

Women of SWPA

Energy and Modern Infrastructure Society
Small hydropower, Endless possibilities

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EMPOWERING WOMEN IN INDUSTRY



Agenda

- ❖ Global Power Issue
- ❖ Why Small Hydroturbine
- ❖ What's SHP
- ❖ SHP concept and Benefits
- ❖ Modernize existing power plant
- ❖ SHP Applications
- ❖ Solutions and Conclusions



Global Power Issues

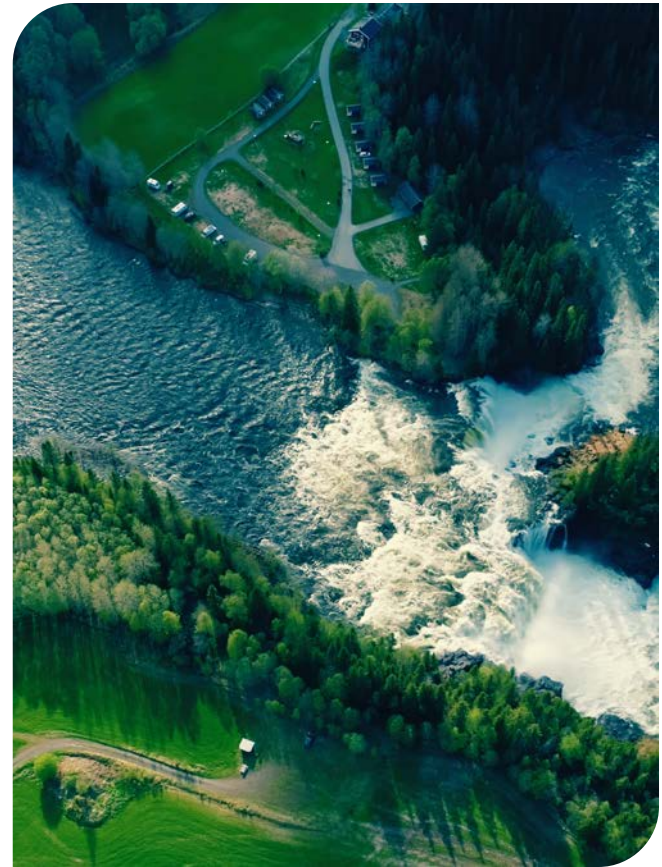
Power Source and Global Implication

- Globally, we are at a crossroads, facing unprecedented environmental and social challenges that require immediate action.
- Fortunately, technology that can help solve many of these problems already exists — and can be implemented immediately — in the form of small hydropower.



Global Power Issues

- Small hydropower is more than just a source of renewable energy.
- It possesses the power to transform entire communities by providing access to electricity and stimulating economic growth.
- It can help reduce our dependence on fossil fuels and mitigate the impact of climate change. And it can empower people to take control of their own energy needs, improving their quality of life and building sustainable futures.



