ONCOR INTERCONNECTION APPLICATION AND PROCESS FOR DISTRIBUTED RESOURCES

2016 Commercial and Residential Solar Programs Kickoff Meeting
November 11-12, 2015

Ken Brunkenhoefer
Oncor Asset Planning
OVERVIEW

1. GENERAL INFORMATION

2. TARIFF APPLICATION AND INTERCONNECTION AGREEMENT STEPS & TIMELINES

3. “What happened to the energy I generated?”
1. GENERAL INFORMATION

2. TARIFF APPLICATION AND INTERCONNECTION AGREEMENT STEPS & TIMELINES

3. “What happened to the energy I generated?”
What has changed since last year?

1. Oncor introduced eTRACK
2. Increase of applications submitted
3. Decrease in overall process time
GENERAL INFORMATION

What has changed since last year?

1. Oncor introduced
   - Increase of applications submitted
   - Decrease in overall process time

11/05/2015 Presented by Ken Brunkenhoefer at the 2016 Commercial and Residential Solar Programs Kickoff Meeting
General Information

1. Oncor introduced eTRACK

What it means for Installers...

- Allows Installers to have administrative control of projects
- Know the status of the project in real time
- Receive email notification, as the project moves through the workflow
- Check the meter and profile status
- Download agreements and permission to operate letters as soon as the documents become available
- Documents for the projects are all ways available in eTRACK
General Information

1. Oncor introduced eTRACK

What it means for Oncor…

- Decreases the amount of time for processing applications and agreements
- Files stored in a centralized location
- Improves data sharing among departments and with installers
- Track the growth of parallel operation interconnected with the Oncor grid
- Improves accuracy of reporting
- Provide better overall service to our customers
General Information

What has changed since last year?

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General Information

Classes of Systems

- 0 – 500 kW → Generally classified as small
- 501- 10,000 kW → Generally Classified as large
- Larger systems normally require Impact Study Fees (See Impact Study Fee schedule in tariff application)
- Network Systems are downtown grid connected systems (Downtown Dallas and Fort Worth; see Impact Study Fee schedule in tariff application)
### GENERAL INFORMATION

- Increase of applications submitted

#### DG FACILITIES INTERCONNECTED WITH ONCOR

<table>
<thead>
<tr>
<th>Type</th>
<th>Residential Facilities</th>
<th>Residential kW</th>
<th>C&amp;I Facilities</th>
<th>C&amp;I kW</th>
<th>Total Facilities</th>
<th>Total kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind</td>
<td>208</td>
<td>899</td>
<td>49</td>
<td>2,714</td>
<td>257</td>
<td>3,613</td>
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<tr>
<td>Solar</td>
<td>4,703</td>
<td>28,005</td>
<td>438</td>
<td>30,267</td>
<td>5,141</td>
<td>58,272</td>
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<tr>
<td>Other</td>
<td>2</td>
<td>9</td>
<td>1</td>
<td>20</td>
<td>3</td>
<td>29</td>
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<tr>
<td>Subtotal</td>
<td>4,913</td>
<td>28,913</td>
<td>488</td>
<td>33,001</td>
<td>5,401</td>
<td>61,914</td>
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<tr>
<td>Synchronous</td>
<td>0</td>
<td>0</td>
<td>112</td>
<td>554,398</td>
<td>112</td>
<td>554,398</td>
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<tr>
<td>Total</td>
<td>4,913</td>
<td>28,913</td>
<td>600</td>
<td>587,399</td>
<td>5,513</td>
<td>616,312</td>
</tr>
</tbody>
</table>

