# Storage on the All-Island System

Gaelectric Energy Storage

9th May 2013

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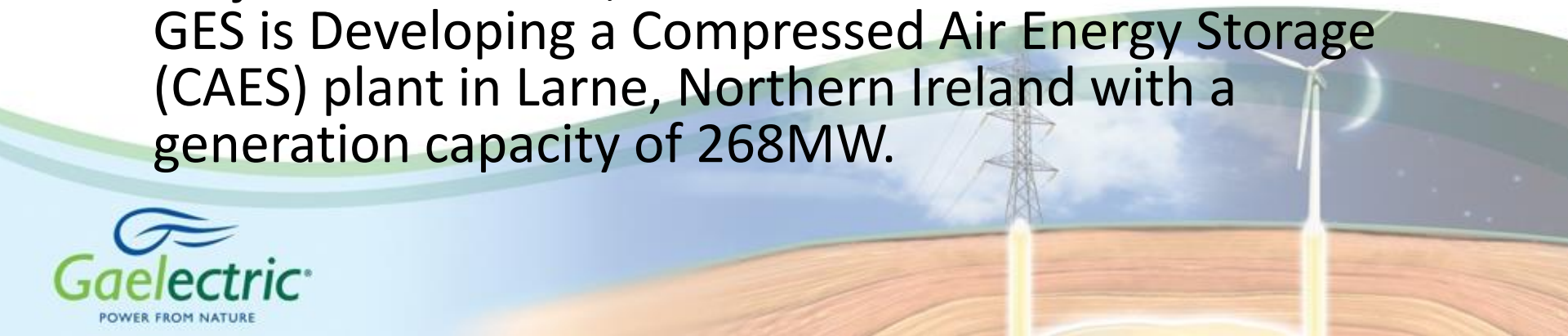
# Gaelectric Energy Storage (GES)

- Founded in 2006.
- Member of the ERC since 2009.
- GES has dedicated team of technical experts and industry professionals to develop energy storage assets on the Irish power system.
- Part of a wider company (Gaelectric Holdings Ltd.) that is also developing up to 300 MW of wind in Ireland and Northern Ireland in the near to medium term.
- Project CAES-Larne, NI:
  GES is Developing a Compressed Air Energy Storage (CAES) plant in Larne, Northern Ireland with a generation capacity of 268MW.



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# Timeline:
# Collaboration between GES and ERC

- Wilmar Modelling:
  - 2009-10: First Study of CAES using Wilmar (2009-10). Pre - Facilitation of Renewable Study (FORS).
  - 2011: Follow on studies of CAES using Wilmar. Including additional constraints outlined by FORS, such as the non-synchronous penetration limit.
- Modelling of Flywheel:
  - Study of up to 200 MW of flywheel on the All-Island System (2010) using Wilmar and Matlab.
- Plexos Modelling:
  - “Virtuestor” Project, an SEAI funded study of storage on the All-Island system in 2020 using Plexos (Completed in November 2012).

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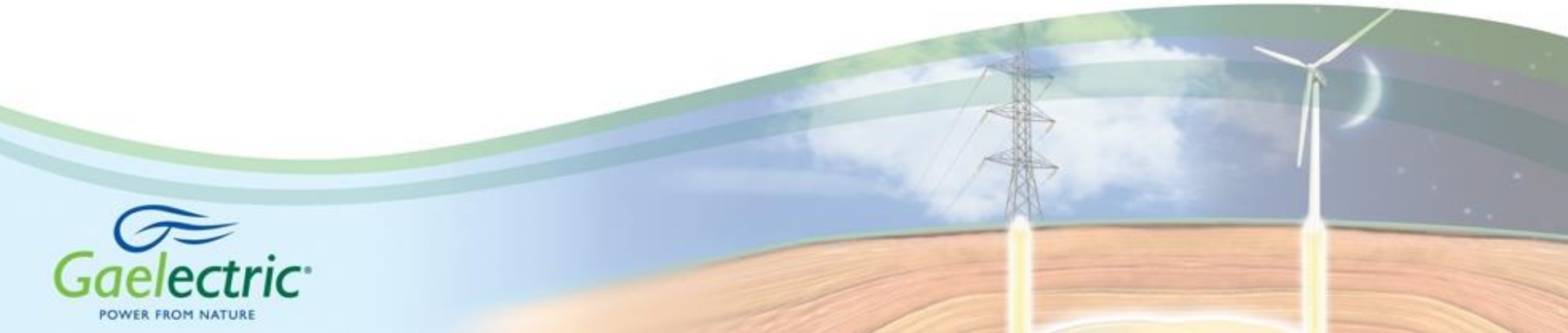
# The Value of Storage: General Trends



