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Production Cost Modeling Exploratory Scenario Analysis to Inform Future Modeling Efforts

2019 Integrated Energy Policy Report

California Energy Commission

Presenter: Hazel Aragon
Date: October 30, 2019
Supply Analysis Office, Energy Assessments Division
California Energy Commission

Topics

- IEPR 2019 Base Assumptions
- Exploratory Electricity System Scenarios
  - Low Hydro Scenario
  - Transportation Electrification Scenario
  - Building Electrification Scenario
  - High Electrification Scenario
  - Low Hydro with High Electrification Scenario
  - 2035 Mid Demand Scenario

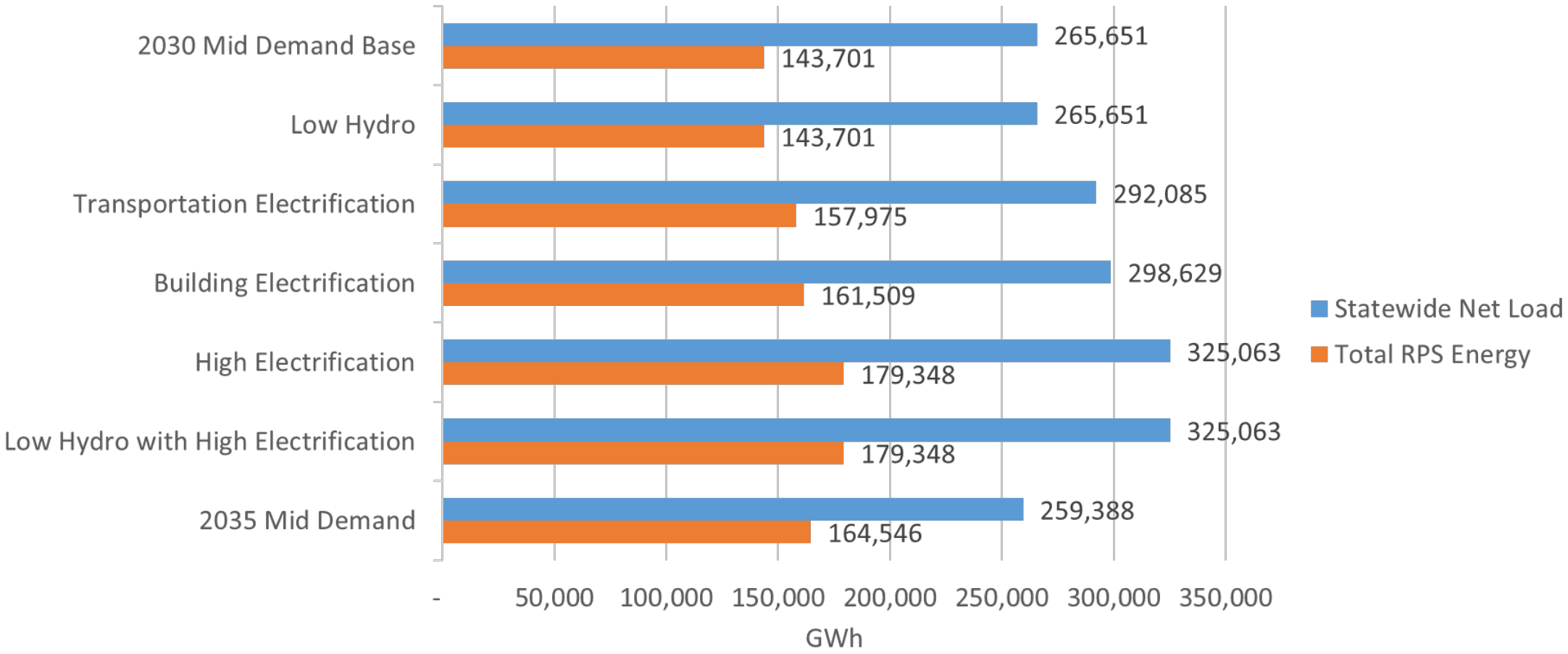
Topics

- Select Simulation Results
  - Reserve Margins
  - Natural Gas Demand for Electric Generation
  - GHG Emissions Projections