September 28, 2015
### General Information

- Increase of applications submitted

### Solar Interconnection Updates as of September 2015

<table>
<thead>
<tr>
<th>Solar</th>
<th>Number of Facilities</th>
<th>kW of Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilities ≤ 2009</td>
<td>270</td>
<td>2,499</td>
</tr>
<tr>
<td>Facilities in 2010</td>
<td>469</td>
<td>4,807</td>
</tr>
<tr>
<td>Facilities in 2011</td>
<td>341</td>
<td>7,895</td>
</tr>
<tr>
<td>Facilities in 2012</td>
<td>303</td>
<td>6,328</td>
</tr>
<tr>
<td>Facilities in 2013</td>
<td>920</td>
<td>9,419</td>
</tr>
<tr>
<td>Facilities in 2014</td>
<td>1,572</td>
<td>17,094</td>
</tr>
<tr>
<td>Total YTD 2015</td>
<td>1,266</td>
<td>10,230</td>
</tr>
<tr>
<td></td>
<td>5,141</td>
<td>58,272</td>
</tr>
</tbody>
</table>
RENEWABLE, SOLAR AND MORE

Distributed generation (DG) is the interconnection of customer-owned, onsite power generation to the utility distribution system, commonly known as the grid. DG is also referred to as operating synchronously or in parallel with the grid. DG can also be referred to as Distributed Resources (DR) and can include Distributed Renewable Generation (DRG). Oncor works with DG customers to ensure safe and reliable interconnection.

Examples of DG:

- Solar (Photovoltaic)
- Wind
- Landfill gas
- Diesel-fueled engines
- Natural gas fueled micro-turbines

For more information, visit:
- Interconnection Steps: Certified Solar and Wind
- Interconnection Steps: Non-Certified Systems - All Others
- Interconnection Applications
- Incentives
- Contact Us
RENEWABLE, SOLAR AND MORE

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General Information

What has changed since last year?

1. Oncor introduced eTRACK
2. Increase of applications submitted
3. Decrease in overall process time
What it means for Installers…

- Overall average application time was up to 6 weeks
- Application initial review time has decreased to approximately 10 days
- Average processing time for Oncor finalizing Agreement and issuing PTO is now up to 5 days
1. GENERAL INFORMATION

2. TARIFF APPLICATION AND INTERCONNECTION PROCESS FOR DISTRIBUTED RESOURCES

3. “What happened to the energy I generated?”
ONCOR INTERCONNECTION STEPS FOR DISTRIBUTED RESOURCES

1. Customer Application
2. Oncor Initial Screening
3. Oncor System Impact Assessment
4. Interconnection Agreement (IA)
5. Customer Signed IA
6. Construction, Commissioning, and Metering
7. Executed IA & Permission to Operate (PTO)
8. ERCOT Profile Changes
1. CUSTOMER APPLICATION

Customer Submits Tariff Application (TA) to Oncor

- Tariff Application available at [www.oncor.com/dg](http://www.oncor.com/dg)
- Applications submitted through eTRACK [https://oncor.anbetrack.com](https://oncor.anbetrack.com) by third party installers signed up by sending email to [dg@oncor.com](mailto:dg@oncor.com)

Considerations

- Submitted by customer or customer’s installer
- Application requirements for small and large systems:
  - Customer information
  - Equipment data
  - Communication contact
  - One-line diagram
  - Layout sketch
  - Relay functional diagram
  - Sequence of operation
  - Breaker failure scheme
  - Preliminary relay settings
  - Study fee

Timing

- Oncor – customer starts the process
- Customer – possible delays due to incomplete applications
2. ONCOR INITIAL SCREENING (smaller systems)

Oncor Reviews Application Advising Customer of the Process

- Application reviewed for completeness, customer provides site location, desired in-service date, connected capacity and equipment details
- eTRACK email notification whether the application is approved or returned back to the customer for additional details

Considerations (smaller systems review)

- Review of ownership and legal name for Interconnection Agreement (IA)
- Review of equipment certification
- Review of contact information
- Review of one-line sketch
- Review of layout sketch
- Review of placard specifications

Timing

- Oncor – majority of applications reviewed within 10 days
- Customer – mutual urgency for transparent exchange of information
Assessment of System Impacts and Upgrades for Reliable Interconnection

- Service study is performed by Oncor
- Review site specific information to determine potential systems impacts
- Metering, feeders, substation, and system protection

Considerations

- Small projects (generally 5 kW or less) are approved and the system impact assessment is done in aggregate
- All other projects are studied on a case-by-case basis considering the capability of Oncor facilities and desired DG capacity

