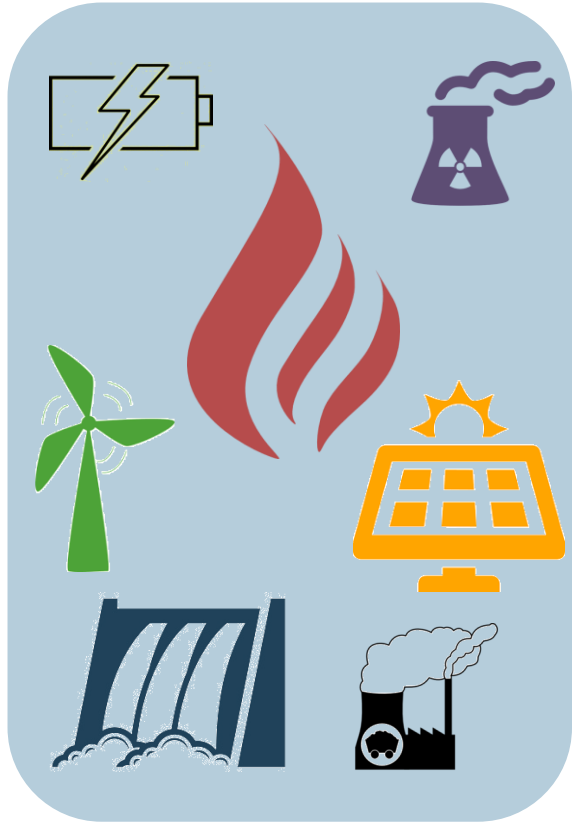
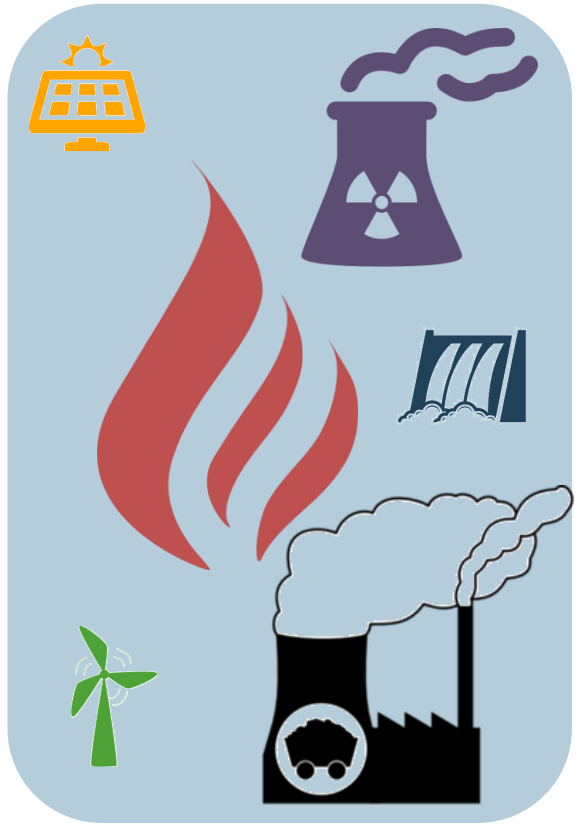
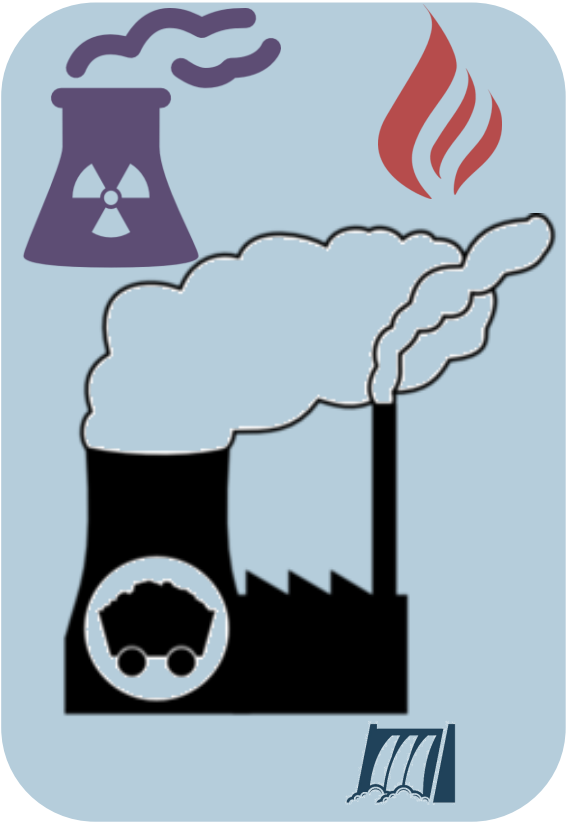


A collage of six images related to hydroelectric power and nature. Top left: A large concrete dam with two towers. Top middle: A long bridge or dam structure over a river. Top right: A wide river flowing through a forested valley. Middle right: An aerial view of a lush, green valley. Bottom left: A close-up of a dam's spillway. Bottom middle: A view from a dam looking down a river channel. Bottom right: An aerial view of a river winding through a dense forest.

