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**Where Next Happens**

# WHY ONTARIO? R&D AND INNOVATION CAPACITY

## Distributed Energy Storage Workshop

27 November 2012

Ontario Centres of Excellence is a member of




Ontario Centres of Excellence (OCE) is funded by the Government of Ontario.



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A competitive edge for Ontario  
companies by leveraging academic  
research, talent and networks

# HIGHLIGHTS 2011-2012

\$29M invested in 509 projects

\$51.6M from industry, highest in OCE history

\$125M of follow-on investment received

47 academic institutions

- > 659 Researchers engaged
- > 692 Partnerships formed

36 new technologies licensed

315 start-ups established

- 15 from core OCE programs
- Additional 300 with partners: CCR (8), TTN/CONII (11), ELPs (281)

1,784 jobs created or sustained in industry

25 years experience leveraging academic research for Ontario companies

\$37M invested in energy-related collaborative research and start-ups since 2005

- Wide range of partners – start-ups to multinationals, LDCs, municipalities
- Electricity: Generation, Transmission & Distribution, Storage
- Efficiency, Conservation and Demand Management

## Significant Investments

- Special Energy Fund: \$15M for “transformative” energy projects
- Atikokan Bio-energy Research Centre: \$4M, 3-year program

Active and expert external support

# ENERGY COMPANIES AND PARTNERS



CENTENNIAL COLLEGE

LAURIER   
Inspiring Lives!

McMaster University 



Queen's UNIVERSITY



RYERSON UNIVERSITY

UOIT CHALLENGE INNOVATE CONNECT



UNIVERSITY OF TORONTO

UNIVERSITY OF WATERLOO



University of Windsor thinking forward 

Western UNIVERSITY • CANADA 

# WHY ONTARIO?



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Innovation Sandbox

Energy storage solves an Ontario problem with  
global opportunity

Growing research capacity

Nascent commercial activity

R&D and Startup Support

Fundamentals





Prepared for 4 Ministries + External Advisory Group – Fall / Winter 2011-12

Comprehensive overview of emerging energy technology assets

- Companies, Researchers, Utilities and Others

Global trends, opportunities and challenges

Identify specific technology and product opportunities

Determine state of technology ‘clusters’

# GENERAL OBSERVATIONS

## ENERGY ASSET MAP



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### A potential “sandbox” for innovation

- Policy and Investments in smart meters and renewables on the grid have created an interesting environment with potential for new innovations

### Opportunity to lock-in the change

- This experience could provide the basis for competitive products and services that could be sold outside of Ontario

### Most profiled sectors are large and growing opportunities

- Size and growth rates of sectors make attractive investment opportunities for existing and new companies. But, require large, sustained investment

### Fragmentation

- Ontario’s efforts are fragmented, particularly in utilities and research which can present a barrier to development of scalable industries



# ACADEMIC RESEARCH ENERGY ASSET MAP

Canada invested over \$708M in energy-related research in 2009

- Investments only began to increase in 2007
- Nuclear (AECL) and fossil fuel still dominate research investments

GEA and FIT driven activity helped increase research

Fragmented research activities across Ontario institutions

- Each strives to demonstrate core expertise

## Opportunities

- Build research capacity where strong industry receptor capacity exists and where research provides a key competitive advantage
- Match IT and Communications expertise with energy domain expertise and problems
- Develop long term strategy to sustain and develop excellence

# STORAGE SECTOR ENERGY ASSET MAP

## Identified as a “Speculative” opportunity

- \$10B global market growing at 20%
- Storage technology as enabler for next generation grid and power generation
- Link to investments in renewables, interconnection, smart grid and PEV
- Research and commercialization challenges