# Virtuestor Project: Overview and Results

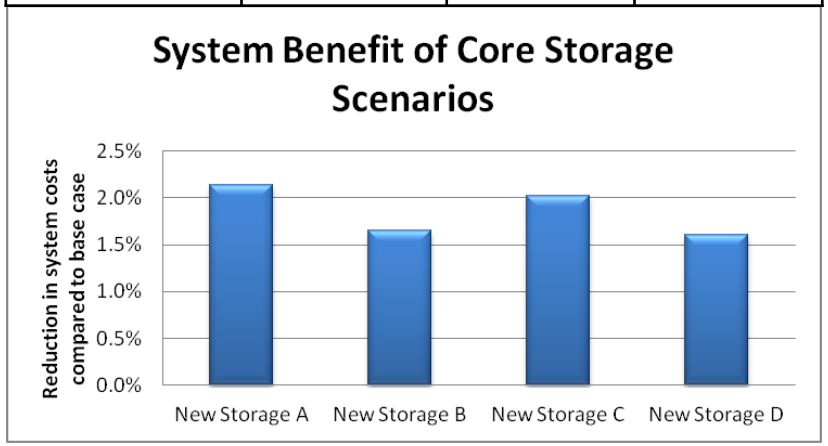
**Background:**

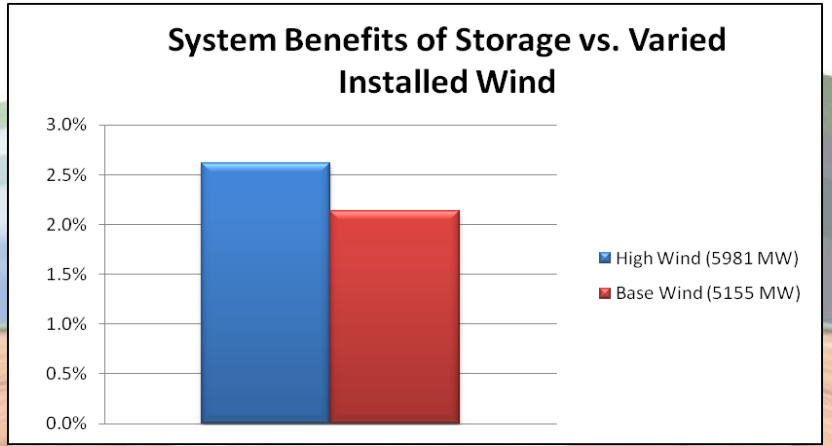
- Funding provided by the Sustainable Energy Authority of Ireland (SEAI) to assess the impact of storage on the All-Island System in 2020.
- Study carried out by GES and ERC/Ecar using Plexos.
- ***Technology neutral:*** Range of bulk storage scenarios chosen, using generic technical characteristics.

**Key Results:**

- More economic provision of reserve by storage is a significant value driver. Flexibility!
- Value of storage increases significantly as more wind comes onto the system.
- Installed capacity of storage has more impact compared to energy density (MW more important than MWh).
- A new, flexible 300 MW / 1800 MWh storage unit will reduce system costs by over €30 million in 2020.

| Storage plant scenario | Generation Capacity (MW) | Storage Volume (MWh) | Facility Size |
|---|---|---|---|
| **A** | 300 | 1800 | Large |
| **B** | 150 | 900 | Intermediate |
| **C** | 300 | 900 | Intermediate |
| **D** | 150 | 450 | Small |

