Electrovaya Company Background and Energy Storage Products

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Disclaimer

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About Electrovaya

- Electrovaya (TSX:EFL) is a leading lithium ion developer and manufacturer that provides alternative energy solutions to help increase energy efficiency and reduce climate changes

- Headquartered in Mississauga, Ontario and has operations in the U.S. and Europe

- Holds over 150 global patents for its advanced battery technology *Lithium Ion SuperPolymer® 2.0*

- Electrovaya has created battery systems for wide range of applications including automotive, stationary energy storage, commercial markets and many other applications

World: Moving from Fossil Fuels to Electric

- London 1952: The Great Smog befell London starting on December 4, 1952, and lasted until March of 1953. About 8,000 people died; London went from fossil fuels to electric
- Beijing, New Delhi and most cities in India & China have a similar situation.
- World is moving from fossil fuels to electricity: a $5 trillion transformation

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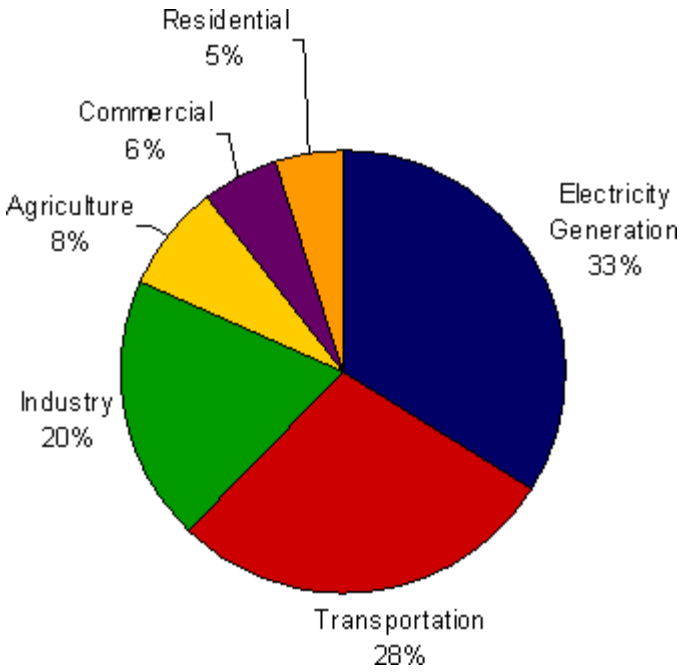
Climate Change and the Grid

- Climate change and our electricity generation go hand in hand
- In most countries, electricity generation is the primary source of GHG emissions

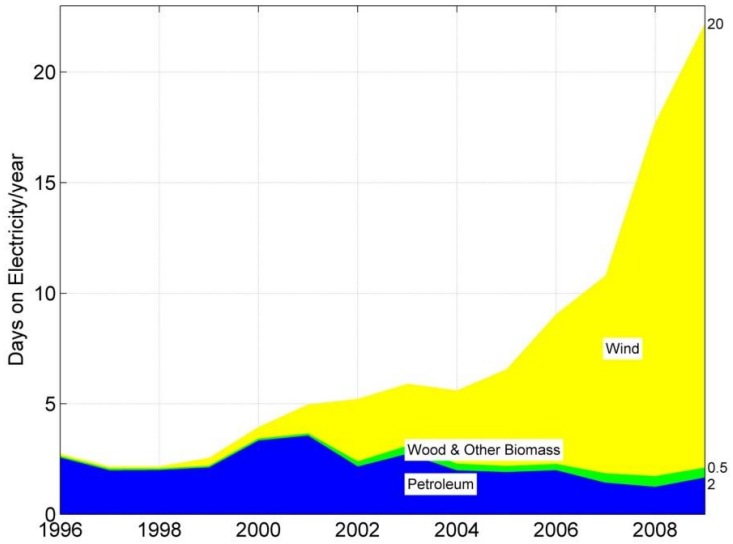


US GHG Emissions by Sector, 2006

High Growth of Renewables

- Growth of renewable generation is occurring at a remarkable rate

Concentrated Solar facility in California



Texas Wind Generation Growth

Offshore wind, Denmark

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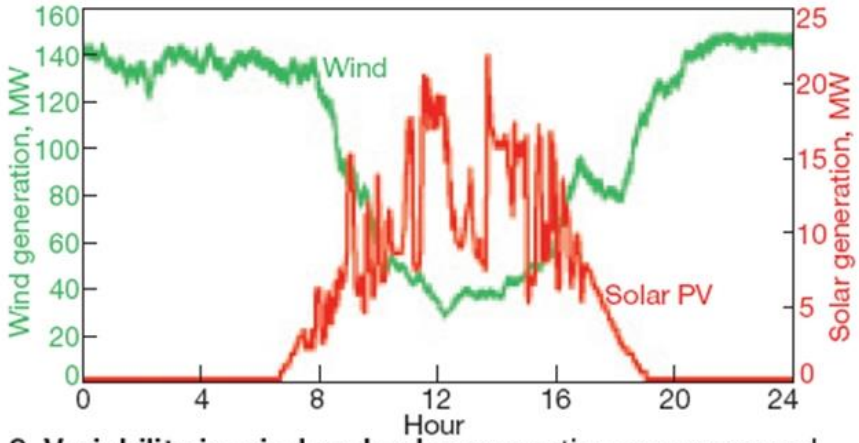
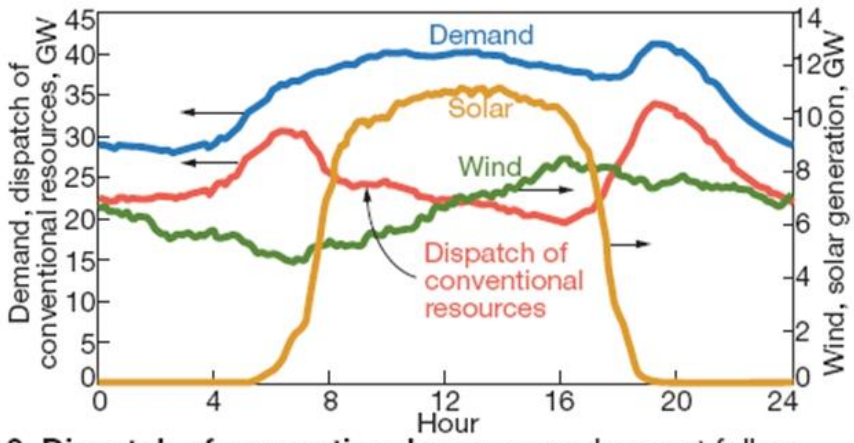
Intermitancy

