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Estimating the Value of Improved Distributed Photovoltaic Adoption Forecasts for Utility Resource Planning

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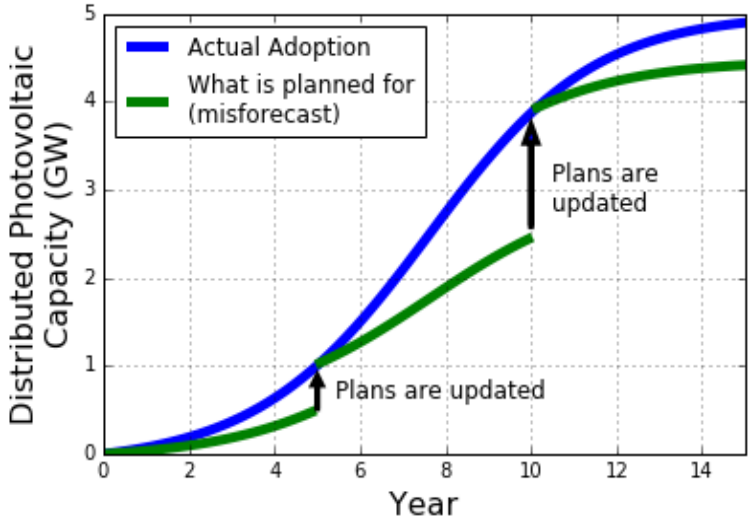
2019 Meteorology & Market Design for Grid Services Workshop

June 4-6, 2018


Distributed PV (DPV) is growing—
and utilities need to know how to plan for it.

Forecasting errors in future DPV adoption can be **costly**.

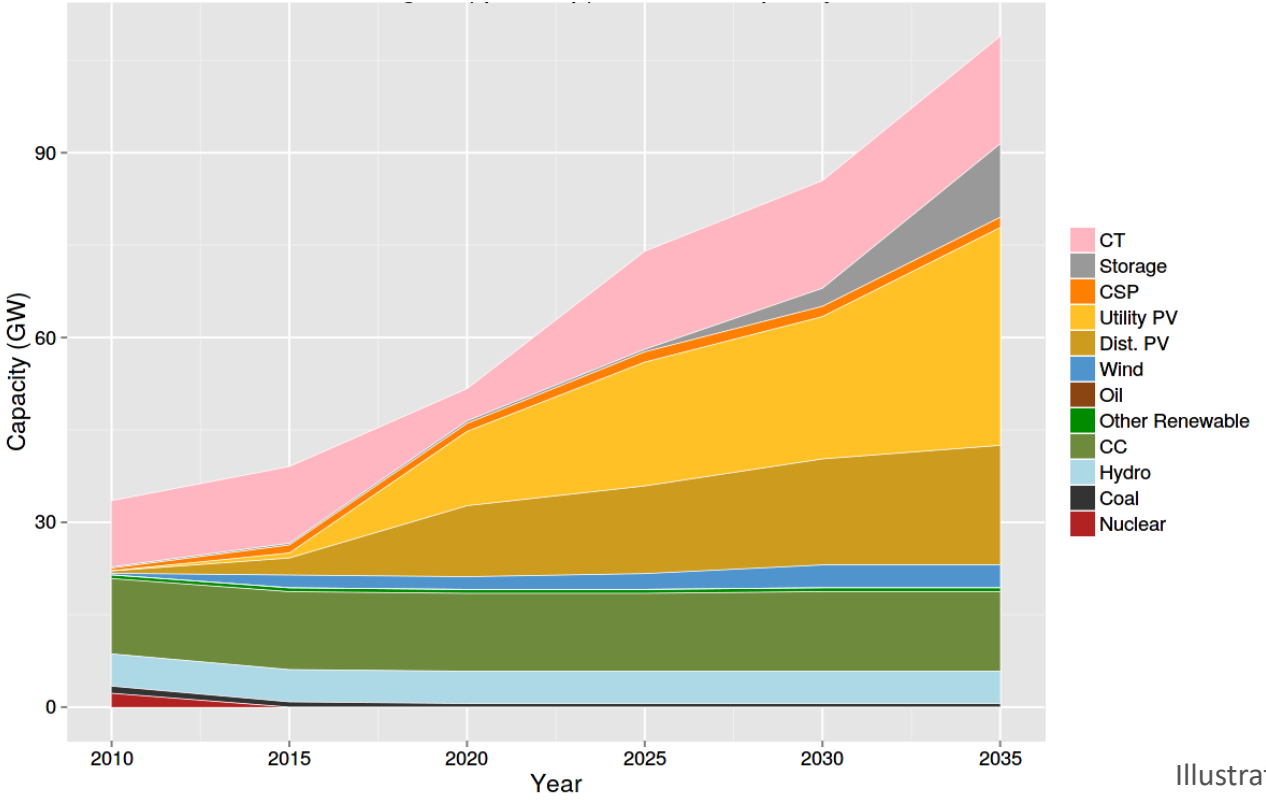
Reducing errors in forecasting DPV **improves planning** and **reduces costs**.



