



Rooftop Solar Opportunities

May 11, 2012

Presentation Overview

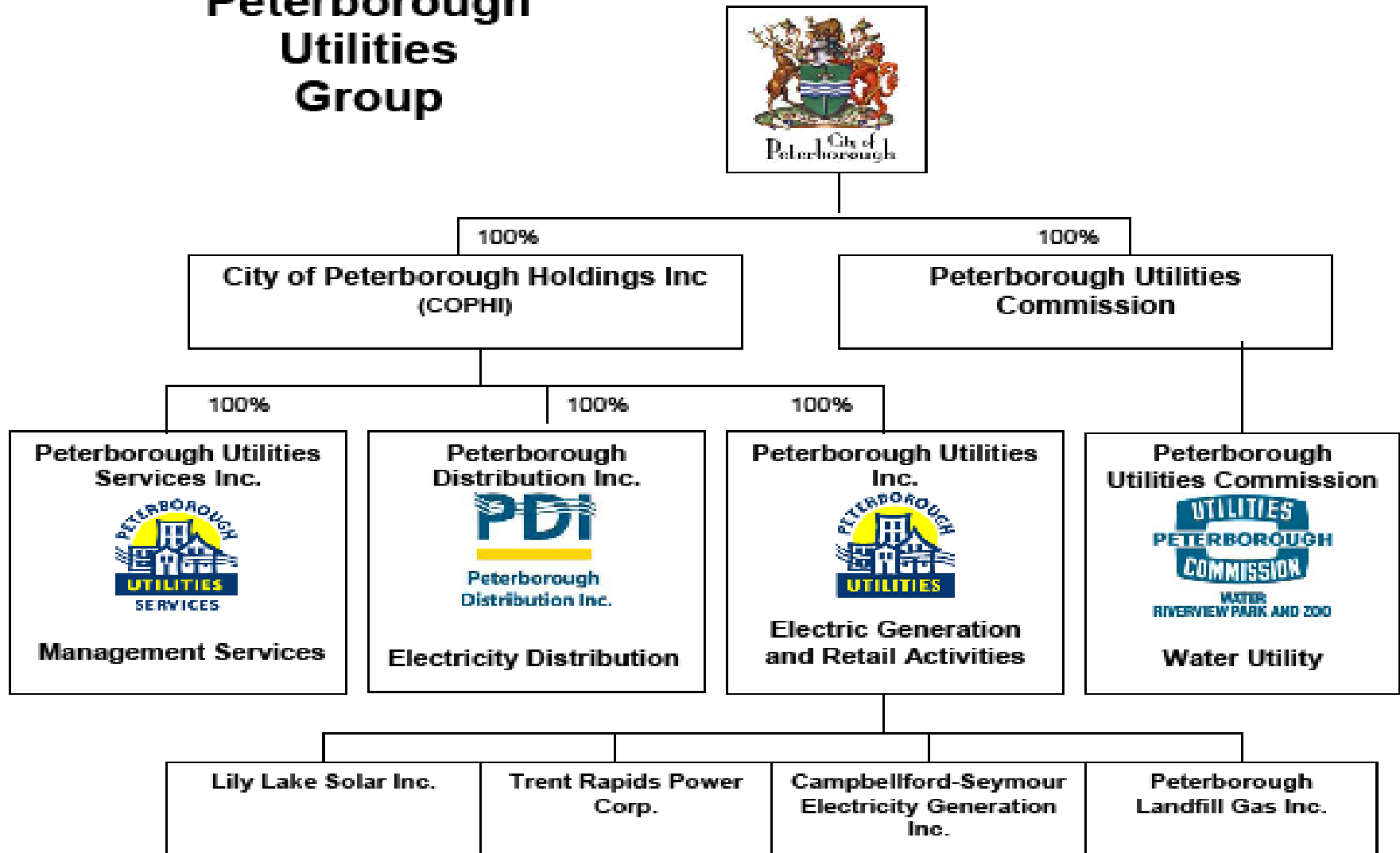
- Peterborough Utilities: Who We Are and What We Do
- Overview of the Renewable Energy Market
- Update on the Feed-In-Tariff (FIT) Program
- Understanding Rooftop Solar Systems
- Opportunities to Participate in the FIT Program
- Potential Benefits of Rooftop Solar Projects

Peterborough Utilities Group

Peterborough Utilities Group includes:

1. **Peterborough Utilities Commission** - Potable water treatment and distribution in Peterborough & Lakefield; Riverview Park & Zoo
2. **Peterborough Distribution Inc.** - Electric power distribution in Peterborough, Lakefield and Norwood
3. **Peterborough Utilities Services Inc.** - Employment and technology services for the Peterborough Utilities Group and City of Peterborough
4. **Peterborough Utilities Inc.** – Renewable power generation and retail services
5. **City of Peterborough Holdings Inc.** – Consolidated holding company wholly owned by the City of Peterborough

Peterborough Utilities Group



Peterborough Utilities Inc.