- Solar and wind are “intermittent” resources



8. Variability in wind and solar generation are compared for a cloudy California day. The solar PV field is rated 24 MW, the wind farm 150 MW



9. Dispatch of conventional resources does not follow the typical load curve when significant amounts of intermittent renewables are injected into the grid

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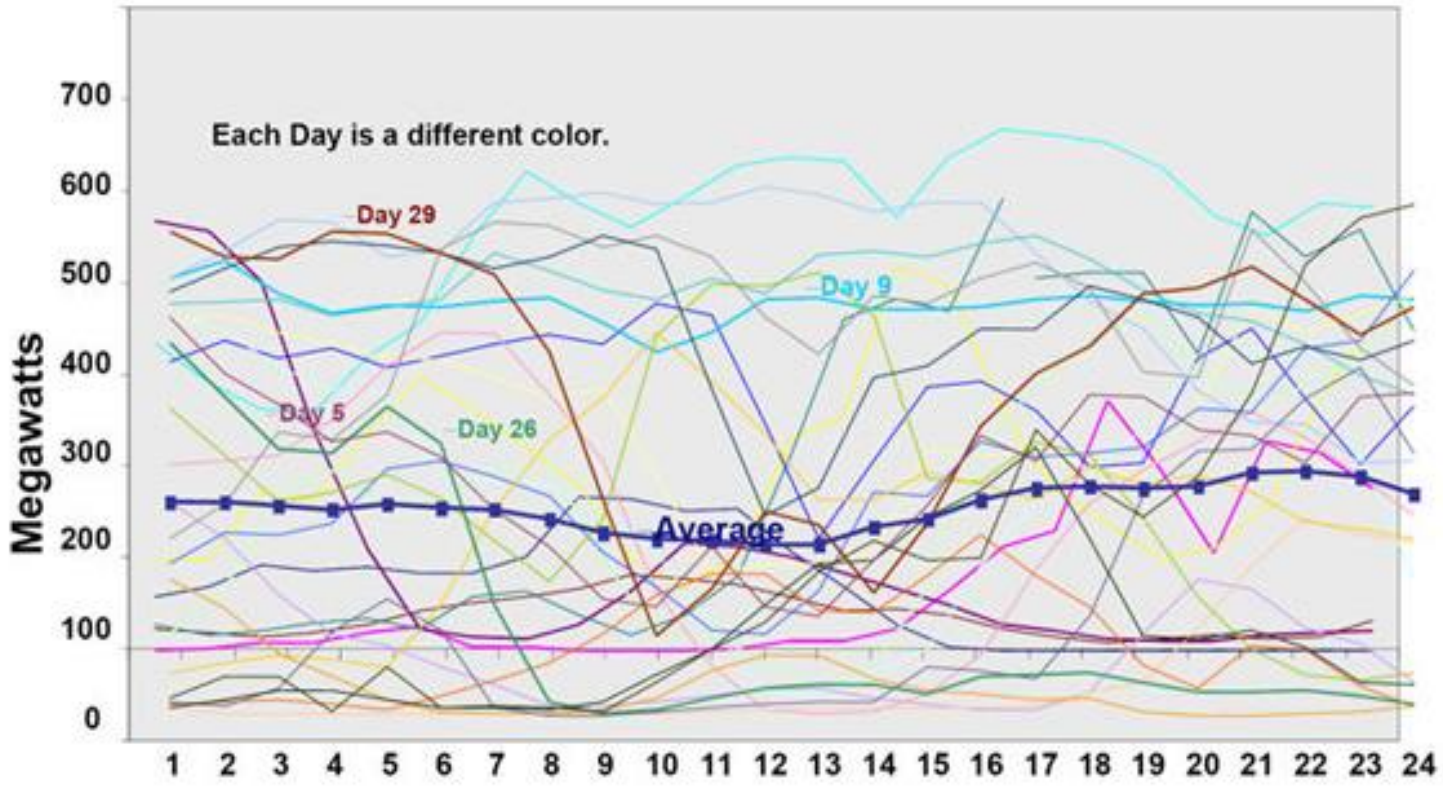
Wind Variability

- Wind has substantial day to day variation
- Majority of wind farm production occurs at night during the lowest demand (hence price) periods



