

Gravitricity

Mechanical Energy Storage

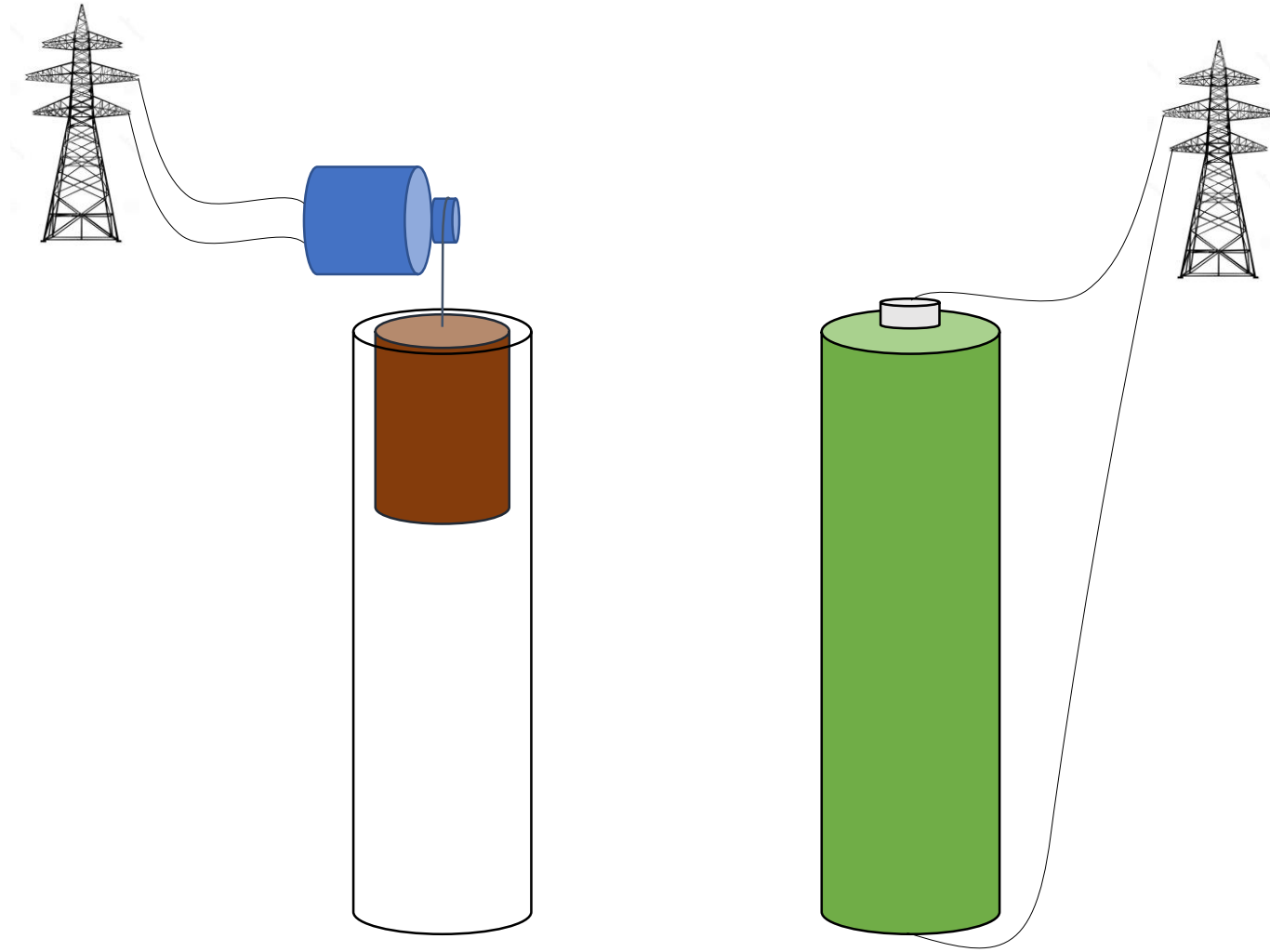


