PV Penetration Forecast: Moving Beyond Compliance Targeting

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Background: Arizona

- **Renewable Energy Standard (RES)**
  - 15% of retail sales must come from renewable resources by 2025
    - Of which 30% must come from distributed generation (DE)
    - 50/50 split between Residential and C&I

- **1st full year was 2007**
  - Didn’t meet DE compliance until 2010 (residential) and 2011 (total)
  - 2012: Ended year significantly above compliance
Previous DE Forecast

- Utility incentives determine the penetration levels
  - Incentives would “catch-up” with panel price reductions
- Forecast was ultimately a function of compliance
Incremental Residential Grid-Tied PV Systems
Motivation to change Forecast Methodology

• Forecast was previously programmatic in nature
  – Used compliance targets as the guide
  – Not especially grounded /linked to market/company conditions

• Penetration levels are now less direct incentive driven
  – Incentives still provided via rate offsets due to net metering

• Incorporate customer decision-making framework
  – Allows for more flexibility to calculate “what if” examples
  – Capital cost and rate offset changes etc

• Higher DE penetrations will have significant impacts on resource planning decisions, revenue and fuel projections
  – For example:
    – 1) Mis-match between DE production and system load shape
    – 2) Differential between revenues lost and utility costs avoided
Penetration Model

• Building off NREL SolarDS model

- PV Revenue + Incentives
- PV System Costs
- Discounted Payback Period/IRR
- Maximum Market Share
- Adoption Rate (S-Curve)
- Customer PV Penetration Levels

• Note: Need inputs/assumptions from a variety of sources
Some Key Starting Points to think about

- Technical/Economic Potential
  - What percentage of customer rooftop space is “suitable” for PV?

- PV installed costs
  - Some studies like to lean on DOE Sunshot goals

- Rate offset
  - And (perceived) rate of escalation

- Discount rate
  - Decision making versus pure financial

- Investment Tax Credit Assumption

- Leasing Model Impacts
PV Maximum Market Share

Source: NREL
Adoption Percentage: Bass Diffusion

\[
N(t) = m \cdot \left( \frac{1 - e^{-(p+q)(t-t_0)}}{1 + \frac{q}{p} e^{-(p+q)(t-t_0)}} \right)
\]

- Coefficient of innovation (p): advertising effect
- Coefficient of imitation (q): word-of-mouth effect
Stylized Results

Annual Residential MW installed

• 100 MW equals approx 15,000 customers installing

ITC Reduction
What if…

Annual residential MW Installed

MW


w/ITC change  w/o ITC drop
Final Remarks

• Will PV installations follow the standard diffusion type model?

• Extra detail does not easily translate into a more accurate forecast
  – Lot’s of “X’s to forecast”

• Having forecast integrated with other areas of the company is appealing
  – Ability to create scenarios that are grounded in standard decision-making tools
Some Reading

