Net Metering and Simplified Process Interconnection Seminar

November 6, 2014
Co-hosted by:

Western Massachusetts Electric
The Northeast Utilities System

MASSACHUSETTS CLEAN ENERGY CENTER

Unitil

Mass ACA

nationalgrid

DOER
Massachusetts Department of Energy Resources

NSTAR ELECTRIC

2015 Seminars

Seminars are held throughout Massachusetts. Below is the current schedule for the upcoming 2015 seminars:

February 26	-	WMECO
May 13	-	WMECO
August 26	-	WMECO
November 5	-	WMECO

Interconnection Contacts & Tariff Links

- National Grid
  - Email: 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
  - http://www.nationalgridus.com/non_html/shared_interconnectStds.pdf

- NSTAR
  - Brett Jacobson | 781-441-8196 (brett.jacobson@nu.com)
  - Paul Kelley | 781-441-8531 (paul.kelley@nu.com)
  - http://www.nstar.com/business/rates_tariffs/interconnections

- Unitil
  - Email: generator@unitil.com
  - Gary Miller | 603-227-4516 (millerg@unitil.com) for C&I projects
  - Carol Fluet | 978-353-3234 (fluet@unitil.com) for Residential projects
  - John R. DiNapoli | 978-353-3259 (dinapoli@unitil.com) for Municipal projects
  - http://www.unitil.com/energy-for-residents/electric-information/distributed-energy-resources/renewable-energy-generation

- WMECO
  - Email: 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 (Mass ACA)
  Web site: www.MassACA.org
  Email: 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
  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

- Net Metering Information
  Web Site: http://www.mass.gov/dpu/netmetering

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.**
- This session provides a great safety moment. All benefits derived from DG quickly lose their value if someone is injured as a result of an improper connection.
- 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 at 811 or 1-888-dig-safe (1-888-344-7233). Also refer to (www.digsafe.com).

Logistics & Introductions

- **Facilities**
  - Emergency exits
  - Restrooms
  - Designated smoking area

- **Guests and presenters**
  - DPU / DOER / Mass ACA / Mass CEC
  - MA Utilities: National Grid / NSTAR / Unitil / WMECO

What We'll Be Covering Today

- Net Metering
  - Mass ACA
- Q&A (Please hold questions until the end of the Net Metering segment)
- Basic Information
  - How the electric grid works
  - Overview of Interconnection Process
- Simplified Interconnection Process
- Q&A (Please hold questions until the end of the DG segment)

Net Metering in Massachusetts

Net Metering in Massachusetts

- December 2009 Net Metering Tariff, updated November 2013 by DPU.
- This tariff is effective until MA DPU issues an 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 (though compensation differs depending on type of generation).
  - 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” such as a wind turbine or inverter.
- Facility is defined as one project on one parcel of land with one meter and one point of interconnection.
  - Private limited to 2 MW per parcel, Public limited to 2 MW per unit and 10 MW per entity.
  - Other non-Net Metered generation can exist on the same parcel as a Net Metering Facility.
- Established “Public” and “Private” Facilities (Class II and III only).
  - 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 may allocate only to customers who are certified as a Municipality or Other Gov. Entity. Ten MW limit per entity in Massachusetts.
  - Private: All other Host Customers.
- Apply to DPU to be certified as a Public Facility.
  - Host Customer of and those being allocated to by a Public Facility.
  - 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.
- Interconnected generation which contributes towards limits are posted on each Distribution Company's web site and updated monthly. (For WMECO: http://www.wmeco.com/netmetering)
- Small Renewable Energy Facilities are excluded from Private cap.
  - Up to 10 kW single phase Facility on single phase service, up to 25 KW three phase Facility on three phase service.
- Private and Public Facilities can not receive net metering services from Company until they have a cap allocation.

Net Metering in Massachusetts

- Class II and Class III need to install their own revenue grade production meter on generation.
- Class II and III may 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 *and* all other requirements have been met.
  - 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 net kWh export multiplied by the following

				Credit the following charges			
Class	min	max	Type	Default Service kWh **	Distribution kWh ***	Transmission kWh	Transition 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	Public 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 Basic Service rate. 3) Distribution kWh *** = For WMECO, include following kWh components of Distribution, Revenue Decoupling Mechanism, Pension/PBOP Adj. Mechanism, Residential Assistant Adj. Clause, Solar Program Cost Adj., Basic Svc. Cost Adj. (True Up), Net Metering Surcharge, AG Consultant Expenses and Storm Recovery Adj..

Western Massachusetts Electric Company M.D.P.U. No. 1039F

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

Billing Account Number: 541234567891

Meter Number: 112233445 Application ID Number: 2A100-2000

Is the Host Customer a: _____ Municipality _____ Other Governmental Entity

If so, submit certification provided by the DPU when obtained.

Complete if applicable, otherwise leave blank

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?

X 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, which 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

Does not apply to solar or wind

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

Complete if applicable, otherwise leave blank

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

Complete if applicable, otherwise leave blank

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

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
X Provide the Company with a report in writing of the generation by January 31 and again on *September 30 each year*

Select One

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

X Apply all of the Net Metering Credits to the account of the Host Customer (Skip Items F and G)

_____ 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)

Complete if applicable, otherwise leave blank

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

Customer Name: (Customer Name as listed on Electric Bill)
Service Address: (Service Address as listed on Electric Bill. This is NOT the Mailing Address)
Billing Account Number: (Billing Account number as listed on Electric Bill)
If public entity, DPU Public Classification ID: (Complete if applicable, otherwise leave blank)
Amount of Net Metering Credit Allocated: (Amount being allocated to this account) %

Customer Name: ____________
Service Address: ____________
Billing Account Number: ____________
If public entity, DPU Public Classification ID: ____________
Amount of Net Metering Credit Allocated: ____________ %

Customer Name: ____________
Service Address: ____________
Billing Account Number: ____________
If public entity, DPU Public Classification ID: ____________
Amount of Net Metering Credit Allocated: ____________ %

Customer Name: ____________
Service Address: ____________
Billing Account Number: ____________
If public entity, DPU Public Classification ID: ____________
Amount of Net Metering Credit Allocated: ____________ %

Customer Name: ____________
Service Address: ____________
Billing Account Number: ____________
If public entity, DPU Public Classification ID: ____________
Amount of Net Metering Credit Allocated: ____________ %

Customer Name: ____________
Service Address: ____________
Billing Account Number: ____________
If public entity, DPU Public Classification ID: ____________
Amount of Net Metering Credit Allocated: ____________ %

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.

____
Host Customer (Signature) ← *Primary Account Holder*

____
Host Customer (Print)

____
Date

Please return Schedule Z to:

Western Massachusetts Electric Company
Attention: WMECO DG
55 Russell Street
Hadley, MA 01035-9455
Email: wmecodg@nu.com
Fax: 413-585-1709

Net Metering
Production Reporting

- Net Metering Tariff requires reporting of generator's kWh output.
- Reporting required by January 31 and September 30.
- WMECO is encouraging customers to participate in the MassCEC Production Tracking System (PTS).
- WMECO and NSTAR obtain production data from PTS, not directly from Net Metered Customers.

Net Metering Summary

- If planning to Net Meter, submit Schedule Z with interconnection application.
- 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.
- 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.
- Obtain a cap allocation from Mass ACA when required.
- Production reporting is required.
- Class II and III Facilities - capacity registration required and associated ISO-NE OP 18 metering.

Compensation if not Net Metered

- If the customer will never export power – no concern.
- 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.
- 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).)

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

Net Metering Questions?

