

INDUSTRY
OVERVIEW
SEGMENTS

HYDROPOWER SUPPLY CHAIN

ENERGY & MANUFACTURING in Appalachia

Table of Contents

ENERGY & MANUFACTURING® in Appalachia

Industry Overview

INDUSTRY OVERVIEW AND MARKET OPPORTUNITIES

The hydropower industry is a mature but evolving industry with steady growth primarily through upgrades, prospects for increased generation and storage capacity driven by renewable integration, and growth in key western states (Washington, Oregon, and California). Hydropower accounts for **nearly 6%** of all utility-scale electricity generation as of 2025, with total capacity just over 80 GW across 2,200 plants. Recent growth has primarily come from upgrades to existing plants and adding hydropower capacity at non-powered dams. The pumped storage hydropower (PSH) sector, crucial for energy storage, added 1.4 GW of capacity during the past decade, primarily through facility upgrades. Drought conditions in the Western states, which hold about half of the nation's hydropower capacity, have impacted growth.

The U.S. small hydropower sector is also growing, with market size expected to reach $366.5 million by 2030, expanding at a CAGR of 2.6% from 2025 to 2030.

The overall U.S. hydropower market, including large and small projects, is influenced by ongoing modernization efforts, environmental regulations, and investments in efficiency and flexibility improvements.

Despite some challenges such as high capital costs and environmental regulations for new large facilities, government incentives like tax credits promote the development of pumped-storage projects and smaller-scale hydropower initiatives. The industry also benefits from technological advances and modernization efforts that enhance reliability and integration with other renewable sources.

SMALL SCALE HYDROPOWER SECTOR

In the United States, the small scale hydropower sector is generally defined as hydroelectric projects with a maximum capacity of up to 20 megawatts (MW). The Federal Energy Regulatory Commission's (FERC) classifies small hydropower plants under 20 MW in size. Small hydropower projects in the U.S. often use existing dams, canals, or water conduits and can include retrofitting non-powered dams and in-conduit hydropower. Small hydropower is typically categorized into different types such as non-powered dams, conduit hydropower, new stream reach projects, and pumped storage (though pumped storage facilities are usually larger). The sector represents a significant portion of the hydropower development pipeline, with many projects under 20 MW capacity aimed at providing renewable electricity with lower environmental impact and quicker permitting processes.

This sector plays an important role in the U.S. renewable energy mix by contributing decentralized, small-scale electricity generation, particularly in rural or isolated areas. Federal policies in recent years have aimed to simplify the licensing process for small hydropower projects, encouraging growth and investment in this area.

https://issuu.com/waterstrategies/docs/mwl_feb_2020-2/s/10170986

Hydropower Feasibility in the Northeast U.S.

Hydropower is technically feasible across the Northeast and Appalachian Basin with the strongest opportunities generally found in small hydropower, run-of-river systems, retrofits at existing dams, and in-conduit projects rather than construction of large new impoundments. The region already contains existing hydro facilities and non-powered dams that illustrate practical development pathways, particularly on the Ohio River system and in mountainous watersheds with usable hydraulic head.

REGIONAL FEASIBILITY

The Pacific Northwest dominates U.S. hydropower generation overall, but the Northeast and Appalachian region remain relevant for small hydro development, especially where there are existing dams, water infrastructure assets, and steeper stream gradients.
A national assessment of small hydropower development trends found concentrations of projects and pipeline activity in New York, Pennsylvania, and Ohio, with Appalachian areas showing notable potential for non-powered dam and conduit development.

An **Appalachian Regional Commission** report describes small and low-impact hydropower as an underdeveloped renewable resource in Appalachia and identifies feasible hydropower potential across Appalachian. Oak Ridge National Laboratory has also highlighted opportunities for modular and dam-less micro-hydropower concepts in Appalachian streams, especially where fish passage and lower ecological disturbance are important design goals.

In practical terms, the most realistic development paths in these states are usually one of three models:

- Retrofitting an existing non-powered dam with generation equipment.
- Building a low-head run-of-river project on a regulated river reach or navigation structure.
- Installing microhydro or in-conduit systems where existing water movement and elevation change can be captured with limited new civil works.