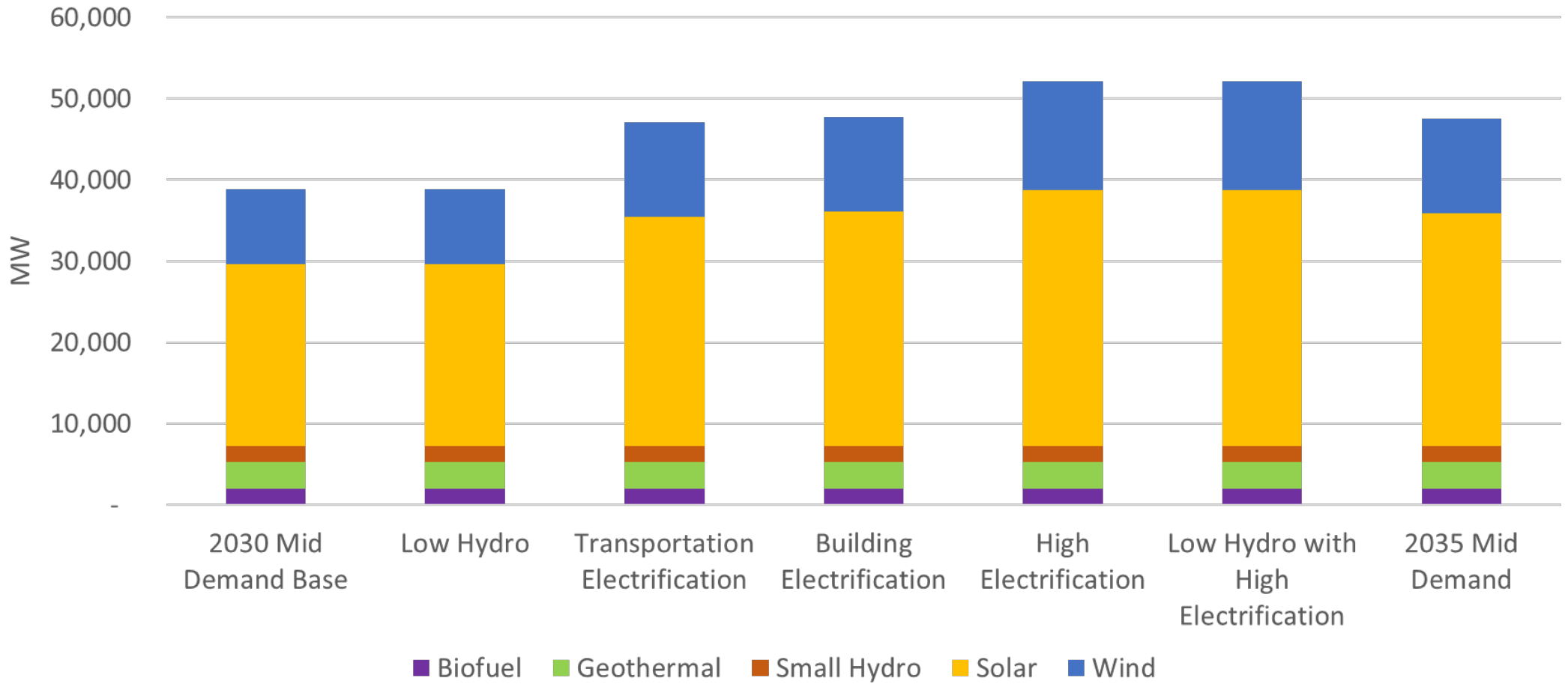
IEPR 2019 Base Case Assumptions

- 60% by 2030
- CED Forecast Update 2018-2030
- Existing renewables & planned retirements
- 2,100 MW of additional battery storage
- 75% renewable energy must come from in-state
- WECC-wide RPS policies as of 12/31/2018
- 10-year average hydro profile

Exploratory Scenario Assumptions: Statewide Net Load, RPS Energy



Total Renewable Capacity by Resource Type



Assumption Changes

Scenario	RPS Target	Additional Battery Storage
2030 Mid Demand Base	60%	0
Low Hydro	60%	0
Transportation Electrification	60%	0
Building Electrification	60%	1,221
High Electrification	60%	0
Low Hydro with High Electrification	60%	0
2035 Mid Demand	70%	0

Minimum of Reserve Margins

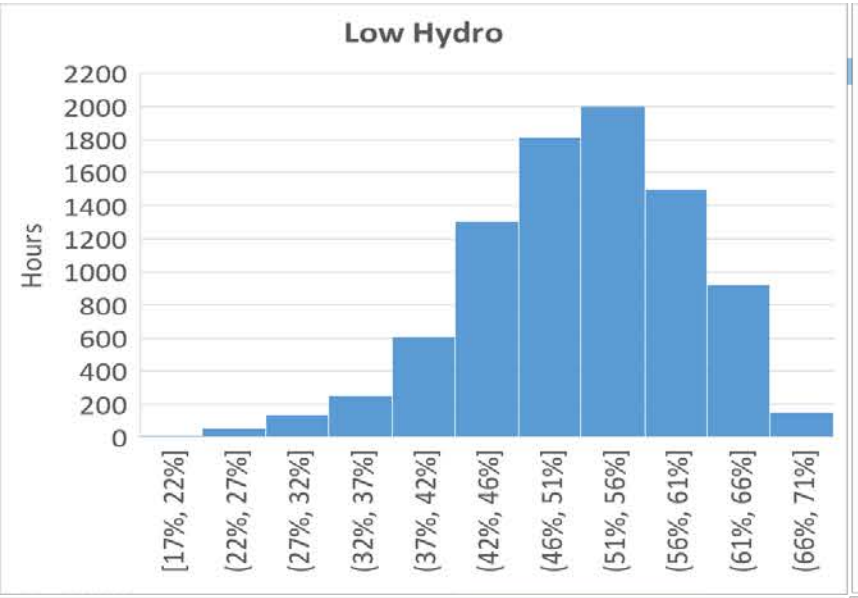
Scenario	Min of RM	Hour of Min RM
2030 Mid Demand Base	15.5%	9/3/30 6:00 PM
Low Hydro	17.3%	8/19/30 7:00 PM
Transportation Electrification	11.0%	9/3/30 6:00 PM
Building Electrification*	15.2%	9/3/30 6:00 PM
High Electrification	10.5%	9/3/30 6:00 PM
Low Hydro with High Electrification	13.8%	7/25/30 8:00 PM
2035 Mid Demand	12.5%	9/13/35 6:00 PM