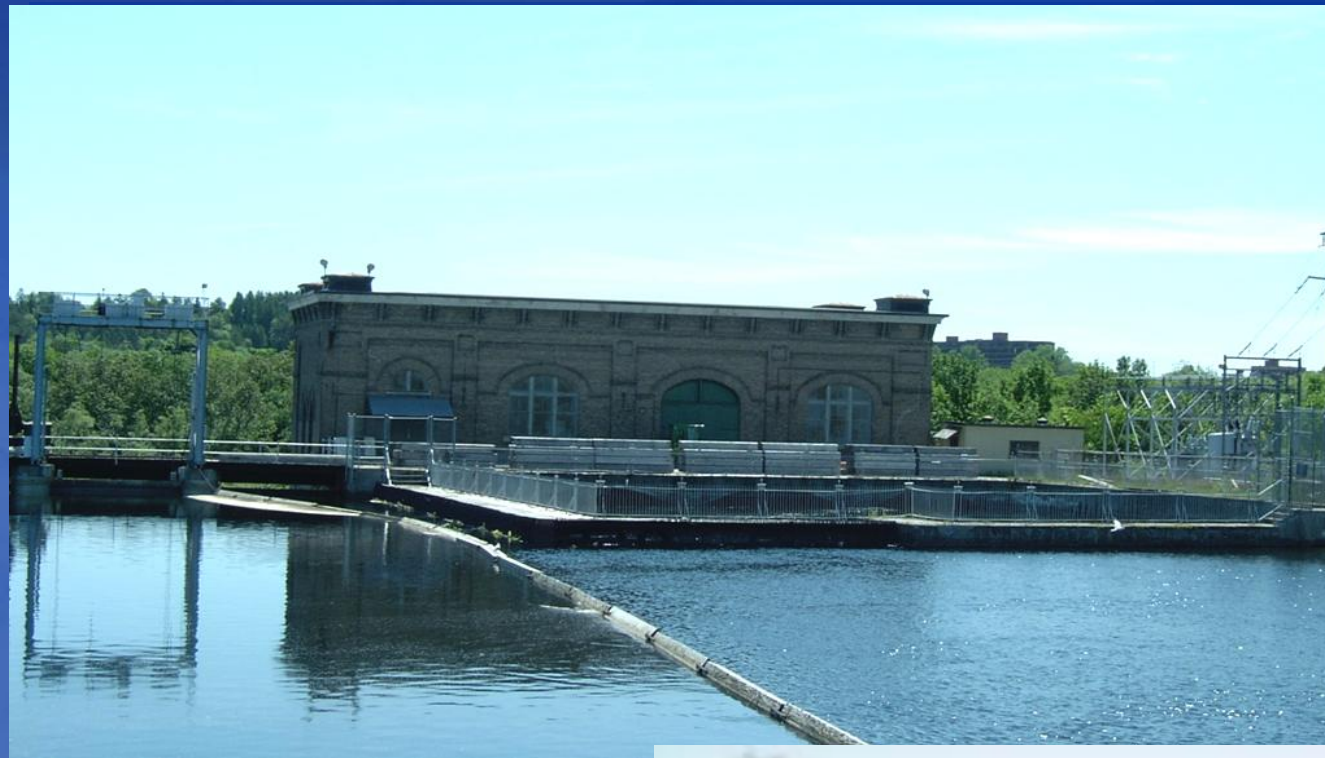
Four operating renewable energy generation facilities:

- 1) London St. Generating Station (4 MW hydroelectric)
- 2) Campbellford-Seymour G.S. (6 MW hydroelectric)
- 3) Robert G. Lake G.S. (8 MW hydroelectric)
- 4) Lily Lake Solar Farm (10 MW solar PV)

Several projects under development:

- 1) Peterborough LFG Generation Project (2 MW) – 2012
- 2) Expansion of the London St. GS (6 MW) - 2013
- 3) Rooftop Solar Projects – 2013 & 2104

We are the largest municipally-owned renewable energy generator in the Province of Ontario.



