

# Net Metering and Expedited / Standard Interconnection Process Seminar

March 14, 2013  
Co-hosted by:



**Western Massachusetts  
Electric**

The Northeast Utilities System



MASSACHUSETTS  
CLEAN ENERGY  
CENTER



**Unitil**

**nationalgrid**



**NSTAR  
ELECTRIC**

# Logistics & Introductions

- **Facilities**

- Emergency exits
- Restrooms
- Designated smoking area

- **Guests and presenters**

- DPU / DOER / MassCEC
- MA Utilities: National Grid / NSTAR / Unitil / WMECO

# DOER Welcome Remarks

## DOER's role in Distributed Generation:

- Assisting with incentives for clean energy
  - Portfolio Standards (RPS/SRECs/APS)
  - Net Metering
- Increasing awareness about policies
  - Interconnection
  - Rates
  - System Planning / Service Quality
- Advising on new policies
  - Streamlining Interconnection
  - Hands-on assistance with challenging projects

# MassCEC Welcome Remarks

- Dedicated to accelerating the success of clean energy technologies, companies and projects in MA.
  - Sector Development, Investments, Workforce Development, and Renewable Energy Generation
- Provide financial incentives to renewable energy projects.
  - Solar PV, Solar Thermal, Wind, and Hydro
  - Support interconnection studies for some projects
- Provide technical support to policymakers.
  - The DG Interconnection Report

# Interconnection Contacts & Tariff Links

- National Grid

- Email: [Distributed.Generation@us.ngrid.com](mailto:Distributed.Generation@us.ngrid.com)
- Alex Kuriakose | 781-907-1643, Bob Moran | 508-897-5656  
W. 'Adam' Smith | 781-907-5528, Vishal Ahirrao | 781-907-3002  
Kevin G. Kelly | 978-725-1325, Sean Diamond | 781-907-2611
- [http://www.nationalgridus.com/non\\_html/shared\\_interconnectStds.pdf](http://www.nationalgridus.com/non_html/shared_interconnectStds.pdf)

- NSTAR

- Joseph Feraci | 781-441-8196 ([joseph.feraci@nstar.com](mailto:joseph.feraci@nstar.com))
- Paul Kelley | 781-441-8531 ([paul.kelley@nstar.com](mailto:paul.kelley@nstar.com))
- [http://www.nstar.com/business/rates\\_tariffs/interconnections](http://www.nstar.com/business/rates_tariffs/interconnections)

- Unitil

- Email: [generator@unitil.com](mailto:generator@unitil.com)
- Tim Noonis | 603-773-6533 ([noonis@unitil.com](mailto:noonis@unitil.com))
- <http://www.unitil.com/energy-for-residents/electric-information/distributed-energy-resources/renewable-energy-generation>

- WMECO

- Email: [wmecodg@nu.com](mailto:wmecodg@nu.com)
- WMECO DG | 413-787-1087, Cindy Janke | 413-585-1750
- <http://www.wmeco.com/distributedgeneration>

# Other Information Resources

- Application for System of Assurance Cap Allocation  
Web site: [www.MassACA.org](http://www.MassACA.org)  
Email: [administrator@massaca.org](mailto:administrator@massaca.org)  
Phone: 877-357-9030
- Application for a Municipality or Other Governmental Entity Certification  
Web site: <http://www.env.state.ma.us/dpu/docs/electric/12-01/7912dpuordapc.pdf>  
Email: [dpu.netmetering@state.ma.us](mailto:dpu.netmetering@state.ma.us)  
Phone: 617-305-3500
- MA DG, Interconnection and Net Metering Information  
Web site: <http://sites.google.com/site/massdgic/>
- Interconnection Guide for Distributed Generation (Mass CEC)  
Web Site: [http://www.masscec.com/masscec/file/InterconnectionGuide toMA\\_Final%281%29.pdf](http://www.masscec.com/masscec/file/InterconnectionGuide%20toMA_Final%281%29.pdf)

# Safety Moment

## Avoid the Danger Zone

- Overhead power lines are not insulated and carry enough energy to cause serious injury or even death. Regard all wires as live.
- Keep yourself, your co-workers, tools and vehicles at least 10 feet away from electric lines and equipment.
- Stay alert. Keep ladders at least 10 feet away from power lines when carrying, moving and raising them.
- Make sure the area is clear of wires before working near trees or shrubs.
- Never attach or tie anything off to power lines or electrical equipment.
- If you need to dig, contact Dig Safe at least 72 business hours prior to digging to get underground utilities marked. Dig Safe can be reached by calling 811 or 1-888-dig-safe (1-888-344-7233). Also refer to ([www.digsafe.com](http://www.digsafe.com)).

# What We'll Be Covering Today

- Net Metering
- Q&A (Please hold questions until the end of the Net Metering segment)
- Basic Information
  - How the electric grid works
  - Overview of Distributed Generation
  - State vs FERC Interconnection Process
  - Overview of Interconnection Process
- Expedited/Standard Interconnection Process
- Q&A (Please hold questions until the end of the DG segment)



# 2013 Seminars

Seminars are held throughout Massachusetts. The 2013 schedule has not yet been fully developed. Times and locations are yet to be determined.

Below is the current schedule for 2013 seminars:

April 17	-	NSTAR
April 25	-	NGRID (Worcester)
June 13	-	WMECO (Hadley)
June 20	-	NSTAR
July 25	-	NGRID (Waltham)
August 29	-	WMECO (Hadley)
September 10	-	NSTAR
October 17	-	NGRID (North Andover)
November 7	-	WMECO (Hadley)

# Net Metering in Massachusetts

# Net Metering in Massachusetts

- December 2009 Net Metering Tariff, updated July 2012 by DPU.
- This tariff is effective until MA DPU issues a new tariff.
- Net Metering means the process of measuring the difference between electricity delivered by a Distribution Company and the electricity generated by a Class 1, Class II, or Class III Net Metering Facility and fed back to the Distribution Company.
- Three Classes of Net Metering Facilities in Net Metering Tariff:
  - Class I: Any generator up to 60 KW is eligible.
  - Class II: Agricultural, Anaerobic Digestion, Solar, or Wind Net Metering Facility over 60 KW but less than or equal to 1 MW (for Municipality or Other Governmental Entity it's "per unit").
  - Class III: Agricultural, Anaerobic Digestion, Solar, or Wind Net Metering Facility over 1 MW but less than or equal to 2 MW (for Municipality or Other Governmental Entity it's "per unit").

# Net Metering in Massachusetts

- Defines “Unit”.
- Facility is defined as one project on one parcel of land with one meter and one point of interconnection.
- Established “Public” and “Private” Facilities.
  - Public: Host Customer is certified as a Municipality or Other Governmental Entity by the DPU and has Class II or Class III Facility. Host Customer allocates to only customers who are certified Public. Ten MW limit per entity.
  - Private: All other Host Customers.
- Apply to DPU to be certified as a Public Facility.
  - Host Customer and those being allocated to.
  - Send copy of certificate(s) to utility.

# Net Metering in Massachusetts

- Limits based on each Distribution Company's peak load; 3% cap for Private and 3% cap for Public Facilities.
  - 80% of DC-STC rating used towards cap for capacity of Solar Facilities.
  - For WMECO, peak was 845 MW so 3% is 25.35 MW.
- Contributions towards limits are posted on each Distribution Company's web site and updated monthly.  
(For WMECO: <http://www.wmeco.com/netmetering>)
- System of Assurance set up by Cadmus Group, Inc.
- Eligibility granted by Mass ACA for cap allocation.
  - Must apply for cap allocation after you have an interconnection application.
- Small Renewable Energy Facilities are excluded from Private cap.
  - 10 kW single phase on single phase service, 25 KW three phase on three phase service.

# Net Metering in Massachusetts

- Class II and Class III need to install their own revenue grade production meter on generation.
- Class II and III need a phone line to Company revenue meter.
- Eligible electric customer (Host Customer) submits Schedule Z to utility with interconnection application.
  - Can submit up to two per calendar year once facility is on line.
- Dollar credits are applied to electric account(s), customer does not receive a check\*. No annual true up.

(\* NOTE = Distribution Company may elect to pay Host customer of Class III Facility. WMECO credits accounts.)

# Net Metering in Massachusetts

- Customer is compensated for energy produced after receiving approval to operate.
  - If you have questions regarding billing, compensation for exported energy, and/or credit allocation contact the WMECO Customer Care Department at 888-783-6617.
- Net metering credits may not be applied to the Host Customer's account until the next billing cycle.
  - WMECO customers may be on different billing cycles.
  - Credits allocated to other WMECO accounts may be applied on a different billing cycle than the Host Customer's account.
- Once online, review and implementation of a new Schedule Z will take a minimum of one billing cycle.

# Net Metering Credits

Energy use is “netted” over the billing period, typically a month

- If there is net energy usage, Host Customer is billed for net purchases.
- If there is net energy sales, credit is export kWh times the following

Class	min	max	Type	Credit the following charges			
				Default Service kWh **	Dist-ribution kWh	Trans-mission kWh	Trans-ition kWh
I	0	60 KW	Agricultural, Anaerobic Digestion, Solar, Wind	X	X	X	X
I*	0	60 KW	All Other				
II	>60 KW	1 MW	Agricultural, Anaerobic Digestion, Solar, Wind	X	X	X	X
III	>1 MW	2 MW	Agricultural, Anaerobic Digestion, Solar, Wind	X	Gov't only	X	X

- Customer still responsible for customer charges and demand charges, even if net export
- Tariff allows credits to be allocated (with limitations)

Notes: 1) Class I\* All Other (Non-Renewable) = Credited at average monthly clearing price set by ISO-NE. 2) Default Service kWh \*\* = Fixed default service rate.



# For Example Only – Your Answers May Vary

## Schedule Z

### Additional Information Required for Net Metering Service

Please fill out the form completely.

*Primary Account Holder*

Host Customer Name: John Doe Telephone: (413)-123-4567

Address of Facility: 123 Main Street, Town, MA 01000

Electric Account Number: 541234567891

Meter Number: 112233445 Application ID Number: 2A103-2010

A) Is the Host Customer applying for net metering service an electric company, generation company, aggregator, supplier, energy marketer, or energy broker, as those terms are used in M.G.L. c. 164, §§ 1 and 1F and 220 C.M.R. 11.00?

No  
 Yes (you are not eligible for net metering service)

NOTE: Definitions are:

“Electric company” means a corporation organized under the laws of the commonwealth for the purpose of making by means of water power, steam power or otherwise and for selling, transmitting, distributing, transmitting and selling, or distributing and selling, electricity within the commonwealth, or authorized by special act so to do, even though subsequently authorized to make or sell gas; provided, however, that electric company shall not mean an alternative energy producer; provided further, that a distribution company shall not include an entity which owns or operates a plant or equipment used to produce electricity, steam and chilled water, or an affiliate engaged solely in the provision of such electricity, steam and chilled water, where the electricity produced by such entity or its affiliate is primarily for the benefit of hospitals and nonprofit educational institutions, and where such plant or equipment was in operation before January 1, 1986; and provided further, that electric company shall not mean a corporation only transmitting and selling, or only transmitting, electricity unless such corporation is affiliated with an electric company organized under the laws of the commonwealth for the purpose of distributing and selling, or distributing only, electricity within the commonwealth. G.L. c. 164, § 1.

“Generation company” means a company engaged in the business of producing, manufacturing or generating electricity or related services or products, including but not limited to, renewable energy generation attributes for retail sale to the public. G.L. c. 164, § 1.

“Aggregator” means an entity which groups together electricity customers for retail sale purposes, except for public entities, quasi-public entities or authorities, or subsidiary organizations thereof, established under the laws of the commonwealth. G.L. c. 164, § 1.

“Supplier” means any supplier of generation service to retail customers, including power marketers, brokers and marketing affiliates of distribution companies, except that no electric company shall be considered a supplier. G.L. c. 164, § 1.

For the terms “energy marketer” and “energy broker,” please use the definition for “Electricity Broker,” which means an entity, including but not limited to an Aggregator, that facilitates or otherwise arranges for the purchase and sale of electricity and related services to Retail Customers, but does not sell electricity. Public Aggregators shall not be considered Electricity Brokers. 220 C.M.R. 11.02.

B) If applying for Net Metering as an Agricultural Net Metering Facility, please answer the following questions:

1) Is the Agricultural Net Metering Facility operated as part of an agricultural business?

