



Connecting to the Grid – Alberta's New Micro-Generation Regulations

Solar Energy Society of Canada



– Calgary Chapter

www.solaralberta.ca/calgary



Calgary Central Library

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(download this presentation from www.hme.ca/presentations)

Alberta's Micro-Generation Regulations

- What does this mean to us?
- How do we use the regulations?
- Who can use the regulations?
- Are the regulations as easy as they sound?
- Will they allow us to generate all our own electricity?
- What price will we get paid for our electricity?
- Can we make money at it?
- What will our electricity bill look like?
- What do you do if your electricity delivery company says “no”?

5.6 kW solar PV system
Riverdale NetZero energy house
Edmonton
www.riverdalenetzero.ca
Connected to EPCOR D&T



8.4 kW solar PV system
Laebon Homes net zero energy house
Red Deer
www.laebon.com

Connected to Red Deer Electric Light and Power

8.4 kW solar PV system
Avalon Central Alberta
net zero energy house
Red Deer

www.avaloncentralalberta.com

Connected to Red Deer Electric Light and Power



Intro: The Prime Focus of this Presentation

Prime Focus

- House-sized micropower systems
- Inverter-based micropower systems using solar or microwind
- Systems grid-connected to ENMAX Power and FortisAlberta in the Calgary area
- Regulatory paperwork process for getting your micropower system approved

Not Covered

- Business-sized micropower systems
- Synchronous or induction generators
- Systems grid-connected to other electricity deliver companies not in the Calgary area
- How micropower systems work, how to design or size them, how to find suppliers, what are the costs and economics (these subjects are covered in other presentations)

Three points to take away...

1. You can generate your own electricity on your house.
2. The new regulations now make it easy to:
 - get approvals
 - sell your excess electricity to the grid.
3. Solar electricity is within your budget.

5 kW solar PV system
Dave Shiflett house
near Devon
Connected to Fortis Alberta



2.4 kW solar PV system
Mel Krisher house
near Sangudo
Connected to Central Alberta REA



People who say it cannot be done
... should not interrupt those who are doing it.

George Bernard Shaw

Intro: My Goals...

- To **empower** and **envision** you to get ready to manage the energy and environmental issues coming upon us
- To help you **understand** the steps to get approval to connect your micropower system to your neighbourhood electricity grid

2.2 kW PV systems
Premier Gardens, California



Every revolution is about power!

Intro: Howell-Mayhew Engineering

- We are solar system project developers
- We are not specifically equipment suppliers
- We have no vested interest in any technology
- Our interest is that you choose wisely
 - with your eyes wide open
 - based on the facts and whether it is right for you or not.

Context: What is the Electricity “Grid”?

- The grid is the wires and equipment that connects all our homes, farms, businesses and industries to the electricity generating plants

Electricity fuel sources in Alberta (AESO):

Coal – 74%

Natural gas – 17%

Large hydro – 4%

Wind – 2%

Biomass +
Diesel – 1%

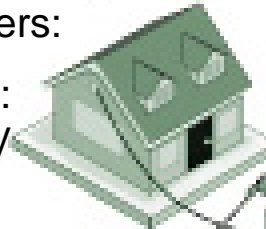
Imports – 2%



Electricity
generating
plant

Most Customers:

House voltages:
240 and 120 V



Transformer
and electrical
delivery pole

Electrical substation

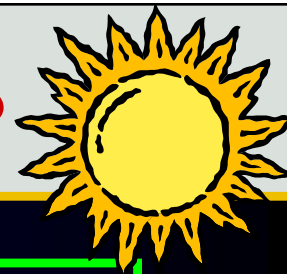
Delivery grid
25,000 volts and lower

High voltage
transmission tower

Transmission grid
from 25,000 volts to 250,000 volts

Source of image: Canadian Centre for Energy Information, 2004

Context: Can We Really Get Connected?



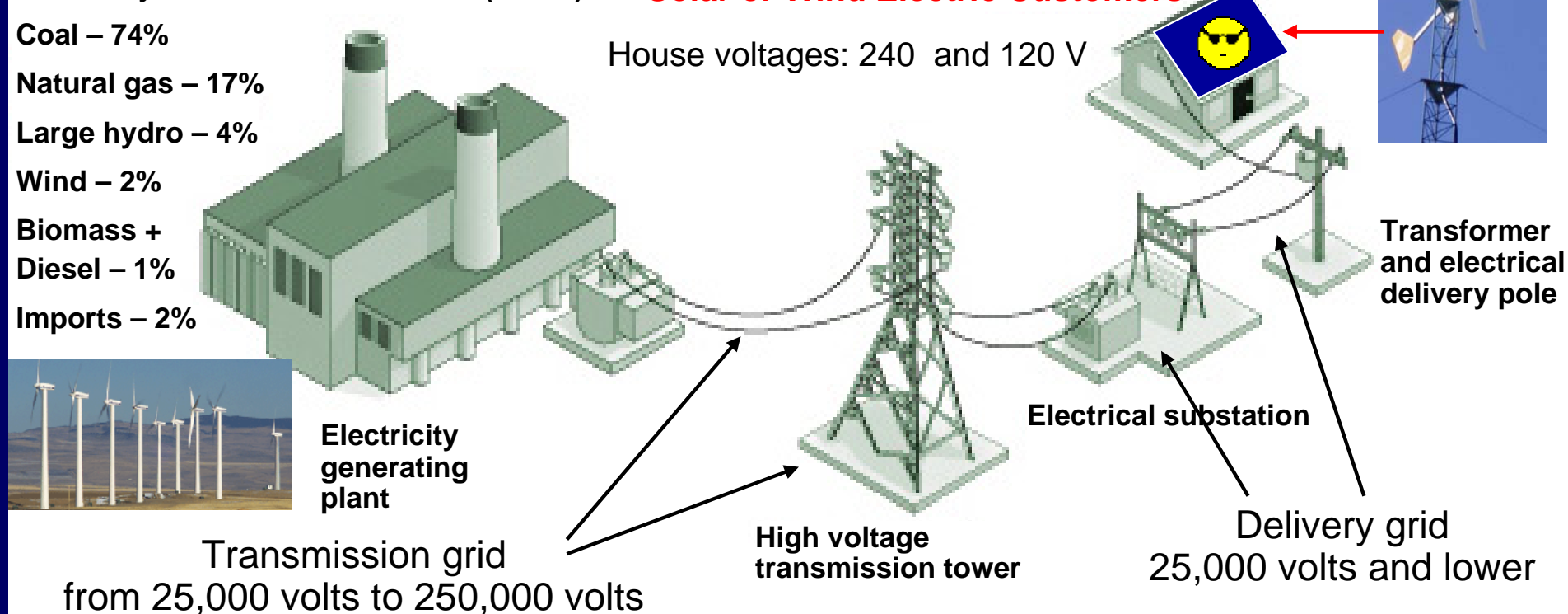
- Yes!
- The solar electric or the microwind electric system is typically connected to the home, business, or farm.

Electricity fuel sources in Alberta (AESO):

Coal – 74%
Natural gas – 17%
Large hydro – 4%
Wind – 2%
Biomass +
Diesel – 1%
Imports – 2%

Solar or Wind Electric Customers

House voltages: 240 and 120 V



Source of image: Canadian Centre for Energy Information, 2004

If you don't like change...
you're going to like irrelevance even less.

General Eric Shinseki
Chief of Staff, American Army

Who is who in Alberta's Electric Industry?

Behind The Scenes

- Electricity Generators
 - Some 90 big electricity generating plants in the province
 - Owned by TransAlta, ATCO Power, ENMAX Power, EPCOR, Canadian Hydro Developers and many others
- Alberta Electric System Operator (AESO) www.aeso.ca
 - Government agency that manages the transmission lines, and the wholesale electricity market
- Alberta Utilities Commission (AUC) www.auc.ab.ca
 - The “policeman” that makes sure that everyone is co-operating
- Alberta Department of Energy www.energy.gov.ab.ca
 - Government department that makes the policies and regulations for the politicians

Who is who in Alberta's Electric Industry?

In Contact With You

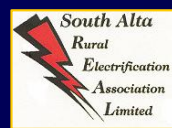
- Customer and Micropower System Owner www.myspace.com
 - most important player (that is you)
- Electricity Delivery Companies
 - Runs the delivery system,
 - Delivers your electricity,
 - Maintains the power lines, and
 - Gets things fixed during a power outage
- Energy Retailers
 - Sells you your electrical energy

Electricity Delivery Companies



There are some 78 Electricity Delivery Companies...
(maybe a bit fewer?)

- 2 **private** Wires Owners that are Wires Operators:
 - ATCO Electric, FortisAlberta
- 9 **municipally-owned** Wires Owners that are Wires Operators:
 - ENMAX Power, EPCOR, Red Deer, Medicine Hat, Lethbridge, Cardston, Fort Macleod, Ponoka, Crowsnest Pass
- 6 **Rural Electrification Associations** that are Wires Operators
 - South Alta REA, Central Alberta REA, Battle River REA, Rocky REA, North Parkland Power REA, Lakeland REA
- 61 (?) Rural Electrification Associations that are Wires Owners only



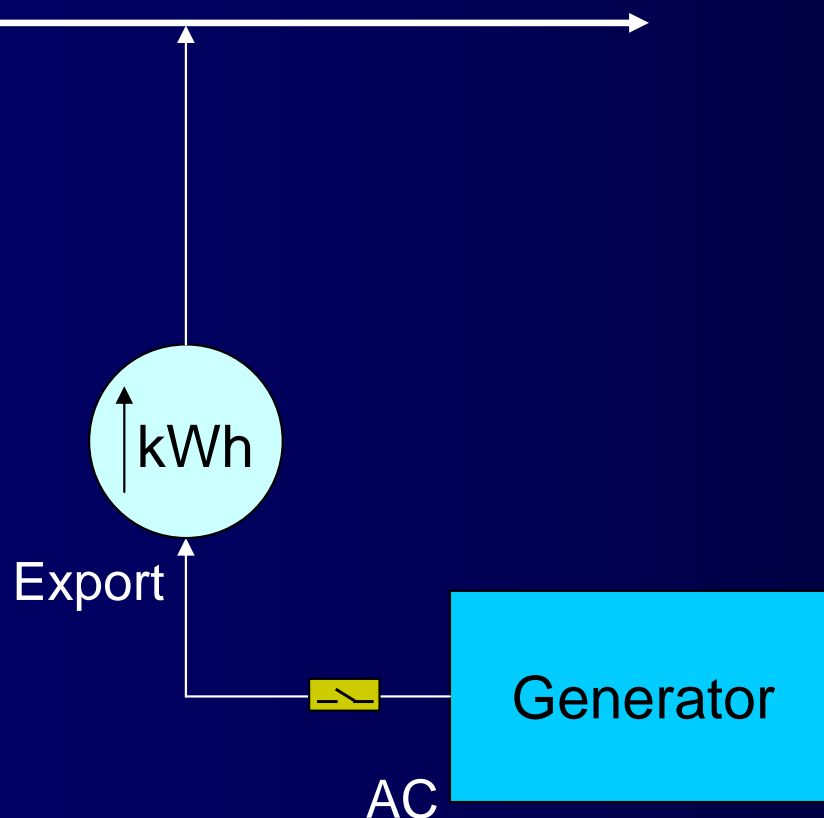
Who is your Electricity Delivery Company?

- Your electricity bill is sent to you by your Energy Retailer
- Find your Electricity Delivery Company on the second half of your electricity bill
- Your bill will have
 - on the first half:
 - energy purchase and administration charges on it from your Energy Retailer
 - on the second half:
 - energy delivery, administration, riders and other fees on it from your **Electricity Delivery Company (ENMAX Power in Calgary)**

“Merchant Power” Generators

Connection: Electricity Delivery Company's electricity transmission or delivery grid

Energy sales: AESO's wholesale electricity market



- Only sells to the grid.
- Services it can sell:
 - energy,
 - power (capacity),
 - spinning reserve,
 - voltage support,
 - power quality (power factor, *etc*)

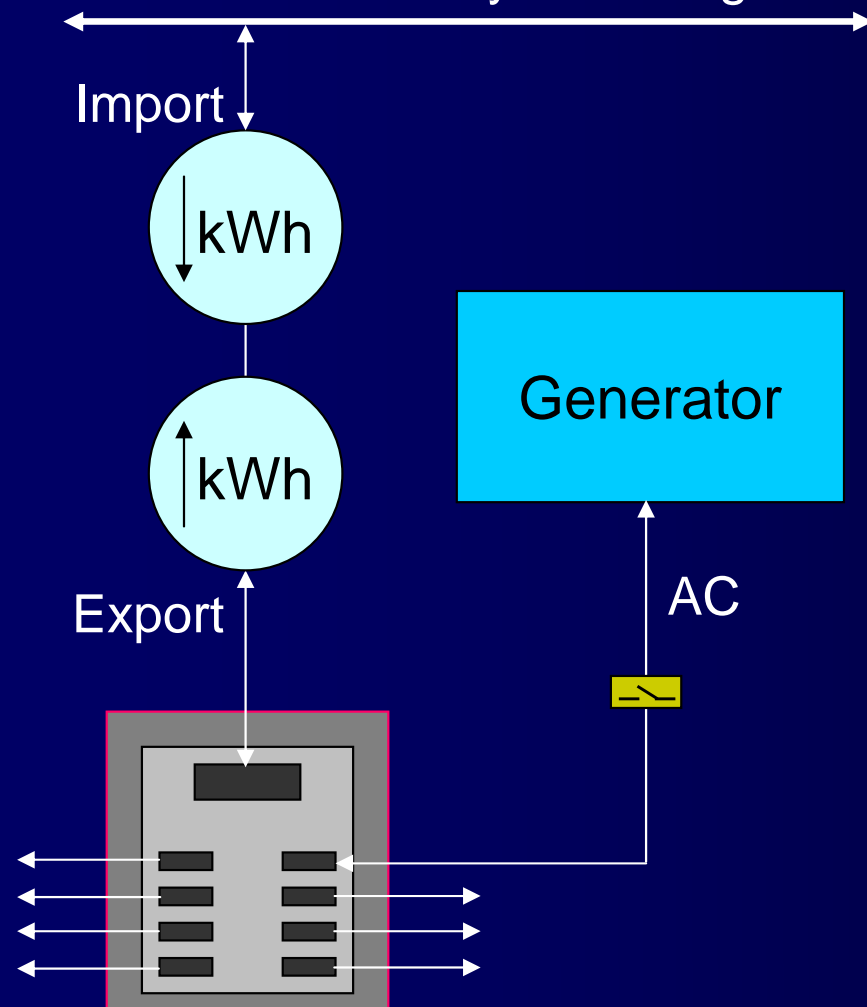
Alberta's Micro-Generation regulations do not apply to Merchant Generators.

All merchant generators can always be connected under the standard connection regulations.

“Load-Offset” Electricity Generators

Connection: Electricity Deliver Company's electricity delivery grid

Energy sales: Energy Retailer (or electricity market if you are big enough)



Building electrical circuits

- Used to enhance site electrical security (if a battery bank or fuel generator is included).
- The generator can be considered as a back-up to the grid.
- Can sell to the grid.
- Can buy from the grid.
- For fuel-based systems, the generator's controls can follow the changes in on-site electricity consumption.

Alberta's Micro-Generation regulations are designed for load-offset systems only.

Solar Electricity

The technology is called "photovoltaics",
but we only call it "PV".

Solar PV Cell

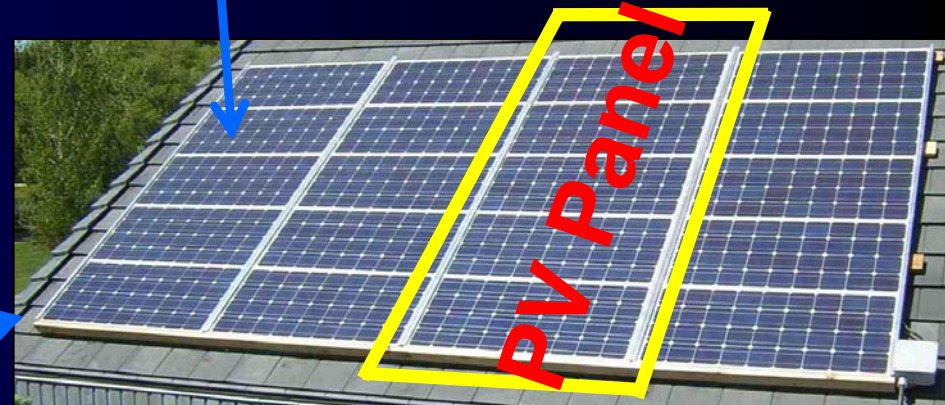
PV can generate any amount of electricity.
Large PV systems = more PV modules.