How the Grid Works

&

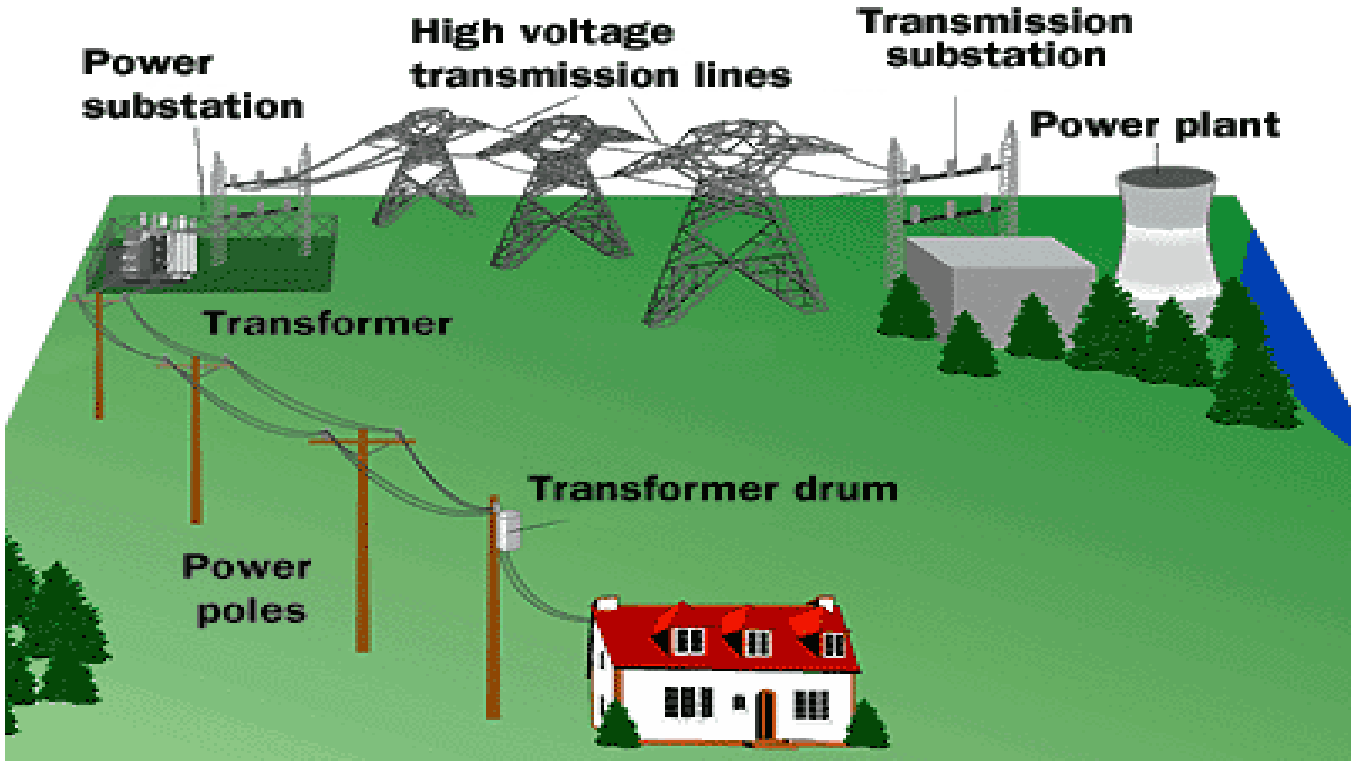
Overview of Interconnection Process

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 2013.
- 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 officially starts with the application. (But you may be required to submit a Pre-Application Report Form.)

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. ***** If your proposed project is 500 kW or greater, you *must* submit a *Pre-Application Report Form* prior to submitting an interconnection application. *****
  - Company can supply general circuit information for the proposed location; voltage, radial/network, three phase/single phase.
  - For RFP's – Customer can consult utility prior to going out for bid, questions should be directed to customer for submittal to utility. Bidders should not contact utility for site specific information.

- 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 CIAC tax liability.**

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 (Exhibit H of tariff)

Simplified Interconnection Process

Simplified Process

- APPLIES TO:
  - Single phase service with listed single-phase inverter based systems 15 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: Inverter based system 1/15 of electric customer's **MINIMUM** load.
  - Simplified Area Network Process: Inverter bases system 15 kW or less and 1/15 of **MINIMUM** load.
  - 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. Online submittal to be available in near future.
- 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

	Simplified Process
Eligible Facilities	Listed Small Inverter
Acknowledge Receipt of Application (Note 2)	(3 days)
Review Application for Completeness	10 days
Complete Review of All Screens	15 days (20 Days) (Note 3)
Complete Supplemental Review (if needed)	N/A
Complete Standard Process Initial Review	N/A
Send Follow-on Studies Cost/Agreement	N/A
Complete Impact Study (if needed)	N/A
Complete Detailed Study (if needed)	N/A
Send Executable Agreement (Note 4)	Done
Construction Schedule	By Mutual Agreement
Notice/ Witness Test	< 1 day with 10 day notice or by mutual agreement

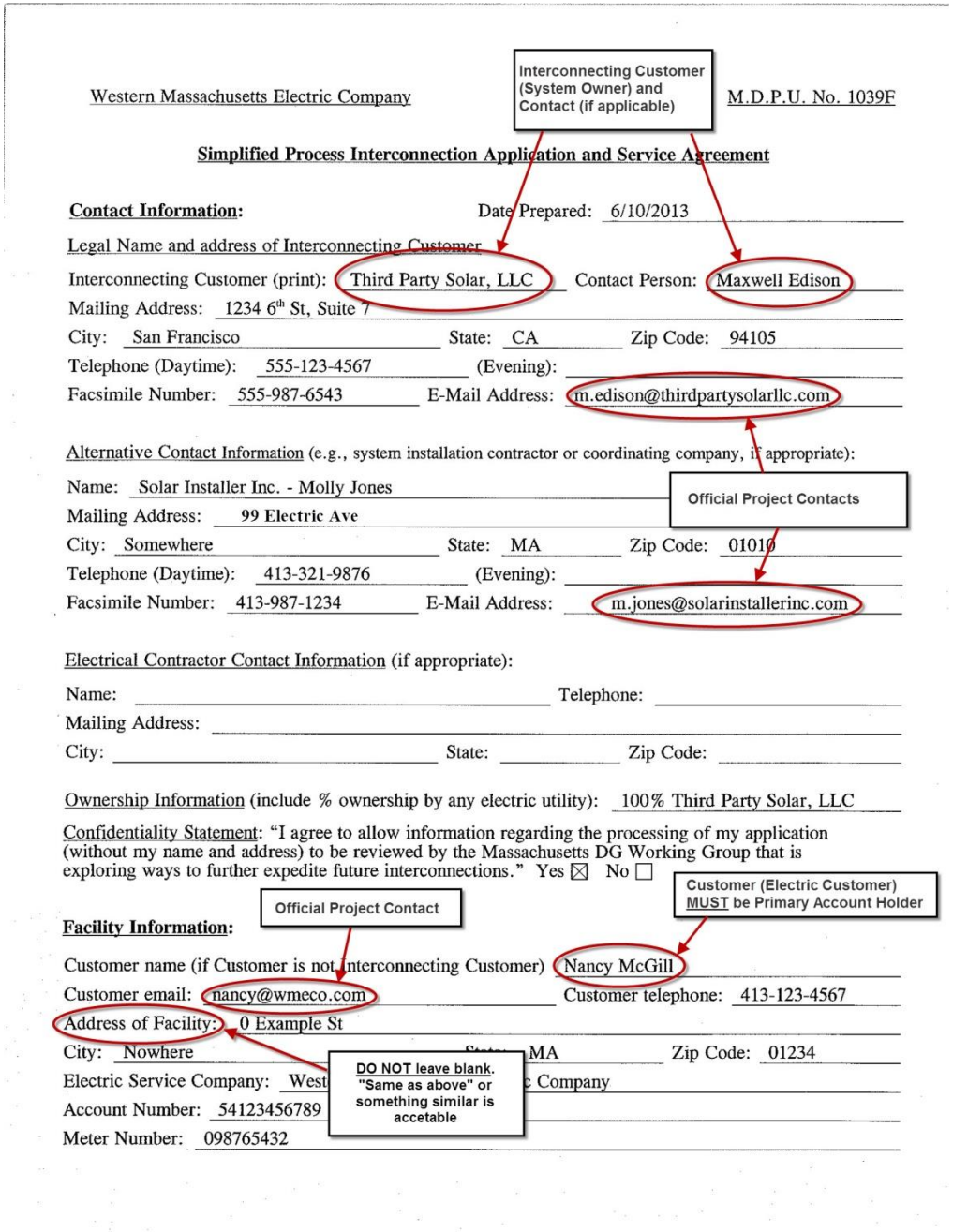
Simplified Process

- Simplified Spot and Area Networks
  - Timelines are longer
  - Application fee of $100 (=< 3kW) or $300 (> 3 kW)
  - Minimum load information needed, may need to be measured for a period of time
  - External disconnect switch required.
  - Witness Test will be performed.

