

June 13, 2023

# Locational Solar and Storage Forecasting

ESIG Long-term Load Forecasting Workshop



**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

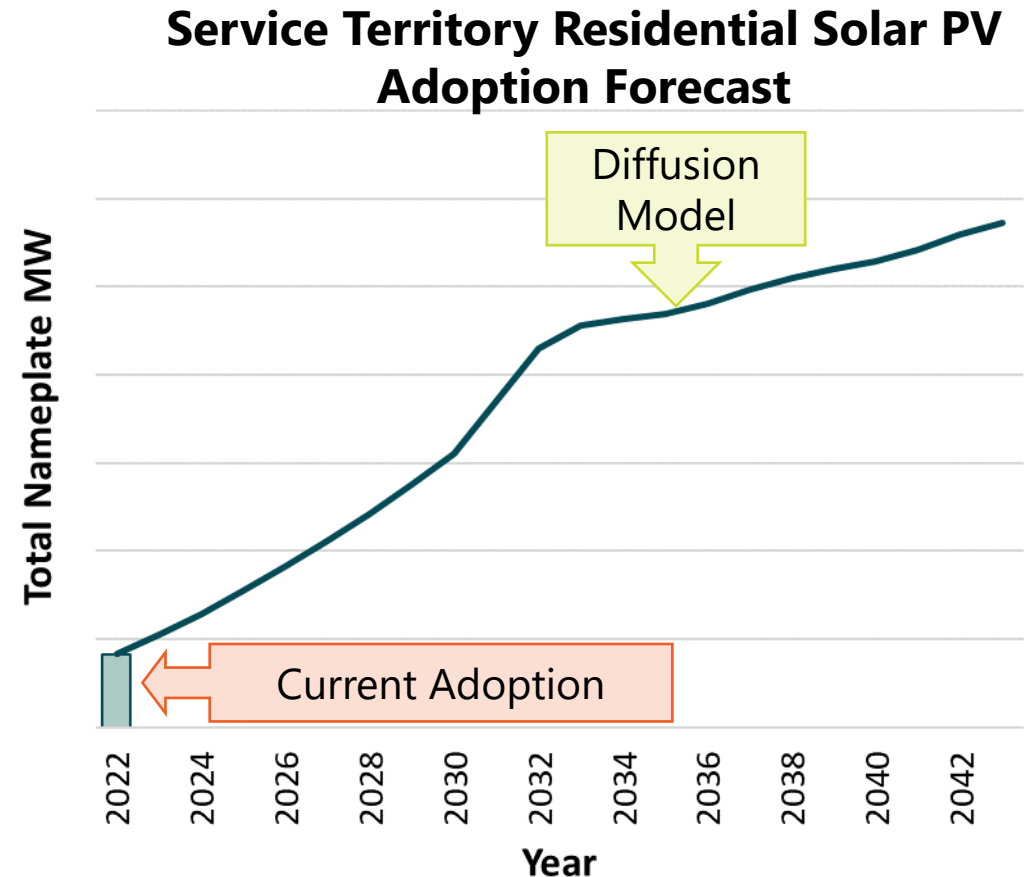


These slides apply the framework to Residential, BTM Solar PV.