Here, a utility under forecasts DPV growth by -50% in each plan.

Figure from Gagnon et. al. 2018

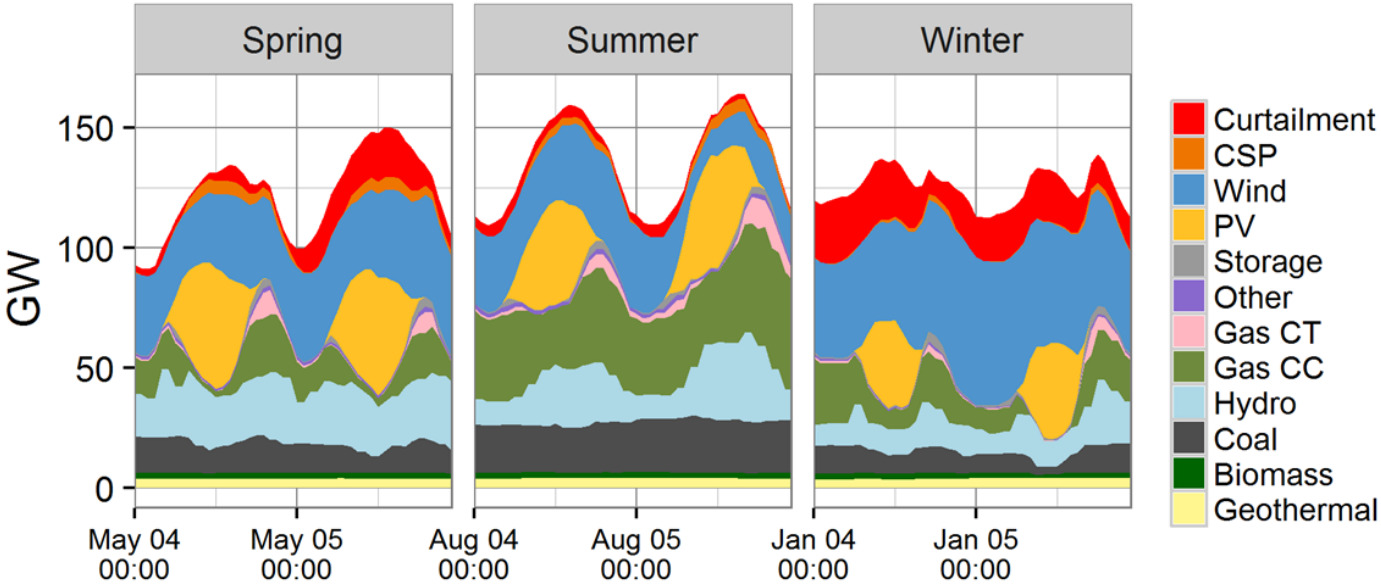
About the Resource Planning Model (RPM)



RPM projects the **optimal (least-cost) buildout of the bulk power system** by applying assumptions about **future conditions** as well as **operational and policy constraints**

Illustrative Example, not actual results

About Production Cost Modeling (PLEXOS)



PLEXOS predicts the **optimal (least cost) way a future power system would operate** considering **operational and transmission constraints** at an hourly resolution for a full year

Illustrative Example, not actual results

About the Distributed Generation Market Demand Model (dGen)

We used NREL's Resource Planning Model (RPM) and Distributed Generation Market Demand Model (dGen) along with the commercial tool PLEXOS to assess the **economic impacts** of errors in forecasting DPV adoption.