Table 5 of Section 3

	Simplified Spot and Area Network
Eligible Facilities	Listed Inverter
Acknowledge Receipt of Application (Note 2)	(3 days)
Review Application for Completeness	10 days
Complete Review of All Screens	Site review 30/90 days (Note 3)
Complete Supplemental Review (if needed)	N/A
Complete Standard Process Initial Review	N/A
Send Follow-on Studies Cost/Agreement	N/A
Complete Impact Study (if needed)	N/A
Complete Detailed Study (if needed)	N/A
Send Executable Agreement (Note 4)	Done (Comparable to Simplified for Radial)
Construction Schedule	By Mutual Agreement
Notice/ Witness Test	1 day with 10 day notice or by mutual agreement

Example – Customer Installing 13 kW photovoltaic System



Western Massachusetts Electric Company — M.D.P.U. No. 1039F

Interconnecting Customer (System Owner) and Contact (if applicable)

Simplified Process Interconnection Application and Service Agreement

Contact Information: Date Prepared: 6/10/2013

Legal Name and address of Interconnecting Customer

Interconnecting Customer (print): Third Party Solar, LLC Contact Person: Maxwell Edison

Mailing Address: 1234 6th St, Suite 7

City: San Francisco State: CA Zip Code: 94105

Telephone (Daytime): 555-123-4567 (Evening):

Facsimile Number: 555-987-6543 E-Mail Address: m.edison@thirdpartysolarllc.com

Alternative Contact Information (e.g., system installation contractor or coordinating company, if appropriate):

Official Project Contacts

Name: Solar Installer Inc. - Molly Jones

Mailing Address: 99 Electric Ave

City: Somewhere State: MA Zip Code: 01010

Telephone (Daytime): 413-321-9876 (Evening):

Facsimile Number: 413-987-1234 E-Mail Address: m.jones@solarinstallerinc.com

Electrical Contractor Contact Information (if appropriate):

Name: Telephone:

Mailing Address:

City: State: Zip Code:

Ownership Information (include % ownership by any electric utility): 100% Third Party Solar, LLC

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 Working Group that is exploring ways to further expedite future interconnections." Yes ☒ No ☐

Official Project Contact

Customer (Electric Customer) MUST be Primary Account Holder

Facility Information:

Customer name (if Customer is not Interconnecting Customer) Nancy McGill

Customer email: nancy@wmeco.com Customer telephone: 413-123-4567

Address of Facility: 0 Example St

City: Nowhere MA Zip Code: 01234

Electric Service Company: West Company

Account Number: 54123456789

Meter Number: 098765432

DO NOT leave blank. "Same as above" or something similar is accetable

NOTE: System Design Capacity is based on aggregate maximum AC output (as listed on cut sheet) of all units.

Required Information

Inverter Manufacturer: Ted's Inverters

Model Name and Number: TED 1300US Quantity: 1

Nameplate Rating: 13 (kW) 13 (kVA) 240 (AC Volts) Single ☒ or Three ☐ Phase

System Design Capacity: 13 (kW) 13 (kVA)

For Solar PV provide the DC-STC rating: 14.1 (KW)

Required If Net Metered Photovoltaic

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 X No ____

Estimated Install Date: 7/1/2013 Estimated In-Service Date: 7/20/2013

Interconnecting Customer (System Owner) Signature

Interconnecting 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: Maxwell Edison Title: Manager Date: 6/10/2013

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

Approval to Install Facility (For Company use only) ***(To be filled out by WMECO)***

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 ____

DO NOT COMPLETE this information.
This area is to be completed by WMECO when Approval to Install is given.

Simplified Process *Requirements*

Submit with Simplified Application:

- Electrical Sketch
- Site Plan/Drawing
- Inverter cut sheet
- Schedule Z, if Facility will be Net Metered
- Work Request number if there if new service or there is a service upgrade.
- UL 1741 certification (if not already on file).

- If necessary, identify ownership of property and provide proof of site control if Customer and/or Interconnecting Customer does not own the property.

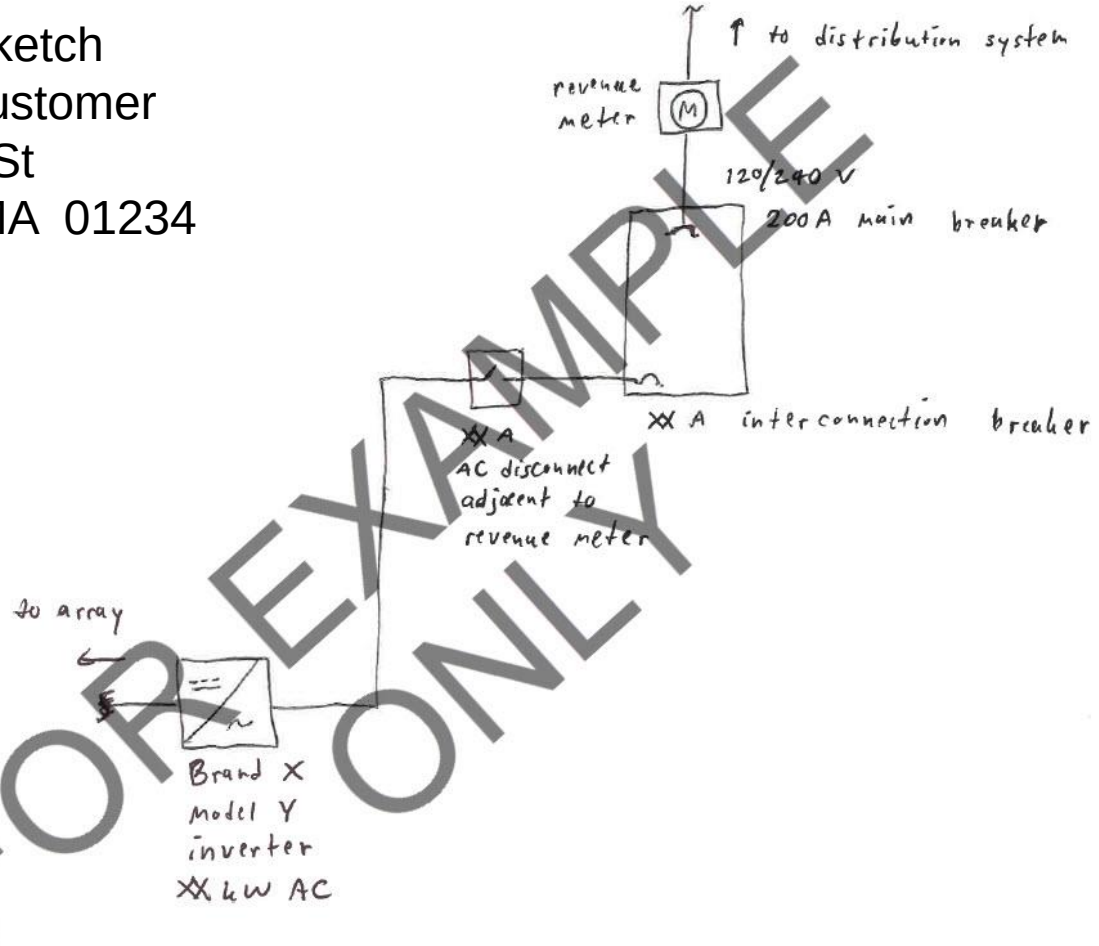
Simplified Process *Requirements*

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*

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 require a service upgrade you must submit a Request for Service to WMECO's New Service Clearing Desk (800-880-2433 or at www.wmeco.com)
  - If you have instrument rated revenue metering, the meter department will review your plans.

Simplified Process *Requirements*

Interconnection via line side tap (cont'd):

- Will NOT require a service upgrade if:
  - A load center will not be installed beyond the tap.
  - Any load center installed beyond the tap will ONLY contain generation circuits and will contain NO LOADS and NO OPEN POSITIONS
    - This type of design must be clearly specified on the electrical sketch
    - Photos clearly showing the load center(s) must be included as part of the completion photos.
    - A system which is granted Approval to Install based on the preceding conditions, but then is installed such that an upgrade is required WILL NOT be given Approval to Operate until the system is installed as designed or the upgrade is completed.
- WILL REQUIRE a Service upgrade (i.e. 100 A to 200 A or 200 A to 400 A) if:
  - A load center is installed beyond the line side tap which contains load circuits or open positions in addition to generation circuits.
    - The application will be considered on hold for New Service, and Approval to Install will NOT be granted until the upgrade is completed.
    - All WMECO's New Service requirements must be met.

