

# Storelectric Ltd

Storelectric offers safe, clean and cost-effective energy storage at truly grid scale (Gigawatts and Gigawatt-hours).

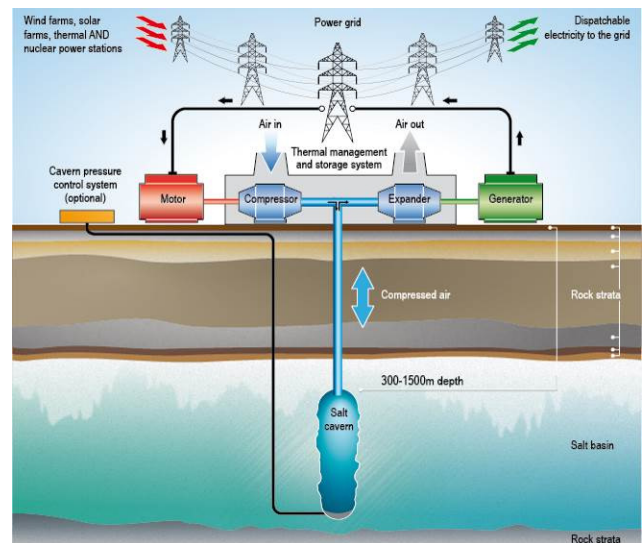
## Why is Energy Storage Needed

Natural resources such as wind and solar are unpredictable, only generating electricity when nature's conditions allow. This makes them unreliable and unsuitable for satisfying either baseload or variable demand, and costly as other forms of generation must be kept available to back up times when it is not available. Storing renewable energy for use when needed would make them cost effective and viable without subsidies.

The main thing that eludes the energy industry is how to store energy in large quantities, cost effectively and safely. Battery technology has not yet advanced far enough and are one thousandth or less of the scale required, and other forms of energy storage currently being used are limited in capacity and high cost.

## Compressed Air Energy Storage (CAES)

Surplus low-price electricity is used to pressurise air, which is stored underground in very high capacity salt caverns, as most natural gas is currently stored world-wide. During peak demand, when prices are high, this air is released to regenerate electricity. It draws off and feeds into the grid, so supporting all generation technologies. It is safe, far underground, and salt caverns are naturally hermetic and self-sealing. The application has been proven in Huntorf in Germany (from 1978) and in McIntosh, Alabama, USA (1991). These facilities have proven successful and safe, but only achieve 42-54% efficiency. Storelectric's plants will achieve close to 70% efficiency and up to 100% renewable.



CAES can satisfy global energy storage needs as there are many suitable geologies globally.

## Why is Storelectric different?

Storelectric's CAES uniquely has the potential to make both existing and renewable generation profitable without subsidy, dramatically cut emissions and provide complete energy security to countries and regions. The company is developing two CAES technologies: based on CCGTs and Thermal Energy Storage (TES). It also has a more developmental hydrogen-based technology.

	CCGT CAES	TES CAES	Traditional CAES
Capex for 500MW	£365m first, target £330m	£460m first, target £350m	£700m
IRR in today's market	Double digit %, big up-side	Double digit %, more up-side	Low, some up-side
Increasing market volatility	Improves IRR a little	Improves IRR dramatically	Improves IRR a little
Efficiency (round trip)	>60%	>68%	54%
Emissions % of CCGT	~55%	0-5% (2 configurations)	~55-60%

Both plants use off-the-shelf equipment, well proven in other industries, which reduces risk considerably. TES CAES has been validated by Costain, Fortum, Siemens, Mott MacDonald, Arup and others as delivering its intended services using standard technologies; a 40MW first-off commercial plant is planned for TES CAES. CCGT CAES is even more similar to a CCGT, so a small plant is not needed. Storelectric has a developing consortium of blue-chip multinational partners, with land and salt caverns ready to go, and supportive planning authorities. Plants can be built throughout the world: suitable geologies are widespread, and others available in future. There is great interest in financing full-scale plants, following a successful first-off. Global market potential for peak smoothing alone is 3,500 large plants, with first mover and technology advantages

The European Commission and ENTSO-E have approved as a **Project of Common Interest** a Cheshire 40+500MW TES project, meaning that it is important infrastructure at a continental scale, giving access to €5.3bn Connecting Europe Facility, €5.12bn ECB funding for energy, & assistance with permits in all 35 member countries. Both technologies will be eligible for PCI status throughout Europe for future plants.