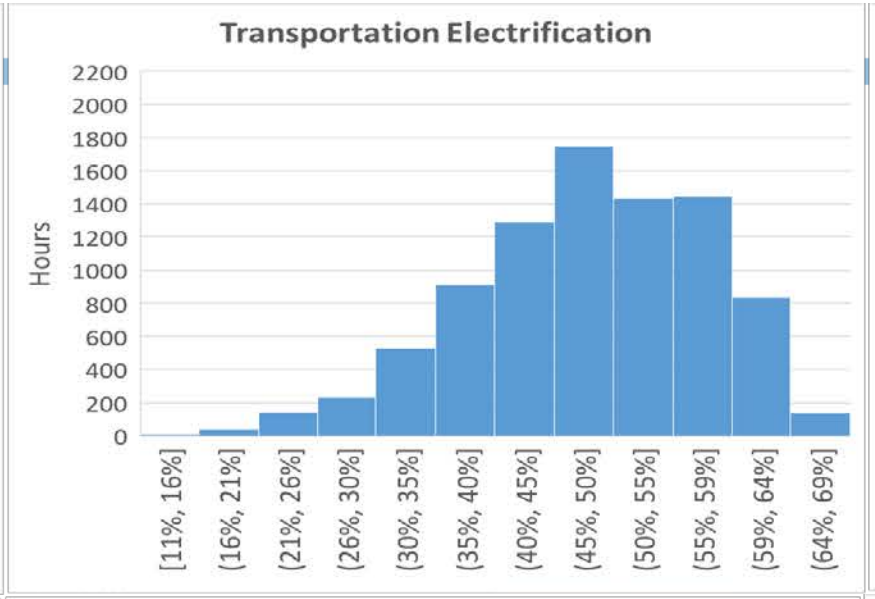
Reserve Margins at Maximum Load

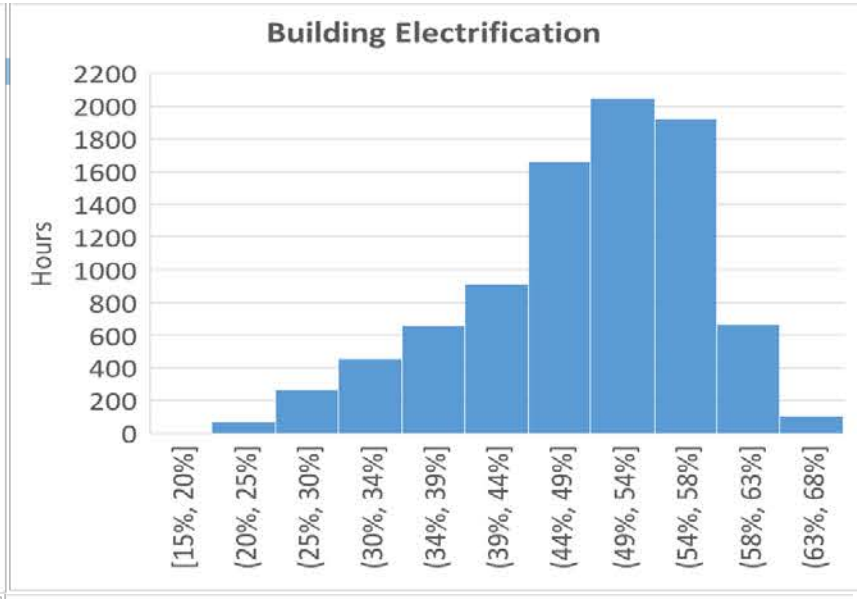
Scenario	RM at Max Load	Max of Load (MW)	Hour of Max Load RM
2030 Mid Demand Base	15.5%	55,511	9/3/30 6:00 PM
Low Hydro	17.9%	55,516	9/3/30 6:00 PM
Transportation Electrification	14.6%	57,931	9/3/30 8:00 PM
Building Electrification*	15.2%	58,345	9/3/30 6:00 PM
High Electrification	10.5%	60,658	9/3/30 6:00 PM
Low Hydro with High Electrification	14.0%	60,651	9/3/30 6:00 PM
2035 Mid Demand	15.9%	55,287	9/3/35 6:00 PM

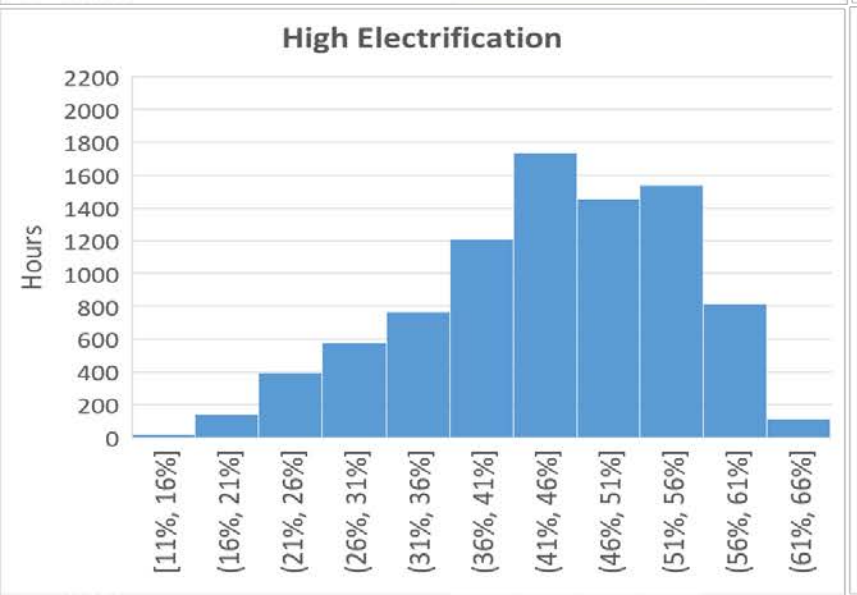
California total peak net import limit assumption = 13,100 MW