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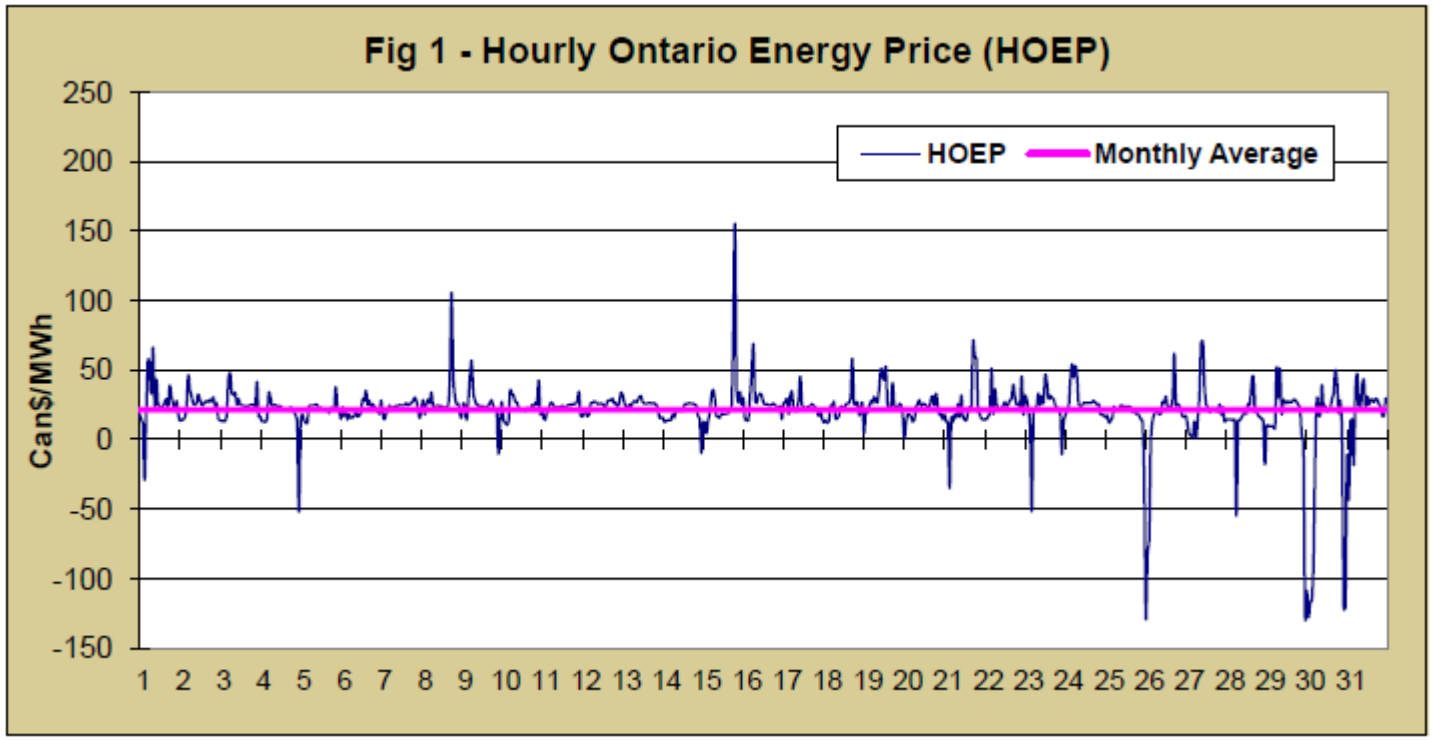
Oct 2012 Hourly Ontario Energy Price



Hourly Ontario Energy Price $/MWh			
	For the month	On-Peak	Off-Peak
Average	21.55	25.74	17.78
Maximum	154.81	154.81	105.63
Minimum	-128.13	-122.36	-128.13

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The need for storage

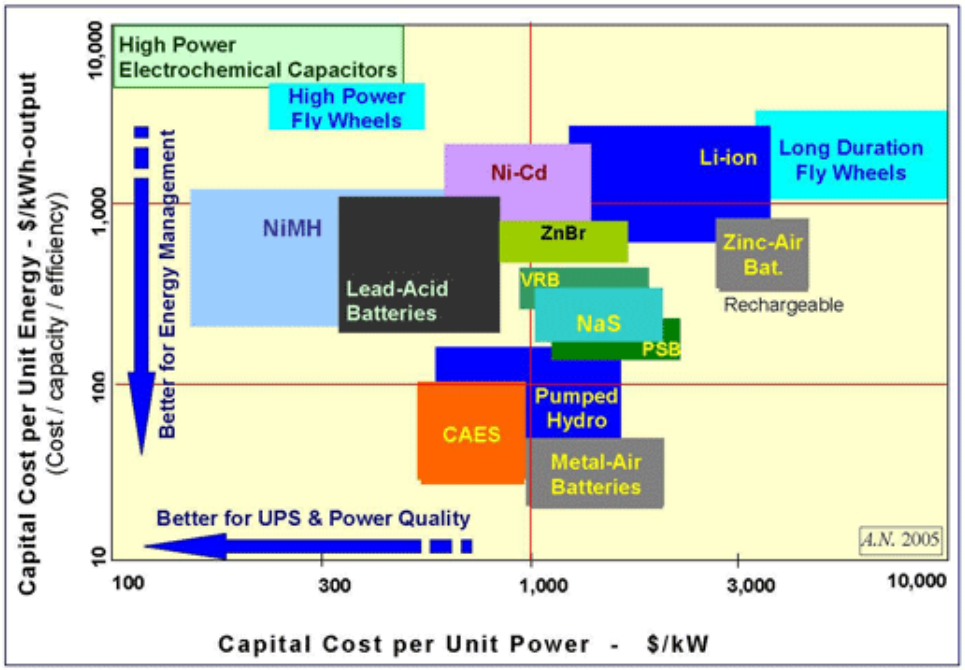
- Renewables, Renewables, Renewables!
- Inflexible base load capacity: Nuclear, gas replacing coal

Leads to some interesting scenarios….

- Street lights left on during the daytime in Germany (high PV penetration)
- Negative pricing in many jurisdictions: Ontario, Denmark, Texas etc.
- More generation than load on a windy day (Denmark)!