**London Street
Generating Station
(4 MW) – c.1920**

**Campbellford-Seymour
Generating Stations**

Plant #1 (2 MW) – c.1920

Plant #2 (4 MW) - 1994





**Robert G. Lake
Generating Station
(8 MW) – Dec. 2009**

**Lily Lake Solar Facility
(10 MW) - April 2011**



Renewable Energy Market

Ontario's Long Term Energy Plan

- Target 10,700 MW of wind, solar and bioenergy by 2018.
- Approximately 9,700 MW has already been procured through the FIT & microFIT Programs; RESOP Program; RES I, II and III Programs; and the Korean Consortium.
- Approximately 1,000 MW remaining to be procured.
- Government plans to procure the balance by 2015.
- Surplus generation capacity in the Province is expected until 2019 when Bruce & Darlington nuclear units taken out of service for upgrades.

Government plans to achieve its long-term renewable energy target three years ahead of schedule.

Feed-In-Tariff Program

Feed-In-Tariff (FIT) Program Update

- Developed under the 'Green Energy Act'
- Launched on October 1st 2009 (2+ years ago)
- Open to various renewable technologies – solar, wind, waterpower and bioenergy.
- Different prices for each technology. 20 year contract term for all technologies with exception of waterpower (40 years).
- More than 10,200 applications totaling almost 21,000 MW
- Approximately 2,000 contracts totaling approximately 4,600 MW of contracts awarded to date (~285 MW in service)
- Has encouraged billions of dollars of investment and thousands of jobs.

FIT Program has been very successful to date and the Government has nearly achieved its target for renewable generation.

Feed-In-Tariff Program

FIT 2.0 Program

- FIT Program has undergone a review process that commenced two years after its launch.
- Key outcomes of the Review include:
 - Continue commitment to clean energy;
 - Streamline processes;
 - Encourage greater aboriginal and community participation;
 - Improve Municipal engagement;
 - Reduce prices to reflect lower costs (and consumer interests); and
 - Expand Ontario's clean energy economy (create more jobs)
- Draft FIT 2.0 Rules and Contract have been posted and final versions are expected shortly.

Changes reflect Government's intent to strike a balance between the interests of rate-payers and municipalities, while building upon success of the clean energy economy.

Feed-In-Tariff Program

FIT 2.0 Procurement

- Minister of Energy has directed the Ontario Power Authority (OPA) to immediately procure 50 MW of microFIT projects (less than or equal to 10 kW – typical residential installation).
- Minister of Energy has directed the OPA to also procure 200 MW of 'small' FIT projects (projects greater than 10 kW but less than or equal to 500 kW).
- Majority of the 'small' FIT projects will be rooftop solar projects.
- Procurement window for 'small' FIT has not been established but is expected to occur this summer.

May be the last opportunity for rooftop solar projects to participate in the FIT Program.

Feed-In-Tariff Program

FIT 2.0 Rule Changes

- New points scoring system will be used to prioritize and award FIT 2.0 Contracts.
- Priority will be given to projects with aboriginal or community support or participation, and those hosted by a public funded educational, health or long-term care facility.
- All existing FIT applications will be returned and may be resubmitted under FIT 2.0.
- Greater restrictions on assignment and change of control.
- Rooftop solar applications must include feasibility and structural engineering reports.

Maximizing points under the new scoring system will be instrumental in obtaining a FIT Contract.

Feed-In-Tariff Program

	PROJECT TYPE	POINTS
Community Participation Project	A Co-op of at least 50 members for large FIT projects and of at least 35 members for small FIT projects having an economic interest in the project of at least 15.	3
Aboriginal Participation Project	An Aboriginal Community having an economic interest in the project of at least 15%.	3
Education or Health Participation Project	A university, college, school, hospital or long-term care facility having an economic interest in the project of at least 15%.	2

Feed-In-Tariff Program

	NON-PROJECT TYPE	POINTS
Municipal Support Resolution	Resolution from council or other governing body of local municipality in which the project is located demonstrating support for the project.	2
Aboriginal Support Resolution	Resolution from any aboriginal community that may hold rights to the land on which the project is located demonstrating support for the project.	2
Project Readiness	Demonstration of site control through ownership, lease or option. Rooftop solar projects must also have feasibility and structural analysis studies.	2
Education or Health Host	Publicly funded school, college, university, hospital, long-term care facilities that host project.	2
System Benefit	Water power or bioenergy projects.	1

