June 13, 2023

Locational Solar and Storage Forecasting

ESIG Long-term Load Forecasting Workshop

cadeo

AdopDER is Cadeo's

site-level simulation model that estimates

locational, 8760-hour load impacts for

40+ distributed energy resources

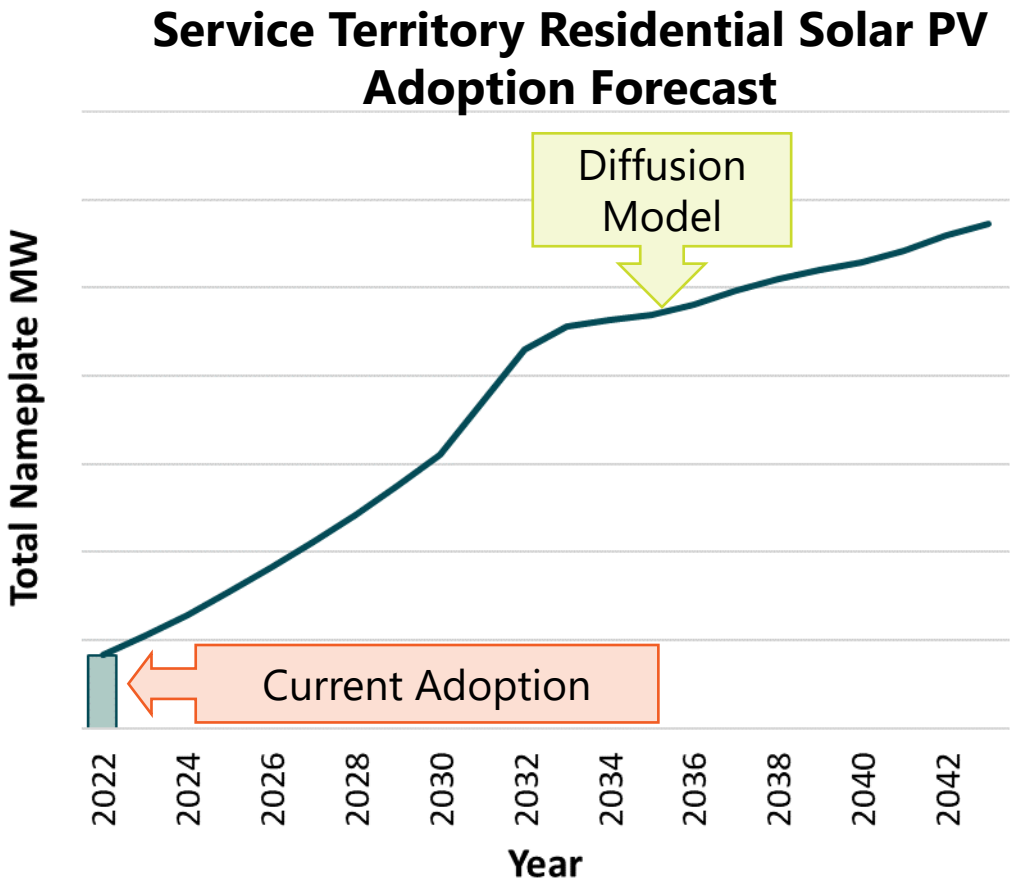
Framework for locational, 8760 solar and storage forecast

Solar and Storage Forecasting Framework

These slides apply the framework to Residential, BTM Solar PV.