### POTENTIAL FOCUS SECTORS

Sector	Justification and Observations	Initial Target Markets
<b>“Smart Grid” Related Sectors</b>	Leverage investments and combine with ICT experience to improve system performance	North America Adapt to other international grid topologies
<b>Grid Interconnection</b>	Leverage investment in renewables, research base, extend life and performance of local grid	North America Regions with large DG investment
<b>PHEV / PEV</b>	Existing significant automotive industry in Ontario makes it important to establish a position in what may develop as an important segment of the global automotive sector	North America
<b>Energy Efficiency / Green Buildings</b>	ROI Opportunity to innovate business models and energy source combinations	Canada Selected international
<b>Nuclear</b>	Adaptation of CANDU experience to life extension, decommissioning	Global

### STORAGE

**Preliminary Observations**

**1. Key Facts/Trends:**

- Ontario has several mid-sized and early start-ups with promising technologies (8 companies identified)
- The main drivers of demand for energy storage are large scale adoption of intermittent renewable energy, rising activity in PHEV development and arbitrage

**1. Feedback:**

- Technical challenges in getting cost of manufacturing down.
- Start-ups require large amount of capital to demonstrate utility scale storage and this is a major barrier to commercialization.
- Inexpensive overnight electricity is an advantage for storage facilities sited in Ontario.
- Large incentives and markets for storage technologies in US

**3. Hypothesis:** A large, unsolved global problem for the electrical grid, solution to which would be an enabler for a wide range of technologies.

**Select Key Companies:**

- Hydrogenics (Mississauga, ~\$21M)
- ElectroVaya (Mississauga, ~\$21M)
- eCamion (Markham, ~\$0.99M)
- Temporal Power (Mississauga, 6 employees, startup)
- Hydrostor (Toronto, 6 employees, startup).

**Select Key Research:**

- Queens: fuel cells (B. Peppley)
- Windsor: electricity storage and management (R. Cariveau)
- Waterloo: fuel cell reliability (M. Fowler), materials & chemistry (L. Nazar)
- Riverson: grid battery storage (B. Venkatesh)
- 14 Research Centres

**Select Local Market / Customers**

- LDCs: HydroOne, OPA,
- Large industrial customers
- Off-shore wind farms, off-grid communities
- Auto manufacturers

Market: \$10.2B?      Growth: 20%?      Rel. ON Strength: Low

### STORAGE MARKET

**Global Opportunities**

**Market Size**

- Considering utility and stationary storage, estimates \$10.2B in 2011 (McKinsey)
- Growth estimated in the range of 14-20% CAGR
- California is offering generous subsidies for storage technologies based on the services they provide to the grid and Ontario companies are trying to take advantage.
- in many jurisdictions the cost of power makes the business case for storage very attractive.

**Opportunities**

- Micro-grids for remote communities – both in Canada and globally
- Deferral of new production in constrained sections of the a grid

**Market Barriers, Risks, and Threats**


- Growth likely constrained by niche applications where storage can provide a competitive alternative to expensive generation.
- Most installations (aside from some compressed air and pumped hydro installations) are pilot stage only.
- At present Ontario-based companies involved in storage are only now exploring export opportunities, they will need showcase-type demo projects in the global marketplace.
- Start-up technologies also need support from large partners such as Siemens or Ericsson to leverage their name for large grid scale projects.
- Business case for storage is complex as there are many beneficiaries (system, market, distribution, end-user) yet cost is usually borne by end user.

For discussion only – Please do not disseminate

# ONTARIO R&D SUPPORT

## Range of supports available for industry-led R&D Strong early stage startup support


### R&D PROGRAMS FOR INDUSTRY



	Program	Collaboration	Focus
On your own	SR&ED	Not required	Tax credit support for R&D
	NRC IRAP	IRAP ITA Optional external	Offset % of R&D cost Project-based
Talent Access	MITACS Accelerate	Internship positions, small projects	Talent development and exchange
	NSERC Post-Grad Scholarships		
	FedDev SEE Internships		
	OCE Connections Co-op Programs		
Collaboration Increasing time horizon	OCE First Job NRC IRAP Youth Emp. Strategy	Hiring graduates	Transfer knowledge through new-hires, early experience opportunities
	NSERC Engage	With academic institution	Build relationship, short-term engagement
	OCE Technical Problem Solving		
	CON III College Applied Research		
	FedDev Collaborative R&D		
	OCE Collaborative Research	With academic institution	Research challenge, now IP, multi-year
	NSERC CRD / NSERC I3 (CC)	With academic institution	Research challenge, now IP, multi-year
	NSERC Partnerships and Networks	Multiple institutions and companies	Strategic research
	Ontario Research Foundation Canada Foundation for Innovation	Company interest	Research