*Does not apply to solar or wind*

*Complete if applicable, otherwise leave blank*

- Yes
- No (the facility is not eligible for Net Metering as an Agricultural Net Metering Facility)
- 2) Has the Commissioner of the Department of Agriculture recognized the business as an agricultural business?
  - Yes
  - No
- 3) Is the Agricultural Net Metering Facility located on land owned or controlled by the agricultural business mentioned in Item B.1 above?
  - Yes
  - No (the facility is not eligible for Net Metering as an Agricultural Net Metering Facility)
- 4) Is the energy from the Agricultural Net Metering Facility used to provide electricity to metered accounts of the agricultural business mentioned in Item B.1 above?
  - Yes
  - No (the facility is not eligible for Net Metering as an Agricultural Net Metering Facility)

C) If applying for neighborhood net metering, please answer the following questions:

*Complete if applicable, otherwise leave blank*

- 1) Are all participants served by the same distribution company?
  - Yes
  - No
- 2) Are all participants served by the same ISO-NE load zone?
  - Yes
  - No
- 3) Do all participants reside in the same municipality?
  - Yes
  - No

NOTE: If any of the answers to the questions in Item C are no, then the facility is ineligible for neighborhood net metering unless granted an exception by the Department of Public Utilities under 220 C.M.R. 18.09(6).

D) Please indicate how the Host Customer will report to the Company the amount of electricity generated by the net metering facility. The information is due twice each year: (1) by January 31 for the prior year’s generation; (2) by September 30 for the year-to-date generation:

- Provide the Company access to their ISO-NE GIS account
- Provide the Company access to their metering or inverter data
- Provide the Company with a report in writing of the generation by January 31 and again on September 30 each year

E) For any Billing Period in which the Host Customer earns Net Metering Credits, please indicate how the Distribution Company will apply them:

*Select One*

- and G) Apply all of the Net Metering Credits to the account of the Host Customer (Skip Items F and G)
- Net Metering Facilities skip Item F) Allocate all the Net Metering Credits to the accounts of eligible Customers (Class I and II Net Metering Facilities skip Item F)
- Both apply a portion of the Net Metering Credits to the Host Customer’s account and allocate a portion to the accounts of eligible Customers (Class I and II Net Metering Facilities skip Item F)

F) If the Host Customer has a Class III Net Metering Facility, please indicate below the range that best represents the number of eligible Customer accounts to which Net Metering Credits would be allocated. Alternatively, please complete Item G. This information will allow the Company to exercise its option to purchase Net Metering Credits from the Host Customer rather than allocating such credits.

The Company will notify the Host Customer within 30 days of the filing of Schedule Z whether it will allocate or purchase Net Metering Credits. If the Company elects to purchase Net Metering Credits, the Company will render payment by issuing a check to the Host Customer each Billing Period, unless otherwise agreed in writing by the Host Customer and Company. If the Company elects to allocate Net Metering Credits, the Host Customer must complete Item G and submit the revised Schedule Z to the Company.

- \_\_\_\_\_ Allocate Net Metering Credits to fewer than 50 eligible Customer accounts (Skip Item G)
- \_\_\_\_\_ Allocate Net Metering Credits to 100 or fewer eligible Customer accounts (Skip Item G)
- \_\_\_\_\_ Allocate Net Metering Credits to more than 100 eligible Customer accounts (Skip Item G)

G) Please state the total percentage of Net Metering Credits to be allocated.

\_\_\_\_\_ % Amount of the Net Metering Credit being allocated. The total amount of Net Metering Credits being allocated shall not exceed 100 %. Any remaining percentage will be applied to the Host Customer's account.

Please identify each eligible Customer account to which the Host Customer is allocating Net Metering Credits by providing the following information (attach additional pages as needed):

NOTE: If a designated Customer account closes, the allocated percentage will revert to the Host Customer's account, unless otherwise mutually agreed in writing by the Host Customer and the Company.

Complete if applicable, otherwise leave blank

Name: (Customer name as listed on Electric Bill)  
 Billing Address: (Service Address as listed on Electric Bill. This is NOT the Mailing Address)  
 Account number: (Billing account number as listed on Electric Bill)  
 Amount of the Net Metering Credit: \_\_\_\_\_ % (Amount being allocated to this account)

Name:  
 Billing Address:  
 Account number:  
 Amount of the Net Metering Credit: \_\_\_\_\_ %

Name:  
 Billing Address:  
 Account number:  
 Amount of the Net Metering Credit: \_\_\_\_\_ %

Name:  
 Billing Address:  
 Account number:  
 Amount of the Net Metering Credit: \_\_\_\_\_ %

Name:  
 Billing Address:  
 Account number:  
 Amount of the Net Metering Credit: \_\_\_\_\_ %

Complete if applicable, otherwise leave blank

Name:  
 Billing Address:  
 Account number:  
 Amount of the Net Metering Credit: \_\_\_\_\_ %

Name:  
 Billing Address:  
 Account number:  
 Amount of the Net Metering Credit: \_\_\_\_\_ %

Name:  
 Billing Address:  
 Account number:  
 Amount of the Net Metering Credit: \_\_\_\_\_ %

Name:  
 Billing Address:  
 Account number:  
 Amount of the Net Metering Credit: \_\_\_\_\_ %

Name:  
 Billing Address:  
 Account number:  
 Amount of the Net Metering Credit: \_\_\_\_\_ %

H) The Company may elect to seek to obtain capacity payments from ISO-NE for the electricity generated by Class II and III Net Metering Facilities. The Company will notify the Host Customer within 30 days of the filing of Schedule Z whether it will assert title to the right to seek those capacity payments. If the Company elects to assert title to those capacity payments, the Company will include any capacity payments received from ISO-NE in the Company's annual Net Metering Recovery Surcharge reconciliation.

I) The terms of this Schedule Z shall remain in effect unless and until the Host Customer executes a revised Schedule Z and submits it to the Company. Unless otherwise required herein or mutually agreed to in writing by the Host Customer and the Company, a revised Schedule Z shall not be submitted more than twice in any given calendar year.

J) A signature on the application shall constitute certification that (1) the Host Customer has read the application and knows its contents; (2) the contents are true as stated, to the best knowledge and belief of the Host Customer; and (3) the Host Customer possesses full power and authority to sign the application.

*Primary Account Holder* →

John Sae  
Host Customer

6/14/2012  
Date

# Net Metering Production Reporting

- Net Metering Tariff requires reporting of generator's kWh output.
- Class I, II, and III Facilities to provide in writing by January 31 and September 30 to WMECO.
- Class II and Class III Facilities may participate in MassCEC production tracking system (PTS).

# Compensation if not Net Metered

- If the customer will never export power – no concern.
- Customer with a Qualifying Facility (QF) certificate from FERC for the generator, can receive compensation under the local utility's Power Purchase Schedule (PPS) rate.  
(The PPS Short Run Energy rate is the ISO-NE locational marginal price (LMP).)
- If customer will export power – they can sell their exported power to the market through a registered market participant.
  - Customer become or work with a registered market participant to sell power.
  - Customer must pay for all power they use.

FERC QF page: <http://www.ferc.gov/industries/electric/gen-info/qual-fac.asp>

# Net Metering Summary

- If planning to Net Meter, submit Schedule Z with interconnection application.
- Host Customer must apply to DPU for certification as a Municipality or Other Governmental Entity and submit confirmation to Distribution Company.
  - If allocating credits to customers, those customers must also obtain certification.
- Correctly fill out Schedule Z.
  - Host Customer is primary account holder on the electric account.
  - Must be signed by Host Customer.
- If allocating, verify name/address/account info of electric customer(s) or will need to submit corrected form.
- Must obtain a cap allocation from Mass ACA.
- Production reporting is required.
- Class II and III Facilities - capacity registration required and associated ISO-NE OP 18 metering.

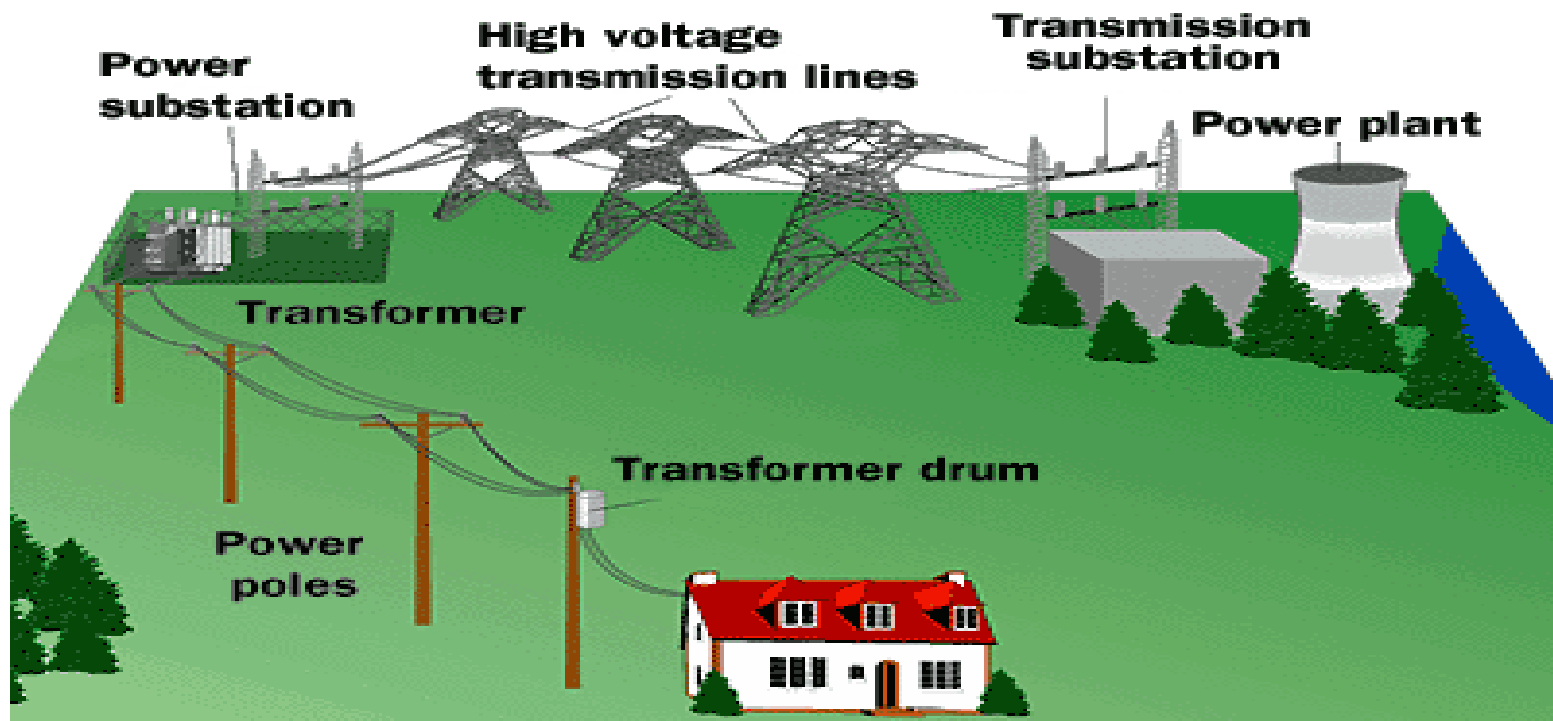
# Net Metering Questions?

# **State vs. FERC Interconnection Process**



# Distribution or Transmission?

MA interconnection standard applies to generators that will connect (grid tied) to the Distribution System (below 69KV). For transmission, apply to the Independent System Operator, ISO New England (ISO-NE).



# When is an Interconnection Request Submitted to the Utility?

- Interconnecting generation to a distribution circuit that does not have a wholesale transaction at the time of the application (**State Jurisdictional**)
- Generating facility will not be used to make wholesale sales of electricity in interstate commerce
- Energy will be consumed only on retail customer's site (will not export)
- Qualifying Facility, as defined by the Public Utility Regulatory Policies Act, selling 100% of its output to interconnected electric utility (i.e. through Power Purchase Schedule)

# Where to Submit Application = State or FERC Jurisdictional?

- Applications are either submitted to the utility or ISO-NE.
- Contact the utility for a determination.

## **ISO New England Information:**

- ISO-NE applications
  - [http://www.iso-ne.com/genrtion\\_resrcs/nwgen\\_inter/index.html](http://www.iso-ne.com/genrtion_resrcs/nwgen_inter/index.html)
- Contacts for interconnections:
  - Dave Forrest 413-540-4584, [dforrest@iso-ne.com](mailto:dforrest@iso-ne.com)
  - Cheryl Ruell 413-540-4219, [cruell@iso-ne.com](mailto:cruell@iso-ne.com)
- Contact for other questions:
  - ISO Customer Service 413-540-4220

# When is an Interconnection Request Submitted to ISO-NE?

- Interconnecting generation to a distribution circuit which already has a wholesale transaction (**FERC Jurisdictional**)
- You will be selling your power to a third party
- Increasing capacity of an existing generating facility\*
- Materially modify an existing generating facility\*
- Changing from energy only (NR) to energy and capacity unit (CNR)
- There is no minimum size
- Net Metered Facility which wants to enter the capacity market.