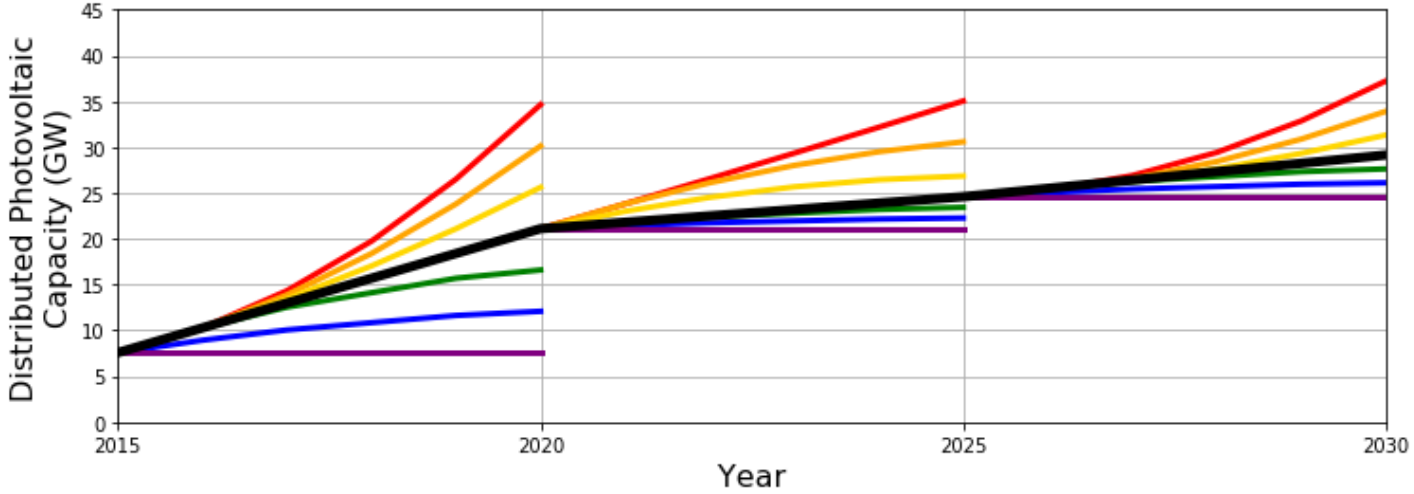


Figure from Gagnon et. al. 2018

Forecasting errors have opposite impacts on Capital and Operating Costs

Over-estimating DPV adoption leads to building less bulk power capacity, however it leads to a system that is more costly to operate

