Ohio House of Representatives

Energy and Natural Resources Subcommittee on Energy Generation

Hydroelectric Generation

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Executive Director/Ohio Municipal Electric Association (OMEA)

Good afternoon, Co-Chairmen Stein and O'Brien and members of the Subcommittee. My name is Jolene Thompson. I am an Executive Vice President for American Municipal Power, Inc. (known as AMP) and Executive Director of the Ohio Municipal Electric Association. I am pleased to have the opportunity to be with you this afternoon to discuss the important role that hydropower plays as a generation resource.

Both AMP and OMEA are membership organizations that represent municipal electric utilities. Ohio is home to 89 municipal electric utilities, which serve approximately 400,000 customers and represent approximately 5% of the state's electric load. Municipal electric utilities are locally owned and governed by their communities – their customers and shareholders are essentially one and the same.

AMP is the non-profit wholesale power supplier and services provider for 135 municipal electric utilities in nine states. We were founded nearly 50 years ago to help municipal electric utilities leverage economies of scale to provide more affordable power supply, generation and energy-related services. Currently, AMP member utilities serve more than 650,000 customers across our nine state footprint. AMP has resources and load in both PJM and MISO.

Formed in 1962, the OMEA serves as the legislative liaison for 80 municipal electric communities and for AMP. Ohio municipal electric systems range in size from Cleveland Public Power with 73,000 meters to the City of Toledo with a single customer. The majority of our member communities are villages.

AMP and OMEA are headquartered in Columbus and AMP's commitment to Ohio remains strong, with 84 Ohio member communities and power generation across the state.

Municipal electric systems are often referred to as "public power" because the utilities are part of the local government elected by the local constituents.

Nationwide, there are more than 2,000 public power systems, which provide about 15 percent of all electric sales. Some of the nation's largest cities – Los Angeles, Orlando, San Antonio and Seattle – operate publicly owned electric utilities; however, most public power systems are small-to-medium sized and serve 3,000 or fewer customers.

AMP offers our member municipal electric utilities a diverse portfolio of energy resources, including baseload, intermediate, and peaking generation, utilizing coal, natural gas, hydropower, solar, wind and diesel – as well as market purchases. In addition to power supply, AMP offers a

variety of services to support our members' efforts to serve their customers, including energy efficiency and sustainability programs. We're also working to ensure our member municipal electric utilities are kept up to date on the new technologies and customer-driven changes impacting the electric utility industry.

In Ohio, AMP has 23 owned or operated generating sites, including the AMP Fremont Energy Center natural gas combined cycle plant, diesel engines, natural gas turbines, a wind farm, and utility-scale solar. In addition, we have negotiated power purchase agreements for our member municipal electric utilities for energy from landfill gas, wind and solar resources located in Ohio.

I'm here today to focus on hydropower generation because AMP is considered a leader in the hydro arena. We recently completed the largest development of new run-of-the-river hydropower generation in the United States with four new plants along the Ohio River. Additionally, our CEO Marc Gerken has been a leader for many years on the governing board of the National Hydropower Association. In total, AMP and our member municipal electric utilities own and/or operate more than 500 MW of hydropower generation in the region, with additional hydro resources under long-term purchase power agreements or contract.

Hydropower has long served a critical role in the United States electric sector. Hydropower provides a host of benefits, including: favorable capacity factors; low operation and maintenance costs; carbon-free, renewable energy; and 80-100 year lifespans. Hydropower has been a mainstay of the national electric grid since the late 1800's and has supplied a cumulative 10% of U.S. electricity generation over the past 65 years (1950–2015), and 85% of cumulative U.S. renewable power generation over the same time period.[i]

Hydropower is truly an untapped resource in our country. Released in July 2016, the U.S. Department of Energy's Wind and Water Power Technologies Office, "Hydropower Vision: A New Chapter for America's 1st Renewable Electricity Source" released a comprehensive analysis of hydropower's existing and future potential in the United States. The analysis found that U.S. hydropower could grow from the current hydropower generation fleet of 2,198 active power plants with a total installed capacity of 101 gigawatts (GW)[ii] to nearly 150 GW by 2050. Growth under this modeled scenario would result from a combination of 13 GW of new hydropower generation capacity (upgrades to existing plants, adding power at existing dams and canals, and limited development of new stream-reaches), and 36 GW of new pumped storage capacity. With this deployment level, more than 35 million average U.S. homes could be powered by hydropower in

2050. In Ohio, the analysis identified potential development of 3,795 MW of capacity, with an estimated 60% capacity factor equating to 19,986,000 MWh/year.