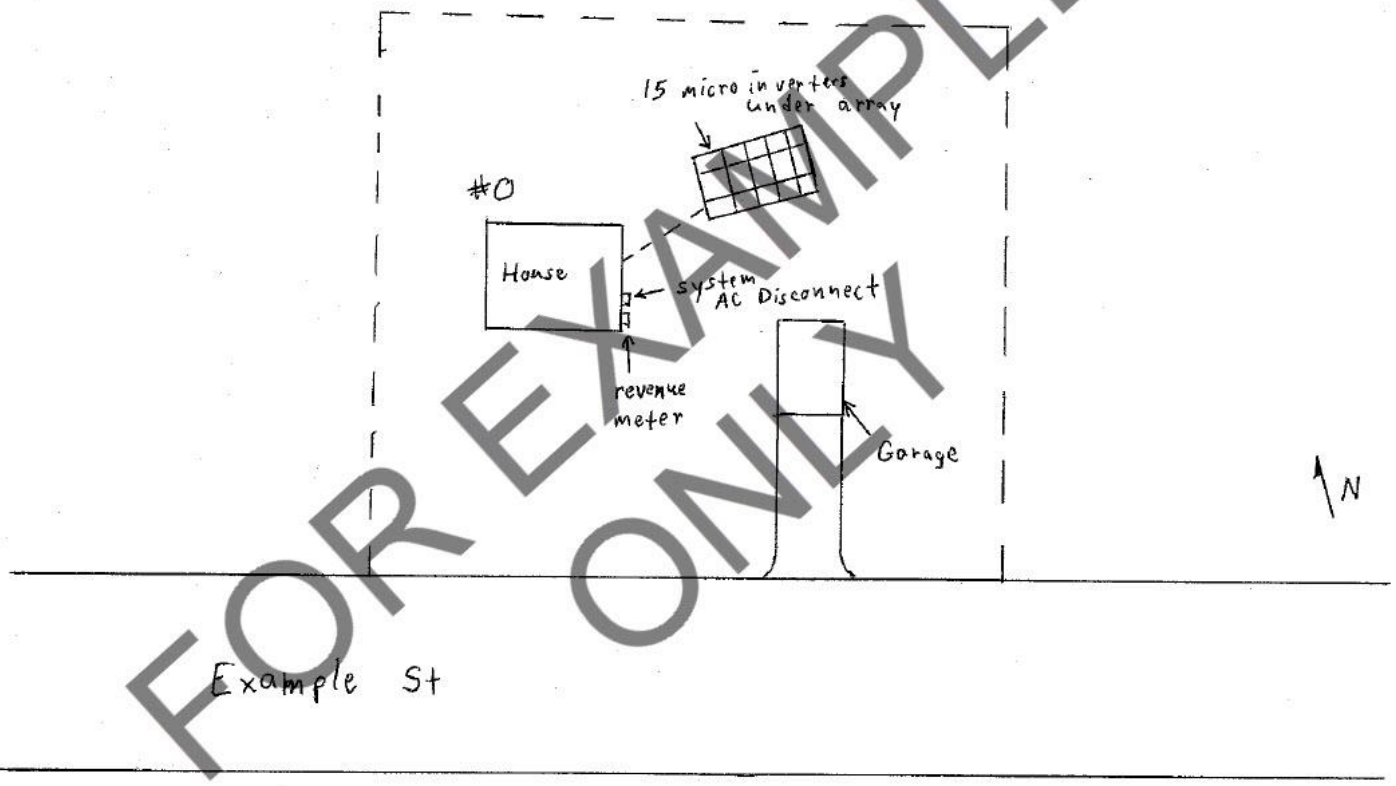
Simplified Process *Requirements*

Submit with Simplified Application:

- Site Plan/Drawing:
  - Must show revenue meter (i.e. utility meter) location and location of inverter(s) and all existing generation.
  - 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 view i.e. vertical NOT "birds eye"/isometric/"3/4" view.
  - Must show lot lines (generation must be on one lot), and, if Net Metered, show any other generation on the same lot.

Example Site Plan

Site Plan
Example Customer
0 Example St
Nowhere, MA 01234



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.

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

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 or Wiring Inspector signing off a Work Request Number (WR #). Give the WR # to the local inspector who will sign off that you pulled a permit. This requirement replaces need to send in the 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(s) must be clear enough to verify the number of modules and, by extension, the number of inverters.
    - 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 (the door must be open in the photo).
    - All other pertinent AC equipment between the service entrance and the inverters i.e. production meter(s), load centers etc.
  - 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 and is not exporting power.

Simplified Process Tips

- WMECO suggests you submit the complete application at least six weeks before you plan to start construction.
- Provide the WR # to the Electrical or Wiring Inspector.
- If you are installing a new service or making a change to your existing service, that work must be complete before your Simplified Application can be approved for installation.

Summary

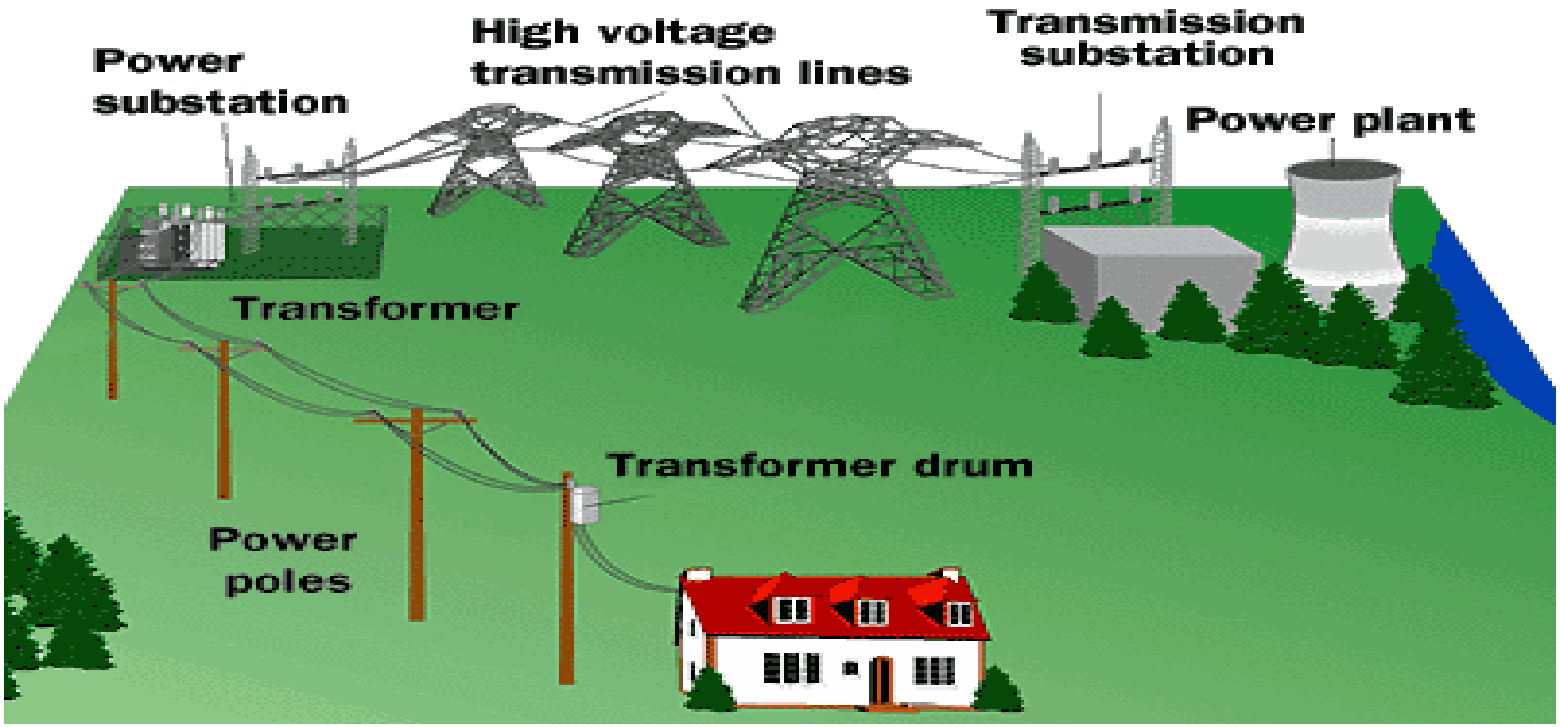
- When submitting application, include inverter cut sheet(s), site plan and electrical sketch or un-stamped electrical sketch/one line (it may be PE stamped if customer/installer chooses)
- Completion Documents needed are:
  - Photos of inverter(s), inverter nameplate(s) or entire array, AC disconnect(s), main panel, interconnection point (junction box, properly labeled interconnection breaker etc.), and pertinent AC equipment
  - Certificate of Completion
  - Electrical or Wiring Inspector sign off of WR #
- Bidirectional revenue meter will be set after WMECO has the appropriate completion documents and WR # is signed off.
- WMECO is doing Witness Tests of some Simplified projects. We inspect all battery backup systems.
- Submit required documentation by December 5th to ensure that we can install the bi-directional meter and schedule a Witness Test by the end of December.