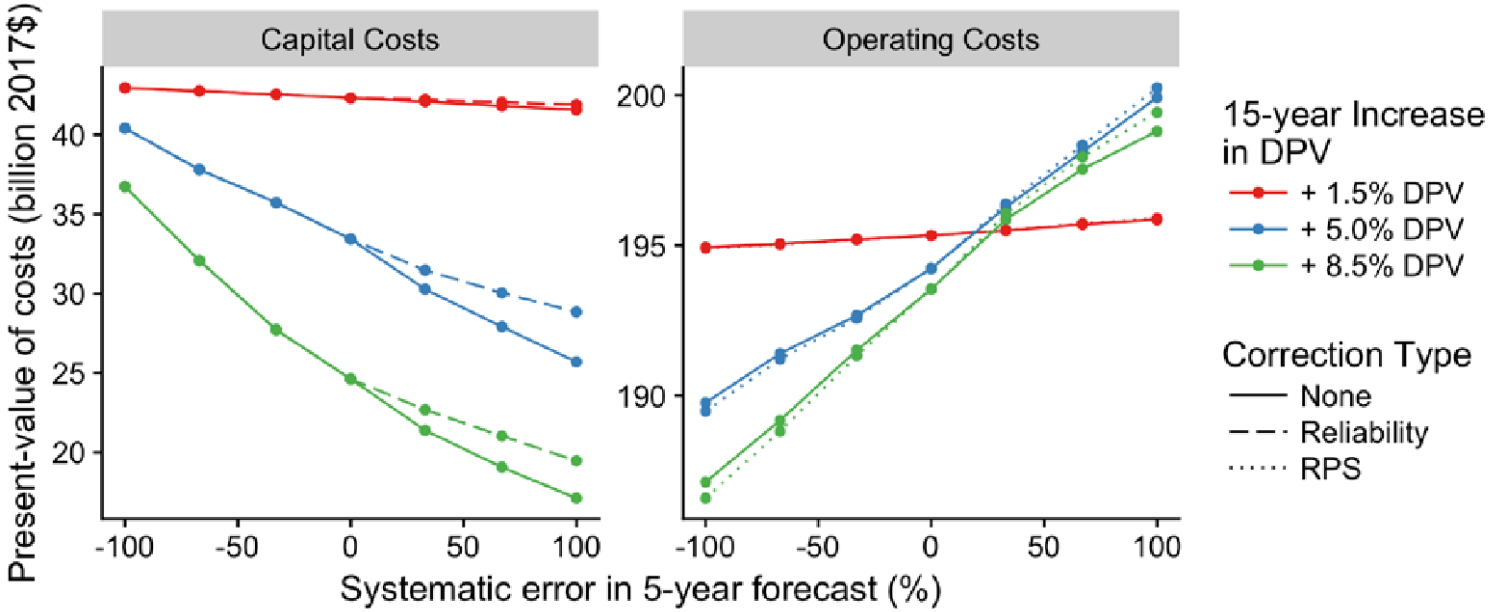
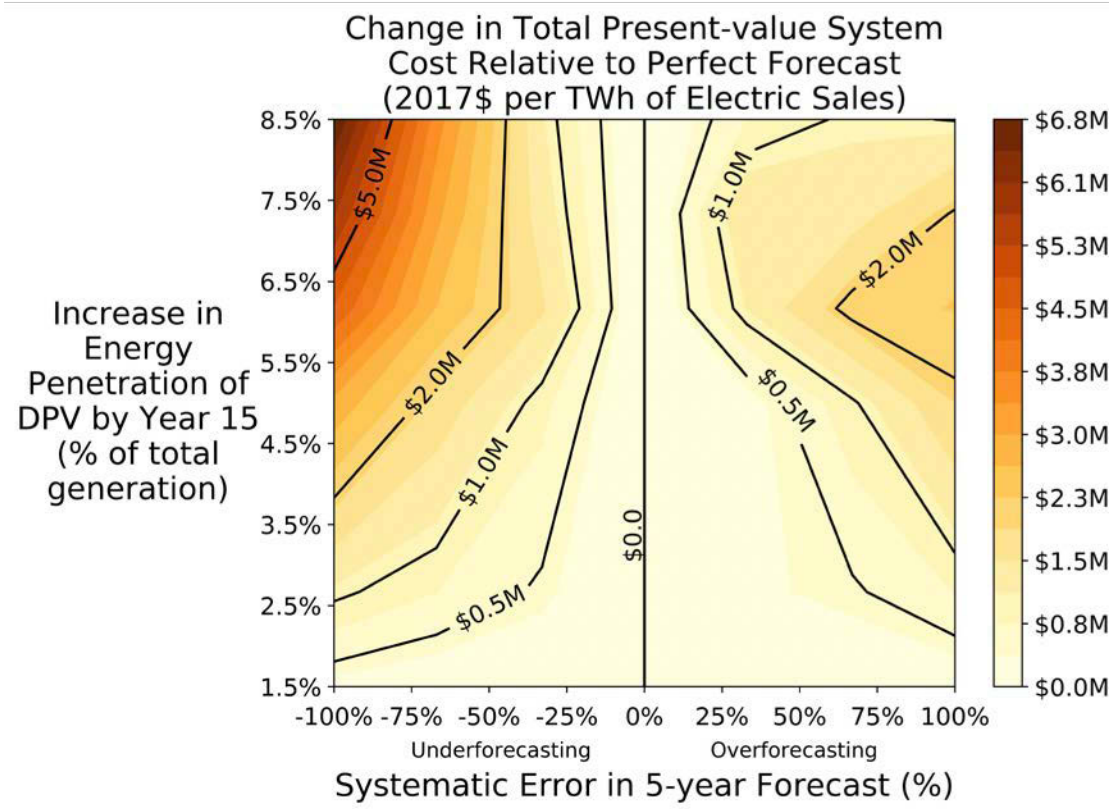


Figure from Gagnon et. al. 2018

The Results: Impacts on Present Value System Cost



Errors in forecasting DPV has the **greatest impact** on present value system costs when either **DPV penetrations are high**, or **DPV adoption trends are severely incorrectly forecasted**

Figure from Gagnon et. al. 2018

Sensitivities on Present Value Cost Impacts

Many other factors also influence the net impacts of DPV forecasting errors, including load growth, natural gas prices, and availability of RECs

