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California Energy Demand 2019 Revised Forecast, 2020-2030

Statewide and Planning Area Summary



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California Energy Commission



2019 Forecast Products

Electricity Consumption and Sales Forecast

- Annual 2019 to 2030
- by planning area and sector

Peak Forecasts

- Annual and hourly 2020 to 2030
- by TAC (Hourly) and BAA (Form 1.5)

End-Use Natural Gas Forecasts

- Annual 2019 to 2030
- by planning area and sector



2019 Forecast Products

Managed Sales and Peak Forecast

- Incorporate latest 2019 P&G Study for IOUs
- Also includes savings for POUs from CMUA study
- Mid-Mid and Mid-Low used for planning purposes



Method

Models

- End-use models by sector
- Electricity and NG rate forecasts
- Self-generation + Storage
- Transportation electrification
- Hourly Forecasting Model (HLM)

Adjustments

- Committed efficiency savings and AAEE
- Climate change



Three Baseline Demand Case

- **High Demand**
 - High econ/demo, climate change impacts, and EVs
 - Low electricity rates and self-generation
- **Low Demand**
 - Low econ/demo and EVs
 - High electricity rates and self-generation
 - No climate change impacts
- **Mid Demand**
 - Baseline assumptions between high and low demand cases



Economic Inputs

Economic and Demographics – Moody's and DOF

– GSP, employment, households, population, employment, etc

Mid Case Assumptions

- Unemployment rate will increase through 2022
- Slower wage growth
- Uncertainty around trade limiting business investment
- Some rebound in the near-term
- Increase in households while population growth slows



Other Inputs

PV Energy

- 2019-2030 CAGR of 8.7%
- Reaches 40,800 GWh by 2030

LDEV

- 15,000 GWh of consumption by 2030
- 70% attributed to residential charging

MDHD

- From 22 GWh in 2019 to 1,300 GWh by 2030 in Mid Case

Off-road

- 1,750 GWh by 2030



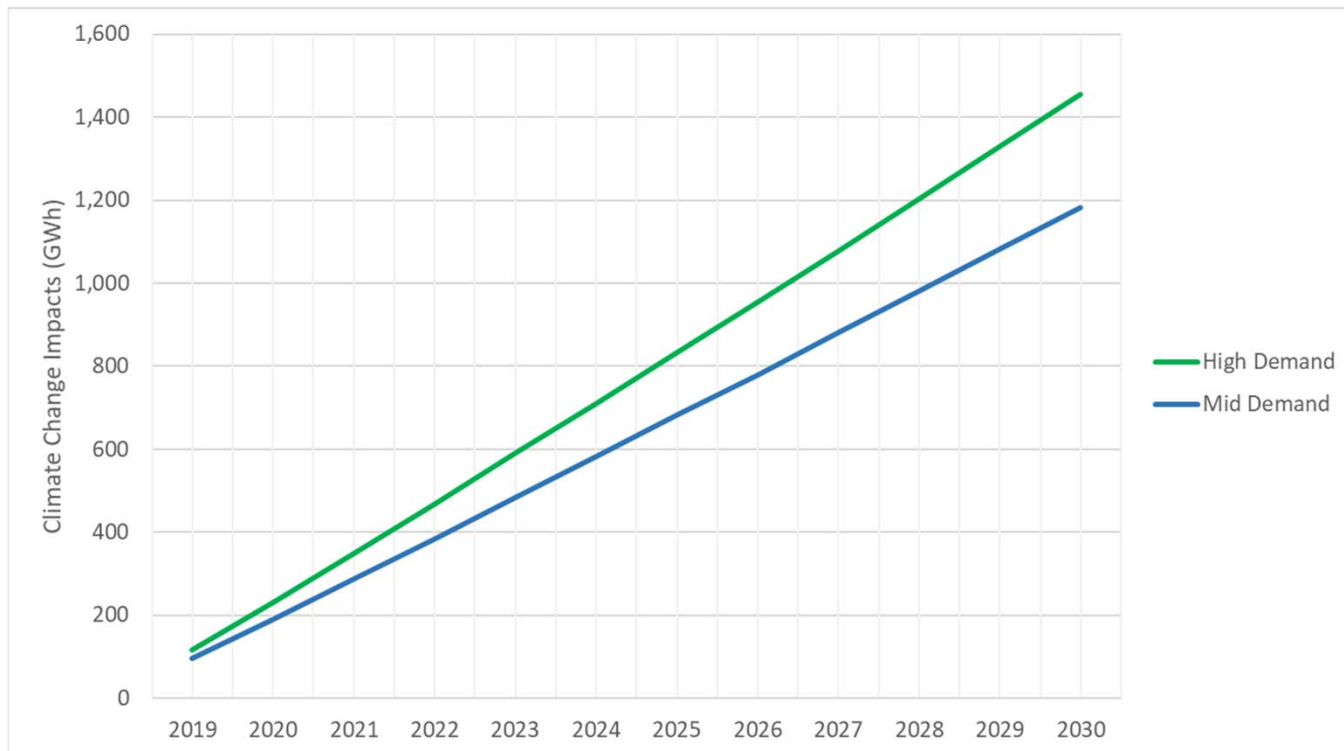
Other Inputs

- **Climate Change**
 - Weather scenarios developed by Scripps
 - Applied to High and Mid Cases
- **Ag and water pumping (AGWP)**
 - Adjusted by new cannabis cultivation forecast
 - ~12,400 GWh by 2030, 1% annual growth



