



Utility Scale Energy Storage



Opportunities & Challenges

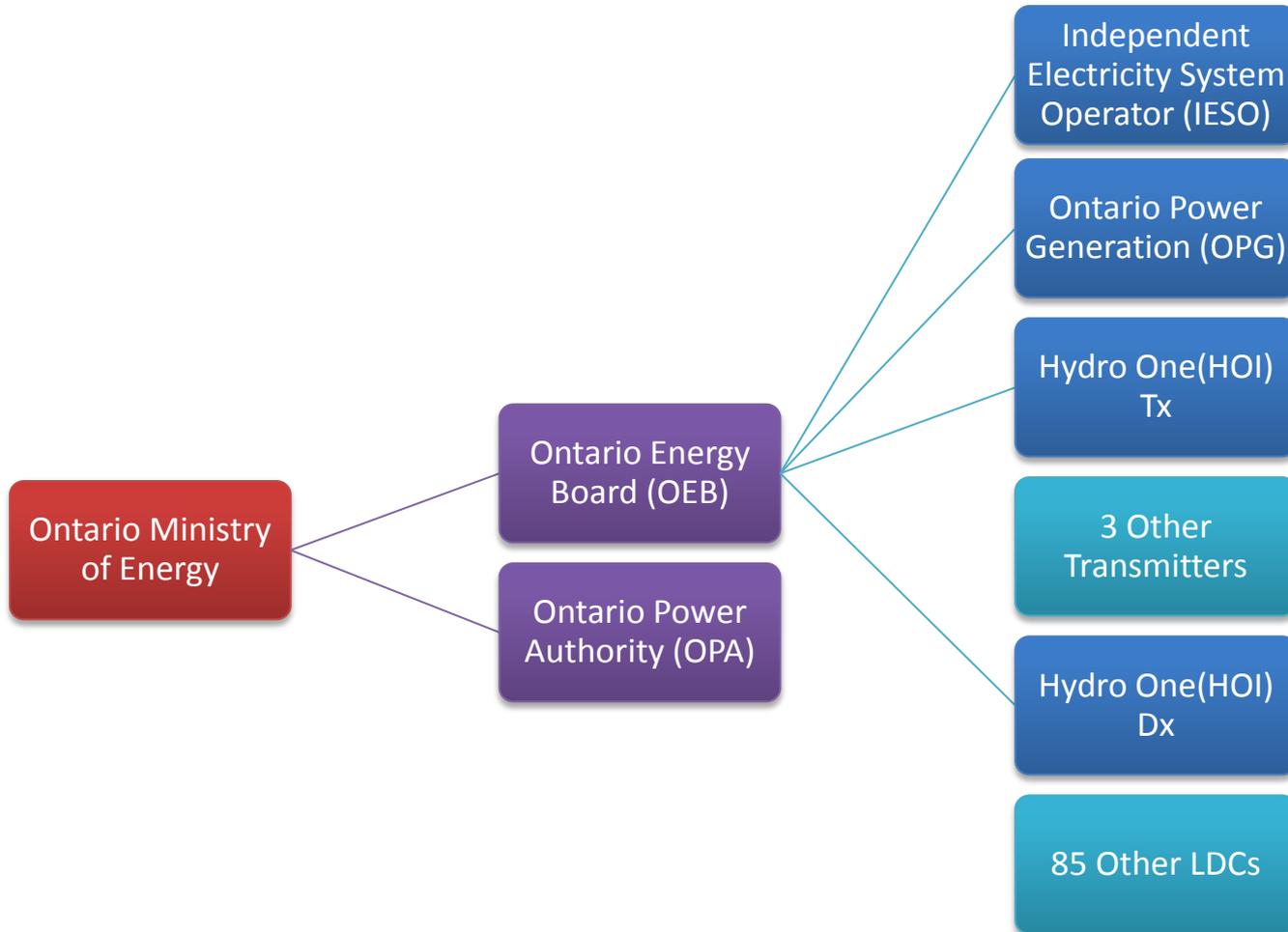
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Outline