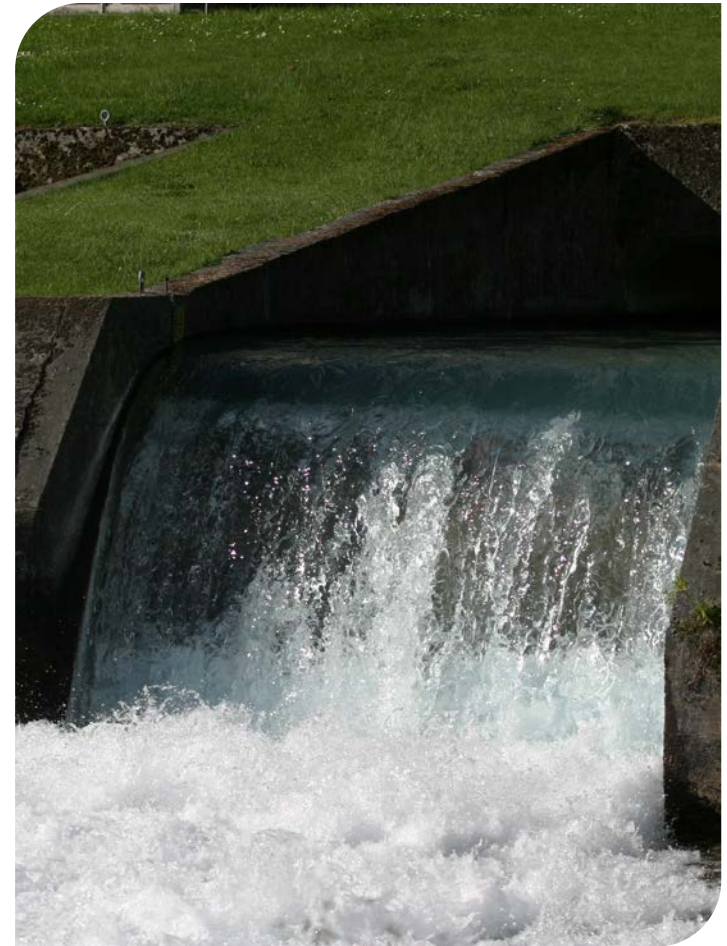
Why Small Hydroturbine

- As we work to address the challenges of the 21st century, we must embrace small hydropower..
- Most small hydropower plants are run-of-river systems, meaning they use the natural flow of small rivers or streams to generate electricity.



Why Small Hydro Turbine

- Today's small hydro turbines can also be installed to produce energy wherever there's a consistent flow of water, opening up a huge raft of possibilities.
- This includes existing water infrastructure such as old water mills, dams and wastewater treatment plants.
- Connecting small hydro turbines to existing systems provides renewable, plannable energy without the need for new infrastructure or dams. This effectively eliminates the environmental impact of new construction and keeps water flows unaffected.



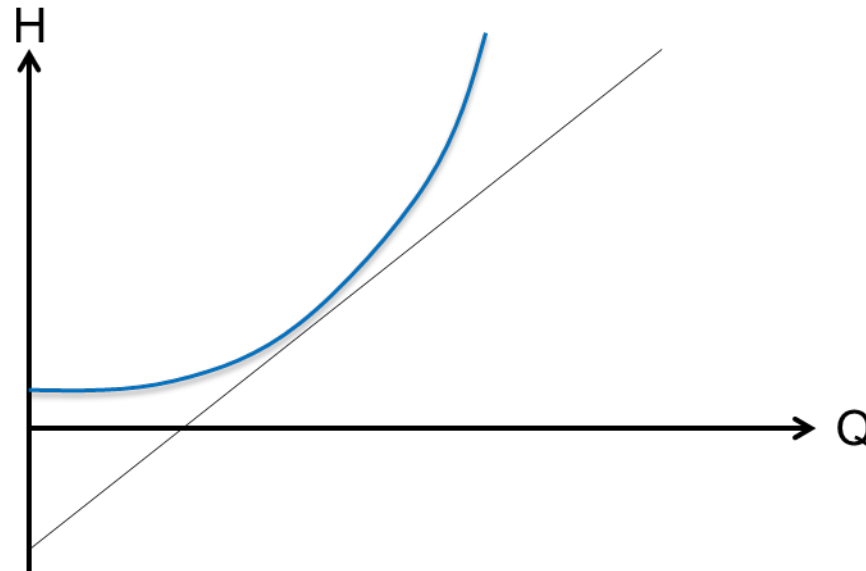
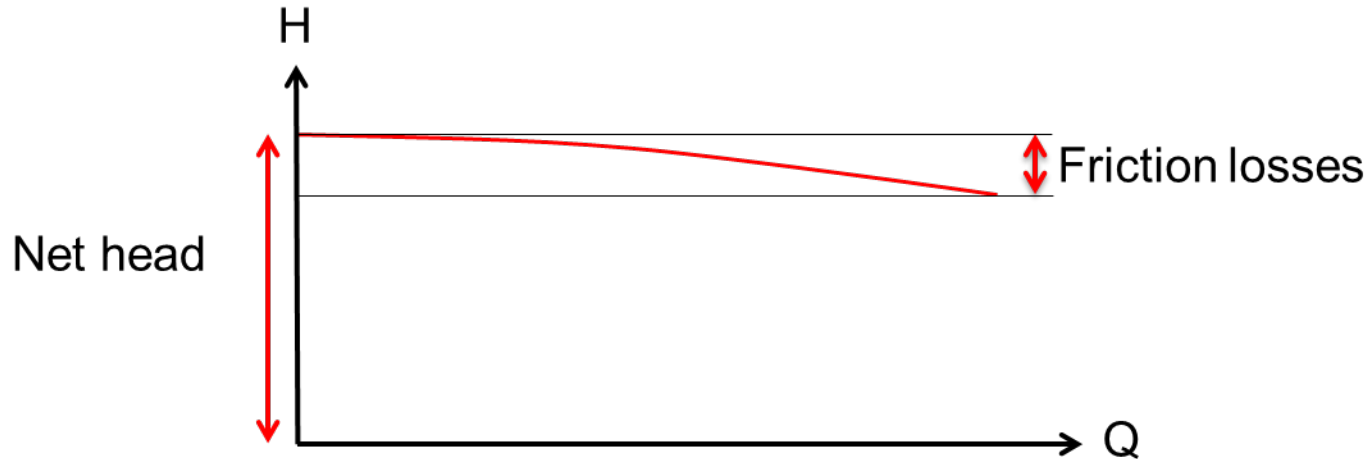
What's Small Hydroturbine

Conventional hydropower involves water flowing through an intake at a reservoir and then through a penstock to a powerhouse, where the pressure of the moving water spins a turbine, turning a generator, and transforming mechanical energy from the spinning turbine into electric power.