# 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

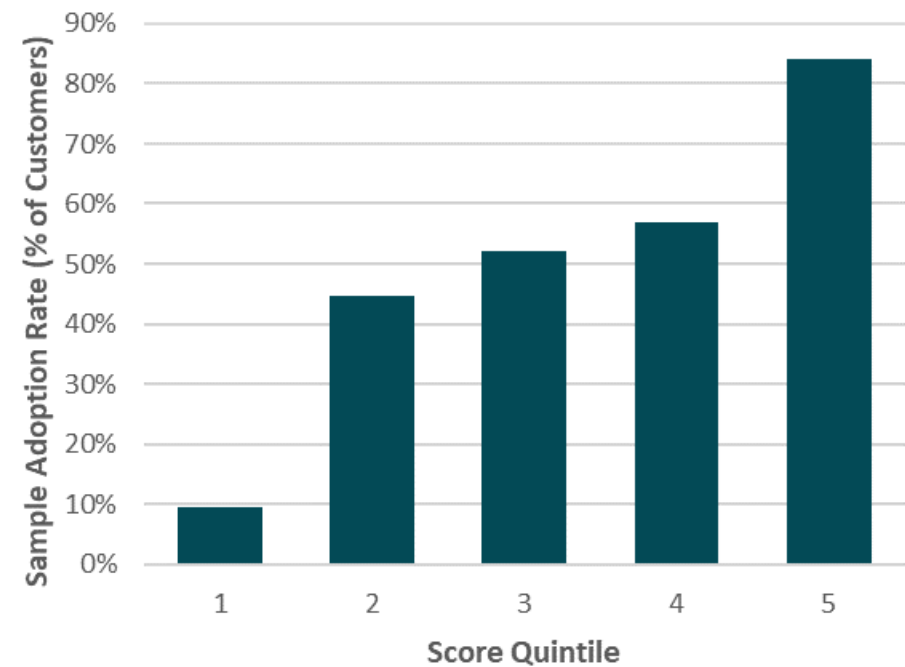


# Overlay a propensity model to allocate adoption to site level

- 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"



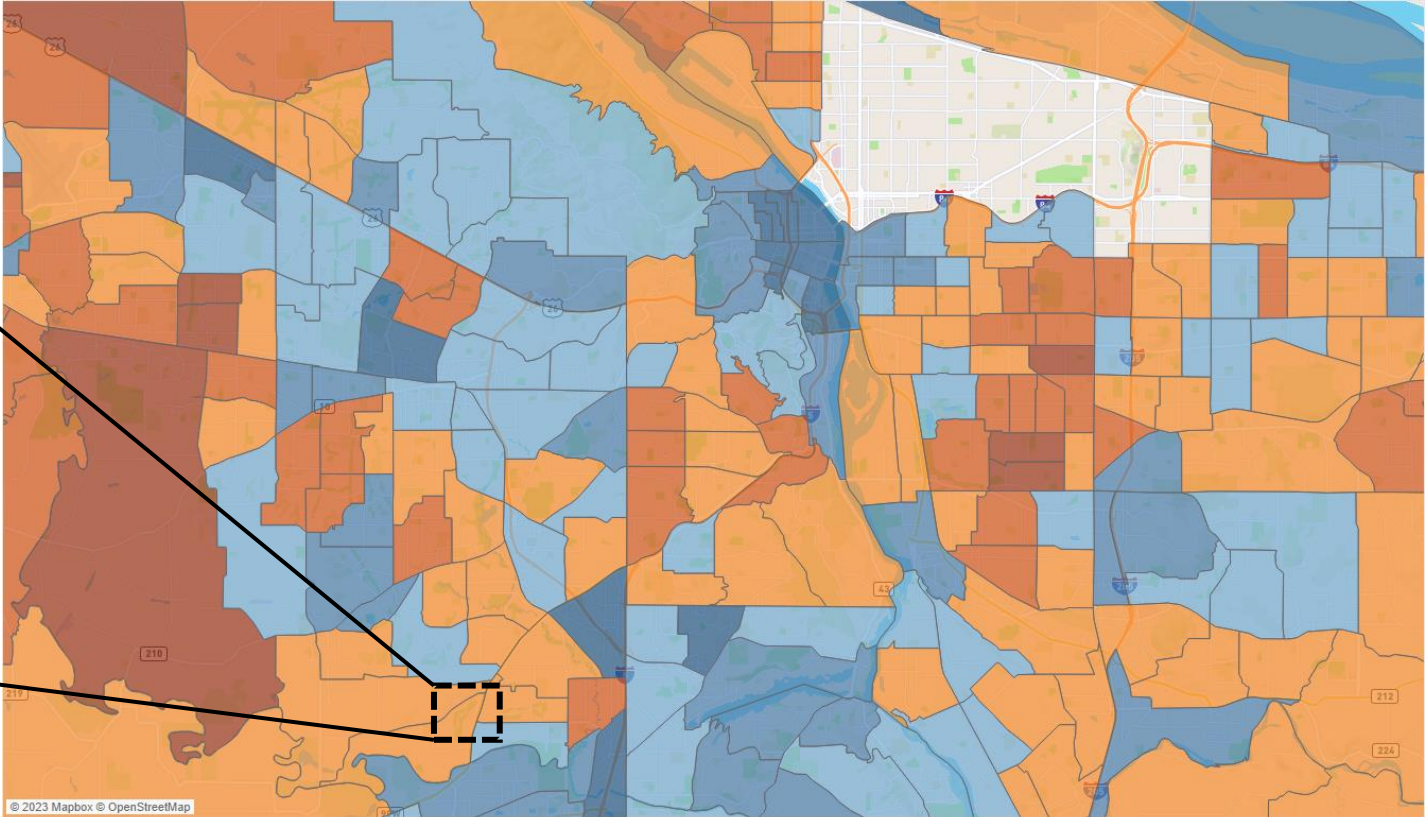
**Residential Solar PV Adoption Rate by Propensity Score Quintile**



