Forecasting Distributed Energy Resources: Progress and Challenges

Ben Sigrin - NREL
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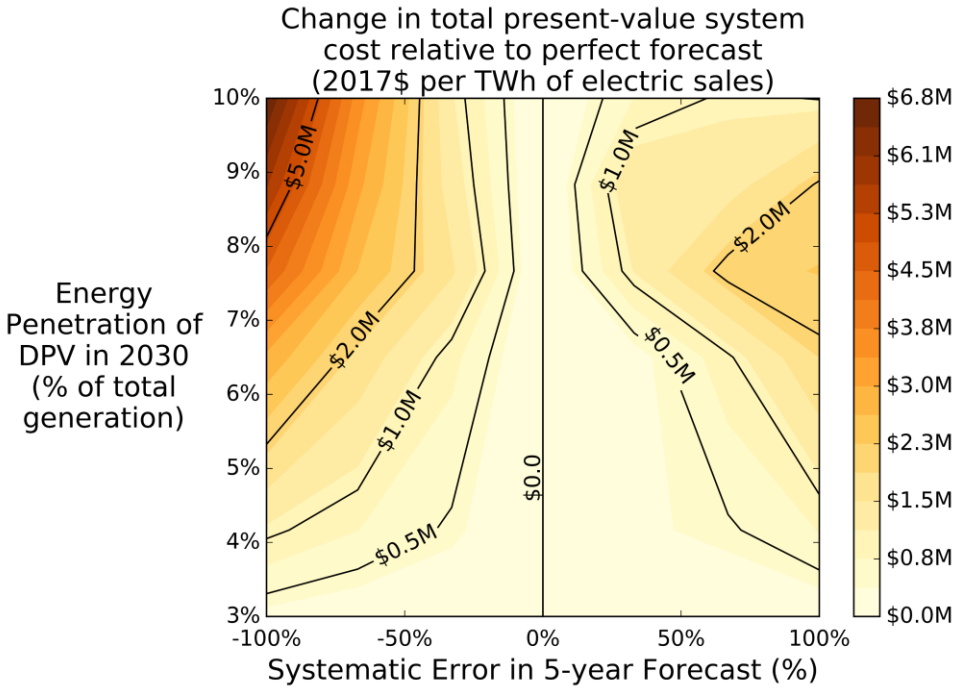
The grid is decentralizing

Misforecasting Is Expensive



Normalized total present-value costs due to systematic DPV misforecasts in the Western Interconnection through 2030

Estimating the Value of Improved Distributed Photovoltaic Adoption Forecasts for Utility Resource Planning, NREL, May 2018 (Gagnon et al. 2018)

Improved DPV capacity forecasting could save ratepayers $400,000/TWh of utility sales

Under-forecasting: An overbuilt system with unused capacity

Over-forecasting: An underbuilt system without sufficient capacity and reliability issues.

Two Types of Forecasting

Transmission-level

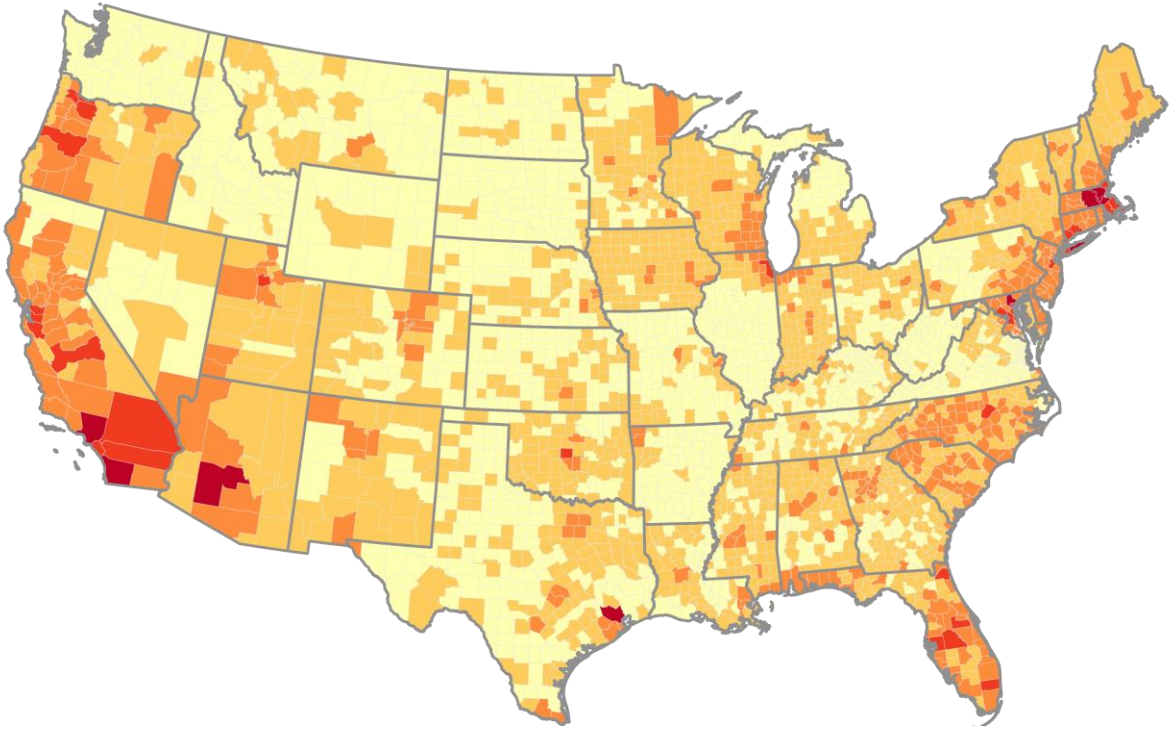
- Focus is on predicting aggregate amount, e.g. state, county, or ISO-level
- Forecasts primarily affect generation and transmission resource plans