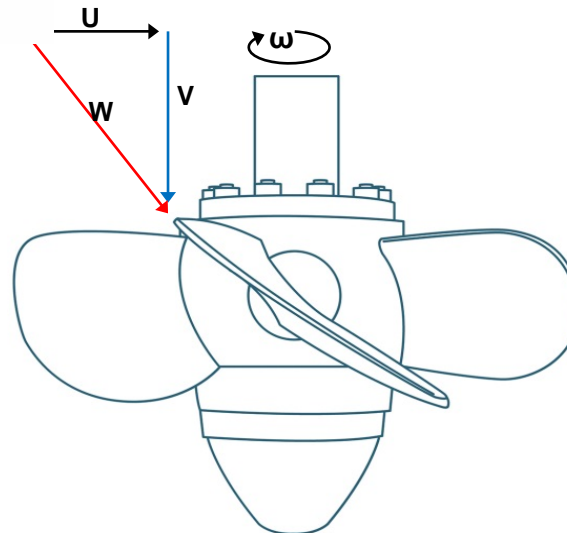
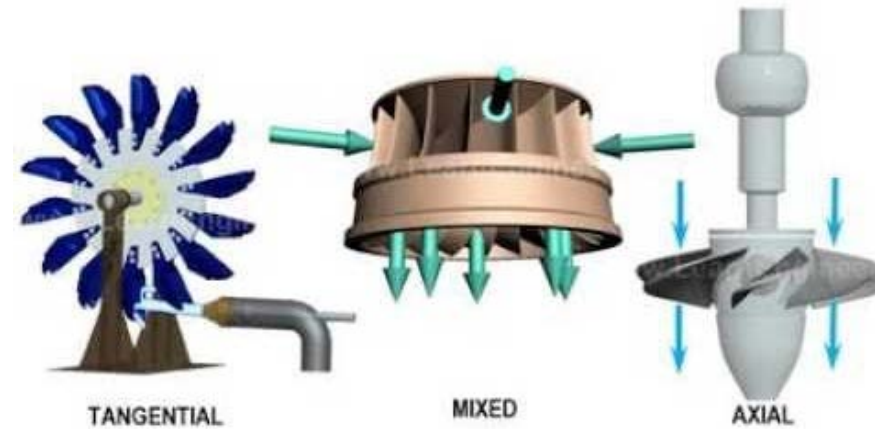
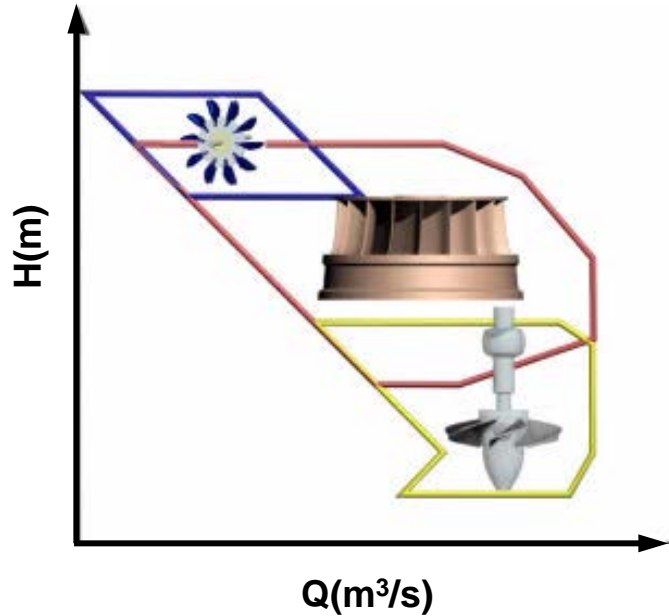
The net head (distance from reservoir water surface to turbine minus losses from conveyance friction) and water flow determine the potential power output of the turbine



Hydroturbine System Curve



Semi Kaplan Turbine type



Exercise

What is a fast estimation of potential power of this site?