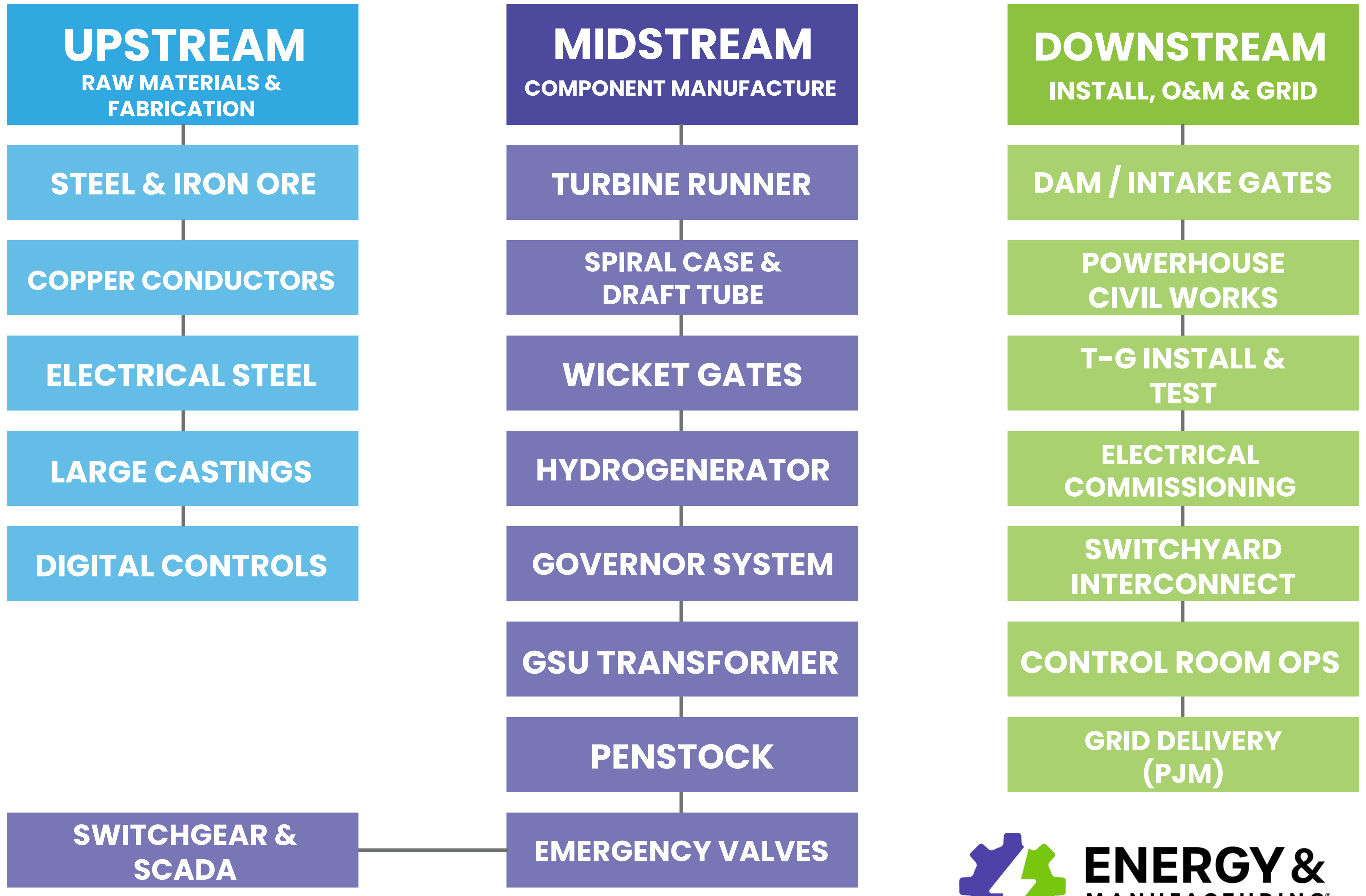
SUPPLY CHAIN ARCHITECTURE

The U.S. Department of Energy and the National Renewable Energy Laboratory (NREL) define the hydropower supply chain as consisting of three sectors:

- **Upstream** - Mining, Extraction, and Primary fabrication
- **Midstream** - Component Manufacture and Assembly
- **Downstream** - Installation, Construction, and Grid delivery

The principal raw materials underpinning all hydropower components are carbon or stainless steel and copper, and most critical components are custom-engineered with replacement lead times ranging from months to years.

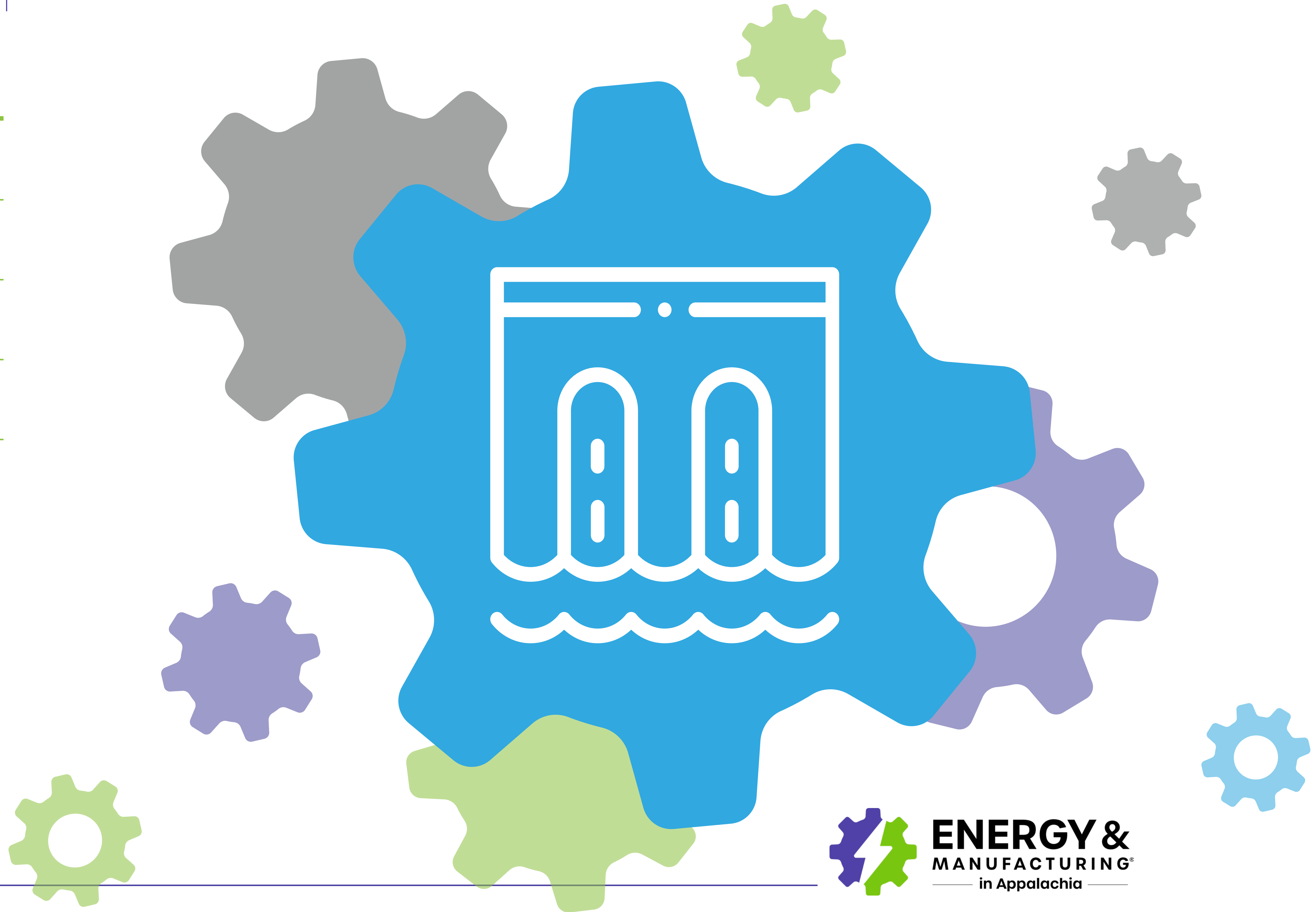
A key structural feature of this supply chain is the central role of the turbine manufacturer as a hub: turbine OEMs typically also supply generators and control systems through joint ventures and subcontracts, and a single turbine manufacturing plant supports dozens of downstream specialty suppliers. For large units (>100 MW), supplier diversity contracts sharply — only three global OEMs (Andritz, GE Vernova, and Voith) dominate turbine supply, and stator windings for generators ≥100 MW are extremely difficult to source domestically.