Solar PV Module

Solar PV Array

5,000 modules
1000 kW

30,000 modules, 6000 kW



20 modules (120 W ea.)
2400 W PV array

55,000
modules
(200 W ea.)
11,000 kW
PV array

Microwind Electricity

Microwind turbines

Bergey 10 kW



SkyStream



**Windmills
grind grain!**

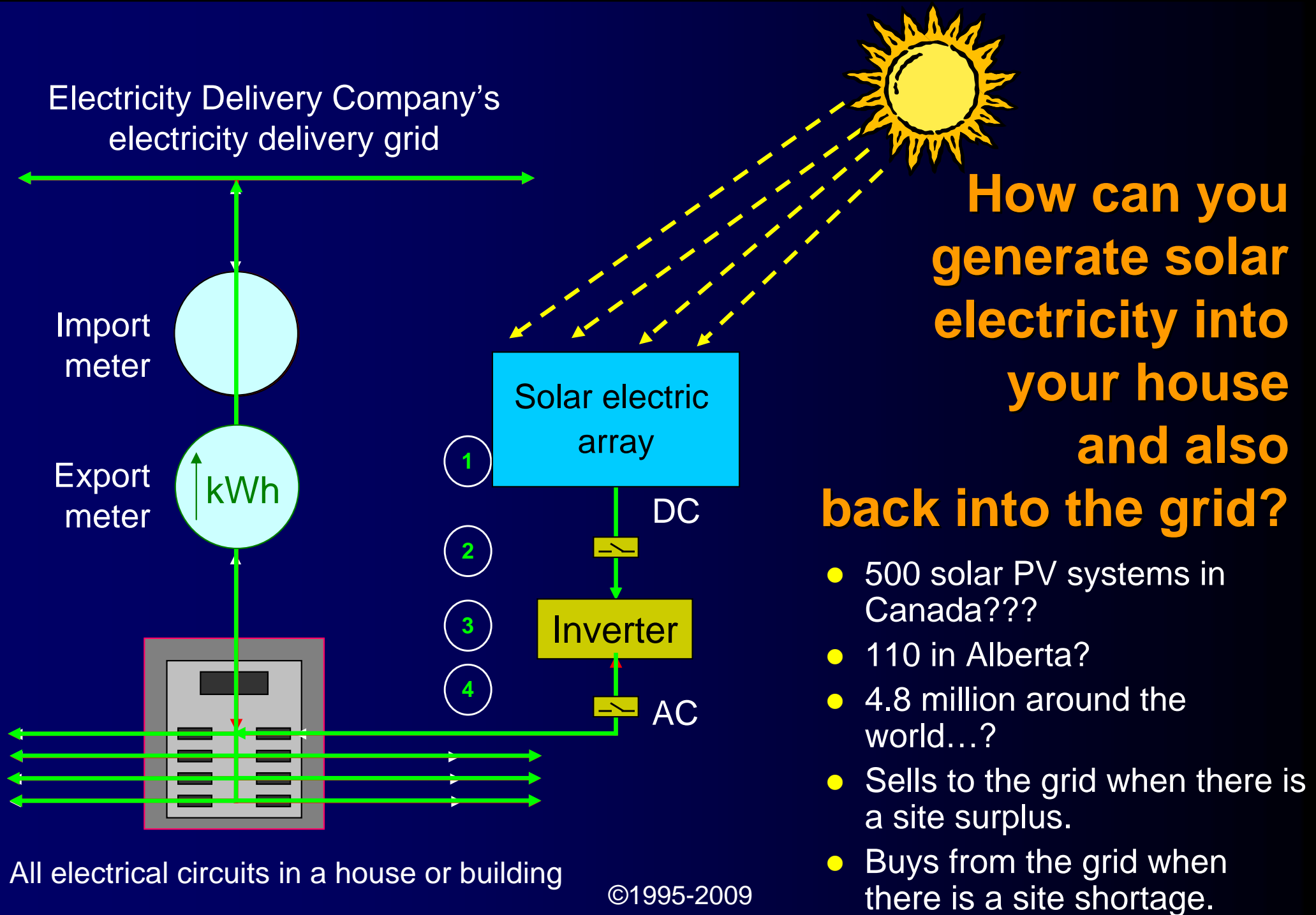
**They do not
generate
electricity.**

ARE 442 10 kW

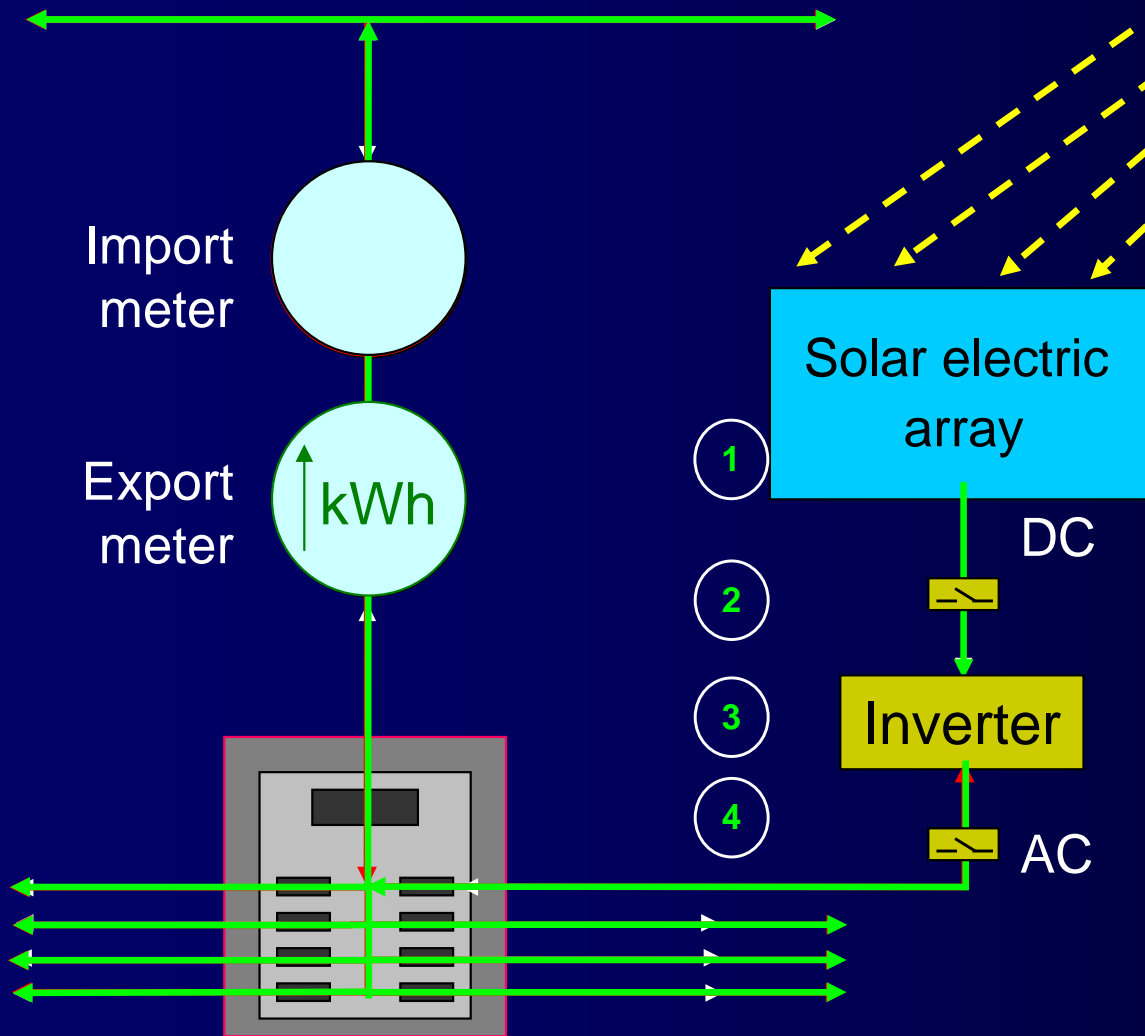


Knowing is not enough... we must apply.
Willing is not enough... we must do.

Johann Wolfgang
von Goethe



Electricity Delivery Company's
electrical delivery grid



What happens during a power outage?

The inverter senses that there is a power outage and turns itself off.

When power returns it turns itself on automatically.

All electrical circuits in a house or building

©1995-2009

Riverdale NetZero Energy House, Edmonton

www.riverdalenetzero.ca

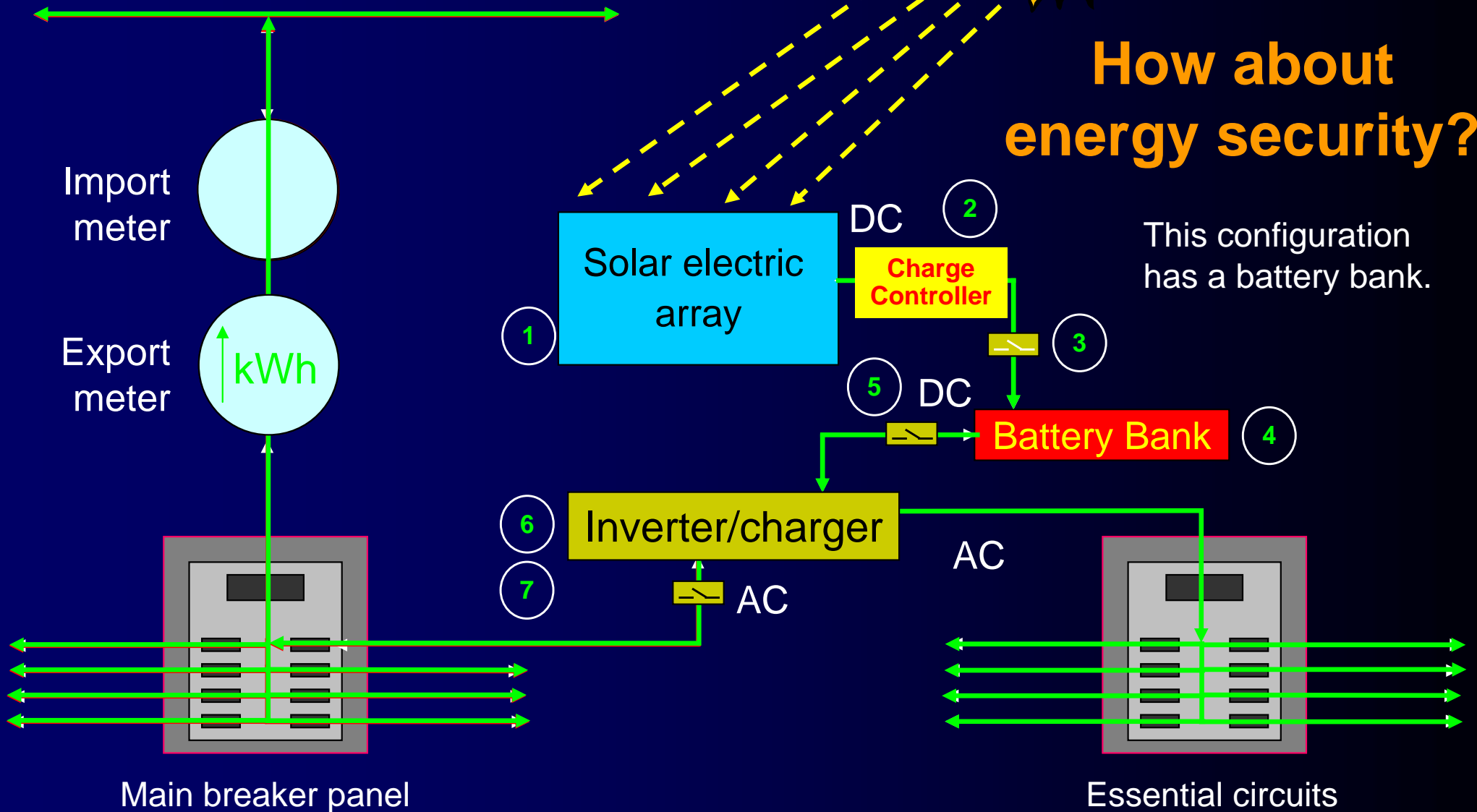


Solar Electric System:

- 33 m², 5.6 kW Sanyo solar PV array
- 53° tilt for annual optimum
- sells surplus to the grid almost every day