Feed-In-Tariff Program

FIT 2.0 Contract Changes

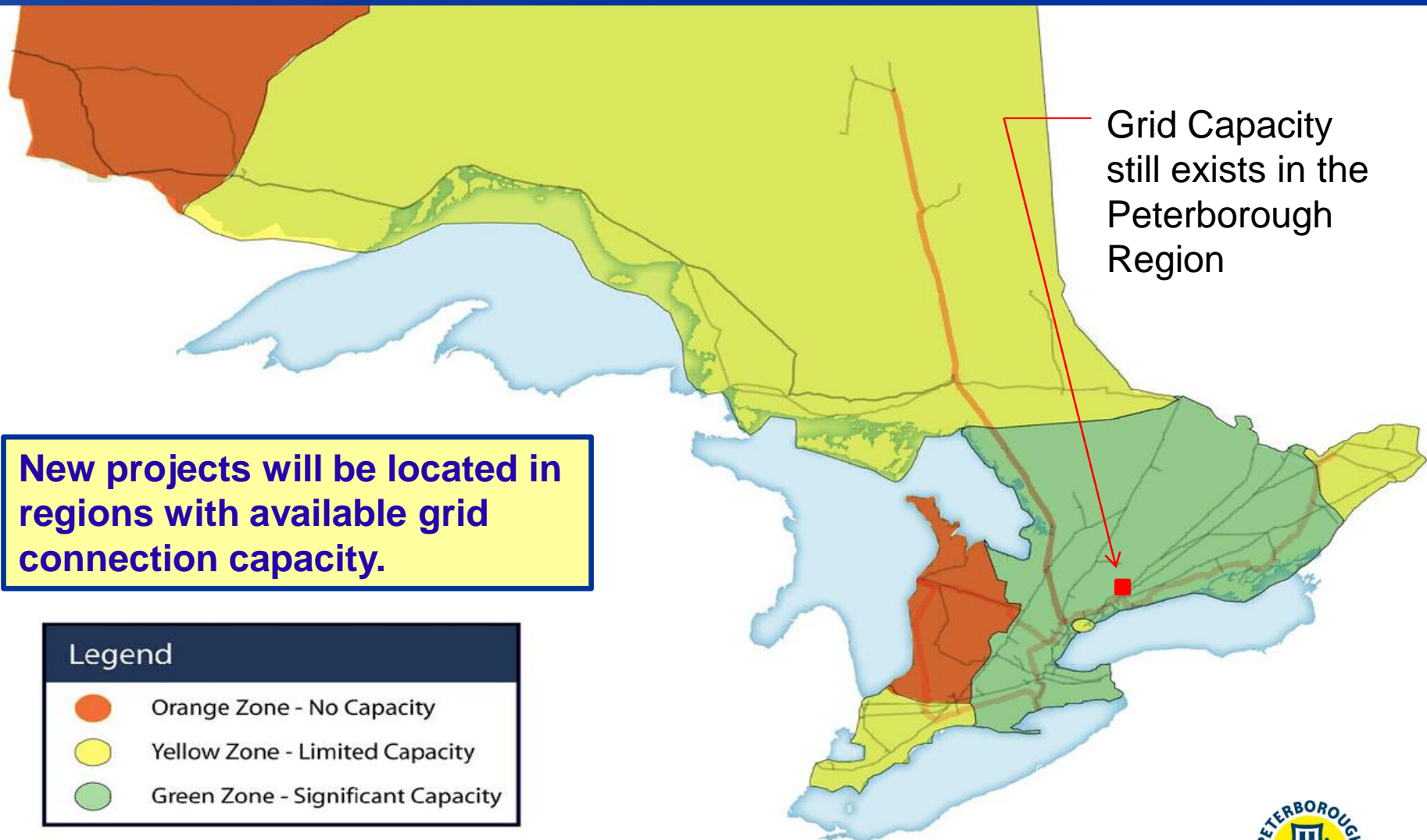
- Revised pricing schedule. Price paid for rooftop solar projects has decreased by as much as 31.5%.
- Highest price has decreased from 80.2 to 54.9 cents/kWh.
- No changes allowed – the OPA will no longer have any obligation to consent to reasonable changes in the project.
- Greater termination rights for the OPA at all stages of the project (amount of compensation is not clearly defined).
- Liquidated damages for all projects of \$0.25/kW/day.
- No extension of contract term for failure to meet the milestone date for commercial operation.