Energy Storage Technologies

- Many different energy storage technologies available
- Predominant technology, pumped hydro, has limited ability for expansion (already built and requires rivers/dams)
- Many technologies currently being demonstrated



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Energy Storage: The holy grail for clean tech

Electric Vehicles

Energy Storage for Utilities

Strategic Energy Storage Systems

- **Global lithium-ion battery market: "Triple to $32 billion in 2015"**
- **Electric Automotive: "A US $150 billion industry by 2030"**
- **Energy Storage: "$220 billion by 2021**

Sources: Alliancebernstein, Pike Research, Marketresearch.com

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History of Electrovaya

1996 — Founded in Ontario Canada

1998 — Breakthrough in Nanotechnology developed

2000 — Company listed on Toronto Stock Exchange (EFL)

2002 — PowerPad® Electrovaya's external laptop battery product, first commercially launched

2004 — Receives NASA Prime Contract large-format batteries for aerospace

Electrovaya, in partnership wit GM/Suzuki JV, creates its first electric car

2006 — Sold Phostech Lithium shares shortly launches MN-Series chemistry

2008 — Partners with subsidiary of the Tata Motors in Europe

Delivers first Ford Escape PHEV conversion demonstrator

2010 — CHRYSLER Announced as Chrysler Ram PHEV Battery Supplier

Electrovaya unveils Maya Electric. Test program with ExxonMobil: Lithium Ion Powered city car

2011 — Electrovaya awarded first MWh Scale energy storage contact with Hydro One

Electrovaya partners with ABB for utility energy storage systems

Electrovaya began delivering kWh scale energy storage systems to Manitoba Hydro

2012 — CHRYSLER Electrovaya awarded contract for Chrysler Town and Country Minivan PHEV. Completes delivery of 140th Dodge Ram PHEV

Electrovaya delivered its first 1.5MWh unit

CHUBU Electric Power — Electrovaya delivers first ESS systems to Japan for Chubu Electric

2013 — DFM — Electrovaya lithium Ion SuperPolymer® battery for Dongfeng Motor for Electric Vehicle program

SSE — Electrovaya lithium Ion SuperPolymer® battery systems selected by SSE for Smart Grid City Project in the UK

Product Portfolio

AUTOMOTIVE	 	DFM CHRYSLER
ENERGY STORAGE	  	hydro one SSE
INDUSTRIAL	 	Hospitals Multi-national Retail Store
SPECIALTY	  	SOLUND VERFT AS NASA