Upstream: Raw Materials & Primary Fabrication

INPUT MATERIAL	ROLE IN HYDROPOWER	SUPPLY CHAIN RISK
Carbon & Stainless Steel	Turbine runners, penstocks, scroll cases, draft tubes	Large castings (>10 tons) cannot be sourced from U.S. foundries
Copper	Generator stator & rotor windings, busbars, conductors	Domestic supply exists; cost-sensitive to commodity pricing
Electrical Steel	Generator core laminations, transformer cores	Specialty grades largely imported from Asia and Europe
Large Forgings (50–75 tons)	Turbine shafts, generator shafts	Only one domestic forging facility with this capacity
Microchips & Digital ICs	Governor controls, SCADA, protection relays	Manufactured primarily in Asia; long lead times

Large steel castings for turbine runners weighing more than 10 tons cannot be procured from U.S. foundries, representing one of the most acute supply chain vulnerabilities identified by DOE's 2022 and 2024 supply chain assessments.
A single domestic facility can produce the stator windings needed for large hydrogenerators (≥100 MW), creating a critical single-point-of-failure risk. NREL's 2024 Gap Analysis confirmed these constraints persist and recommended strategic investment to reshore casting and forging capabilities.



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Midstream: Component Manufacture & Assembly

The midstream tier covers the design, precision machining, and assembly of all electromechanical and hydromechanical equipment. Key component families and their supply characteristics are described below.

TURBINES

Three turbine types dominate the regional market: **Francis** turbines (medium-to-high head, used at Muddy Run, Holtwood, and Lake Lynn), **Kaplan** turbines (low-head run-of-river plants such as the Ohio River AMP projects and the planned Pike Island facility), and **Pelton** turbines (high-head applications). Each turbine assembly includes the spiral/scroll case, runner, wicket gates, head cover, bottom ring, draft tube, shaft, and bearings. The three largest global turbine manufacturers — Andritz, GE Vernova, and Voith — account for the substantial majority of large-unit turbine supply.

HYDROGENERATORS

Generator assemblies encompass the stator, rotor, windings, poles, generator shaft, thrust bearings, ventilation/cooling system, and exciter. For the planned Ohio River and Susquehanna rehabilitation projects, generators are procured with nameplate capacities ranging from approximately 20 MW (Kaplan pit units at Pike Island) to 138 MW per unit (Muddy Run Francis units). Canadian General Electric and Voith Siemens supplied the original Muddy Run generators, illustrating the historically international character of this supply chain.

GOVERNORS & EXCITATION SYSTEMS

Governor hydraulic control systems regulate turbine speed and power output and are tightly integrated with the generator excitation system. Both rely heavily on electronic components and programmable logic controllers (PLCs) sourced primarily from Asia, creating exposure to the broader semiconductor supply chain.

STEP-UP TRANSFORMERS (GSU)