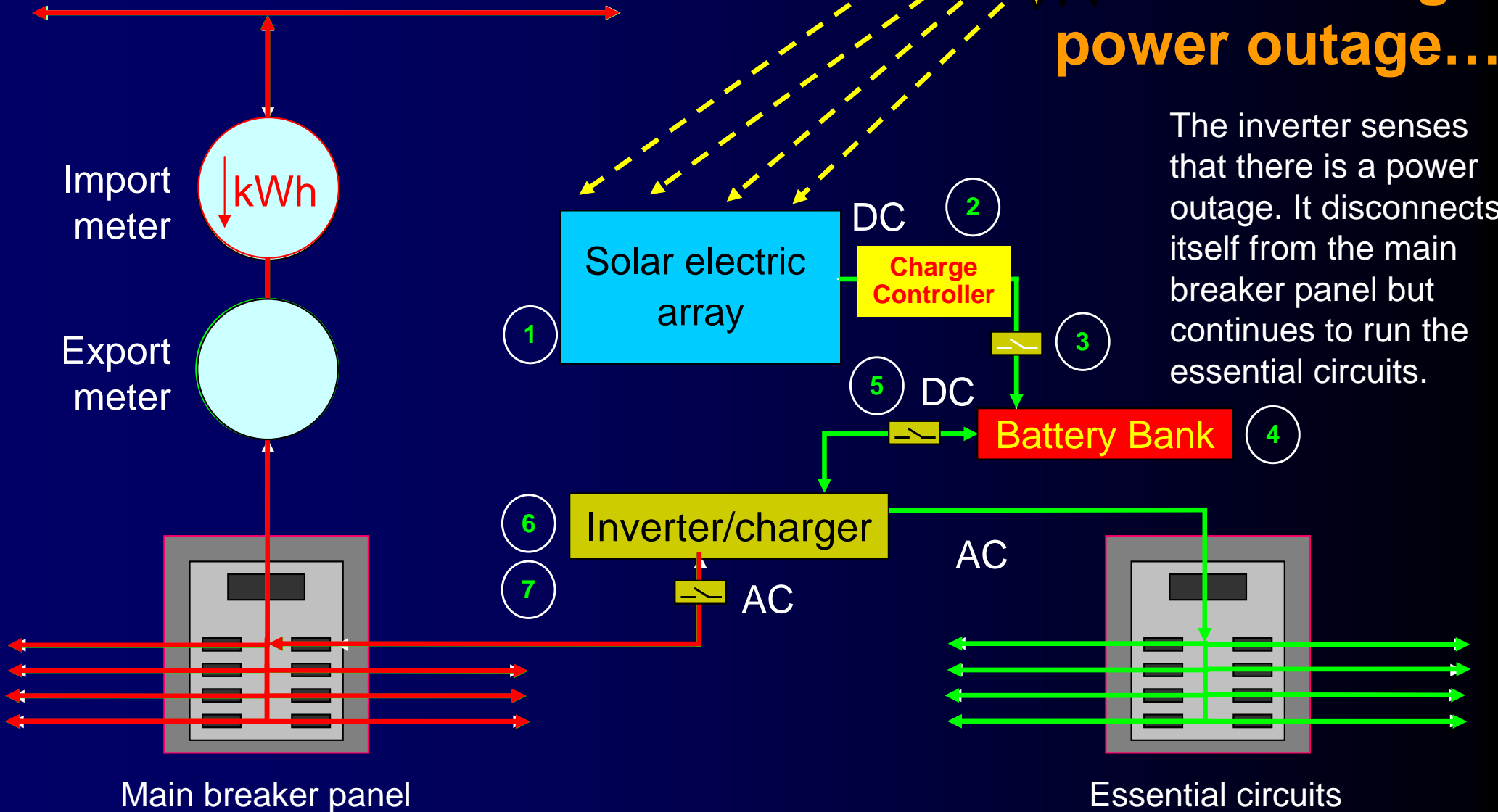
SunnyBoy 6000 W inverter

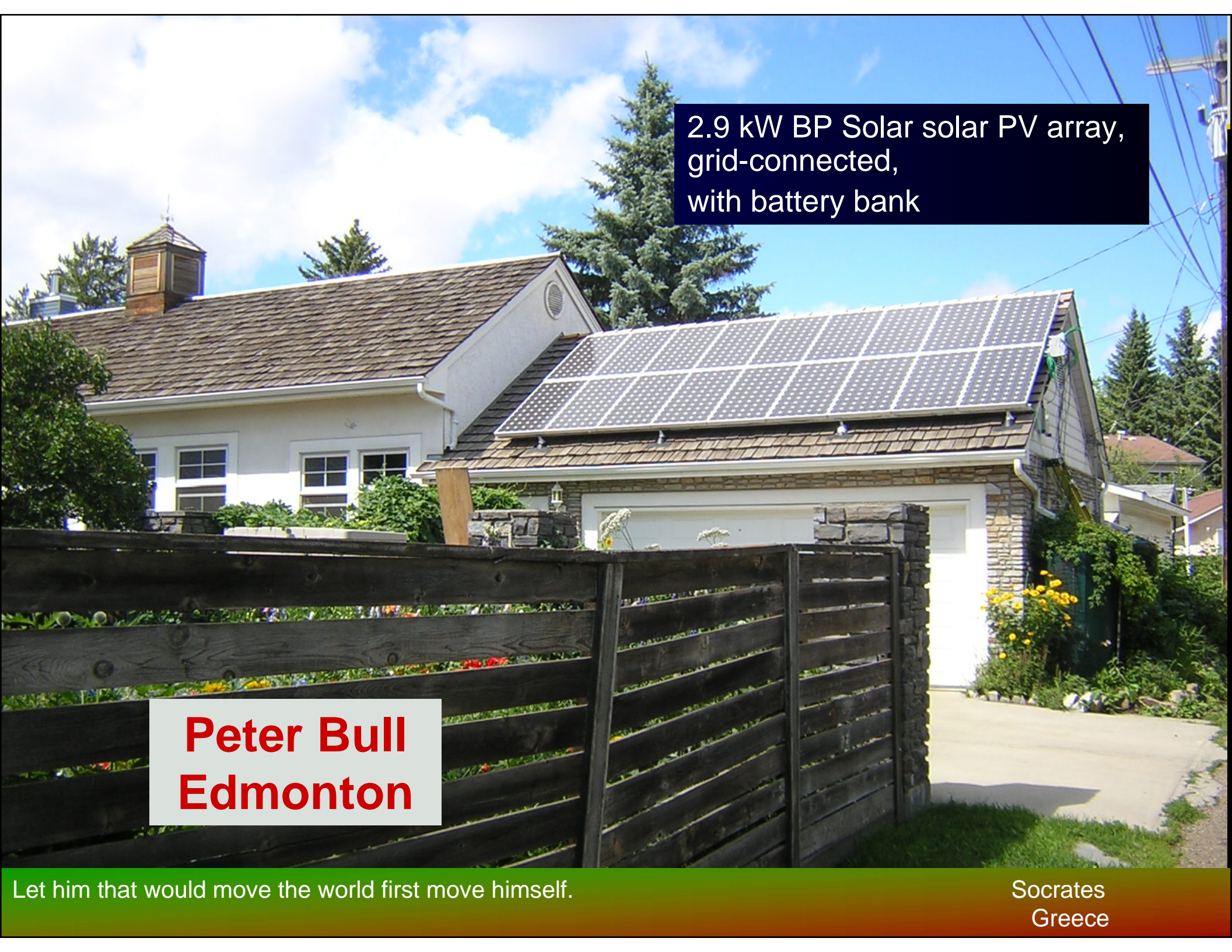
Electricity Delivery Company's
electrical delivery grid



You must skate to where the puck is going
...not to where it is now.

Electricity Delivery Company's
electrical delivery grid





2.9 kW BP Solar solar PV array,
grid-connected,
with battery bank

**Peter Bull
Edmonton**

Let him that would move the world first move himself.

Socrates
Greece

Inverter, charge controllers, DC switches, meters

Charge
controllers



Xantrex
Inverter
/charger



DC
array
switches

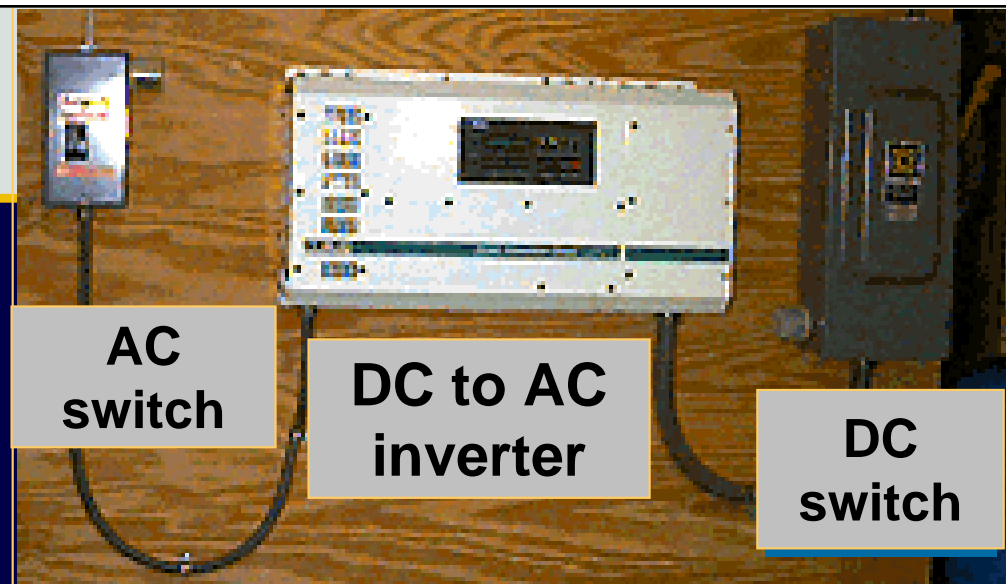


**Peter Bull
Edmonton**



1 of 2 batteries with 60 electrochemical
electrical energy storage cells

DC to AC Inverters...



wild frequency AC to
DC to 60 Hz AC
inverter
(for a microwind
turbine)

DC to AC
inverter



DC
switch

AC switch

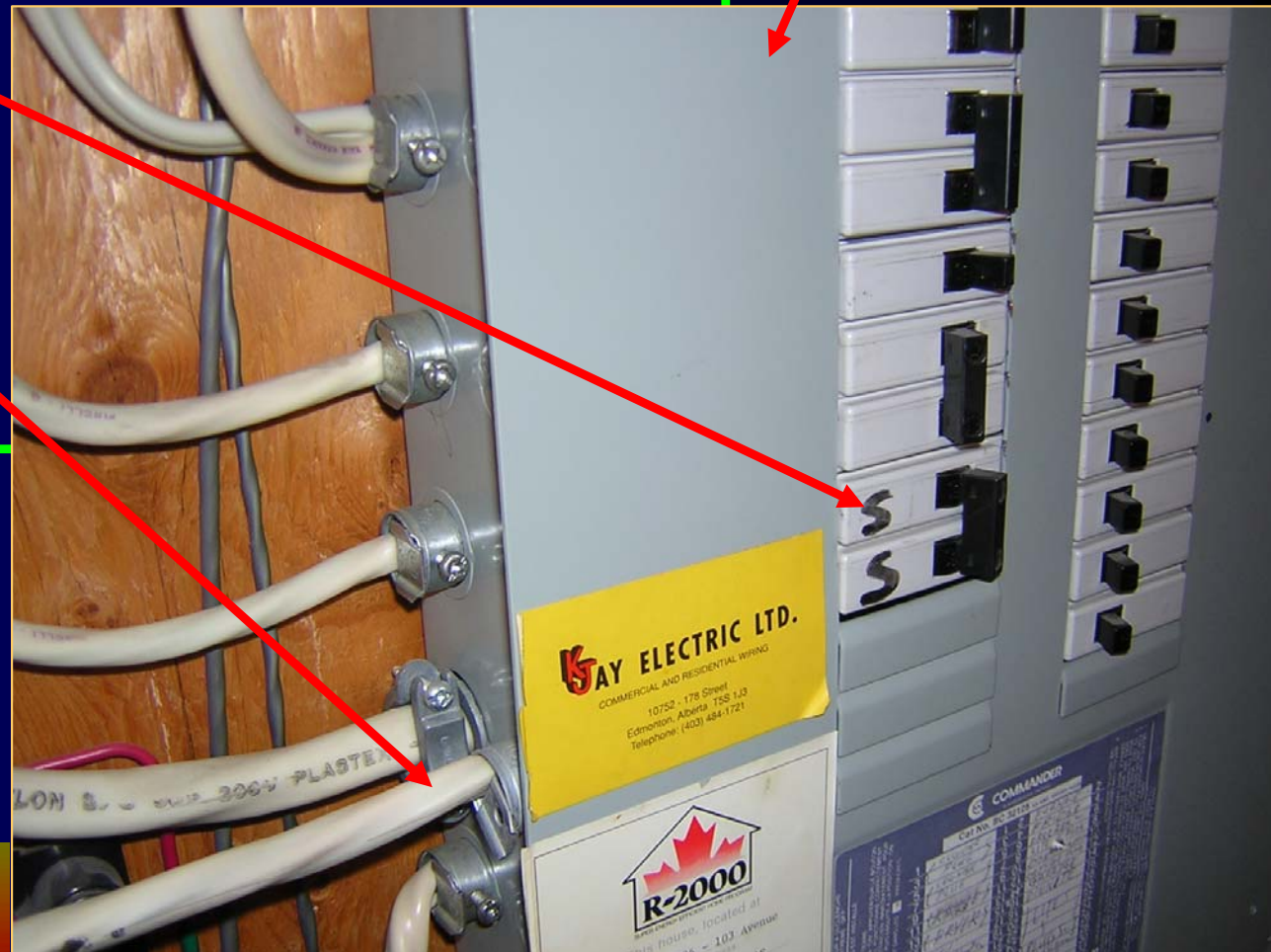
The Grid-Connection Point...

- The connection to the grid is a wire attached to a normal house or building breaker!

Breaker panel

The solar breaker

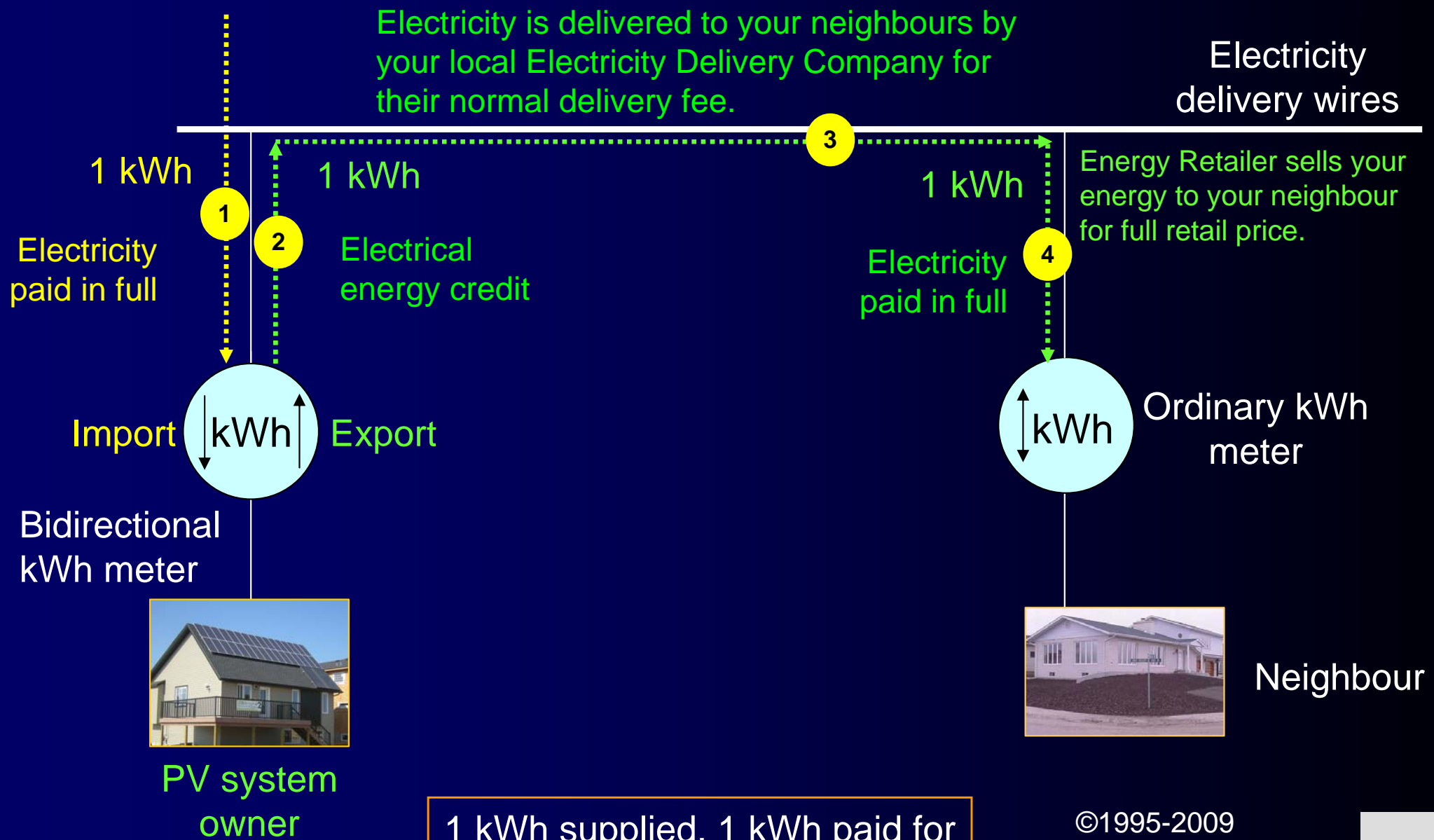
The wire from the solar electric system



If you're in a hole
...stop digging.

Energy Retailer,
Electricity Delivery
Company

Where does exported electricity go to?



Connecting to the Grid

Alberta's Regulatory Process for connecting Micro-Generators (MG) to the electric grid

- brand new as of 2009 January 01
- 6 paperwork steps to receive approvals for a house-sized solar power system
 - the system is connected to your Electricity Delivery Company
- Another 1? step to sell your electricity
 - your electricity will be sold to your Electricity Retailer

Previous Steps to Connect a Micropower System

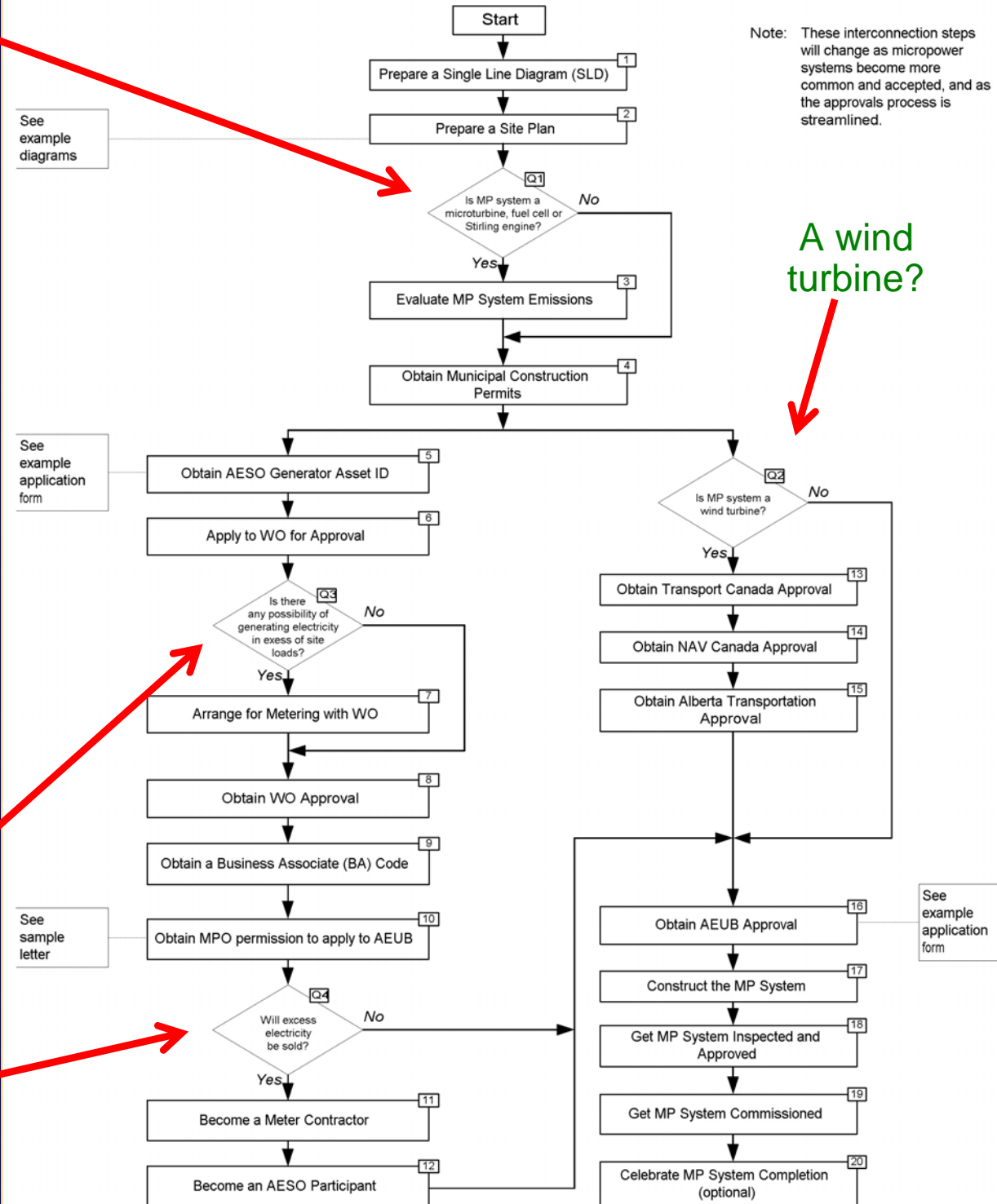
It is still required for all generators (large or small) that are not officially “Micro-Generators” – 60 steps to connect, another 16 to sell electricity –

Any excess electricity?