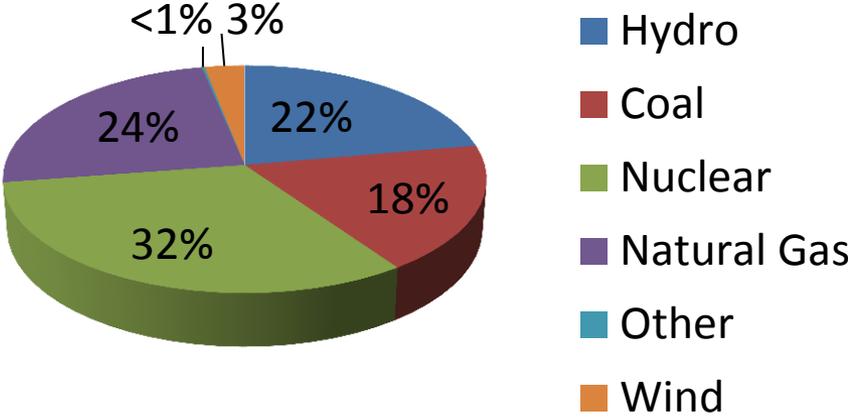
- Ontario's Electricity Agencies
- Drivers of Change in Ontario
- Imminent Changes to the Grid
- Benefits of Storage
- Challenges
- Proposed Solution