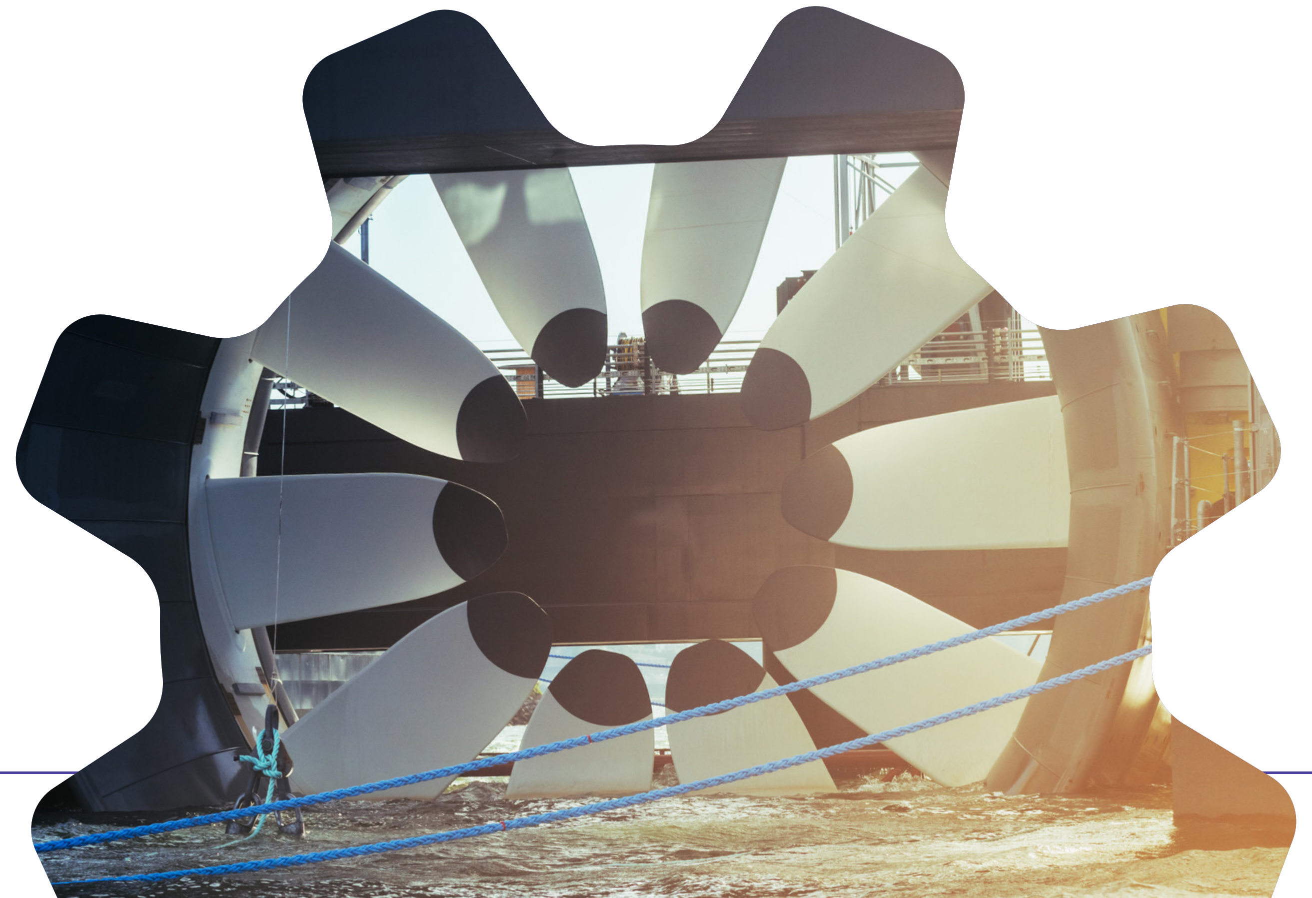
Generator step-up transformers are among the most critical and longest-lead-time items in the hydropower supply chain, with procurement cycles of 12–24 months for large units. DOE's companion transformer assessment noted that large power transformers (LPTs) face supply chain challenges parallel to those of turbines and generators.

PENSTOCKS, GATES & VALVES

Penstocks are the high-pressure steel conduits connecting the forebay or reservoir to the turbine inlet. They are fabricated from carbon or stainless steel plate, designed to withstand both static and dynamic hydraulic pressures (including water hammer loads), and typically require on-site welding and coating. Emergency closure systems (turbine inlet valves, stop gates, trash racks) are heavy hydromechanical structures fabricated by specialty steel shops.

SWITCHGEAR & SCADA

High-voltage switchgear and SCADA (Supervisory Control and Data Acquisition) control systems connect the powerhouse to the transmission switchyard and enable remote monitoring and dispatch. Modern hydropower SCADA integrates real-time turbine speed, water level, gate position, power output, and protective relay status.



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Downstream: Installation, Operations & Grid Delivery

The downstream tier encompasses civil and structural construction, equipment installation and commissioning, and long-term operations and maintenance (O&M). Hydropower plants operate with equipment lifecycles of 30–50 years, and the current U.S. fleet — much of it built in the mid-20th century — is entering an intensive rehabilitation cycle: by 2030, an estimated 40% of global hydropower plants will be at least 40 years old.

TYPICAL PLANT COMPONENTS

Whether a project is utility-scale or microhydro, the main physical components are broadly similar. A typical layout includes:

- Intake or diversion weir, often with a trash rack or screen to keep debris out.
- Settling basin or forebay to reduce sediment and condition flow before the penstock.
- Penstock, which conveys water under pressure to the turbine.
- Turbine and generator, which convert hydraulic energy into electricity.
- Powerhouse, which contains generation and control equipment.
- Tailrace, draft tube, valves, gates, transformers, and interconnection equipment as supporting infrastructure.

AERIAL PLANT EXAMPLE

This Willow Island example is a practical low-head, run-of-river plant on the Ohio River system, showing a river-integrated hydro facility rather than a large mountain storage reservoir.

Source image: Willow Island Hydroelectric Plant aerial photo.

