



ADVANCED ENERGY CENTRE  
**MaRS** Cleantech | Ontario, Canada

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## Ontario Deployment of Distributed Energy Resources and Microgrids

CCRE Conference 2016

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# Ontario Has A Lot Of Distributed Energy...

- Bio Energy > 500 MW
- Solar > 1800 MW
- CHP > 400 MW
- Energy From Waste > 30 MW
- Wind > 480 MW

## Bio-Energy

Ashbridges Bay Cogen	10 MW
Merrick Landfill	1.6 MW
ENS Poultry	14 MW AD
Woolwich Bioen Inc.	2.9 MW
Kawartha Biogas	9.8 MW
Grimsby Biogas	1 MW AD
Whitesands First Nation Cogen and Pellet Mill	3.6 MW

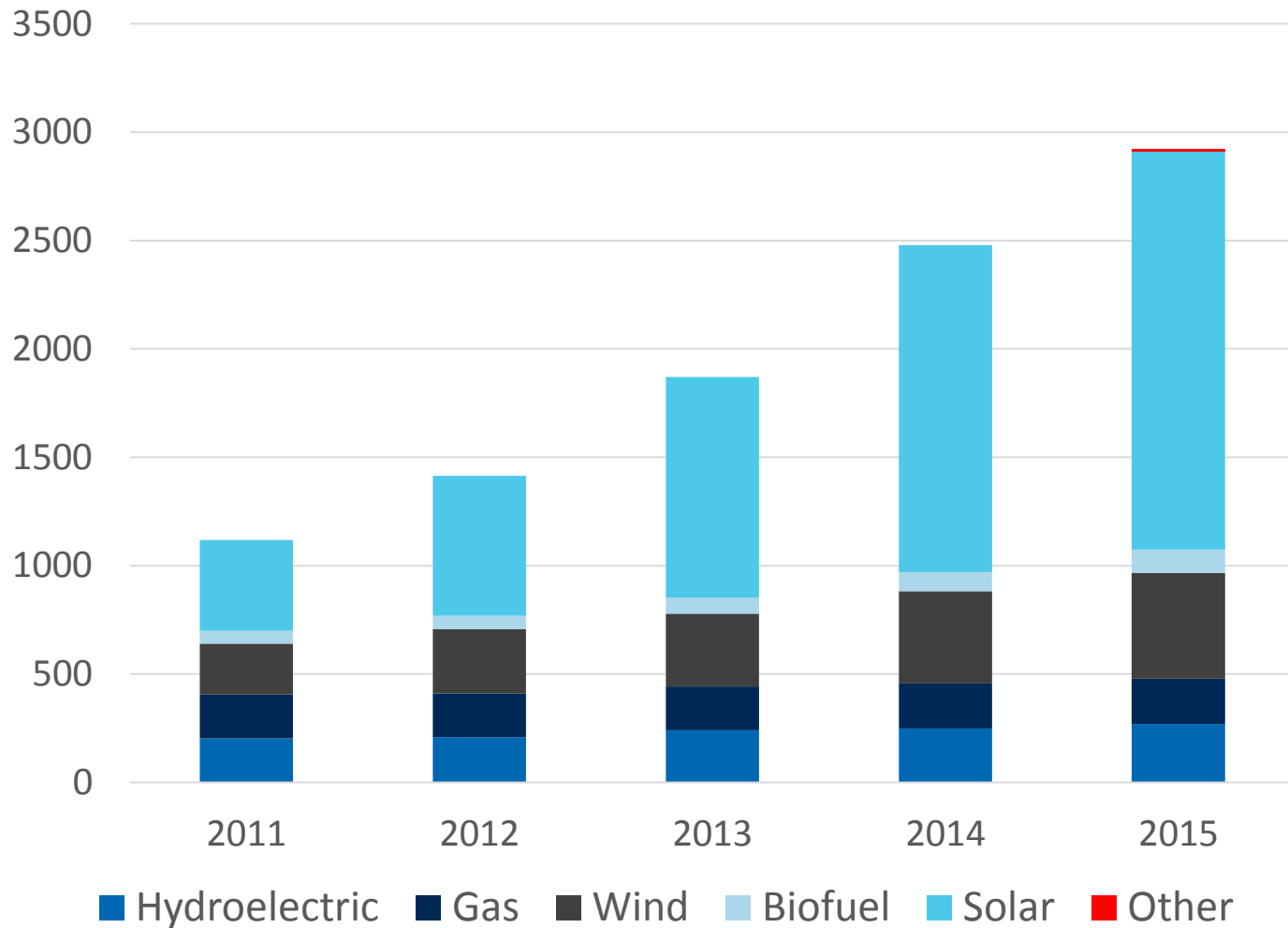
## Community Energy

Oxford Community Energy Corp	18 MW Wind
Mariposa and Lakeview Solar Farm	38 MW Solar
Barrie Windcatcher Corp	2 MW Wind
Beach Community Energy Corp	50 Kw Rooftop Solar
ZooShare Biogas Corp	500 Kw Biogas

## Combined Heat and Power

Birchmount Energy Centre	2.6 MW
Bur Oak Energy Centre	3.3. MW