Electrovaya's Global Expansion

Canada
Headquarter in Mississauga, Ontario

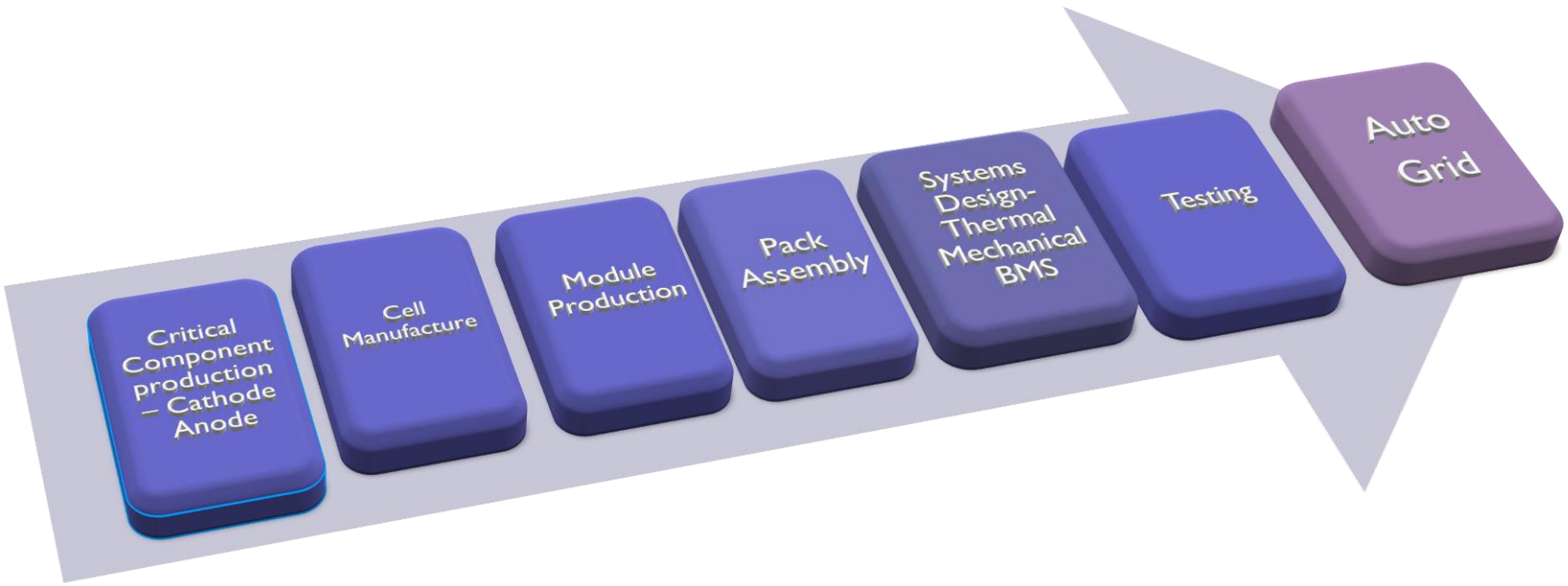
USA
Assembly plant in New York

Norway
Acquisition of Miljobil from Tata Motors

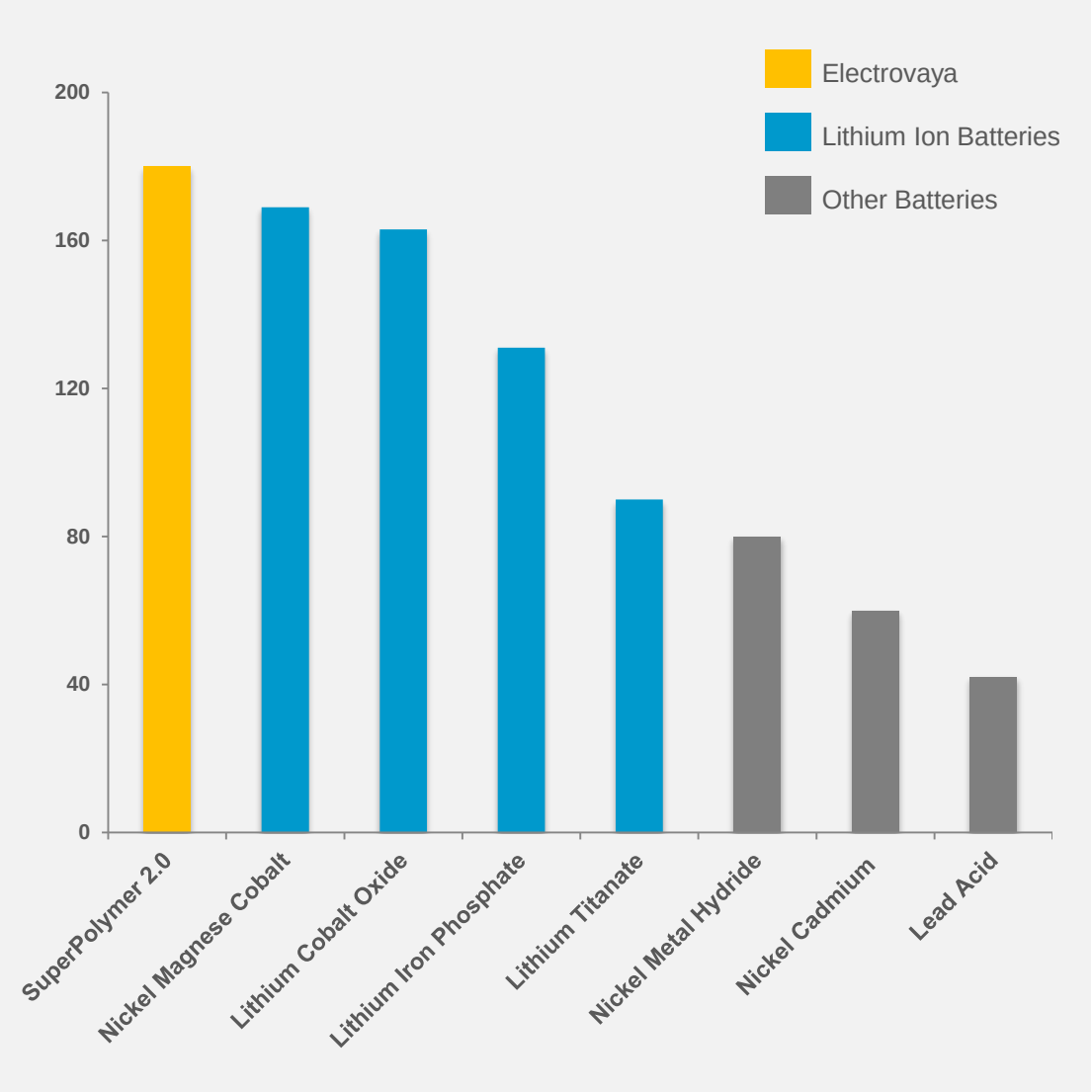
Japan
MOU with multi-national conglomerate