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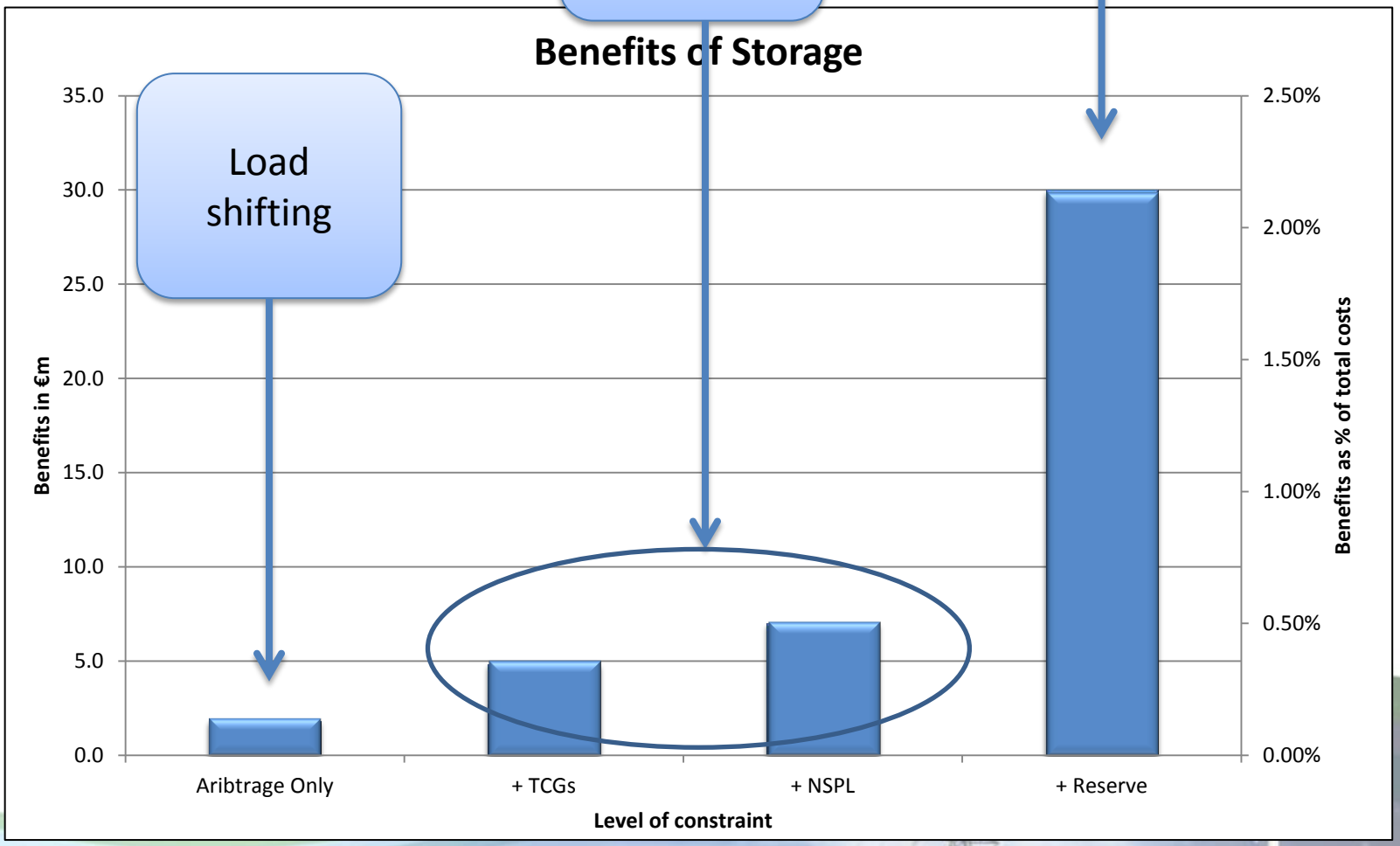
# Virtuestor Project: Varied System Cons[illegible] Assess Storage Value




Additional constraints added to each model run

- *TCG = Transmission Constraint Groups: Minimum generation levels etc.*
- *NSPL = Non Synchronous Penetration Limit (50%)*