Durham College District Energy	2.3 MW
London Cogen Facility	12 MW
Warden Energy Centre	5 MW Energy From Waste
York Durham Energy Centre	20 MW

# Contracted Embedded Generation (MW)



Source Q4 2015 Ontario Energy Report

# Four Ontario Distributed Energy Project Examples

- Home Microgrid - Veridian
- Recreation Complex Microturbine
- Home Microgrid – PowerStream
- Regional Health Centre CHP – North Bay Hydro

# Veridian Connections Microgrid

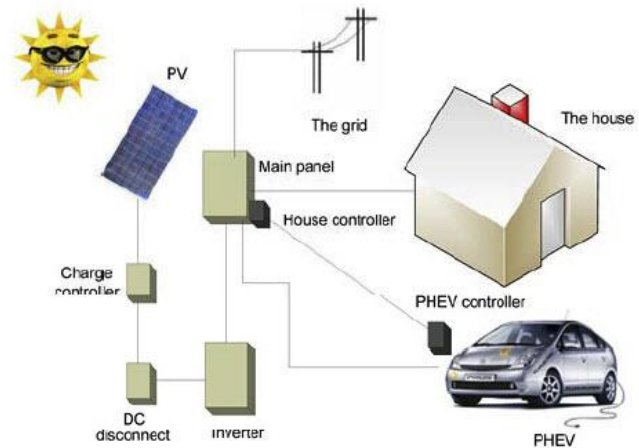
## What

- 2 home pilot project
- 10 kwh solar, 7 kwh battery
- Electric vehicle charging
- Control and monitoring to control centre

## Why

- Customer control
- Remove fear of outage
- Efficiency of integrated systems
- Understand component size and mix that brings value

## Home Microgrid



# Veridian Connections Microgrid

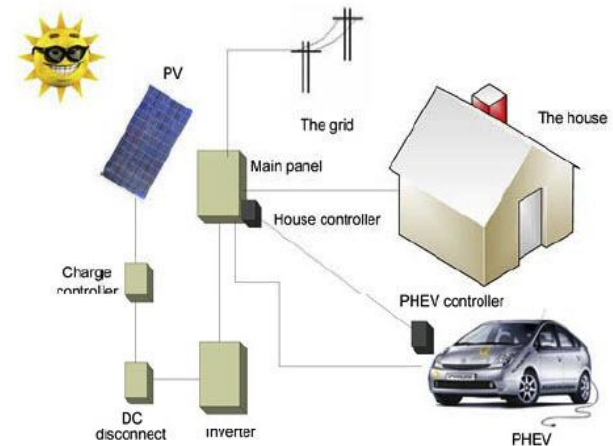
## How

- Working with builders to make homes pv/batter ready or displace gas heat
- Cost per home - \$45k
- Utility owned; rate base financed ?