ELECTROVAYA BATTERY TECHNOLOGY

Electrovaya: Provides the entire Li-Ion Value Chain



High Energy Density

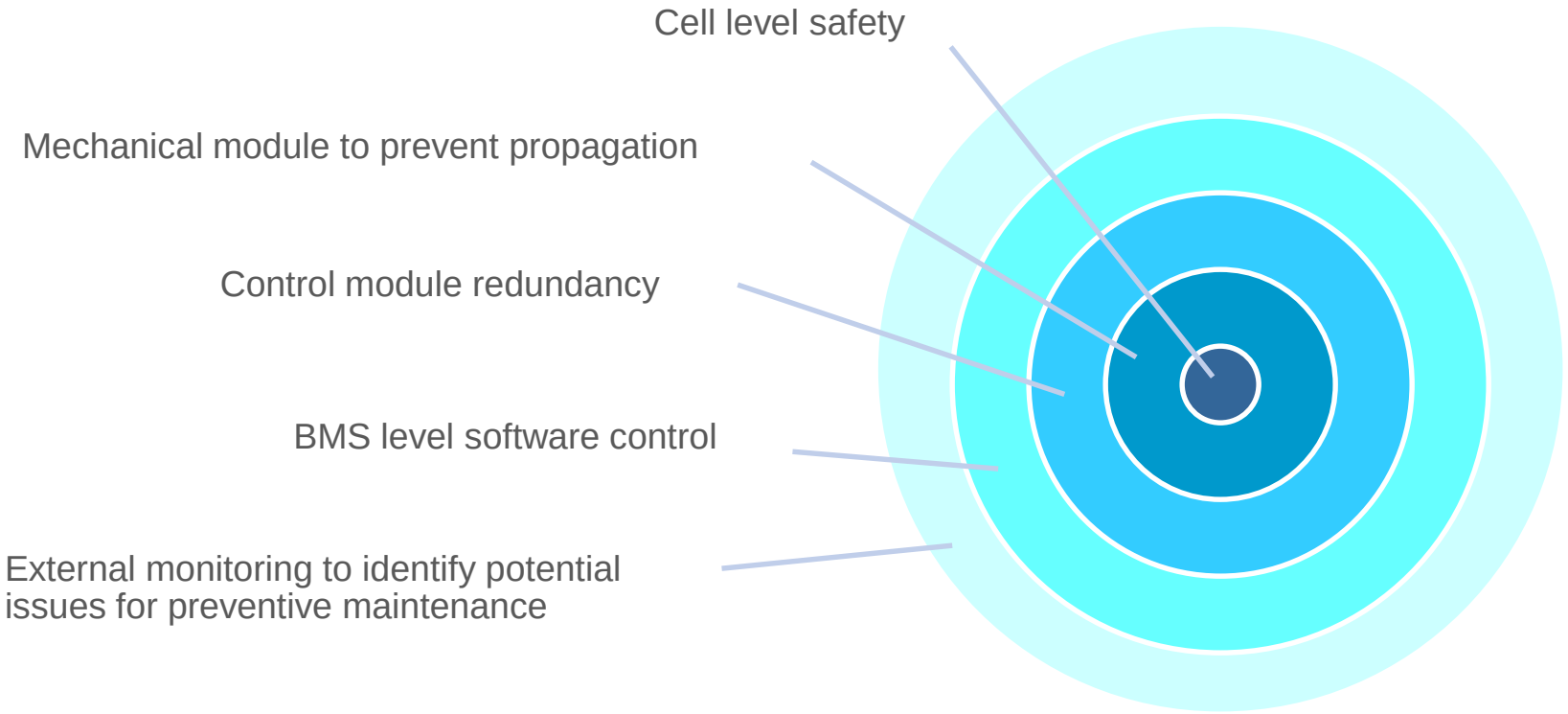


- Energy density determines the size and weight of the battery. Higher energy density means the battery takes less space and weight.
- Batteries with high energy density are suitable for applications that requires long run-time or range.
- Electrovaya has a market leading energy density compared to other lithium ion batteries and other types of batteries

Safety Approach

- Electrovaya follows a “Safety-By-Design” philosophy and the battery systems are designed for safe operation and easy maintenance

- *Lithium Ion SuperPolymer®2.0* battery systems have multiple layers of built-in safety features at the cell, module and system level



Responsible Innovation

Electrovaya has a “Responsible Innovation” philosophy and believes that the supply chain of the green technology should be sustainable.

Unlike most lithium ion battery manufacturers, Electrovaya has a toxin-free manufacturing process, and avoid using a toxic chemical called NMP (N-Methylpyrrolidone)

Toxin-Free Manufacturing

- Electrovaya has a "Responsible Innovation" philosophy and use a toxin-free manufacturing process, whereas most lithium ion battery companies use a toxic chemical called NMP (N-Methylpyrrolidone)
  - Studies have shown that exposure to NMP can cause negative effect on the human health
  - NMP is regulated in several countries in North America, EU, and Asia
- NMP must removed from the final product of the battery, thus, companies using NMP require additional capital cost and operational cost

Organization	Occupational Exposure Limit (ppm)
American Industrial Hygiene Association (AHIA)	10
California EPA Hazard Evaluation System & Information Service (HESIS)	5
United Kingdom Health and Safety Executive (UK HSE)	25
Australia	25
Ontario (Canada)	100
Japan	1
New Zealand	25
South Africa	100
EU (varies by country)	5 – 50

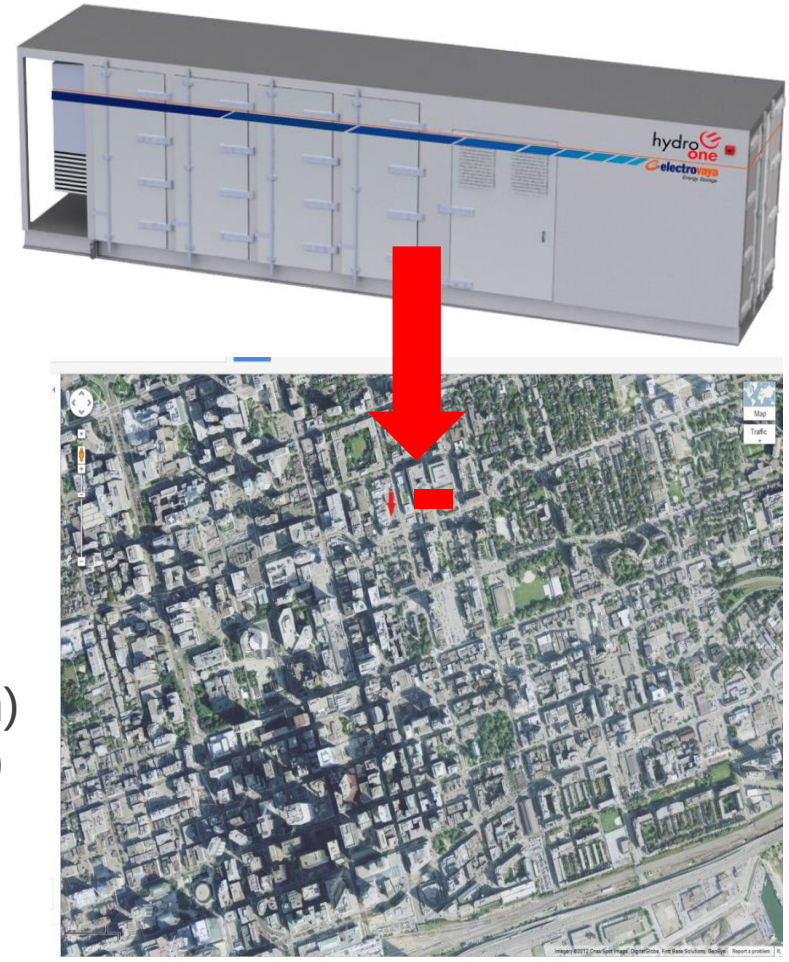
ELECTROVAYA STATIONARY ENERGY STORAGE SYSTEMS AND CASE STUDIES

Electrovaya's Energy Storage Systems

Electrovaya has experience developing several battery systems for the specific needs of the customers.

We deliver battery systems for multiple applications from renewable energy storage to industrial batteries.