\* NOTE = Generation facility with wholesale sales of electricity in interstate commerce (i.e. not compensated under Net Metering Tariff or Power Purchase Schedule).

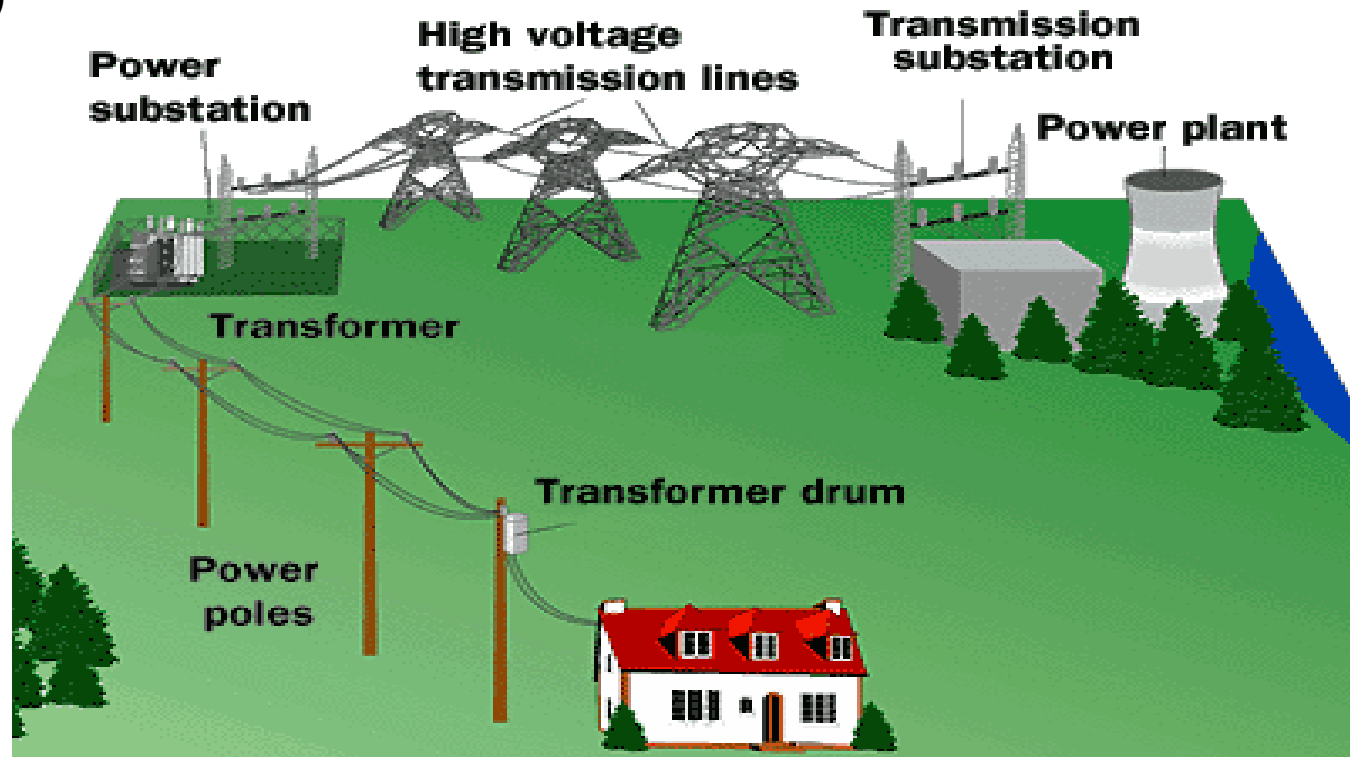
**DG Overview**

**And**

**Expedited / Standard**  
**Interconnection Process**

# How Does the Electric Grid Work?

- **Power Plants:** Produce electricity (usually large and centralized generators – nuclear, coal, natural gas)
- **Transmission System:** Transmits electricity at high voltage from power plants to distribution systems where the power is needed
- **Distribution System:** Distributes electricity to customers via lower voltage wires (below 69kV)



# What is the Interconnection Process?

- Seminar concerns Standards for Interconnecting Distributed Generation, the current tariff approved by the DPU in 2009.
- Process of getting an interconnection agreement from your local electric distribution company to connect a distributed generation system to their distribution system.
- This process is used by the four investor owned utilities (IOU) in Massachusetts (National Grid, NSTAR, Unitil and WMECO).
- Municipally owned utilities are not required to follow this process and may follow a different process.
- The process is used to make sure interconnecting DG systems are integrated into the distribution system responsibly with respect to impacts on reliability, power quality and safety.
- Everything starts with the application.

# Overview of Some Sections in Standard

- Introduction and Definitions – Section 1
- Process Overview – Section 3
- Operating Requirements - Section 6: Interconnecting Customer must operate system safely and to ensure no adverse affects or interference to other customers
- Disconnection – Section 7: Covers planned and unplanned outages
- Metering, Monitoring, and Communication – Section 8: Covers requirements for metering the account the generation is interconnected with
- Dispute Resolution Process – Section 9
- Confidentiality Statement – Section 10
- Insurance Requirements – Section 11: Many Interconnecting Customers with generation over 60 KW must maintain general liability insurance and name the appropriate utility as an additional insured
- Exhibits – shows all pro forma applications, agreements, terms and conditions, and Schedule Z



# Section 2 - Basic Understandings

**If you don't read any other portion of the standard – at least read this.**

- Interconnecting Customer / Customer and Company must enter into an agreement to interconnect generation.
- Consult with the Company before design to determine what utility facilities are present.
  - Company can supply general circuit information for the proposed location; voltage, radial/network, three phase/single phase.
  - Customers can not cross public ways or property lines, MA law protects utility franchise rights.
  - For RFP's – Customer should consult utility prior to going out for bid, WMECO can attend pre-bid meeting, all questions should be directed to customer.
- We're here to help guide you through the interconnection process.

# Section 4 - Interconnection Requirements a.k.a “Why all the Reviews/Studies?”

- 4.1 Interconnecting Customer will ensure its Facility meets or exceeds requirements including:
  - Transient Voltage Conditions
  - Noise and Harmonics
  - Frequency
  - Voltage Level
  - Machine Reactive Capability
- 4.2 Protection Requirements for New or Modified Facility Interconnections with the EPS. Covered in extensive detail. Someone on Interconnecting Customer’s team needs to understand and be responsible for meeting these requirements.
  - NPCC underfrequency settings; 57Hz in 0.16 seconds and 58 Hz in 32 seconds for DG 30 kW and larger
- As size of DG increases and more DG is added to circuits, more studies are required, even for smaller DG.
- There is an interconnection queue and applications are processed in order received on the circuit and/or substation.

# Section 5 - Responsibility for Costs

- Interconnecting Customer responsible for:
  - Costs of the review by the Company and any interconnection studies conducted. (Application Fee, Supplemental Review, Impact Study, Detailed Study)
  - All costs associated with the installation and construction of the Facility and associated interconnection equipment on the Interconnecting Customer's side of the PCC.
  - All costs incurred by Company to design, construct, operate and maintain the System Modifications. Can include ongoing charges.
    - Costs for new services, service upgrades, service relocations, etc.
    - Construction costs include taxes (CIAC).

# Third Party Ownership

- Tariff allows for third party ownership of generation
- Application must include information for both generation owner (***Interconnecting Customer***) and electric customer (***Customer***)
- Utility (***Company***) will correspond with owner, customer and installer
  - Listing email addresses for all parties on application makes communication easier and faster
- Utility will enter into agreement with our electric customer (Attachment G of tariff)

# Expedited / Standard Process

- APPLIES TO:
  - Projects which do not qualify for Simplified Process.
  - Single phase listed single-phase inverter based systems above 10.0 KW on single phase service.
  - Three phase listed three-phase inverter based systems above 25.0 KW on three phase service.
  - Inverter based systems with service configuration mismatch (i.e. single phase inverter(s) on three phase service).
  - All non-inverter based generation (i.e. synchronous and induction generators) and non-listed inverter based systems.

# Everything Starts with the Application

- A complete application includes:
  - All appropriate sections of 4-page application completely filled out and **SIGNED** by the Interconnecting Customer. Customer will likely need assistance from vendor/engineer.
  - **Application fee** \$3/KW (\$300 minimum and \$2,500 maximum). This fee covers the initial review and is non-refundable.
  - **Stamped electric one-line diagram**, showing relay controls (3 copies, 1 paper copy if submitted electronically) (Stamped by Massachusetts Electrical PE)
  - **Site diagram** (3 copies, 1 paper copy if submitted electronically)
  - Three copies of any **supplemental information** – i.e. inverter cut sheet, UL 1741 certification, TCC curves of fuses used etc. (if electronic – single copy acceptable)
  - Identify electric utility customer and owner of proposed generation
  - **Schedule Z** if planning to be compensated under Net Metering Tariff
- Errors or problems with application will slow down the process and “stop the clock”
- Send **Electronic copy** of all documents if possible – Easier to distribute, saves paper and is faster.

# Expedited/Standard Application

- **Larger generators can impact the electric power system and must be reviewed individually**
- **Expedited** – This is for Listed Facilities that pass certain pre-specified screens on a radial EPS.
- **Standard** – This is for all facilities not qualifying for either the Simplified or Expedited interconnection processes on radial and spot network EPS, and for all Facilities on area network EPS.

Review Process	Expedited	Standard
Eligible Facilities	Listed DG	Any DG
Acknowledge receipt of Application	(3 days)	(3 days)
Review Application for completeness	10 days	10 days
Complete Review of all screens	25 days	↓
Complete Supplemental Review (if needed)	20 days	
Complete Standard Process Initial Review	↓	20 days
Send Follow-on Studies Cost/Agreement		5 days
Complete Impact Study (if needed)		55 days
Complete Detailed Study (if needed)	↓	30 days
Send Executable Agreement (Note 3)		10 days
Total Maximum Days (Note 4)	40/ 60 days (Note 5)	125/150 days (Note 6)
Notice/ Witness Test	1-2 days with 10 day notice or by mutual agreement	By mutual agreement

Table 1 of Section 3

# Expedited

## Time Frame

### Fee Schedule

	Expedited
	Listed DG
Application Fee (covers Screens)	\$3/kW, minimum \$300, maximum \$2,500
Supplemental Review or Additional Review (if applicable)	Up to 10 engineering hours at \$125/hr (\$1,250 maximum) (Note2)
Standard Interconnection Initial Review	N/A
Impact and Detailed Study (if required)	N/A
Facility Upgrades	Actual cost
O&M (Note 5)	TBD
Witness Test	Actual cost, up to \$300 + travel time (Note 6)

Table 2 of Section 3

- Typically little or no (utility) system modifications required. If meter only – usually no charges passed to customer.
- Application fee plus any Supplemental Review charges up to \$1,250.
- Relay control system must be well defined to make supplemental review easier.
- Witness Test fee of up to \$300 plus travel is required.