Climate Change

By 2030 reach 1,450 GWh in High Case and 1,200 GWh in Mid Case; Net effect due to more CDD but less HDD





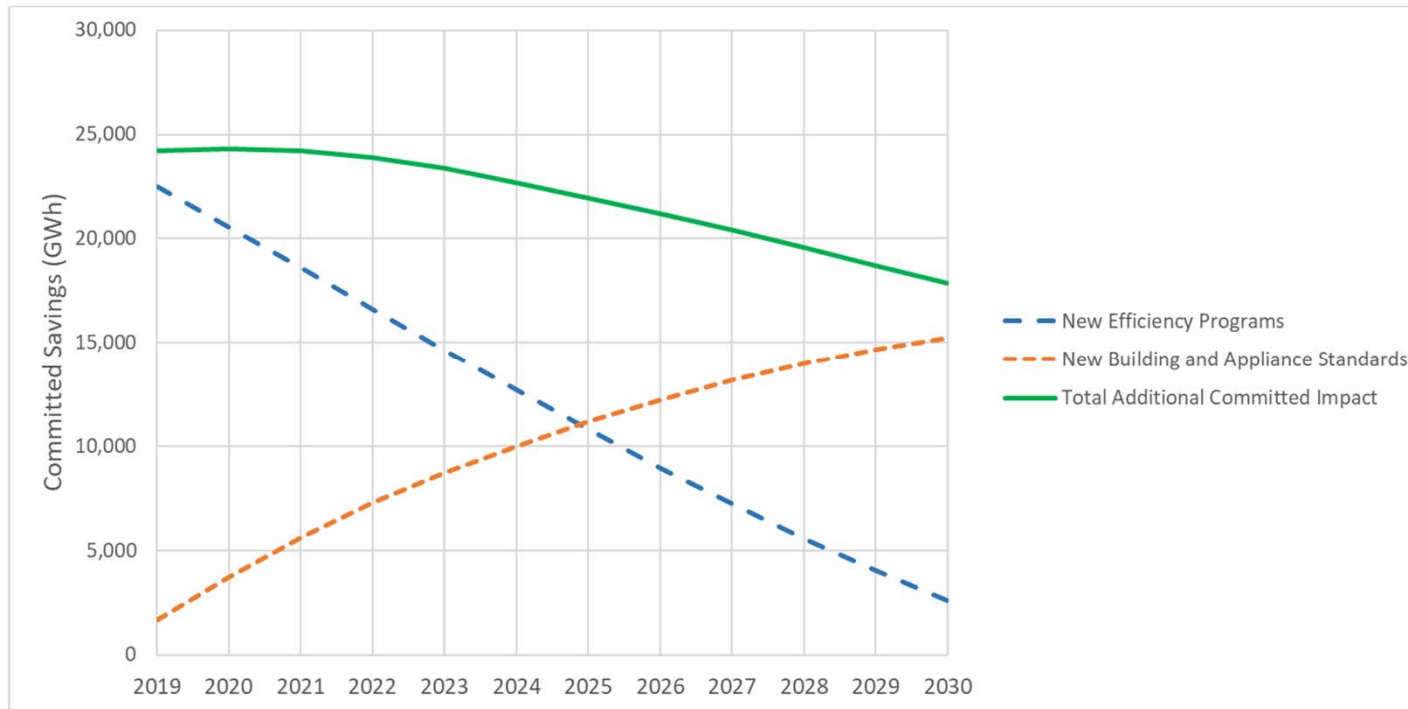
Energy Efficiency

- CED 2019 Revised incorporates 2018-2019 utility program savings (IOU and POU)
- Also includes 2019 Title 24, Title 20, and Federal standards
- Additional Achievable Energy Efficiency (AAEE) updated based on latest Potential and Goals Study