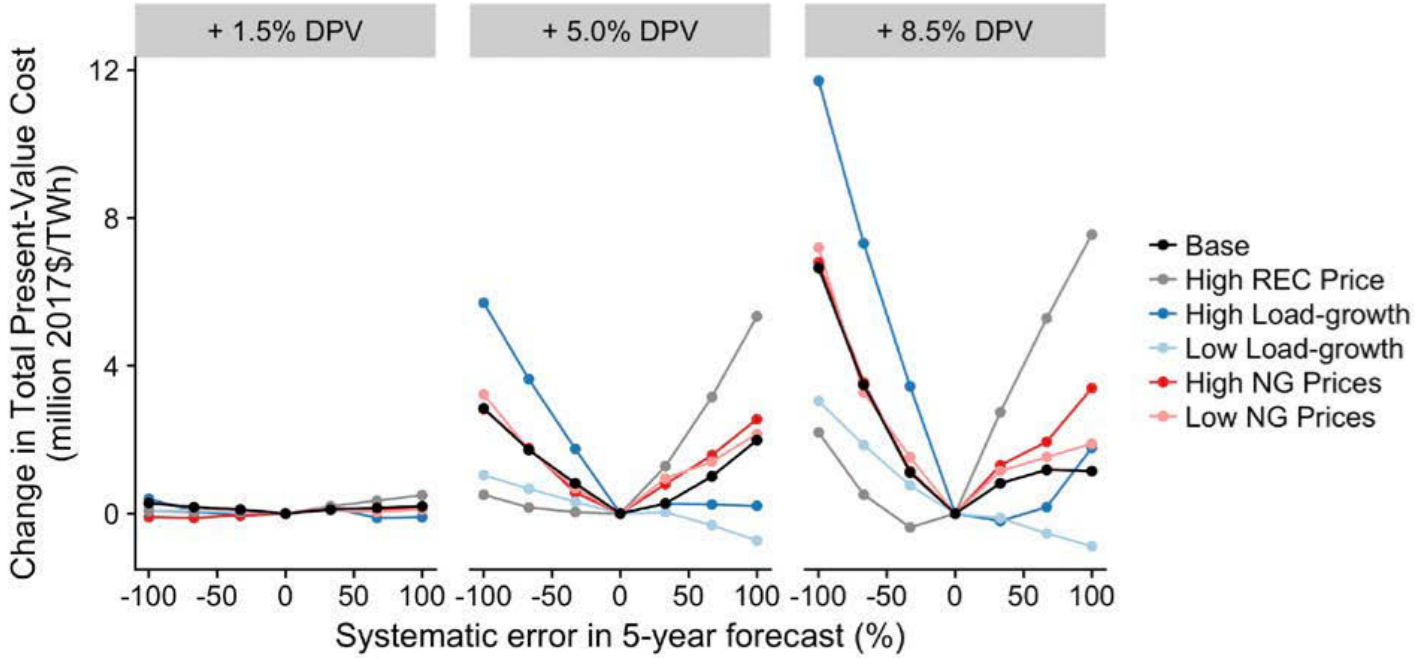
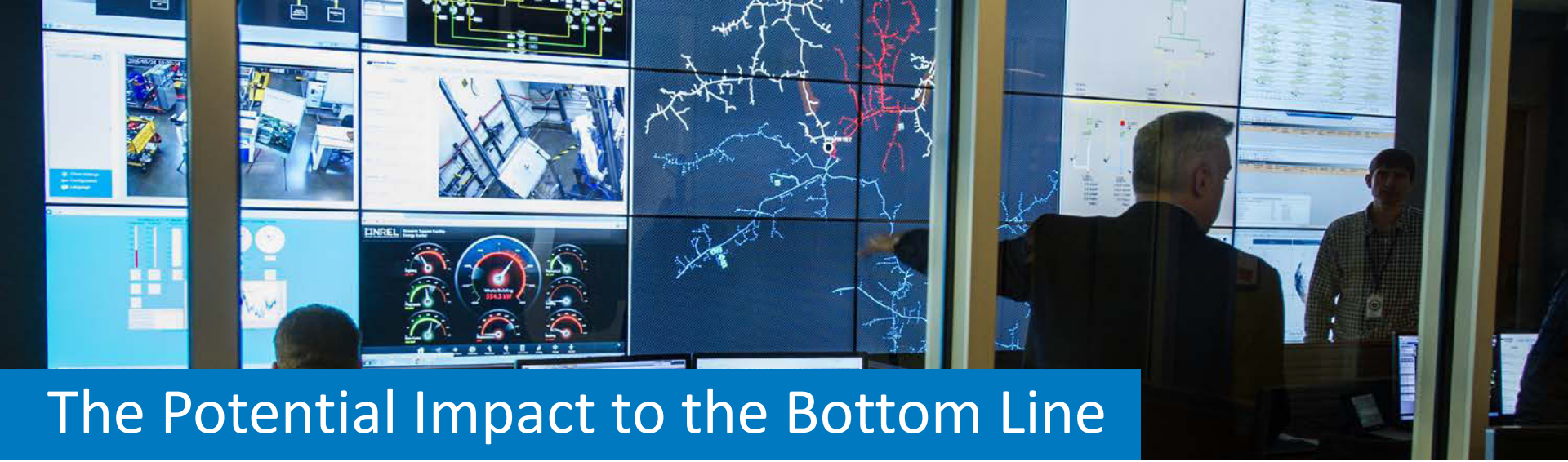


