Study reveals effects of hydropower projects in China on Mekong River

AALTO, Finland
01/09/2017
By Elizabeth Ingram
Managing Editor

Operations of hydropower projects in China have caused major river flow changes to the Mekong River since 2011, according to research recently published by scientists with Aalto University in Finland.

An analysis of river flows in Northern Thailand indicates that the hydropower operations increased dry season flows, decreased wet season flows, and made dry season flows increasingly variable. Impacts were largest in 2014 after completion of Nuozhadu Dam, the largest hydropower project in the Mekong Basin, Aalto University says in a press release. This dam, in the Yunnan Province, impounds water for the 5,850-MW Huaneng Nuozhadu hydropower plant, which was reported to be the fourth largest hydro project in China in 2014. These impacts were observable more than 2,000 km downstream in Cambodia, researchers say.

The Mekong River is one of the world's largest rivers. Energy demand is growing rapidly in the region. Hydropower operations dampened the Mekong River's annual flood, a key driver of ecological productivity. "The river flows are feared to affect the ecological productivity of the river and thus the livelihoods, economy and food security of the downstream people," said research Timo Rasanen. "However, the ecological and social consequences of the hydropower operations are not yet well understood and more research is needed."

Rasanen indicates downstream countries are building hydropower facilities and the cumulative impacts "need further attention." "Therefore the research highlights the importance of strong transboundary cooperation between upstream and downstream countries for understanding and mitigating the negative consequences," he says.

The research was published in the December 2016 *Journal of Hydrology*.

HydroWorld has reported on several hydro projects under construction on the Mekong River, including 1,285-MW Xayaburi in Laos.

Update: Oroville Dam auxiliary spillway suffers erosion, nearby residents evacuated

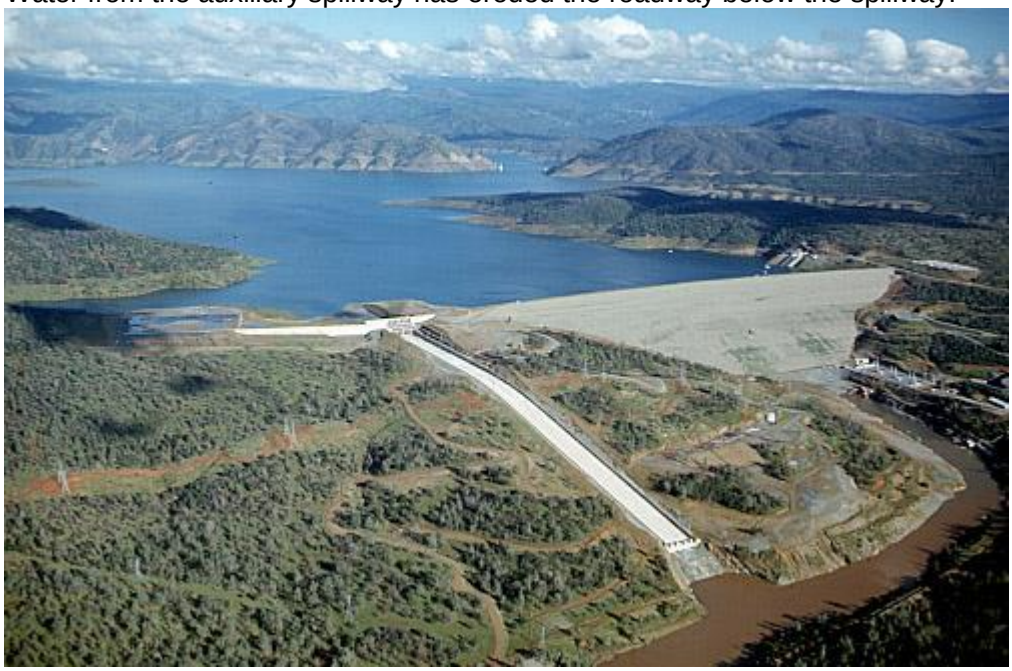
OROVILLE, Calif., U.S.
02/13/2017
By Elizabeth Ingram
Managing Editor

In breaking news that occurred over the weekend, the auxiliary spillway at Oroville Dam suffered erosion during high flows, leading to the evacuation of a reported 188,000 nearby residents. According to the California Department of Water Resources, evacuation orders were delivered to residents surrounding Lake Oroville at about 4:30 pm on Sunday, Feb. 12.