While the quintessential view of hydropower is the Hoover Dam facility located in the western United States, hydropower generation is grouped into three distinct types: impoundment (like Hoover Dam), run-of-river and pumped storage. More details on all three are in the attachments to my written testimony. Today, I'll focus on the prevalent form of hydropower in our region – run-of-the-river at existing locks and dams.

Ohio is home to the Auglaize, Hamilton, O'Shaughnessy, Stockport Mill Inn, Greenup and Racine hydropower plants, all but the Stockport and Racine plants are owned or operated by AMP members. In 2017, the U.S. Energy Information Administration (EIA) estimated that hydropower constituted 1.7% of total in-state generation capacity.

AMP's hydropower plants are run-of-river plants at existing Army Corps of Engineers (USACE) locks and dams on the Ohio River. In each case, the USACE operated locks are on one side of the dam and AMP's hydropower plants are located on the other side of the river.

AMP's history with hydropower began with the 1999 commercial operation of the Belleville Hydroelectric Plant in West Virginia. This 42 MW run-of-the-river power plant at USACE Belleville Locks and Dam southwest of Marietta, Ohio is jointly owned by 42 Ohio member communities. The Belleville project annually generates more than 250,000 MWh and has outperformed feasibility study estimate projections. In just under 20 years of operation, the Belleville project has surpassed its five-millionth net MWh delivered to participating communities. The milestone was crossed on Dec. 10, 2018 – between six months to one year sooner than projected.

While several of our projects are located in Kentucky and West Virginia, a total of 68 Ohio municipal electric utilities contract for output from the facilities. Further, our four new projects, which achieved full commercial operation in 2017, total more than 300 megawatts (MW) and represent nearly $2.6 billion in capital investment. During the multi-year construction the projects resulted in an estimated 1,600 direct jobs, more than 1,000 indirect jobs, $342 million in payroll and the use of vendors from at least 12 states, including Ohio.

Regardless of the type of hydropower plant, the initial project development of sizeable projects is capital intensive and rates for the projects are typically above market until financing costs are paid

off. Construction of new units the size and scope of ours is a major undertaking. Attached to my written testimony are pictures of our projects.

Our member city and village governing bodies made the decision to invest in hydropower because of the overall and long-term benefits, including:

- Renewable resource that has the ability to provide baseload power (unlike many other renewable resources);
- Dispatchability (predictable day-ahead output forecasting);
- The ability to provide ancillary services and grid support;
- No fuel risk (meaning no hedging exposure, no counterparty risk and no transportation risk);
- No waste stream;
- Low operation and maintenance costs;
- Reliability;
- Predictable rates;
- Limited regulatory risk (once operating);
- A long life span (80 to 100 years); and
- No emissions (a zero carbon resource and the leading form of renewable energy in the country).

AMP offers its hydropower generation into the PJM capacity auctions as capacity resources, just like other coal, gas and nuclear generating resources. As a capacity resource, AMP's hydropower plants are subject to the same risks of nonperformance and penalties as other capacity performance resources and may also receive revenue if they clear the auctions.

Many hydropower resources have the capability to come online quickly and provide significant rotating mass (inertia). As grid-scale battery storage prices continue to decrease, the addition of battery storage to existing generation technologies, including hydro plants will become increasingly cost effective. This co-location would benefit the grid by deferring or avoiding costly transmission upgrades at a time when the North American Electric Reliability Council (NERC) has emphasized the need for grid upgrades related to integrating wind and solar resources.

Hydropower does have limitations, particularly in our region where the number of existing dams and the generation capacity are finite; however, more can be done to encourage continued use

and expansion of hydropower at existing dams, large and small, across the region. In fact, many smaller dams across Ohio are ideal for small-scale run-of-river plants, and some are already in the development phase.

AMP has a unique perspective on the challenges of hydropower development, operation, and the associated regulatory processes. Regardless of where in the country you are located, the siting and permitting processes for any new hydropower generating asset are not for the faint of heart; the licensing and permitting processes for hydropower are especially arduous and typically take more than a decade. While the Federal Energy Regulatory Commission (FERC) is the lead agency, approvals for hydropower developments must come from myriad federal and state agencies and require separate permitting by the USACE and state resource agencies.

To endure this lengthy approval process a developer must have significant capital (millions of dollars in many cases) to cover the cost of a proposed sizeable hydropower project through permitting, including: subsurface core drilling, hydraulic model studies, design and initial payments for equipment with long lead times. Long-term financing is unlikely until a developer has all of the required permits in hand, which can drive both the timing of the access to the market and the cost of money.