Ontario's Electricity Agencies

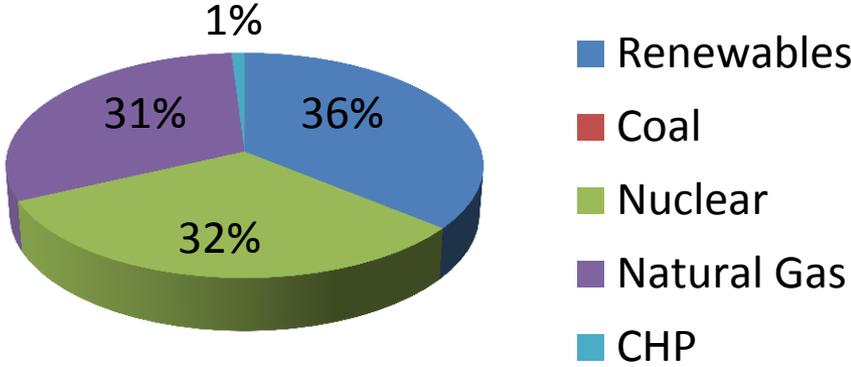


Ontario's Supply Mix

2010



OPA's Advice for 2015

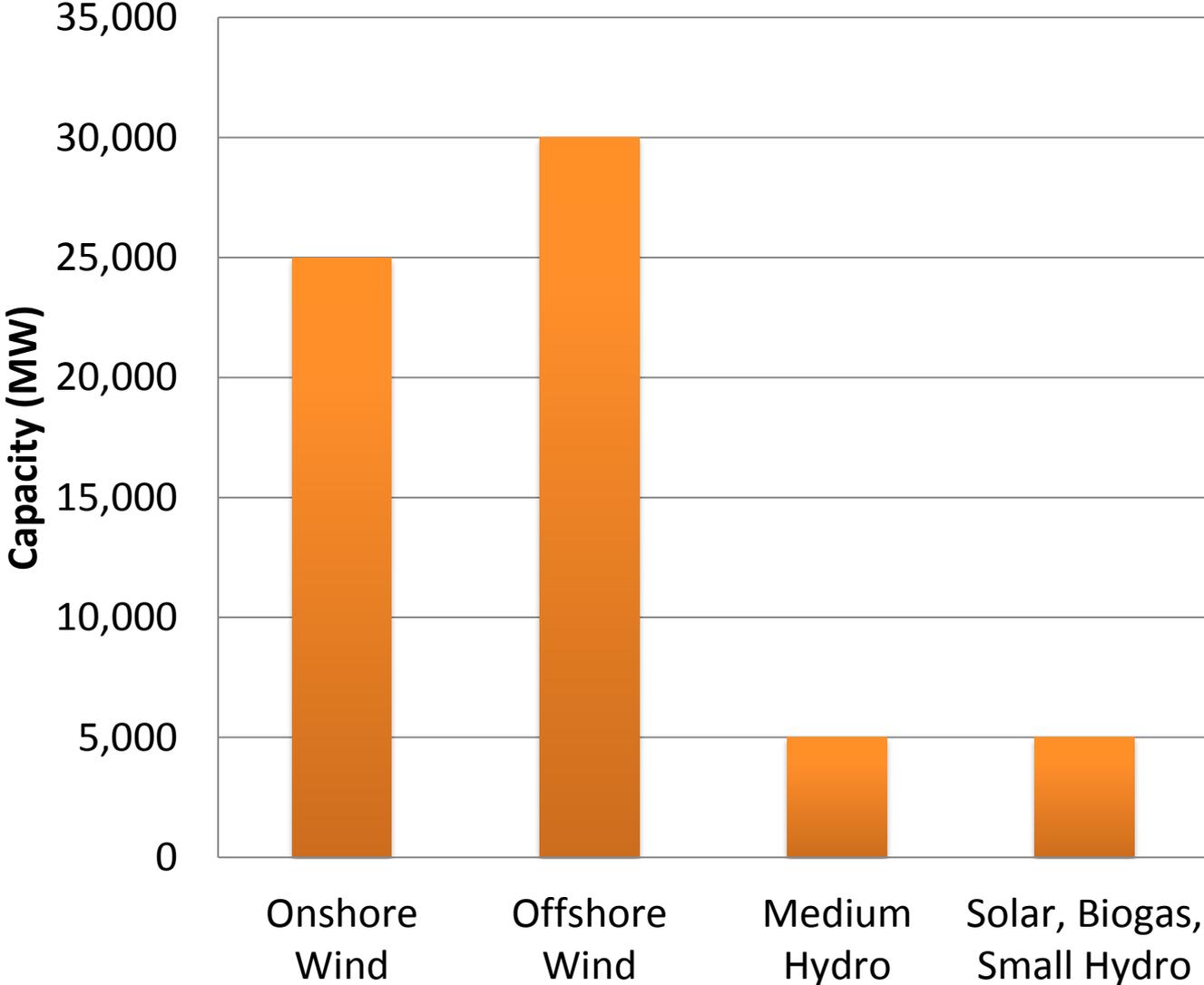


Total Installed Capacity 35,781 MW

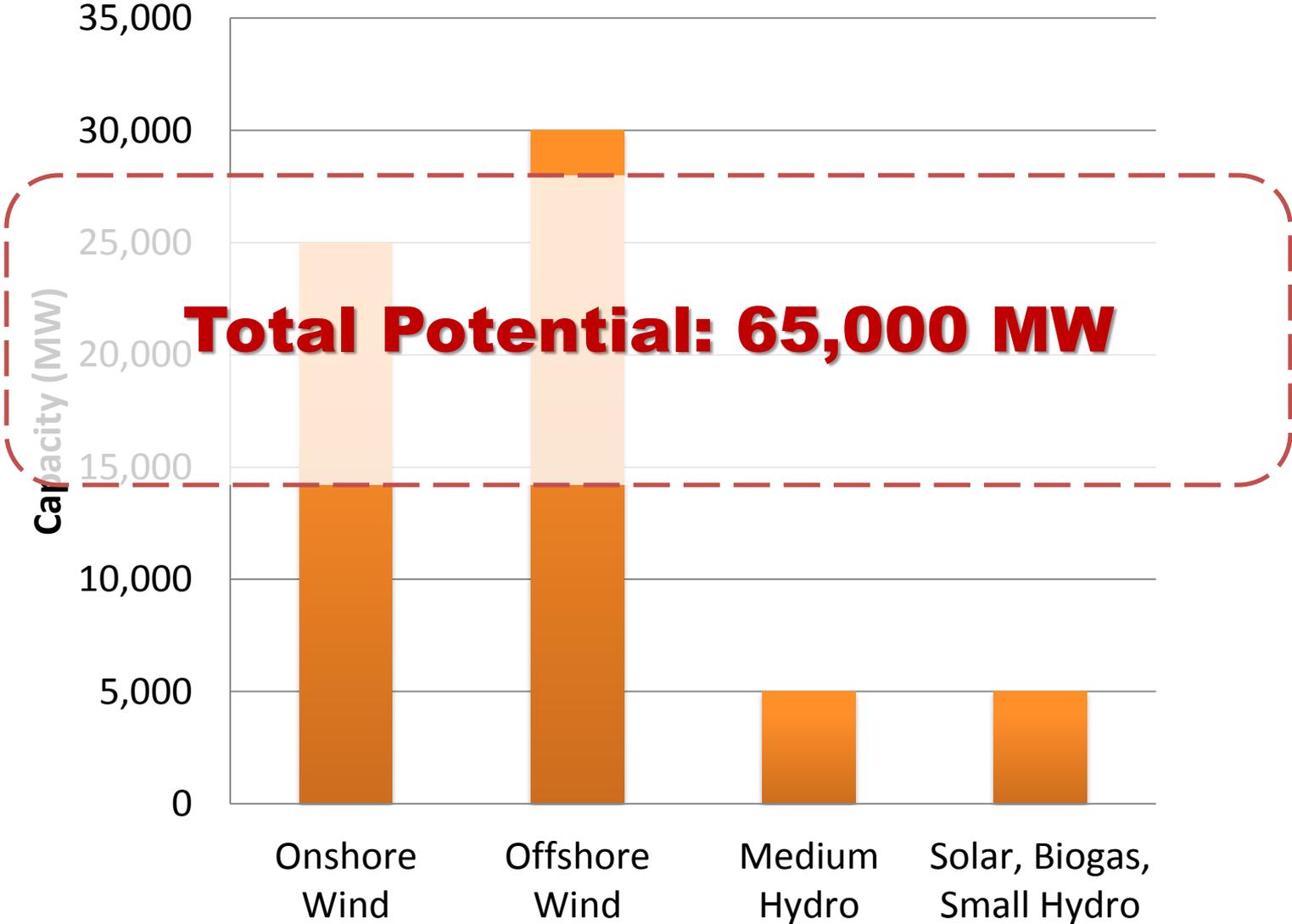
Effective Capacity ~ 29,300 MW

Extreme Weather Peak Demand 25,998 MW