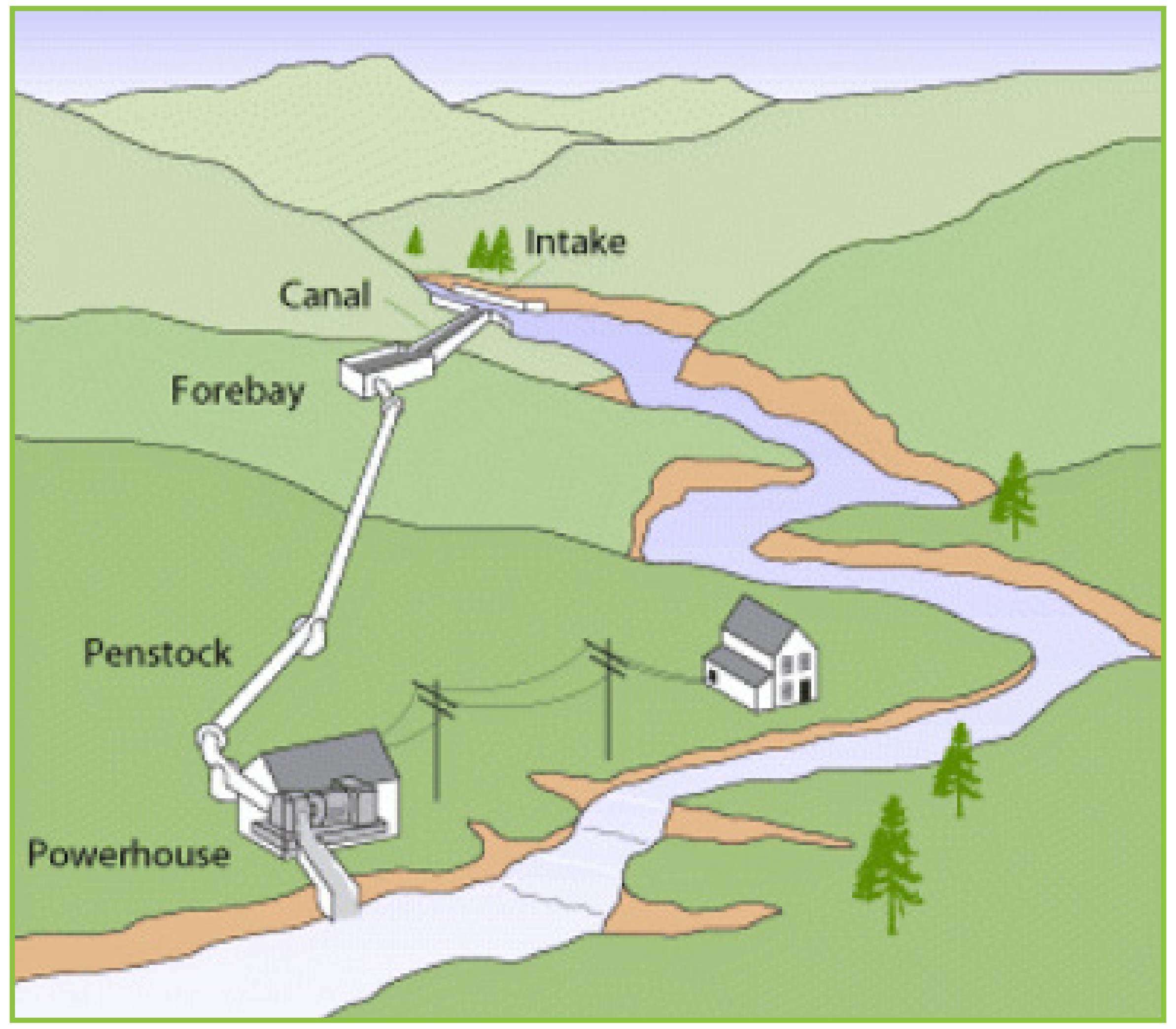
The facility uses bulb turbines and includes an intake approach channel, reinforced concrete powerhouse, and tailrace channel, which is a typical low-head river hydro components in the region.

MICROHYDROPOWER SYSTEMS

Microhydropower systems are smaller in scale, generating up to 100 kilowatts of electricity. These systems are typically used for smaller operations including businesses, farms, or homeowners. These systems can be installed near facilities with readily accessible water supply and help to generate renewable energy for sustainability efforts.

Run-of-the-river microhydropower systems consist of these basic components:

- **Water conveyance** - Channel, pipeline, or pressurized pipeline (penstock) that delivers the water
- **Turbine, pump, or waterwheel** - Transforms the energy of flowing water into rotational energy
- **Alternator or generato**r - Transforms the rotational energy into electricity
- **Regulator** - Controls the generator
- **Wiring** - Delivers the electricity.



Many systems also use an inverter to convert the low-voltage direct current (DC) electricity produced by the system into 120 or 240 volts of alternating current (AC) electricity.

Key Manufacturers & Operators in the Region

EQUIPMENT MANUFACTURERS

COMPANY	LOCATION	PRODUCTS / SERVICES
Voith Hydro Inc.	York, PA	Turbines (Francis/Kaplan/Pelton), generators, governors, automation systems; only hydro OEM in North America with a hydraulic test lab
American Hydro	York, PA	Francis/Kaplan turbine components, rehabilitation, CNC manufacture, pump-turbines; 123,000 sq ft facility
GE Vernova (Hydro Power)	Schenectady, NY	Hydro turbines, generators, modernization services; >25% of total installed global hydro capacity
Pennsylvania Transformer Technology (PTT)	Canonsburg, PA	Power transformers 500 kVA–750 MVA through 765 kV; two
Pennsylvania Switchgear	Canonsburg, PA	HV dead-tank circuit breakers, 72.5–170 kV, 40 kA; backed by Quanta Services
West Virginia Manufacturing Solutions (WVMS)	West Virginia	Precision machining, turbine components, dam infrastructure, flow control fabrication
Brayman Construction	Pittsburgh, PA	Dam safety assurance, heavy civil, marine and dam construction/rehabilitation
Great Lakes Construction	Hinckley & Cincinnati, OH (serves OH/WV/PA)	Power plant civil construction, structural concrete, substation earthwork

