

May 11, 2023

# DER and Load Forecasting Considerations

Prepared for Massachusetts DOER GMAC



# Forecasting is a component of distribution system planning

- April 13, 2023 GMAC meeting included a distribution system planning (DSP) presentation from LBNL.
- Load and DER forecasting play a role in DSP; location is important

### Substantive elements (1)

- Baseline information on current state of distribution system
  - ▣ Such as system statistics, reliability performance, equipment condition, historical spending by category
- Description of planning process
  - ▣ Load forecast – projected peak demand for feeders and substations
  - ▣ Risk analysis for overloads and plans for mitigation
  - ▣ Budget for planned capacity projects
    - ▣ Asset health analysis and system reinforcements
    - ▣ Upgrades needed for capacity, reliability, power quality
    - ▣ New systems and technologies
    - ▣ Ranking criteria (e.g., safety, reliability, compliance, financial)
- Distribution operations — vegetation management and event management

Source: Xcel Energy 2021

ENERGY TECHNOLOGIES AREA | ENERGY ANALYSIS AND ENVIRONMENTAL IMPACTS DIVISION | ELECTRICITY MARKETS & POLICY 12

### Substantive elements (2)

- DER forecast
  - ▣ Types, amounts and locations
- Hosting capacity analysis
  - ▣ Including maps
- Grid needs assessment and NWA analysis to identify:
  - ▣ Existing and anticipated capacity deficiencies and constraints
  - ▣ Traditional utility mitigation projects
  - ▣ A subset of these planned projects that may be suitable for NWA to defer or avoid infrastructure upgrades for load relief, voltage, reducing interruptions, resilience

ENERGY TECHNOLOGIES AREA | ENERGY ANALYSIS AND ENVIRONMENTAL IMPACTS DIVISION | ELECTRICITY MARKETS & POLICY 13



# First, some definitions.

- **Distributed Energy Resource (DER).** Includes Solar, Storage, DR/Flex Loads, Building Electrification, Transportation Electrification. Consistent with NARUC definition.
- **DER Forecast.** Long-term (5+ year) forecast of DER adoption.
- **DER Load Impacts.** Hourly, net change in energy consumption from DER adoption.
- **Load Forecast.** Long-term (5+ year) forecast of hourly energy consumption. Can include hourly DER load impacts.



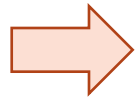
# Four considerations for DER and Load Forecasting

- Account for local variability in equipment stock
- Use scenario analysis to set bounds
- Use 8760 hourly DER load Impacts
- Disaggregate by DER type