Vertical axis labels: "More 'DP' Company Led" (top), "More 'RP' Researcher Led" (bottom)

### PUBLIC STARTUP SUPPORT



	Program	Offer	Eligibility / Notes
Increasingly like Venture Capital	Courses - Success of Software Entrepreneurship 101, Usability		
	Business Acceleration Program (BAP)	Advisory services delivered through Regional Innovation Centres (RICs)	Any high growth potential startup in Ontario
	Accelerators: Ultra, J&S, DMZ, Velocity, Next 36, Techne, McMan Creative Destruction Lab,...	Venture, some may offer some cash (for equity), space, advice, process...	Venture, some target students, recent graduates. Mileage may vary - "graduates", qualifications?
	OCE Market Readiness	Cumulative to \$250K, through several stages	Spin-out of Ontario academic research institution. Technology based on academic research. Matching requirements vary by stage.
	VentureStart / OCE SmartStart	\$50,000, 1:1 cash match	Now on entrepreneurship, STEM graduate
	Embedded Executive / Executive Programs - OCE CCR, NRC, IRAP	Pays for executive to address gap, typically 3-6 month placement	Venture with administrator
	Investment Accelerator Fund (IAF)	Up to \$100,000 in return for small equity, convertible debt	Any Ontario technology-based startup.
	FedDev Investing in Business Innovation	Co-investment fund with angel investor networks or venture placement	Southern Ontario small business (<50 employees)
	FedDev Prosperity Initiative -Regional Diversification	Typically <\$1M	Southern Ontario SME. Repayable contribution toward eligible costs
	Ontario Emerging Technologies Fund (OETF)	Co-investment fund with venture funding	Co-investment to help close or top up a venture investment
	Ontario Innovation Demonstration Fund (OIF)	\$100K to \$4M per project for up to 50% of eligible project costs	Advanced, pilot stage. Has mainly be used for clean-tech

# R&D PROGRAMS FOR INDUSTRY



	Program	Collaboration	Focus	
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More "D" Company Led

More "R" Researcher Led

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Increasingly like Venture Capital

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<b>Business Acceleration Program (BAP)</b> Administered by MaRS Advisory Services	Advisory services delivered through Regional Innovation Centres (RICs)	Any high growth potential startup in Ontario
<b>Accelerators:</b> UTest, Jolt, DMZ, Velocity, Next 36, Techno, Rotman Creative Destruction Lab,...	Varies. Some may offer some cash (for equity), space, advice, process...	Varies, some target students, recent graduates. Mileage may vary – “graduates”, qualifications?
<b>OCE Market Readiness</b>	Cumulative to \$650k, through several stages	Spin-out of Ontario academic research institution Technology based on academic research. Matching requirements vary by stage
<b>VentureStart / OCE SmartStart</b>	\$30,000, 1:1 cash match	New entrepreneur, STEM graduate
<b>Embedded Executive / Expertise Programs</b> - OCE CCR, MaRS, IRAP	Pays for executive to address gap, typically 3-6 month placement	Varies with administrator
<b>Investment Accelerator Fund (IAF)</b>	Up to \$500,000 in return for small equity, convertible debt	Any Ontario technology-based startup.
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# FUNDAMENTALS MATTER



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Infrastructure

Access to USA

Workforce

Economy

Legal system

Health system

Talent – management, technical and entrepreneurial

Support services / value chain

# WHY ONTARIO?

## Innovation Sandbox

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Fundamentals

## Work to be done... (my 2 cents)

- Focus
- Commitment
- Customers + Capacity + Capital – Especially receptor pull and capacity
- Mid to later stage finance – “smart” money





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# THANK YOU

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