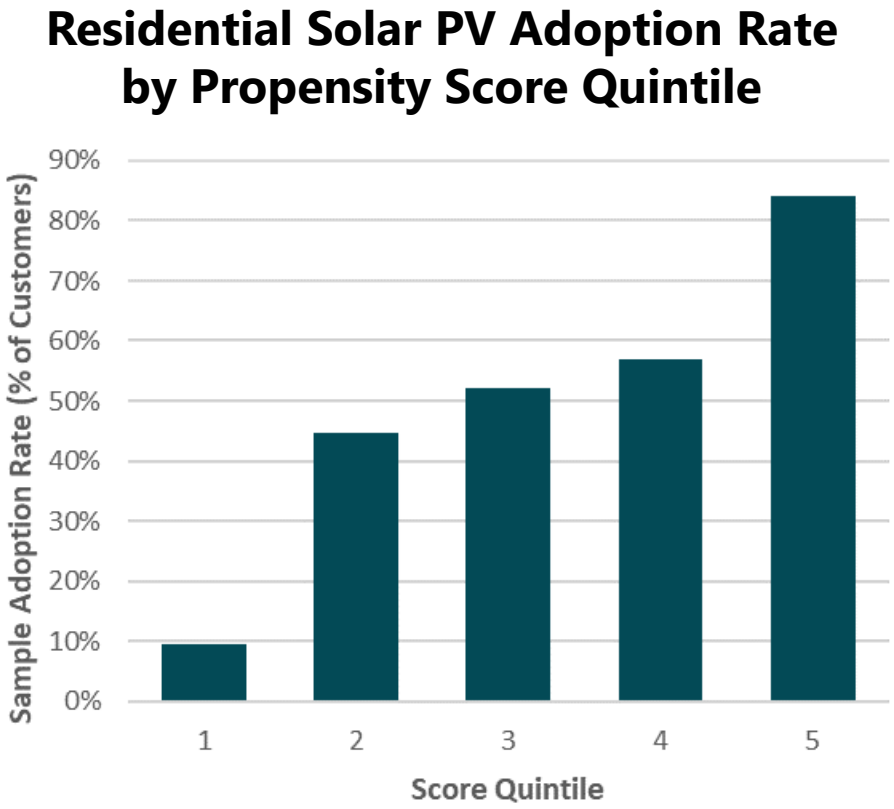
Start with service territory adoption forecast

- Calibrate to **current adoption**
- Use **diffusion model** for the forward-looking shape
- NREL's DGEN is a diffusion model, accounts for
  - technology cost
  - applicable incentives
  - electric consumption
  - utility rates



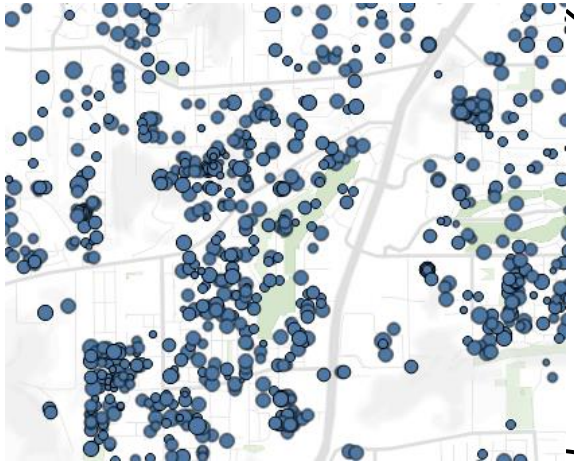
Overlay a propensity model to allocate adoption to site level

- Some sites are more likely to adopt than others;
- Binary classification model using historic adoption data
- Includes
  - Building Type
  - Census Tract HH Income
  - Rent vs Own
  - “Neighborhood Effects”