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Major Plant Operators

OPERATOR	STATE(S)	KEY ASSETS	CAPACITY
Brookfield Renewable	PA	Holtwood (Susquehanna R.), Safe Harbor (Susquehanna R.)	252 MW + 417 MW
Constellation Energy	MD	Conowingo Dam (Susquehanna R.), Muddy Run PSH	548 MW + 1,070 MW
New York Power Authority (NYPA)	NY	Robert Moses Niagara, Robert Moses St. Lawrence, Blenheim-Gilboa PSH	2,525 MW + 1,088 MW + 1,160 MW
Eagle Creek Renewable Energy	Multi-state (incl. WV)	85 facilities across 18 states	~690 MW total
American Municipal Power (AMP)	OH/WV	Willow Island, Cannelton, Smithland (Ohio River)	~208 MW operational
Current Hydro	OH/WV	Pike Island (OH), Robert C. Byrd Locks & Dam (WV)	19.99 MW + 28.5 MW (under development)
Hawks Nest Hydro LLC	WV	Hawks Nest-Gauley Bridge Complex (New River)	102 MW
Eagle Creek / Lake Lynn	OH/PA	Lake Lynn (Cheat River)	51.2 MWx`

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Regional Market Overview

PENNSYLVANIA

Pennsylvania ranks 6th nationally in non-powered dam (NPD) hydropower potential, with an estimated economically feasible capacity of 520 MW from NPDs alone. The state currently generates approximately 1.1% of its electricity from hydropower. The Lower Susquehanna River hosts five operating projects — York Haven, Safe Harbor (417.5 MW), Holtwood (252 MW), Muddy Run PSH (1,070 MW), and Conowingo (MD/PA border) — representing the highest concentration of large hydro assets in the region. In July 2025, Brookfield Renewable and Google announced the **world's largest corporate hydropower deal**, a $3+ billion, 20-year PPA covering the Holtwood and Safe Harbor facilities totaling 670 MW to support Google's PJM operations. Pennsylvania also has 11 pumped storage hydropower projects under permit consideration, the most of any state.

NEW YORK

New York has the **highest conventional hydroelectricity generation capacity east of the Mississippi,** accounting for approximately 6% of national conventional hydro capacity and generating 12% of U.S. hydroelectric power. In 2025, hydropower accounted for 19.5% of New York's total generation mix. NYPA's Robert Moses Niagara Power Station (2,525 MW, 13 generators) is the fourth-largest hydropower plant in the U.S. and largest in the state. The Robert Moses St. Lawrence facility adds 1,088 MW, and the Blenheim-Gilboa pumped storage project contributes 1,160 MW of flexible capacity.

WEST VIRGINIA

West Virginia's hydropower assets are concentrated on the Ohio, Cheat, Kanawha, Gauley, and New rivers, primarily as additions to existing Army Corps of Engineers navigation dams. The Hawks Nest-Gauley Bridge complex on the New River generates 102 MW. Lake Lynn on the Cheat River (51.2 MW, four Francis turbine units, operational since 1926) straddles the WV/PA border. Multiple Ohio River projects completed after 2016 — Willow Island (44 MW, bulb turbines), Cannelton, and Smithland — brought total Ohio River installed capacity to approximately 554 MW. The Robert C. Byrd Locks and Dam project (28.5 MW, six Kaplan pit turbines) filed its FERC license application in early 2025, with construction targeted for 2026.

MARYLAND

Maryland's hydropower sector is dominated by the Conowingo Dam on the lower Susquehanna River, 9.9 miles from the Chesapeake Bay. Owned by Constellation Energy's subsidiary Susquehanna Electric Company, Conowingo has an installed capacity of 548 MW (11 generators: seven 36 MW units and four 65 MW units) and has operated as a run-of-river plant since 1928. It ranks 27th among all U.S. hydropower plants in annual generation and generated approximately 1.6 TWh annually as of early 2026. The adjacent Muddy Run pumped storage facility (1,070 MW, eight Francis units) uses Conowingo Pond as its lower reservoir.

OHIO

Ohio's hydropower resources are concentrated along the Ohio River, where a series of Army Corps of Engineers locks and dams are being equipped with generation units. The AMP Combined Hydroelectric Project (Willow Island on the WV side plus Cannelton and Smithland) represents the first major wave of Ohio River generation, adding approximately 208 MW. Current Hydro's Pike Island project (19.99 MW, two Mavel Kaplan pit turbines, Belmont County, OH) is under development with construction expected to begin in early 2026. Voith of York, PA supplied the turbines, generators, and automation systems for the first Ohio River AMP projects.

SUPPLY CHAIN RISK PROFILE

RISK AREA	SEVERITY	DETAIL
Large steel castings (>10 tons)	**Critical**	No domestic foundry capability; imports from Canada, Europe, Brazil
Stator windings ≥100 MW	**Critical**	Single U.S. facility; long lead times
Large shaft forgings (50–75 tons)	**High**	Single domestic forging facility
Microchips / digital controls	**High**	Asia-sourced; semiconductor supply chain volatility
Step-up transformers (LPT)	**High**	12–24 month lead times; limited domestic production
Small turbine components (≤30 MW)	**Moderate**	Greater supplier diversity; more domestic options
Civil construction labor	**Moderate**	Skilled workforce constraints in rural dam locations

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Appalachian Basin Proposed Hydropower Projects

