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The **POWER** of Renewable Energy

TUWIEN

POWER: Empowerment of Youth on Renewable Energy for Sustainable Societies
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www.renewableenergyforyouth.org

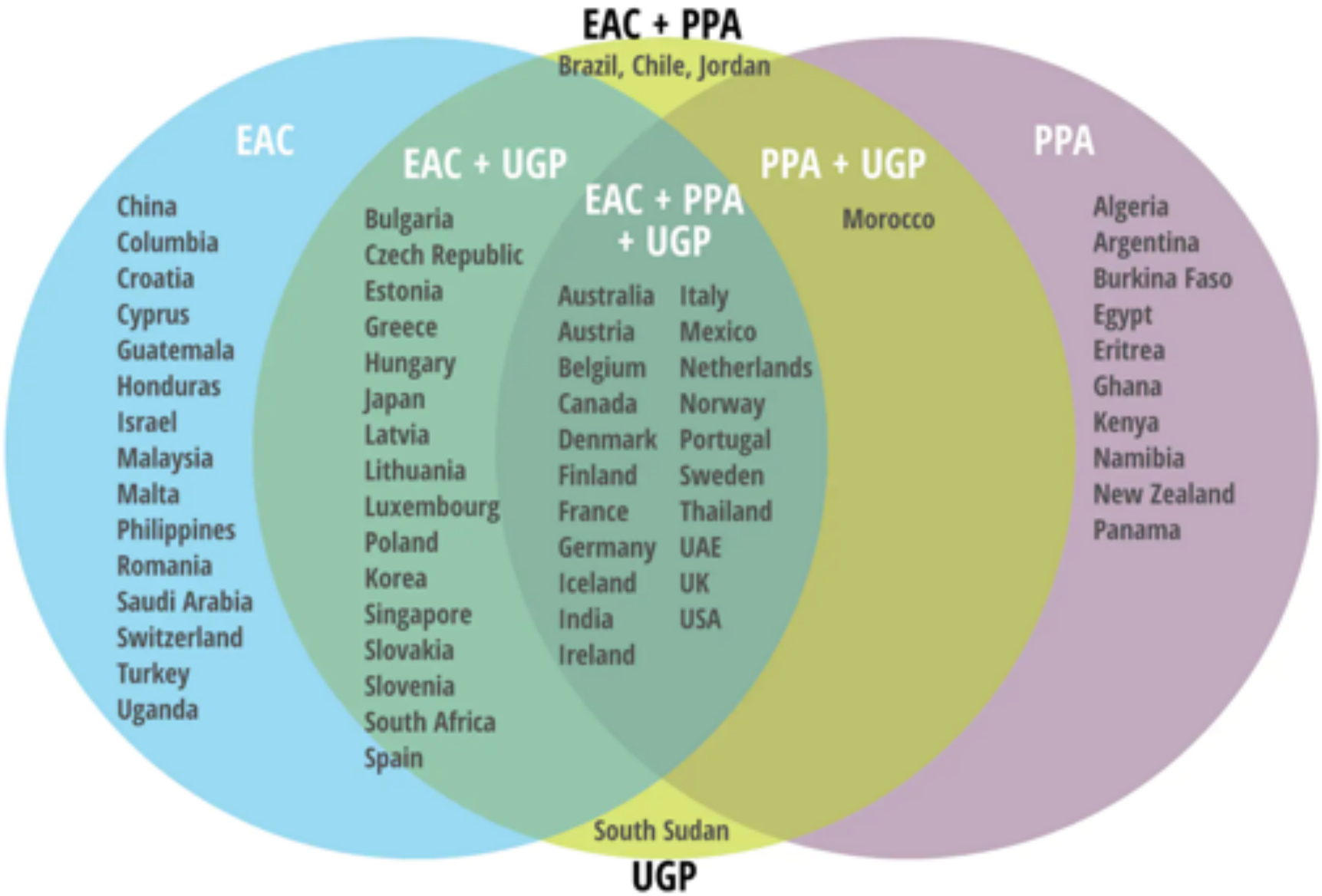
Renewable energy sources (RES)

RES undergone massive development, enabled by

- privatisation,
- unbundling of the energy sector,
- financial incentives, and
- energy policy initiatives

Source: Deloitte analysis.