Any electricity to be sold?

Burns fuel?

Steps to Interconnect a Micropower System



What is new about it all?

- Lots
 - It is much simpler and clearer now
 - There is a good dispute resolution process
- Note that micropower systems have always (at least since 1994) been able to connect to the grid...

They have needed to have followed the similar complex process as for large generators.
- It is an excellent step for the province to take.

What are Alberta's Micro-Generation Regulations?

- 9 pages
 - (you normally don't need to read them)
- developed by Alberta Energy with comments and feedback from electricity delivery companies, energy retailers, the solar PV industry and others
- is part of the Electric Utilities Act.
Re-interprets parts of the Act.
- regulates grid-connected load-offset renewable electricity generators up to 1000 kW of generating capacity
- applies everywhere except Medicine Hat
- download them from hme.ca/mgregs

APPENDIX

Electric Utilities Act

MICRO-GENERATION REGULATION

Table of Contents

1	Interpretation
2	Notice to owner
3	Meters
4	Connection and operation
5	Load settlement
6	Exclusion from power pool
7	Compensation for micro-generation
8	Billing services
9	Application
10	Expiry

Interpretation

1(1) In this Regulation,

- (a) "bi-directional cumulative meter" means a metering device or devices that measure the total electricity that has flowed in a circuit from one reading date to the next in each of 2 opposite directions, and that store in separate data registers the data respecting the flow of electricity in each direction;
- (b) "bi-directional interval meter" means a metering device or devices that measure the total electricity that has flowed in a circuit during defined intervals in each of 2 opposite directions, and that store in separate data registers the data respecting the flow of electricity;
- (c) "Commission" means the Alberta Utilities Commission;
- (d) "ISO" means the Independent System Operator established under section 7 of the Act;
- (e) "large micro-generation" means, subject to section 3(3), generation of electric energy from a micro-generation generating unit with a total nominal capacity of at least 150 kW but not exceeding 1 MW;
- (f) "load settlement rules" means the rules respecting load settlement established by the Commission pursuant to section 24.1 of the Act as amended from time to time;

What do the Micro-Generation Regulations cover?

- Definitions and interpretations of key words
- The application process to be grid-connected
- The electricity metering and metering costs
- The billing and crediting of exported electricity
- The relationship dispute process
- Expiry date:
 - 2013 December 31
 - which allows the government the option to also renew it or amend it

APPENDIX

Electric Utilities Act

MICRO-GENERATION REGULATION

Table of Contents

- 1 Interpretation
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- 8 Billing services
- 9 Application
- 10 Expiry



Purpose of Micro-Generation Regulations

in my words...

- To simplify the grid-connection regulatory process
 - so that micropower systems deriving their electricity from renewable and alternate energy sources
 - will not have to go through the same complex (and appropriate) process as large generators in getting connected to the grid.
- To enable the micropower technologies that are commercially available (solar PV, microwind, biogas, Stirling engine, fuel cell...)
- To not be so out-of-step with other provinces (BC, SK, ON, QU) and other countries (Japan, Germany, Austria, Spain, Italy, France, Australia...)

Technologies that the regulations cover

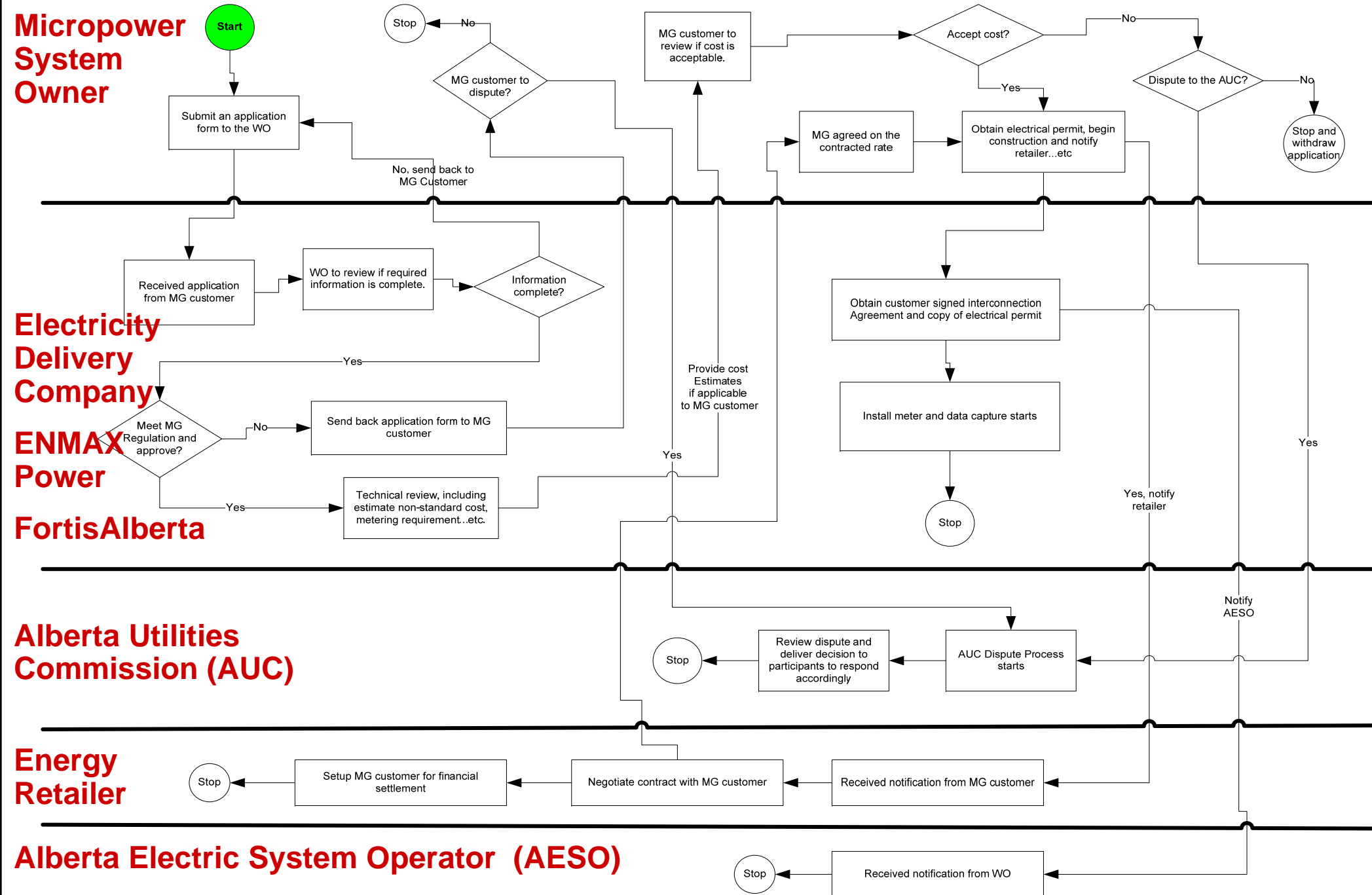
- Must be a renewable or alternative energy source
- Renewable energy
 - Solar PV electric
 - Solar thermal electric
 - Microwind electric
 - Microhydro electric
 - Geothermal electric
- Alternative energy
 - Must generate electricity with an emissions rate of less than 0.418 kg/kWh
 - Stirling engine generators
 - Biomass and biogas generators
 - Fuel cells

Size of Micropower System

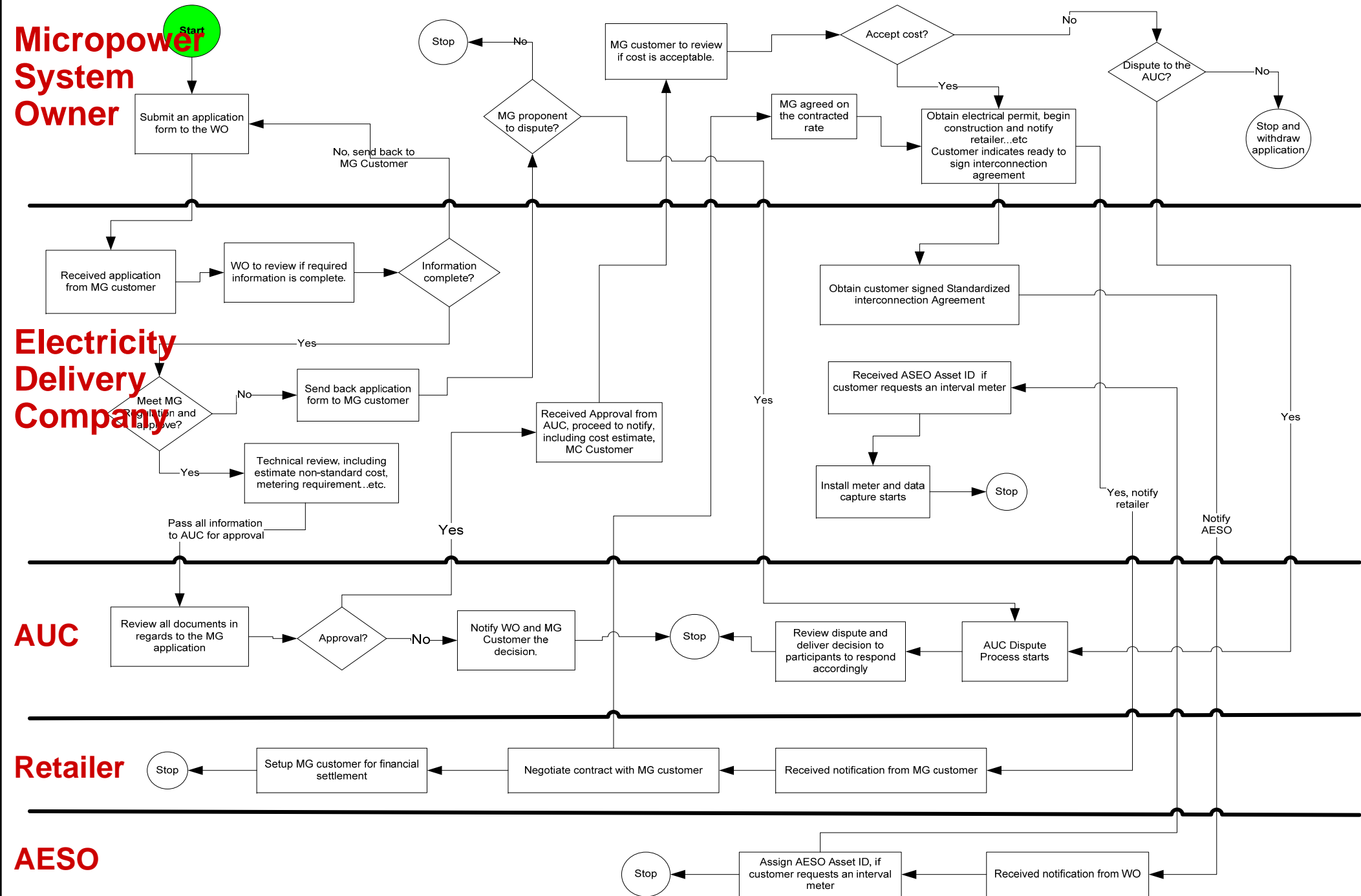
- Three categories:
 - **Mini** micro-generator: < 10 kW and inverter-based (mostly on houses)
 - **Small** micro-generator: ≤ 150 kW
 - **Large** micro-generator: > 150 kW and ≤ 1000 kW
- Must be connected to the low-voltage electricity delivery grid, not the high-voltage electricity transmission grid



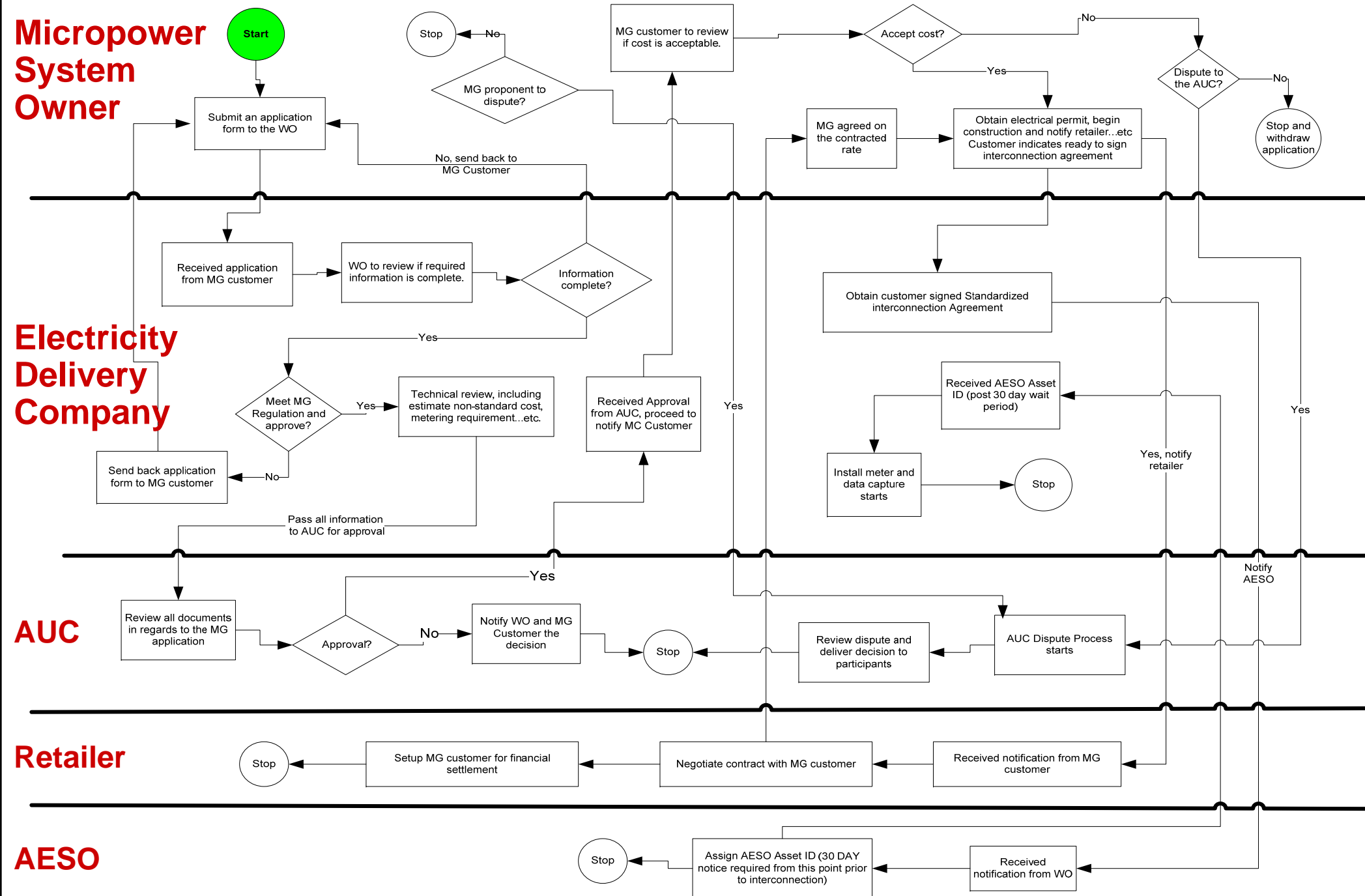
Mini MG Application Process: < 10 kW Inverter-Based



Small MG Application Process: ≤ 150 kW



Large MG Application Process: > 150 kW, <= 1000 kW



What are AUC's Rules Respecting Micro-Generation?