1. Transmission Congestion Relief
2. Ramp Rate Control
3. Peak Shift
4. Integration with PVs



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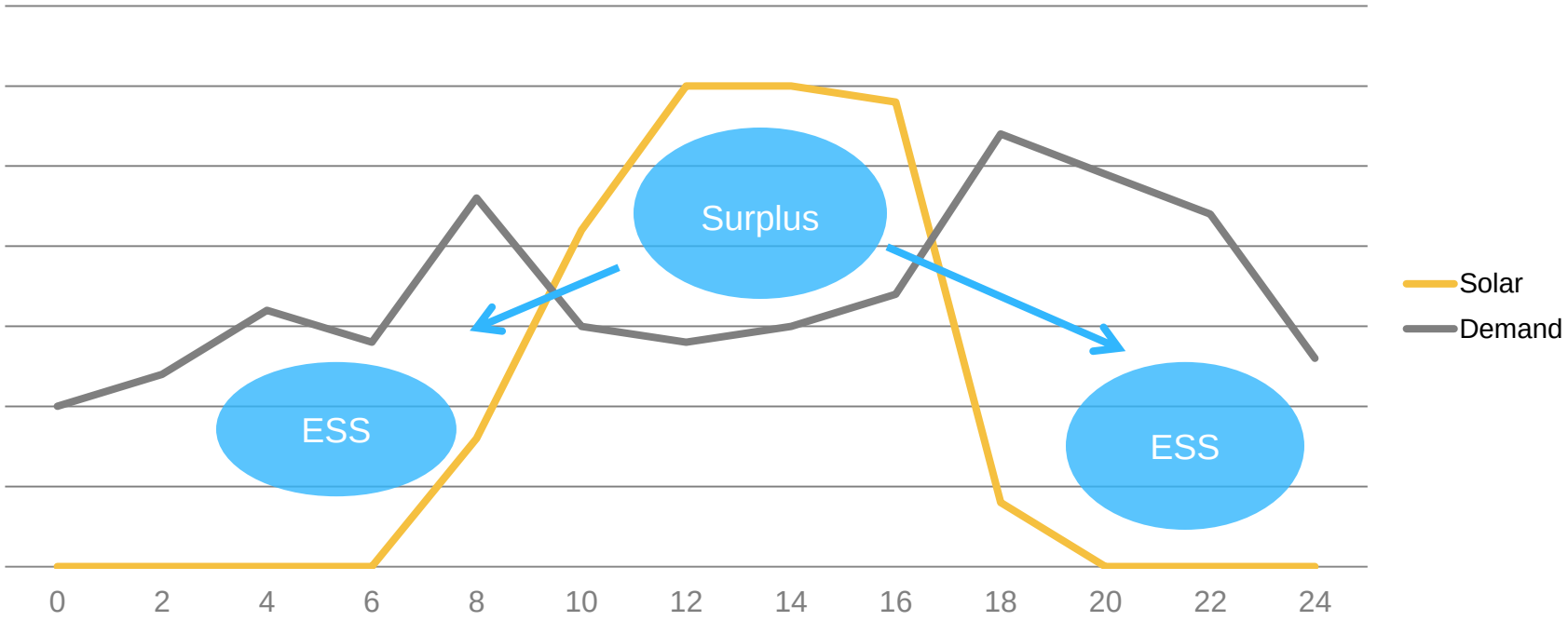
Utility in Ontario, Canada

Customer Reference

- Safety features (Installation in downtown)
- Small footprint (Installation in downtown)
- Transportable after installation
- No noise and odor (Nearby residential area)



Surplus energy from PVs can be stored and be used during peak demand hours.

1.2 MWh System Specifications – Solar Panels

Maximum Power	90 kW
Number of Modules	6
Power per Module	15 kW
Module Dimensions L x W x H (m)	20 x 10.5 x 9.6
Efficiency	16%
Mean Output	500 kWh / day
Average Time to Charge 1.2 MWh	2.4 days (can be shortened/lengthened by adding/removing panels)

100+ MW Custom Systems

- Warehouse with 100+ battery cabinets
- Adjacent wind park and/or solar park to recharge batteries
- When batteries are fully charged, excess renewable power can be used directly by the airport
- Reliable power that eliminates the need for diesel generators

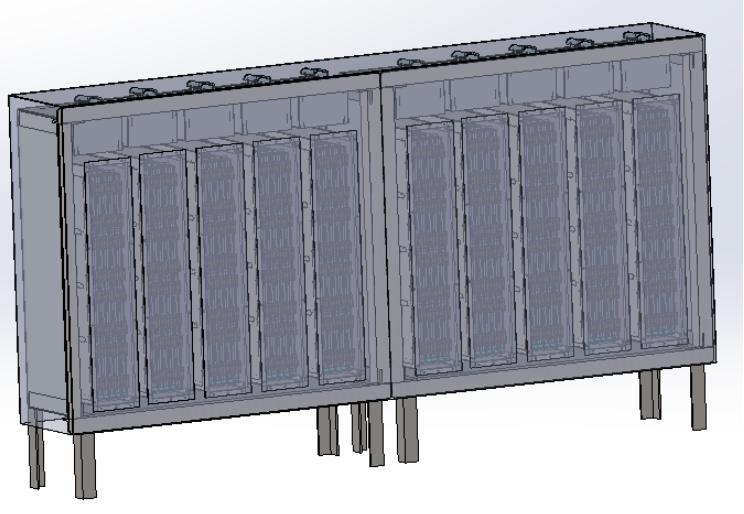
A 500 MWh system could provide up to 6h of backup power at 83 MW.

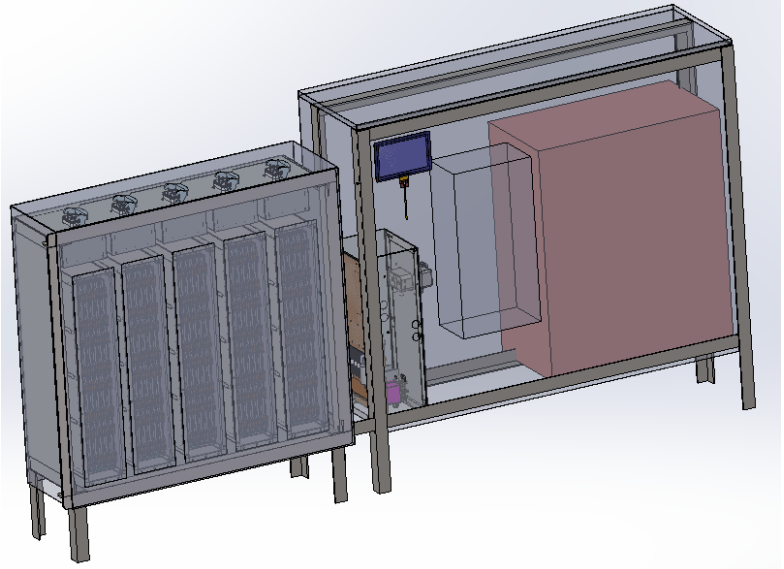
Energy Storage and Management Unit

25+ Units involved in a roll out in the UK with SSE.