# Visualizing the adoption forecast

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

#### Site-Level, Residential Solar PV Adoption Detail

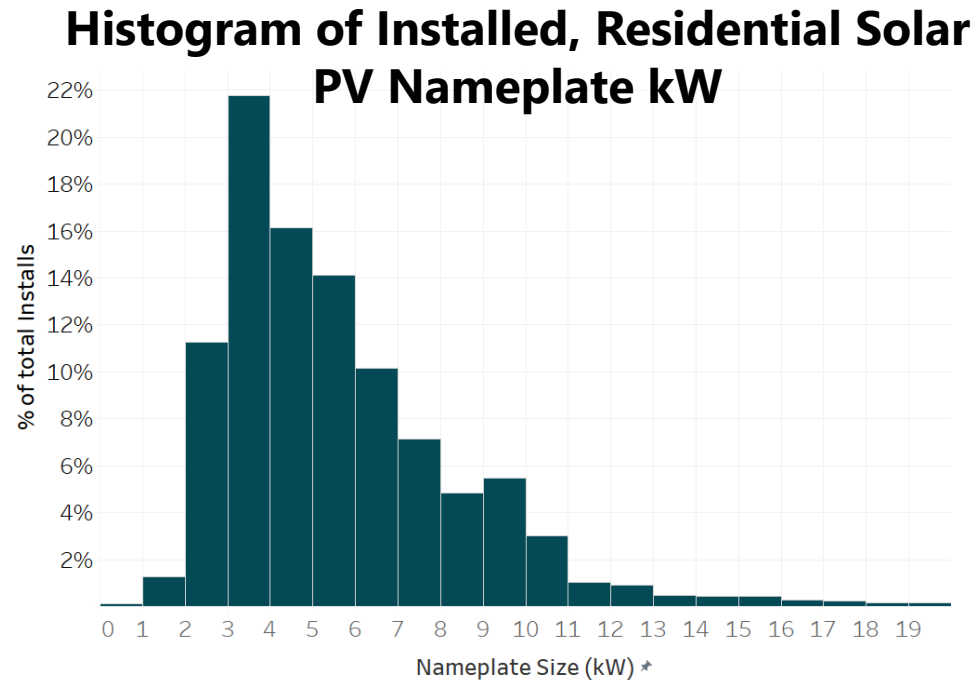


% of Premises  
0.0% 16.7%



# 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.



### Project Sunroof Screenshot



Fine-tune your information to find out how much you could save.

#### YOUR AVERAGE MONTHLY ELECTRIC BILL

We use your bill to estimate how much electricity you use based on typical utility rates in your area.

\$125

#### YOUR RECOMMENDED SOLAR INSTALLATION SIZE

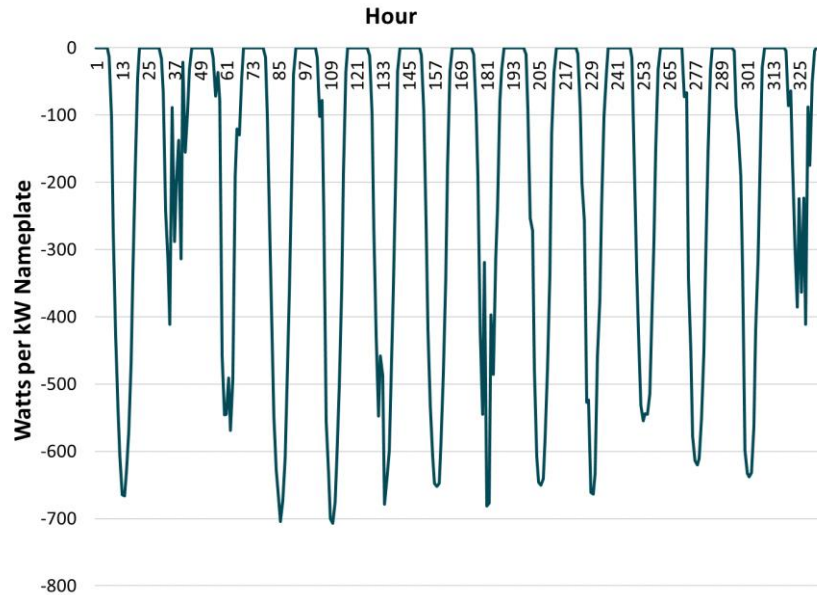
This size will cover about 99% of your electricity usage. Solar installations are sized in kilowatts (kW).