Potentials for Renewable Generation in Ontario

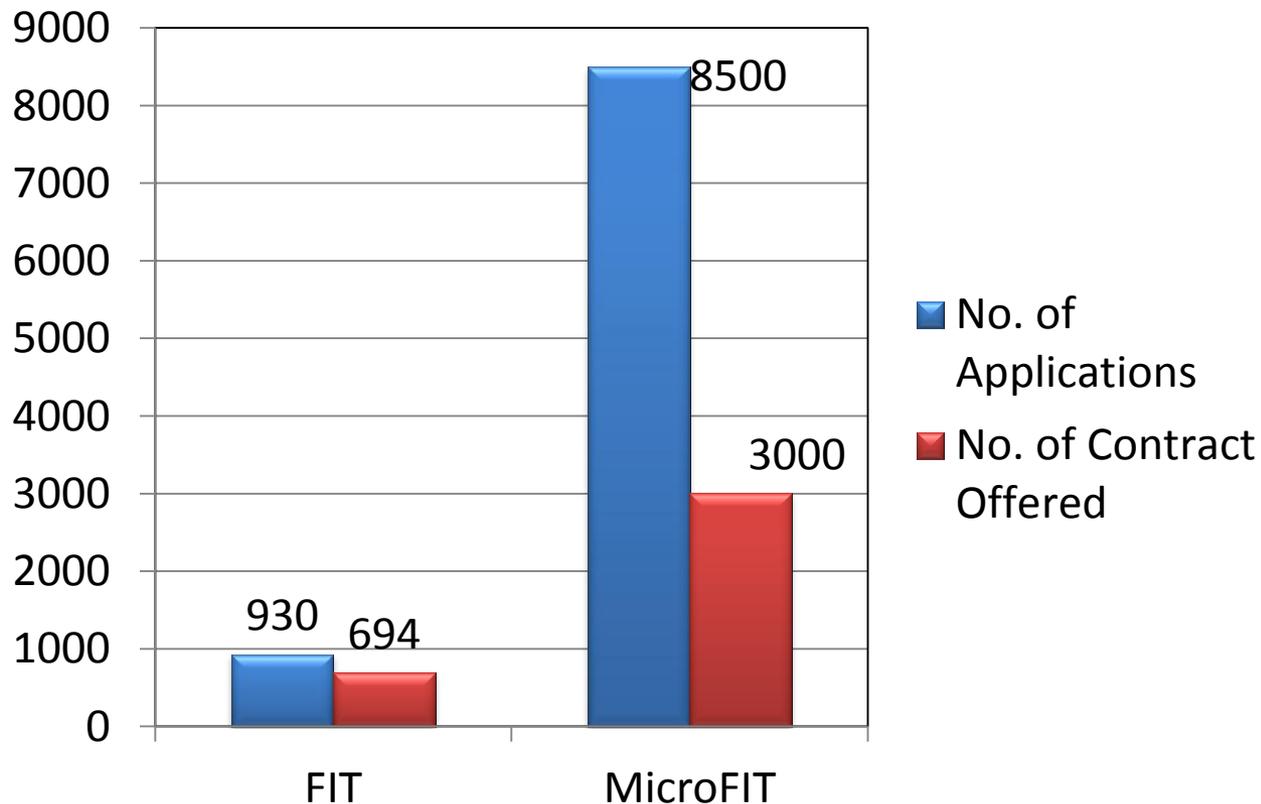


Potentials for Renewable Generation in Ontario



Drivers of Change in Ontario

- Ontario Green Energy Act (GEA)
 - FIT and MicroFIT programs



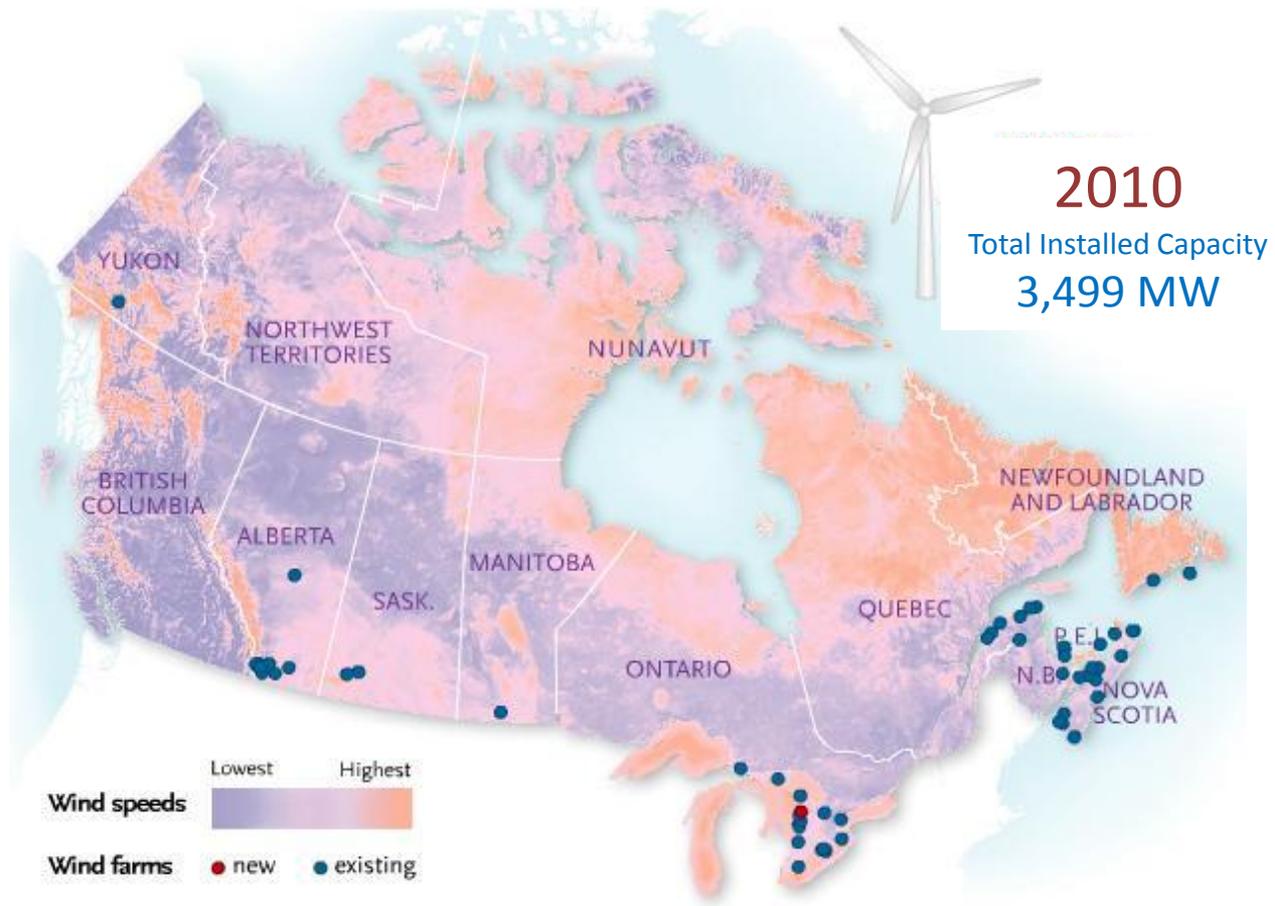
Drivers of Change in Ontario

- Ontario Green Energy Act (GEA)
 - FIT and MicroFIT programs

“Approximately 8,000 MW of wind energy projects have submitted applications for FIT contracts. **At this time, 2,500 MW of capacity will be able to connect to the grid,** but transmission upgrades are planned to allow the connection of significantly more capacity over the next few years.”