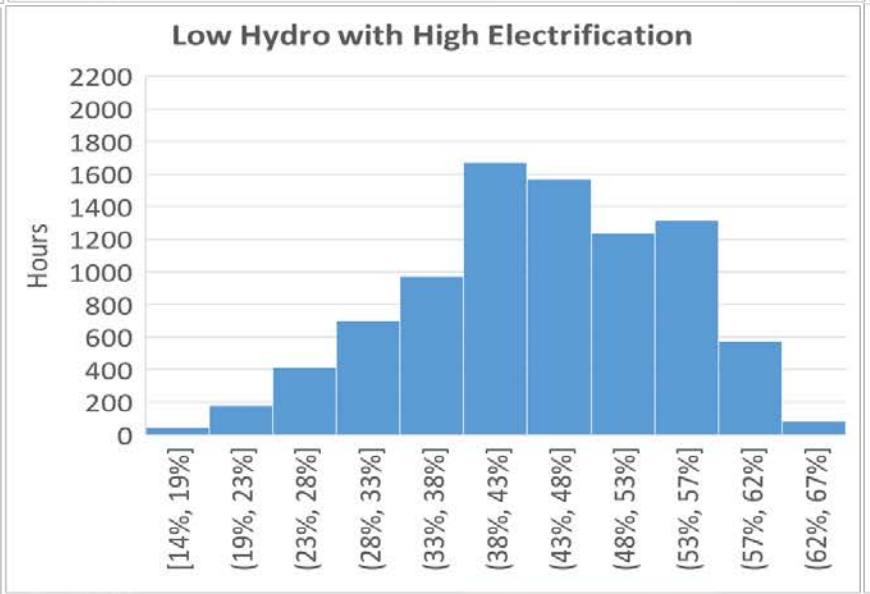
Reserve Margins

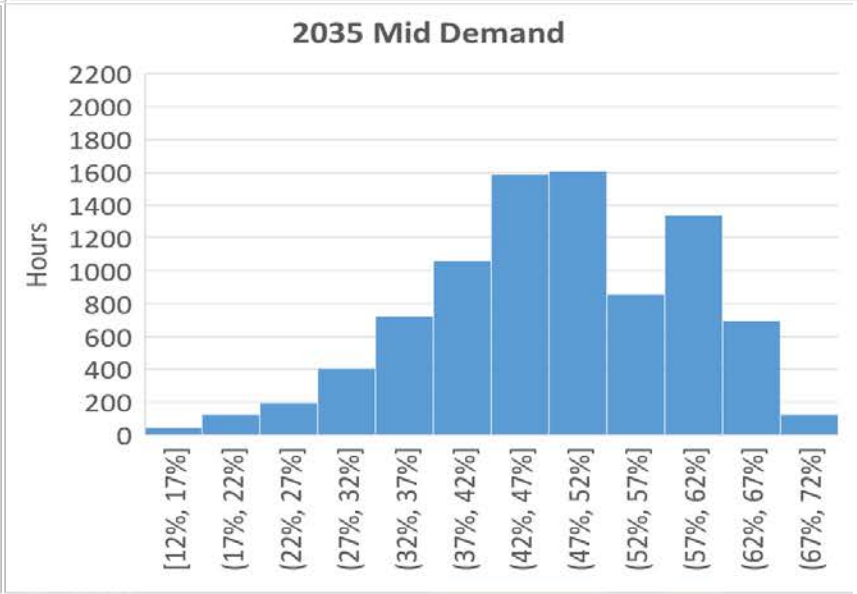




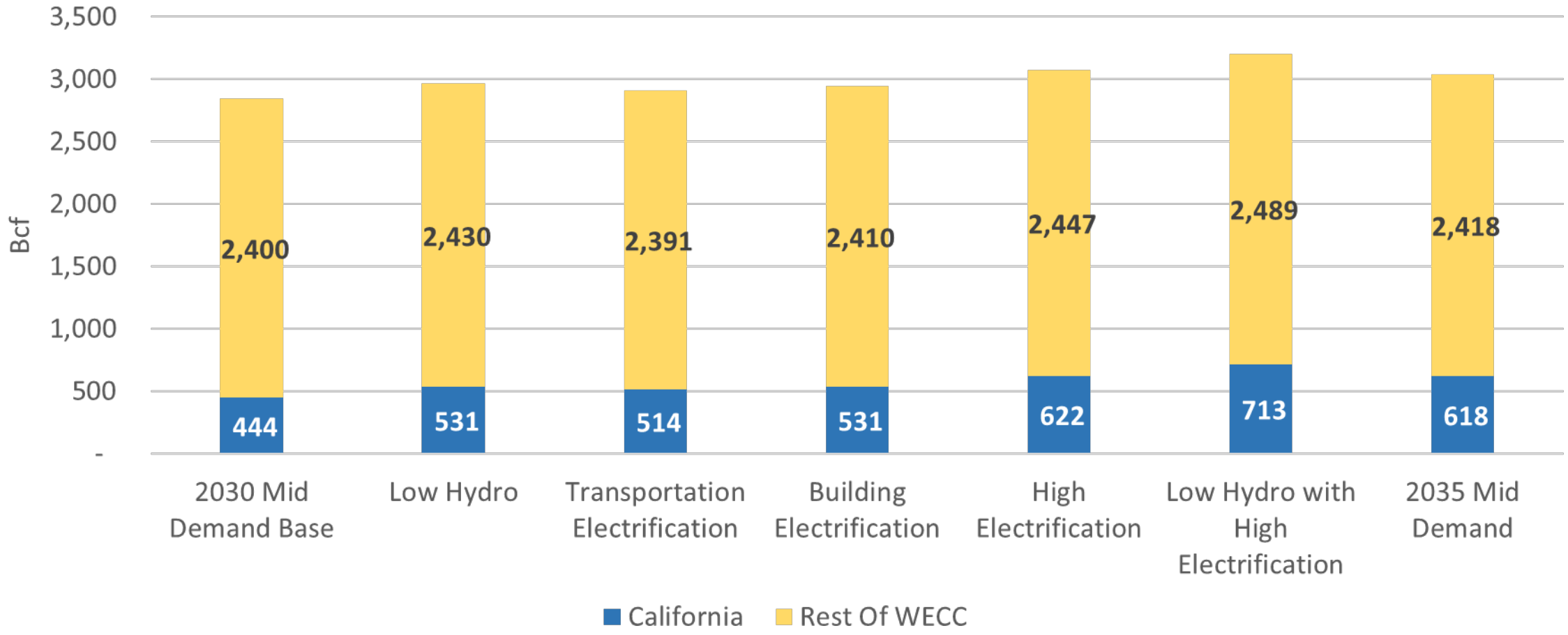