The concern is that erosion at the head of the auxiliary spillway threatens to undermine the concrete weir and allow large, uncontrolled releases of water from Lake Oroville that potentially could exceed the capacity of downstream channels. Lake Oroville is the largest reservoir in the State Water Project, with a capacity of 3.5 million acre-feet. The auxiliary (emergency) spillway has not been used since the dam was finished in 1968.

DWR says it has been monitoring conditions at the main and auxiliary spillways around the clock for signs of erosion that could threaten the integrity of the emergency spillway and allow large, uncontrolled flows to the Feather River.

Water from the auxiliary spillway has eroded the roadway below the spillway.



To lower the lake level, thus reducing flows and the potential for erosion at the top of the emergency spillway, DWR increased flows down the main spillway to 100,000 cubic feet per second from 55,000 cfs. This is the spillway that HydroWorld.com reported on Feb. 10 was damaged, when a cavity opened on the concrete due to erosion. DWR says current releases remain within the capacity of downstream channels.

For comparison, DWR said the morning of Feb. 11 that inflow to the lake was about 95,000 cfs. However, on Feb. 9, DWR reported inflow to the reservoir was about 192,000 cfs, thanks to “a storm that stalled over the watershed.”

Hampered by the erosion to the main spillway, Lake Oroville exceeded the elevation of 901 feet above sea level shortly after 8 am on Saturday, Feb. 11, at which point water began to flow over the concrete weir of the auxiliary spillway.

On Saturday, DWR reported it was focusing on ways to get its 645-MW Hyatt Power Plant, at Oroville Dam, back in operation because 14,000 cfs can be discharged from the plant when it is operating. Power generation was halted when the water levels in the channel that leads from the power plant became high enough to compromise operation.

Oroville Dam is a separate structure from the emergency spillway, and DWR says it remains sound. Oroville is the tallest dam in the U.S. at 770 feet and is a zoned earthfill embankment.

Ethiopian Renaissance Dam stopped

ADDIS ABABA, Ethiopia
03/02/2017
By Elizabeth Ingram
Managing Editor

Multiple news agencies are reporting that Ethiopia has stopped a planned attack on its Grand Ethiopian Renaissance Dam (GERD) and associated 6,000-MW hydro facility.

GERD is under construction on the Blue Nile River, and reports indicate Zadig Abrha, Ethiopia's deputy government spokesman, said 20 members of the Benishangul Gumuz People's Liberation Movement were apprehended while trying to attack the dam site. Abrha said Ethiopian security forces killed 13 of the 20 and the remainder fled into Sudan, where that government captured them and returned them to Ethiopian custody.

The Ethiopian government is saying that the liberation movement is Eritrean, but Eritrean Information Minister Yemane Gebremeskel reportedly told Bloomberg News he had "never heard of this group." Eritrea seceded from Ethiopia in 1991 after a 30-year war for independence.

The GERD project has been under construction since 2011 and is expected to cost $6.4 billion and be completed in 2018. It will be owned and operated by the Ethiopian Electric Power Corp.

GERD will feature the largest roller-compacted-concrete volume dam in the world, at 10.2 million cubic meters. The main dam will be 1,800 meters long and 175 meters high and a concrete-faced rockfill saddle dam will be 5,000 meters long and 60 meters high. Its reservoir will have a capacity of 70 cubic kilometers.

Two powerhouses at the toe of the Main Dam will house 16 Francis turbine-generator units, each with a capacity of 375 MW. Total annual generation from the project is expected to be 15 TWh.