9.8 kW  
(687 ft<sup>2</sup>)

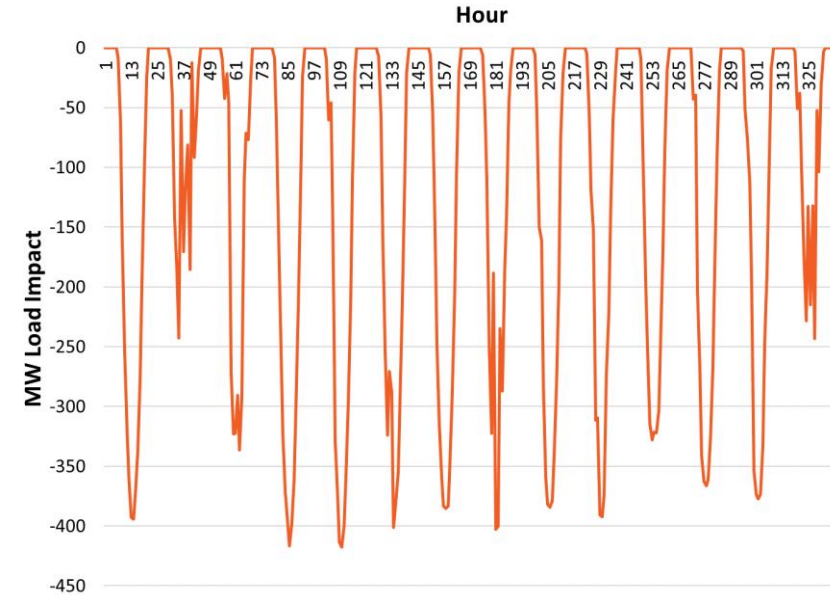


# Load impact assumptions expand adoption to an 8760 forecast

## 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



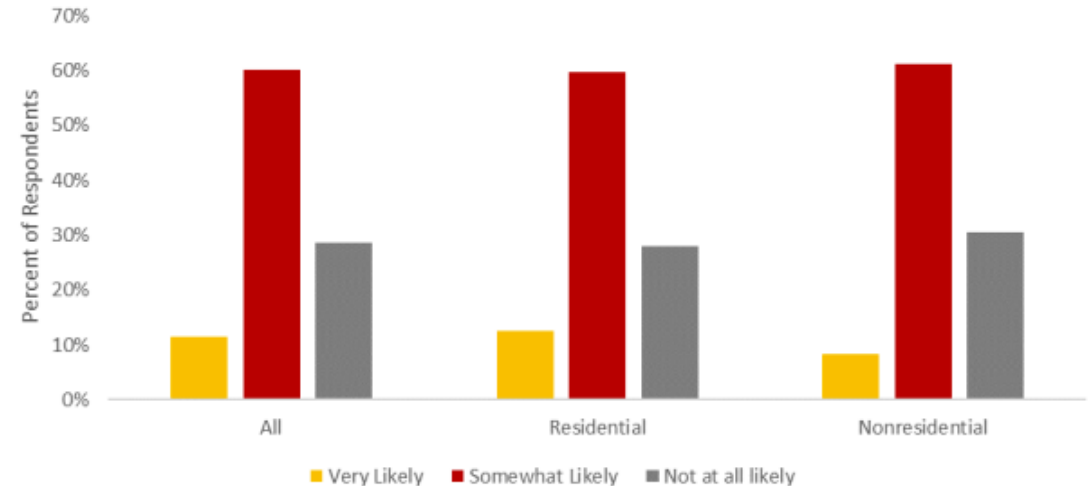


# Closing a few loose ends

- 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



FIGURE 7-2: LIKELIHOOD OF INSTALLING BATTERY STORAGE "IN THE FUTURE" AMONG END USERS WITH SOLAR (N=140)



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!

Fred Schaefer

[fschaefer@cadeogroup.com](mailto:fschaefer@cadeogroup.com)