Market & Industry Trends



Corporations sourced 465 terawatt hours (TWh) of renewables globally in 2017 through self-generation or procurement*

- Energy attribute certificate (EAC)
- Utility green procurement programs (UGP)
- Power purchase agreements (PPAs)

*IRENA, “Corporate sourcing of renewables: Market and industry trends,” 2018

A Question?

Which of the following power plant have longest physical life?

a) Thermal power plant
b) Nuclear power plant
c) Hydroelectric power plant
d) Diesel power plant

The Answer

Answer: c

Explanation: Thermal and diesel power plants are so constructed that their efficiency Falls over time faster as compared to hydroelectric power plant. Nuclear power plant also needs maintenance over time. The components of hydroelectric power plant including turbine, generator and the concrete Dam are so rugged in construction that their life maybe as long as 80 years or even longer.

A Question?

Which power plant has minimum operating cost?

a) Hydroelectric power plant
b) Thermal power plant
c) Nuclear power plant
d) Gas Turbine Power Plant

The Answer

Answer: a

Explanation: Hydroelectric power plant has lowest running cost because it does not need any fuel and can be operated by few number of persons. Nuclear gas and thermal power plant requires fuels also the handling cost of fuels is added with the total cost.

A Question?

Which of the following is not an advantage of hydroelectric power plant?

a) no fuel requirement
b) low running cost
c) continuous power source
d) no standby losses

The Answer

Answer: c

Explanation: Output of such plants is never constant. This is because of their dependency over flow rate of water which is seasonal.

P = eHQg
where:
P = Electric Power Output in kilowatts (kW)
e = Efficiency range 0.75 to 0.88 (75% to 88%)
H = Head, in metres (m)
Q = Design flow, in cubic metres/sec (m3/s)
g = acceleration of gravity, normally 9.81 m/s/s