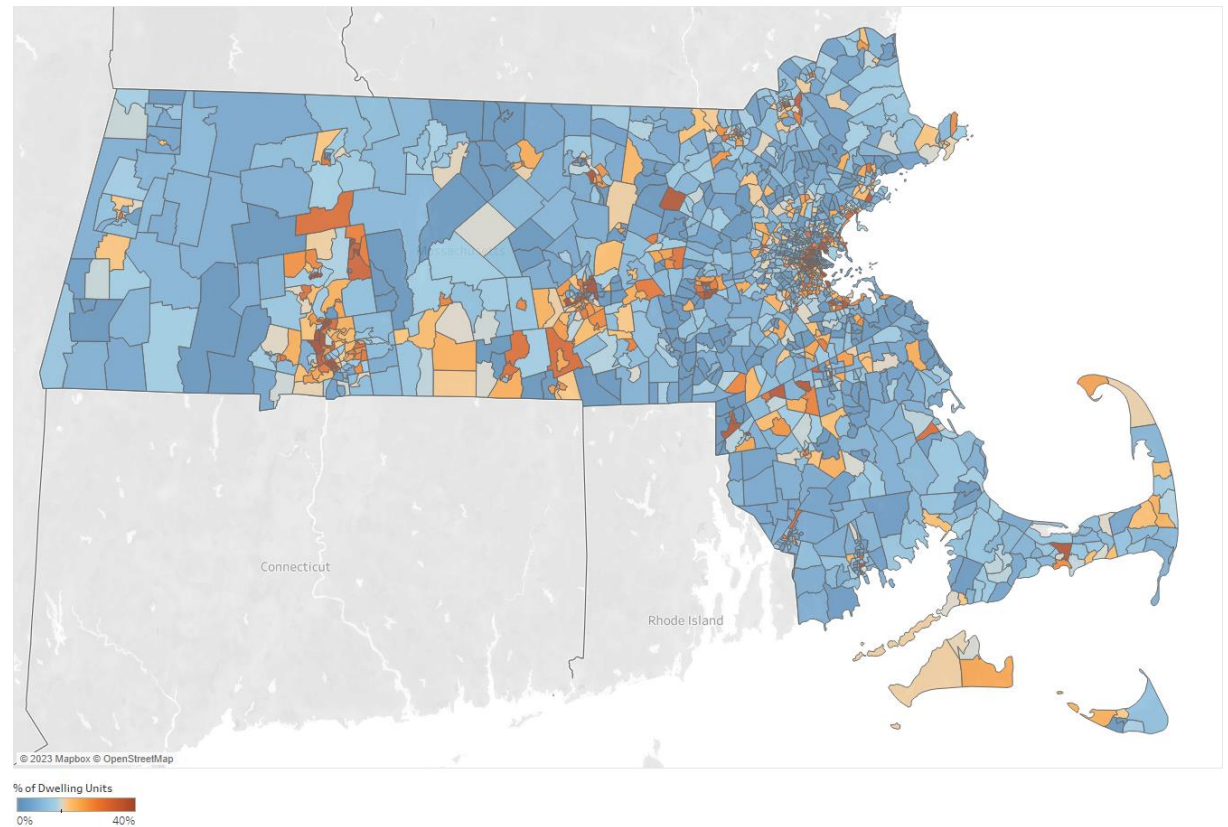


# Account for local variability in equipment stock

- **Use granular stock data** to build DER adoption assumptions.
- DER adoption, especially electrification, will hit differently across the grid.



**Percent of Dwelling Units with Electric Heat**

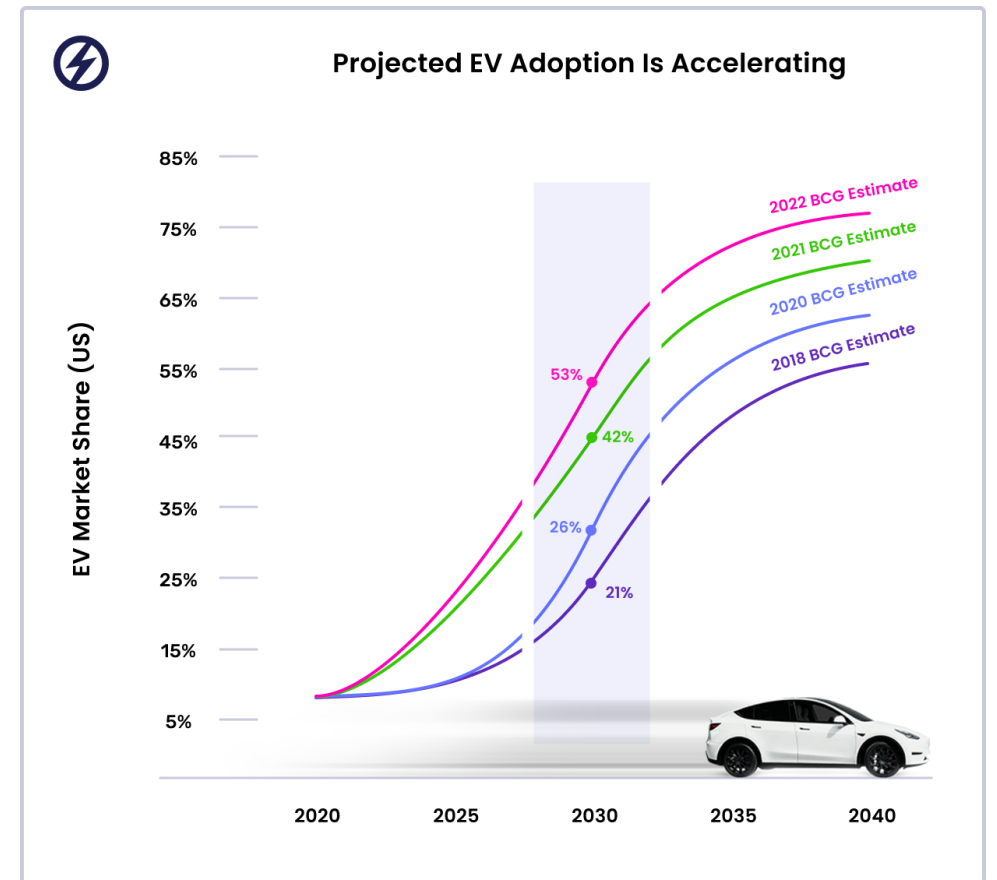
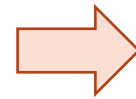


Source: Analysis of American Community Survey. 2019 5-year estimates.