Review Process	Expedited
Eligible Facilities	Listed DG
Acknowledge receipt of Application	(3 days)
Review Application for completeness	10 days
Complete Review of all screens	25 days
Complete Supplemental Review (if needed)	20 days
Complete Standard Process Initial Review	
Send Follow-on Studies Cost/Agreement	
Complete Impact Study (if needed)	
Complete Detailed Study (if needed)	
Send Executable Agreement (Note 3)	10 days
Total Maximum Days (Note 4)	40/ 60 days (Note 5)
Notice/ Witness Test	1-2 days with 10 day notice or by mutual agreement

Table 1 of Section 3 40

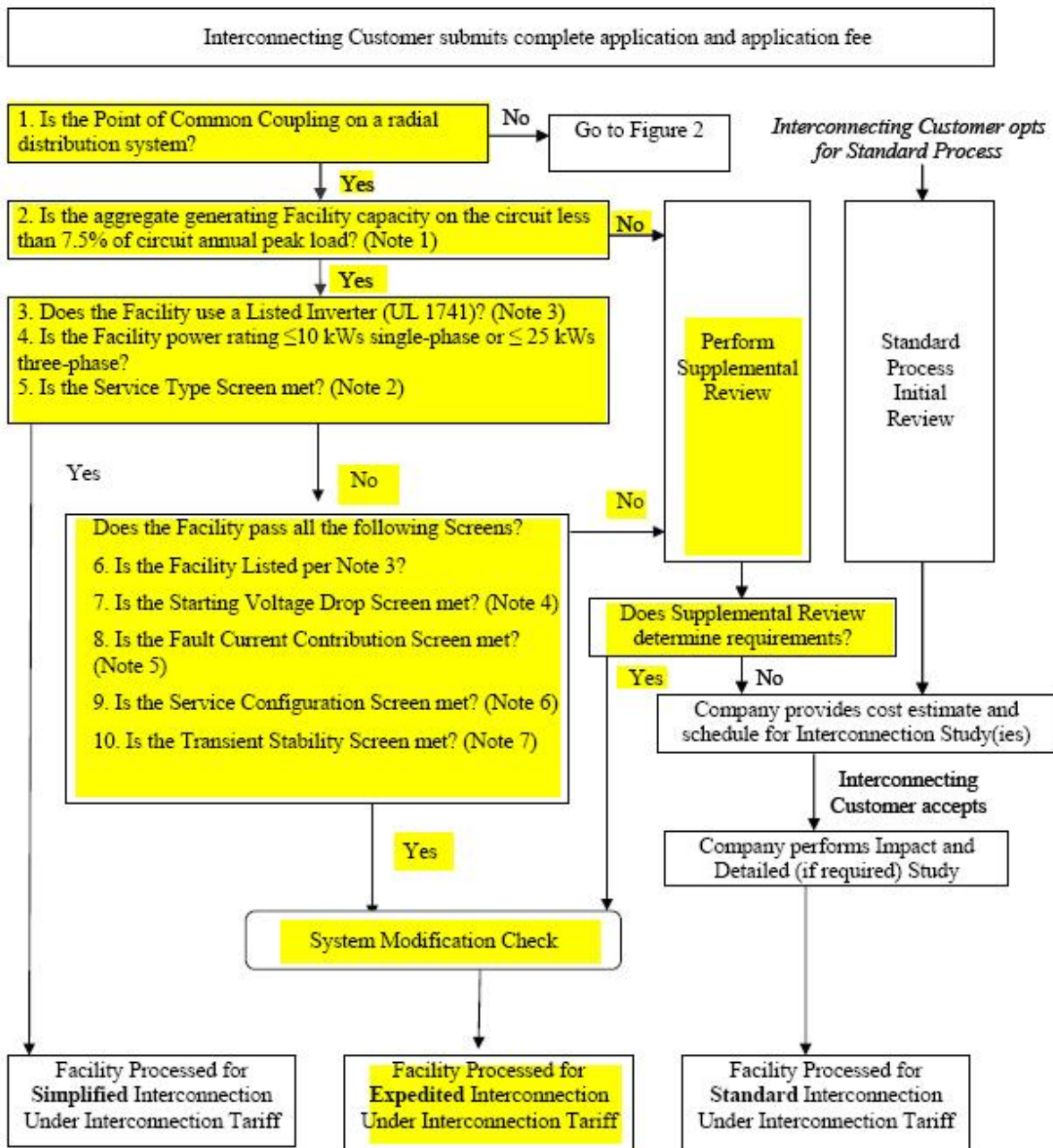


# Expedited Process

Highlighted path shows Expedited Process

## Examples for Expedited:

- Larger PV systems with UL 1741 listed inverters.
- Non-listed systems like small cogeneration or hydro with appropriate relay control package, assuming supplemental review can determine requirements.



Section 3 Figure 1

# Standard

## Time Frame

### Fee Schedule

	Standard
	Any DG
Application Fee (covers Screens)	\$3/kW, minimum \$300, maximum \$2,500
Supplemental Review or Additional Review (if applicable)	N/A
Standard Interconnection Initial Review	Included in application fee (if applicable)
Impact and Detailed Study (if required)	Actual cost (Note 3)
Facility Upgrades	Actual cost
O&M (Note 5)	TBD
Witness Test	Actual Cost

Table 2 of Section 3

- After initial review and/or supplemental review, customer may need to enter Standard Process
- Customer can request Standard Process
- Appropriate study agreement sent for signature and payment
- Studies can include:
  - Impact Study: Determine the impact of the new generator on potentially affected systems, including EPS, other customers and other generators
  - Detailed Study: Refine required utility system modifications and cost, writing of construction work orders, all permitting
- ISO notification and possibly Transmission Study if 1 MW or larger
- After studies – Interconnection Agreement sent for signature
- Witness Test fee is actual cost.

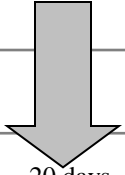
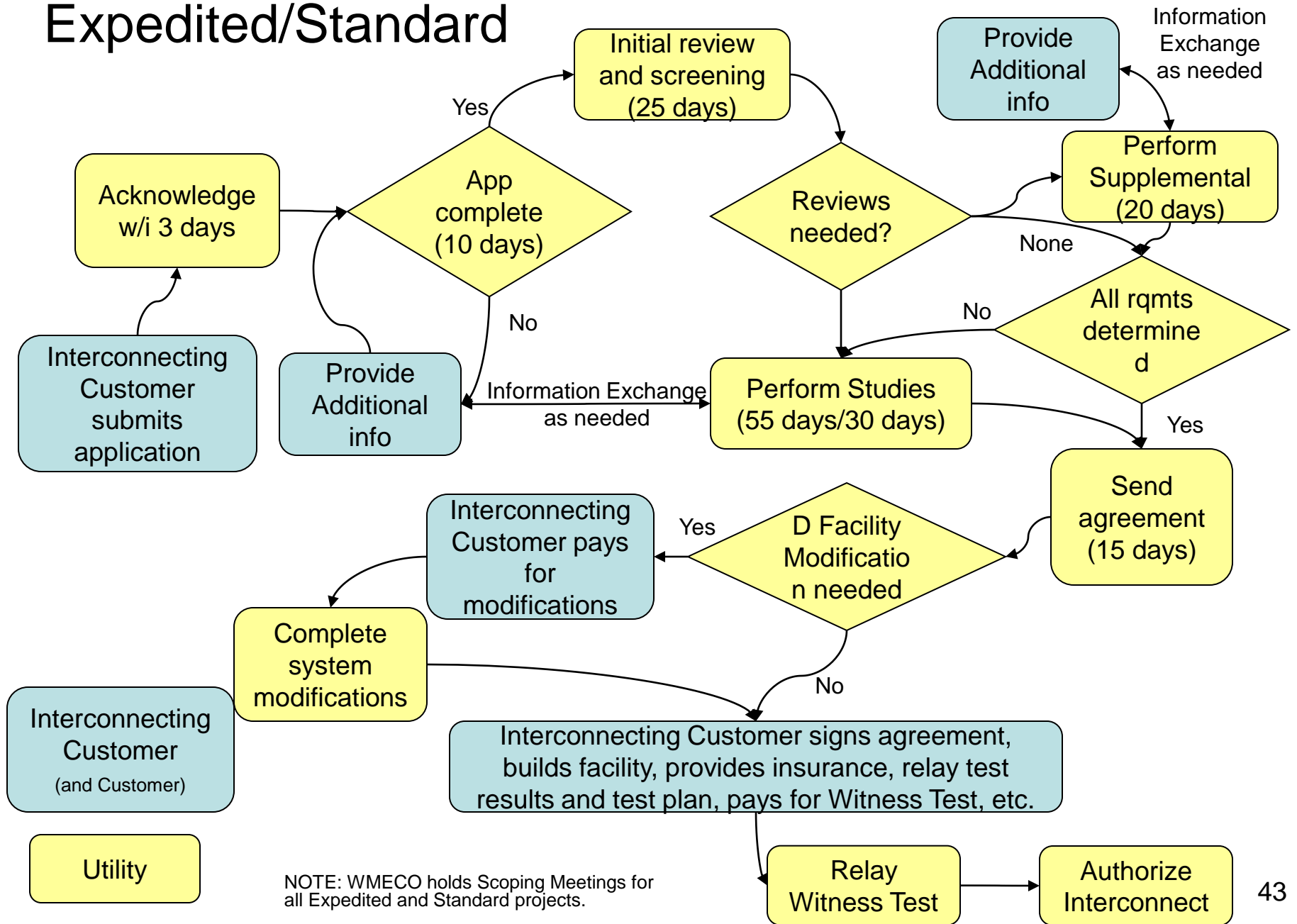
Review Process	Standard
Eligible Facilities	Any DG
Acknowledge Receipt of Application	(3 days)
Review Application for Completeness	10 days
Complete Review of All Screens	
Complete Supplemental Review (if needed)	
Complete Standard Process Initial Review	20 days
Send Follow-on Studies Cost/Agreement	5 days
Complete Impact Study (if needed)	55 days
Complete Detailed Study (if needed)	30 days
Send Executable Agreement (Note 3)	15 days
Total Maximum Days (Note 4)	125/150 days (note 6)
Notice/ Witness Test	By mutual agreement

Table 1 of Section 3

# Expedited/Standard



# Example – Customer Installing 2 MW PV System

10/1/2009

M.D.P.U. No. 1039E

## Generating Facility Expedited/Standard Process Interconnection Application

### Contact Information

Date Prepared: 8/28/2012

#### Legal Name and address of Interconnecting Customer (or, Company name, if appropriate)

Customer or Company Name: Example Solar, LLC Contact Person, if Company: Molly Jones  
Mailing Address: 123 Fourth Street  
City: Washington State: NJ Zip Code: 08888  
Telephone (Daytime): 123-456-7890 (Evening): \_\_\_\_\_  
Facsimile Number: 987-654-3210 E-Mail Address: mjsolar@exsolar.com

#### Alternative Contact Information (e.g., system installation contractor or coordinating company)

Name: \_\_\_\_\_  
Mailing Address: \_\_\_\_\_  
City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_  
Telephone (Daytime): \_\_\_\_\_ (Evening): \_\_\_\_\_  
Facsimile Number: \_\_\_\_\_ E-Mail Address: \_\_\_\_\_

Ownership (include % ownership by any electric utility): 100% Interconnecting Customer

**Confidentiality Statement:** “I agree to allow information regarding the processing of my application (including my name and address) to be reviewed by the Massachusetts DG Collaborative that is exploring ways to further expedite future interconnections.” Yes \_\_\_\_\_ No \_\_\_\_\_

**Must be included  
and accurate**

**Generating Facility Information**

Address of Facility: 99 Old New Main Street - The Town of Nowhere Contact: John Schmidt jschmidt@nowhere.ma.us

City: Nowhere State: MA Zip Code: 01234

Electric Service Company: WMECO Account Number: \_\_\_\_\_ Meter Number: NEW SVC

Type of Generating Unit: Synchronous \_\_\_\_\_ Induction \_\_\_\_\_ Inverter

Manufacturer: Ted's Inverters Model: TI PV500 (4 Units)

Nameplate Rating: 2000 (kW) \_\_\_\_\_ (kV Ar) 208 (Volts) Single  or Three  Phase

**Needed if Net Metered PV**

Fuel Cell  Recip Engine  Gas Turb  Steam Turb  Microturbine  PV  Other \_\_\_\_\_

Solar  Wind  Hydro  Diesel  Natural Gas  Fuel Oil  Other \_\_\_\_\_ (Specify)

For Solar PV provide system total DC-STC rating: 2123.4 (KW)

**If 3rd party owned, include Customer information here**

IEEE 1547.1 (UL 1741) Listed? Yes

permit from DEP? Yes \_\_\_\_\_ No  Not Sure \_\_\_\_\_

If "yes", have you applied for it? Yes  No

Planning to Export Power? Yes  No \_\_\_\_\_ A Cogeneration Facility? Yes \_\_\_\_\_ No \_\_\_\_\_

Anticipated Export Power Purchaser: \_\_\_\_\_

Export Form? Simultaneous Purchase/Sale \_\_\_\_\_ Net Purchase/Sale \_\_\_\_\_ Net Metering  Other \_\_\_\_\_ (Specify)

**"Company" is WMECO, not you**

7/1/2013 Est. In-Service Date: 9/1/2013 Agreement Needed By: 6/1/2013

**Application Process**

**Must be signed by Interconnecting Customer**

I hereby certify that, to the best of my knowledge, all of the information provided is true and correct.