Distribution-level

- Focus is on predicting spatial pattern of adoption, e.g. feeder-level or household-level
- Forecasts primarily affect distribution resource plans

Experiences with Transmission-level Planning

How much DPV will be adopted?



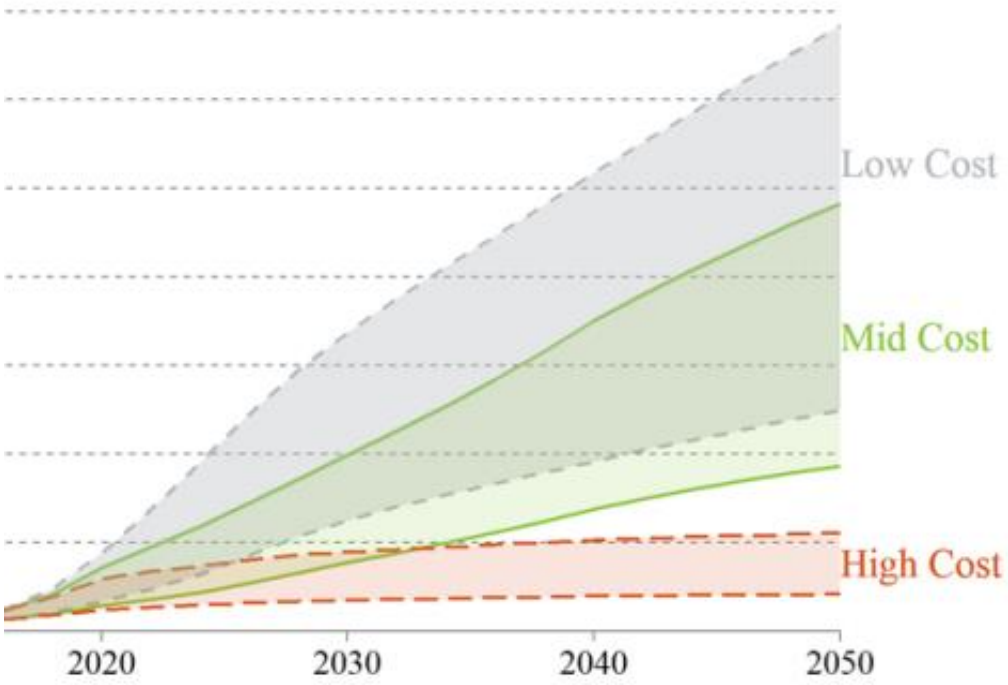
NREL conducts an national DPV adoption forecast annually. This image shows the spatial distribution of the Central scenario for the 2018 study

Transmission-level forecasts are traditionally used in IRPs, load forecasting, and other “big picture” studies

They are often less focused on predictive accuracy and instead on understanding a potential range of outcomes or tipping points.

