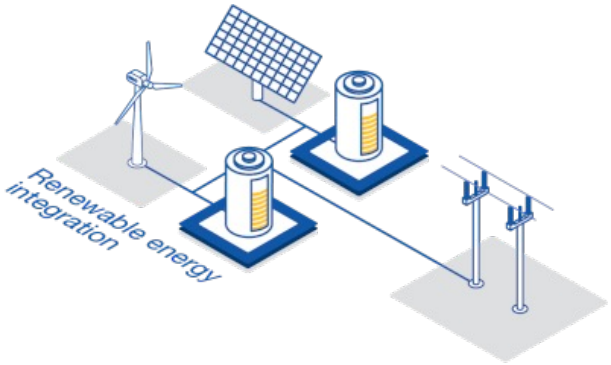
Pumped-storage Hydro Technology In New Zealand

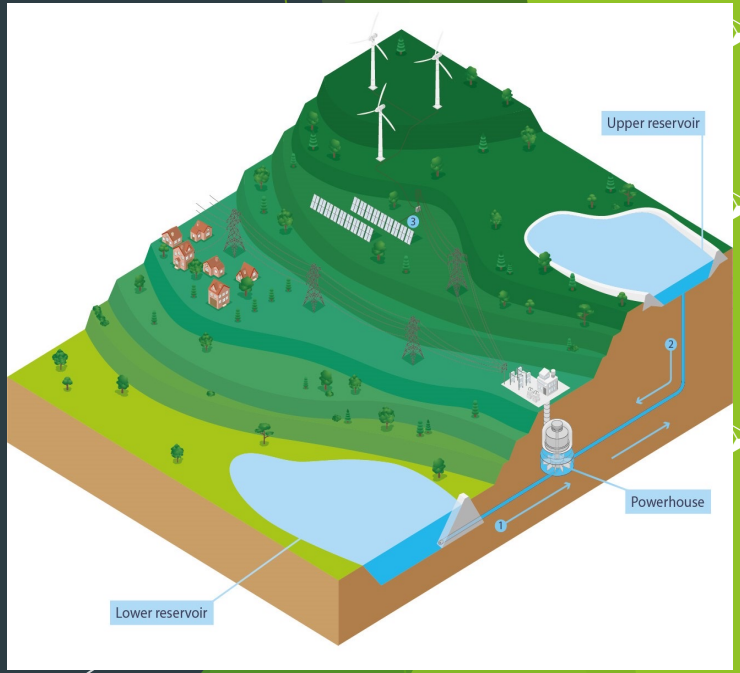
Ugo Mbakwe

Importance of Energy Storage in Modern Power Grids



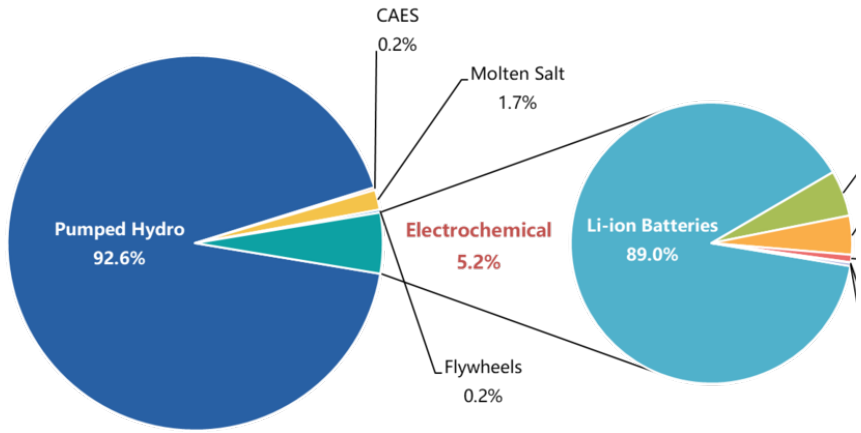
- Balancing supply and demand
- Integration of renewable energy
- Improved grid stability
- Reduced reliance on fossil fuels
- Cost savings and energy efficiency
- Emergency backup and disaster recovery

What is Pumped-storage Hydropower?

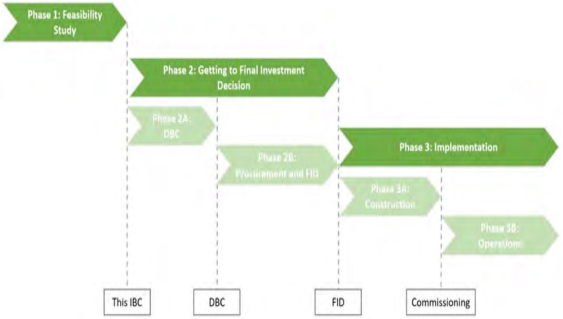


- Pumped storage hydropower (PSH) is a type of hydroelectric energy storage.
- It is a configuration of two water reservoirs at different elevations that can generate power as water moves down from one to the other (discharge), passing through a turbine
- Two types
  - Closed loop - naturally flowing water source
  - Open-loop- without a significant natural inflow