Infrastructure for a New Energy Future
John R. Collins
Cube Hydro Partners

From carbon-based society to renewables-based society



PAST

PRESENT

FUTURE

Challenges of shifting energy supply mix



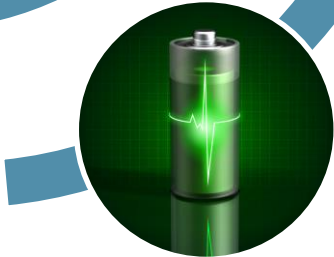
Reliance on gas-fired resources concentrates risk in gas transportation availability



Management of electricity grid

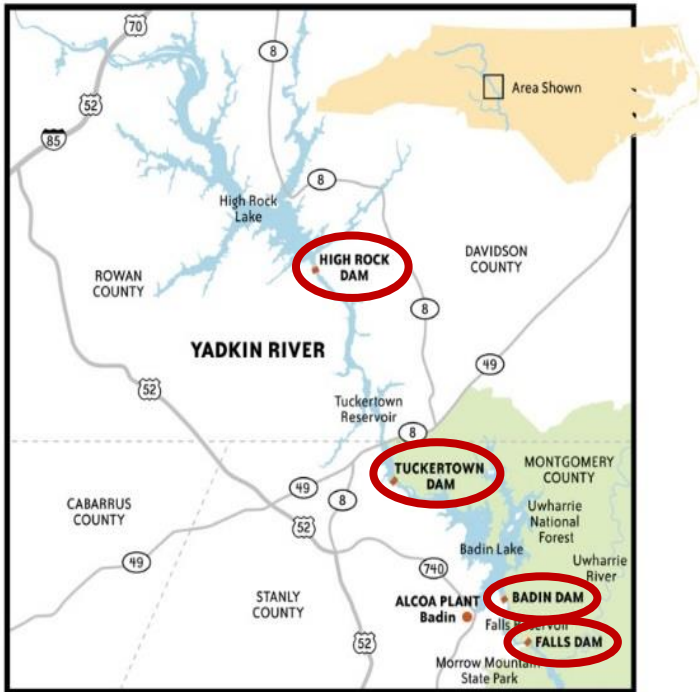


Changing market structure to address intermittent resources



New storage resources

Hydropower offers a unique solution

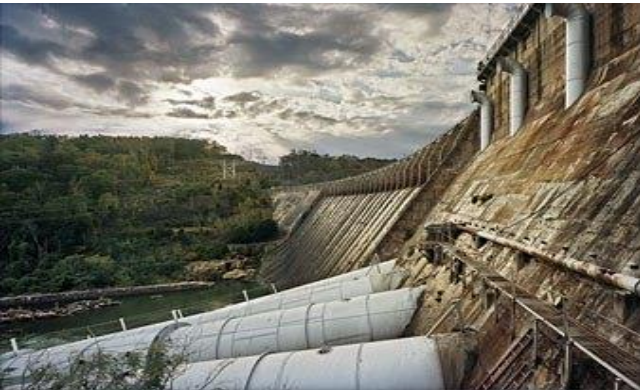


Hydropower plays a key role in the electric grid

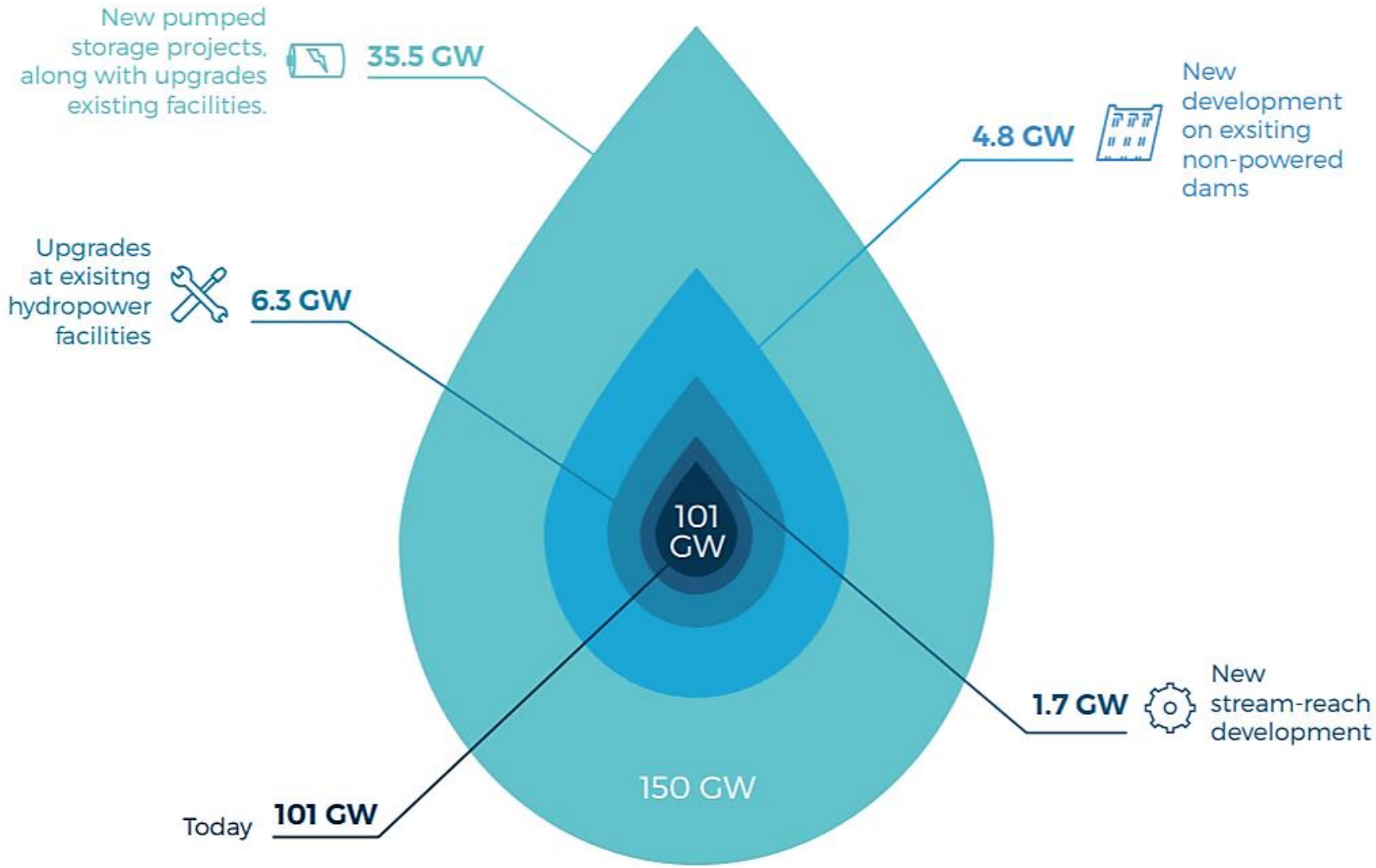
- Proven technology
- System regulation and supply/demand balance
- Voltage and frequency support
- Stability
- Black start capability
- Flexible dispatchability

Like other renewable sources of energy, it offers public health and environmental benefits

- Reduced greenhouse gas emissions
- Reduced air pollutant emissions
- Reduced water consumption