As an example, licensing for a potential new AMP hydropower project – the R.C. Byrd Project, which would be located at the Ohio River Gallia Locks and Dam in Ohio, began in 2007. A decade later, on August 30, 2017, FERC issued the final license, with the delay largely due to issues raised by the USACE. AMP's economic commitment to this project now exceeds $4 million. At this point, we are pursuing the necessary USACE 404 permit and subsequent 408 permit approval that are anticipated to take an additional four years in spite of many of the issues having already been resolved by FERC.

Initial hydropower licenses have traditionally been issued for 30-50 years. As they approach expiration, the licensee must decide whether to let the license expire or pursue a relicense of the facility from FERC. The relicense process mirrors the initial process for obtaining a license by requiring inclusion of resource agencies and stakeholders, and conducting an updated technical assessment of project impacts. The general industry recommendation is to start the relicense process 10 years in advance and estimate costs of several million dollars.

AMP has been supportive of hydropower reform legislation in Congress and efforts to streamline the licensing and relicensing process. We firmly believe that hydropower resources will continue

to play an important role in the efficient operation of the grid. Hydropower, like natural gas, can be a good partner for balancing resources like wind and solar, and can provide ancillary services such as frequency control, regulation, load following, spinning reserves and supplemental reserves.

Hydropower plays an important role in AMP's efforts, and we are encouraged by policymakers' increasing recognition of the contributions hydropower provides to grid stability, achieving renewable energy targets, and economic impacts to the grid. The commitments of AMP and its member communities serve as evidence that hydropower is recognized as a desirable and beneficial contribution to those seeking to embrace a diverse resource portfolio.

Thank you again for holding this hearing and providing us with the opportunity to appear before you today. I would be happy to respond to any questions.

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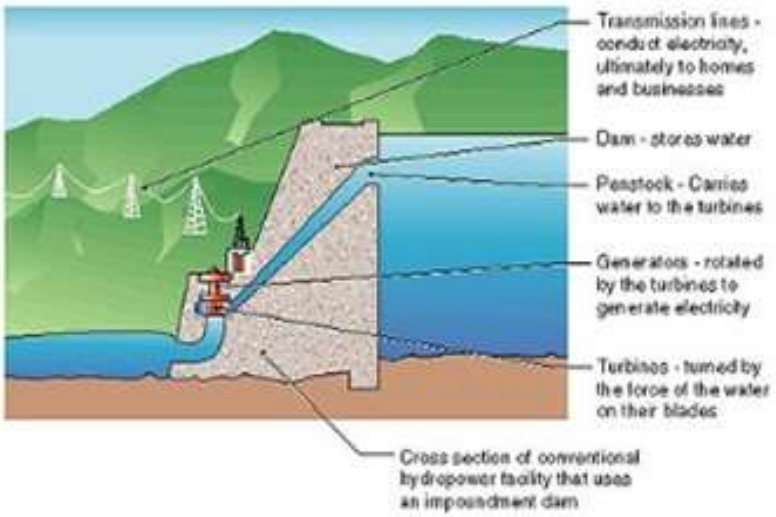
[i] U.S. Energy Information Administration. October 27, 2015. Table 7.2b Electricity Net Generation: Electric Power Sector. Monthly EnergyReview. Accessed July 5, 2016. *http://www.eia.gov/totalenergy/data/monthly/.*

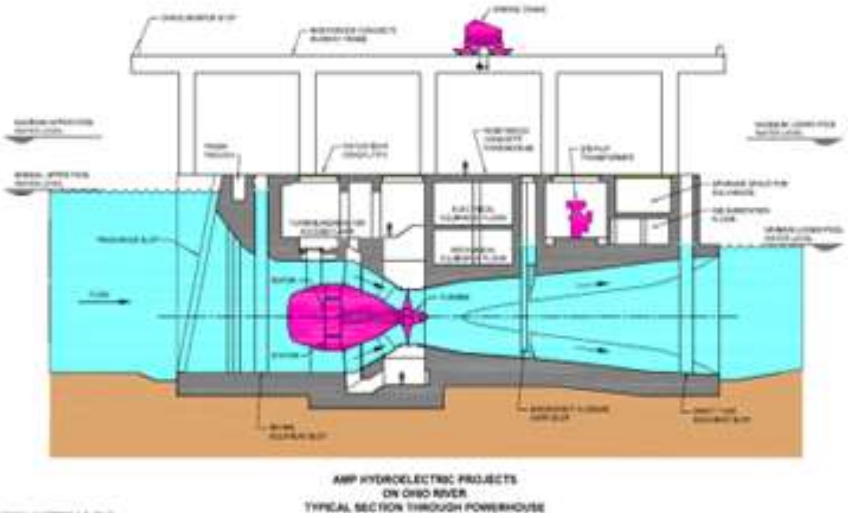
[ii] Uria-Martinez, R., P. O'Connor, M. Johnson. April 2015. "2014 Hydropower Market Report". Prepared by Oak Ridge National Laboratory for the U.S. Department of Energy. DOE/EE 1195. Accessed July 5, 2016. *http://energy.gov/eere/water/downloads/2014-hydropower-market-report.*