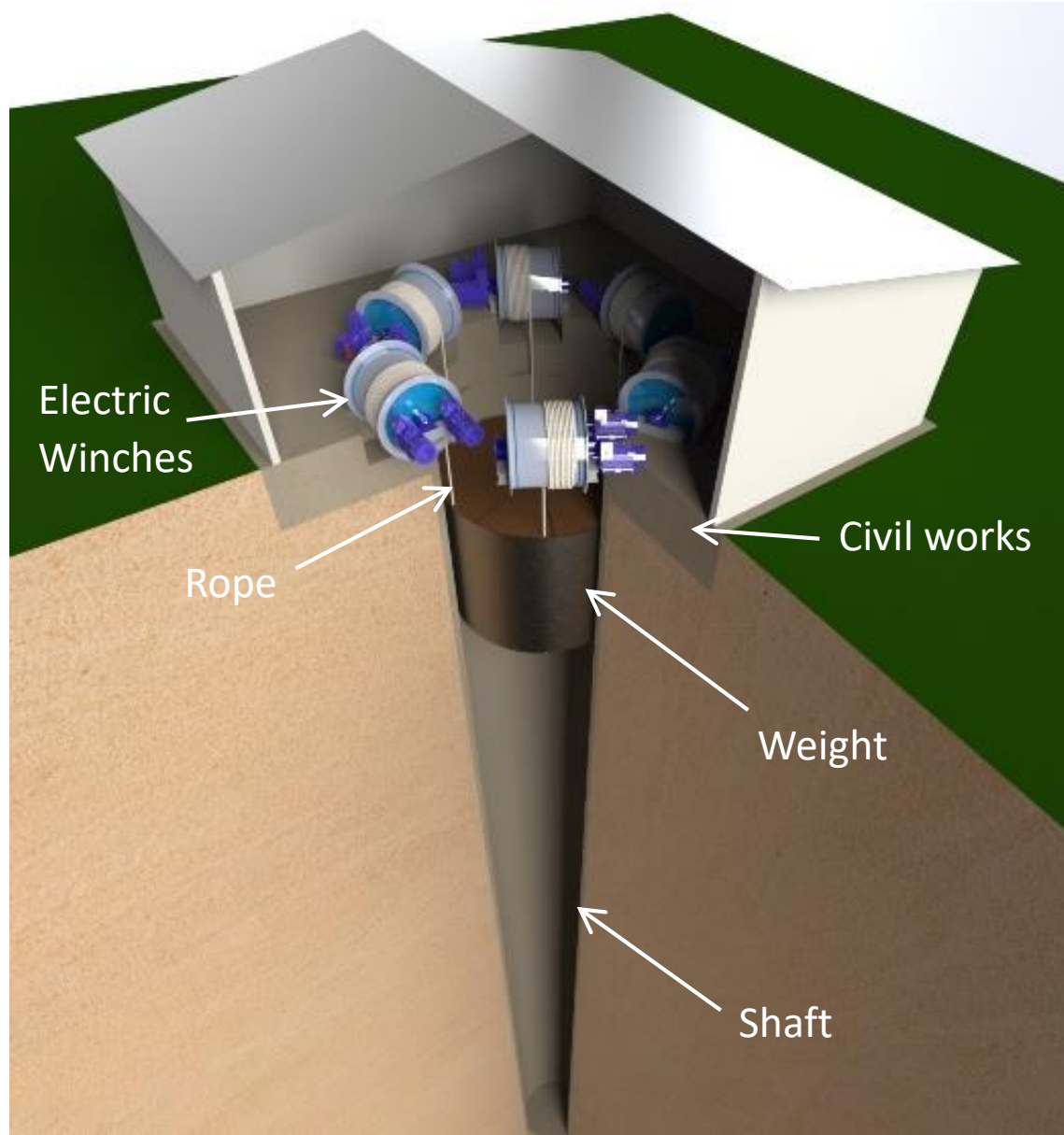
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18 December 2017