## Issues

- How can value streams be monetized?
- Can behind the meter assets be rate based?
- Can home services be offered into market?
- How do customer “operators”, distribution operators, and system operators coordinate?

## Home Microgrid



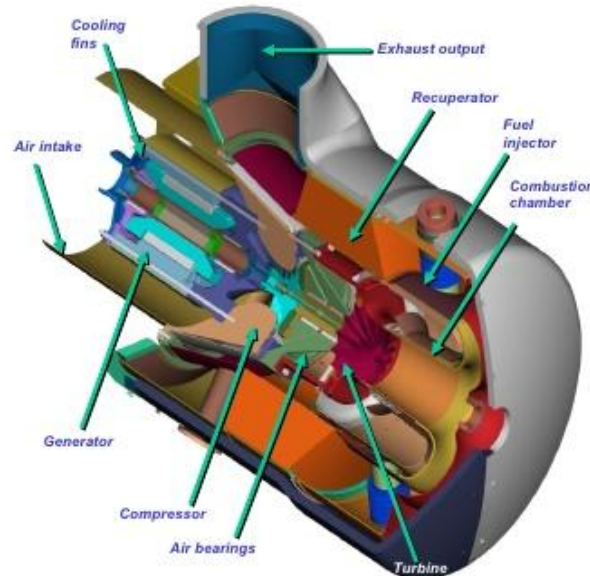
**VERIDIAN**  
CONNECTIONS  
The power to make your community better.

# Recreation Complex Microturbine Combined Heat and Power

## What is a Microturbine?



- In layman's terms, "A miniature jet engine in a case the size of a Sub-Zero refrigerator that runs at 96,000 rpm and generates electricity and heat. It is a total thermal package."
- Electrical power output: 30 kW to 250 kW range
- Ultra low emissions
- Multiple fuels; natural gas, propane, diesel, biodiesel, methane/biomass
- Simple/cost effective design
- Low maintenance/high reliability



5

# Recreation Complex Microturbine Combined Heat and Power

## What

- 2x65 kw gas microturbines provide baseload heat and offset electric use
- Heat for building and pool; boilers supplement
- Efficiency > 80%

## Why

- Save Energy Cost - Capex about \$600 k offset by \$160 k CDM
- Payback about 6 years
- Contribute to CDM Targets
- Good community message





# Recreation Complex Microturbine Combined Heat and Power

## How

- City owned
- Utility financed
- Payback through operating and service contract

## Issues

- Need high thermal load and CDM credit to be economic
- Spark spread critical
- Carbon pricing extends payback
- Building controls, boiler age, space limit applications