Two UK companies will develop marine energy in Indonesia

JAKARTA, Indonesia
03/30/2017
By Gregory B. Poindexter
Associate Editor

Atlantis Resources Ltd. (Atlantis) and DCNS Energies, two United Kingdom-based energy development companies, today announced agreements to develop marine energy in Indonesia.

Atlantis

Atlantis announced it has signed a preferred supplier agreement with SBS International Ltd. (SBS), for the supply of turbines, engineering services and equipment for a 150-MW tidal-stream array located in Lombok, Indonesia.

Energy generated by the project will be sold to Indonesian state-owned utility Perusahaan Listrik Negara through a 25-year power purchase agreement.

In April 2016, HydroWorld.com reported Atlantis and SBS signed a memorandum of understanding and per the agreement, the partners would construct a 150 MW project across a number of stages at an estimated cost of US$750 million.

Phase 1 of this project is expected to commence this year and according to Atlantis, involves front-end engineering and design, and an environmental impact assessment.

In November 2015, according to SBS, the company was the first to establish itself as a marine energy independent power producer in Indonesian.

SBS is a privately-owned international marine, subsea and renewable energy project developer based in Aberdeen, Scotland. The company has branch offices in Bangkok, Thailand; Kuala Lumpur, Malaysia; London, England and Jakarta, Indonesia.

Additionally, SBS has been awarded exclusive development rights to three offshore sites, which are situated around the islands of Lombok and Bali. SBS estimates once the three marine energy sites are completed, they could produce a total combined capacity of 450 MW.

Michael J. Spencer, SBS group chairman and chief executive officer, said, “Atlantis has demonstrated strong commitment to work with SBS on our tidal energy projects in Indonesia and we are confident we have selected the best possible partner. Together, we will complete an efficient supply chain for the first 150MW site as Atlantis establishes its turbine assembly and operations and maintenance base, and we look forward to capturing further efficiencies when they establish the first tidal turbine manufacturing facility in Indonesia and in the region.”

Atlantis said it will seek to establish dedicated local facilities for turbine assembly, testing and maintenance, and turbine manufacturing once aggregate orders for turbines in Indonesia exceed 100 units.

DCNS Energies

DCNS Energies and PT AIR signed a letter of intent today designed to deliver a roadmap for the engineering, industrial development and commercial ramp-up of a tidal energy industry in Indonesia.

DCNS Energies and PT AIR will combine to analyze and assess the commercial and economic conditions required to build a tidal energy industry, according to DCNS Energies. This will allow the two partners to develop a roadmap to ensure the creation of a sustainable Indonesian tidal industry.

PT AIR is an Indonesian company focused on marine renewable energy and according to the company, it is spearheading the marine tidal energy industry in Indonesia.

PT AIR’s manufacturing facility manufactures tidal turbine products for use in Indonesia and throughout Southeast Asia. The company said it works closely with marine consulting and coastal engineering research firm PT ASR, which has been actively surveying and scouting suitable locations for tidal energy projects throughout the Indonesian Archipelago.

Herve Guillou, DCNS group CEO, said, “Over the past two years, we have been working closely with PT AIR to assess the most suitable sites for the development of tidal energy projects in Indonesia. Today’s signing of the letter of intent is a further step in our cooperation that will allow us to structure our organizations and industrial plans for the creation of a tidal industry in the country, with a high level of local manufacturing content.”

Panji Adhikumuro Soeharto, president director at PT AIR, said, “Our ambition is to build a local tidal industry with economic and social benefits for Indonesia. In that purpose, our cooperation with DCNS Energies will be a serious asset to convince Indonesian authorities that thanks to its regularity and predictability, tidal energy is an investment that will contribute to fulfill Indonesia's renewable energy targets as a maritime country.”