Simplified Process 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)

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).

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

- Contacts for interconnections:
  - Dave Forrest 413-540-4584, dforrest@iso-ne.com
  - Cheryl Ruell 413-540-4219, cruell@iso-ne.com

- Contact for other questions:
  - ISO Customer Service 413-540-4220

Expedited / Standard / Complex

Interconnection Process

Everything Starts with the **Application**

- A complete application includes:
  - All appropriate sections of 6-page application completely filled out and **SIGNED** by the Interconnecting Customer. Customer will likely need assistance from vendor/engineer.
  - **Application fee** $4.50/KW ($300 minimum and $7,500 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). (If a three-line diagram is needed, we will request it later in the process.)
  - **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 Process

- APPLIES TO:
  - Projects which do not qualify for Simplified Process.
  - Single phase listed single-phase inverter based systems above 15.0 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.

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.
- **Standard Complex** – This is projects requiring involved studies and time frames can be set by mutual agreement.

	Expedited
Eligible Facilities	Listed DG
Acknowledge Receipt of Application (Note 2)	(3 days)
Review Application for Completeness	10 days
Complete Review of All Screens	25 days
Complete Supplemental Review (if needed) (Note 3)	20 days or Standard Process
Complete Standard Process Initial Review	N/A
Send Follow-on Studies Cost/Agreement	N/A
Complete Impact Study (if needed)	N/A
Complete Detailed Study (if needed)	N/A
Send Executable Agreement (Note 4)	10 days
Construction Schedule	By Mutual Agreement
Notice/ Witness Test	< 1 day with 10 day notice or by mutual agreement

	Standard
Eligible Facilities	Any DG
Acknowledge Receipt of Application (Note 2)	(3 days)
Review Application for Completeness	10 days
Complete Review of All Screens	N/A
Complete Supplemental Review (if needed)	N/A
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
Construction Schedule	By Mutual Agreement
Notice/ Witness Test	10 days or by mutual agreement

Tables 2 and 3 of Section 3

Interconnection Process Fee Schedule

	Simplified	Expedited	Standard (Note 1)	Simplified Spot and Area Network
	Listed Small Inverter	Listed DG	Any DG	Listed Inverter
Application Fee (covers Screens)	0 (Note 2)	$4.50/kW, minimum $300, maximum $7,500	$4.50/kW, minimum $300, maximum $7,500	≤$3/kW $100, > 3kW $300
Supplemental Review or Additional Review (if applicable)	N/A	Up to 30 engineering hours at $150/hr ($4,500 maximum) (Note3)	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 (Note 4)	N/A
Facility Upgrades	N/A (Note 5)	Actual cost	Actual cost	N/A
O&M (Note 6)	N/A	TBD	TBD	N/A
Witness Test	0	Actual cost, up to $300 + travel time (Note 7)	Actual Cost	0 (Note 8)

Table 6 of Section 3

Expedited

- 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 $4,500.
- Relay control system must be well defined to make supplemental review easier.
- Witness Test fee of up to $300 plus travel is required.

Time Frame

	Expedited
Eligible Facilities	Listed DG
Acknowledge Receipt of Application (Note 2)	(3 days)
Review Application for Completeness	10 days
Complete Review of All Screens	25 days
Complete Supplemental Review (if needed) (Note 3)	20 days or Standard Process
Complete Standard Process Initial Review	N/A
Send Follow-on Studies Cost/Agreement	N/A
Complete Impact Study (if needed)	N/A
Complete Detailed Study (if needed)	N/A
Send Executable Agreement (Note 4)	10 days
Construction Schedule	By Mutual Agreement
Notice/ Witness Test	< 1 day with 10 day notice or by mutual agreement

Table 2 of Section 3

Standard

- 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, engineering, all permitting
  - Various timeframes for studies based on amount of modifications
- During studies, may determine that project must follow Standard Complex Process.
- ISO notification and possibly Transmission Study if over 1.0 MW
- After studies – Interconnection Service Agreement sent for signature
- An Early Interconnection Service Agreement can be requested. Detailed Study Agreement will still be required.
- Witness Test fee is actual cost.

Time Frame

	Standard
Eligible Facilities	Any DG
Acknowledge Receipt of Application (Note 2)	(3 days)
Review Application for Completeness	10 days
Complete Review of All Screens	N/A
Complete Supplemental Review (if needed)	N/A
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
Construction Schedule	By Mutual Agreement
Notice/ Witness Test	10 days or by mutual agreement

Table 3 of Section 3

Complex

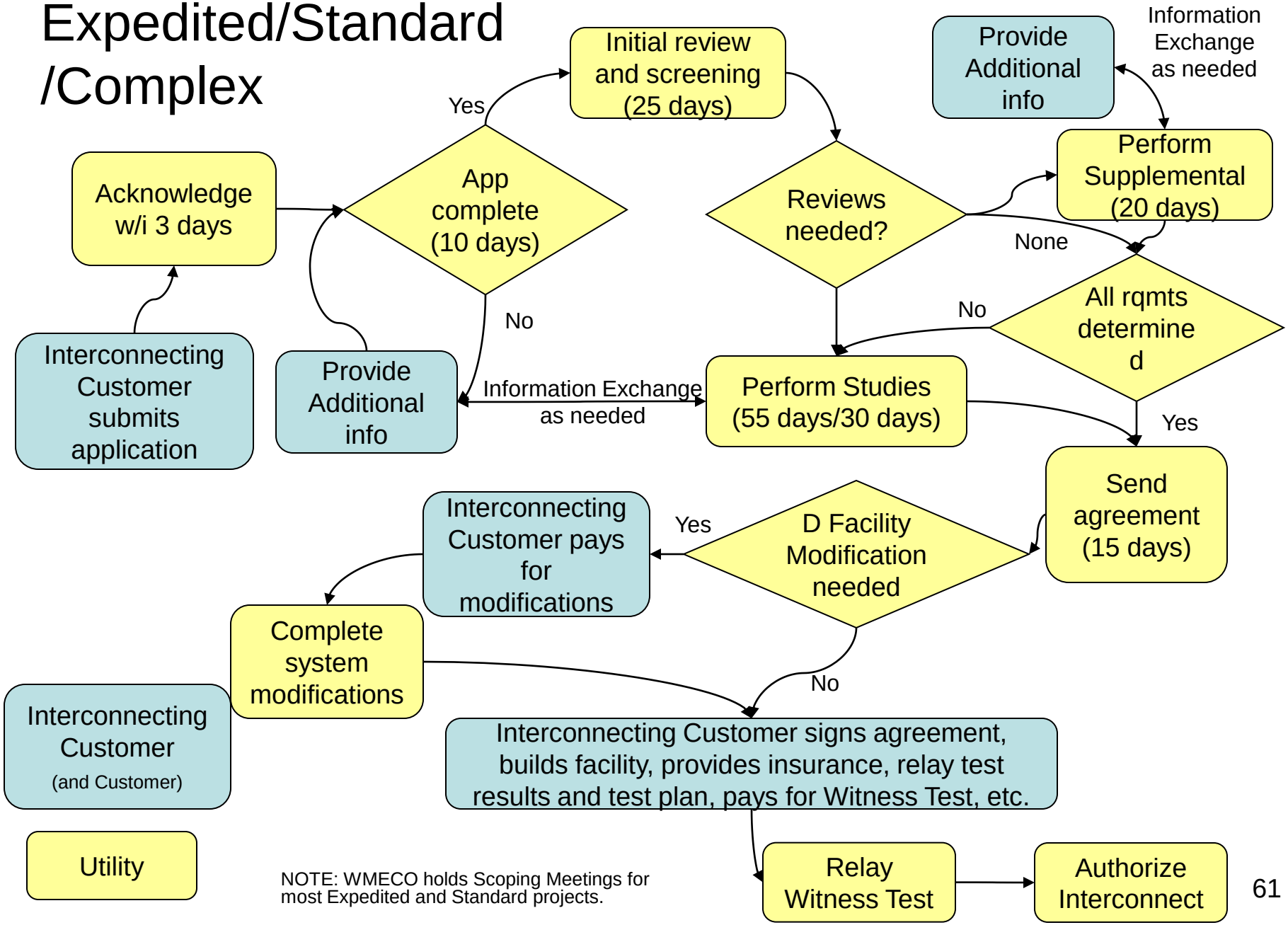
- Also knows as Standard Process Complex Projects
- Similar to Standard Process.
- Usually determined during the Impact Study.
- If substation modifications are required, Impact Study will be 75 days in 2014, 70 in 2015, 60 in 2016 and subsequent years.
- If system modifications are likely to be $200,000 or greater not including service upgrades, the Detailed Study will take 75 days in 2014, 70 days in 2015, and 60 days in 2016 and subsequent years.
- If system modifications are estimated to be $1,000,000 or greater, Impact Study and Detailed Study timeframes will be by mutual agreement.