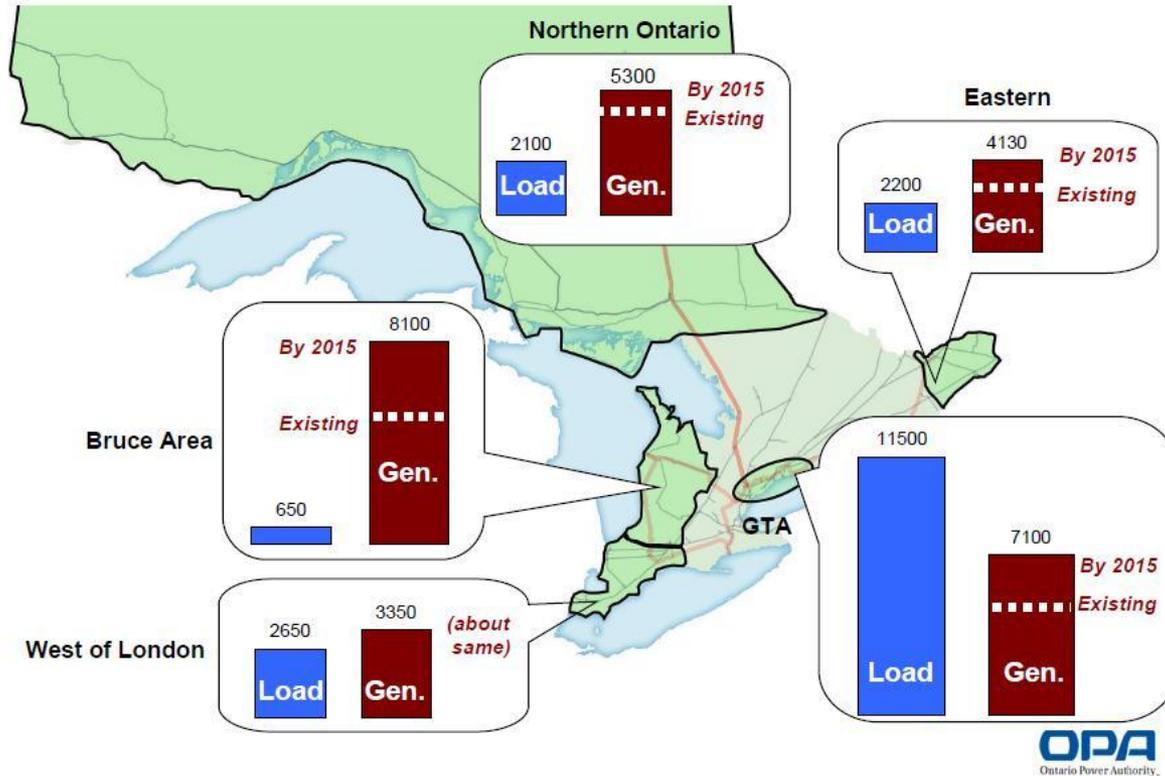
From: Canadian Wind Energy Association (CanWEA)