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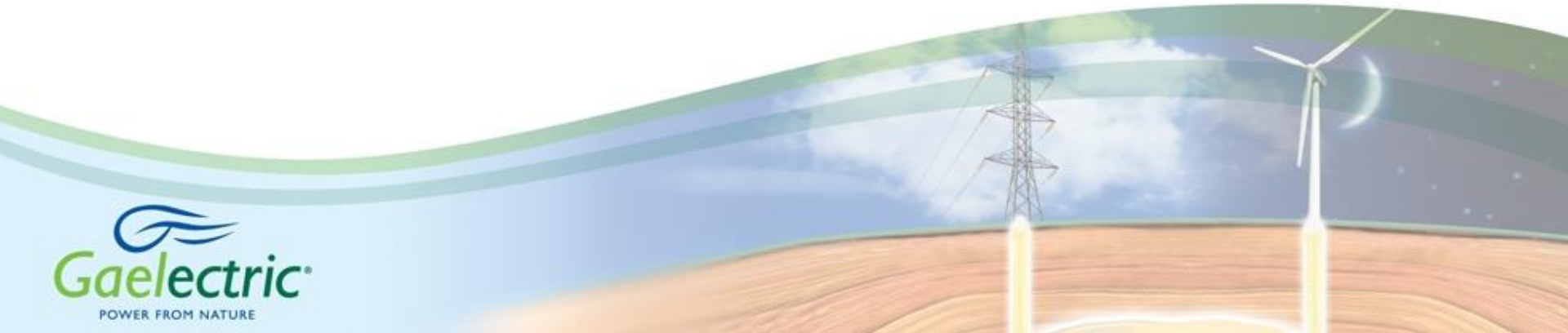
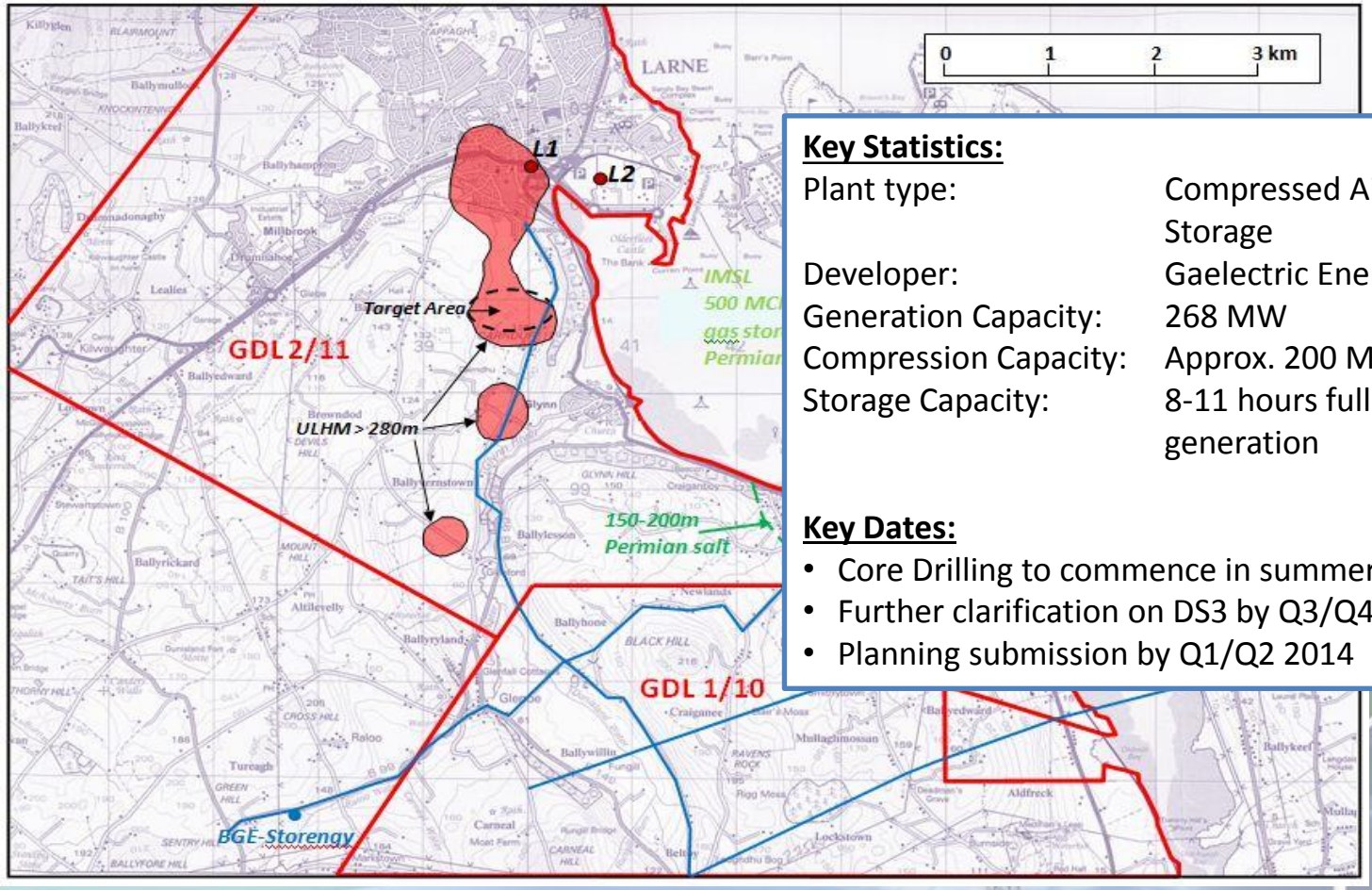
# Compressed Air Energy Storage (CAES)