Essentially More Risk / Less Return for Developers

Feed-In-Tariff Program

Project Type	Project Size	Original FIT Price (c/kWh)	New FIT Price (c/kWh)	Change in Price
Rooftop Solar Projects	<= 10 kW	80.2	54.9	-31.5 %
	10 to 100 kW	71.3	54.8	-23.1 %
	100 to 500 kW	63.5	53.9	-15.1 %
	> 500 kW	53.9	48.7	-9.6 %
Ground Mount Solar Projects	<= 10 kW	64.2	44.5	-30.7 %
	10 to 500 kW	44.3	38.8	-12.4 %
	500 kW to 5 MW	44.3	35.0	-21.0 %
	> 5 MW	44.3	34.7	-21.7 %

Grid Connection Constraints



Thank You

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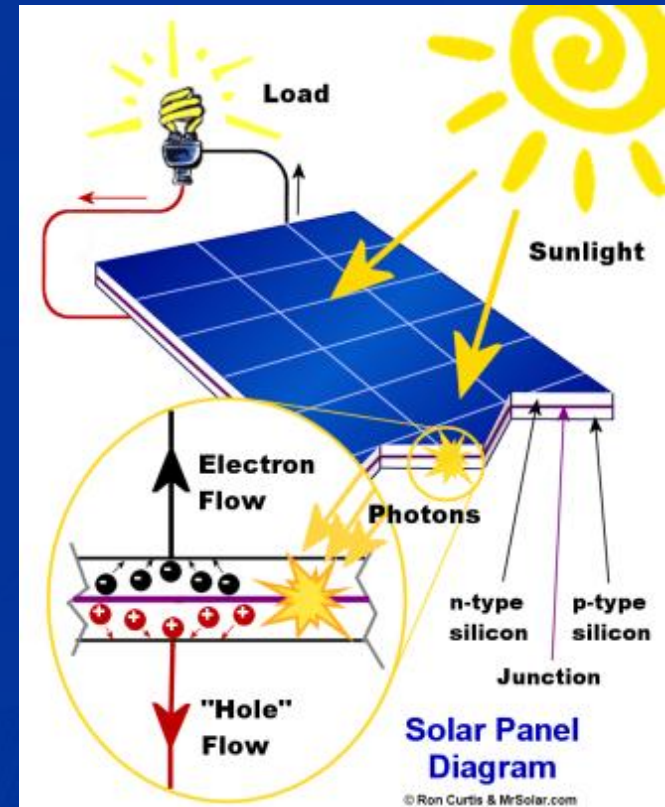
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Presentation Overview

- What is Solar Photovoltaic (PV)?
- Key Components of a Solar PV System
- Feasibility and Application Process
- Pre-Construction Process
- Construction Process
- Frequently Asked Questions
- Rooftop Solar Summary

What is a Solar Photovoltaic?

- Photovoltaic (PV) implies photo meaning “light” and voltaic meaning “electricity”.
- Solar cells are made of semi conductive materials (silicon).
- For solar cells, a thin semiconductor wafer is specially treated to form an electric field, positive on one side and negative on the other.
- Light energy strikes the solar cell, electrons are knocked loose from the atoms in the semiconductor material.
- Electrical conductors are attached to the positive and negative sides, capturing the electrons and forming an electrical current that is used for electricity.



Key Components of a Rooftop Solar PV System

A solar panel is a packaged, connected assembly of Photovoltaic cells.



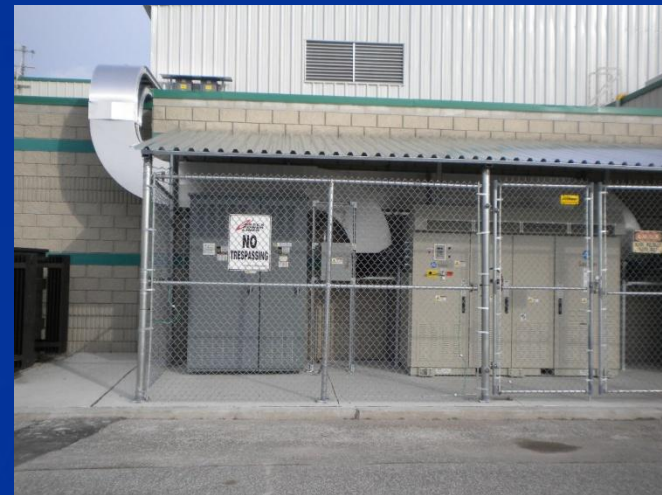
A solar racking system is a fabricated material (typically aluminum) to support and mount solar panels to the roof.

Key Components of a Rooftop Solar PV System

Inverter is an electrical device that changes direct current (DC) into alternating current (AC).



Switchgear is the combination of electrical disconnect switches, fuses or circuit breakers used to control, protect and isolate electrical equipment.