Hydropower has strong growth potential



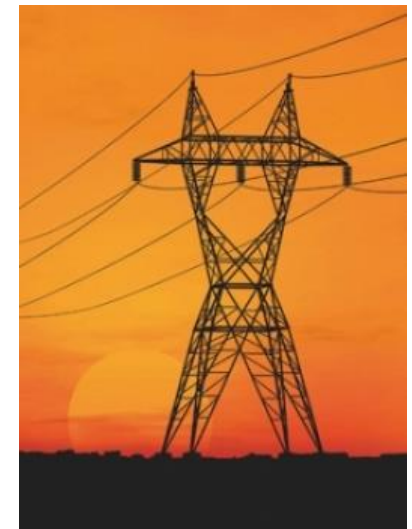
Integration of renewable resources will be key

Intermittent renewables provide challenges in managing the grid due to:

- Variability
- Difficulty in projecting resource availability
- Need for resources with dispatch flexibility

Moving forward, more focus will be needed on:

- Renewables offering operational flexibility, like hydropower
- Large scale storage
- Transmission upgrades
- Impact of microgrids



A collage of six images related to hydroelectric power and nature. Top left: A large concrete dam with two towers. Top middle: A long bridge or dam structure over a river. Top right: A wide river flowing through a forested valley. Middle right: An aerial view of a forested valley with a winding river. Bottom left: A close-up of a dam's spillway. Bottom middle: A view from a dam looking down a river channel. Bottom right: An aerial view of a river winding through a dense forest.

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