Time Frame

	Complex
Eligible Facilities	Any DG (Note 2)
Acknowledge Receipt of Application (Note 3)	(3 days)
Review Application for Completeness	10 days
Complete Review of All Screens	N/A
Complete Supplemental Review (if needed)	N/A
Complete Standard Process Initial Review	20 days
Send Follow-on Studies Cost/Agreement	5 days
Complete Impact Study (if needed)	(Note 4)
Complete Detailed Study (if needed)	(Note 5)
Send Executable Agreement (Note 6)	15 days
Construction Schedule	By Mutual Agreement
Notice/ Witness Test	10 days or by mutual agreement

Table 3 of Section 3

Expedited/Standard /Complex



NOTE: WMECO holds Scoping Meetings for most Expedited and Standard projects.

Example – Customer Installing 2 MW PV System

Western Massachusetts Electric Company M.D.P.U. No. 1039F

Generating Facility Expedited/Standard Process
Interconnection Application

Contact Information: Date Prepared: 8/29/2013

Legal Name and address of Interconnecting Customer

Interconnecting Customer (print): Example Solar, LLC Contact Person: 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, if appropri

Name: Maxwell Edison - Example Power Engineers Inc.

Mailing Address: 667 Fleet Street

City: St. Louis State: MO Zip Code: 65432

Telephone (Daytime): 999-888-7777 (Evening):

Facsimile Number: E-Mail Address: medison@expower.com

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

Site Control? (Y/N) Y

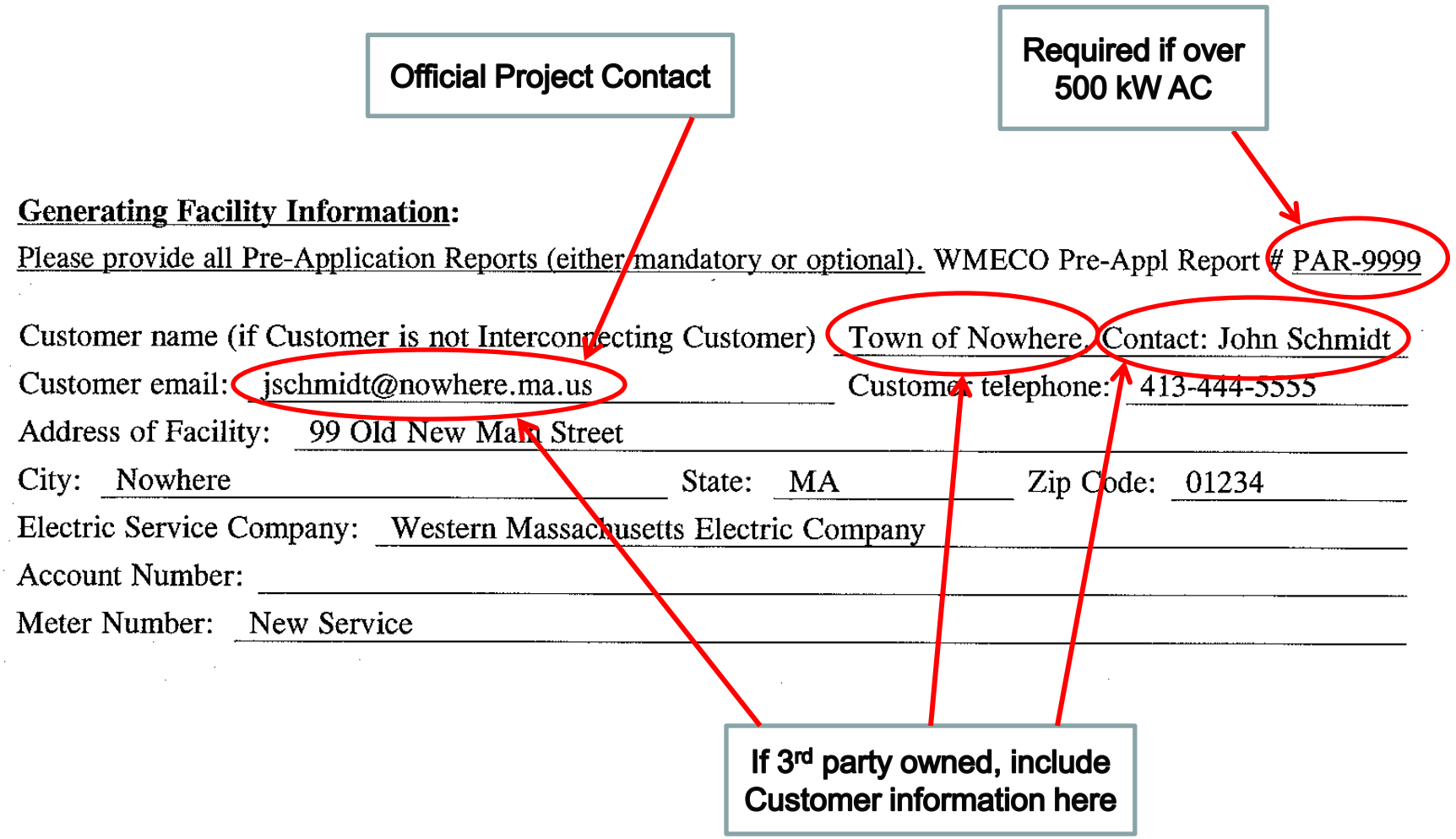
Will Facility be constructed on a single parcel of land? (Y/N) Y

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 Working Group that is exploring ways to further expedite future interconnections." Yes ☒ No ☐

Group Study Agreement: "I agree to allow my contact information to be shared with other parties interested in a potential group study in the same geographic area." Yes ☐ No ☒

Official Project Contacts

Must be included and accurate


Official Project Contact
Required if over 500 kW AC
Generating Facility Information:
Please provide all Pre-Application Reports (either mandatory or optional). WMECO Pre-Appl Report # PAR-9999
Customer name (if Customer is not Interconnecting Customer) Town of Nowhere, Contact: John Schmidt
Customer email: jschmidt@nowhere.ma.us
Customer telephone: 413-444-5555
Address of Facility: 99 Old New Main Street
City: Nowhere
State: MA
Zip Code: 01234
Electric Service Company: Western Massachusetts Electric Company
Account Number:
Meter Number: New Service
If 3rd party owned, include Customer information here

Type of Generating Unit: Synchronous _____ Induction _____ Inverter X

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

Nameplate Rating: 2000 (kW) _____ (kVAr) 208 (AC Volts) Single ☐ or Three ☒ Phase

Prime Mover: Fuel Cell ☐ Reciprocating Engine ☐ Gas Turbine ☐ Steam Turbine ☐ Microturbine ☐
Photovoltaic ☒ Other _____

Energy Source: Solar ☒ Wind ☐ Hydro ☐ Diesel ☐ Natural Gas ☐ Fuel Oil ☐
Other _____ (Please Specify)

For Solar PV provide the DC-STC rating: 2123.4 (kW)

IEEE 1547.1 (UL 1741) Listed? Yes X No _____

Need an air quality permit from DEP? Yes _____ No X Not Sure _____
If "yes", have you applied for it? Yes ☐ No ☐

Planning to Export Power? Yes X No _____ A Cogeneration Facility? Yes _____ No _____

Anticipated Export Power Purchaser: _____

Export Form? Simultaneous Purchase/Sale _____ Net Purchase/Sale _____ Net Metering X

Other (Specify) _____

Est. Install Date: 8/1/14 Est. In-Service Date: 10/1/14 Agreement Needed By: 7/1/14

Application Process

I hereby certify that, to the best of my knowledge, all of the information provided in this application is true:

Interconnecting Customer Signature: Molly Jones Title: Director Date: 8/29/2013

The information provided in this application is complete:

Company Signature: _____ Title: _____ Date: _____

Needed if Net Metered Photovoltaic

Must be signed by Interconnecting Customer

"Company" is WMECO. Leave this section BLANK

Generating Facility Technical Detail

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.				