Interconnecting Customer Signature: Molly Jones Title: Director Date: 8/28/2012

The information provided in this application is complete:

Company Signature: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

**Generating Facility Technical Detail**

Date: 8/28/2012

Information on components of the generating facility that are currently Listed:

Equipment Type	Manufacturer	Model	National Standard
1. Inverter	___ Ted's Inverters	___ TI PV500	___ UL 1741
2. Relay	___ Ted's Relays	___ T1000	___
3. Switchgear	___ Ted's Power Equipment	___ TS2000	___
4.	___	___	___
5.	___	___	___
6.	___	___	___

**"Generating Unit" is an inverter, wind turbine etc.**

**4**

Total Number of Generating Units in Facility? 4

Generator Unit Power Factor Rating: 0.99

Max Adjustable Leading Power Factor? \_\_\_\_\_

Max Adjustable Lagging Power Factor? \_\_\_\_\_

Generator Characteristic Data (for all inverter-based machines)

Max Design Fault Contribution Current? 1600 A at 208 V Instantaneous \_\_\_\_\_ or RMS? X

Harmonics Characteristics: < 3% THD

Start-up power requirements: \_\_\_\_\_

Generator Characteristic Data (for all rotating machines)

Rotating Frequency: \_\_\_\_\_ (rpm)

Neutral Grounding Resistor (If Applicable): \_\_\_\_\_

Additional Information for Synchronous Generating Units

Synchronous Reactance, X<sub>d</sub>: \_\_\_\_\_ (PU)

Transient Reactance, X'<sub>d</sub>: \_\_\_\_\_ (PU)

Subtransient Reactance, X''<sub>d</sub>: \_\_\_\_\_ (PU)

Neg Sequence Reactance, X<sub>2</sub>: \_\_\_\_\_ (PU)

Zero Sequence Reactance, X<sub>0</sub>: \_\_\_\_\_ (PU)

kVA Base: \_\_\_\_\_

Field Voltage: \_\_\_\_\_ (Volts)

Field Current: \_\_\_\_\_ (Amps)

Additional information for Induction Generating Units

Rotor Resistance, R<sub>r</sub>: \_\_\_\_\_

Stator Resistance, R<sub>s</sub>: \_\_\_\_\_

Rotor Reactance, X<sub>r</sub>: \_\_\_\_\_

Stator Reactance, X<sub>s</sub>: \_\_\_\_\_

Magnetizing Reactance, X<sub>m</sub>: \_\_\_\_\_

Short Circuit Reactance, X<sub>d</sub>'': \_\_\_\_\_

Exciting Current: \_\_\_\_\_

Temperature Rise: \_\_\_\_\_

Frame Size: \_\_\_\_\_

Total Rotating Inertia, H: \_\_\_\_\_

Per Unit on kVA Base: \_\_\_\_\_

Reactive Power Required In Vars (No Load): \_\_\_\_\_

Reactive Power Required In Vars (Full Load): \_\_\_\_\_

Additional information for Induction Generating Units that are started by motoring

Motoring Power: \_\_\_\_\_ (kW)

Design Letter: \_\_\_\_\_

**Interconnection Equipment Technical Detail**

Date: 8/28/2012

Will a transformer be used between the generator and the point of interconnection? Yes  No

Will the transformer be provided by Interconnecting Customer? Yes  No

Transformer Data (if applicable, for Interconnecting Customer-Owned Transformer):

Nameplate Rating: 2000 (kVA) Single  Or Three  Phase

Transformer Impedance: 4.9 (%) on a 2000 kVA Base

If Three Phase:

Transformer Primary: 13,800 (Volts)  Delta  Wye  Wye Grounded  Other

Transformer Secondary: 208 (Volts)  Delta  Wye  Wye Grounded  Other

Transformer Fuse Data (if applicable, for Interconnecting Customer-Owned Fuse):

(Attach copy of fuse manufacturer's Minimum Melting & Total Clearing Time-Current Curves)

Manufacturer: Ted's Fuses Type: TS800 Size: 800 A Speed: \_\_\_\_\_

Interconnecting Circuit Breaker (if applicable):

Manufacturer: \_\_\_\_\_ Type: \_\_\_\_\_ Interrupting \_\_\_\_\_ (Amps) \_\_\_\_\_ (Cycles)

Interconnection Protective Relays (if applicable):

(If microprocessor-controlled)

List of Functions and Adjustable Setpoints for the protective equipment or software:

Setpoint Function	Min	Max	Units
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____

(If discrete components)

(Enclose copy of any proposed Time-Overcurrent Coordination Curves)

Manufacturer: \_\_\_\_\_ Type: \_\_\_\_\_ Style/Catalog No.: \_\_\_\_\_ Proposed Setting: \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Type: \_\_\_\_\_ Style/Catalog No.: \_\_\_\_\_ Proposed Setting: \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Type: \_\_\_\_\_ Style/Catalog No.: \_\_\_\_\_ Proposed Setting: \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Type: \_\_\_\_\_ Style/Catalog No.: \_\_\_\_\_ Proposed Setting: \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Type: \_\_\_\_\_ Style/Catalog No.: \_\_\_\_\_ Proposed Setting: \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Type: \_\_\_\_\_ Style/Catalog No.: \_\_\_\_\_ Proposed Setting: \_\_\_\_\_

Current Transformer Data (if applicable):

(Enclose copy of Manufacturer's Excitation & Ratio Correction Curves)

Manufacturer: \_\_\_\_\_ Type: \_\_\_\_\_ Accuracy Class: \_\_\_\_\_ Proposed Ratio Connection: \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Type: \_\_\_\_\_ Accuracy Class: \_\_\_\_\_ Proposed Ratio Connection: \_\_\_\_\_

Potential Transformer Data (if applicable):

Manufacturer: \_\_\_\_\_ Type: \_\_\_\_\_ Accuracy Class: \_\_\_\_\_ Proposed Ratio Connection: \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Type: \_\_\_\_\_ Accuracy Class: \_\_\_\_\_ Proposed Ratio Connection: \_\_\_\_\_

**Required information, but commonly omitted**

**Please note: WMECO's 3 Ph. 13.8 and 23 kV circuits are Multi-grounded wye**



# Expedited / Standard Process

## Requirements

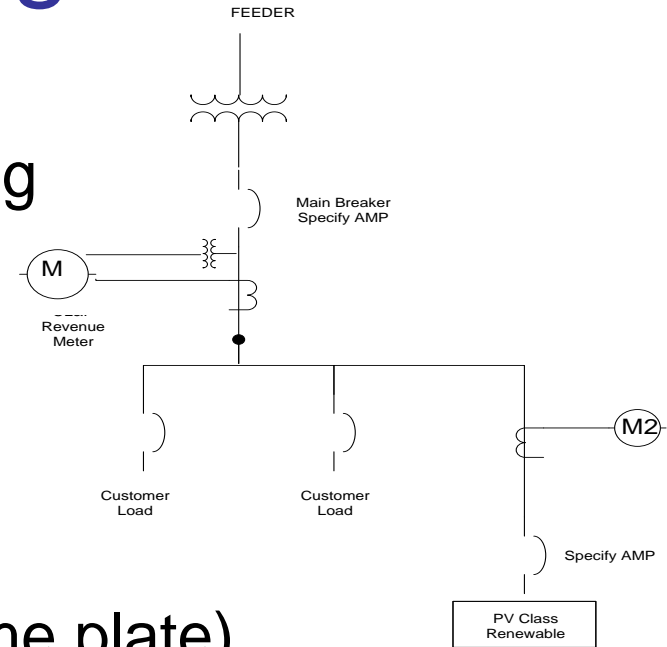
### Submit with Expedited / Standard Application:

- One line:
  - DOES need to be stamped by a MA PE.
  - Must show the existing/proposed service, including the revenue metering, and how/where the proposed generation will interconnect to it.
  - Include: Size of main breaker, external disconnect switch, kW rating, Customer name, address of facility, Inverter(s) and existing generation (if applicable).
  - CT's and PT's for relays with ratios.
  - Inverter settings.
  - Interconnecting Customer owned transformer size, configuration, impedance.
  - SHOULD NOT specify equipment TBD by Company



# Technical Issues – Components of a One Line Diagram

- Well documented electric service including Point of Common Coupling with Interconnecting Device
- Size of main breaker
- External disconnect switch
- Generator breaker & size
- Generator connection point
- kW rating matches application (name plate)
- Location of revenue meter, instrument transformers and protection – Metering Sequence
- Title block with Customer name, address, date, drawing number and revision number
- Inverter settings
- Definitive relay settings, relay, PT's and CT's



# Expedited / Standard Process

## Requirements

### Service configuration:

- Interconnection via a line side tap:
  - CANNOT be made in meter trough or at lugs of meter.
  - CANNOT be made on an instrument rated service, even if existing service is hot sequenced.
  - MUST be made in a junction box or an approved location. (Interconnection can be made in the panel if the panel is UL listed to be used as a junction box.)
  - If it will increase the rating of the service you must submit a Request for Service to WMECO's New Service Clearing Desk (800-880-2433) i.e. installing a second 200 A load center beyond a line side tap.

# Expedited / Standard Process

## Requirements

- Protection Requirements:
  - Single phase generation on a three phase service (balanced or unbalanced) **MUST** have three phase protection.
  - Three Line (AC Schematic)
    - Including all AC Current and Voltage circuits
    - Required before Impact Study
  - Control Schematic (DC Elementary Diagram)
    - Including protection functions
    - Tripping schemes
    - Required before Witness Test

# Expedited / Standard Process

## Requirements

### Submit with Expedited / Standard Application:

- Site Plan:
  - Must show revenue meter location and location of inverter(s) and/or generators.
  - Must show AC generator disconnects.
  - Must show production meter if Net Metered.
  - Can be hand drawn but must be legible.
  - Must be a plan form view i.e. vertical NOT “bird’s eye” or isometric view.
  - Title block with Customer name, address, date, drawing number and revision number
  - Must show property lines.

# Supplemental Review

- If one or more Screens are not passed, the Company will provide a Supplemental Review Agreement.
- Interconnecting Customer signs agreement and pays fee for additional engineering time (max fee is \$1,250).
- The Supplemental Review may be able to determine what impacts the generation system will have and what (if any) modifications are required. If so - an interconnection agreement will be sent to customer detailing:
  - System modification requirements, reasoning, and costs for these modifications
  - Specifics on protection requirements as necessary
- If Supplemental Review cannot determine requirements, Impact Study Agreement (or equal) will be sent to the customer. (Project shifts to the Standard Process.)

# Impact Study

- If one or more Screens are not passed, the Company will provide an Impact Study Agreement.
- Interconnecting Customer signs agreement and sends first payment.
- The Impact Study determines what impacts the generation system will have and what (if any) distribution system modifications are required for safe and reliable interconnection. It includes a protection review.
- If distribution system modifications are required, a Detailed Study Agreement is required.
- Impact Study Report is provided to Interconnecting Customer with:
  - System modification requirements, reasoning, and + / - 25% cost estimate for these modifications (electric utility work only)
  - Specifics on protection requirements as necessary

# Detailed Study

- If system modifications are required, Company sends a Detailed Study Agreement to Interconnecting Customer.
- Interconnecting Customer signs agreement and pays first payment and work is scheduled.
- When complete, an Interconnection Service Agreement will be sent to customer detailing:
  - System modification requirements + / - 10% estimated cost for these modifications (electric utility work only)
- Detailed Study includes any permitting such as for pole sets, tree trimming, environmental work to be done the electric utility.
- ISO notification for applications 1.000 MW – 4.999 MW can be done in conjunction with Detailed Study.

# When is ISO-NE Notification Required?

- Proposed Plan Applications (PPA):
  - 0 - 0.999 MW cumulative increase\* - no form required
  - 1.000 - 4.999 MW cumulative increase\* - notification form required to go to **Reliability Committee**.
    - Submitted after Impact Study is completed.
    - Transmission Owner submits PPA if generator is not a NEPOOL participant.
    - If generator is NEPOOL participant, Transmission Owner must review PPA first.
  - > 4.999 MW cumulative increase\* - PPA and studies required to go to **Stability and Transmission Task Forces** and **Reliability Committee**
    - After Impact Study completed, determine if any Substation / Transmission upgrades required.
    - Transmission Owner and Task Forces need to agree if transmission study will/will not be required.
    - Transmission Owner submits PPA if generator is not a NEPOOL participant.
    - If generator is NEPOOL participant, Transmission Owner must review PPA first.
    - A stability model will likely be required.
- Refer to Planning Procedure 5-1

\* NOTE = new generation or cumulative increase from last approved PPA



# Expedited / Standard Process

## Requirements

- COMPLETION DOCUMENTS & WITNESS TEST:
  - Certificate of Completion (CoC) signed by local wiring inspector and dated no earlier than the date on the Interconnection Service.
  - Electrical permit or building permit for Electrical Work.
  - Witness Test Procedure.
  - If inverters used, printout of applied inverter settings. If relays were installed, certified test results from a testing company.
  - As built one line, three line and wiring diagrams.
  - System must be installed as designed in the One Line (and three line when required) and specified on the Application.
  - Revenue meter change will be scheduled after receipt of all completion documents.
  - Witness Test is required and will be scheduled after completion documents are reviewed by the utility's engineering departments.