Pumped Hydro occupies 93% of global energy storage market



- Pumped storage hydropower is the world's largest battery technology,
- Hydropower storage capacity is expected to increase by almost 50 per cent by 2030 – from 161,000 MW today to 239,000 MW
- Pumped hydro complement electrochemical batteries, they best for longer storage solution



NZ Battery Project

This climate change initiative is investigating the ability of pumped hydro, and alternative technologies, to address New Zealand's dry year electricity problem

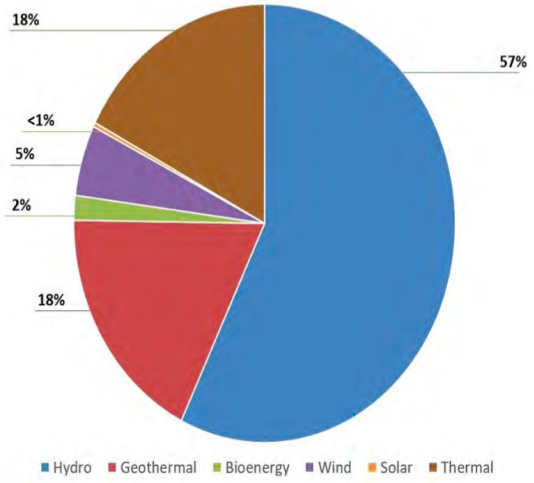
The project comprises of 3 phases:

- Phase 1-feasibility study
- Phase 2 -Detailed business case, final investment decision
- Phase 3- Implementation

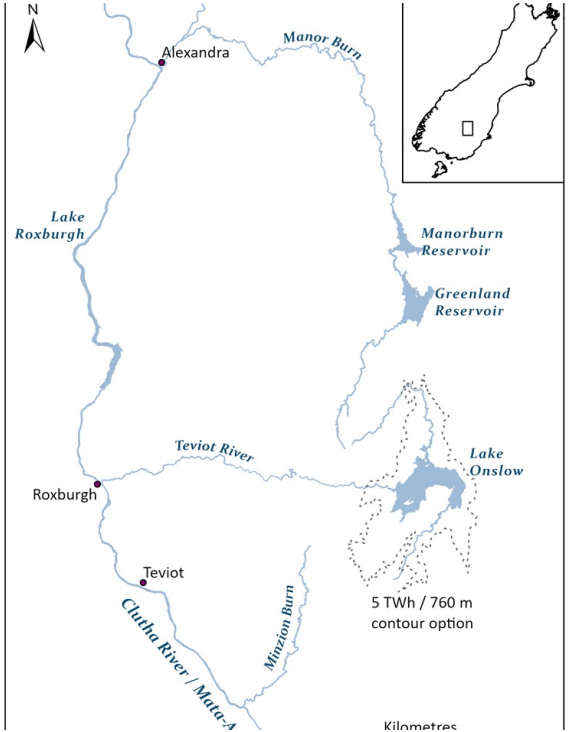
The dry year problem

- New Zealand's 'dry year problem' is when existing hydro-power systems don't receive enough rainfall or snowmelt and the level of the storage lakes runs low. When this occurs some form of back-up is needed, and this is currently provided by fossil fuel generation.
- 'Dry years' usually last for a few months, and it's not possible to predict when one might occur, or how long it may last.
- NZ Battery Project estimates there can be an energy deficit of between 3 and 5 TWh in the worst dry years. This is about 10% of our current annual energy needs.

Scope of the NZ Battery Project



- The NZ Battery Project focuses on security of supply on the longer timescale of the dry year problem
- Evaluate the hydrology, but also ecology and to work if it is technically feasible.



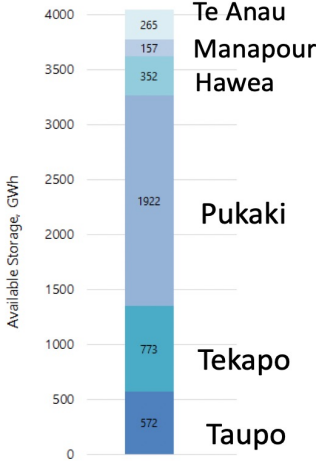
Lake Onslow

Development of pumped hydro scheme in Central Otago in the South Island. Lake Onslow is anticipated to have an upper reservoir capable of storing up to **5TWh of energy with turbines able to generate 1,000MW.**

- It is estimated to have a construction and commissioning timeframe of between 7 and 9 years.
- The estimated cost of the Lake Onslow pumped hydro scheme is about $15.7 billion.
- 700 meters above Clutha River

Onslow (8 TWh)

World's largest scheme by energy storage capacity



The real feature of Onslow is its large energy storage capacity

Sources

https://www.socomec.com/energy-storage-renewable-energy-integration_en.html

https://www.tcenergy.com/operations/power/canyon-creek-pumped-storage/

https://www.energy.gov/eere/water/pumped-storage-hydropower

https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/low-emissions-economy/nz-battery/

https://www.energy.gov/eere/water/pumped-storage-hydropower

Question ???