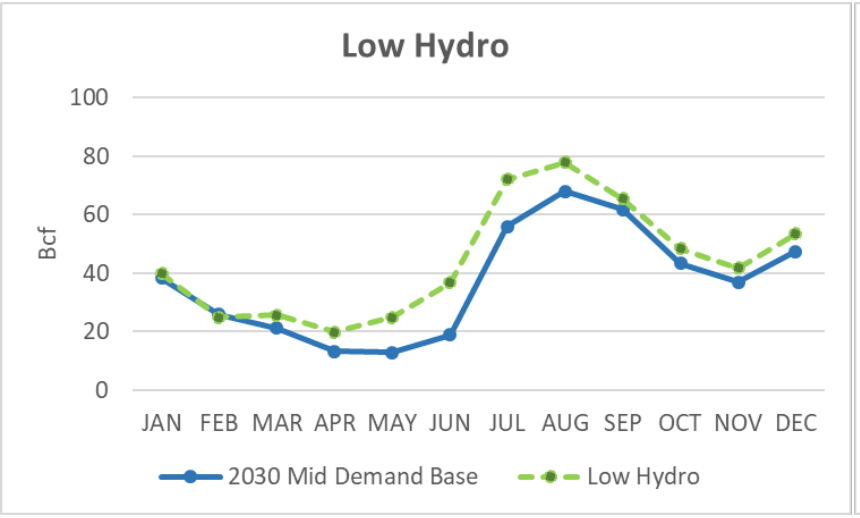


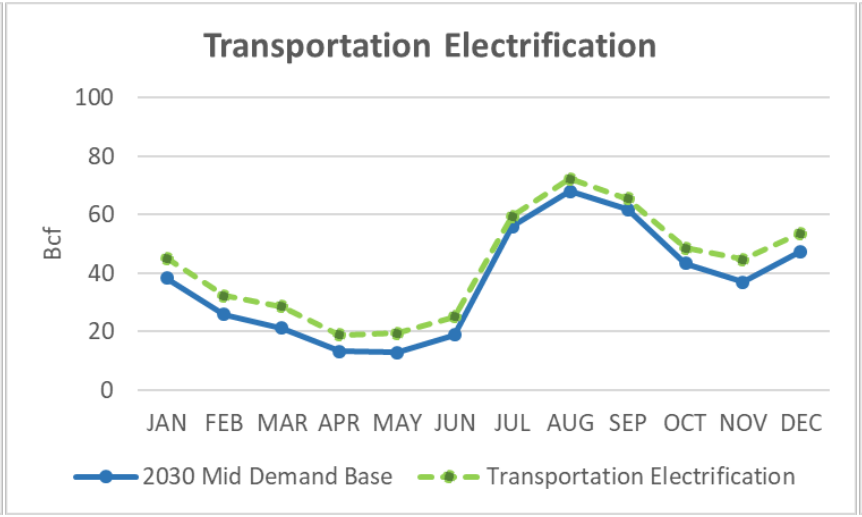


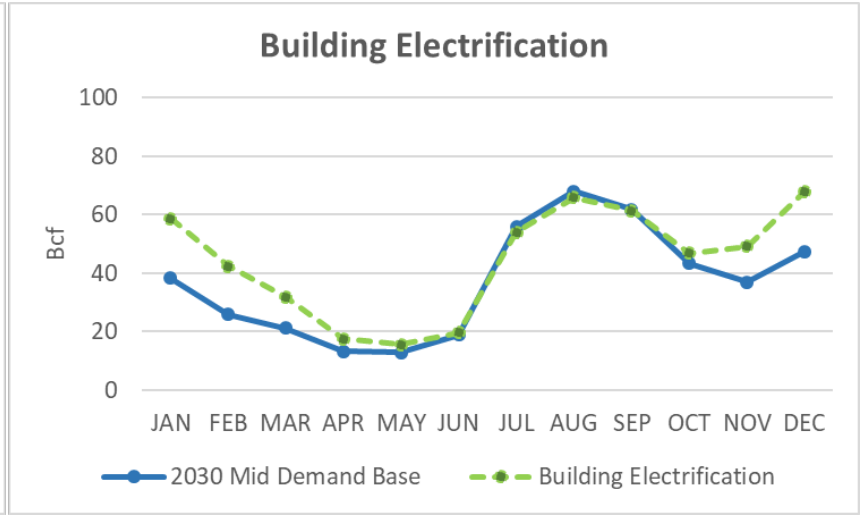
WECC-Wide Annual Natural Gas Consumption

