REGULATORY FRAMEWORK FOR DISTRIBUTED GENERATION IN USA

ERRA – TENVA CONSULTATION
November 16, 2016
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Alliant Energy Background

Regulated Utility Profile

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<th>IPL</th>
<th>WPL</th>
<th>Total</th>
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<td>Operating Revenues (millions)</td>
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<td>$1,435</td>
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Service Territory Advantages
- Favorable commission rankings
- Economic diversity
- High quality renewable resources
- Access to ANR, Northern Border, and Northern Natural Gas pipelines
- Access to Powder River Basin coal
Alliant Energy Background

- Investor Owned Utility
- Two Utilities:
  - Interstate Power and Light (IPL)
  - Wisconsin Power and Light (WPL)
- Retail rates regulated by the state
- Wholesale markets for capacity and energy
- Wholesale markets regulated by the US (Federal Energy Regulatory Commission)
- All generation resources are submitted into wholesale market for economic dispatch.
- Transmission assets owned by third parties
- Transmission rates also regulated by FERC
Alliant Energy Background

- Independent non-profit member-based organization (MISO) administers the wholesale markets and transmission planning.
Alliant Generation Capacity Mix

**IPL**
- Gas: 37%
- Coal: 38%
- Purchased Power - Nuclear: 13%
- DSM: 11%
- Wind: 1%

Total 2015 MW 3,217

**WPL**
- Gas: 53%
- Coal: 39%
- DSM: 5%
- Wind: 1%
- Hydro: 1%

Total 2015 MW 2,888
Alliant Electric Sales Mix

IPL

Electric Sales - MWh

- Commercial: 26%
- Industrial: 43%
- Residential: 24%
- Sales For Resale / Other: 7%

2015 US Avg.: 38% Residential, 36% Commercial, 26% Industrial

WPL

Electric Sales - MWh

- Commercial: 16%
- Industrial: 33%
- Residential: 24%
- Sales For Resale / Other: 27%

2015 US Avg.: 38% Residential, 36% Commercial, 26% Industrial
Transitioning Resources
Regulatory Support for Small DG

- Federal law provides for non-discriminatory access to the grid for small DG customers.
  - Utilities must offer to interconnect small DG to operate in parallel with the electrical system
  - Interconnection rules govern the safe and reliable interconnection of DG

- Federal law also obligates utilities to purchase generation from small DG customers.
  - Small renewables are defined as “Qualifying Facilities”
  - Purchase rates are not to exceed a utilities avoided cost
  - Net metering is a billing arrangement versus a purchase of power

- Federal law also provides that utilities provide standby and supplementary service at non-discriminatory rates
Federal Support for Small DG

- US Tax law provides for:
  - Investment Tax Credits of 30% of cost of system
  - Accelerated depreciation (business)

- US Department of Agriculture provides:
  - Grants for renewables
  - Loan Guarantees

- US Department of Energy provides loan guarantees
State Support for Small DG

- Iowa and Wisconsin provide the interconnection engineering rules and specifications for small DG to interconnect with the grid.

- Determination of the appropriate avoided cost rate for payment of generation from small DG is determined by the state unless otherwise negotiated by the parties. Standard purchase rates for generators 100 kW or less.

- Iowa and Wisconsin have Renewable Portfolio Standards (RPS) for the amount of energy utilities must purchase or generate from renewable sources.
State Support for Small DG

- Net metering Tariffs
  - Iowa allows up to 1 MW nameplate capacity for net metering
  - Wisconsin allows up to 20 kW

- Utility rebate programs
  - As part of IPL’s energy efficiency programs renewable rebates were provided to DG (discontinued in 2014)

- Feed-in / Value-of-Solar (VOS) tariffs
  - Purchase rates for solar energy that may be above full retail rate

- Community Based Energy Development (CBED) tariffs
  - Front loading a purchase power rate
PotentialRoles for Small DG

- Avoidance of energy kWh purchases by utility
  - May eliminate need to purchase power during high cost periods

- Avoidance of the need to purchase or build kW capacity
  - Power pool accredits some or a portion of the capacity
  - Operational characteristics of the generation
  - Coincidence with utility peak demand (kW) time periods

- Helps utility meet an RPS standard
Potential Roles for Small DG

- Avoidance of the need to build distribution capacity
  - May help on circuits that are overloaded
  - May require smart inventors and two-way communication with the grid

- Reduction in line losses
  - Generation closer to the source

- Fuel diversity
Potential Roles for Small DG

[Map of Photovoltaic Solar Resource of the United States]
Example-- Daily Residential Load Profile

![Graph showing daily residential load profile with two lines, one labeled DG (8/30/2013) and the other Res System (08/30/2013). The graph plots kW on the y-axis and Hour on the x-axis.](#)
Small DG on Peak Day – KW Demand
Small DG on Peak Day - KVA
Small DG on Peak Day - KVAR

![Graph showing KVAR profile for Small DG on Peak Day - Channel 2实践中。](image-url)
Factors Impacting Distribution Circuit DG Hosting Capacity and Operating Issues

- Size of DER
- Location of DER
- Feeder characteristics
- Proximity to other DER
- DER control (e.g., smart inverters)

Production Uncertainty

DER = Distributed Energy Resources
Disincentives of Small DG
DG Installations in Iowa
Disincentives of Small DG
DG Installations in Iowa
Disincentives of Small DG