The Gravitricity Concept

Gravitricity 





The Characteristics

Long cycle life with no cyclical degradation: (75,000+ cycles)

Low levelised (lifetime) cost of storage

Rapid response: full rated power <1s

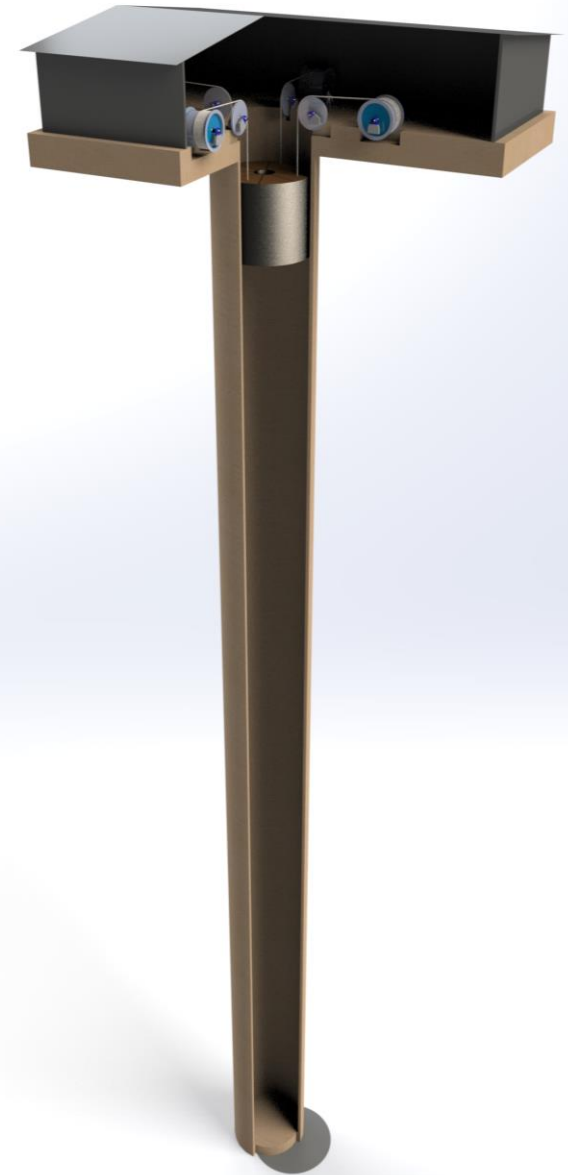
Versatile Power/Demand ratio: i.e. c-rate