- 3 pages
 - (you normally don't need to read them)
- AUC's rules describe the ways in which the AUC responds to and enforces the government regulations
(which is good)
- download them from hme.ca/mgrules



Rule 024

Rules Respecting Micro-Generation

The Alberta Utilities Commission (AUC/Commission) has approved this rule on June 17, 2008.

Definitions

1 In these rules:

- (a) "Act" means the *Electric Utilities Act*;
- (b) "applicable owner" means the owner of an electric distribution system in whose service territory the relevant micro-generation unit and interconnection of that unit is located;
- (c) "Commission" means the Alberta Utilities Commission;
- (d) "customer" means a person purchasing electricity for the person's own use;
- (e) "inverter" means an electronic device that converts DC electricity into AC electricity;
- (f) "mini micro-generator" means a micro-generation generating unit of a micro-generator which is using an inverter, or a technology which has been proven by an independent third party to act like an inverter, and has a generation capacity of no more than 10kW of electrical energy and is generating or proposing to generate electric energy solely for the customer's own use;
- (g) "notice of application" means a notice provided by the customer to the applicable owner in accordance with section 2(1) of the regulation and in the form set out in Appendix A;
- (h) "notice of complaint" means a notice prepared by the customer and filed with the Commission in accordance with subsection 3(5) of the regulation and in the form set out as Appendix C;
- (i) "notice of dispute" means a notice prepared by the applicable owner and filed with the Commission in accordance with section 2(2) or section 4(3) of the regulation and in the form set out in Appendix B;
- (j) "owner" means the owner of an electric distribution system;
- (k) "regulation" means the *Micro-Generation Regulation*, Alta. Reg. 27/2008.

What do the AUC's Rules cover?

- sets out the grid-connection application and approval steps
- sets out timelines for the Electricity Delivery Company to respond to grid-connection applications
- sets out a dispute and complaint process:
 - whether a micropower system qualifies under these regulations
 - who pays for “extraordinary” costs

Hydro and Electric Energy Act Requirements

- 2 The customer must obtain approval from the Commission to construct and operate its proposed micro-generation generating unit pursuant to section 11 of the *Hydro and Electric Energy Act* unless the customer is proposing to generate within the meaning of section 13 of *Hydro and Electric Energy Act*.
- 3 The customer may use the notice of application form as its application form for *Hydro and Electric Energy Act* approval.
- 4 Section 2 of the rules does not apply to a customer who intends to install a mini micro-generator.

Application to Supply Electric Energy

- 5 A customer who intends to supply electric energy to the interconnected electric system from a micro-generation generating unit shall complete a notice of application and shall serve the notice of application on the applicable owner.

Qualification as a Micro-Generation Generating Unit

- 6 If, following receipt of a complete notice of application from a customer, the applicable owner considers that the customer's proposed generating unit will not qualify as a micro-generation generating unit, the applicable owner shall complete a notice of dispute.
- 7 Within 14 days following receipt of a complete notice of application, a copy of the notice of dispute shall be served by the applicable owner on the customer at the contact address and in the manner indicated in the notice of application.
- 8 The notice of dispute shall be filed with the Commission by the applicable owner within 14 days following receipt of a complete notice of application. On receipt of the notice of dispute, the Commission shall, within 30 days or such long period as the Commission considers necessary issue its decision in accordance with the provisions of subsection 2 (3) of the regulation.

Costs of Interval Meter

- 9 If a customer has requested that a bi-directional interval meter be installed for its small micro-generation and the applicable owner declines the request, the applicable owner shall notify the customer of its decision within 14 days following receipt of this request.
- 10 The notice required under section 9 of these rules, declining the bi-directional interval meter request, shall be served on the customer at the contact address and in the

manner indicated in the notice of application, and shall indicate the contact address and manner in which the applicable owner may be served.

- 11 On receipt of a notice declining the bi-directional interval meter request, the customer may apply to the Commission for an order requiring the applicable owner to comply with the customer's request for the installation of a bi-directional interval meter by completing and filing with the Commission a notice of complaint.

- 12 The notice of complaint must be filed with the Commission within 14 days following receipt of the notice declining the bi-directional interval meter request.

- 13 A copy of the notice of complaint must be served by the customer on the applicable owner.

Extraordinary Interconnection Costs

- 14 Following receipt of a complete notice of application from a customer, if the applicable owner considers the costs of connecting a customer's micro-generation generating unit to be extraordinary for the reasons set out in subsection 4(3) of the regulation, the applicable owner shall file a notice of dispute with the Commission within 14 days from the date in which the applicable owner finalizes its cost estimate.

- 15 A copy of the notice of dispute shall be served on the customer, by the applicable owner, at the contact address and in the manner indicated in the notice of application within 14 days from the date in which the applicable owner finalizes its cost estimate.

General Provisions

- 16 With respect to any application or complaint filed with the Commission pursuant to the regulation or these rules, the Commission will determine the process it considers appropriate to follow given the subject matter before it.

- 17 AUC Rule 021, Settlement System Code, shall apply, as required, to all transactions conducted under the regulation.

What is Involved to Connect to the Grid?

Two basic areas of work to generate your own electricity and stay connected to the grid:

1. Getting the **paperwork** done to permit its installation
2. Buying, **installing**, and operating the solar or microwind electric system

Three Parts to the Paperwork Approvals

1. Getting municipal development, building and electrical permits
 - **Key factors of interest:** neighbourly relationships, safety
 - Always requires an electrical permit
2. Getting approval to physically make electrical connection to the grid
 - Electrical connection to your Electricity Delivery Company
 - **Key factors of interest:** safety, power quality
3. Selling electrical energy (not power) to the grid
 - Sell to your Energy Retailer
 - **Key factors of interest:** price of energy sold to the grid



Paperwork #1. Contacting your Wires Company

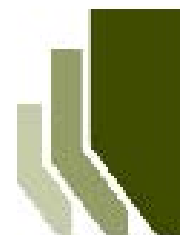
- #1. Phone your Electricity Delivery Company (EDC) and ask for their Micro-Generator grid-connection documents.
- Your Electricity Delivery Company is to send you 4 items:
 - a. The AUC **Application Guide** with lots of great info in it;
 - b. The AUC **Application Form** with the EDC name on the top of it;
 - c. The EDC grid-connection **Operating Agreement**; and
 - d. The EDC **Terms and Conditions**.
 - Make sure they e-mail you all these.
 - Also download all this info from **[www.hme.ca /connect to the grid](http://www.hme.ca/connecttothegrid)** (with no spaces)
 - I do **NOT** recommend that you phone:
 - your Energy Retailer;
 - the Alberta Government, Alberta Energy or Alberta Environment.

I have found that you get incorrect and mis-leading information if you phone them (hopefully that will improve) – and besides, it is not with them that you need to develop your grid-connection relationship.

 - the Alberta Utilities Commission (AUC).

What is the AUC Application Guide?

- 37 pages
- Developed by the AUC
- Includes all categories of micro-generation
- Includes solar PV & wind
- To be used (almost) everywhere in the province
 - except for Medicine Hat



AUC

Alberta Utilities Commission

auc.ab.ca

MICRO-GENERATOR APPLICATION GUIDELINE

(Version 1.0)

July 18, 2008

What does the AUC Application Guide contain?

- Describes the grid-connection process for micro-generators
- Provides:
 - micropower information;
 - helpful recommendations;
 - flowcharts of the application process;
 - single-line diagrams;
 - the application form; and
 - the dispute forms.

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What does the AUC Application Form look like?

- 1 page 😊
- Developed by the AUC
- Has the Electricity Delivery Company name on it
- To be used (almost) everywhere throughout the province
 - except for Medicine Hat
 - with small differences with FortisAlberta and Central Alberta REA



Micro-Generation Application

Please check one of the following boxes:

(Please refer to the Application Guide, www.auc.ab.ca, for clarification.)

- Mini- MG ☐ – Inverter-based, 10 kW and smaller
 Small MG ☐ – From 0 kW to 150 kW (excluding Mini-MG)
 Large MG ☐ – Greater than 150 kW and less than 1 MW

(Note: For Mini MG, fields with * and ** are optional.)
 (Note: For a Small MG, please fill in fields denoted with *.)
 (Note: For a Large MG, please fill in fields denoted with **.)

APPLICANT IDENTIFICATION			
Name (Person):		** Company Name:	
		** Business Associate Code: not applicable	
Address:		City:	
Province:	Postal Code:	Phone:	Fax:
E-mail Address:		Preferred Method Of Contact: E-mail <input type="checkbox"/> Mail <input type="checkbox"/> Fax <input type="checkbox"/>	
Consultant Name:		Consultant Phone:	
Consultant Address/City/Province/Postal Code:			
Other Interested Parties:			
PROJECT DESCRIPTION			
Legal Land Description:		Site ID:	
Service Address:		Retailer Name:	
Have you notified your Retailer about your MG project? Yes <input type="checkbox"/> No <input type="checkbox"/>			
Generator Type: Solar <input type="checkbox"/> Wind <input type="checkbox"/> Hydro <input type="checkbox"/> Biomass <input type="checkbox"/> Fuel Cell <input type="checkbox"/> Other <input type="checkbox"/> specify:			
Generator To Utility Interface: * Inverter <input type="checkbox"/> * Non-Inverter <input type="checkbox"/> ** Induction <input type="checkbox"/> ** Synchronous <input type="checkbox"/>			
Generator Rated Capacity (kW):		** Demand (kVA):	Customer Annual Usage (kWh):
Voltage Level Of Connection:		Phase: Single <input type="checkbox"/> Three <input type="checkbox"/>	
Is the energy produced to be used primarily by the Generator Owner?		Yes <input type="checkbox"/> No <input type="checkbox"/>	
** Does your Generator Unit satisfy the anti-islanding requirements of CSA Standard C22.2 No.107.1?		Yes <input type="checkbox"/> No <input type="checkbox"/>	
Does your generator meet the MG Regulation's Renewable/Alternative Energy Definition?		Yes <input type="checkbox"/> No <input type="checkbox"/>	
Requested In-Service Date (YY-MM-DD):			
SUPPORTING DOCUMENTS ATTACHED			
Electric Single-Line Diagram: Yes <input type="checkbox"/> No <input type="checkbox"/>		Site Plan: Yes <input type="checkbox"/> No <input type="checkbox"/>	
Has an Electrical Permit been obtained? Yes <input type="checkbox"/> Not Yet <input type="checkbox"/>			
Have you met all applicable municipal and zoning requirements? Yes <input type="checkbox"/> No <input type="checkbox"/>			
Applicant Signature:		Date Of Application:	
WIRE OWNER USE ONLY			
Wires Owner's Application Reference #:		** AESO Asset ID:	
Received By:		Interconnection Line:	
Approval: Yes <input type="checkbox"/> No <input type="checkbox"/> – Reason(s) For Disapproval:			
Interconnection Agreement: Yes <input type="checkbox"/> No <input type="checkbox"/> Not Applicable <input type="checkbox"/>			
Meter Type: Interval <input type="checkbox"/> Cumulative <input type="checkbox"/>		Substation Number:	
Meter Installed Date:			

1. What size of MG system are you installing?



Micro-Generation Application

Please check one of the following boxes:

(Please refer to the Application Guide, www.auc.ab.ca, for clarification.)

Mini- MG	<input type="checkbox"/>	– Inverter-based, 10 kW and smaller
Small MG	<input type="checkbox"/>	– From 0 kW to 150 kW (excluding Mini-MG)
Large MG	<input type="checkbox"/>	– Greater than 150 kW and less than 1 MW

(Note: For Mini MG, fields with * and ** are optional.)

(Note: For a Small MG, please fill in fields denoted with *.)

(Note: For a Large MG, please fill in fields denoted with **.)

APPLICANT IDENTIFICATION	
Name (Person):	** Company Name:
Address:	ble
Province:	
E-mail Address:	<input type="checkbox"/> Mail <input type="checkbox"/> Fax <input type="checkbox"/>
Consultant Name:	Consultant Phone:
Consultant Address/City/Province/Postal Code:	
Other Interested Parties:	

- Check off one square
- A solar PV system or a microwind turbine on a home would most likely be a mini-MG unless it was a big solar PV system

2. Who are you?



- This is likely the easiest part.
- What happens if you put a PV system on your rented apartment?
Who applies for the grid-connection?

(See www.auc.ab.ca, for clarification.)

Please check one of the following

Mini- MG ☐ -- Inverter-based, 10 kW and smaller

Small MG ☐ -- From 0 kW to 150 kW (excluding Mini-MG)

Large MG ☐ -- Greater than 150 kW and less than 1 MW

(Note: For Mini MG, fields with * and ** are optional.)

(Note: For a Small MG, please fill in fields denoted with *.)

(Note: For a Large MG, please fill in fields denoted with **.)

APPLICANT IDENTIFICATION

Name (Person):

** Company Name:

** Business Associate Code: not applicable

Address:

City:

Province:

Postal Code:

Phone:

Fax:

E-mail Address:

Preferred Method Of Contact: E-mail ☐ Mail ☐ Fax ☐

Consultant Name:

Consultant Phone:

Consultant Address/City/Province/Postal Code:

Other Interested Parties:

3. Where is your micropower system installed?

PROJECT DESCRIPTION

Legal Land Description:

Site ID:

Service Address:

Retailer Name:

Have you notified your Retailer about your MG project? Yes ☐ No ☐

```
Generator To Utility Interface: * Inv
```

Generator Rated Capacity (kW):

Voltage Level Of Connection:

Is the energy produced to be used primarily for:

**** Does your Generator Unit satisfy the following conditions?**

Requested In-Service Date (YY-MM-DD):

SUPPORTING DOCUMENTS ATTACHED

Electric Single-Line Diagram: Yes ☐ No ☐

Site Plan: Yes ☐ No ☐

Applicant Signature: _____

Date Of Application:

4. Describe your micropower system?

PROJECT DESCRIPTION

Legal Land Description:

Service Address:

- Get your PV or microwind supplier to provide you with this information

Have you notified your Retailer about your MG project? Yes ☐ No ☐

Generator Type: Solar ☐ Wind ☐ Hydro ☐ Biomass ☐ Fuel Cell ☐ Other ☐, specify:

Generator To Utility Interface: * Inverter ☐ * Non-Inverter ☐ ** Induction ☐ ** Synchronous ☐

Generator Rated Capacity (kW): ** Demand (kVA): Customer Annual Usage (kWh):

Voltage Level Of Connection: Phase: Single ☐ Three ☐

Is the energy produced to be used primarily by the Generator Owner? Yes ☐ No ☐

** Does your Generator Unit satisfy the anti-islanding requirements of CSA Standard C22.2 No.107.1? Yes ☐ No ☐

Does your generator meet the MG Regulation's Renewable/Alternative Energy Definition? Yes ☐ No ☐

Requested In-Service Date (YY-MM-DD):

SUPPORTING DOCUMENTS ATTACHED

Electric Single-Line Diagram

Has an Electrical Permit been obtained?

Have you met all applicable code requirements?

- Anti-islanding – when the inverter either shuts down or disconnects the house from the grid.
- Any typical grid-connected inverter is acceptable...
- All off-grid inverters are not acceptable.

Applicant Signature:

Date Of Application:

5. Provide some other documents

SUPPORTING DOCUMENTS ATTACHED	
Electric Single-Line Diagram: Yes <input type="checkbox"/> No <input type="checkbox"/>	Site Plan: Yes <input type="checkbox"/> No <input type="checkbox"/>
Has an Electrical Permit been obtained? Yes <input type="checkbox"/> Not Yet <input type="checkbox"/>	
Have you met all applicable municipal and zoning requirements? Yes <input type="checkbox"/> No <input type="checkbox"/>	
Applicant Signature:	Date Of Application:

WIRE OWNER USE ONLY

Wires Owner's Appl
Received By:
Approval: Yes ☐
Interconnection Agr
Meter Type: Inter
Meter Installed Date
Please send comp
and documents to:

- Electric Single-Line Diagram (to be discussed next)
- Site Plan – doesn't always seem to be required
- Electric Permit (does not have to be done at this time) – it is highly recommended that you hire a **knowledgeable and properly qualified** electrician to install your system (rather than do it yourself)
- Municipal and zoning requirements...

