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Towards a Sustainable and Affordable Energy Future
Valuing DG Solar Output
Marcel Hawiger, Energy Attorney

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TURN – A Consumer Advocacy Organization

- **Fighting for Small Ratepayers since 1973**
  - **Founded by legendary advocate Sylvia Seigel.**
- **Largest Utility Consumer Organization in U.S.**
  - **15 staff, including 7 energy/telecom attorneys.**
- **Advocacy**
  - **Litigation at the California Public Utilities Commission**
  - **Legislative work in Sacramento**
  - **Community organizing with allies**

What is Distributed Generation?

- Power generation located at the site of power consumption
- Power generation located 'close to' power demand (load)
- Power generation interconnecting with a utility distribution system
- Power generation smaller than a central station power plant

Two Types of Solar DG

1. "Behind the meter" (NEM)
   - Located on the same premises as power use
   - Connected to the same utility meter, so that power is first used on site (reduces inflow) and flows backwards through the meter when production exceeds demand
   - Payment is through Net Energy Metering (NEM)
     - Offsets entire utility bill

Two Types of Solar DG

2. "Wholesale DG" (WDG)
   - Power flows directly through a meter onto the grid, without being first consumed on-site
   - Could be any size
   - Payment is based on contract price
     - A "generation" payment
     - A premium for renewable power

Size Categories of DG

- Residential Rooftop (NEM) 5-20 kilowatt (kW)
- Commercial Rooftop (NEM) 20-1000 kW
- Feed-In Tariff WDG 10-3,000 kW (or up to 3MW)
- RAM program 3-20 MW

Why Does Size Matter?

- Price
  - rooftop solar – 20-40 cents/kWh
  - utility-scale renewable – 10-18 cents/kwh
  - Yes, these numbers do not include everything, but even with proper “valuation” rooftop solar will be more expensive
- Quantity
  - Large renewable energy added 2003-2012: 4500 MW. Another 3200 MW forecast for 2013.
  - Residential rooftop 2003-2011: about 400 MW
  - Commercial rooftop 2003-2011: about 600 MW
- Ultimate goal - displace fossil fuels

NET ENERGY METERING

Net Energy Metering – The Current Method of Paying for Rooftop Solar

- Exports and imports are 'netted' over the month to calculate 'bill credits'
- What this means is that every kWh of solar 'exported' gets paid exactly the maximum price you would pay to the utility for electricity
- This price includes everything – generation, transmission, distribution, energy efficiency programs, low-income programs
- There are three potential problems
  - If, for example, you produce as much as you use over the course of the year, you pay nothing to the utility, even though you use the grid to power everything at night (*the battery problem*)
  - If you are on tiered rates, these rates are designed to reward conservation, but under NEM they reward consumption and pay you more the more you use (*the equity problem*)
  - Is the 'reward' to the solar customer higher than the cost of other renewable power (*the subsidy problem*)

The Battery Problem

- The solar owner pays nothing to the utility if total net exports equal total imports, even though they still use grid electricity at night
- What if everyone went solar – who would pay for the grid?
- Compare to an off-grid solar owner – they have to buy expensive marine battery pack and replace it every few years.
- Should we get rid of the grid and all buy our own battery storage systems?
- Is it fair for NEM customer to avoid all utility fixed T&D costs – depends on value of their export!

The Equity Problem

- Consider a PG&E customer on E-1 (standard residential). Your prices for tiered useages are about 12/14/29/33 cents/kwh.
- If you are on tiered rates:
  - PG&E customer who uses 1000 kWh and produces 800 kWH gets $0.20/kWh for her solar output
  - PG&E customer who uses 2000 kWh and produces 800 kWh gets $0.34/kWh for his solar output
- Solar installers understand this. Market solar to large users.
- “Unintended Consequence” – Tiered rates designed to promote conservation when charged for consumption, but have the opposite effect when charged for generation

The Subsidy Problem

- Issue
  - What is the “average” price we pay for solar export under NEM?
  - Is this price higher or lower than the “value” of this solar output?
    - Note: We agree it should be compared to renewable, not dirty power
    - Note: Most of the societal benefits (health, security, etc.) are similar for all renewables
- Are there other benefits of rooftop that ratepayers should pay for
  - Real economic benefits due to avoided transmission or distribution
  - Environmental benefits due to habitat preservation
- The problem
  - Rooftop MORE expensive than larger-scale renewable energy

VALUING ROOFTOP SOLAR

What is a "fair" price for rooftop solar that really considers the additional costs and benefits of local rooftop solar power:

- Value of the renewable energy (not just dirty power, but other renewable energy) (10-15 c/kWh)
  - It's renewable stupid – OK, what about the REC
- No transmission lines (1-3 c/kWh)
- Does it replace some distribution system?
- Environmental benefits compared to large scale renewable power?