# Use scenario analysis to set bounds

- At minimum, **use low, reference, and high scenarios** in DER and load forecasting
- The future is uncertain – lots of things can change
- Massachusetts has a climate action plan and decarbonization goals
  - What happens if the Commonwealth achieves its goal?
  - What if it falls short?



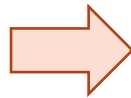
Source: <https://www.recurrentauto.com/research/ev-adoption-us>



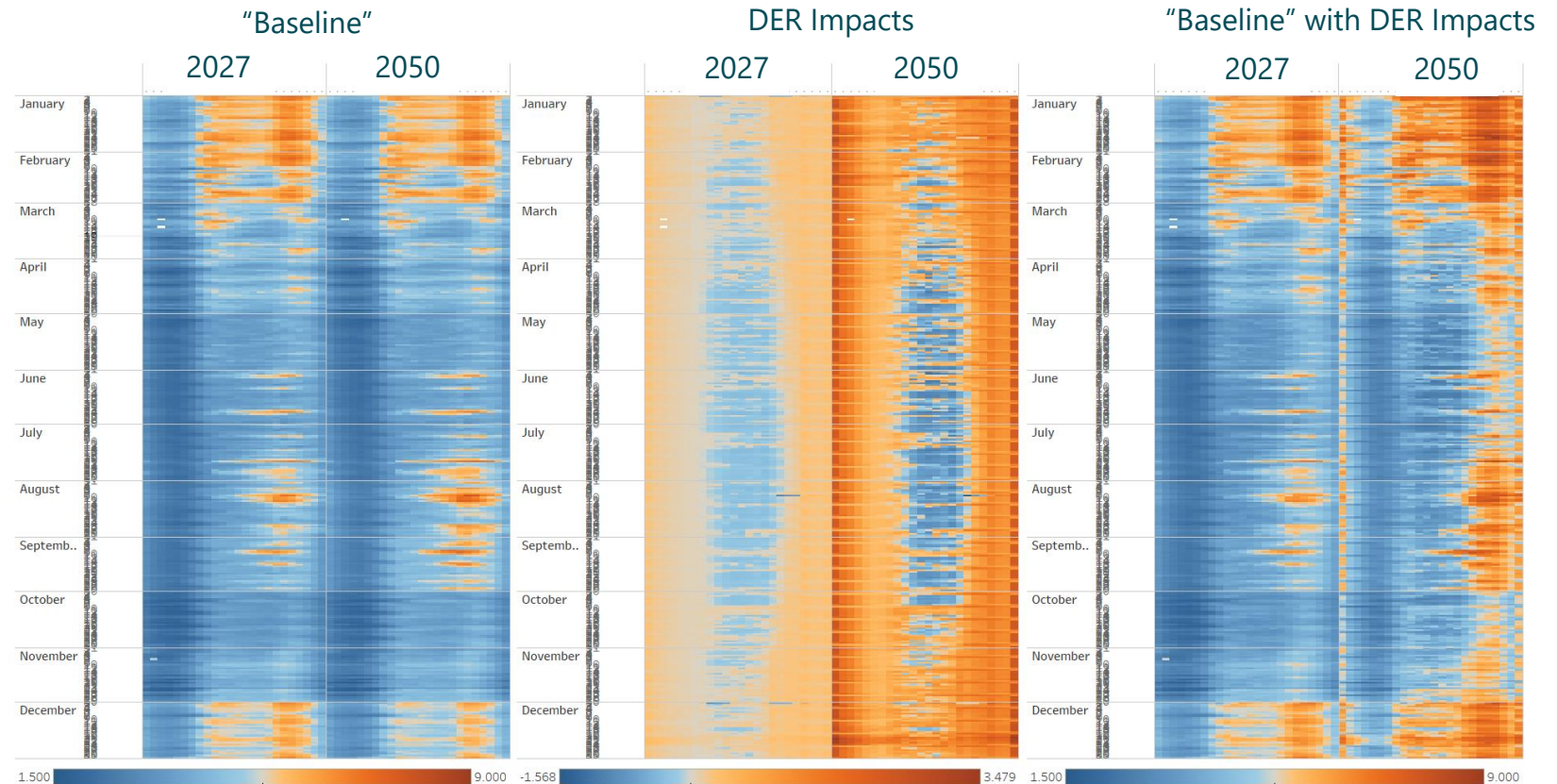


# Use 8760 hourly DER Impacts

- Use hourly DER impacts in load forecasting.
- DER adoption can shift peaks.