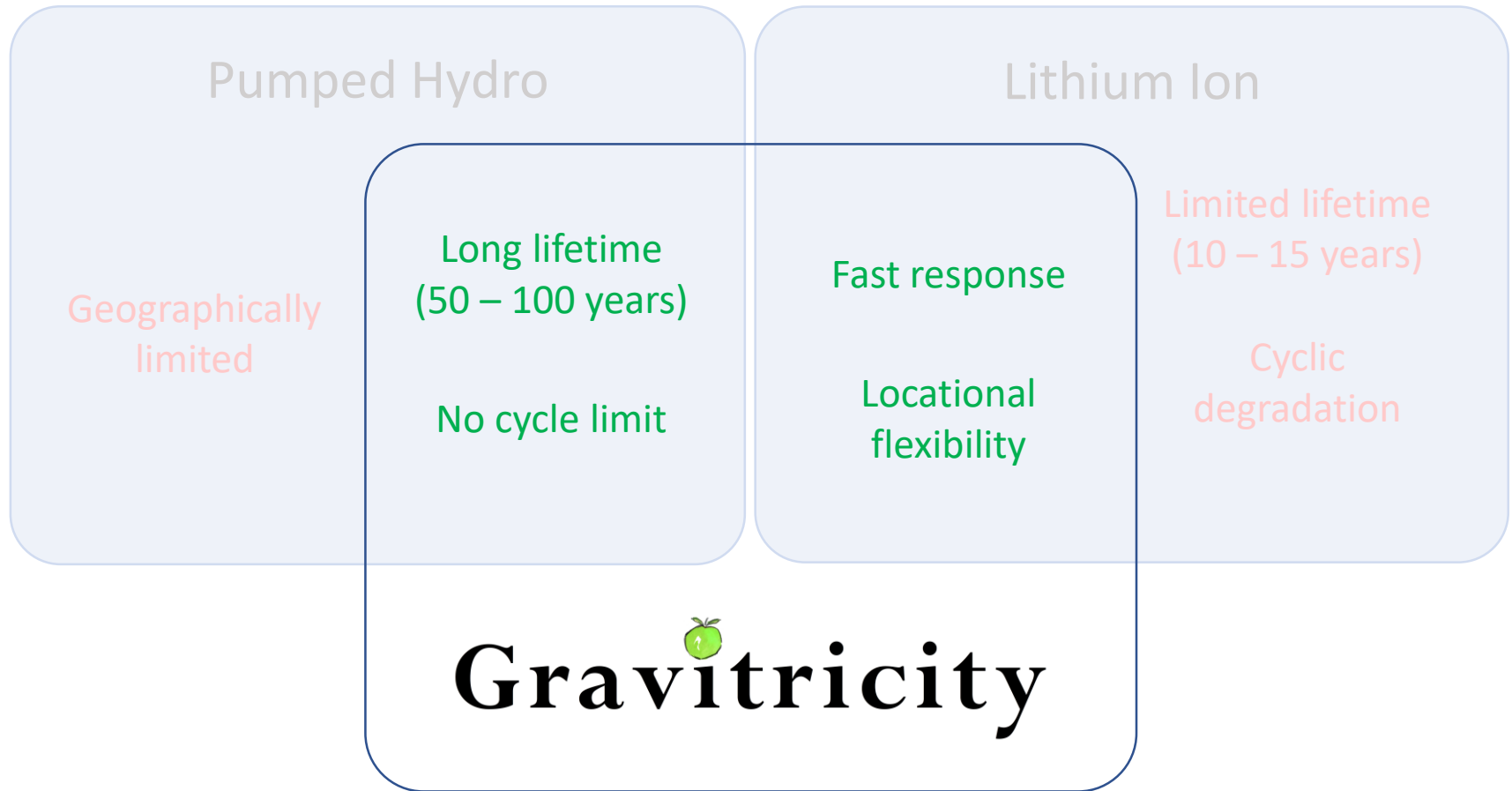
Load following: dynamic frequency response

No standing losses, no depth-of-discharge limits

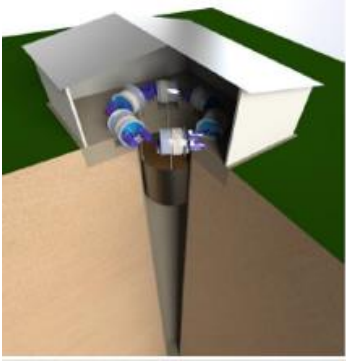
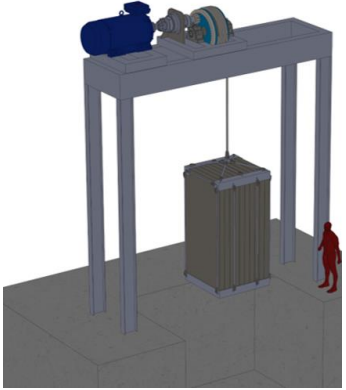
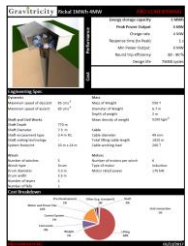
High efficiency: 80 - 90%

Small footprint: <30mx30m for 8 MW facility. Can be sunk below ground. Low locational constraints at new-shaft sites

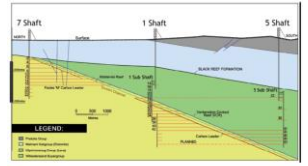




Technology Development



Driefontein Mine – Carletonville SA



2013

2016-17

2018-19

2019-20

2020 ->

Proof of Concept

- Underlying dynamic analysis
- Proof of market
- Patents x2

Detailed Modelling

- Full system simulation
- Business Plan developed
- Design for market
- Detailed design patent