DCNS Energies also said it will use its expertise gained from developing marine energy projects and the experience of its subsidiary, tidal technology company OpenHydro, in designing, manufacturing and installing tidal turbines in various Indonesian maritime environments.

Wyden announces Clean Energy for America Act

WASHINGTON, D.C.
05/05/2017
By Elizabeth Ingram
Managing Editor

U.S. Senate Finance Committee Ranking Member Ron Wyden, D-Ore., announced the Clean Energy for America Act Thursday, May 4.

This legislation is intended to "measurably reduce carbon pollution over the next decade through a series of incentives for clean energy and the promotion of new technologies in the private sector."

The act includes technology neutral tax credits for domestic production of clean electricity and clean transportation fuel, as well as performance-based tax incentives for energy-efficient homes and office buildings. The credits are open to all resources, including fossil fuels that capture carbon or make efficiency improvements.

"This bill is built around the proposition that the law ought to reward innovative energy technologies with incentives that spark investment in the private economy," Wyden said. "These investments will shrink electric bills for American families and create new clean energy jobs in Oregon and across the country."

Currently there are 44 different energy tax incentives, more than half of which are too short-term to effectively stimulate investments, while also providing different subsidies to different technologies with no clear policy direction, according to a press release from the U.S. Senate Committee on Finance. Wyden's bill proposes a dramatically simpler set of long-term, performance-based energy tax incentives that are technology neutral and promote clean energy production and storage in the U.S.

In essence, "The bill creates a performance-based incentive that would be neutral and flexible between clean electricity technologies. Taxpayers are able to choose between a production tax credit (PTC) and an investment tax credit (ITC), which are scaled based on the carbon emissions of the electricity generated – measured as grams of carbon dioxide equivalents (CO_2e) emitted per kilowatt hour (KWh) generated. Power plants that emit at least 35 percent less carbon than the current nationwide average begin qualifying for a small incentive, which increases for power plants that are progressively cleaner. Zero emission facilities qualify for the maximum credits – a 2.3 cents per KWh hour PTC or a 30 percent ITC. The PTC is available for the 10 years after a facility is placed in service."

Specific to hydropower, the bill says that: "Power plants placed in service before January 1, 2019 that add energy storage technology or carbon capture equipment are able to claim the maximum 30 percent ITC for those investments, which can enhance grid stability and reduce the emissions of current fossil fuel power plants. Storage technologies include hydroelectric pumped storage, thermal energy storage, fuel cells, and batteries, among others."

For the full text of the bill, click here.

Oroville Dam situation leads state to order in-depth assessment of more than 50 dams

SACRAMENTO, Calif., U.S.

06/19/2017

By Elizabeth Ingram
Managing Editor

The California Division of Safety of Dams is requesting that dam owners in the state assess dam appurtenant structures, including spillways, to confirm they meet minimum safety standards.
This is part of the Spillway Re-Evaluation Program, which was established in 2017. This "on-going screening process and re-evaluation of spillways at dams" starts with those that potentially pose the highest hazard, DSOD says. The evaluation includes the assessment of:

- The spillway's design and construction and geologic attributes while concurrently reviewing the dam owner's maintenance and inspection program
- The spillway's historical performance
- Any previous spillway repairs

DSOD says it is "working closely with dam owners to expedite the development of the required assessments and restore any known areas of disrepair."
Dam owners have received a spillway notification letter as part of DSOD's first phase condition assessment request:
"As a result of the recent major incidents at Oroville Dam, which led to significant damage and erosion of the Service and Emergency Spillways, Governor Brown issued a plan to bolster the State's dam safety program. To strengthen the State's inspection program, the Governor has ordered detailed evaluations of dam appurtenant structures, such as spillways. This new review is being expedited for dams that have large spillways and structures similar to Oroville Dam. Based on this directive, the Division of Safety of Dams is immediately conducting detailed re-evaluations of large spillways at high-hazard dams."