$$P=Q*H*8$$

(SI m³/s and m)

$$P=\frac{(Q*H)}{14.5}$$

(US cfs and ft)

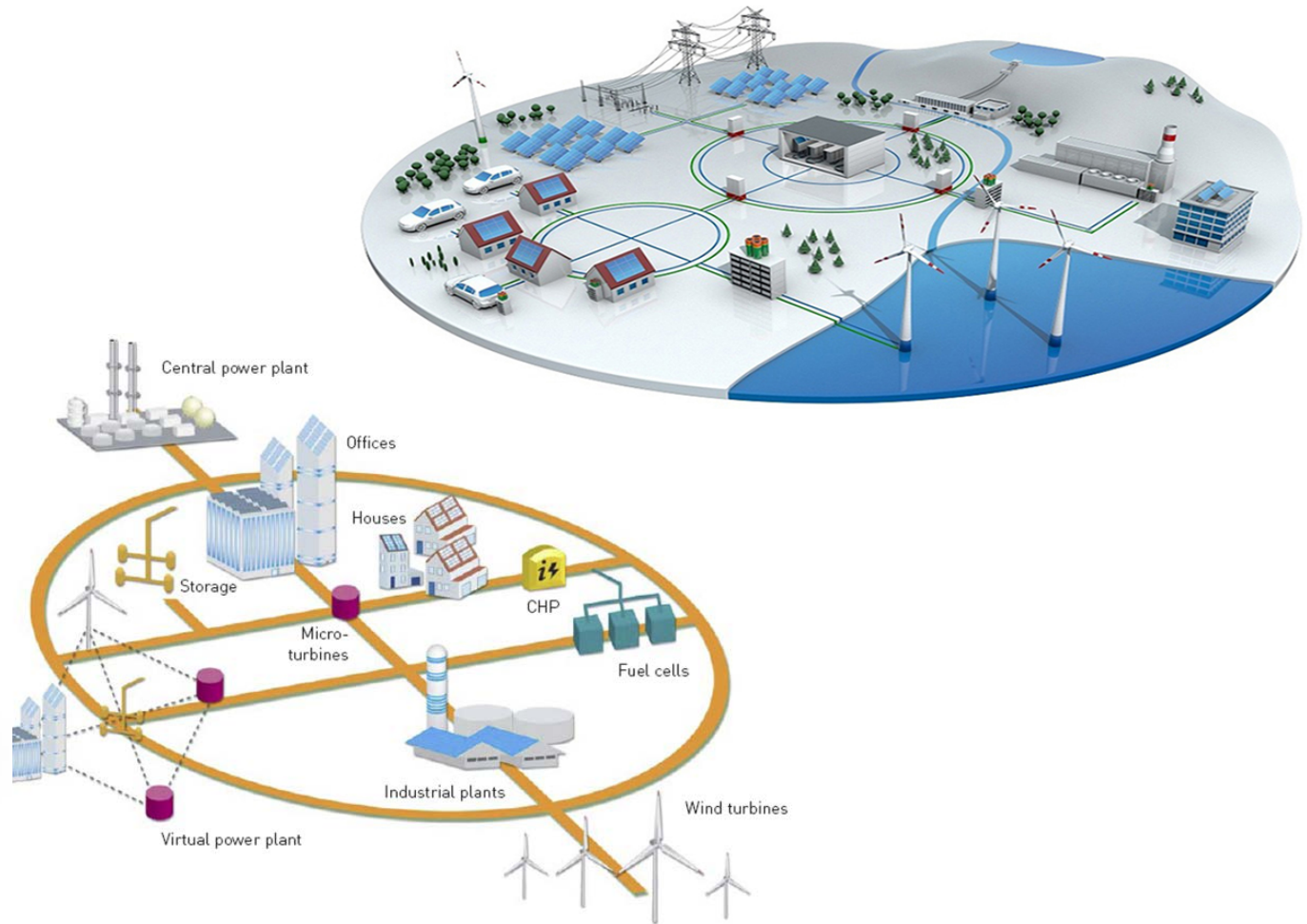


Benefits of Small Scale Hydropower

- It is a continuously renewable electrical energy source.
- It is non-polluting - no heat or noxious gases are released.
- It has no fuel cost and with low operating and maintenance costs, it is essentially inflation proof.
- It is a proven technology that offers reliable and flexible operation.
- The stations have a long life and many existing stations have been in operation for more than a few decades and are still operating efficiently.
- Hydropower station efficiencies of over 80% are achieved making it the most efficient of energy conversion technologies.
- It offers a means of responding within seconds to changes in load demand.
- Hydroturbines are on top of that are also submersible!