PROJECT	FERC DOCK	STATE	COUNTRY/ LOCATION	WATERBODY/ BASIN	PROJECT TYPE	CAPACITY (MW)	STAGE OF PROJECT	STATUS /STAGE DETAIL	DEVELOPER/ SPONSER	PRIMARY SOURCE URL
York Energy Storage Water Project	P-15332	Pennsylvania	Chanceford Township, York County; near Lake Clarke / Safe Harbor	Susquehanna River, Appalachian Basin	Pumped-storage hydropower	858	Preliminary permit issued / feasibility stage	FERC granted a 48-month preliminary permit in November 2024; studies may proceed but construction is not authorized by the permit.	York Energy Storage LLC	https://www.federalregister.gov/
Cabin Run Pumped Storage Project	P-15318	West Virginia	Hardy and Grant Counties	Appalachian Basin regional project area	Pumped-storage hydropower	230	Preliminary permit stage	Reported in March 2024 as under FERC review; later Federal Register notice said a preliminary permit had been issued on April 25, 2024 before a 2025 surrender request.	Rye Development / Cabin Run Pumped Storage, LLC	https://wvpublic.org/pumped-storage-power-project-could-be-coming-to-northern-w-va/
Opekiska Lock and Dam Hydroelectric Project	P-13753	West Virginia	Marion County area	Monongahela River / Ohio basin	Conventional hydropower at existing lock and dam	6	Proposed project in environmental review record	Listed by FERC in its multi-project environmental assessment for proposed lock-and-dam hydropower developments.	FFP Missouri 16, LLC	https://www.ferc.gov/sites/default/files/2020-06/P-13753-002-EA.pdf
Point Marion Hydroelectric Project	P-13771	Pennsylvania	Fayette County	Monongahela River / Ohio basin	Conventional hydropower at existing lock and dam	N/A	Proposed project in environmental review record	Identified in FERC multi-project environmental assessment as a proposed hydropower development under review.	N/A	https://www.ferc.gov/sites/default/files/2020-06/P-13753-002-EA.pdf
Grays Landing Hydroelectric Project	P-13763	Pennsylvania	Greene and Fayette Counties	Monongahela River / Ohio basin	Conventional hydropower at existing lock and dam	12	Proposed project in environmental review record	Listed in FERC multi-project environmental assessment for proposed projects at existing navigation structures.	FFP Missouri 13, LLC	https://www.ferc.gov/sites/default/files/2020-06/P-13753-002-EA.pdf
Montgomery Locks and Dam Hydroelectric Project	P-13768	Pennsylvania	Beaver County	Ohio River	Conventional hydropower at existing lock and dam	42	Proposed project in environmental review record	Appears in FERC project materials as a proposed hydropower development at an existing Corps facility.	Solia 6 Hydroelectric, LLC	https://www.ferc.gov/sites/default/files/2020-06/P-13757-002-EA.pdf
Emsworth Back Channel Dam Hydroelectric Project	P-13761	Pennsylvania	Allegheny County	Ohio River	Conventional hydropower at existing dam	12	Proposed project in environmental review record	Appears in FERC project materials as a proposed hydropower development at an existing dam site.	FFP Missouri 6, LLC	https://www.ferc.gov/sites/default/files/2020-06/P-13757-002-EA.pdf

Hydropower Equipment NAICs

CATEGORY	EQUIPMENT	FUNCTION	NAICS CODE	NAICS TITLE	NAICS DESCRIPTION
Turbine & Generator Systems	Hydraulic turbines & complete turbine–generator sets (incl. runners, scroll/spiral cases, draft tubes, wicket gates, shafts, governors)	Convert hydraulic head and flow into mechanical, then electrical power in Francis/Kaplan/Pelton units	333611	Turbine and Turbine Generator Set Units Manufacturing	Manufacturing turbines (except aircraft) and complete turbine generator set units, including hydraulic and water turbines and hydraulic turbine generator sets.
Turbine & Generator Systems	Hydrogenerator assemblies (stator, rotor, poles, windings, generator shaft)	Generate electricity from turbine mechanical power; often supplied as integrated turbine–generator sets	333611	Turbine and Turbine Generator Set Units Manufacturing	Manufacturing steam, hydraulic, gas, and wind turbines and turbine generator set units.
Turbine & Generator Systems	Governor and excitation systems (hydraulic power units, mechanical actuators, exciter hardware)	Regulate turbine speed and power output and control generator voltage	333611; 333995	Turbine and Turbine Generator Set Units Manufacturing; Fluid Power Cylinder and Actuator Manufacturing	Manufacturing turbine governor equipment as part of turbine generator sets and manufacturing hydraulic and pneumatic fluid power cylinders and actuators.
Electrical & Controls	Generator step-up transformers (GSU)	Step generator voltage up to transmission level for grid interconnection	335311	Power, Distribution, and Specialty Transformer Manufacturing	Manufacturing power, distribution, and specialty transformers for utility, industrial, and commercial applications.
Electrical & Controls	High-voltage switchgear, power switchboards, generator control/switchgear panels	Provide switching, protection, and isolation between generators and the transmission or distribution system	335313	Switchgear and Switchboard Apparatus Manufacturing	Manufacturing switchgear and switchboard apparatus, including power circuit breakers, switchboards, and related equipment.
Electrical & Controls	Industrial control panels, relays, and SCADA I/O hardware for powerhouse automation	Implement turbine–generator control, protection, and plant SCADA functions	335314	Relay and Industrial Control Manufacturing	Manufacturing relays, motor starters, controllers, and other industrial control devices and control equipment.