Types of Hydropower Plants

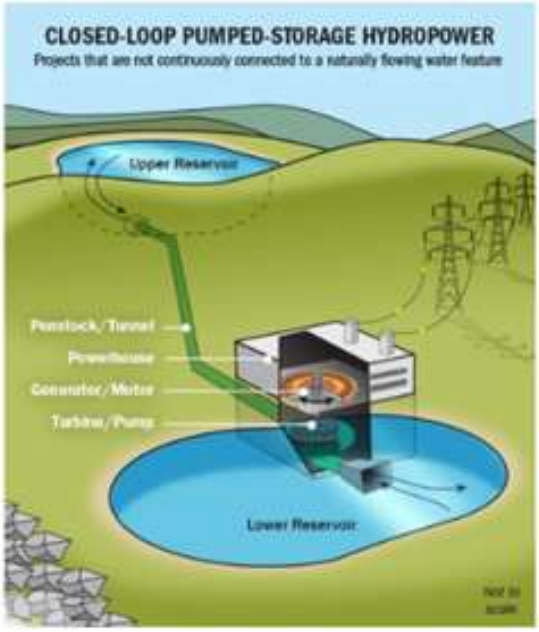
Impoundment
Electrified impoundment dams are the most common type of hydroelectric plant. Not all impoundment dams are electrified, but when they are, the height of reservoir water creates downward pressure forcing water through a vertical (usually) turbine. The turbine's spinning shaft is attached to an electrical generator that generates power.



Run-of-the-River
Run-of-river hydropower plants, also known as diversion plants, direct a section of existing flowing river water flow through turbines, usually horizontally.



Pumped Storage
Pumped storage is the only widely implemented grid-scale energy storage technology in the country. When the cost or demand for electricity is low, water is pumped to a higher elevation reservoir. Subsequently, when cost or demand warrants, the high reservoir releases water to a low reservoir and through a turbine to generate electricity on demand.



NHA
National Hydropower Association

OHIO

HYDROPOWER'S POTENTIAL

- Ohio currently has 6 hydropower facilities with a combined capacity of 129.6 megawatts
- Renewable energy supples about 2.5% of Ohio's net electricity generation.
- Hydropower is Ohio's third largest generator of renewable energy (behind wind & biomass)

The U.S. Department of Energy identified 48 existing, non-powered dams with the potential to add approximately 430 megawatts of hydropower capacity to Ohio.

Data sources: U.S. Energy Information Administration, U.S. Department of Energy Hydropower Vision Report