DSOD came into existence as a result of the St. Francis Dam failure in southern California in 1028. The division operates under the California Department of Water Resources, and its engineers and engineering geologists review and approve plans and specifications for the design of dams and oversee their construction to ensure compliance, as well as inspect more than 1,200 dams on a yearly schedule to ensure they are performing and being maintained in a safe manner.

On June 7, California DWR provided an update on the status of rehabilitation work at Oroville Dam. The agency said prime contractor Kiewit Infrastructure West has been focusing on removing the lower 2,000 feet of the main spillway and removing the last 600 feet of the upper chute, leaving in place the 1,000 feed that leads to the radial gates. In addition, the Board of Consultants has approved DWR's final design of the reconstruction and repair to the main and emergency spillways.

Hydro Group Associate Editor Gregory B. Poindexter spoke with William A. Croyle, acting director of California DWR, in April to get an update on the situation at Oroville Dam. Below is an audio clip from that interview.

PowerChina signs EPC deal for Philippines' 500-MW Wawa pumped storage plant

RIZAL, Philippines

07/14/2017

By Michael Harris
Associate Editor

Philippine developer Olympia Violago Water & Power Inc. has signed a partnership with **PowerChina** for the design, procurement and construction of the 500-MW Wawa pumped storage hydroelectric project.

The plant will be located in Rizal province and is expected to cost US$1 billion, according to power producer Equis Energy, which is also partnering in the project. Also included in the development group is San Lorenzo Ruiz Builders and Developers.

"The Wawa pumped storage project is one of the **Philippines**' most strategically important power generation assets in terms of ensuring the immediate reduction of power prices," Equis chairman David Russell said.

Wawa is intended to help support the Philippine government's push toward tripling the country's green generating capacity by 2030 by providing grid stability.

"OVPI will deliver a project of national significance with the best technology that will not only provide gainful employment for the local communities, but also will ensure a stable supply of energy for generations of Filipinos to come," Olympia Violago Water & Power chair Oscar Violago said.

Construction on the pumped storage plant is expected to begin by the end of this year, with commissioning planned for 2022.

For more pumped storage news, **visit here**.

CTGC begins construction on the 16-GW Baihetan hydropower station in Southwest China

WUHAN, Hubei, China

08/03/2017

By Gregory B. Poindexter
Associate Editor

China Three Gorges Corp. (CTGC) has begun construction of the 16-GW Baihetan hydropower station located on the lower reaches of the Jinsha River, between the borders of Sichuan and Yunnan provinces in Southwest China.

China's state-run news agency, *Xinhua*, reports construction on the station began today. According to 2016 estimates from China's National Development and Reform Commission, the project will cost about US$6.3 billion.

According to CTGC, the project's main structures consist of the dam, flood discharge structures, water diversion and power generation facilities. The dam is a double-curvature arch dam with a

maximum height of 277 m, a crest elevation of 827 m, a crest width of 13 m and a maximum bottom width of 72 m.

The underground powerhouse will contain 16 generating units at 1,000 MW each and have an average annual power output of 60.24 TWh, which is equal to two-thirds of Beijing's electricity consumption in 2015, CTGC said.

The first group of units are expected to begin operating in 2021. The project should be fully-commissioned by the end of 2022.

About 100,000 residents in Sichuan and Yunnan will be relocated to make way for the project that will manage a basin area of 430,000 km^2, which is 91% of Jinsha River's basin area.

Baihetan will be the world's second highest capacity hydropower facility, second to the 22.5-GW Three Gorges hydroelectric projectspanning the Yangtze River in Hubei province. Currently, the 14-GW Itaipu hydroelectric power plant is the world's second-largest hydro facility, located on the Parana River at the border between Brazil and Paraguay.

During the first week of July in an attempt to ease flood pressure on the Yangtze River, Three Gorges and the 2.9 GW Gezhouba hydro plants shut down a combined 26 generators, according to *Xinhua*. Three Gorges cut its output from 18.12 GW to 6 GW and Gezhouba from 2.9 GW to 1.5 GW.