Concept Demonstrator 250kW

- Modelling validation
- Physical proof of integration (single module)
- Proof of commercial characteristics (response time etc)
- Control System development

Full-scale prototype 4-8MW

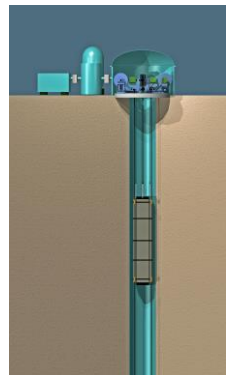
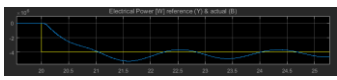
- Full system integration (multiple modules)
- Mineshaft HSE / consents
- Weight structure and installation demo
- Multi-module control system
- Proof of commercial operation (via aggregator)

Commercial Projects

- Own projects / Partnerships
- Turnkey / EPC contracts
- Licence revenues
- Cost reduction (volume)

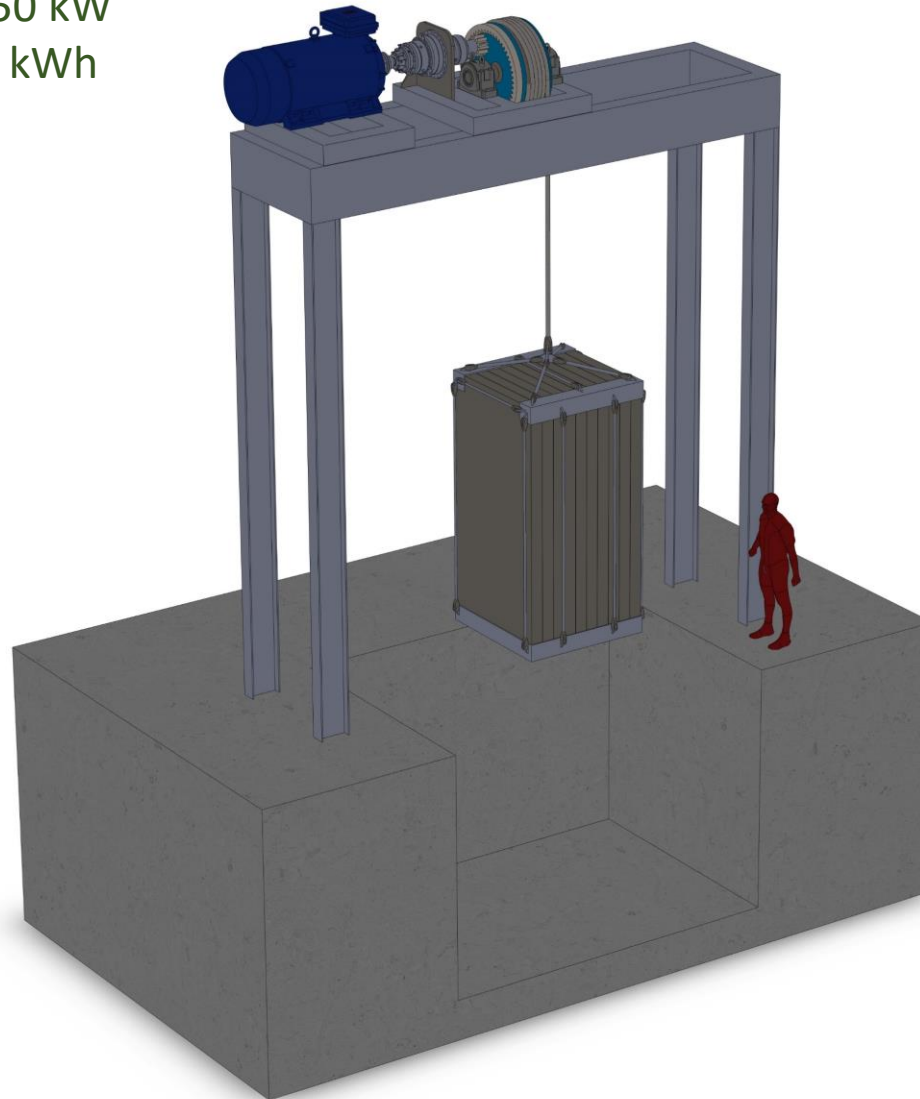
Gravitricity R&D

- Cost reduction (winch design)
- Increase MWh (lift capacity)
- Increase MWh (CAES)
- Shaft sinking R&D



Concept Demonstrator

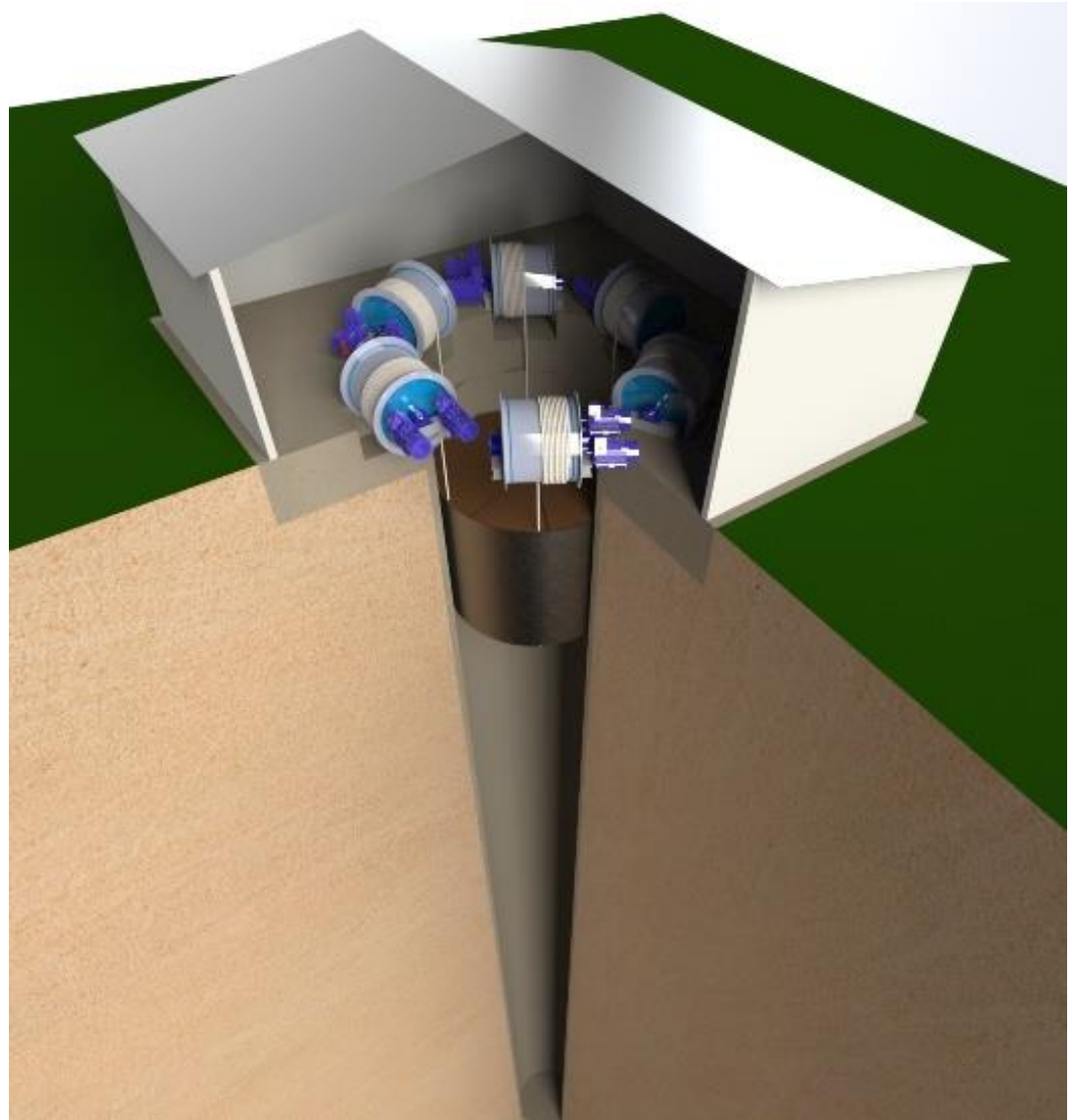
Peak power = 250 kW
Total Energy = 1 kWh

