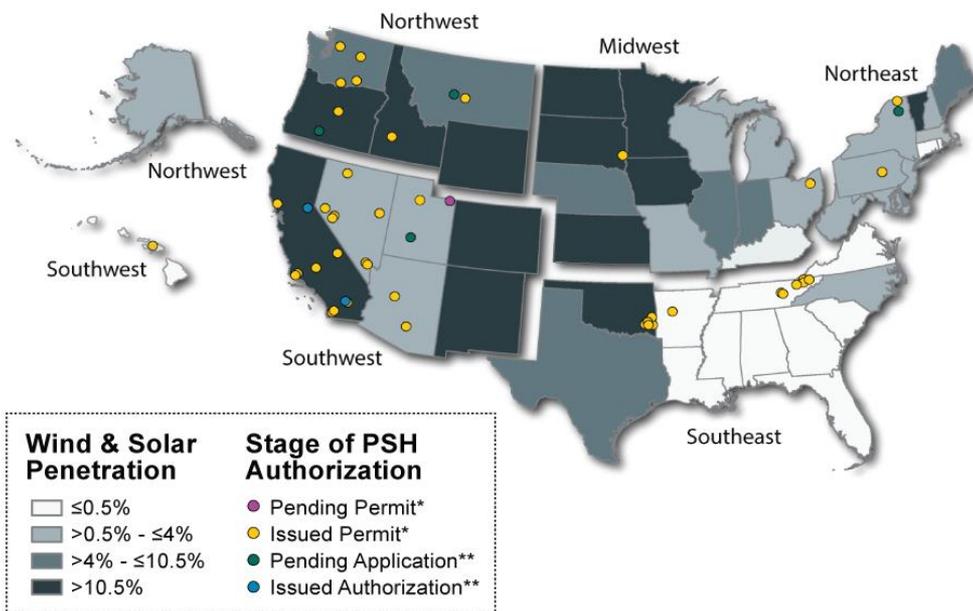
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Source: FERC, Reclamation LOPP database, HydroWorld, and web searches

Hydropower project development pipeline by region, status, and project type  
(as of December 31, 2015)

- Non-Powered Dam (NPD) projects account for 64% of projects and 63% of proposed capacity.
- Conduit projects (88 projects) follow a variety of permitting pathways:
  - 32% of the conduit projects are facilities below 5MW on non-federal conduits that have received "qualifying conduit" status from FERC.
  - 9% of the projects are on conduits owned by the Bureau of Reclamation and require LOPP authorization.
  - The rest pursue a FERC exemption or license.
- Of the 33 New Stream-Reach Development (NSD) projects proposed, 18 are in Alaska and only 1 is outside of the West.
  - 54% of planned NSD capacity corresponds to a single project: Susitna (AK), 600 MW.
- 66 projects were at the *Issued Authorization* stage; if all of them moved forward, significant construction would take place in the next few years for certain combinations of regions and project types.
  - 29 conduit projects in the Southwest
  - 10 NPD projects in the Southeast
  - 9 NPD projects in the Midwest

# Interest in pumped storage continues, and most proposed facilities are in or close to states with high wind and solar penetration.



Note: This map displays the location and development status of proposed new pumped storage hydropower (PSH) projects in the United States in relation to the fraction of total generating capacity that is either wind or solar in each state. The point locations of PSH projects were derived by computing county centroids. Please note: some points overlap due to county level aggregation.

\*Projects on the *Pending Permit* and *Issued Permit* stages have high attrition rates.

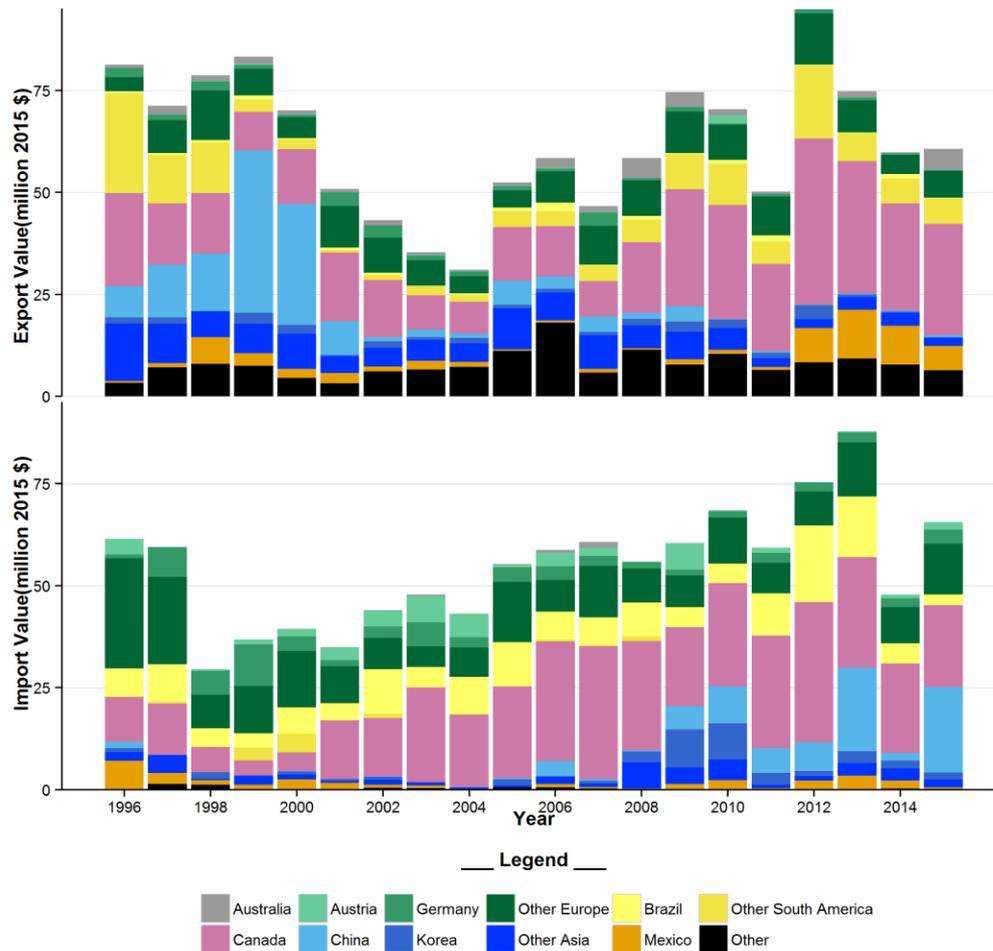
\*\**Pending Application* includes projects that have applied for an original FERC license. *Issued Authorization* includes projects that have been issued an original FERC license.