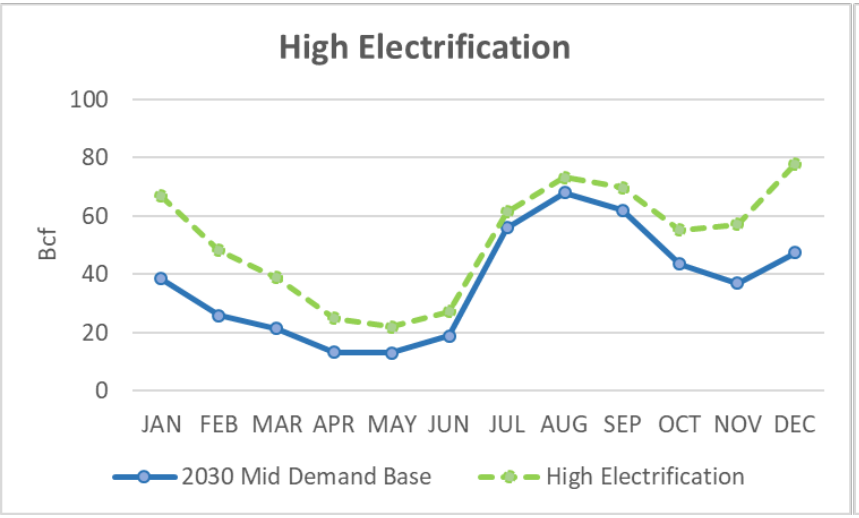


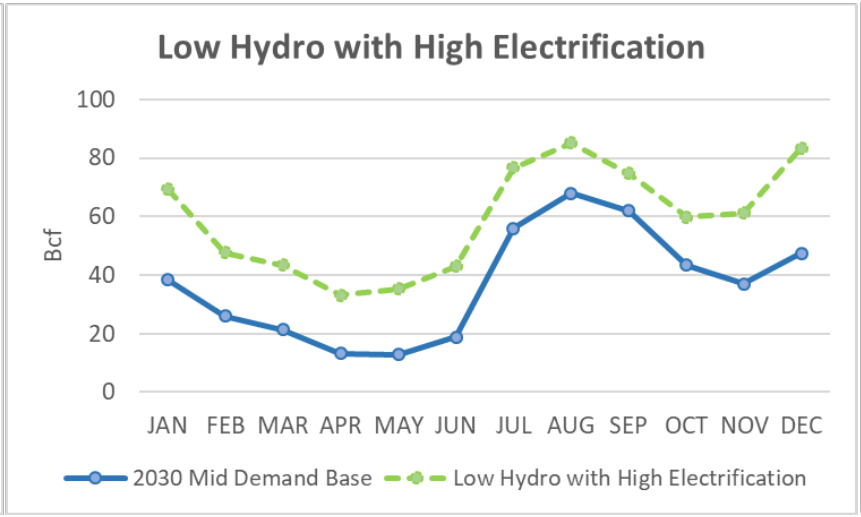
Monthly Natural Gas Consumption

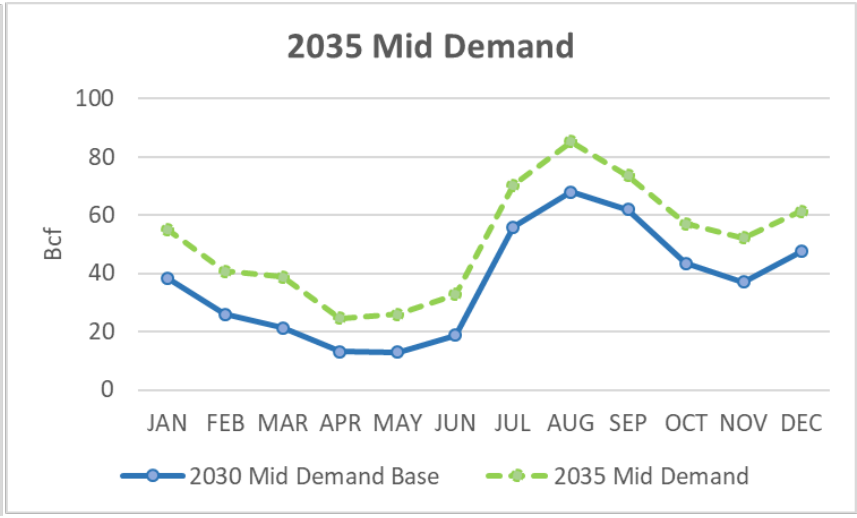




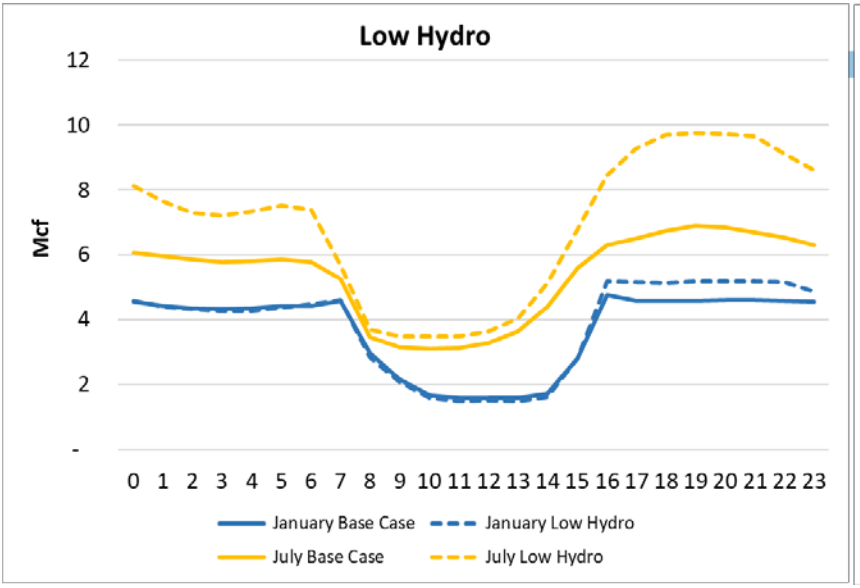


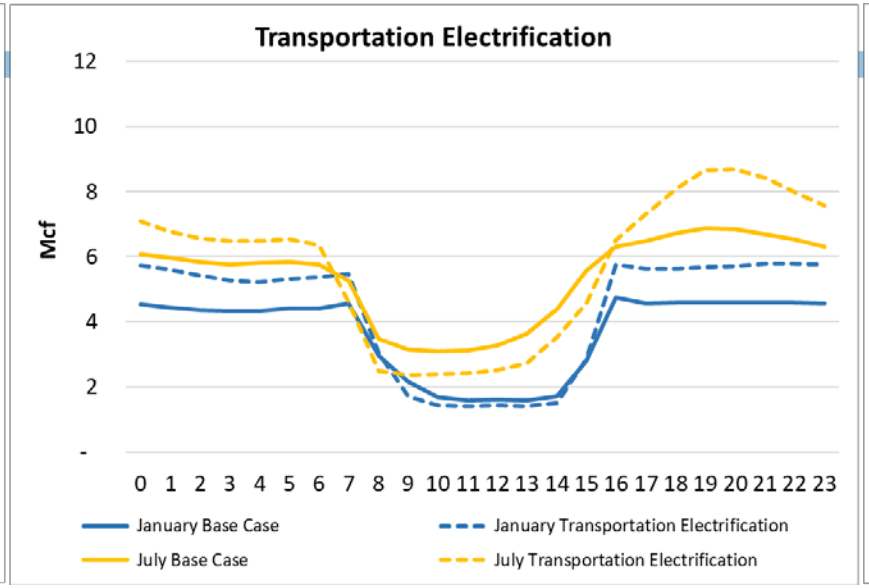


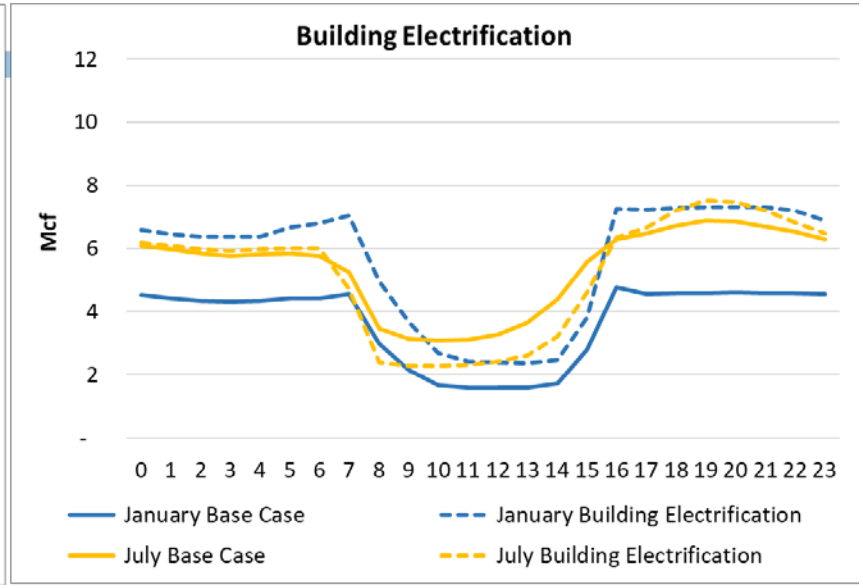


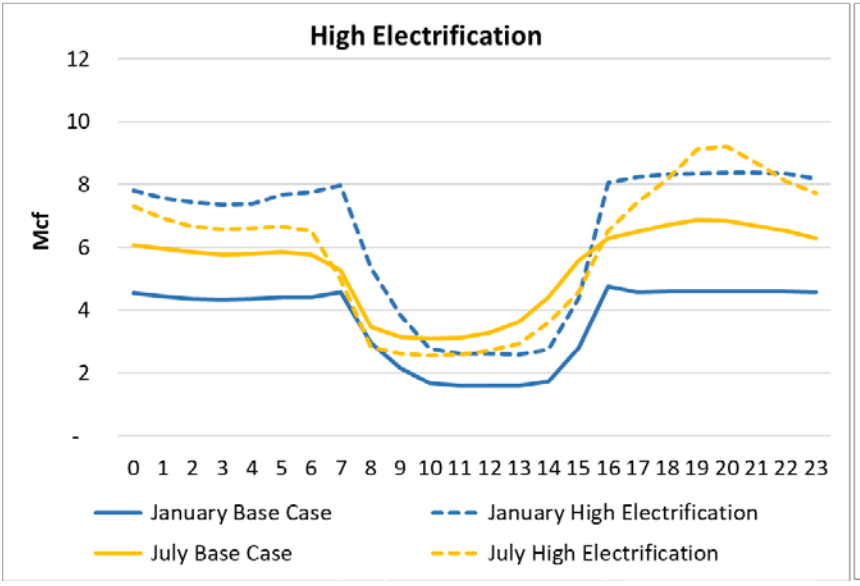


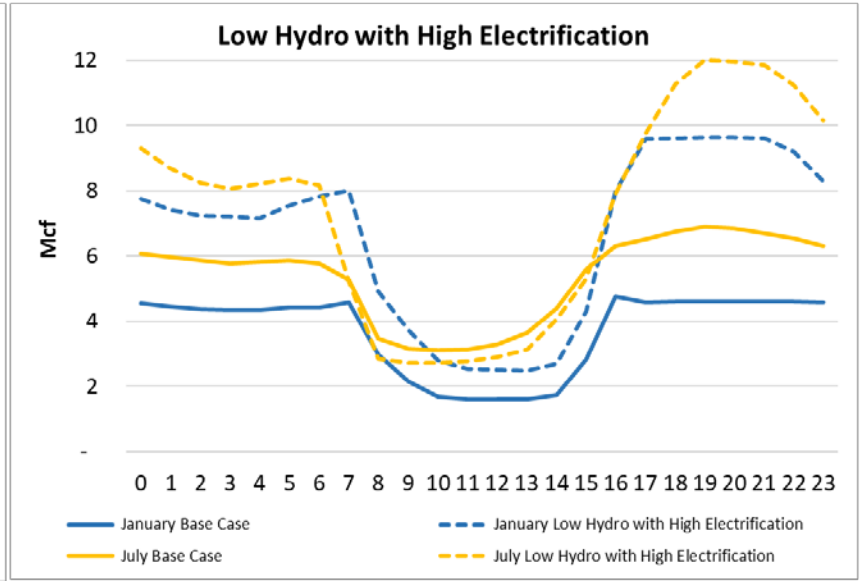