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? _____

"Generating Unit" is an inverter, wind turbine, gen-set etc.

Complete applicable area. Leave others blank.

Generator Characteristic Data (for all inverter-based machines)

Max Design Fault Contribution Current? 1600 A Instantaneous X or RMS? _____

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, Xd: _____ (PU) Transient Reactance, X'd: _____ (PU)

Subtransient Reactance, X"d: _____ (PU) Neg Sequence Reactance, X_2: _____ (PU)

Zero Sequence Reactance, Xo: _____ (PU) kVA Base: _____

Field Voltage: _____ (Volts) Field Current: _____ (Amps)

Additional information for Induction Generating Units

Rotor Resistance, Rr: _____ Stator Resistance, Rs: _____

Rotor Reactance, Xr: _____ Stator Reactance, Xs: _____

Magnetizing Reactance, Xm: _____ Short Circuit Reactance, Xd": _____

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: _____

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 X Phase
Transformer Impedance: 4.9 (%) on a 2000 kVA Base
If Three Phase:
Transformer Primary: 13,800 (Volts) ____ Delta ____ Wye X Wye Grounded ____ Other
Transformer Secondary: 208 (Volts) X Delta ____ Wye ____ Wye Grounded ____ Other

Transformer Fuse Data (if applicable, for Interconnecting Customer-Owned Fuse):
(Attach copy of fuse manufacturer's Minimum Melt & Total Clearing Time-Current Curves)

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

Interconnecting Circuit Breaker (if applicable):

Manufacturer: _____ Type: _____ Load Rating: _____ (Amps) Interrupting Rating: _____ (Amps) Trip Speed: _____ (Cycles)

Interconnection Protective Relays (if applicable):
(If microprocessor-controlled)

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

	Setpoint Function	Minimum	Maximum
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: _____

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

Required information, but commonly omitted

Expedited / Standard / Complex Process

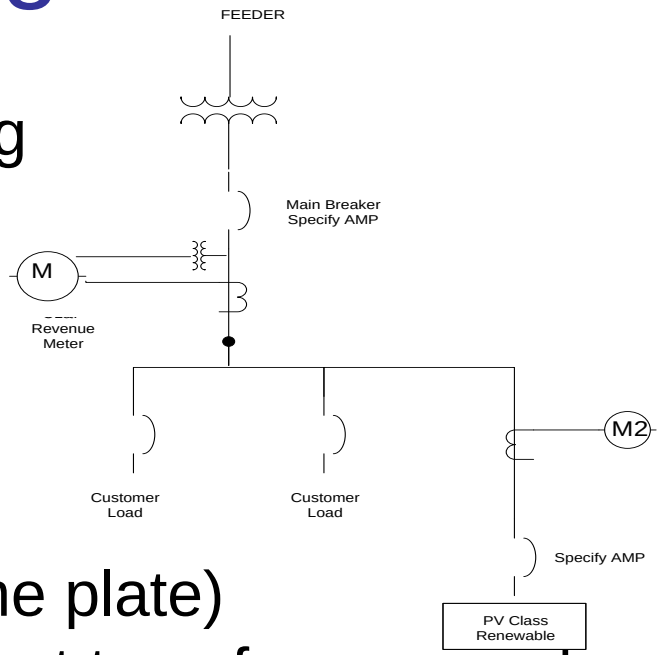
Requirements

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, relay settings.
  - 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 in table form
- Definitive relay settings in table form, relay(s), PT's and CT's



Expedited / Standard / Complex 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.)
  - CANNOT be made on a cold sequenced instrument rated service.
  - If you have an existing hot sequenced instrument rated service, a service upgrade to a cold sequenced instrument rated service is likely.
  - 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).

Expedited / Standard / Complex Process

Requirements

Interconnection via line side tap (cont'd):

- Will NOT require a service upgrade if:
  - A load center will not be installed beyond the tap.
  - Any load center installed beyond the tap will ONLY contain generation circuits and will contain NO LOADS and NO OPEN POSITIONS
    - This type of design must be clearly specified on the electrical sketch
    - Photos clearly showing the load center(s) must be included as part of the completion photos.
    - A system which is granted Approval to Install based on the preceding conditions, but then is installed such that an upgrade is required WILL NOT be given Approval to Operate until the system is installed as designed or the upgrade is completed.
- WILL REQUIRE a Service upgrade (i.e. 100 A to 200 A or 200 A to 400 A) if:
  - A load center is installed beyond the line side tap which contains load circuits or open positions in addition to generation circuits.
    - The application will be considered on hold for New Service, and Approval to Install will NOT be granted until the upgrade is completed.
    - All WMECO's New Service requirements must be met.

Expedited / Standard / Complex 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 / Complex 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.
  - Does not need to be PE Stamped.
  - 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/lot lines.

Supplemental Review

- If one or more Screens are not passed or if additional time is needed to determine system modifications or technical review, the Company will provide a Supplemental Review Agreement.

- Interconnecting Customer signs agreement and pays fee for additional engineering time (max fee is $4,500).

- 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 may be 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 over 1.0 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 participate.
    - 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 participate.
    - 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 / Complex 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 Agreement.
  - Electrical or Wiring Inspector signing off a Work Request Number (WR #). Give the WR # to the local inspector who will sign off that you pulled a permit. This requirement replaces need to send in the 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

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 (three total 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.

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. ISO time frames are NOT included in the Tariff time frames.
- Class II and III Net Metered facilities (over 60 kW) may require a dedicated analog phone line to the meter.
- Inverter based generation over 500 kW requires utility grade relays.
- Stand alone generation facilities 500 kW and greater 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 over 1.0 MW
  - 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