Canada Wind Atlas



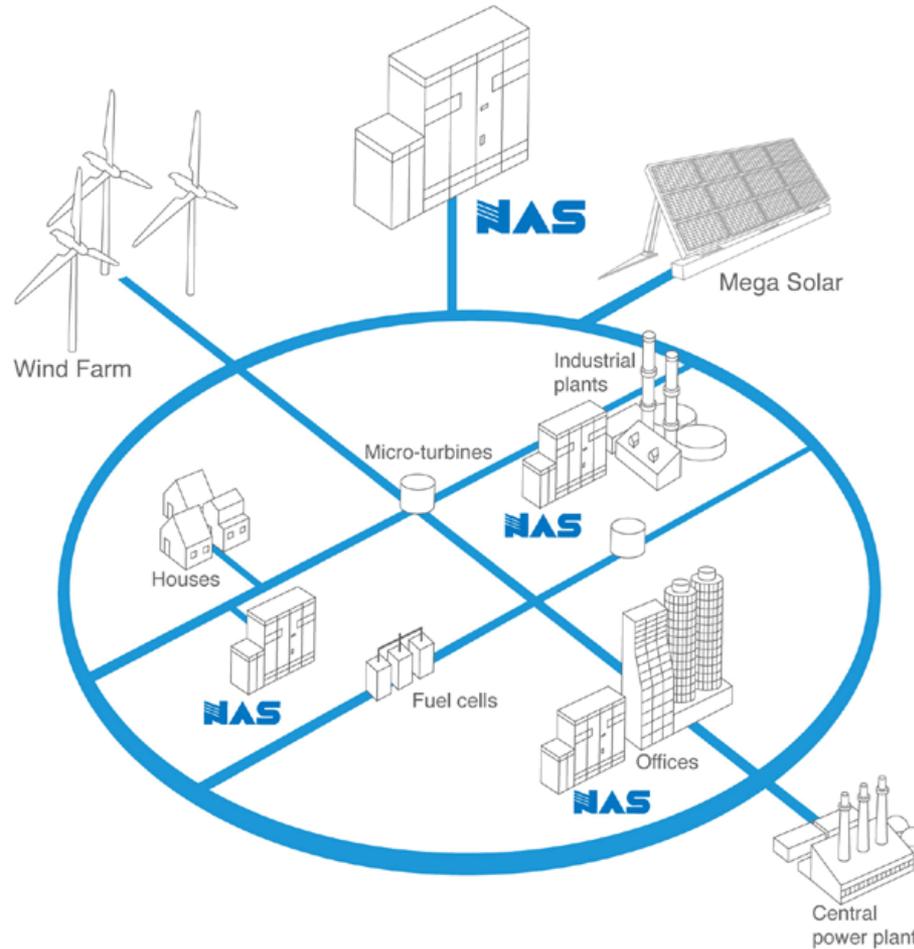
[Source: Canadian Geographic]

Generation & Load by 2015



[Source: Ontario Power Authority]

Role of Energy Storage in the Smart Grid



[Source: NGK Insulators]

Applications of Storage

- Bulk Energy Storage
- Grid Support Applications (Utility Applications)
- Backup Power Supply

Benefits of Energy Storage

- DG Integration (Capacity Addition)
 - » System Upgrade Deferral
- Load Management (Peak Shaving)
- Energy Arbitrage
- PQ Improvement
 - » Voltage Smoothing
 - » Frequency Stabilization
- Loss Mitigation
- Asset Utilization

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Storage Technologies

- Lead Acid Battery
- Sodium Sulfur Battery
- Vanadium Redox Battery
- Lithium Ion Battery
- Flywheel
- Super Capacitor

Criteria for Storage Site Selection

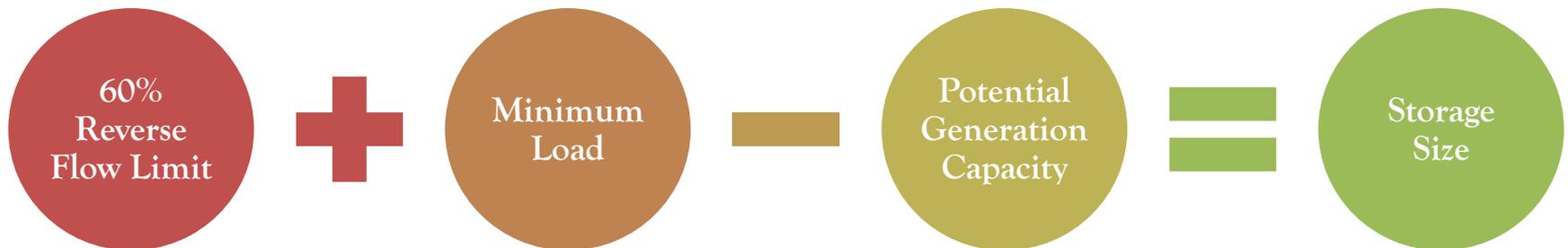
- Overloaded Stations
- Renewable-rich Areas
- Number of FIT Applications
- Accessibility and Security
- Hydro One's ADS Project

Location Alternatives

- At transmission/distribution stations
- Along the feeders
- Beside the generators
- Inside the houses

Optimum Size of Storage

- Gap between maximum accepted generation and potential generation capacity



Thank you

Any Questions?