# Studies and Agreements Can Involve Many Parties – On Both Sides

## Utility

- Application analyst – processes application and contracts
- Lead Engineer for reviews/studies
- Relay Engineering
- Distribution Planning
- Distribution Dispatch
- Distribution Design Engineering
- Meter Operations
- Meter Engineering
- Meter Data Services
- Relay Telecom Operations
- Inspection team
- Transmission and/or Substation Design
- Customer Service / Billing
- Energy Supply (asset registration)
- Legal
- Transmission Study
- ISO-NE notification and/or application

## Interconnecting Customer

- Customer
- Interconnecting Customer
- Equipment vendor
- Lead contractor
- Electrician
- Electrical Engineer (PE)
- Relay Engineer
- Relay testing firm
- Legal

Many moving parts to coordinate



ISO-NE

# Behind the Scenes at Utility...

- Review and replacement of metering, modifications to billing.
- Modifications to protection systems as required (e.g. replace or install fusing, install switch, modify breaker/recloser set-points, transfer trip, etc.).
- Larger generators require review by NEPOOL reliability committee and registration with ISO-NE.
- Adding generation asset to geographic information systems, maps, system one-lines, dispatch systems, etc.
- Publish internal special operating guidelines for utility field personnel on larger generators.
- Set up future testing for relay protection, meter calibration, insurance tracking, etc.

# Tips to Avoid Process Delays

- Include cut sheet for inverter with application
- Specify generator secondary / service voltage
- Indicate number of generators being used
- Specify DC-STC rating of PV on application
  - Required for Net Metering
- Include correct electric utility account and meter number
- Address of facility must match service address on electric utility account
- Name on application must match name of primary account holder on electric utility account
- Include accurate contact addresses, phone numbers and email addresses
- Identify if generator is single or three-phase
- Application must be signed by Interconnecting Customer
- Include Qualifying Facility documentation, if not compensated under Net Metering Tariff
- Identify ownership of property, provide proof of site control if necessary
- Identifying third party ownership of generator
- Provide sketch for new construction, service upgrades or relocations and commercial customer systems to identify meter sequence and point of connection
- CoC signed and dated after given approval to install, include electrical permit and photos

# Allow Additional Time For:

- New construction
- Service upgrade or relocation
- Change in Interconnecting Customer or Customer
- If email address(s) not available for communication
- If you make a change to your project (inverter, proposed system size or other equipment), you will need to submit a new application
- Can submit up to two options with original application
- Possible distribution system upgrades to accommodate the proposed generation
- ISO notification and approval

# Tips to Remember

- Contact local utility to inquire about the service configuration of your specific location.
- **Apply early** – each project and location is unique.
- The interconnection standard contains a wealth of information – get to know it.
- The time frames in the Tariff are business days.
- Interconnection expenses should be budgeted into your project.
- The number and complexity of interconnection applications has picked up remarkably in the last year.
- Generation larger than customer's load takes longer to review.
- Stand alone (no or minimal load) interconnection applications take longer to review.
- Interconnection timeframes do not apply to Electric Power System construction when required.

# Summary

- When submitting application, include site plan and PE stamped one line
- Completion Documents needed are:
  - Witness Test procedure
  - Certified relay test results
  - PE Stamped as-built wiring diagrams
  - Certificate of Completion
  - Electrical Permit
- Bidirectional revenue meter will be set after WMECO has the appropriate completion documents.
- WMECO is doing Witness Tests of some Simplified projects and all Expedited/standard projects. We inspect all battery backup systems.
- Submit required documentation by December 6<sup>th</sup> to insure that we can install the bi-directional meter and schedule a Witness Test by the end of December.

# Technical Requirements

- Modifications to protection systems as required (e.g. replace or install fusing, install switch, modify breaker/recloser set-points, transfer trip, etc.).
- Larger generators require review by NEPOOL reliability committee and registration with ISO-NE.
- Class II and III Net Metered facilities (over 60 kW) require a dedicated analog phone line to the meter.
- Inverter based generation over 500 kW requires utility grade relays.
- Stand alone generation facilities over 500 kW will be primary metered with a DSCADA equipped recloser.
- For generators 500 kW and larger, WMECO will write a operating guideline for utility field personnel, dispatch and the customer.
- Set up future testing for relay protection, meter calibration, insurance tracking, etc.



# Technical Issues - Rules of Thumb

- High fault current may impact your interconnection costs.
- Some things of note on various things that must happen between the time an application is received and a system can go on line:
  - During initial analysis and various studies, there is usually an exchange of information which takes time.
  - ISO-NE Reliability Council review if 1 MW or larger
  - If distribution system modifications are required, specialty equipment may need to be ordered (lead times for reclosers, meters, substation equipment can be 3 to 6 months) after interconnection agreement is executed.
  - System modifications must be scheduled and can take time. Must be coordinated with Interconnecting Customer, other utilities (such as phone company for pole sets and phone line installation).
  - Asset registration if 60 KW or larger and will export power.

# Technical Issues - Rules of Thumb

## Continued

- If aggregate generation on a feeder is over 7.5% of peak feeder load, there may be special reviews required.
- Feeder voltage may impact the size of generator that can be safely interconnected at the distribution level. (e.g. 4.1KV, 23KV, 69KV).
- If the generator will sell on the market and has to apply through ISO-NE, the process may take longer than the standard time frames.
- Generators over 10 KW are most likely going to be three-phase.

# Technical Issues – Metering, Disconnection and Data Acquisition

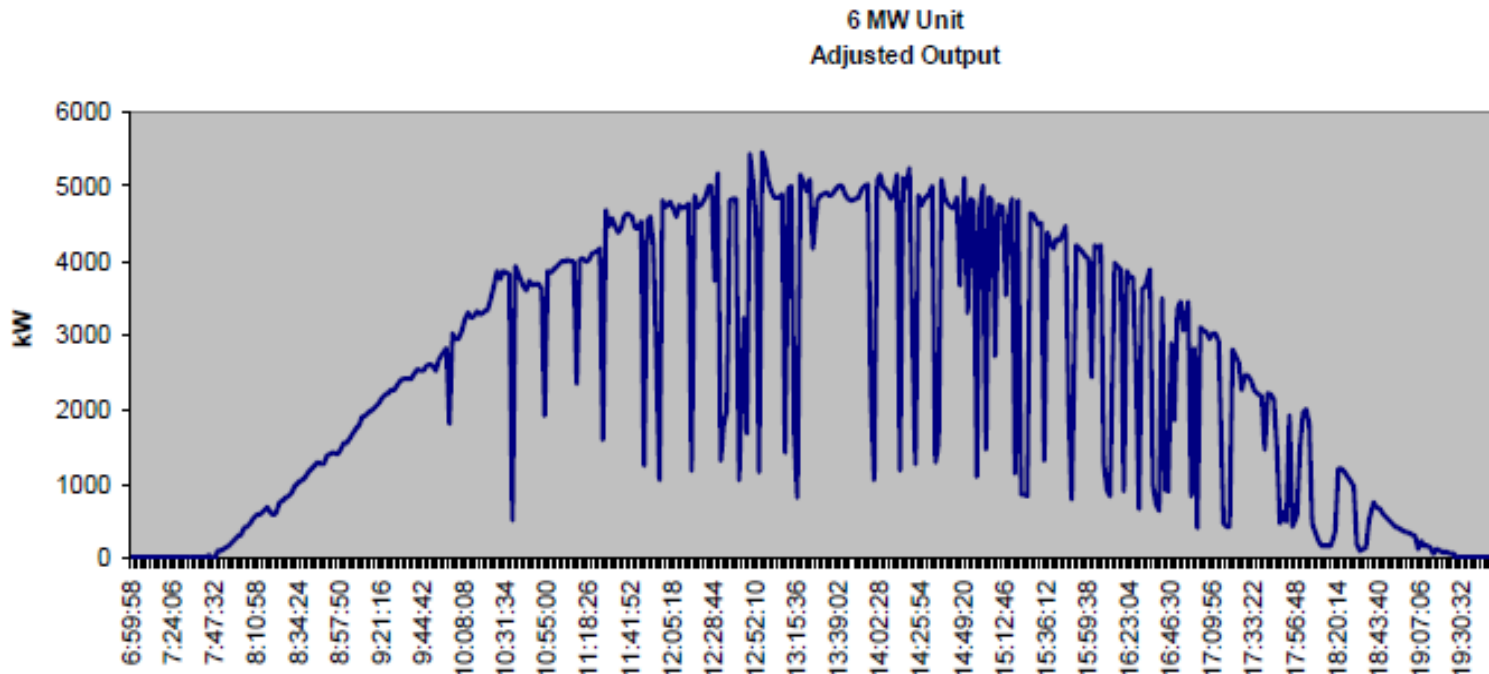
- Generator must be installed behind utility revenue meter
- Can not interconnect in meter socket or trough
- Cold sequence metering required. Line side taps not permitted even if customer has existing hot sequenced instrument rated metering
- Approved disconnect means must be provided to isolate metering instrument transformers
- Metering with remote data access required for all generation 60 KW and larger that will export power onto utility EPS
- Installation over 500 KW will also require a recloser with remote control and data access to be installed to
  - Monitor voltage, current
  - Act as a utility controlled redundant protection system
  - Provide for remote disconnect

# Technical Issues – NGRID Intermittent Generator Guidelines

- Interconnections Applications on **non-dedicated** circuits
  - Largest wind application is 3.3 MW on 13 kV class circuits
  - Largest solar application is 6 MW on 23 kV class circuits
- Interconnections Applications on **dedicated** circuits
  - Largest wind application is 30 MW
  - Largest solar application is 10 MW on 13 kV class circuit
- The distribution system was not designed with Distributed Generation in mind. Large generation at the system fringes cause challenges (i.e. protection, power regulation...) to distribution and transmission systems.
- WMECO does not currently have limits – will study application and design necessary upgrades required to interconnect generation.

# Technical Issues - Large Intermittent Generators

- **Ramp rates** of intermittent generators can affect electric power system operations and power quality.
- **Geographic diversity** effects not yet fully understood.



# DG Questions?

**Appendix**

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**Simplified Process**

# Simplified Process

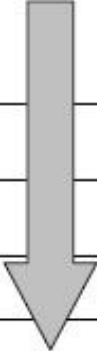
- APPLIES TO:
  - Single phase service with listed single-phase inverter based systems 10 kW or less on radial feed.
  - Three phase service with listed three-phase inverter based systems 25 kW or less on radial feed. Single phase inverters on a three phase service DO NOT QUALIFY for Simplified Process interconnection.
  - Simplified Spot Network Process: Single phase inverter on a spot network system 15 kW or less may be eligible.
  - A listed inverter means:
    - Complies with current IEEE Standard 1547. MA has adopted UL1741.1 as the standard for inverters to comply with IEEE 1547.
    - Nationally recognized test lab results.



# Simplified Process

- Typical process and time line
  - Submit complete application (use fax, scan/email, snail mail) – must be signed
  - Utility reviews and gives approval to install or requests additional information.
  - Install system and send completion documentation to utility
  - Utility will change meter
  - Utility inspects within 10 days of receipt of completion documents – utility can waive inspection

Table 1 of Section 3

Review Process	Simplified
Eligible Facilities	Listed Small Inverter
Acknowledge receipt of Application	(3 days)
Review Application for completeness	10 days
Complete Review of all screens	10 days
Complete Supplemental Review (if needed)	
Complete Standard Process Initial Review	
Send Follow-on Studies Cost/Agreement	
Complete Impact Study (if needed)	
Complete Detailed Study (if needed)	
Send Executable Agreement (Note 3)	Done
Total Maximum Days (Note 4)	15 days
Notice/ Witness Test	< 1 day with 10 day notice or by mutual agreement

# Advantages of Simplified

- No cost to customer (95% of cases)
  - There is the potential for EPS upgrade costs. It is still uncommon but becoming more frequent as size of DG increases and more DG penetrates the system.
- Faster approvals
  - WMECO received a record number of applications in 2012.

Remember:

The application has information the utility needs to update records and prepare required internal and external reports.

# Example – Customer Installing 5 KW PV System

WESTERN MASSACHUSETTS ELECTRIC COMPANY

M.D.P.U. No. 1039E

DISTRIBUTED GENERATION INTERCONNECTION  
STANDARDS AND PROCEDURES TARIFF

Customer must be the  
Primary Account Holder.