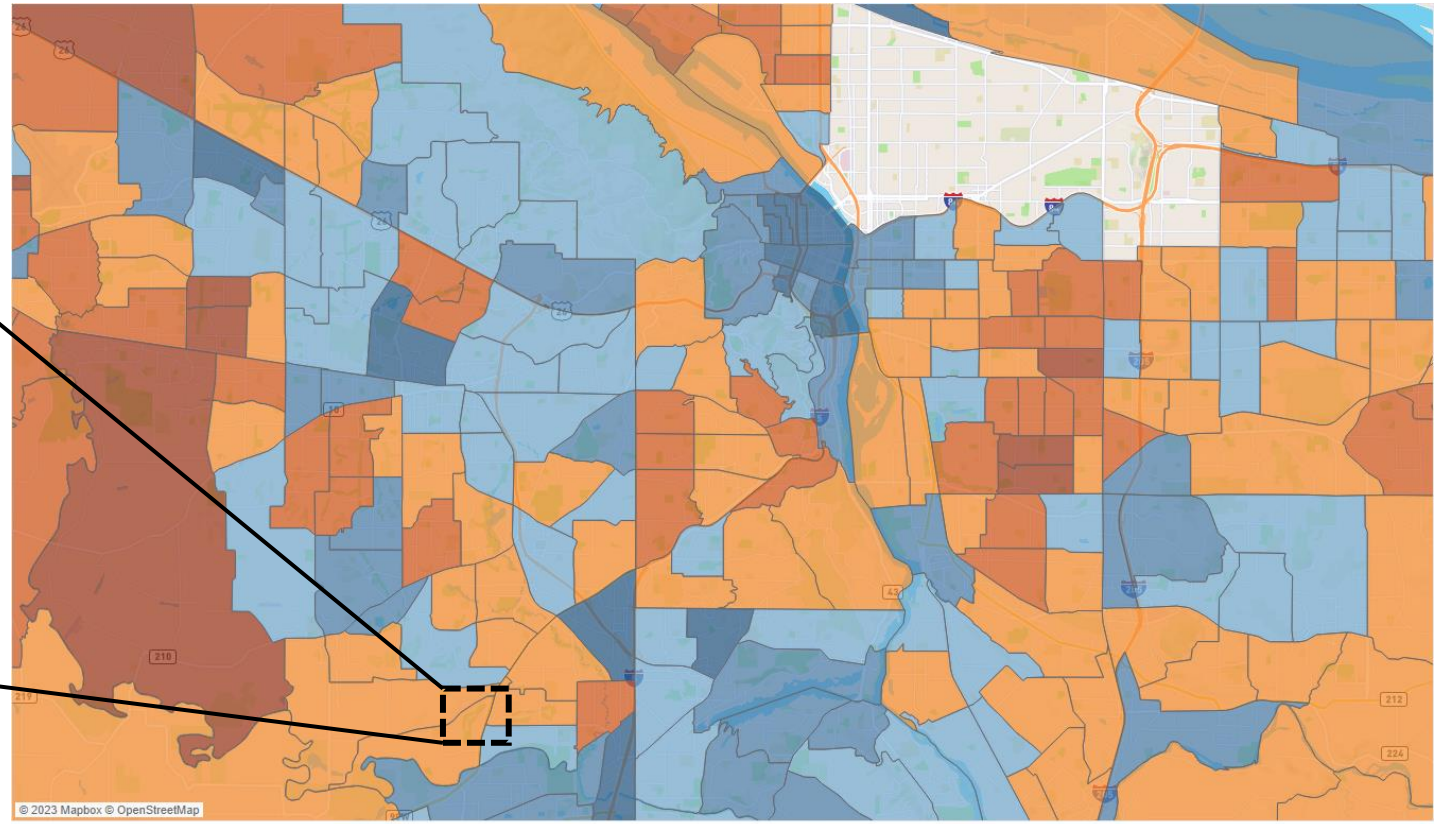


Visualizing the adoption forecast

Site-Level, Residential Solar PV Adoption Detail



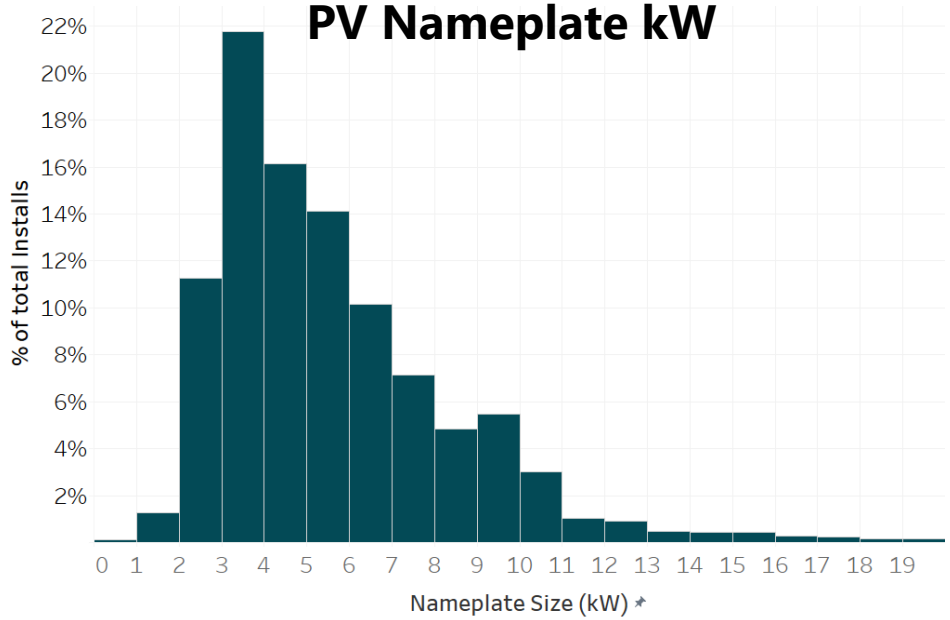
Estimated Residential Solar PV Adoption Rate by Census Tract (Year 2030)