Standing Seam Rooftop Application



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Flat Roof Solar Application



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Rooftop Solar Process Overview

Feasibility and Application Process

- Obtain Council Approval
- Feasibility Study
- Option/Lease Agreement
- Municipal Endorsement
- Ontario Power Authority (OPA) Application Submission

Pre Construction Process

- OPA Contract Execution
- Hydro One Connection Impact Assessment

Construction Process

- OPA Notice to Proceed
- Design & Procurement
- Construction of Solar PV System
- Commercial Operation

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Feasibility and Application Process

1. Obtain Council Approval

- Facilitates feasibility investigation of rooftop solar project

2. Feasibility Study

- Evaluate shading or obstructions of facility
- Identify usable solar array space
- Identify area of connection and equipment placement (i.e. inverters, metering, etc..)
- Assess remaining roof life and make recommendations (if necessary)
- Assess structural capability and make recommendations (if necessary)

Feasibility and Application Process

3. Option/Lease Agreement

- Negotiate and obtain council approval for Option and Lease agreement between PUI and Host Facility.

4. Municipal Endorsement

- A letter from municipal council endorsing the rooftop solar project.

Feasibility Process

5. Ontario Power Authority (OPA) Application Submission

- Submit OPA application form
- Application fee \$0.50/kW (minimum of \$500, maximum of \$5,000) (example 250kW = \$500)
- Application Security \$20/kW for solar PV, (example 250kW = \$5,000) returned once contract has been issued.
- Municipal endorsement letter
- Option/lease agreement
- Evidence of property classification
- FIT 2.0 project scoring summary

Pre Construction Process

1. OPA Contract Execution

- Fit contract offer notice from the OPA
- 10 business days to accept issuance of contract offer by OPA
- Submit required completion & performance security payment of \$50/kW for solar PV (example, 250kW = \$12,500) returned when project reaches commercial operation

2. Hydro One Connection Impact Assessment (CIA)

- Submit CIA signed form B
- Administration fee \$3,000
- Study agreement
- Single line diagram

Construction Process

1. OPA Notice to Proceed

- Domestic content plan
- Financing plan
- Evidence of completed impact assessment
- Second completion and performance security \$25/kW for solar PV, (example 250kW = \$6,250) returned when project reaches commercial operation

2. Design and Procurement

- Finalize system design
- Permitting stage (i.e. building permit, electrical permit)
- Tender and award structural reinforcement work (if required)
- Complete structural reinforcement (If required)
- Roof repair work to establish 20 year life span

Construction Process

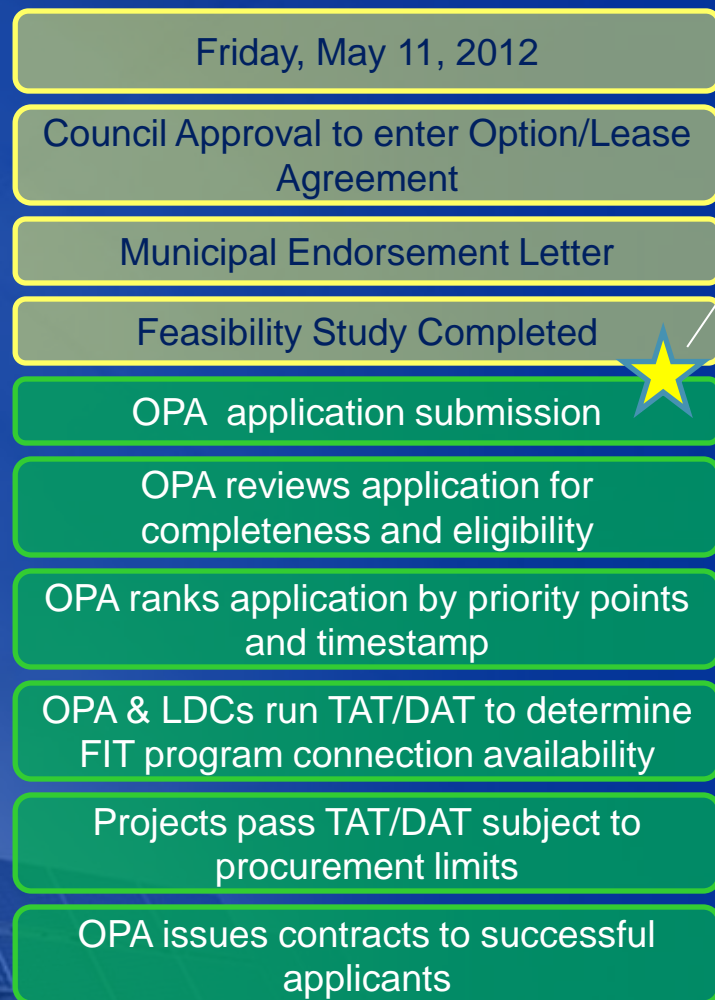
3. Construction of Solar PV System

- Procurement of material
- Installation of solar PV system
- Testing & commissioning