HYDROPOWER BENEFITS

Clean, affordable and reliable energy

Enabling solar, wind and other renewables

Responsibly managed freshwater

Protecting from floods and drought

Boost to economic growth and jobs

Avoiding pollutants and emissions

Improved infrastructure and waterways

Enhancing cooperation between countries

Community investments in rural areas

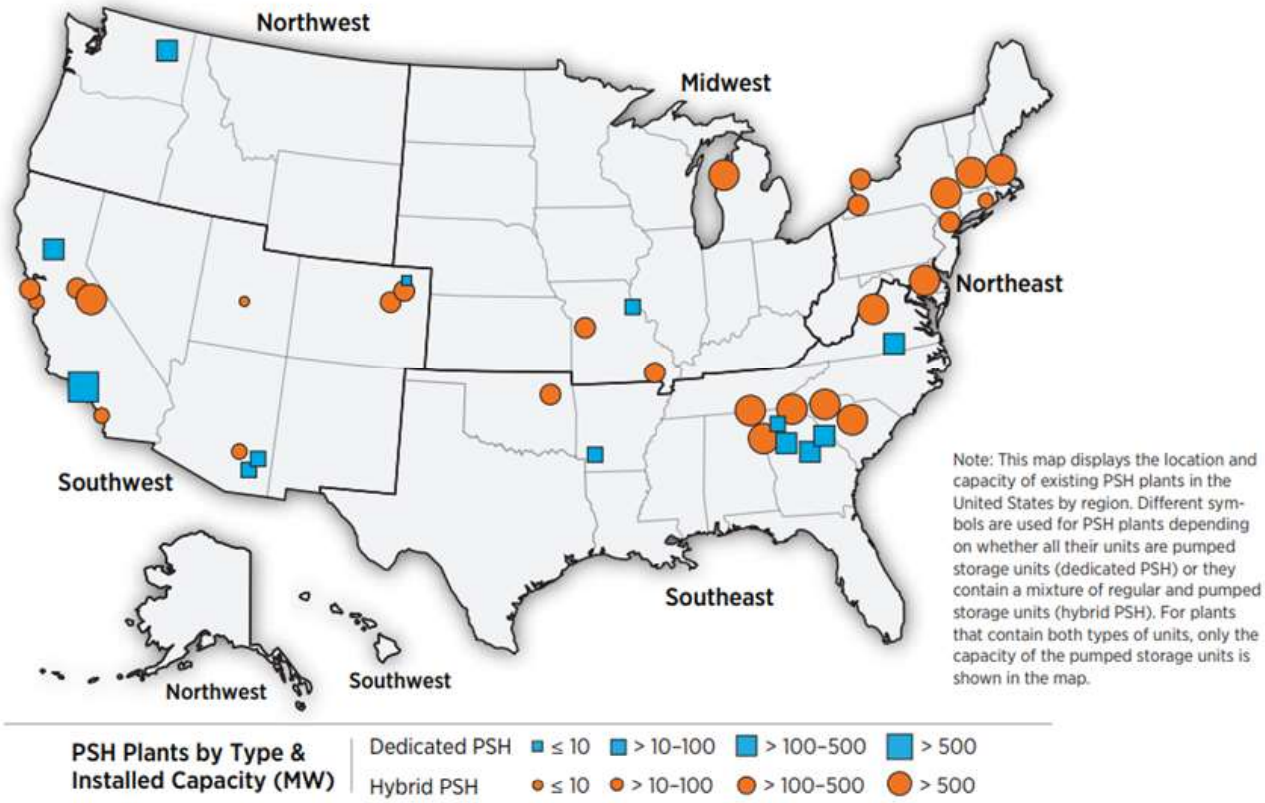
Recreational activities and tourism

iha
international hydropower association

www.hydropower.org/status2018

Pumped Storage Hydropower Plants in the U.S.

Source: U.S. Department of Energy (July 2016) Hydropower Vision: A New Chapter for America's 1st Renewable Electricity



Source: Uría-Martínez et al. 2015[2]

AMP Owned / Operated Hydro Generation

Belleville Hydro Plant
(Member Owned)
Estimated Capacity = 42 MW
Commercial Operation = 1999

Greenup Hydro Plant
(AMP & Hamilton owned)
Estimated Capacity = 70.2 MW
Commercial Operation = May 1982

Smithland Hydro Plant
(AMP owned)
Estimated Capacity = 76 MW
Commercial Operation = August 2017

Meldahl Hydro Plant
(AMP owned; operated by City of Hamilton)
Estimated Capacity = 105 MW
Commercial Operation = April 2016

Willow Island Hydro Plant
(AMP owned)
Estimated Capacity = 44 MW
Commercial Operation = February 2016

Cannelton Hydro Plant
(AMP owned)
Estimated Capacity = 88 MW
Commercial Operation = June 2016

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Jolene Thompson has been with AMP since 1990 and currently serves as executive vice president of member services and external affairs. She is also the executive director of the Ohio Municipal Electric Association (OMEA), the legislative liaison to AMP and Ohio's municipal electric systems, and the general manager of the Municipal Energy Services Agency (MESA). Thompson, active nationally, serves as vice chair of the American Public Power Association (APPA) Board of Directors, she also serves on the executive committee and is chair of the non-dues revenue committee. Additionally, Thompson is an active member of the Transmission Access Policy Study (TAPS) Group Board of Directors where she serves on the executive committee and as chair of the legislative committee. She previously chaired the APPA Advisory and Legislative and Resolutions committees, and has been a member of the Nominations and Awards Committee three times. Thompson is a recipient of APPA's Harold Kramer-John Preston Personal Service Award. She holds a Bachelor of Arts degree in journalism from Otterbein University. She advocates with state and federal policymakers on behalf of AMP and its members and led the environmental permitting and public relations teams that worked on AMP generation projects in multiple states. She headed up the launch of the $26-million Efficiency Smart program for AMP members, and has overseen major human resource and benefit program updates. As executive vice president of member services and external affairs, Thompson provides oversight to AMP's government relations, communications, technical services, environmental affairs, sustainability initiatives, risk, insurance, strategic planning and member programs. This includes leading the organization's environmental, safety and North American Electric Reliability (NERC) compliance activities.