Paperwork #2. A Single Line Diagram

#2. Task for your System's Electrical Designer:

1. Prepare a SLD (example SLDs are given in the Application Guide)
2. (optional) Submit your SLD to your electrician for review and to inform them.
3. (optional) Electrical inspector...
 - a) Look on the internet to see who the electrical inspectors are for your area.
 - b) Request a review and approval of your SLD by the electrical inspector so that they are in agreement with your design
 - c) Incorporate electrical inspector's comments into your SLD.
4. Check to ensure that all electrical components have Canadian electrical approvals – this is legally required, but some suppliers ignore it !!!

AUC's Single Line Diagram

Notes:

1. Wiring arrows indicate direction of electrical energy flow.
2. Grid-connection safety requirements are given by the Canadian Electrical Code Section 84, and the Wires Service Provider.
3. All components shall meet Canadian electrical product certification standards.
4. All components shall contain nameplate labels indicating the acceptable Certifying Organization.
5. An inverter with a Canadian Certification Mark thus meets the CSA's standard C22.2 No. 107.1 for utility grid-connection.
6. Separate Grid Disconnect is optional and may or may not be required by the Wires Service Provider.
7. If installed, Grid Disconnect shall comply with Canadian Electrical Code Rule 84-024 (2006).
8. Generator Disconnect and Grid Disconnects may be integral to the inverter.

Mini Micro-Generation Source

- ☐ Solar PV DC
- ☐ Micro-wind DC or AC
- ☐ Stirling engine DC or AC
- ☐ Micro-hydro DC or AC
- ☐ Biomass DC or AC
- ☐ Fuel cell DC
- ☐ Other: _____



Mini Micro-Generator

Brand: _____
 Model: _____
 Rated capacity: _____ kW
 Certification Mark: _____
 Location on site: _____

Type of Generator Interface

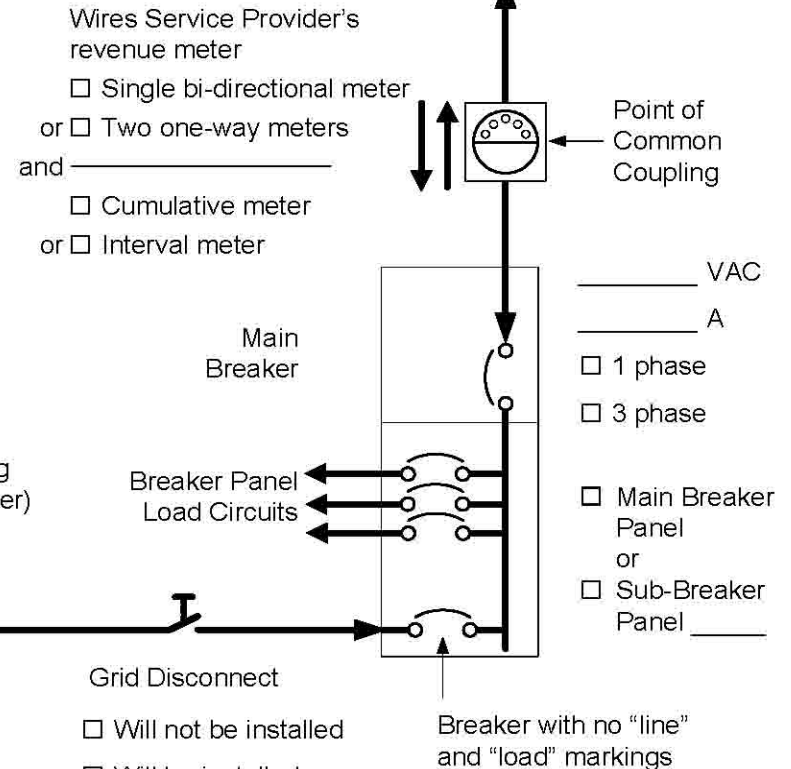
- ☐ DC to AC Inverter
- ☐ AC to DC to AC Inverter
- ☐ Non-Inverter with anti-islanding protection (equivalent to inverter)

Generator to Utility Interface

Brand: _____
 Model: _____
 Rated capacity: _____ kW_{AC}
 Certification Mark: _____
 Location on site: _____

Wires Service Provider: _____

Electric Distribution System



- This typical SLD is included in the AUC application Guide.
- Get your PV or microwind supplier to provide you with this information. You can use this SLD if your system fits with it, or you can draw your own.

Paperwork #3: Municipal Permits

1. Phone municipality's permit office and ask if the following are needed:
a **development** permit, **building** permit
 - Some require it, some don't
 - No development and building permits are needed for most common residential solar PV applications in Calgary
2. If required for **building permit**, get any structural part of the micropower system designed by a structural engineer.
3. If required, prepare **development permit** application:
letter of intro, site plan, elevation view, prepare building permit application
4. If required, submit **development permit** and **building permit** application to municipality along with any fees

Paperwork #4. Application Form

#4. Submit to the Electricity Delivery Company:

- the 1-page application form (page 34 of the Guide)
 - the single-line diagram (pages 25 or 26)
 - other approvals for wind turbines
 - municipal development permits...
- They will approve it;
or
- **Within 14 days**, they will send a notice to the AUC as to why they don't approve it (page 35).
 - The AUC will then decide on whether your project will proceed as submitted or not.
- If you have a **complaint** then you fill out page 36 and submit it to the AUC for a decision.

Paperwork #5. Sign the Operating Agreement

- This sets out what the Electricity Delivery Company wants you to agree to in connecting and operating your system safely.
- It is reasonable and not too legally complex.
- ENMAX Power's Operating Agreement is 3 pages long (only)
- (Section 5.2) You cannot sell your solar-PV house without prior written consent from ENMAX Power – and ENMAX Power shall not unreasonably withhold their consent.
- The new owner of your solar-PV house needs to have this same agreement with ENMAX Power.



INTERCONNECTION AND OPERATING AGREEMENT (LESS THAN 10 kW Inverter Based)

In consideration of ENMAX Power Corporation (the "**Wires Owner**") agreeing to allow the undersigned micro-generation customer (the "**MG Customer**") to connect the MG Customer's inverter-based 10 kW or smaller installed capacity Generation Facility located at [land location] (the "**Generation Facility**") to the Wires Owner's distribution system, MG Customer hereby agree to the following terms and conditions.

1.0 Eligibility

1.1 The MG Customer agrees that the connection between the Generation Facility and the Wires Owner's distribution system will be subject to all applicable laws and bound by the Wires Owner's Distribution Tariff Terms and Conditions of service (the "**Terms of Service**"), which are filed with, and approved by, the Alberta Utilities Commission ("AUC") from time to time, and which are available to you on request.

1.2 The MG Customer certifies that the MG Customer meets all of the requirements of AUC Rule 024.

2.0 Technical Requirements

2.1 The MG Customer represents and warrants that the MG Customer has installed, or covenants that the MG Customer will: (a) install prior to the connection of the inverter based Generation Facility to the Wires Owner's distribution system; and (b) maintain thereafter in accordance with and for the duration of this Agreement, an inverter satisfying Section 84 of the Canadian Electrical Code and CSA C22.2 No. 107.1-01 (General Use Power Supplies) or UL 1741.

2.2 The MG Customer covenants and agrees to perform regularly scheduled maintenance to the MG Customer's Generation Facility as outlined by its manufacturer in order to assure that its connection devices, protection systems, and control systems are maintained in good working order and in compliance with all applicable laws. The MG Customer agrees to keep a log of maintenance performed to the Generation Facility, along with records relating to any such maintenance, and to allow the Wires Owner to inspect the maintenance log within 5 days of a written request to do so by the Wires Owner.

2.3 The MG Customer agrees to the automatic disconnection of the MG Customer's Generation Facility from the Wires Owner's distribution system in the event of: (a) a planned or unplanned power outage on the Wires Owner's distribution system, (b) any abnormal operation of the Wires Owner's distribution system, (c) a direction from the Independent System Operator ("ISO") or other governmental authority, or (d) any other event that requires such disconnection pursuant to the Terms of Service, applicable law or good electricity practice.

2.4 The MG Customer covenants and agrees that the design, installation, maintenance, and operation of the MG Customer's Generation Facility will be conducted in a manner that ensures the safety and security of both the Generation Facility and the Wires Owner's distribution system.

2.5 The MG Customer acknowledges the Wires Owner's obligation to maintain the safety and reliability of its distribution system. In the event the Wires Owner determines, in its sole opinion, acting reasonably, that the MG Customer's Generation Facility is or is reasonably likely to: (i) cause damage to; and/or (ii) adversely affect other distribution system customers or the Wires Owner's assets, the MG Customer covenants and agrees that the MG Customer will disconnect the MG Customer's Generation Facility immediately from the Wires Owner's distribution system upon direction from the Wires Owner. The MG Customer covenants to correct the problem at the MG Customer's own expense prior to

Paperwork #6. Read the Terms and Conditions

- Terms and Conditions are approved by the AUC.
 - ENMAX Power's Ts and Cs are 75 pages long.
 - Goes through what services ENMAX Power offers you, what those will cost, and has details on your relationship with them.
 - You probably are already bound by them with your house's present connection to ENMAX Power.
- If you have a grid-connected generator, you "must purchase liability insurance for the operation of the generator that a prudent operator of a similar generator would maintain".



ENMAX POWER CORPORATION

DISTRIBUTION TARIFF

Terms and Conditions

Contact ENMAX Power: [generationinterconnection @ enmax.com](mailto:generationinterconnection@enmax.com) (with no spaces)

Contact Fortis Alberta: [microgen @ fortisalberta.com](mailto:microgen@fortisalberta.com) (with no spaces)

Costs to Connect to the Grid

- Your Electricity Delivery Company will let you know if there are any equipment costs to connect to the grid (such as transformers or line upgrades, *etc.*)
- For mini MG systems there should not be any costs.
- For larger systems there may be some costs (such as service or line upgrades).
- The Electricity Delivery Company's only choice is to send a "Notice of Dispute" to the AUC regarding any costs. The AUC will then decide on whether the costs are legitimate or not.
- If you have a complaint about the costs then you fill out a "Notice of Complaint" and submit it to the AUC for a decision.

Notice of Dispute

- 1 page
- Developed by the AUC
- To be used by the Electricity Delivery Company only
- To be used if the Electricity Delivery Company rejects your micropower system or wishes to charge you for any costs
- Submitted to the AUC
- The AUC's ruling is final.



Form B - Notice of Dispute

To be completed by Applicable Owner. Information required must include the following:

Contact Person who submits the Dispute Notice:	Name:
	Phone :
If Applicable Owner is represented by other party?	Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, provide Name and Contact Information:
Attached a copy of the MG Application Form:	Yes <input type="checkbox"/> No <input type="checkbox"/>
Type of Rejection:	<input type="checkbox"/> Qualification (MG Regulation - Section 2.2) <input type="checkbox"/> Extraordinary costs (MG Regulation – Section 4.3)
If dispute is related to Section 2.2, has owner served notice on customer within 14 days?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Rejection Rationale:	
Other information attached:	

Date of submitting this notice: _____

Notice of Complaint

- 1 page
- Developed by the AUC
- To be used by the micropower system owner
- To be used if the micropower system owner has a complaint against the Electricity Delivery Company
- Submitted to the AUC
- The AUC's ruling is final.



Form C - Notice of Complaint

To be completed by customer. Information required must include the following:

Contact Person who submits the Complaint Notice:	Name:
	Phone :
If Customer is represented by other party?	Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, provide Name and Contact Information:
Attached a copy of the MG Application Form.	Yes <input type="checkbox"/> No <input type="checkbox"/>
Type of Complaint:	<input type="checkbox"/> Interval Metering Costs (MG Regulation Section 3 (5))
Provide Full Details of the Complaint:	
Other information attached:	

Date of submitting this notice: _____

Paperwork #7. Selling Electricity to the Grid

- #7. Apply to your **Energy Retailer**, not your Electricity Delivery Company
 - Regulated Rate Option Energy Retailer
 - such as ENMAX Energy, City of Lethbridge, Direct Energy Regulated Services, EPCOR Energy, Prairie Power
 - Deregulated Energy Retailer such as
 - ENMAX Energy
 - Direct Energy
 - Alberta Energy Savings Plan
- We don't know exactly how this will be done...
 - It may be as simple as phoning your Energy Retailer and letting them know!
 - Some Electricity Delivery Companies contact your Energy Retailer for you.
- I presently am working through my first applications to FortisAlberta, ATCO Electric, Red Deer Electric Light and Power, EPCOR and Central Alberta REA and the Energy Retailers.

Selling Electricity to the Grid – what price?

- Mini MGs and small MGs

will get paid for the energy you sell, but not the delivery of the energy.

- Average regulated electrical energy price from ENMAX Energy in Calgary in 2008 was 10.89 ¢/kWh, which includes energy and GST only. This is what you will be paid for the electrical energy you export.
- Average regulated delivered energy price from ENMAX Energy in Calgary in 2008 was 13.70 ¢/kWh. This includes energy, delivery, municipal franchise fees, riders and GST. This is the price of the electricity you purchase for a house.

- Large MGs

- will get Alberta Electric System Operator's Electricity Market price
- changes every hour – look for it at <http://ets.aeso.ca>
- ranges between 1 ¢/kWh and 99 ¢/kWh

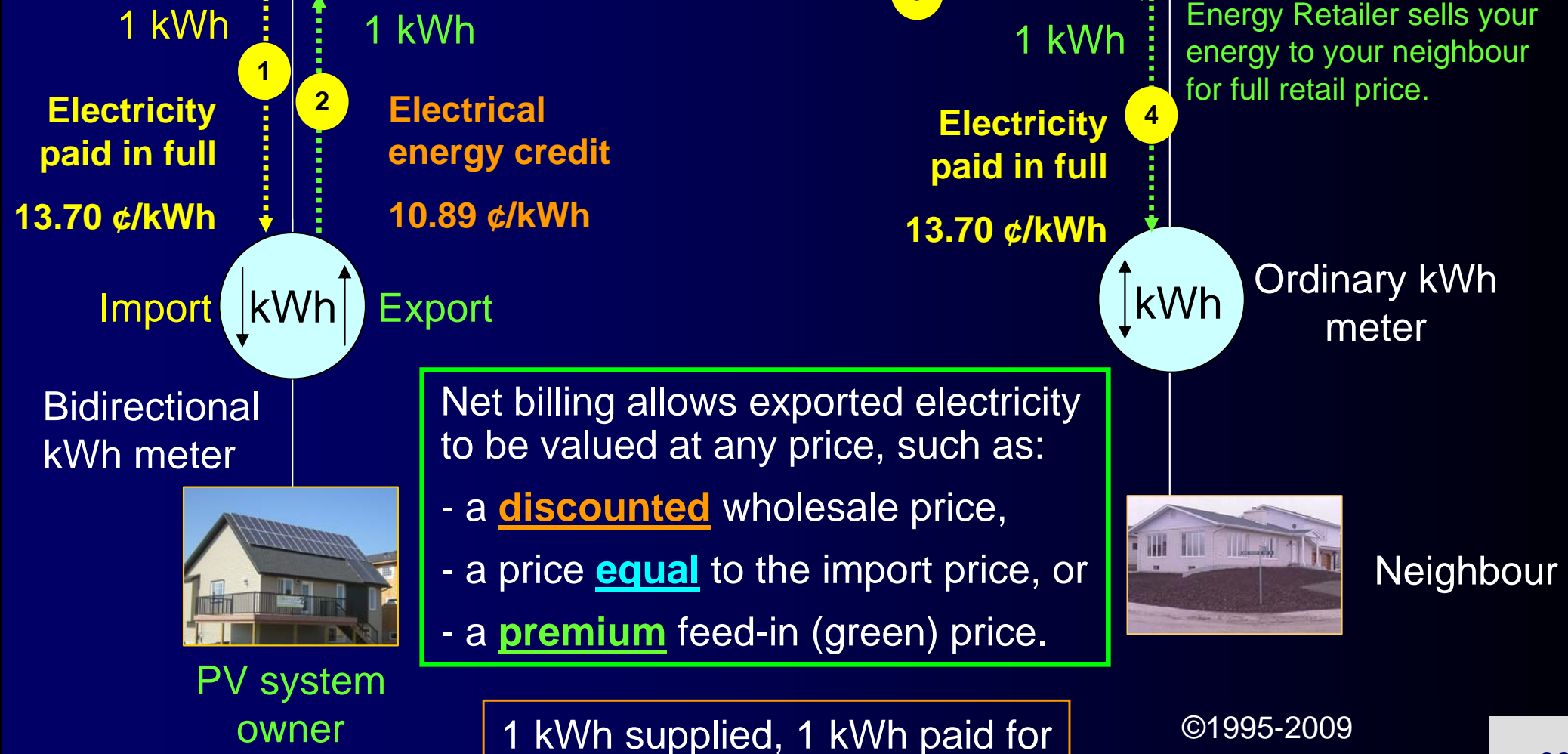
How does net billing work?