Pricing Components of a Customer Bill

Current Full Requirements Customer Rate Design

Fixed Charge

Energy Rate
Solar Profile

Residential - Partial vs Full Requirements

K
W

Hour

## Disincentives of Small DG

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<th>Typical Residential Customer</th>
<th>DG Residential Customer</th>
<th>Difference</th>
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<td>916</td>
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<tr>
<td>System CP kW</td>
<td>2.53</td>
<td>1.60</td>
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<tr>
<td>Class CP kW</td>
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<tr>
<td>Max Monthly kW</td>
<td>5.37</td>
<td>6.39</td>
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</table>

*CP – Coincident Peak kW Demand (either with IPL system or with customer class)*
Economics of DG on Utility Business Model

- DG owners should be compensated for the value DG provides the grid

- Utility model is based upon providing shareholders a return for the capital invested by the utility

- Capital invested in utility assets increases rate base to provide a return

- Utility has an obligation to provide service to customer 24 hours per day every day of the year

- DG is an intermittent resource
Economics of DG on Utility Business Model

• Who should pay to modernize the grid to accept 2-way flow of power and capitalize of DG benefits?

• Will DG additions increase rates?

• Are current rate designs applicable for additional DG additions?

• Should DG customers be provided an incentive to install DG? If so what is the incentive based on?

• DG costs continue to drop while there continues to be upward pressure on rates for investments to make the grid more resilient and reliable.
DG Business Models

• Direct sales of DG systems
• Lease of system
• Third Party Purchase Power Agreements
• Community Solar
DG Business Models

• Value proposition is typically to not only offset usage but to take advantage of net metering tariffs

• Federal investment tax credit reduces cost of systems by 30%

• Business can also take advantage of accelerated depreciation for tax purposes

• Variety of either federally subsidized loans or direct grants
DG Business Models

• Business customers typically require shorter payback periods than residential customers.

• When tax credits and other government incentives are coupled with the availability of net metering, customers may have a payback period of 4-6 years if not less.
DG Business Models

• Leases typically work best when a customer does not have tax liabilities (for example non-profits) or do not want to tie up capital

• For residential customers, long-term leases may create issues if customer wants to sell the residence
DG Business Models

• Third party purchase agreements similar to leases except customer pays a per kWh charge for each kWh generated by the DG system

• DG owner is able to take advantage of tax credits to lower the kWh charge

• DG owner may end up selling/assigning the purchase power agreement in a secondary market
DG Business Models

• Third party purchase agreements attractive to non-profits and governmental bodies

• Third party purchase agreement more prevalent under a net metering tariff.

• Typically the third party PPA rate is slightly less than the corresponding utility rate but escalates each year of the PPA.
DG Business Models

- Community Solar is seen as a way to offer solar to customers that have no other way to take advantage of solar

- Customers typically make an initial payment of $300-$400 which entitles them to a share of the community solar project

- Community solar installation may range in size from 50 kW to 3 MWs
DG Business Models

• Community Solar may be owned by a third party or by the utility

• Participants are granted a block share of the project, for example 1 kW. That entitles them to the energy production associated with their share.

• The energy share may be reflected as a dollar credit on their bill or an offset to their kWh consumption.
DG Business Models

Community Solar

SOLAR PANELS

Electricity is distributed to the grid.

UTILITIES

Participants pay for a share of the solar farm.

PARTICIPANTS

Participants are credited for their share of generated electricity.
Net Metering

• Most contentious issue regarding customer-owned DG

• Each state has different variations on the net metering tariff (if offered)

• FERC has ruled that the state not the Fed has jurisdiction on net metering since it involves a billing arrangement
Net Metering

• Most of the growth in small DG has come about through net metering

• Utilities see net metering as compensating DG at full retail rate (for example, DG customer may possibly offset all usage from the grid and not pay any charges for grid)

• Solar industry sees net metering as compensating for the “Value of Solar”

• Main growth in small DG in Iowa is solar (90%).
### Net Metering Examples

**Various constructs of net metering**

#### Offset Example

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<th>Customer Load</th>
<th>Generation</th>
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Customer billed for 1,000 kWh

#### Net Metering Example

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Customer billed for 625 kWh

#### Net Metering with banking Example

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Customer billed for 0 kWh with 75 kWh banked
Potential Growth of DG Net Metering

DG Projected Growth Rates

- Residential DG % of Sales
- General Service DG % of Sales

Year:
- 2015
- 2016
- 2017
- 2018
- 2019
- 2020
- 2021
- 2022
- 2023
- 2024

Percent of kWh Sales:
- 0.00%
- 0.50%
- 1.00%
- 1.50%
- 2.00%
- 2.50%
- 3.00%
- 3.50%
- 4.00%
- 4.50%
- 5.00%
Net Energy Metering and Revenue Impacts

Full Requirements Bill
$1,356 ($113 monthly)

NEM Bill*
$744 ($62 monthly)
Avoided fuel savings - $113
Revenue Impact - $612

NEM = Net Energy Metering
Net Energy Metering Rate Alternatives

- Increase Customer Charge
- Fixed monthly charge
- Minimum bill
- Capacity / standby charge
- Demand charges
## Recent Rate Reform Activity

### Recent Rate Reform Options by State

<table>
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<tr>
<th>State</th>
<th>Utility</th>
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### Key
- ✓ Approved
- ✓ Proposed (decision pending)
- × Proposed & rejected or withdrawn

Source: Edison Electrical Institute