Source: FERC

Pumped storage hydropower project development pipeline by region and status in relation to state-level penetration of variable renewables (as of December 31, 2015)

- There were 49 projects in the development pipeline at the end of 2015 (two less than one year earlier).
  - 43 have an issued preliminary permit and are investigating feasibility.
  - Projects are spread throughout the West and clustered in a few spots in the rest of the country.
- Three more projects applied for FERC licenses in 2015 (Mineville, NY; Swan Lake, OR; Gordon Butte, MT) but no new FERC licenses were issued.
- The two projects that received authorization in 2014 have not started construction.
  - Eagle Mountain (CA) has purchased the land for the project site but still needs approval to build the power line needed to connect to the grid.
  - SMUD performed engineering and geotechnical studies for Iowa Hills (CA) in 2015 but it dropped the project in February 2016 due to increased cost estimates and financial risk considerations.

# The United States has been a net exporter of hydraulic turbines and parts in 11 out of the last 20 years.



- Hydraulic turbines and parts are the only hydropower equipment component for which international transactions can be tracked from USITC data.
- During 2015, USITC published final data for 2014 and new 2015 data.
  - The decreasing trend in total export value observed in 2012-2014 came to a halt in 2015.
  - The 2014 slump in import value was partly reversed in 2015 with a 37% increase relative to the previous year.
- Canada and Mexico alone accounted for 55% of U.S. exports in 2015 but some exported turbines and parts reached faraway markets like Australia.
- China continued consolidating its position as one of the top exporters of hydraulic turbines to the United States, along with more established sources like Canada and “Other Europe.”

Source: USITC Interactive Tariff and Trade Data Web

- The North American Energy Security and Infrastructure Act, which was introduced in September 2015 and passed the House of Representatives in December 2015, includes provisions for modernizing hydropower regulatory processes:
  - FERC is designated as lead agency that coordinates with all other agencies involved in the issuance of federal authorizations and sets a schedule for the licensing proceedings.
  - Agencies are encouraged to avoid duplication of environmental impact studies by
    - using existing peer-reviewed studies whenever appropriate
    - conducting new region or basin-wide studies that can then be used for multiple licensing proceedings
  - FERC is required to improve the efficiency of license amendment procedures.
  - Closed-loop pumped storage projects and non-powered dam projects that do not materially change the operations of the dam are identified as project types for which special, expedited permitting procedures should be developed.
- Extension of the production and investment tax credits for renewables, passed in December 2015 as part of the Consolidated Appropriations Act of 2016, applies to qualified hydropower projects that start construction in 2015 and 2016.
  - In contrast, the wind PTC and the solar ITC were extended until 2019 and 2021 respectively.
- The Clean Power Plan final rule, whose objective is to reduce CO<sub>2</sub> emissions from U.S. power plants 32% below 2005 levels by 2030, was published in October 2015 but its future remains uncertain after being put on hold by the Supreme Court in February 2016.
  - The final rule harmonizes the treatment of hydropower and other renewables in the calculation of state emissions goals and makes additional hydropower capacity (excluding pumped storage hydro) installed after 2012 a valid compliance option that would receive emission reduction credits.
  - Hydropower is excluded from the Clean Energy Incentive Program whose objective is to encourage early investment in renewables (exclusively wind and solar) going online in 2020/2021 (binding emissions limits under the CPP are proposed to start in 2022).

- Net change in installed U.S. capacity has remained positive in 2014; on the other hand, generation has decreased for a third consecutive year and remained below the 2002-2014 average largely due to ongoing severe drought conditions in the Southwest region.
- 332 hydropower projects and 49 pumped storage hydropower projects were at some stage of the development process in the United States at the end of 2015.
  - 90% of hydro projects leverage existing infrastructure (non-powered dams and conduits for hydropower facilities) and many pumped storage projects select sites where one of the reservoirs already exists or partial work for it has already been done (e.g., abandoned mine pits)
  - Noteworthy development activity has been reported in the first quarter of 2016.
    - More than 100 MW of new hydropower became operational at AMP's Cannelton (KY) and Willow Island (WV) facilities.
    - The Sacramento Municipal Utility District (SMUD) dropped the Iowa Hills (CA) pumped storage hydropower project.
- Rehabilitations and upgrades worth at least \$600 million started construction in 2015 to help maintain or improve reliability and performance of the existing fleet.
- In 2015, the United States imported \$65.6 million in hydraulic turbines and parts and exported \$60.6 million.
  - 65% of the exports stayed within the Americas; 65% of total imports came from Asia and Europe.
- Legislation containing hydropower licensing modernization initiatives was introduced in 2015.
- Hydropower projects starting construction in 2015 or 2016 might be able to benefit from the extension of production and investment tax credits. In the long-run, the future of the Clean Power Plan remains an important uncertainty regarding regulatory-driven incentives for new hydropower development.