Often, the projections are highly dependent on policy assumptions

Challenges with Transmission-level Forecasting

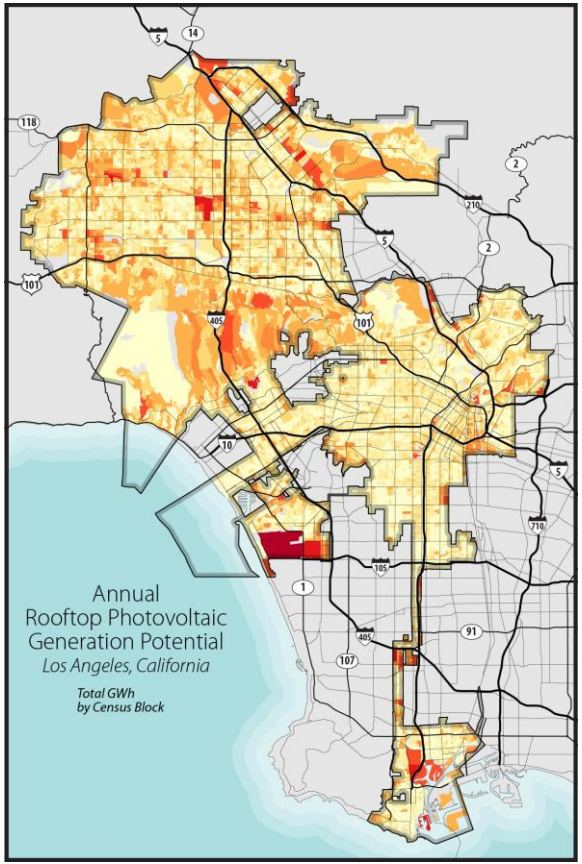


Scenarios show range of cost and DPV future compensation scenarios. Cole et al (2016). *2016 Standard Scenarios Report: A U.S. Electricity Sector Outlook*.

- Projections span a wide range of jurisdictions, making it challenging to reflect current policy and retail electricity parameters
- Wide range of methods to calibrate models, with limited focus historically on validation
- Very few models are publicly accessible or receive stakeholder feedback

Experiences with Distribution-level Planning

Where will DPV be adopted?



Distribution-level DER modeling seeks to understand DER adoption patterns either at the individual or substation-level to inform distribution planning

In ongoing projects with Los Angeles Department of Water and Power (LADWP) and the Orlando Utility Commission (OUC), NREL is developing customer-level probabilities of adoption based on individual-level data

These forecasts are then used to inform, variously, distribution hosting capacity, capacity expansion modeling, and rate design.

Challenges with Distribution-level Modeling

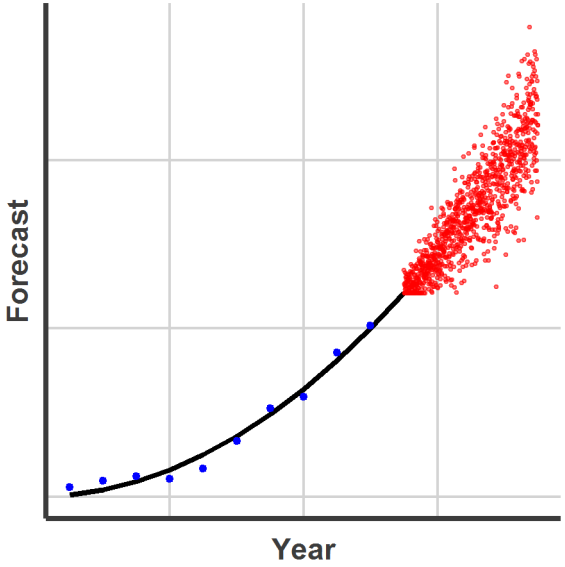
- Highly data and computationally intensive, with varying levels of types of data available
- High risk of overfitting – *when do models add value, vs noise*
- Very few models are publicly accessible or receive stakeholder feedback

Resilient Planning for Distributed Energy Resources (RiDER)

Advancing the state-of-art in long term resource planning

- **Open sourcing** NREL's **dGen** model, an **agent-based** model for DER customer adoption.
- Develop **county-level projections** of **distributed solar and storage** deployment for each of the **ISO/RTO participants'** control areas
- **Multidisciplinary team** comprises members of the NREL dGen modeling team, NREL Commercial and Residential Buildings modeling team, the University of Texas at Austin

Improving foundational methods



Develop data-driven models ***to validate model's predictive performance***

Develop statistically-representative load profiles ***with electrification and EE scenarios***

Making data and code available to all

Publishing county and ISO-level forecasts (Dec 2019)

Open sourcing model code (Sept 2020)
Interactive web app (Mar 2020)
Free training (2020 – 2021)

ercot

California ISO

ISO new england

NEW YORK INDEPENDENT SYSTEM OPERATOR

MISO

pjm

SPP Southwest Power Pool

Three ways to learn more

Attend our workshop:

March 21st 1 – 5pm after ESIG
Tamaya Hyatt – Badger Room
Email for call-in information

Email us:

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Subscribe to the dGen mailing list:

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