Figure from Gagnon et. al. 2018



The Potential Impact to the Bottom Line

- Changes in the capacity mix resulting from DPV forecasting errors lead to an **overall increase in the cost to operate the system**.
- Capital and operating cost could increase **up to $7 million per TWh** of electric sales, cumulatively over the 15-year planning period, compared to the correct DPV forecast.
- These results represent average expected impacts for the areas studied, the western interconnection of the United States.

Q&A

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NREL/PR-6A20-74132

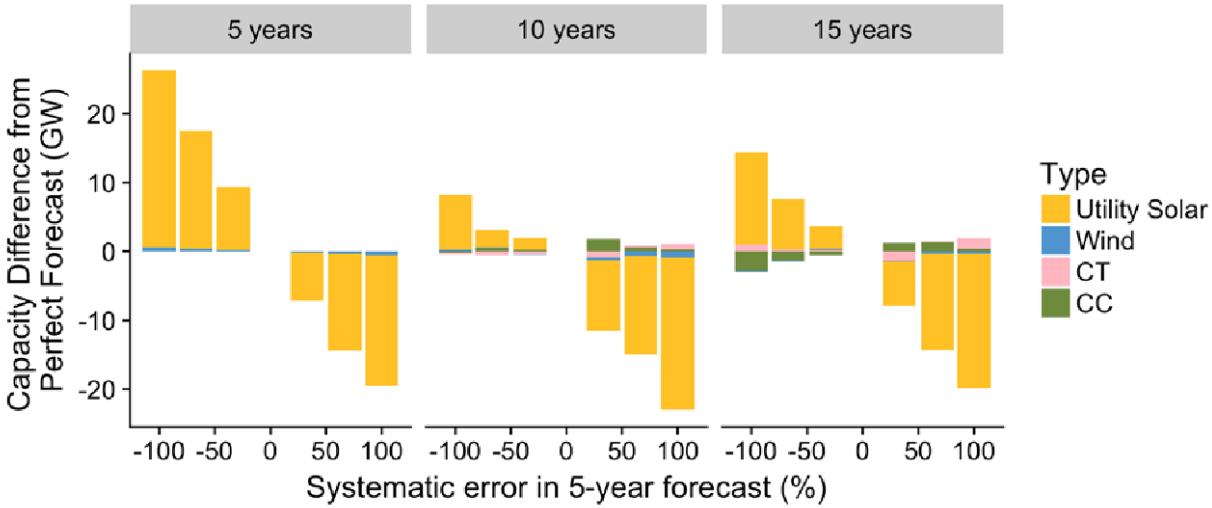
RPM: https://www.nrel.gov/analysis/models-rpm.html

dGen: https://www.nrel.gov/analysis/dgen/

Learn more from our paper: https://www.nrel.gov/docs/fy18osti/71042.pdf

This work was authored by the National Renewable Energy Laboratory, operated by Alliance for Sustainable Energy, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC36-08GO28308. Funding provided by the U.S. Department of Energy Office of Energy Efficiency and Renewable Energy Solar Energy Technologies Office. The views expressed in the article do not necessarily represent the views of the DOE or the U.S. Government. The U.S. Government retains and the publisher, by accepting the article for publication, acknowledges that the U.S. Government retains a nonexclusive, paid-up, irrevocable, worldwide license to publish or reproduce the published form of this work, or allow others to do so, for U.S. Government purposes.

Capacity Impacts of DPV Misforecasting



DPV misforecasts typically present tradeoffs between DPV and utility-scale solar with a direct change in installed capacity between the two solar technologies.

More complicated impacts arise through path dependencies and other system needs to change the installed capacity of gas CC and CT plants