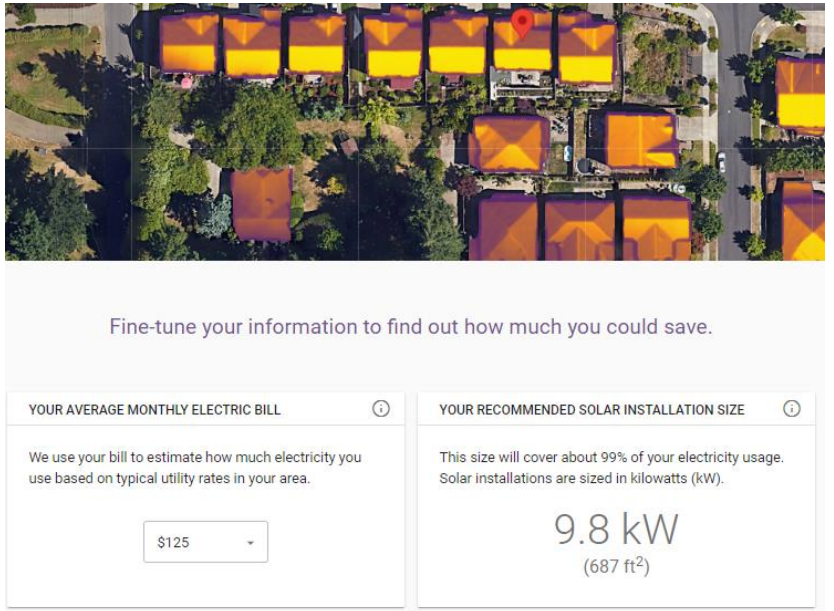
We use a size assumption for each Solar PV adopter

- Historic data is a good source
- Project Sunroof (Google) would be better, but it's proprietary and not very scalable.