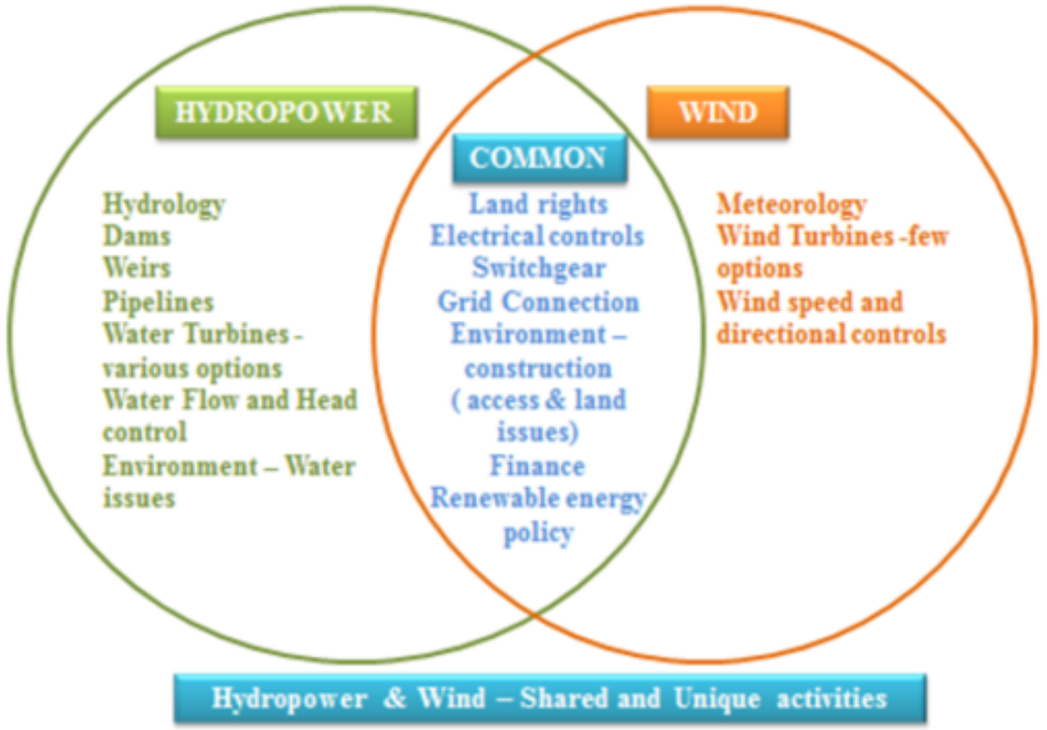
Hydropower

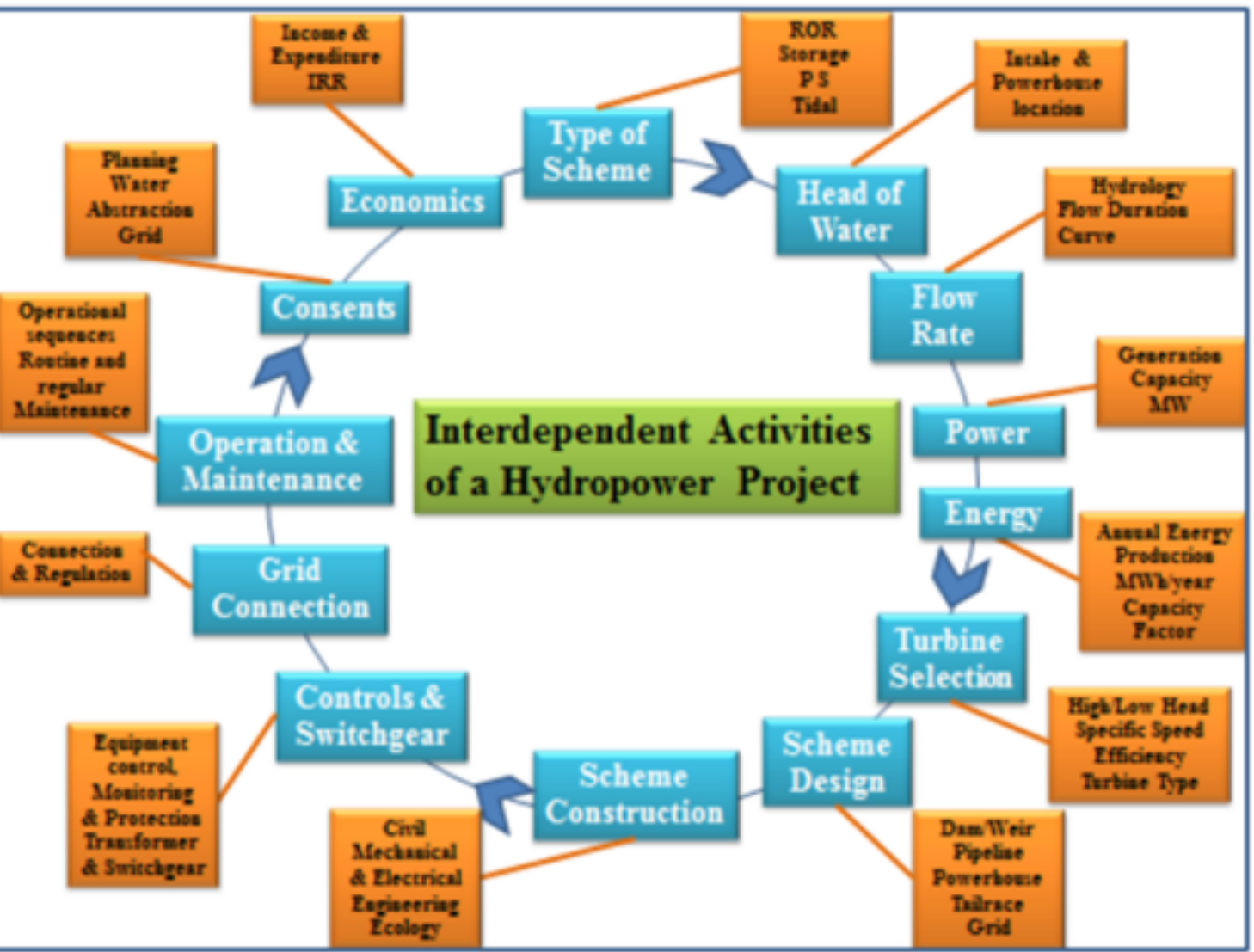
Hydroelectricity enjoys several advantages over most other sources of electrical power. These include a high level of reliability, proven technology, high efficiency, very low operating and maintenance costs, and the ability to easily adjust to load changes.