4. Commercial Operation

- All projects are required to be completed within a certain time frame (18 months for roof top solar PV as per FIT)
- Submit a declaration of commercial operation to OPA for FIT payments to begin
 - Metering plan
 - Single line electrical drawing identifying connection point, transmission & distribution facilities
 - Independent engineer certificate
 - Commercial operation declaration
 - Domestic content report

Rooftop Solar Project Milestones



Mid-July 2012

Summer 2012 OPA window for small FIT applications to open (last chance for opportunities to participate in FIT program for small FIT projects).

Application Review (60 Days)
Application review will not begin until application period closes

Connection Screen (60 Days)

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Rooftop Solar Project Milestones

OPA contract execution

10 Business days to accept

Hydro One Connection Impact
Assessment

60 days upon the receipt of a
completed CIA application

OPA Notice to Proceed

20 business days after the request is
made

Design & Procurement

Construction of solar PV system

Commercial Operation

3 – 6 month process dependant on
structural reinforcement and roof work
required.

18 months from issuance of
OPA FIT contract

Frequently Asked Questions by Host Facilities

Q - Will the facility roof be penetrated?

A - Although fastening the panels is determined by the roof type, all means of penetration are to be avoided.

Q - When will construction take place?

A - Construction can take place the best possible time for both Host and PUI (taking into account 18 month window from contract execution).

Q - How much of the facility managers' time will be required during construction?

A - The facility manager's time will be very minimal as PUI project management will coordinate all aspects of the construction and processes.

Frequently Asked Questions by Host Facilities

Q - What are the insurance implications?

A - Insurance works precisely as it does if you lease the inside of the building: Host insures the building; and PUI insures the solar PV system.

Q - What if I need to fix or even replace my roof before the end of 20 years?

A - We would be happy to discuss the specifics of your roof situation and find a solution that works for both parties.

Summary – Rooftop Solar Projects

- Rooftop solar project – process extensive and complex
 - Feasibility and Application
 - Preconstruction
 - Construction and Commissioning
- Small window of opportunity for building owners to participate in FIT 2.0 – applications due June/July
- Last chance for FIT program rooftop solar projects in Ontario

Thank You

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Rooftop Solar Generation

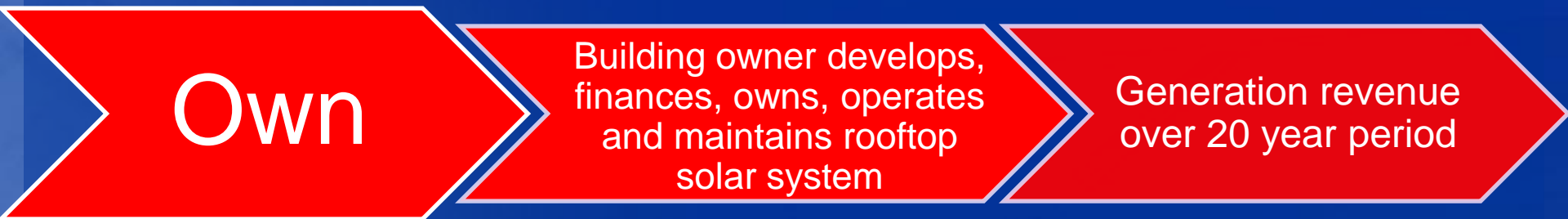
Presentation Agenda:

- Options to participate – High and Low Risk
- Difference between PUI and Solar Developers
- Benefits to buildings owners – Rooftop Solar Generation
- Low Risk – PUI Generation Revenue Sharing
- Generation Revenue Sharing Example
- Summary and next steps

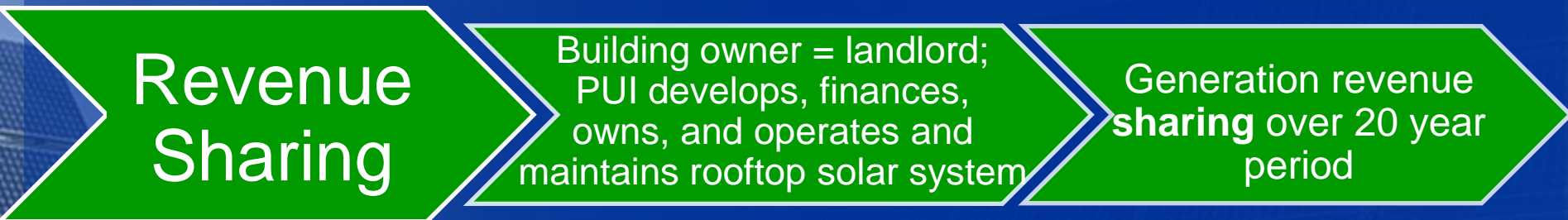
How to Participate – Rooftop Solar?