Histogram of Installed, Residential Solar PV Nameplate kW

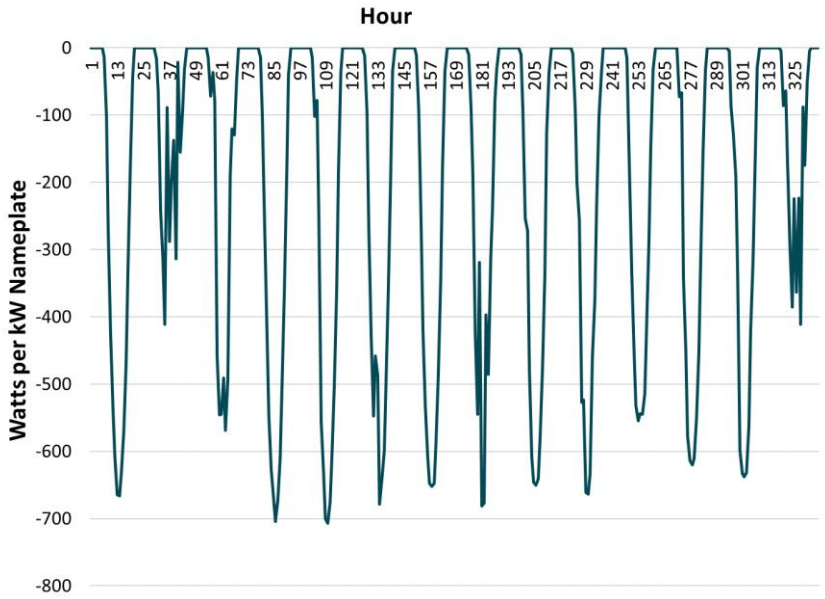


Project Sunroof Screenshot

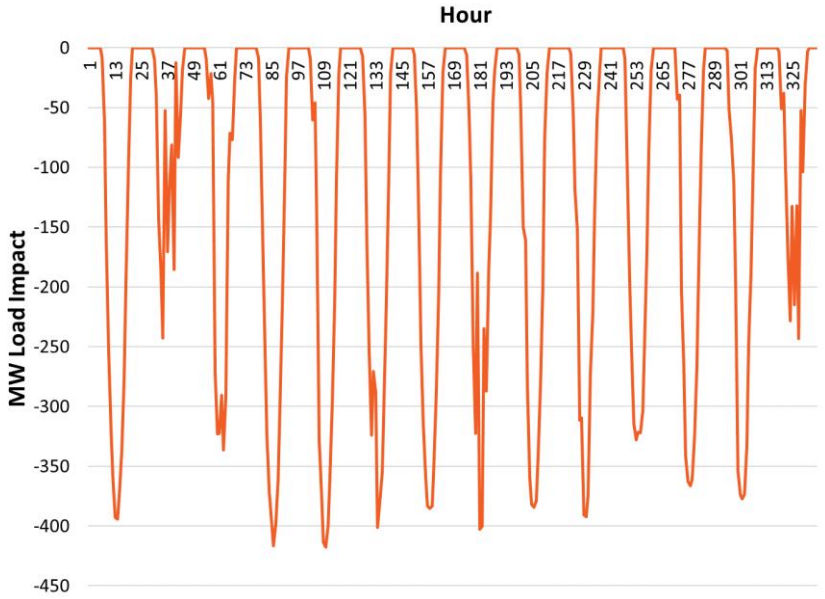


Load impact assumptions expand adoption to an 8760 forecast

Unitized Load Impact by Hour (Aug 1-14)



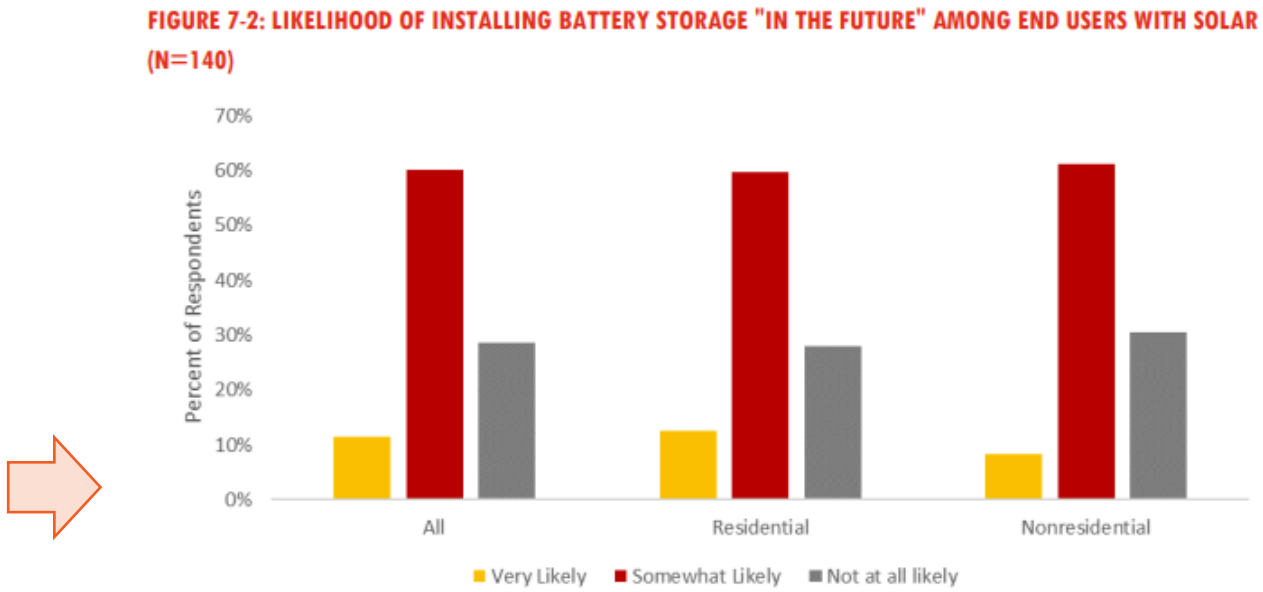
Total Load Impact by Hour (Aug 1-14, 2030)



- We use PV Watts to get “unitized” 8760 shapes for a representative set of orientation/tilt

Closing a few loose ends

- Similar approach for non-res solar PV
- Storage
  - Standalone storage is rare
  - We use solar PV "attachment rate" assumption for adoption forecast
- Always do scenario analysis



Source: 2019 SGIP Market Assessment and Cost Effectiveness Report (Itron)

We've encountered challenges along the way

- Friction in data acquisition
  - Tools (i.e., Project Sunroof) are rate-limited and/or proprietary
  - Panel sizing can be complex
- Calibration to actual adoption is necessary
- Accounting for ever-evolving incentive programs
  - Federal, state, and local incentives
  - Low-income programs
- Scenarios vs statistics

Thanks!

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