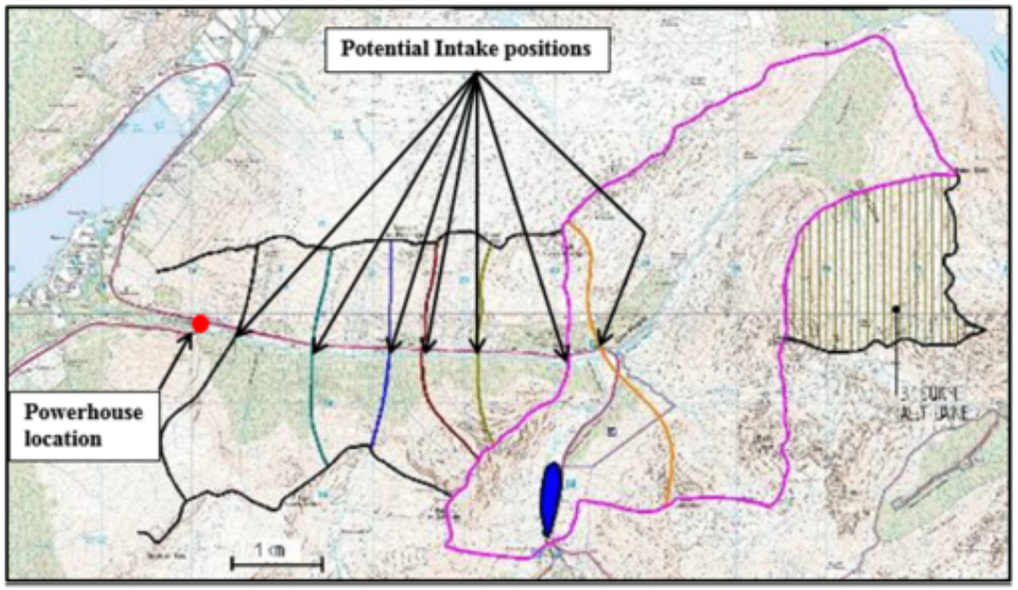
Because many hydropower plants are located in conjunction with reservoirs, hydropower projects often provide water, flood control, and recreation benefits. In addition, hydropower does not produce waste products that contribute to air quality problems, acid rain, and greenhouse gases. It is a renewable resource that reduces the use of other fuels (oil, gas, and coal).

Disadvantages of hydroelectricity include high initial costs of facilities; dependence on precipitation (no control over amount of water available); changes in stream regimens (can affect fish, plants, and wildlife by changing stream levels, flow patterns, and temperature); inundation of land and wildlife habitat (creation of reservoir); and displacement of people living in the reservoir area.