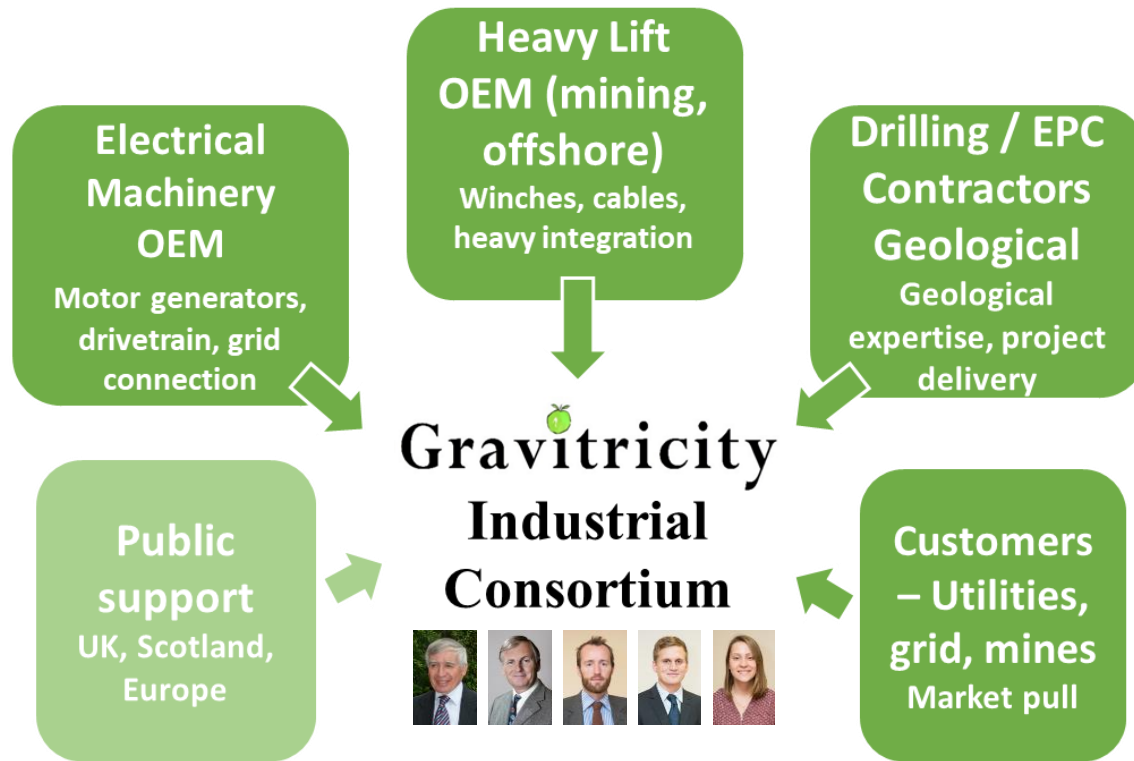


First of a kind Full Scale system

Peak power = 4 MW
Total Energy = 1 MWh

Exiting mine shaft: 7.3 m x 770 m





- Long-life system energy storage system
- Clear set of development steps ahead
- Building industrial consortium with key technology partners and relationships with investors and customers
- Making the case for long-life storage

Long lifetime (50 – 100 years)	Response time <1s
No cycle limit	Locational flexibility
Flexible Power/Energy ratio	Small footprint

Gravitricity