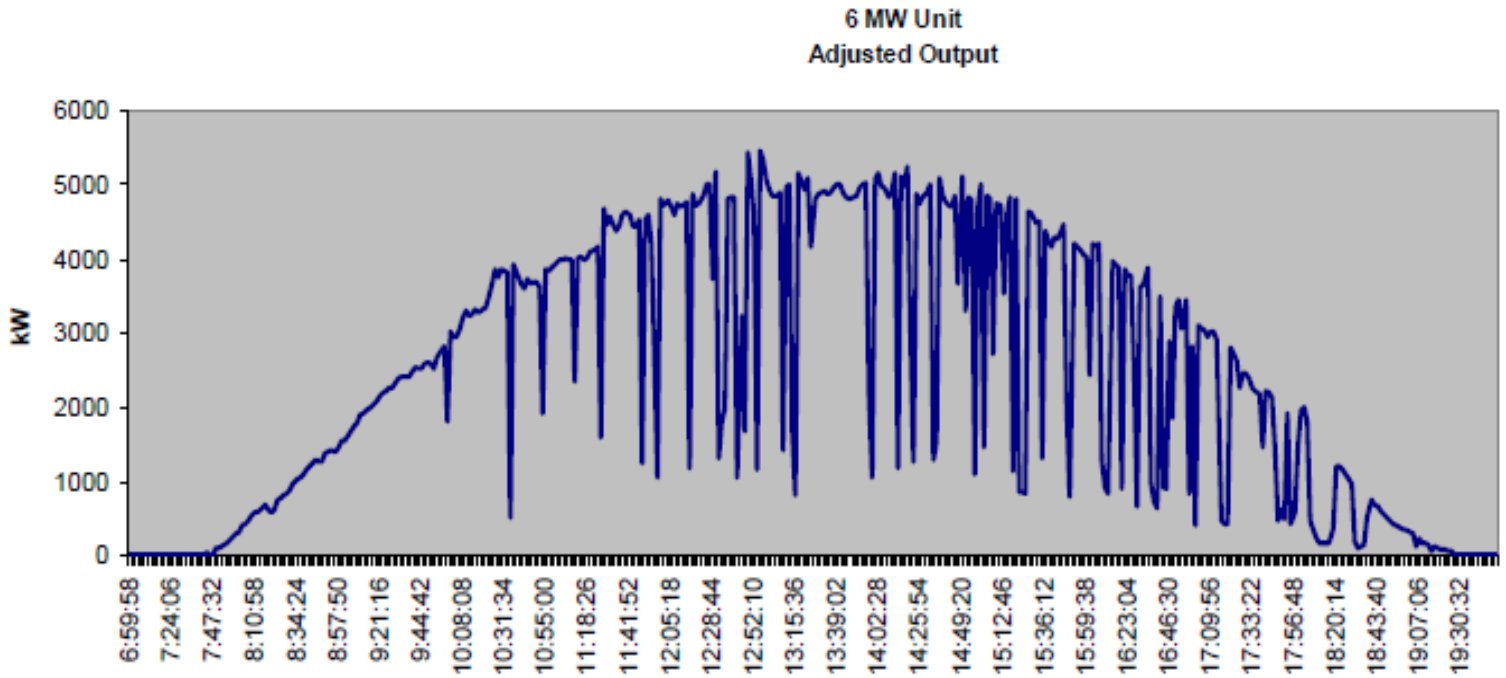
- If aggregate generation on a feeder is over 15% of peak line section and/or or feeder load, there may be special reviews required.
- Feeder voltage may impact the size of generator that can be safely interconnected at the distribution level. (e.g. 4.1 kV, 23 kV, 69 kV).
- If the generator will sell 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/meter 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 500 kW and larger will also require a recloser with remote control and data access to be installed to
  - Monitor voltage, current
  - Act as a utility controlled protection system
  - Provide for remote disconnect

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.



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 5th to insure that we can install the bi-directional meter and schedule a Witness Test by the end of December.

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

Behind the Scenes at Utility…

- Review and replacement of metering, modifications to billing.
- Verifying wiring inspector signed off on Work Request Number.
- 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.

Expedited / Standard / Complex Process Questions?

Appendix

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DOER, MassCEC & Mass ACA Slides

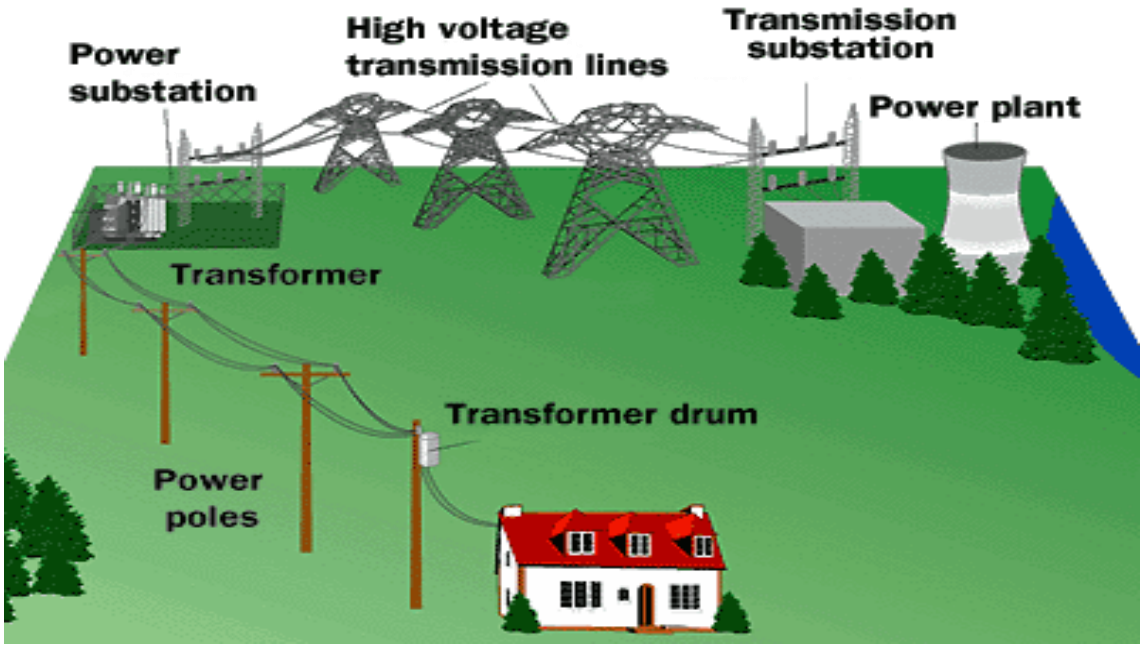
How Does the Electric Grid Work?

•**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*).

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.

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

Mass ACA

Submitting an Application for Cap Allocation

- **All Private and Public Facilities seeking net metering services must use the System of Assurance to obtain a reservation for Cap Allocation.**
- **Exempt facilities include:**
  - **Facilities with a capacity of 10 kW or less and connected to a single-phase circuit**
  - **Facilities with a capacity of 25 kW AC or less and connected to a three-phase circuit**
- **Applications for Cap Allocation must be submitted via the System of Assurance at http://www.MassACA.org.**
- **Guidance on submitting an Application for Cap Allocation is available at:**
  - **http://www.massaca.org/help.asp, via the Help@MassACA.org email, or the MassACA Helpline (877) 357-9030**
- **Weekly Cap Reports can be found on www.MassACA.org under the Public/Private Cap Info link.**

Mass ACA

What is needed to submit a successful ACA?

Item 1: An Executed Interconnection Services Agreement (ISA)

- Executed means a current and active ISA, counter-signed by the applicant and the distribution company representative. For a Simplified Process application the Interconnection Application is also the Interconnection Agreement.

Item 2: Executed Documentation of Site Control.

- Examples of documentation include executed lease agreements or signed options. If the Host Customer Entity owns the location where the facility will be installed, no additional documentation is needed at the time of submission.

Item 3: All necessary, executed governmental non-ministerial permits and approvals required to construct the facility.

- Non-ministerial permits and approvals often require some level of discretion by the grantor, such as a vote, a finding from a board, or peer review. Examples of permits **not** required include local Building and/or Electrical Permits.

Item 4: Application Fee of $100.

- Paying the Application Fee **does not** qualify as submitting the ACA, the applicant must click the submit button to send the Application to the Administrator for review.

Item 5: Reservation Fee of $3.15 kW per kW AC

- After an Application for Cap Allocation is determined to be complete by the Administrator, the applicant has 15 business days to pay the reservation fee.

Mass ACA

Common Issues When Submitting ACAs

- As of 1/1/2014, a fully executed Early ISA is sufficient for submittal.
- Documents that need to be split into multiple files, or do not have an appropriate title on the ***Permits and Approvals*** page, can be added to the ***ACA Documents*** page as ***Other Documents.***
- When an ACA is ready for submission, select the ***Edit Application*** button to make the ***Submit Application*** button available, and then select the ***Submit Application*** button.
  - Only Host Customer Administrators can submit ACAs.
  - Paying the ***Application Fee*** is a separate action from submitting the ACA.
- Files must be in Adobe Acrobat (.PDF) format and 10 MB or less.
  - For large files please reduce or split documents. An unlimited number of documents may be uploaded to support an ACA.
- Check out the ***Quick Start Guidance*** for a brief description of how to use the System of Assurance (http://www.massaca.org/pdf/QuickStart.pdf).

Mass ACA

System of Assurance Requirements

- "Complete" ACAs:
  - Reservation Fee of $3.15 per KW is required to enter the "Reservation Period"
- Reservation Period:
  - Ranges from **9-27 Months**, depending technology and facility specifics.
  - Extensions to the Reservation Periods are available:
    - 6 month extension is available to all, for an additional deposit;
    - 6 months if the Facility undergoes a legal challenge, or
    - Pending Authorization to Interconnect.
  - **Quarterly Reporting to Mass ACA** is required for each facility
    - To exit the System of Assurance, a copy (in PDF format) of the Authorization/Approval to Operate must be submitted.
    - A copy of an email received from the Distribution Company is sufficient.