Connected directly to Power Grid



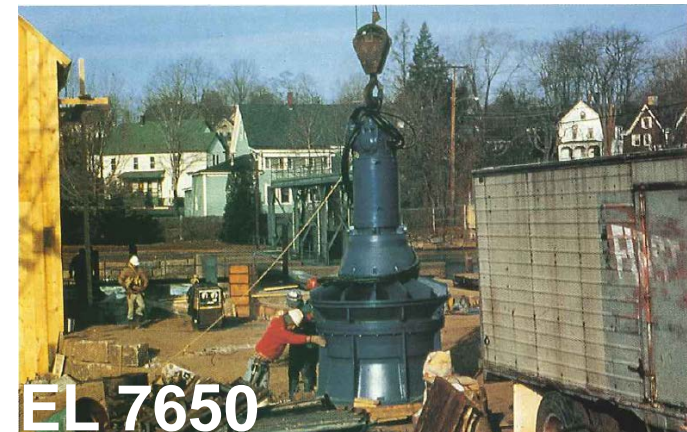
Forging the Future of the Submersible Wastewater Pump Industry

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Modernize existing power plant



- Whether you're solving for outdated equipment or heightened energy demands and environmental awareness, Small turbines make modernization attainable with minimal effort.
- Small turbines can easily replace existing machinery to increase efficiency and capacity while lowering costs — all without the need for new infrastructure.



Installation Examples – Old Mills



COVERED FLUME:

Bukówka, Poland

E7650 + E7650R H=4.4-4.7 m Q=3.6-21.4 m³/s P=748kW



TANDEM FLUME:

Fleminge, Sweden

3 x E7620 + E7620R H=4.8-5.8 m Q=1.8-24 m³/s P=1100kW

Installation Examples – Invisible Power



UNDERWATER CHAMBER:

Reichenbach, Germany

E7600R H=3.3 m Q=1-3.5 m³/s P=90kW



CHAMBER SIPHON:

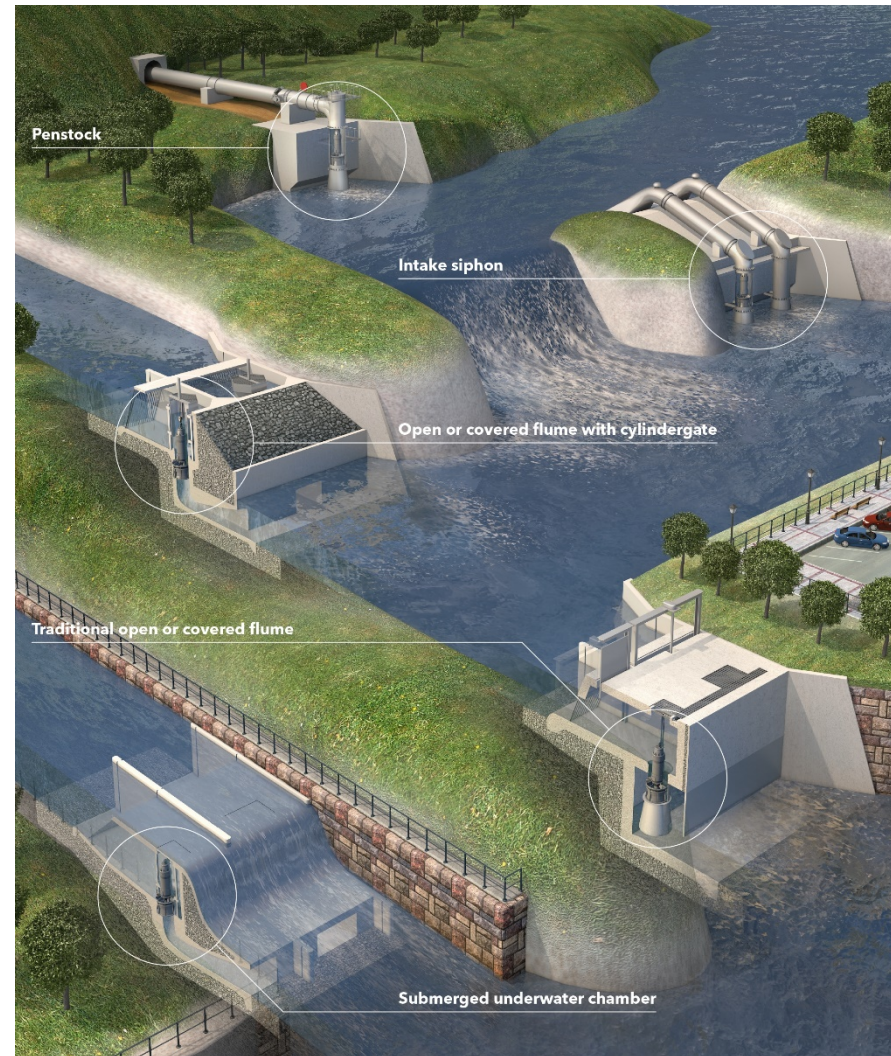
Neuville-sur-Ain, France

3 x E7650 H=3-4.5 m Q=9.8-29 m³/s P=850kW

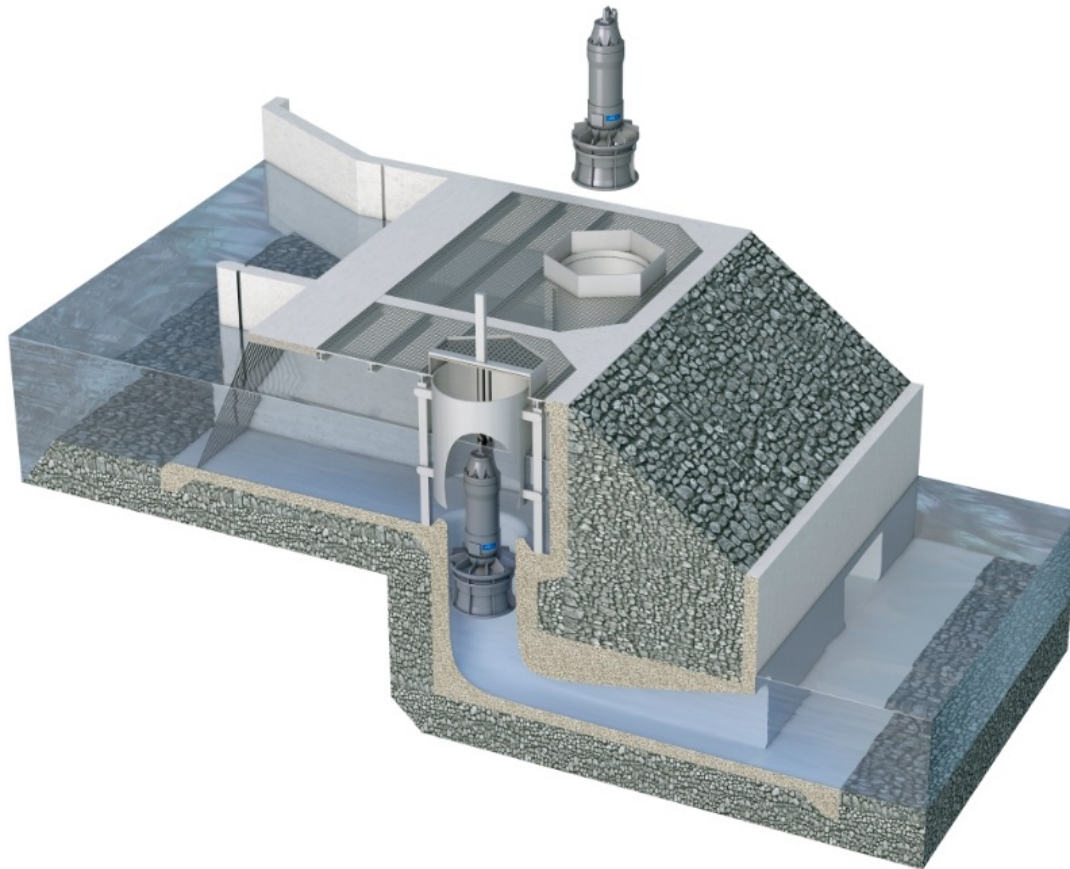
Submersible Small Hydroturbine Applications

- Possible to install in many ways with two main installation categories:

- Flume
- Penstock
- Siphon



Turbine power station components



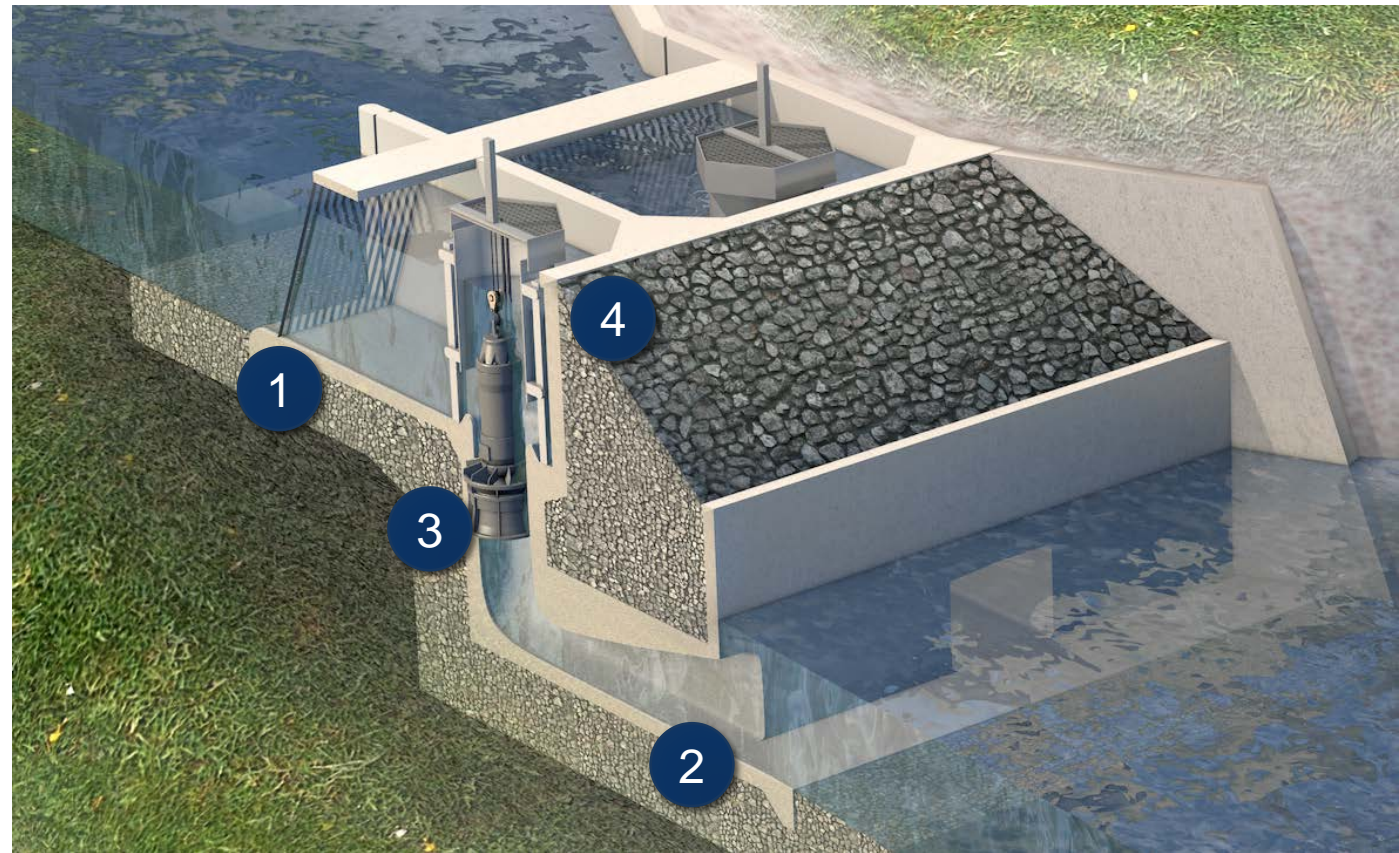
- Screen
- Cylinder gate
- Generator turbine
- Draft tube
- Hydraulic cabinet
- Power stage
- Control unit
- Civil structures

Flume Station Overview



- Flume installations include:

1. A short intake flume
2. A turbine seat
3. A straight or elbow draft tube
4. A sluice or cylinder gate

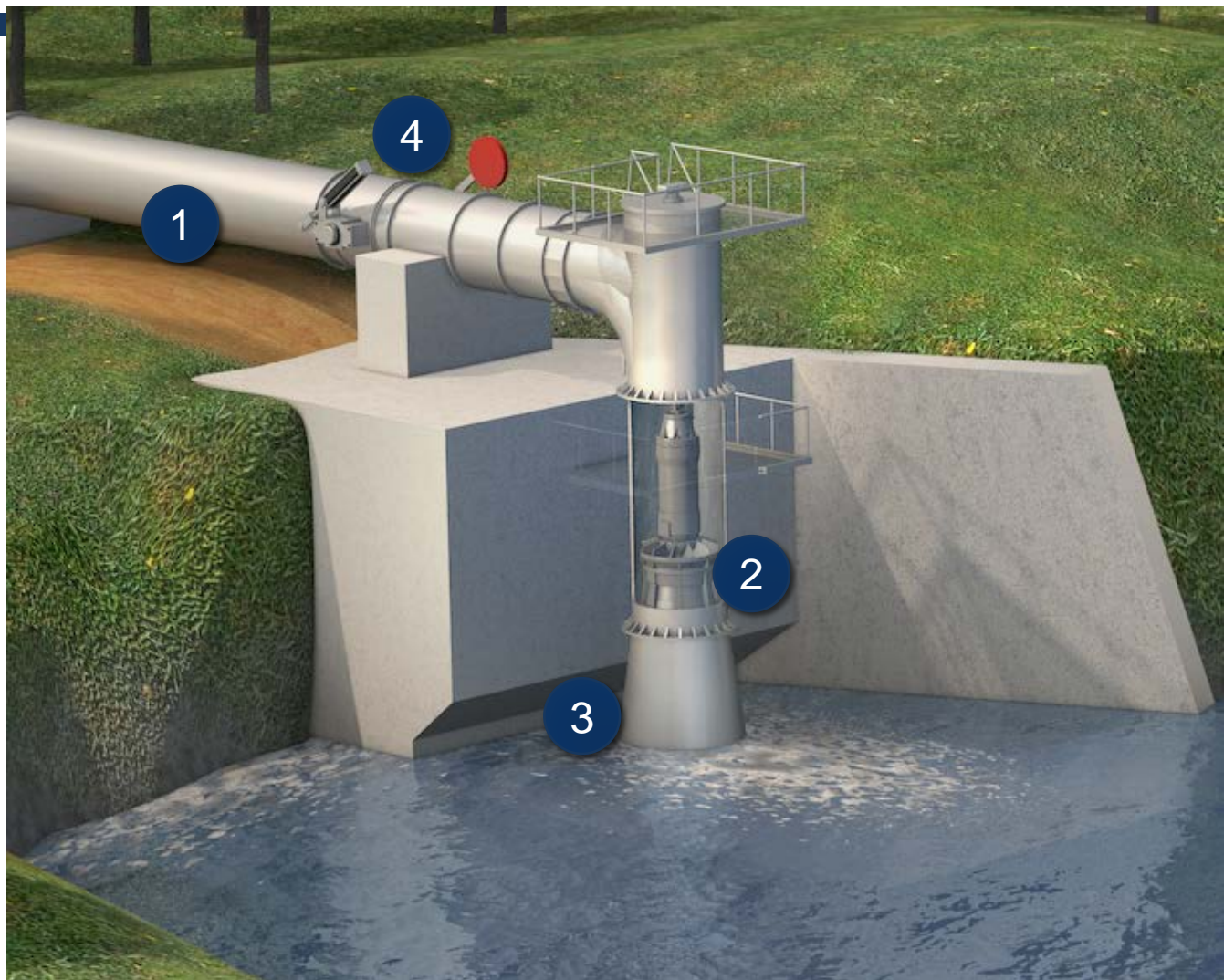


Penstock Installation overview



- Penstock Installations Include:

1. Penstock Intake Pipe
2. Turbine Seat
3. Draft Tube
4. On/off Valve



Siphon Option



- Siphons can be used:
 - To add hydroturbines to existing sites
 - Reduce excavation for new sites



Penstock Siphon Example

Solutions

The benefits of small hydropower are clear:

1. Modernize → Reimagining what's old as new
2. Innovate → Looking at moving water differently
3. Optimize → Seeing the big picture

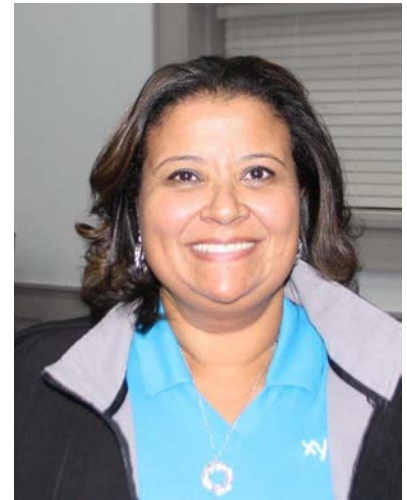


Conclusion

- Hydropower is a mature source of renewable energy that has been around for centuries.
- It's the only source of energy that all modern industries are built upon — and the potential is staggering.
- As we continue to face an ever-increasing demand for renewable and dispatchable energy, now is the time to identify and seize every opportunity that sustainable hydropower creates.
- Small hydropower is one of the most promising of these sources, providing clean energy to communities while minimizing the environmental impact.
- Plus, there is power in numbers. The more small hydropower plants that we modernize or create, the more we can accelerate our transition to clean energy.

THANK YOU

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Forging the Future of the Submersible Wastewater Pump Industry

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