Energy Storage System
12.5 kWh-85kWh Integrated Systems for curb side installations

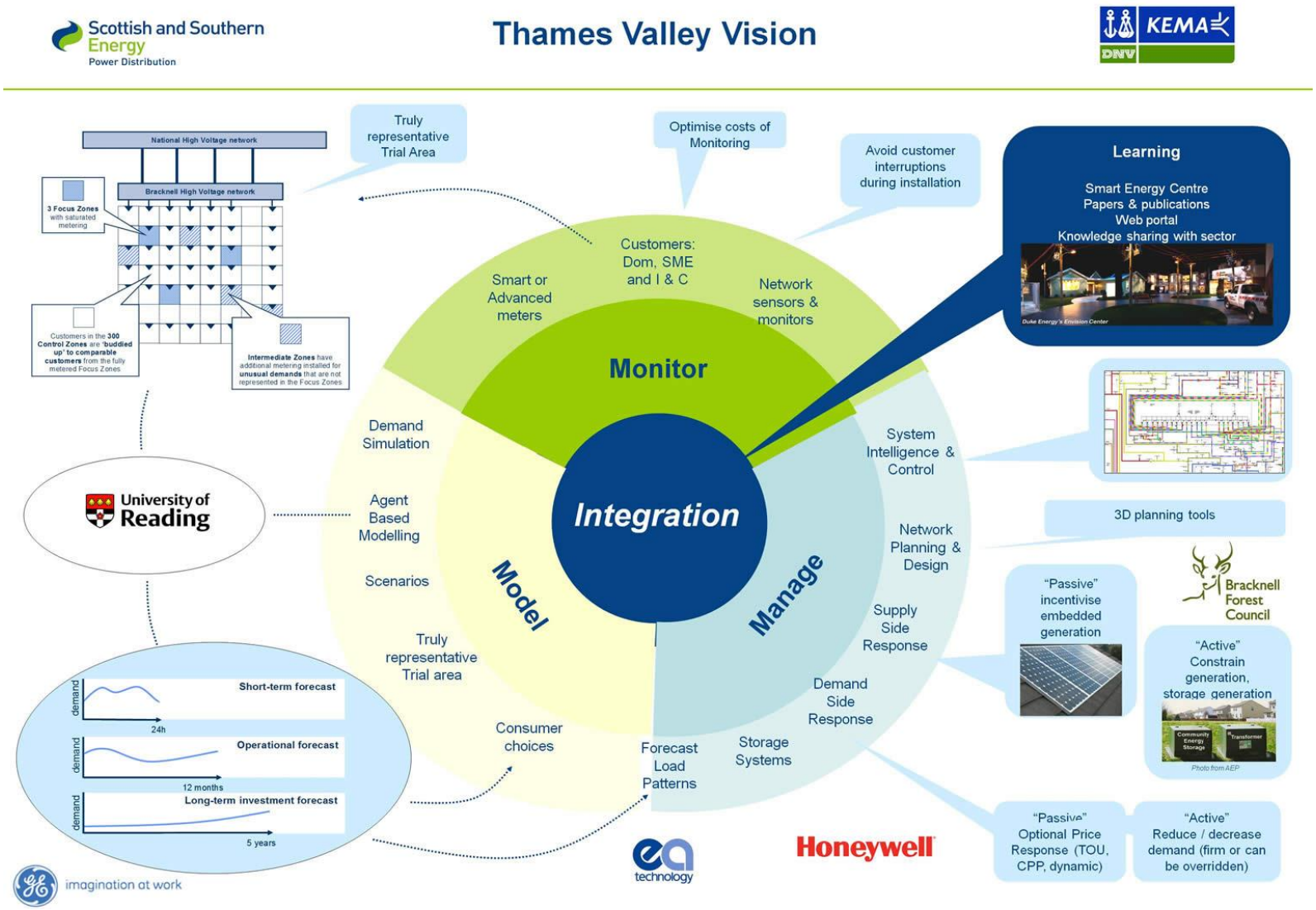
Applications
- Micro-grid
- Harmonic mitigation
- Phase imbalance support
- Frequency regulation





SSE Thames Valley Vision Project

- Electrovaya will be part of this £30M Overall Smart Grid Project



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25 kWh Energy Storage System

Nippon Kouatsu Electronic, power distribution company in Japan

Energy Storage System

25 kWh system that will be integrated with a PCS

Applications:

- Renewable energy integration
- Peak-shaving
- Load leveling

Mobile Diesel Replacement Systems

- Electrovaya is seeing significant demand for diesel replacement systems
- This ranges from telecom applications to mobile applications (e.g. Electrification of Ferry vessels)
- Systems developed for seamless replacement and integration

Mobile Diesel Replacement

Hybrid Solutions for Telecom Towers

Lithium Ion Battery

Grid
Peak shaving

Off-Grid
Allows hybridization

- No maintenance required
- Have x2- 3 longer cycle life
- Wider operating temperature range
- 80% DOD
- No environmentally harmful component

- Increased fuel efficiency
- Can install genset with lower power rating

Grid
Can be used for secondary back up

Off-Grid
Less usage of genset

Battery Systems for Difficult Applications

Electrovaya has always been technically focused on large-format cells and battery systems for some of the world's most demanding applications.

Sole supplier to Kongsberg Maritime, a global leader in Underwater Autonomous Vehicles

Our mission:

"Reduce climate change by making energy storage systems a commercial reality "