Average Hourly Natural Gas Use

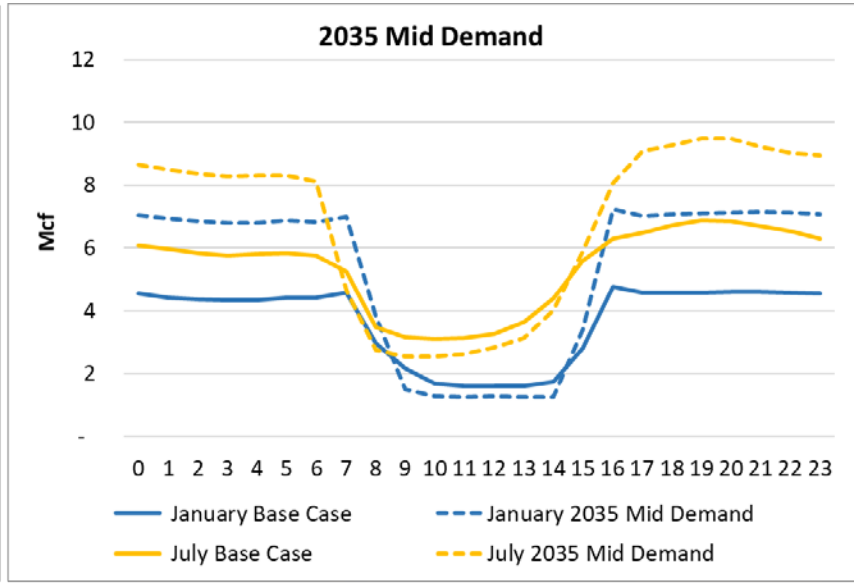








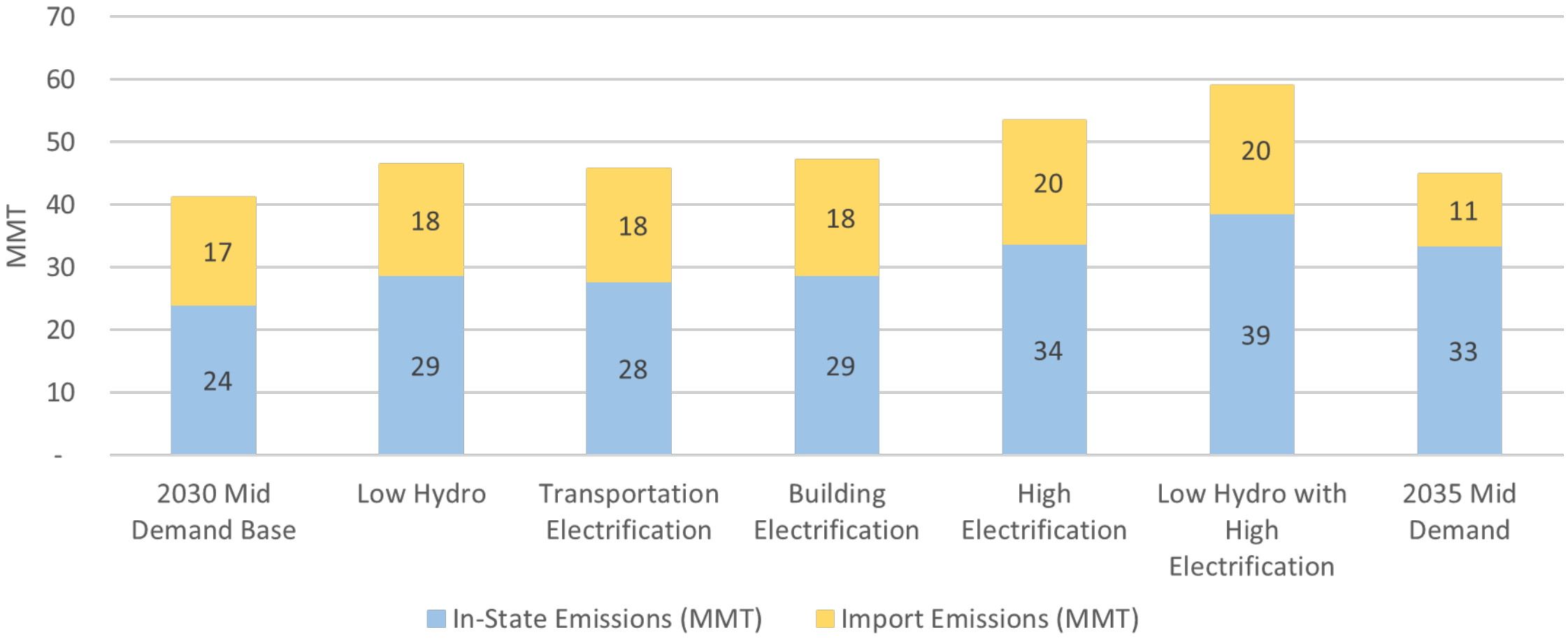




California Emission Intensity

Scenario	Emission Intensity (MMT/MWh)
2030 Mid Demand Base	0.15
Low Hydro	0.17
Transportation Electrification	0.15
Building Electrification	0.15
High Electrification	0.16
Low Hydro with High Electrification	0.17
2035 Mid Demand	0.16

California Emissions



California Emission Intensity

Scenario	Net Imports to California (GWh)
2030 Mid Demand Base	54%
Low Hydro	50%
Transportation Electrification	46%
Building Electrification	46%
High Electrification	44%
Low Hydro with High Electrification	41%
2035 Mid Demand	23%

Thank You

Questions and Comments:

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