Timing

- Oncor – small projects within 5 days, others as schedule with customers
- Customer – decision to proceed if upgrades are necessary
4. INTERCONNECTION AGREEMENT (IA)

Oncor Prepares an Interconnection Agreement

- Interconnection Agreement language is approved by the PUC, continues to be evaluated, and generally non-negotiable
- IA provisions for private or federal governmental entities

Considerations

- IA prepared with direct customer input including all customer information, equipment data, one-line diagram and layout sketch
- For small systems, eTRACK forwards the IA electronically to the customer (or customer’s third party installer) for customer approval and signature
- Oncor utilizes electronic signatures through eTRACK or can accommodate the entire process manually for individual customers as needed

Timing

- Oncor – IA prepared within 3 days
- Customer – dependent on customer approval and signature
5. CUSTOMER SIGNED IA

Customer Returns Signed Interconnection Agreement (IA)

- An interconnection agreement is required for all distributed resources that operate in parallel with the Oncor delivery system
- Distributed resources that never connect electrically in parallel do not have any interconnection requirements by Oncor

Considerations

- Signed IA uploaded into eTRACK by customer or customer’s agent
- If the agreement is not signed and returned (generally within 90 days) it will be cancelled and deleted from eTRACK

Timing

- Oncor – project on hold awaiting customer signature
- Customer – dependent on customer approval and signature
6. CONSTRUCTION, COMMISSIONING, AND METERING

Oncor Proceeds with Construction, Commissioning and Metering

- Oncor orders equipment and schedules resources following the fully executed IA and payment for system upgrades
- Peak demands greater than 700 kW or distributed resources greater than 1,000 kW require Interval Data Recorder (IDR) metering
- ERCOT Polled Settlement (EPS) metering is optional unless the distributed resource capacity exceeds 10 MW then it is required

Considerations

- Majority of distributed resources (small certified systems) use AMS metering and do not require system upgrades or commissioning
- AMS meters are currently field programmed to enable an out-flow channel so both in-flow and out-flow of energy are reported

Timing

- Oncor – most within 10 days after the IA is signed
- Customer – dependent on customer commissioning of equipment
METERING

Obtaining Energy Data

Today's reading minus previous reading and result (encourage charting history)

**Oncor FAQ – From Website**

Can I get a list of common questions relating to metering?
How do I read my DRG Meter?
7. EXECUTED IA AND PERMISSION TO OPERATE (PTO)

**Oncon Approves IA and Sends Permission to Operate**
- Final signature approval and date by Oncor fully executes the IA and with the PTO, the customer may operate their distributed resource.
- Credits from the out-flow of energy to the grid will not be reported to ERCOT until the first full monthly billing cycle following either the date of the executed IA or the meter reprogram date.

**Considerations**
- Permission to Operate (PTO) notification is sent automatically from eTRACK by email following the fully executed IA.
- The electronic communication from eTRACK is directed by customer input to their designated contacts.

**Timing**
- Oncor – within 5 days for most projects and eTRACK sends the PTO same day following the fully executed IA.
- Customer – dependent on when customer chooses to operate.
8. ERCOT PROFILE CHANGES

Oncor Assigns a Profile ID for Distributed Resources

- Normal load profile is changed to a distributed resource profile necessary for accurate wholesale settlement and customer billing
- Load profile changes enable the customer’s Retail Electric Provider (REP) to recognize out-flow energy sent to the grid

Considerations

- Changes to the distributed resources profile are submitted to ERCOT after the Oncor IA is fully executed
- Customer may operate with the understanding that credits for the out-flow of energy to the grid will not be available for billing until the first full month (billing cycle) following the latter of either the fully executed IA or the date the meter is reprogrammed to register out-flow

Timing

- Oncor – most within 30 days
- Customer – transparent to the customer
SAFETY

Electrical Equipment and Placard Requirements

- Oncor requires placards at the utility meter to help employees know there is a DG system on-site and where they can disconnect it if necessary
- PUC rule §25.212 requires customers furnish and install a disconnect device with visible break and capable of being locked in the open position
- Certified systems meet UL-1741 and the applicable provisions of IEEE1547 regarding safety and disconnect requirements
- For non-certified systems Oncor requires specific relaying elements for protection