## Simplified Process Interconnection Application and Service Agreement

Contact Information: Date Prepared: 8/31/2010

Legal Name and address of Interconnecting Customer (or, Company name, if appropriate)  
Customer or Company Name (print): Eleanor Rigby Contact Person, if Company: \_\_\_\_\_

Mailing Address: 66 Church St

City: Savoy State: MA Zip Code: 01234

Telephone (Daytime): (413) 555-1966 (Evening): Same

Facsimile Number: None E-Mail Address: erigby@gmail.com

Alternative Contact Information (e.g., system installation contractor or coordinating company, if appropriate):  
Name: Bioletti Solar - Desmond Jones

Mailing Address: 67 Penny Ln

City: Windsor State: CT Zip Code: 98765

Telephone (Daytime): (860) 555-1967 (Evening): (856) 555-2000

Facsimile Number: (860) 555-7777 E-Mail Address: djones@bsolar.com

Electrical Contractor Contact Information (if appropriate):  
Name: \_\_\_\_\_ Telephone: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Ownership Information (include % ownership by any electric utility): \_\_\_\_\_

Confidentiality Statement: "I agree to allow information regarding the processing of my application (without my name and address) to be reviewed by the Massachusetts DG Collaborative that is exploring ways to further expedite future interconnections." Yes  No

Facility Information:

Address of Facility: SAME AS CUSTOMER

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Electric Service Company: WMECO Account Number: 12345678900 Meter Number: 987654321

Inverter Manufacturer: Solectria Model Name and Number: PVI 5000 Quantity: 1

Nameplate Rating: 5.0 (kW) \_\_\_\_\_ (kVA) 240 (AC Volts) Single 1 or Three \_\_\_\_\_ Phase

System Design Capacity: 4.89 (kW) \_\_\_\_\_ (kVA) For Solar PV provide the DC-STC rating: 6.2 (KW)

Prime Mover: Photovoltaic  Reciprocating Engine  Fuel Cell   
Turbine  Other \_\_\_\_\_

Energy Source: Solar  Wind  Hydro  Diesel  Natural Gas  Fuel Oil   
Other \_\_\_\_\_

IEEE 1547.1 (UL 1741) Listed? Yes  No

Estimated Install Date: 10/4/10 Estimated In-Service Date: 10/29/10

Customer Signature

I hereby certify that, to the best of my knowledge, all of the information provided in this application is true and I agree to the Terms and Conditions on the following page:

Interconnecting Customer Signature: E. Rigley Title: Owner Date: 8/31/2010

***Please attach any documentation provided by the inverter manufacturer describing the inverter's UL 1741 listing.***

Approval to Install Facility (For Company use only)

Installation of the Facility is approved contingent upon the terms and conditions of this Agreement, and agreement to any system modifications, if required (Are system modifications required? Yes \_\_\_ No \_\_\_ To be Determined \_\_\_):

Company Signature: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

Application ID number: \_\_\_\_\_ Company waives inspection/Witness Test? Yes \_\_\_ No \_\_\_

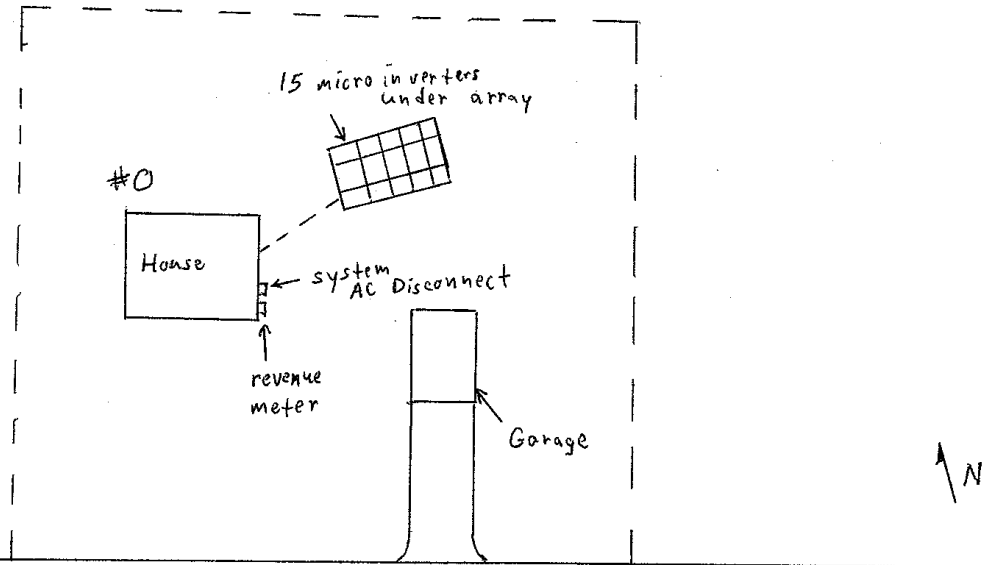
# Simplified Process Requirements

## Submit with Simplified Application:

- Site Plan/Drawing:
  - Must show revenue meter location and location of inverter(s).
  - Must show any AC generator disconnects (required for systems over 10.0 kW) NOTE: Utility may require switch for smaller systems.
  - Can be hand drawn but must be legible. Include Customer name and address of facility
  - Must be a plan form view i.e. vertical NOT “birds eye” view.
  - Must show lot lines (generation must be on one lot)

# Example Site Plan

Site Plan  
Example Customer  
0 Example St  
Nowhere, MA 01234



Example St



# Simplified Process Requirements

## Service Configuration:

- Interconnection via a line side tap:
  - CANNOT be made in meter trough or at lugs of meter.
  - MUST be made in a junction box or an approved location. (Interconnection can be made in the panel if the panel is UL listed to be used as a junction box.)
  - If it will increase the rating of the service you must submit a Request for Service to WMECO's New Service Clearing Desk (800-880-2433 or at [www.wmeco.com](http://www.wmeco.com)) i.e. installing a second 200 A load center beyond a line side tap.

# Simplified Process Requirements

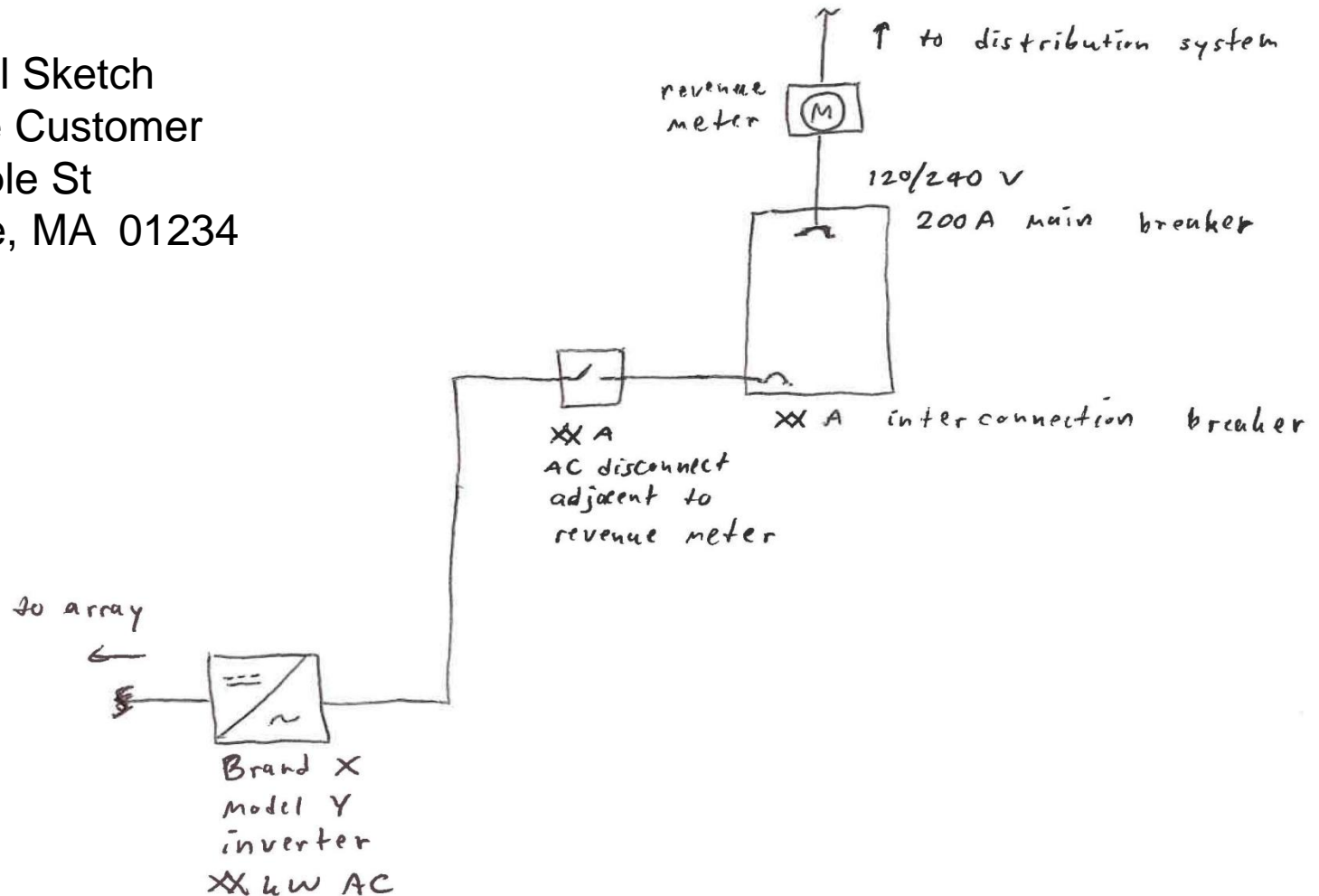
## Submit with Simplified Application:

- Electrical sketch:
  - DOES NOT need to be PE stamped.
  - Must show the existing/proposed service, including the revenue metering, and how/where the proposed generation will interconnect to it.
  - Can be hand drawn but must be legible.
  - Include: Size of main breaker, external disconnect switch (when required or installed), kW rating, Customer name, address of facility, Inverter(s) and existing or back up generation (if applicable)
  - Must show actual proposed equipment. Ex: DO NOT include “MIN 60A” for a disconnect size.



# Example Electrical Sketch

Electrical Sketch  
Example Customer  
0 Example St  
Nowhere, MA 01234



# Simplified Process Requirements

## Submit with Simplified Application:

- Inverter cut sheet
- Schedule Z, if will be Net Metered
- Work Request number if there if new service or there is a service upgrade.

# Simplified Process Requirements

- COMPLETION DOCUMENTS & WITNESS TEST:
  - Certificate of Completion (CoC) signed by local wiring inspector and CANNOT be dated before the date on the Letter to Install.
  - Electrical permit or building permit for Electrical Work.
  - Completion photos. Photos must CLEARLY show the following:
    - The inverter(s). If microinverters are used, photo(s) of the ENTIRE array will suffice. The photo must be clear enough to count the number of modules.
    - The inverter nameplate(s). N/A for any microinverters installed.
    - ALL AC generator disconnects.
    - The interconnection point (i.e. breaker position, junction box etc.). If the interconnection is made in a junction box, photo(s) must show the junction box with the COVER OFF.
    - The main panel.
  - System must be installed as designed in the Electrical Sketch and specified on the Application.
  - A Witness Test may be required:
    - If the system is a battery backup system or uses microinverters the Interconnecting Customer / Installer must ensure that there is a means to clearly show instantaneously when the system is exporting power.

# Simplified Process Involves Many Parties – On Both Sides

## Utility

- Application analyst – processes application and contracts
- Lead Engineer for reviews/studies
- Distribution Planning
- Distribution Design Engineering
- Meter Operations
- Meter Engineering
- Meter Data Services
- Inspection team
- Customer Service / Billing
- Legal

## Interconnecting Customer

- Customer
- Interconnecting Customer
- Equipment vendor
- Lead contractor
- Electrician
- Electrical Engineer (PE)
- Legal

Many moving parts to coordinate



# Changes and Upgrades to Existing Interconnections

- Contact your local utility prior to designing any changes to an existing generation facility.
- If you want to replace an inverter or increase the output of your facility, submit a new interconnection application.
- Be clear on application, site plan and electrical sketch as to what equipment is existing, what equipment is new and what equipment (if any) is being replaced. Make additional notes or provide additional documentation if necessary.