A Hybrid Approach

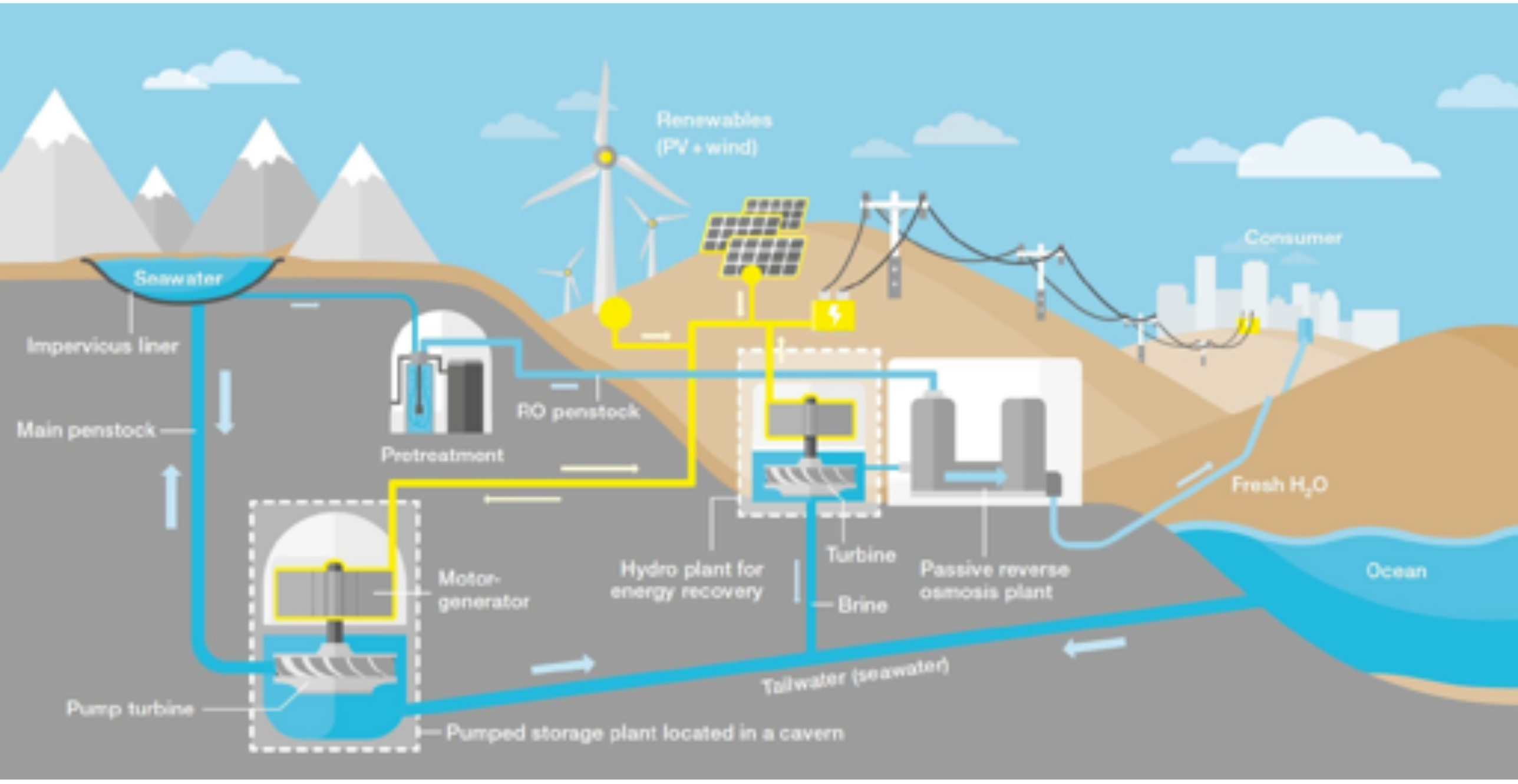






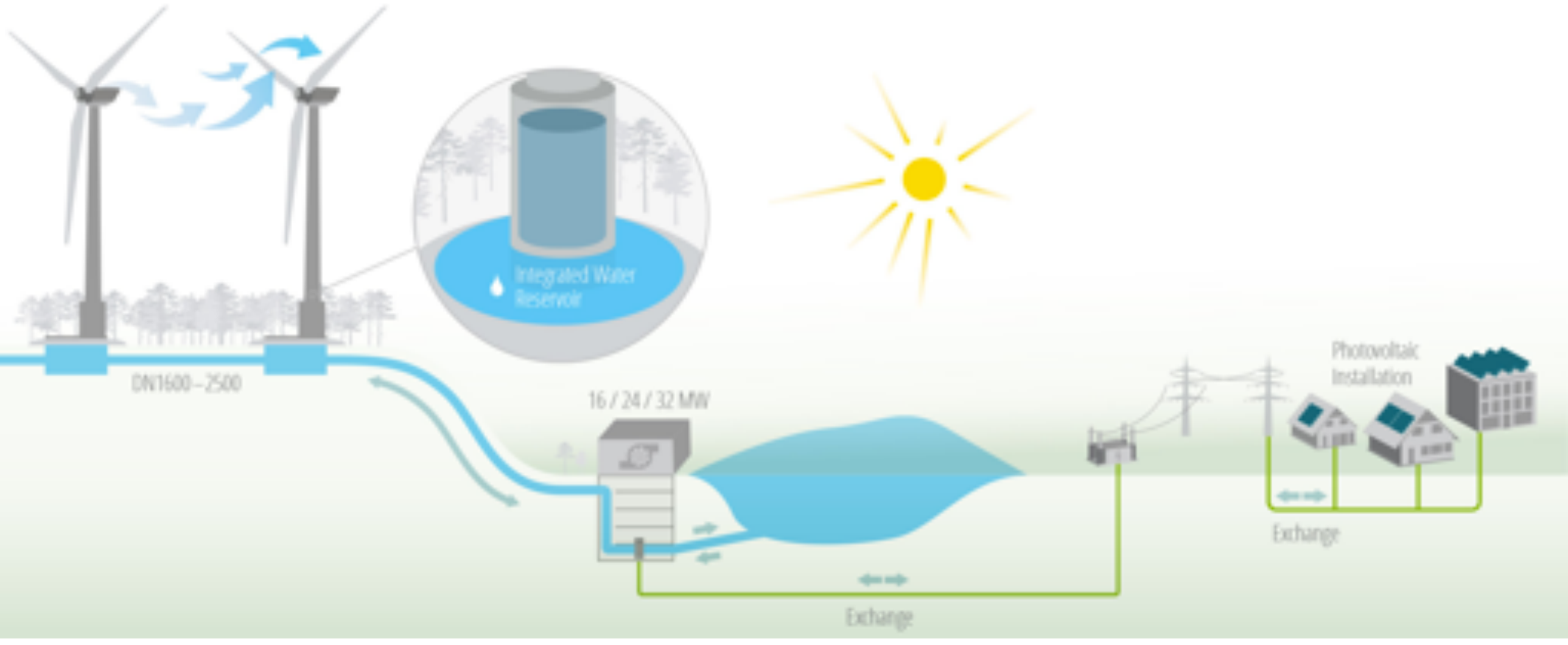
Source: British Hydropower Association

A Hybrid Approach



Source: Voith Global

The Gaildorf Project



Source: Max Boegl Wind AG

The Gaildorf Project

Facts and Figures

Wind turbine capacity:	4 x 3,4 MW
Rotor diameter:	137 m
Annual electricity generation from wind power:	42 GWh
Turbine hub height above ground:	up to 178 m HH
Pumped-storage plant capacity:	16 MW
Electrical storage capacity:	70 MWh
Water fall height:	200 m
Water volume:	160.000 m³
Active reservoir:	up to 40 m
Passive reservoir:	8-13 m

Future: Digitalization

An energy system that is:

- Affordable and accessible to a wide range of consumers,
- Clean and sustainable, minimizing impacts to the environment and health,
- Efficient in production, delivery, and consumption,
- Reliable and available whenever, wherever energy is needed, and
- Resilient to growing physical and cybersecurity threats