Oncor Personnel Training

- Oncor crews are trained to follow safe work procedures with all required personal protective equipment (PPE)
- This training includes isolate and ground procedures that treat everything as energized and this applies with or without DG systems
Real Example – Worse Case Credit Timing

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>9-14-2015</td>
<td>Project Submitted</td>
</tr>
<tr>
<td>9-23-2015</td>
<td>Project Reviewed and Accepted by Oncor and requested Service Study</td>
</tr>
<tr>
<td>9-30-2015</td>
<td>Service Study Generated and approved</td>
</tr>
<tr>
<td>9-30-2015</td>
<td>Agreement generated and sent to customer</td>
</tr>
<tr>
<td>9-30-2015</td>
<td>Agreement signed by customer</td>
</tr>
<tr>
<td>10-1-2015</td>
<td>Agreement signed by Oncor</td>
</tr>
<tr>
<td>10-1-2015</td>
<td>Permission to operate granted</td>
</tr>
<tr>
<td>10-2-2015</td>
<td>Meter out-flow channel programmed</td>
</tr>
<tr>
<td>11-3-2015</td>
<td>ERCOT Profile Updated – cannot change profile before 11-03-2015</td>
</tr>
</tbody>
</table>

**Cycle Date**

<table>
<thead>
<tr>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>08-03-2015</td>
</tr>
<tr>
<td>09-01-2015</td>
</tr>
<tr>
<td>10-01-2015</td>
</tr>
<tr>
<td>10-30-2015</td>
</tr>
<tr>
<td>12-01-2015</td>
</tr>
</tbody>
</table>

- Total time was 41 working days to get to cycle where credits begin
- Worst case when meter set date was first day of cycle date
- Average would be 15 days less if you use mid-cycle example
1. GENERAL INFORMATION

2. TARIFF APPLICATION AND INTERCONNECTION AGREEMENT STEPS & TIMELINES

3. “What happened to the energy I generated?”
What happened to the energy I generated?

I do not see my credits showing up on my bill.

I am confused.

I generated 600 kWhrs from my system, but my REP says I am getting credit for only 200 kWhrs.
What happened to the energy I generated?

Month Long Period

Oncor Distribution Grid

In-flow Register

2400 kWhrs

Out-flow Register

200 kWhrs

Utility Meter

200 kWhrs

400 kWhrs

Customer Facility

2800 kWhrs

Customer Owned Meter

DRG Facility

600 kWhrs

How much did facility consume?

200 kWhrs

400 kWhrs
What happened to the energy I generated?

Go to www.oncor.com/solar and then click Frequently Asked Questions.

How do I know if my distributed renewable generation (DRG) meter is working?

When your meter is registering energy flow, the scroll bar moves across the bottom of the digital register display. When energy is coming in, the scroll bar progresses from left to right. When energy is going out to the grid, it progresses from right to left.

One way to ensure your system is working is to turn off all energy-consuming devices, including your generation system. If everything is off, the scroll bar will stop. Once you’ve verified that it’s stopped, turn your generation system back online and the scroll bar should start to move from right to left.

To determine if your system is operating as expected, take a reading of the 057 out-flow kWh register. If you have a three kW solar system operating at full capacity, then in one hour you should produce three kWh (3 kW x 1 hr = 3 kWh) and the out-flow register should have incremented by three units.

3 kW x 1 hr = 3 kWhr
What happened to the energy I generated?

- Oncor Metered Outflow to Grid Channel 057
- Oncor Metered Consumption Channel 001
- Customer Load Energy
- Customer Owned Measurement Meter
- Customer Load Energy
QUESTIONS?

Contacts:

Email:  dg@oncor.com
On the web:  www.oncor.com/solar
            www.oncor.com/dg
            www.oncor.com/drg

eTRACK Registration for installers *:
* Chris Gregory   214 486 5323   chris.gregory@oncor.com
Ken Brunkenhoefer 214 486 5547   brunkenhoefer@oncor.com
Julio Chavarria    214 486 3935   julio.chavarria@oncor.com