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Storelectric has won many awards, including the global **NAM70 Challenge** for large scale energy storage technologies run by NAM (the Dutch gas-producing Shell-Exxon joint venture), and a Shell Springboard Award; and were one of only two companies invited to present at the 2018 World Economic Forum in China.

### Market Opportunity

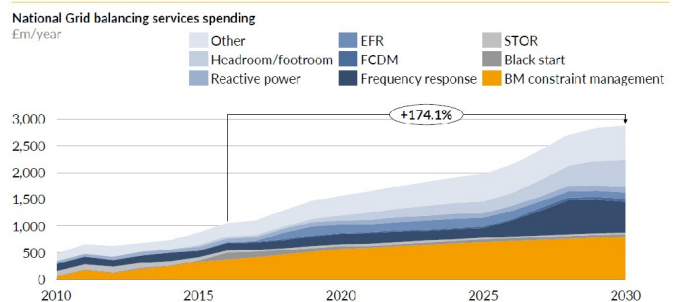
Game-changing effects of intermittent renewables (primarily wind and solar) and increasing electrification are reverberating through global power markets. A mix of traditional, non-traditional and innovative responses are mitigating challenges such as intermittency, grid instability and grid congestion. The scale and economic efficiency of these responses are limited, hence the widespread blackouts in the UK on 9<sup>th</sup> August 2019; we predict these to increase in both frequency and severity unless widespread large-scale long-duration inertial storage is built. Without grid-scale, long-duration, storage, the costs increase inexorably.

The market opportunity is to:

- ◆ Make renewables dispatchable, facilitating their otherwise problematic continued growth;
- ◆ Provide low- or zero-carbon peak shaving / standby capacity;
- ◆ Provide reliable demand turn-up to avoid renewables curtailment and grid congestion;
- ◆ Offer a wide range of ancillary services to stabilise the grid against frequency and voltage fluctuations;
- ◆ Reduce whole system, socialised costs and consumer levies; and
- ◆ Help achieve otherwise out-of-reach carbon targets.

2. Ancillary services value is set to nearly triple due to falling thermal generation and new nuclear

AURORA  
ENERGY RESEARCH



Sources: Aurora Energy Research, Ofgem

### Business Case

Legislation and regulatory structures have yet to catch up with rapidly mounting need for energy storage.



- ◆ Our capital costs per MWh and LCOS are already where batteries aspire to be in the mid-2030s.
- ◆ Our plants provide broad-based synchronised functionality and operational flexibility that reliably accesses multiple revenue streams.
- ◆ The chart shows the plants can access multiple revenue streams, under all combinations of key system conditions of demand and intermittency.
- ◆ This unmatched flexibility mitigates risk, and turns current market stresses into opportunities
- ◆ The technologies are sufficiently compelling to monetise pent-up demand on a merchant basis.
- ◆ Revenue forecasts are based on current short-term contract pricing and yield IRRs in the teens.
- ◆ This outstanding flexibility maintains profitability, in all reasonable regulatory & market scenarios.

### Pipeline Projects

We are developing a number of projects, with a supporting pipeline. Project 2 is approved as an EU PCI.

1. 40MW and 500MW TES CAES in the UK: land identified in existing salt cavern area and in-principle agreements in place. UK national planning process (the 40MW plant may be project 1).
2. 40+MW TES CAES in the Netherlands: in-principle project development agreement with NAM (Shell/Exxon JV) following Storelectric's June '18 success in the NAM70 Challenge (see website and above). Land/caverns and a formal development agreement are currently under discussion.
3. 70MW CCGT CAES retro-fit in the UK, with the owner of the plant, existing caverns and land.
4. 600MW CCGT CAES new build in the UK, with a generator who owns the land and cavern making capability.
5. Developing large-scale TES CAES plant possibility in France; further interest shown in 4 continents.

### Investment opportunity

Storelectric is currently raising initial funds to develop and then to build our first-of-a-kind plant which will be profitable, targeting 15% total project IRR. A 500MW follow-on plant will yield greater IRR. We have been offered caverns in the UK, but can build elsewhere. Developing a 40MW 200MWh plant to shovel ready costs £3.5m (£8m for 500MW), construction £50m. We are also inviting £1.5m investment in Storelectric Ltd, and/or larger investments into the SPVs – similar returns on capital but different exits and durations of investment.