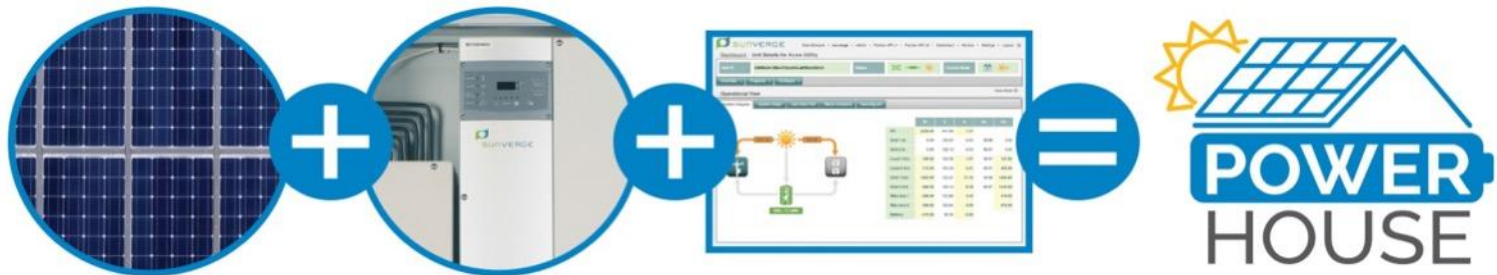


# Powerstream Home Microgrid Project



## What

- IESO funded 20 homes deployed in PowerStream territory
- Technology partner: Sunverge
- Installation partner: Robertson Bright
- 5 KW solar array; 6.8 KW/11.4 KWH battery and EMS
- Aggregation of DERs to create a Virtual Power Plant
- Real-time, responsive web based app to monitor system



# Key Pilot Objectives



## Why

1

**Business Model Definition** – Customer vs Utility Ownership, Financing models, etc.

2

**Required Processes To Support Business Model Implementation** - Internal and External

3

**Technology Evaluation** – Operational flexibility, installation, O&M, etc.

4

**Customer Value** – Dispatch model, bill reduction, value of resiliency

5

**Grid Value** – Capital deferral, congestion management, CDM benefit, Ancillary Services

# Introducing **POWER.HOUSE.**

*Power your home with solar...  
even after the sun goes down!*

## Program Details:

- Reduce electricity bill, up to \$100 per month
- Offering, first time in Ontario, Net Metering on Time-of-Use
- No-worry system; owned, operated and maintained by PowerStream
- Upfront payment towards installation \$3500
- Monthly service fee \$20 over 5 year contract
- Upfront cost guaranteed payback in 5 years
- Installation over 2-3 days
- System commissioned and dispatch model programmed by PowerStream

[www.PowerStream.ca/PowerHouse](http://www.PowerStream.ca/PowerHouse)

**SAVE Money**

**PROTECT Against Outages**

**GENERATE Your Own Power**

## **POWER. HOUSE.**



# POWER.HOUSE Business Model

## CUSTOMER VALUE

- Bill reduction- self generation
- Bill reduction- Net metering
- Bill reduction- Price Arbitrage
- Price certainty
- Incentives- Conservation
- Incentives- Demand Response
- Peak Shaving
- Outage protection

## UTILITY/ SYSTEM VALUE

- Distribution Asset Deferral
- Transmission Asset Deferral
- Frequency Regulation
- Voltage Support
- Generation Asset Deferral
- Relieve Locational Congestion

### Issues

- Can there be TOU for net metering?
- What is it worth to a customer?
- Can all value be captured?

**OWNERSHIP MODEL: Utility Owned**

# North Bay Regional Health Centre Combined Heat and Power

## What

- 1.6 MW gas generator with heat recovery
- Displaces 40% of total energy
- With 2 backup diesels provides 80 to 100 % of Health Centre electrical needs

## Why

- Resilience; Outage protection and city emergency centre
- Save money; reduced energy costs but “Happy to break even”



# North Bay Regional Health Centre Combined Heat and Power

## How

- Owned by Hospital
- Built and run by NB Hydro Services
- Financed by loan from city to NB Hydro and IESO CDM fund

## Issues

- Approval process lengthy
- Carbon price hurts economics
- System technical integration complex