In July, Voith Group and CTGC signed an agreement in Berlin, Germany, in which Voith will supply two 350 MW units for the US$1.5 billion 2.1-GW Zhejiang Changlongshan pumped storage hydropower station.

The project is located in Anji County, Zhejiang province, between the cities of Tianhuangping and Shanchuan.

Nam Ao Dam in Laos burst last week

PHAXAY DISTRICT, Laos

09/19/2017

By Elizabeth Ingram
Managing Editor

Nam Ao Dam, being built to impound water for a small hydropower facility on the Nam Ao River in the Lao People's Democratic Republic, burst last week, according to the Lao News Agency.
Reports indicate flooding of farmland in the Thathom District of Xaysomboun Province after the dam burst Sept. 11. In addition, some sections of a road were under mud but undamaged. No news agencies have reported exactly how much water was released during this incident.
The dam itself is located in the Phaxay District of Xieng Khuang Province and has been under construction since 2015 by the Bothong Inter Company. At the time it burst, construction of the dam was 85% complete, Lao News Agency says.
Generating capacity of the hydro powerhouse when completed has been reported to be both 12 MW and 15 MW.
Officials with the Ministry of Natural Resources and Environment are investing the cause of the incident and estimating damages. No injuries or deaths have been reported. Seven downstream villages were affected.
The Vientiane Times reported the water released did not come from the main reservoir behind the dam but from a "sub-reservoir of the dam which is under construction." This sub-reservoir suffered damage due to heavy rain, according to Thathom district Governor Somboun Sonelitthideth.
There is no indication of how long completion of the facility could be delayed as a result of this incident.
Laos is seeing quite a bit of activity around hydropower development. Earlier this month, Laos signed an agreement with the International Finance Corporation to launch the "first cumulative impact assessment" in the Sekong River Basin.
For more small hydro news, click here.

Scenario in study for pumped storage hydropower in Virginia indicates estimated cost at US$2 billion

RICHMOND, Va., U.S.

10/02/2017

By Gregory B. Poindexter
Associate Editor

Dominion Energy, which currently manages the largest pumped storage hydroelectric project in the U.S., announced results from a study it commissioned on building a proposed pumped storage hydropower facility in the coalfield region of the Commonwealth of Virginia.

Virginia is located in the American Northeast, and the coalfield localities within the state include the counties of Buchanan, Dickenson, Lee, Russell, Scott, Tazewell, Wise and the city of Norton.

The actual size and cost of the proposed facility have not yet been determined. But, according to information from Dominion Energy this week, the study it commissioned from Richmond-based Chmura Economics & Analytics indicates a scenario in which planning and construction costs of a pumped-storage project were estimated at US$2 billion.

The study also said, "…the power station would create nearly $320 million in total economic impact for Southwest Virginia. Construction of the facility would support 2,980 jobs in Virginia between 2017 and 2027, including 2,083 positions in the coalfield localities. The study also found that more than $7.7 million in new tax revenue would be created for the Commonwealth during this phase."

The proposed facility comes as a result of legislation passed by the 2017 Virginia General Assembly, which encourages the development of pumped storage technology in the region.

"We are very excited about the prospect of bringing another major capital investment to the coalfield region of Southwest Virginia," said Mark Mitchell, Dominion Energy vice president of generation construction. "The entire grid system will benefit from having this new generation once it comes online, and the local area will benefit from the jobs and economic benefits that will come from it."

On Sept. 6, Dominion Energy filed a Preliminary Permit Application with the Federal Energy Regulatory Commission, identifying a potential 4,100-acre project site in Tazewell County. The company has also contracted with Virginia Polytechnic Institute and State University (Virginia Tech)

to study the feasibility of using an abandoned coal mine in Wise County to construct a pumped storage facility.