Energy Retailer,
Electricity Delivery
Company

Electricity is delivered to your neighbours by
your local Electricity Delivery Company for
their normal delivery fee.

Electricity
delivery wires

Energy Retailer sells your
energy to your neighbour
for full retail price.



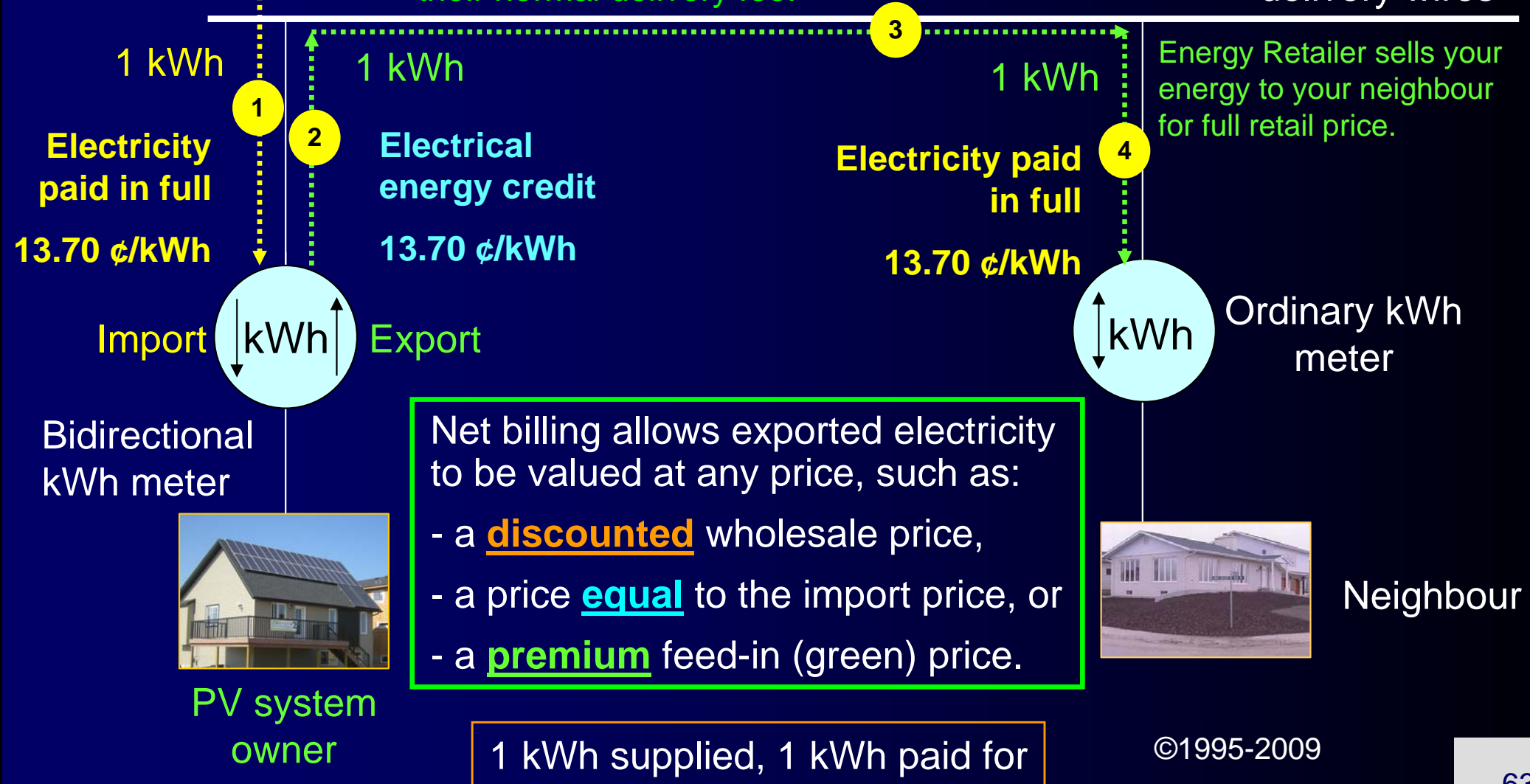
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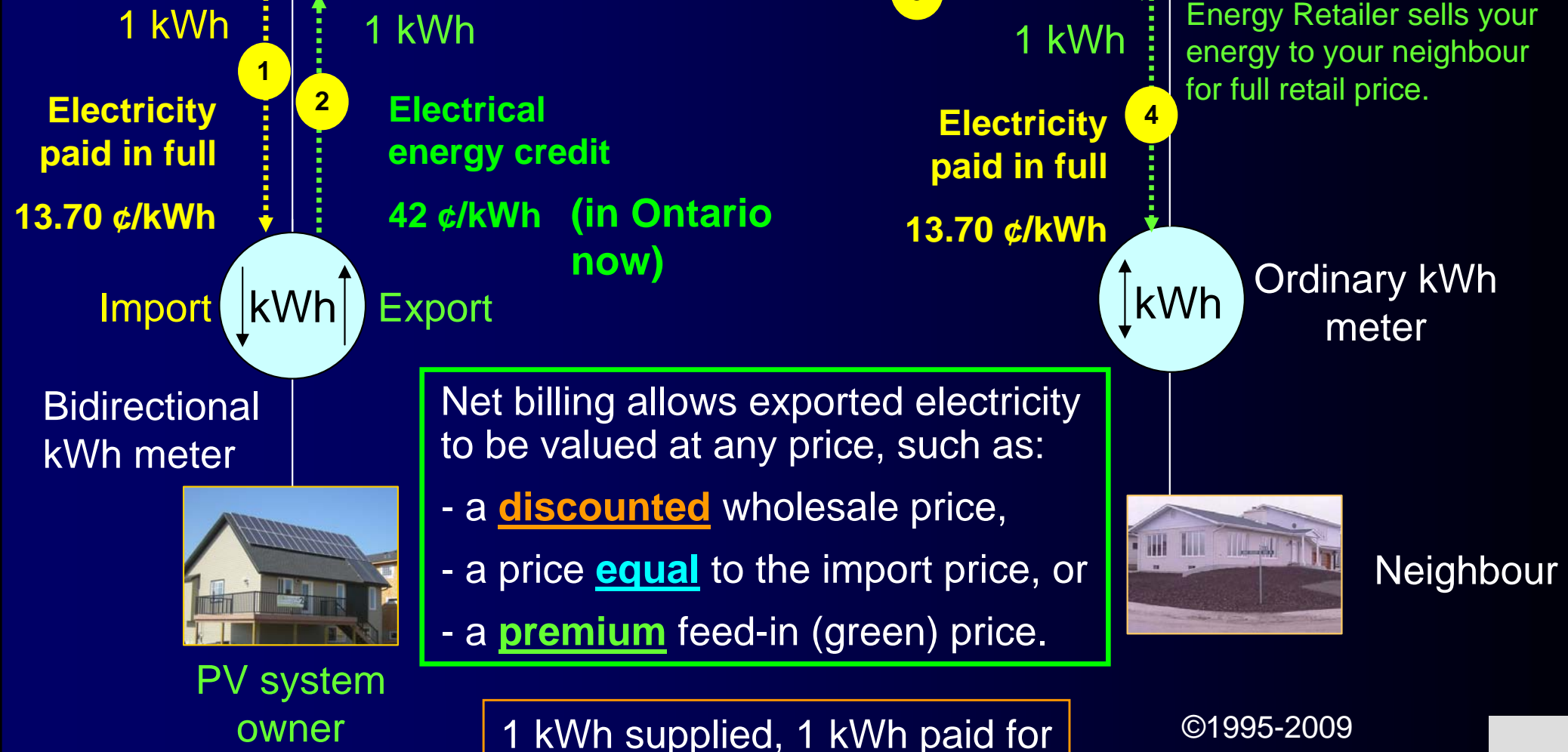
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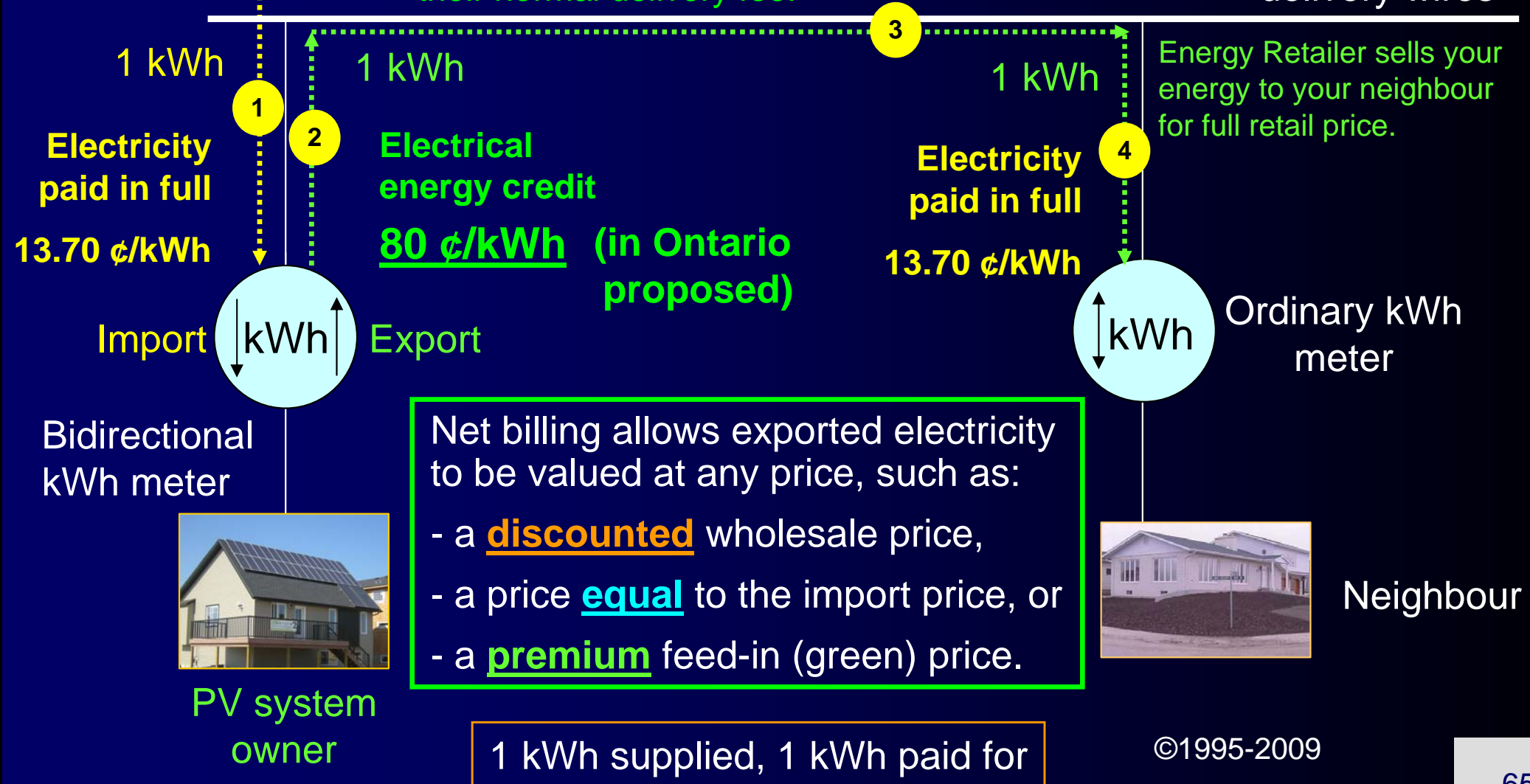
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Energy Retailer,
Electricity Delivery
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their normal delivery fee.

Electricity
delivery wires

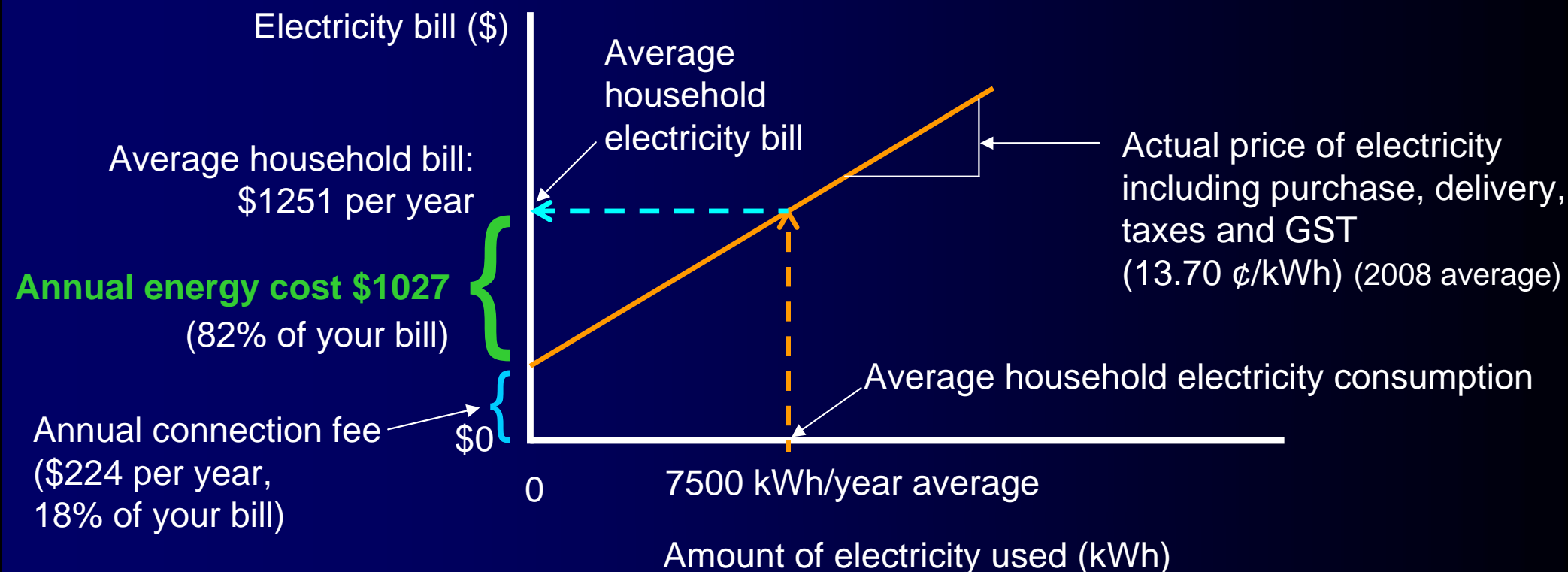
Energy Retailer sells your
energy to your neighbour
for full retail price.



Calgary Electricity Bill with ENMAX RRO

what it is now...