Hydropower Equipment NAICs

CATEGORY	EQUIPMENT	FUNCTION	NAICS CODE	NAICS TITLE	NAICS DESCRIPTION
Steel & Hydromechanical	Penstocks (large fabricated steel pressure pipes)	Convey water under pressure from forebay/ reservoir to turbine inlet	332313	Plate Work Manufacturing	Manufacturing heavy gauge metal plate work by cutting, bending, and welding, including fabricated metal penstocks and similar plate work products.
Steel & Hydromechanical	Dam, spillway, and intake gates; trash racks and related steel hydromechanical structures	Control flow into turbines and spillways and protect intakes	332312	Fabricated Structural Metal Manufacturing	Fabricating structural metal products, including structural steel and similar fabricated metal structures such as dam gates.
Steel & Hydromechanical	Emergency closure valves (turbine inlet valves, bypass valves)	Provide rapid isolation of turbine units and penstocks for safety and maintenance	332911	Industrial Valve Manufacturing	Manufacturing industrial valves and valves for water works and municipal water systems, including gate, globe, and specialty valves.
Steel & Hydromechanical	Hydraulic cylinders & actuators for gates, hoists, and turbine governors	Provide mechanical movement to open/ close gates, hoists, and wicket gates using pressurized fluid power	333995	Fluid Power Cylinder and Actuator Manufacturing	Manufacturing hydraulic and pneumatic fluid power cylinders and actuators used in heavy industrial and infrastructure equipment.
Steel & Hydromechanical	Steel structural components for powerhouse equipment supports (frames, platforms, embedded steel)	Support turbines, generators, cranes, and other plant equipment	332312	Fabricated Structural Metal Manufacturing	Fabricating structural metal products such as structural steel assemblies and support structures.

Emerging Trends & Developments

https://eastasiaforum.org/2025/12/15/india-and-china-in-deep-water-over-himalayan-hydropower/
https://www.renewableenergyworld.com/energy-storage/pumped-storage/
https://fdehydro.com/hydroelectric-dam-construction/

- **Non-Powered Dam (NPD) Development:** The Ohio River corridor and PA's Allegheny River system hold hundreds of existing USACE dams without generation units. Retrofitting these with low-head Kaplan or bulb turbines represents the largest near-term growth vector in the region.

- **Pumped Storage Expansion:** Pennsylvania alone has 11 pumped storage projects under FERC consideration, including the Shenandoah (405 MW), Richmondale (230 MW), and Allegheny (123 MW) permits held by Merchant Hydro Developers. Pumped storage is increasingly valued as battery-equivalent grid storage for PJM.

- **Brookfield–Google PPA:** The $3+ billion Holtwood and Safe Harbor PPA signed in July 2025 is the world's largest corporate hydropower deal and signals growing data center demand for dispatchable, 24/7 carbon-free power from hydroelectricity in the PJM market.

- **Relicensing Wave:** A significant number of Lower Susquehanna and Northeast plant FERC licenses expire between 2025–2035, triggering relicensing proceedings that will require environmental studies, modernization investments, and supply chain engagement.

- **Domestic Manufacturing Investment:** Voith's $30M+ investment at York since 2019 and GE Vernova's $130M+ at Schenectady since 2023 reflect growing commitment to domestic hydropower manufacturing capacity ahead of the anticipated rehabilitation and NPD development wave.

Trade Associations

- **National Hydropower Association (NHA) – www.hydro.org**
  The leading national trade association dedicated to promoting growth of clean US water power including conventional hydropower, pumped storage, and marine energy. Represents over 300 organizations across the hydropower industry.

- **Energy Association of Pennsylvania (EAP) – www.energypa.org**
  The primary trade association representing and advocating for Pennsylvania's electric and natural gas utilities, including those involved in hydropower generation.

- **American Municipal Power – www.amppartners.org**
  American Municipal Power, Inc. (AMP) is a nonprofit wholesale power and services provider for more than 130 public power communities that serve about 661,000 customers across nine states. They represent generation from multiple sources including hydropower.

Energy & Manufacturing in Appalachia Program

HYDROPOWER: OVERVIEW

This Hydropower Overview report was created under the Energy & Manufacturing inAppalachia (EMA) program made possible with grant funding from the Appalachian Regional Commission. EMA provides technical assistance and business support to small and medium manufacturers and enterprises seeking to expand business, production and jobs in the energy supply chains. Energy is a big expense for manufacturing companies.

The Hydropower report was drafted by Matt Henderson. Mr. Henderson is the Owner of Henderson Consulting Services and has over two decades of business development experience and over a decade working within the energy sector. During this time, Matt has worked closely with exploration and production, midstream, transmission and supply chain contractors, along with federal, state and local government officials, economic development agencies, universities and even foreign governments to maximize and seize their opportunities within the unconventional shale sector. Matt develops marketing and business strategies for businesses and entrepreneurs looking to capitalize on shale development in the United States and international markets. He works with small to medium sized business as well as Fortune 500 companies looking to understand their value proposition and entry point to all sectors of the industry. Matt is also a project consultant with the EMA program helping small and medium manufacturers understand the opportunities across the vast energy industry. For questions about this report, contact Matt Henderson at matt@mwhendersonconsulting.com.

This program is managed by Manufacturing Extension Partnership (MEP) organizations from five Appalachian states. The activities and intended outcomes of EMA align with the National Institute of Standards and Technology (NIST) MEP and its mission to enhance the productivity and technological performance of U.S. manufacturing.

Learn more about the Energy & Manufacturing in Appalachia program by visiting: https://www.wemakeithere.org/energy/ and join the EMA LinkedIn group. Contact EMA Program Manager, Tom Reed, directly at Tom@WeMakeItHere.org or (412) 918-4269 with any questions or assistance

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