Value of Rooftop Solar – Two Big Issues

- CPUC – Value to Ratepayers - Does rooftop reduce distribution costs, or does it increase distribution costs??
- Legislature – Value to society – Does rooftop solar provide benefits compared to other renewable power
  - Environmental: Land use, wildlife
  - Intangible psychological

Do Other Customers Subsidize Residential NEM Customers?

- E3 (2009) – Price paid for NEM exports is 19 cents/kwh. Total potential subsidy of $137 mm.
- LBNL (2010) – "net cost" of 2-3 cents/kwh for NEM export. Not much problem.
- VSI (2013)
  - Slight net cost in PG&E territory (1.3 cents/kwh).
  - Slight benefit for SCE (0.7 cents/kwh) and SDG&E.

There Are Technical Flaws with the VSI Study

- Assumes utility rates increase 2.7% per year for 20 years
- Assumes total "avoided cost" of about **19 cents/kwh**
  - Capacity value of about 5 cents/kwh – Higher than E3
  - Avoided T&D from E3 energy efficiency model – not necessarily valid for solar DG
  - Avoided RPS costs of almost 5 cents/kwh
- Much higher than mid- and large-scale renewable power prices of 8-14 cents/kWh. Why?

Forecast of Utility Rate Increases:

- VSI number is different from solar industry forecasts
  - VSI 2.7% annual rate increases
  - Sungevity 6% annual increase
  - Solar City 4.8% annual increase
  - E3 4.5%
- There is no RIGHT number, but we need some scenario analyses. Lower increase has huge impact.
- Also, assumes no change in utility rate design.

Avoided T&D Costs:

- Use utility data for "marginal T&D" costs
- We agree DG avoids some transmission costs (though depends on reason for transmission line)
- But whether solar DG avoids "distribution" costs is highly uncertain
  - Distribution circuits must be sized to peak load
  - Main problem – residential circuits peak at 6-7 p.m.
  - Engineers require DG to be extremely reliable. Can't afford sudden increase in demand due to loss of DG
  - Utilities claim increased DG requires new costs to protect against power flow and islanding

Avoided Distribution:

- Distribution transformers, lines, capacitors, etc. are sized to meet peak load
- Solar Production v. Residential Circuit Peak
  - Solar production peaks 11-2 and declines to almost zero by 5 p.m.
  - Residential circuits peak 6-7 p.m. Total ISO system peaks at 4-5 p.m.
  - Therefore, very little ability of rooftop solar to displace distribution assets on residential circuits, but can help with circuits that primarily have commercial or industrial load

Avoided RPS Costs:

- Not clear how this is calculated
- Benefit due to less demand and thus less need for renewables – OK, though this is true for any energy efficiency also
- Benefit due to "increase in market share of renewables"
  - Assumes customer never sells the RECs
  - But there is no 'actual' benefit to ratepayers since the utility still has to buy other renewable energy to meet the 33% requirement
  - Not at all clear how this is calculated in the model

Prices of Other Renewable Energy

- E3 – average renewable price of 12.5 cents/kWh
  - Utility medium scale (30 contracts for <20 MW mostly solar) in 2012 - less than 9 cents/kWh
  - Utility large-scale wind – 8-10 cents/kwh
  - Utility large-scale solar thermal - 11-15 cents/kwh
  - 2011 MPR – 9-12 cents/kwh for 20-yr contract
  - Ground mounted solar < 5 MW: 13-30 cents/kWh
- Rooftop solar: 20-40 cents/kwh

POSSIBLE ALTERNATIVES TO NEM

Alternative to NEM?

- Pay a solar customer the same output for solar that the utility pays a wholesale solar system?
- Pay a rooftop solar customer some other price?
- Keep NEM, but charge solar customers a ‘battery fee.’

Alternatives to NEM?

- Do nothing – subsidize solar customers and everyone else pays for the grid
- Utilities – sock solar customers with very high monthly customer charges
- TURN – do not use 'NEM' bill crediting, pay all solar customers a fair price for solar output in excess of use (essentially, a feed-in tariff for rooftop solar)