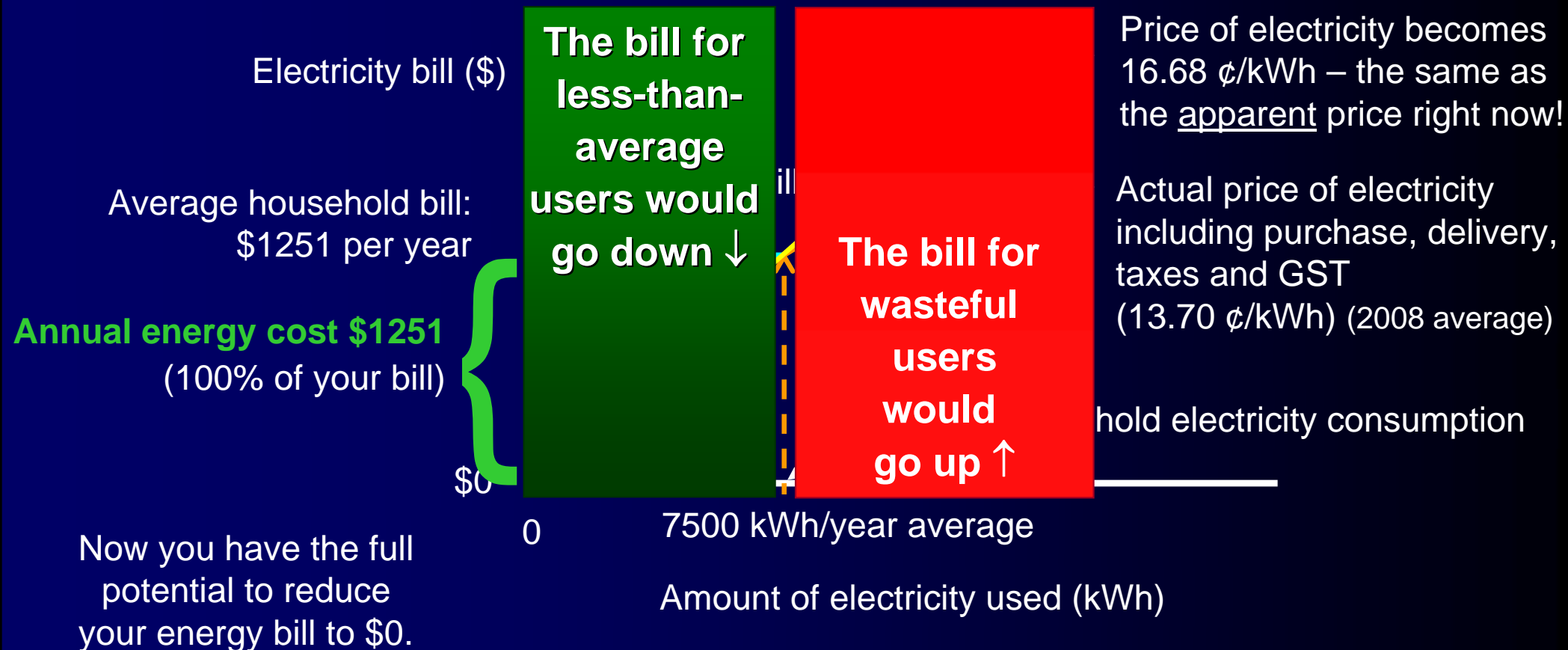
- Connection fee + energy fee
- Selling electricity, delivering electricity, municipal access fees, GST
- Energy fee = amount of electricity purchased and delivered + municipal access fee + GST
- For an average household, the potential savings are \$1027 (82% of your bill) unless you go completely off-grid.



Calgary Electricity Bill with ENMAX RRO



what it needs to become...

- Need much better price signals for people to conserve energy. This means “increase the electricity price”.
 - This would eliminate the connection fee and make the total bill dependent on the amount of electricity you use.
 - The bills for people who waste electricity would rise; the bills for people who conserve electricity would fall.
- It would be revenue neutral to ENMAX Energy and Power.



What will your net import electricity bill look like?

- If you have a **net import** it might look something like this:
 - Import meter reading on Feb 01..... 17976 kWh
 - Import meter reading on Jan 01..... 17768 kWh
 - Amount of electric energy you imported..... 208 kWh ←
 - Export meter reading on Feb 01..... 368 kWh
 - Export meter reading on Jan 01..... 234 kWh
 - Amount of electric energy you exported..... 124 kWh ←
 - Net energy imported.....(208 – 124 =) 84 kWh
 - Jan 01 to Feb 01 84 kWh at 10.89 ¢/kWh..... \$ 9.15
 - Administration charge..... + \$ 8.23
 - Sub-total of Electric Energy Charges..... = \$17.37

	ELECTRICITY	Provided by	EasyMax <small>BY EMAX ENERGY</small>
	OTHER		
Current Charge			
Micro Generation.....		\$ 24.80	CR

What will your net export electricity bill look like?

- If you have a **net export** it might look something like this:
 - Import meter reading on Jul 01..... 17976 kWh
 - Import meter reading on Jun 01..... 17868 kWh
 - _____
 - Amount of electric energy you imported..... 108 kWh ←
 - Export meter reading on Jul 01..... 667 kWh
 - Export meter reading on Jun 01..... 234 kWh
 - _____
 - Amount of electric energy you exported..... 433 kWh ←
 - Net energy imported.....(108 – 433 =) 325 kWh CR
 - Jun 01 to Jul 01 325 kWh at 10.89 ¢/kWh..... \$35.39 CR
 - Administration charge..... + \$ 8.23
 - Sub-total of Electric Energy Charges..... = \$27.16 CR

When will you be paid?

- If there is a **net export** of electricity, the payment for it will be **credited** to your account towards the next month's bill
- If at the end of the year you have a **credit**, then your Energy Retailer will **send you** a cheque.
- The payment schedule can be negotiated, but it is most reasonable that they only send you a cheque at the end of the year if there are any unused credits.

Example...	
<u>Month</u>	<u>Accumulated Credit</u>
Jan.....	\$0
Feb.....	\$0
Mar.....	\$10
Apr.....	\$15
May	\$30
Jun	\$40
Jul	\$60
Aug	\$70
Sep	\$60
Oct	\$40
Nov	\$15
<u>Dec</u>	<u>\$0</u>
Year.....	\$0

Can you make money at this?

- The intent with the micro-generation regulations:
 - for you to generate electricity for your own use
- Are you permitted to have a surplus of credit and thus be given a cheque at the end of the year?
 - Yes... but then you are a merchant power generator
(but then you have costs of some \$3500 per year for metering and electricity sales)
 - No... if you are a “micro-generator”
(and then you have zero costs for metering or electricity sales)
- The issue:
 - How do you determine whether or not your own electricity is to be used by yourself when you export 50% to 70% of it? (as with every PV system)
 - If your PV system capacity is < the capacity of the service equipment to your site, then it is “deemed” (pretended) that you use all the electricity yourself.
 - There won't be any issue most of the time for houses...
but for farms and acreages we are already seeing big issues.

Additional Steps: Business Associate (BA) Code

#8. If you are installing a **large** micro-generator you will need to obtain a Business Associate (BA) code

1. Fill in BA code application form on Petroleum Registries of Alberta web site

www.petroleumregistry.gov.ab.ca

2. Receive BA code by e-mail (1 week)

For Wind Turbines: Transport Canada

- If you are installing a microwind turbine
 1. Read Transport Canada's "Aeronautical Obstructions" web page
 2. Download Transport Canada's "Aeronautical Obstruction Clearance Form"
 3. Get a 1:50,000 chart identifying the site of the wind turbine
 4. Fill in and submit Aeronautical Obstruction Clearance Form and chart
 5. Discuss any wind turbine siting issues with Transport Canada as necessary
 6. Receive approval from Transport Canada (can take a few weeks)

For Wind Turbines: NAV Canada

- If you are installing a microwind turbine
 1. Download and read NAV Canada's "Land Use Proposals Submission Procedures" web page
 2. Download and read NAV Canada's "*Land Use Proposal Submission Form*"
 3. Determine if your site is more than 6 km from an airport or not
 4. Prepare supporting documents for the Land Use Proposal Submission Form
 5. Fill in and submit the Land Use Proposal Submission Form
 6. Discuss your Land Use Proposal with NAV Canada as necessary
 7. Receive NAV Canada's approval and Notice of Construction document (can take 8 weeks)
 8. Fill in and submit NAV Canada's Notice of Construction document

For Wind Turbines: Alberta Transportation

- If you are installing a microwind turbine
 1. Download and read Alberta Transportation's "*Roadside Development Application instructions*"
 2. Download and read Alberta Transportation's "*Roadside Development Application*"
 3. If necessary, fill in and submit the "*Roadside Development Application*"
 4. If required, receive Alberta Transportation's approval

Everyone is learning the new rules...

- The Electricity Delivery Companies, the Energy Retailers, me and you are learning the ropes of the new rules...
 - Some are doing a **great** job
 - ATCO Electric, FortisAlberta, Red Deer Electric Light and Power
 - Some are scrambling to get their staff trained to give you the correct information
 - EPCOR, Direct Energy, Alberta Energy Savings
- I am putting all the information that I know about onto my web space at **hme.ca /connect to the grid** (with no spaces) for you to get all information in one place

What are the next steps? Renewable Incentives

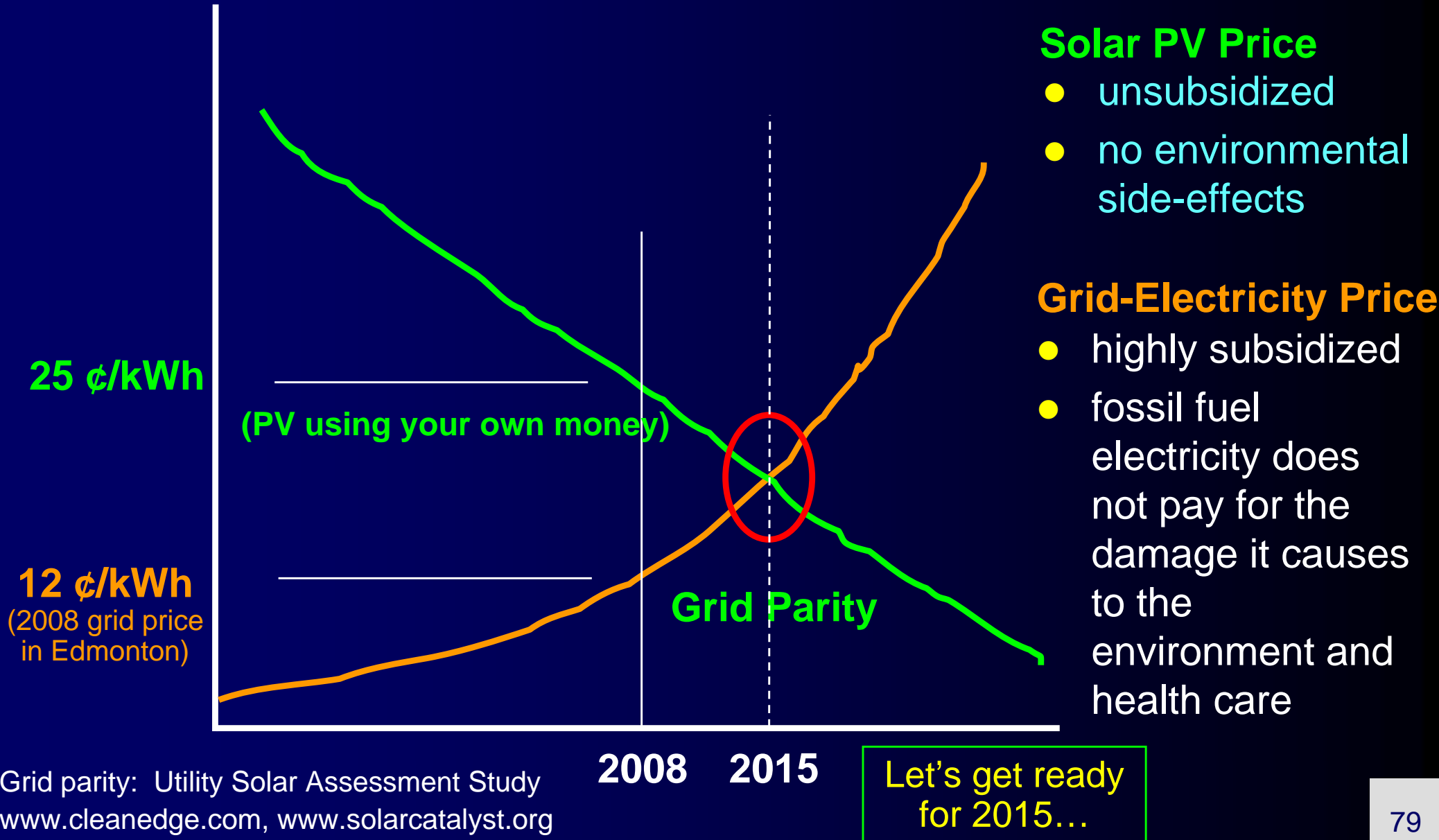
- Feed-in tariff
 - like Ontario, South Australia, Germany, Austria, France and others
- Subsidies
 - like Medicine Hat's Hat Smart green tax-shift programme, www.hatsmart.ca, that puts a small tax on natural gas and electricity to provide incentives for energy efficiency, solar PV and solar heating systems
 - Like Saskatchewan's Solar Heating Initiative for Today (SHIFT) and Net Metering Programmes (35% buy-down for renewable micropower systems) See [hme.ca /shift](http://hme.ca/shift)
- Renewable portfolio standard
 - Requiring all Energy Retailers to have a specified portion of renewable energy in all the electricity they sell

What are the next steps? Level Playing Field

- Create a level playing field for all energy sources so that the market, and not the government, is picking the winners
- We need governments to
 - Eliminate their policies that provide massive public subsidies for grid-electricity and natural gas
 - Determine the full extent of the damage that coal, oil and gas are having on
 - our health care budgets, and
 - our air, lakes, rivers, groundwater, soil and wildlife habitat
- Help Alberta companies
 - realise our huge potential for solar electricity, solar heating, wind electricity
 - in the same way that Alberta has helped companies for the last 90 years realise our coal, oil and natural gas resources, even though they are 300 times smaller than solar.

Declining PV Prices, Increasing Grid Prices

Solar PV's progress to parity with fossil fuels...



Why get your own solar system now?

- Why get your own solar PV system now
if grid parity is coming soon...
 - important question... important answer...
- Society needs leadership in order for it to change
 - You are the most significant leader...
 - If you don't do anything,
it's a sure thing that our governments won't do anything...
- You can get your own PV system now when there is sufficient supply,
or
in 2015 you can get in line when everyone else wants one and then
wait 5 years for delivery...
- This is already happening
 - 2 years to buy a wind turbine, 5 years to buy a fuel efficient jet,
some queues for solar PV

Steps To Get Your Solar PV System .../1,2

1. Getting started: information you need to plan your system

- You can find this out from project development consultants and equipment suppliers.
- Much information is available (books, internet, designers, consultants, suppliers)
- How does it work? What can you expect from it? What is the potential for solar electricity? What new products are available?

2. Selecting a designer

- Is your supplier going to design it?
- Who is reliable? What is their service like? What are their prices?
- Do they know what they are talking about?
- What solid experience do they have?

Steps To Get Your Solar PV System .../3,4

3. Designing a system

- What tilt and orientation of solar array?
- What location for the microwind turbine?
- What size to select? (solar array or microwind turbine, inverter, wiring, switches)
- What equipment brands to select?
- How much room will it take up (roof, basement, yard)?

4. Getting regulatory approvals

- Where from? See [hme.ca /connecttothegrid](http://hme.ca/connecttothegrid)
- How to fill them in?
- What costs?
- How much time to do this?

Steps To Get Your Solar PV System .../5,6

5. Financing

- Using savings, income, deep pockets, or banks?
- How much does it cost? What is the price of its electricity? How does this compare with other prices?

6. Purchasing it

- Who is reliable? What are their prices? What is their service like?
- Do they sell equipment that is legal to sell???
- How do you know you are getting a good deal?
- **What are you buying:** separate equipment? whole system?
energy supply? emissions reduction?
- **Only** buy solar and wind equipment from dealers who are members of
 - the Canadian Solar Industries Association www.cansia.ca or
 - the Canadian Wind Energy Association www.canwea.ca

Steps To Get Your System .../7

7. Installing it

- How do you find a knowledgeable installer?
- What relationship do they have with the supplier?
- Your electrician will:
 1. Take out an electrical permit and pay the permit fees
 2. Wire up your micropower system
 3. Call for an electrical inspection
- Notify your Electricity Delivery Company of completed installation

● Caution:

- Find an electrician who knows about DC electrical wiring (for solar PV), grid-connection, and wiring electricity sources.
- Make sure your electrical inspector is competent in knowing about equipment certification standards and installation, and the Canadian Electrical Code Sections 50 (solar PV) and 84 (grid-connection).

Steps To Get Your System .../8,9

8. Commissioning it

- Does it really work? How do you know it is working?
- Hire your system designer or supplier to:
 - Turn on and commission your micropower system
 - Make sure it is working as designed and intended
- Make sure your purchase contract describes what you are wanting to buy: equipment? system? energy supply? emissions reduction? and thus what will need to be commissioned.

9. Operating it

- What do you need to do? – if anything!
- What maintenance is there?
- Who is supplying the documentation for your system?
- Who is supplying your operation and maintenance training?

Celebrate and Watch Your Meter Spinning

(optional)

- Your leadership is very important...
- Invite colleagues, peers, local MPs, local MLAs, family and friends over to have a party
to celebrate your leadership, vision, and perseverance in adding to Alberta's energy security and green advantage.
 1. Send an e-message to the media inviting them to cover your news story.
 2. Watch your micropower system generate electricity.

Solar Energy Society
of Canada Inc.
SESCI
Calgary Chapter
[www.solaralberta.ca /calgary](http://www.solaralberta.ca/calgary)



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...we hold the future in our hands



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