Currently, Dominion Energy jointly owns the 3,003-MW Bath County pumped-storage hydropower facility, located in Virginia, with First Energy Corp at 60% and 40%, respectively. Dominion manages the scheme, which was completed in 1985, and the Bath County facility is the largest pumped-storage plant in terms of generating capacity in the world.

Dominion Energy has a power generation portfolio of about 25,700 MW.

Deadly Iran-Iraq earthquake damages Darbandikhan Dam

DARBANDIKHAN, Sulaymaniyah, Iraq

11/13/2017

By Elizabeth Ingram
Managing Editor

A magnitude 7.3 earthquake that hit the border region between Iraq and Iran yesterday has killed more than 400 people, injured more than 6,600 and caused cracks in Darbandikhan Dam.
Darbandikhan Dam is on the Diyala River in the northern As Sulaymaniyah Governate of Iraq. It was completed in 1961 and is a rockfill embankment dam with a central clay core. The dam is 420 feet tall and 1,460 feet long. The dam's purposes are irrigation, flood control, hydroelectric power production and recreation. The 249-MW power station was commissioned in 1990 and contains three 83-MW Francis turbine-generator units. In 2013, repairs were completed related to damage from bombing in 1990.
The dam has suffered cracking, and landslides are reported to have pushed rocks and rubble onto the spillway. News agency NRT reported the earthquake" left many vertical and horizontal cracks in the upper part of the 55-year-old dam, one of which is about 450 meters long." NRT says that Rahman Khani, head of Darbandikhan Dam, has halted electricity production for the time but that the water levels behind the dam have not decreased so far.
BBC News has collected video footage of the earthquake occurring at the dam and some of the aftermath.
The dam is owned by the Ministry of Water Resources.
Nearby Mosul Dam is reported to be undamaged.

CEO of hydro developer Ethiopian Electric Power named Power Generation Woman of the Year

LAS VEGAS

12/06/2017

By Elizabeth Ingram
Managing Editor

In recognition of her great work advancing power generation in Ethiopia, on Dec. 5 at POWER-GEN International, Azeb Asnake, chief executive officer of Ethiopian Electric Power, was named the 2017 Power Generation Woman of the Year.

Asnake is a civil engineer by training and is responsible for the construction and operation of generation plants, transmission lines and substations, as well as overseeing the sale of electricity to neighboring Sudan, Djibouti and border towns of Kenya. When she first entered the industry, Ethiopia's electric energy was mainly hydro based and the generation capacity was 2,430 MW. Since then, generation has grown to 4,500 MW.

Asnake was project manager for **the 1,870-MW Gilgel Gibe III** project on the Omo River, which began operating in October 2015. Prior to that, the largest hydro project developed in the country was about 400 MW, and all had been managed by men. She took on the challenge of building this daunting project in a remote and undeveloped area of the country, and succeeded.

She has been CEO of the company for four years. One goal of Ethiopian Electric Power under her guidance is to become a power hub of Africa and reach a generation capacity of 17,000 MW by 2020 to create a system that will carry and sustain the economy level of a middle-income country.

To this end, the company is developing **the 6,000-MW Grand Ethiopian Renaissance Dam** project on the Blue Nile River. Despite some controversy, the project is proceeding as planned.

In Ethiopia, most economic sectors are led by men. A woman leading in an engineering discipline is almost never found. Indeed, Asnake explained in her personal statement that while she was in school her professors and peers discouraged her from entering engineering.

Today, as CEO of a key aspect of Ethiopia's economic sectors — power generation — Asnake is demonstrating not only that women can lead in engineering, but also that they can do so with great success. Electric power is growing exponentially in Ethiopia as the country seeks to expand electricity access to as many of its citizens as possible.

Asnake gave a speech at the Women in Power Luncheon at POWER-GEN and participated in a panel discussion with the other Woman of the Year Finalists: Pamela Rauch, vice president, external affairs and economic development, Florida Power and Light and Caroline Winn, chief operating officer, SDG&E.

For more news about hydropower in Africa, **click here**.