Ownership and Risk Options for Building Owners

High Risk Option



Low Risk Option



High Risk Option:

Building Owner - Total Project Ownership

- Rooftop Solar Project Lifecycle & Complexity
 - Development – OPA contract (new rules), CIA
 - Financing – Bankability, reliability, solar experience
 - Engineering – Exposure, efficiency, productivity
 - Procurement – Supplier quality, availability, domestic
 - Construction – Permits, standards, timelines
 - Commissioning – ESA approval, connection, optimization
 - Operation – Remote monitoring, 24/7 issue resolution
 - Maintenance – Electronics, cleaning, weathering
 - Decommissioning – Removal, disposal, recycling

Low Risk Option:

Building Owner - Total Project Ownership

- All risk associated with rooftop generation system assumed and mitigated by PUI; renewable energy generation is PUI's specialty
- PUI develops, finances, owns, constructs, operates and maintains rooftop solar system
- Building owner compensated (sharing of generation revenue) for granting PUI 20 year use of facility roof space
- Minimal building owner involvement required, no roof degradation, minimal access to facility

Rooftop Solar Generation

PUI vs. Solar Project Developers:

- Peterborough Utilities ~ 90 year history satisfying customer expectations in the areas of electricity distribution, water distribution
- Broad renewable energy generation portfolio (solar, hydro, biogas)
- PUI largest municipal generation company in Ontario (30MW installed)
- We will be around in the future where some developers may not – warranty, operations, maintenance, system removal

Why PUI Rooftop Solar?

- PUI owned by the City of Peterborough - Bankable
- Extensive renewable energy portfolio (Solar – Lily Lake, Hydro – Numerous, Biogas – City/County Landfill)
- Strong reputation for understanding and satisfying customer expectations in utility and power generation
- Extensive PUI renewable energy knowledge and experience - design, install, operate, maintain generation facilities
- Established local partnerships to offer turnkey renewable energy solutions

Why PUI Rooftop Solar?

Pending building roof is good solar candidate:

- Rooftop Solar System will generate a 20 year revenue source for building owner
- Solar generation will assist building owner with achieving reduction plan targets regarding energy usage (2014)
- Reduces GHGs and smog precursors
- Demonstrates strong leadership in the community
- Creates local economic development prospects; utilizes local solar companies and resources

Benefits of PUI Rooftop Solar

- **Contact us**, we will perform an aerial preliminary assessment of your facility (sun exposure, roof size, obstacles) and estimate possible 20 year revenue stream for building owner
- Pending building owner approval to proceed, detailed roof analysis (conditional/structural) performed, and solar system design established
- Detailed solar and building information used to structure a win/win rooftop revenue sharing strategy for 20 year OPA solar contract

Solar Generation Revenue Sharing

- 20 year solar generation revenue sharing between PUI and building owner compensating for use of roof space
- Strategies available to incorporate upcoming roof repair in revenue sharing model, if required
- 20 year guarantee that solar system will not degrade roof condition
- Minimal roof access required (feasibility, install, monitoring)

Rooftop Solar - Example

45,532 sq. ft Usable Rooftop Space (sloped)

System Size: 500 kW (AC)

Annual Yield = 1,200 kWh/kW - affected by orientation

FIT rate = \$0.539/kwh

Revenue Generation

= $500 \times 1200 \times 0.539$

= **\$323,432/yr**

Rate	Annual Revenue	~20 yr Total
4% of revenue	\$12,937	\$258,745
6% of revenue	\$19,405	\$388,118
8% of revenue	\$25,874	\$517,491

Summary – RTS Opportunities

Building owners have two options to utilize their roof space for solar:

1. Develop, own, install, O&M solar system – **High Risk**
 - Complex solar process and system, financing, extensive core knowledge required to achieve expected returns
2. Generation Revenue Share with PUI – **Low Risk**
 - Utilize PUI's extensive core knowledge in solar generation, creating 20yr revenue stream, minimal building owner effort

Summary – RTS Opportunities

- Rate of revenue sharing with building owner (4 to 8%)
- FIT 2.0 will be the last opportunity for building owners to take advantage of rooftop space for solar generation
- Application process tedious, needs to be **started now**

Thank You

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