Feeder-Level Heatmap of 8760 Hourly Load

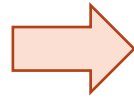


Source: analysis of EDC hourly load data

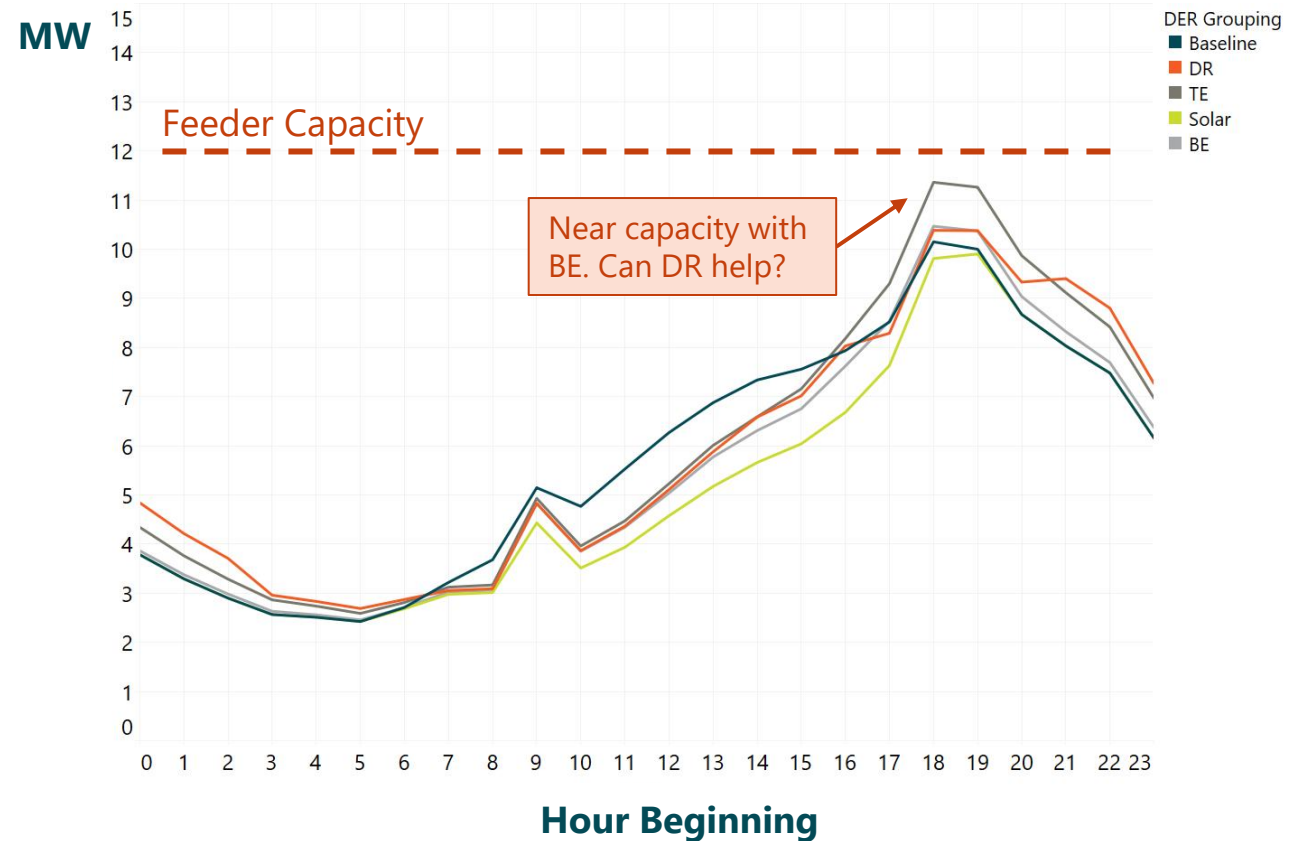


# Disaggregate by DER type

- Look at electrification independent of solar, DR/Flex loads.
- Identify trouble areas before thinking about mitigation opportunities.



Feeder-Level Peak Day Load Profile, Year 2030





# Developing “local” forecasts is a challenge

- Lots of data required
- QA processes requires careful planning
- QC is time-consuming
- Forecasts might not age well





# Thanks!

Fred Schaefer  
[fschaefer@cadeogroup.com](mailto:fschaefer@cadeogroup.com)  
503-660-4215