# Project – CAES Larne, NI




**Key Statistics:**

| | |
|---|---|
| Plant type: | Compressed Air Energy Storage |
| Developer: | Gaelectric Energy Storage. |
| Generation Capacity: | 268 MW |
| Compression Capacity: | Approx. 200 MW |
| Storage Capacity: | 8-11 hours full load generation |

**Key Dates:**

- Core Drilling to commence in summer 2013
- Further clarification on DS3 by Q3/Q4 2013
- Planning submission by Q1/Q2 2014

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# Why Storage – A Global Perspective

- Flexibility levels on electricity systems are decreasing due to large amounts of renewables. Need to find ways to keep renewables online while maintaining security. Storage can be a solution.
- Through initiatives such as the DS3 programme, the All-Island system in Ireland is leading will be one of the first to tackle the flexibility challenge.
- Electricity systems throughout Europe beginning to see similar flexibility and stability issues as those that have been seen in Ireland thus far.

**Italy:**

- Deteriorating System Inertia
- Evening ramping requirement of 15- 17 GW in 2 hours
- Reduction of 25-30% of POR availability in the last 4 years
- Pumped storage increasingly being operated in pumping and generation mode simultaneously.

Source: Terna

**Germany:**

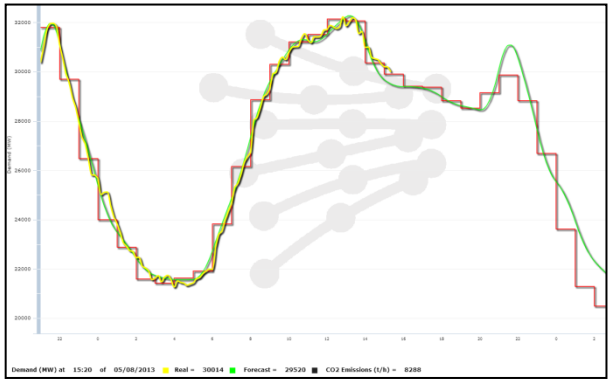
- Cycling of thermal plant: Increased starts, reduced capacity factors.
- Reduction in SOR and minute reserve availability.
- Sources at EnBW have estimated that 23 TWh of storage would be required to cover a wind-calm period of 14 days at projected build out rates. Currently there is 0.04 TWh of storage in Germany.

Source: EnBW

**Spain:**

- Dedicated control centre for dispatching renewables.
- Severe morning ramping requirements.
- Curtailment during night time valleys to keep flexible capacity online for the morning ramp.

Source: RED Electrica



Spanish Electricity Demand: 8th May 2013 (https://demanda.ree.es/demandaEng.html)

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