# Summary

- When submitting application, include inverter cut sheet(s), site plan and electrical sketch or un-stamped electrical sketch/one line (it may be PE stamped if customer/installer chooses)
- Completion Documents needed are:
  - Photos of inverter(s), inverter nameplate(s) or entire array, AC disconnect(s), main panel, and interconnection point (junction box, properly labeled interconnection breaker etc.)
  - Certificate of Completion
  - Electrical Permit
- Bidirectional revenue meter will be set after WMECO has the appropriate completion documents.
- WMECO is doing Witness Tests of some Simplified projects. We inspect all battery backup systems.
- Submit required documentation by December 6<sup>th</sup> to insure that we can install the bi-directional meter and schedule a Witness Test by the end of December.



**Western Massachusetts  
Electric**

A Northeast Utilities Company

Western Massachusetts Electric Company  
55 Russell Street  
Hadley, MA 01035  
(800) 286-2000

www.wmeco.com

# WMECO's January 2012 Production Data Request

Today's Date: \_\_\_\_\_

*Please return by: January 31, 2012*

Host Customer Name: \_\_\_\_\_

Address of Facility: \_\_\_\_\_

\_\_\_\_\_

The following information can be found on your electric bill:

Billing Account Number: \_\_\_\_\_

Service Reference Number: \_\_\_\_\_

Meter Number: \_\_\_\_\_

Please provide below the energy output of your on-site generator by month in kilowatt hours (kWh) for the period September 1, 2011 through December 31, 2011. If this information is not available, please provide monthly reads or cumulative reads. This information can be found on your production meter or inverter.

	Monthly kWh	or	Monthly Reads	or	Cumulative Read	Date of Initial Read
September 2011:	_____		_____		_____	_____
October 2011:	_____		_____		_____	
November 2011:	_____		_____		_____	Date of Cumulative Read
December 2011:	_____		_____		_____	_____

Please return this form to WMECO by January 31, 2012. You can return it as follows:  
FAX to 413-585-1709. PDF to [wmecodg@nu.com](mailto:wmecodg@nu.com). Mail to:

Western Mass Electric Company  
Attn: WMECO DG  
55 Russell St  
Hadley, MA 01035

**Appendix**

**-**

**DOER Slides**



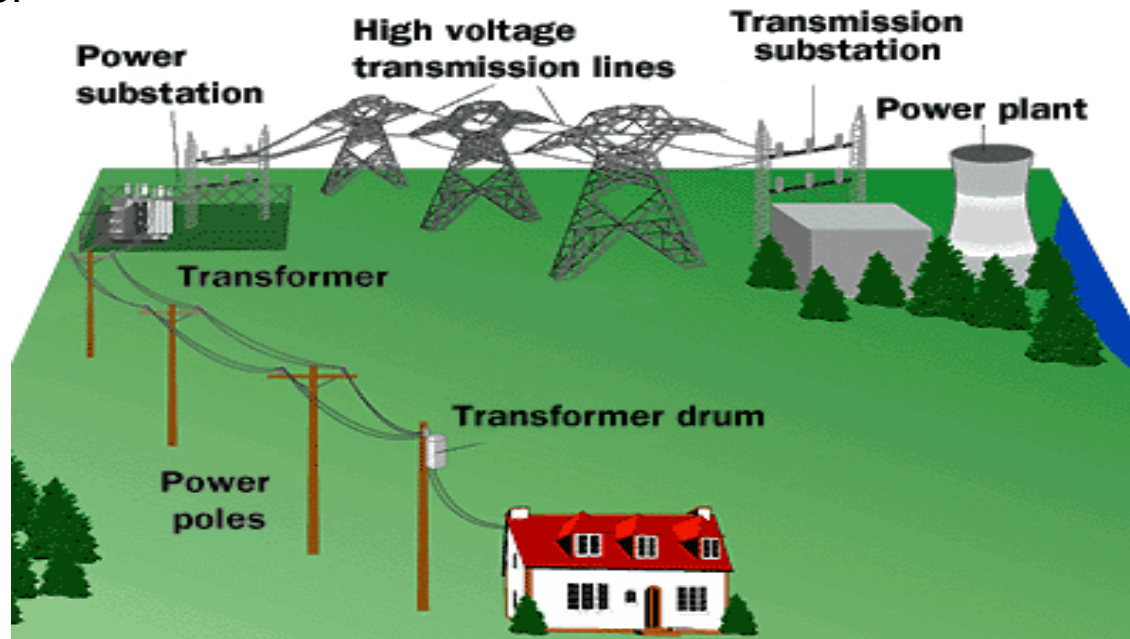
# Massachusetts Interconnection Standard

- In late 2002, the MA DTE directed the investor owned utilities to commence a collaborative process to propose unified interconnection standards, policies, and procedures for distributed generation.
- There are many stakeholders in the process including utilities, regulators, DG industry.
- Current version of “Standards for Interconnecting Distributed Generation” is a result of countless hours of work by the DG Collaborative.
- DPU approved a new tariff in 2009 which includes net metering provisions.
- This interconnection standard covers all forms of generation operating in parallel with the grid (it does not apply to open transition emergency generation).



# How Does the Electric Grid Work?

- **Generators (Power Plants):** Produce electricity (usually large and centralized – nuclear, coal, natural gas)
- **Transmission System:** Transmits electricity at high voltage from generators to distribution systems (where the power is needed)
- **Distribution System:** Distributes electricity to customers via lower voltage wires
- **Substations and Transformers:** Used to “step-down” voltage to the appropriate distribution level



# Distributed Generation and the Electric Grid

Distributed Generation (DG) Systems are becoming more popular due to more aggressive incentives for clean energy such as net metering, RPS/APS, etc.

## **DG Systems are generally:**

- much smaller in MW rating than centralized power generation
- tied to the distribution system of the grid (rather than the *transmission* side)

## **Two Types of grid-connected DG**

- **Behind Meter:** DG system is used to partially or fully supply an on-site load. Any unused electricity is exported to the distribution system (most projects follow the state interconnection process; *there are exceptions that follow the ISO interconnection process*).
- **Stand Alone:** DG system supplies minimal or no on-site load, and is connected to the distribution system (most projects follow the state interconnection process; *there are exceptions that follow the ISO process*).

# Introducing Interconnection

- The interconnection standard (Tariff), is the Standard! It is extremely important that you read and understand this Standard.
- The utilities, DOER, and The MassCEC are resources to help you through the interconnection process. There are resources on each participant's website to make the interconnection process as simple as possible (included in presentation).
- Keep in mind that the electricity system is complex, the process for interconnection must be followed and certain appropriate precautions need to be taken.

# Interconnection 101: The Basics

1. Contact the local utility, DOER and/or MassCEC for assistance or with queries even **before** the system design process. **Everything starts with the Application!**
2. The customer starts the review process by requesting, filling out and submitting an application to the local utility.
3. The utility acknowledges receipt and begins review for completeness and to determine appropriate application path.
4. At first glance, the interconnection process seems simple, but there is a significant amount of information needed by the utility to successfully process the application. **Delays are common due to missing or incorrect information, so it is important that the system design engineer help with the application process.**
5. If approved, the applicant will be required to sign an interconnection agreement with the utility. Small systems must be installed within 12 months of the agreement, or a new application may be required. Larger systems must start construction within 12 months and be completed within 24 months.
6. If there is a dispute over an application, the interconnection standards released by the MA Department of Public Utilities (DPU) include a dispute resolution process.

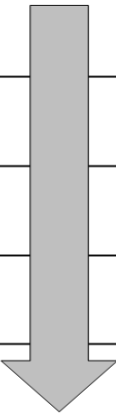
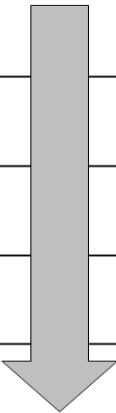
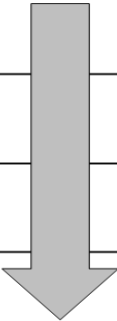
# Interconnection Review Paths

There are three different interconnection review paths a project can follow based on generation type, size, customer load and the characteristics of the grid where the system is to be located. All days listed are business days.

Simplified	Expedited	Standard
For PV and other inverter based technologies served by radial systems, 10 kW or less 1-Phase or up to 25 kW 3-Phase, with corresponding service configuration [Note: Simplified Spot Network path is 30-90 days]	For inverter-based systems greater than 10 kW 1-Phase or greater than 25 kW 3-Phase and other systems of all sizes that are served by radial systems and meet other requirements.	All projects not eligible for Simplified or Expedited review, including all systems on area networks
<b>Typical Projects:</b> small PV, demonstrations or homeowner wind	<b>Typical Projects:</b> certified large renewables, cogeneration, and other turbine or engines of any size	<b>Typical Projects:</b> uncertified large projects, unusually complex projects or projects of any size located on area networks
Total Maximum Days: 15*	Total Maximum Days: 40 – 60*	Total Maximum Days: 125-150*

\* Without delays to interconnection agreement which is the approval to install but not operate

# Review Paths Side-by-Side

Review Process	Simplified	Expedited	Standard	Simplified Spot Network	
<b>Eligible Facilities</b>	<b>Listed Small Inverter</b>	<b>Listed DG</b>	<b>Any DG</b>	<b>Listed Inverter ≤ 15 kW single-phase line</b>	
<b>Acknowledge receipt of application</b>	(3 days)	(3 days)	(3 days)	(3 days)	
<b>Review Application for Completeness</b>	10 days	10 days	10 days	10 days	
<b>Complete Review of all Screens</b>	10 days	25 days		Site review 30/90 days	
<b>Complete supplemental Review if needed</b>		20 days			
<b>Complete Standard Process initial review</b>			20 days		
<b>Send Follow-on Studies Cost/Agreement</b>					5 days
<b>Complete Impact Study (if needed)</b>					55 days
<b>Complete Detailed Study (if needed)</b>			30 days		
<b>Send Executable Agreement</b>	Done	10 days	15 days	Done (comparable to Simplified for radial)	
<b>Total Maximum Days</b>	<b>15 days</b>	<b>40/60 days</b>	<b>125/150 days</b>	<b>40/100 days</b>	
<b>Notice / Witness Test</b>	< 1 day with 10 day notice or by mutual agreement	1-2 days with 10 day notice or by mutual agreement	By mutual agreement	1 day with 10 day notice or by mutual agreement	

# Interconnection Process Fee Schedule

Review Process	Simplified	Expedited	Standard	Simplified Spot Network
	Listed Small Inverter	Listed DG	Any DG	Listed Inverter ≤ 15 kW single-phase line
Application Fee (covers screens)	0	\$3/kW minimum \$300, maximum \$2,500	\$3/kW minimum \$300, maximum \$2,500	≤ 3/kW \$100, > 3kW \$300
Supplemental Review or Additional Review (if applicable)	N/A	Up to 10 engineering hours at \$125/hr (\$12,500 maximum)	N/A	N/A
Standard Interconnection Initial Review	N/A	N/A	Included in application fee (if applicable)	N/A
Impact and Detailed Study (if required)	N/A	N/A	Actual Cost	N/A
Facility Upgrades	N/A	Actual Cost	Actual Cost	N/A
O&M	N/A	TBD	TBD	N/A
Witness Test	0	Actual Cost, up to \$300 plus travel time	Actual Cost	0



# Technical Issues: Spot and Area Networks

Area Networks consist of one or more primary circuits from one or more substations or transmission supply points arranged such that they collectively feed secondary circuits serving one (a spot network) or more (an area network) electric customers.

Portions of the following cities are served by area networks (customers in these areas should ask where the nearest radial system is located for possible tie-in):

National Grid	NSTAR	Unitil	WMECO
Brockton Lynn Worcester	Boston New Bedford Cambridge	Fitchburg	Greenfield Pittsfield Springfield West Springfield

# Upgrades and System Modifications

NOTE: This information was supplied by an organization outside of MA and is not necessarily representative of MA costs or timelines.

## Typical Costs & Schedules for Upgrades

- Distribution Feeder
  - Regulator \$60-200K 2-6 mos.
  - Cap move \$3-10K 1-3 mos.
  - New Capacitor \$17-25K 1-6 mos.
  - Re-conductor \$200-400k/mi 6-12 mos.
  - Express Feeder \$350-600k/mi 8-18 mos.
- Transformer
  - Line Xfrmr \$2-25K 1-3 mos.
  - Substation Xfrmr \$2-4 million 18-24 mos.

# Why do customers produce their own power?

## The Value of Grid-Connected DG

- Produce cleaner energy more efficiently
- Supplement power from grid
- Ensure critical loads always met
- Offset peak-use charges
- Reduce dependence on grid and offset rising electricity prices
- Sell power to grid