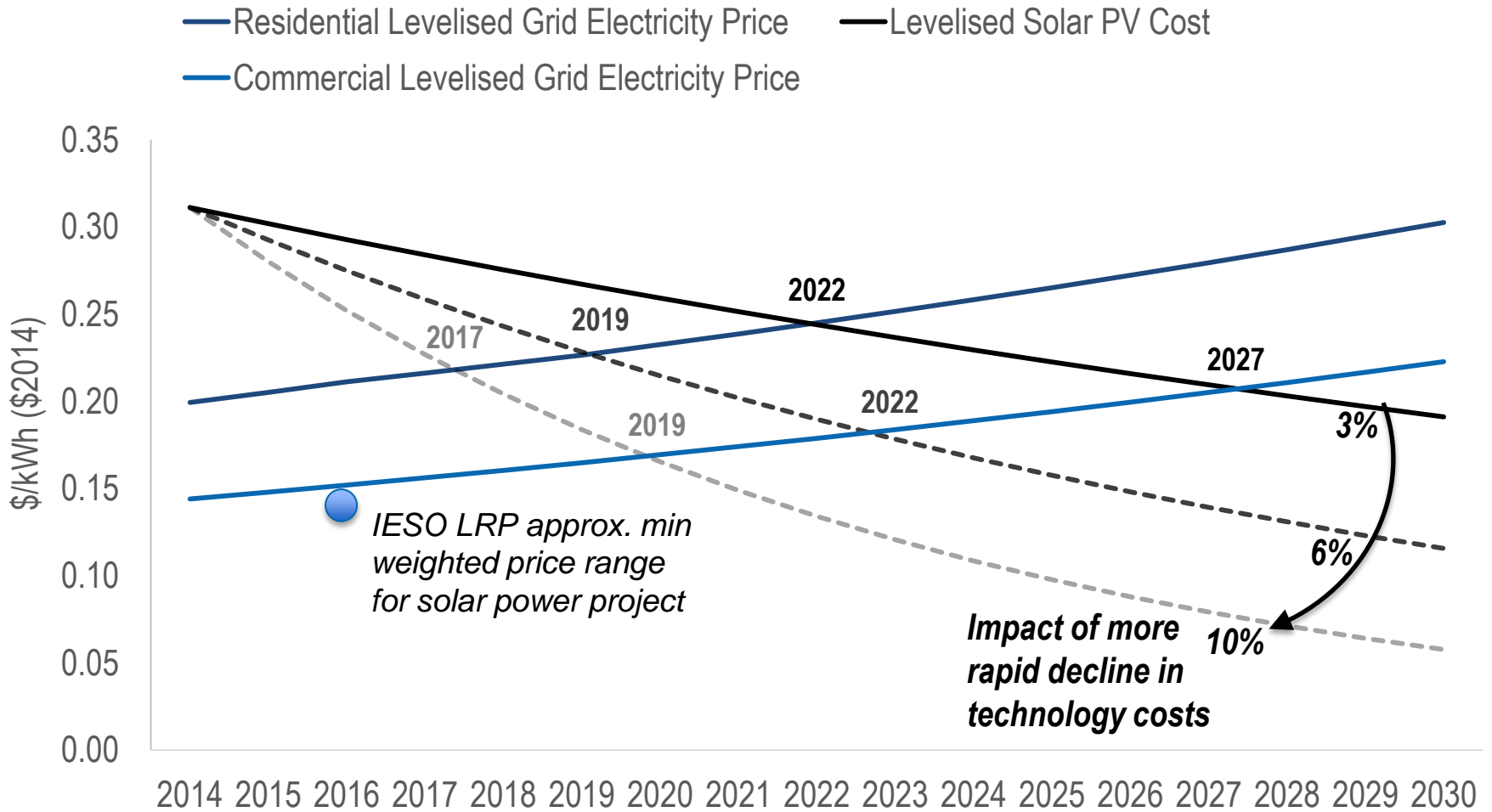


# Ontario DER Current State Observations

- Individual Technologies Reasonably Established But Still Improving
- Integration Not Yet There; Both Technical and Business Model
- Broad Policy Support for Low GHG Applications But Some Conflicting Signals
- Most Utility Applications of Significance are Through Non-regulated Affiliate; Why?
- Capturing Distributed Value Streams Complicated by Disaggregated Industry
- Not Yet Economic For Most End Users Without Subsidy But the Gap is Narrowing



# GRID PARITY FOR RESIDENTIAL OR COMMERCIAL SOLAR INSTALLATIONS COULD OCCUR IN THE NEXT 5 TO 10 YEARS



Source: Navigant