Committed Savings

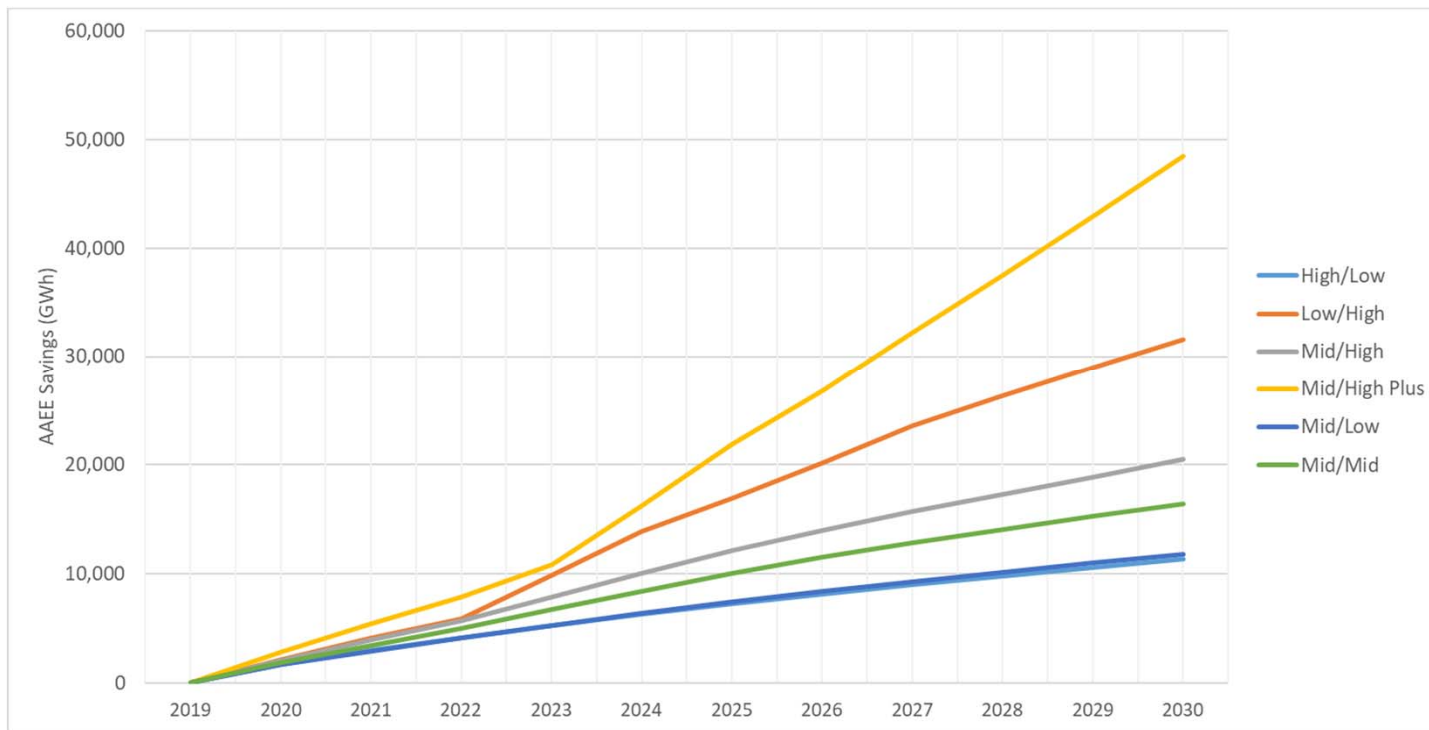
New committed savings initial impact of 24,000 GWh in 2019 that declines to 17,800 GWh by 2030





AAEE Savings

Mid-Mid reaches nearly 16,500 GWh by 2030; more modest Mid-Low reaches 12,000 GWh





Cultivation Forecast

Cannabis Forecast

- Challenges
 - Historical data on production and consumption
 - Uncertainty around energy intensity of cultivation
 - Indoor, Outdoor, or Greenhouse
 - Non-commercial home operations



Cultivation Forecast

Cannabis Forecast Method

- Estimate CA usage
 - Users and amount
 - Substance Abuse and Mental Health Services Administration
 - Under-reporting (+22%: Kilmer et.al.)
- Forecast # of Users
 - Population growth (main driver)
 - Heavy users keep using
 - Light users increase due to legalization
- Account for exports
 - 3x multiplier based on current literature



Cultivation Forecast

Cannabis Forecast Method

- Indoor vs Outdoor Production
 - California Department of Food and Agriculture
 - Outdoor = 20%
 - Indoor = 28%
 - Greenhouse = 52%



Cultivation Forecast

Cannabis Next Steps

- More reliable California specific data on:
 - Number of users of each type (heavy & light)
 - Grams used per user
 - Total cannabis production
 - Distribution of production between indoors and greenhouses
 - Energy intensity of each mode of production

Statewide Results





State Baseline Econ/Demo

CED 2019 Revised average annual % growth 2019-2030

| Driver | Mid | Mid CEDU 2018 | High | Low |
|---------------------------------|-------|------------------|-------|-------|
| Population | 0.76% | 0.79% | 0.76% | 0.76% |
| Households | 1.03% | 0.88% | 1.15% | 1.03% |
| Personal Income | 2.51% | 2.54% | 2.68% | 2.23% |
| Manufacturing Output | 2.35% | 2.42% | 2.55% | 1.91% |
| Total Employment | 0.45% | 0.44% | 0.58% | 0.35% |



State Baseline Rates

CED 2019 Revised average annual % growth 2019-2030

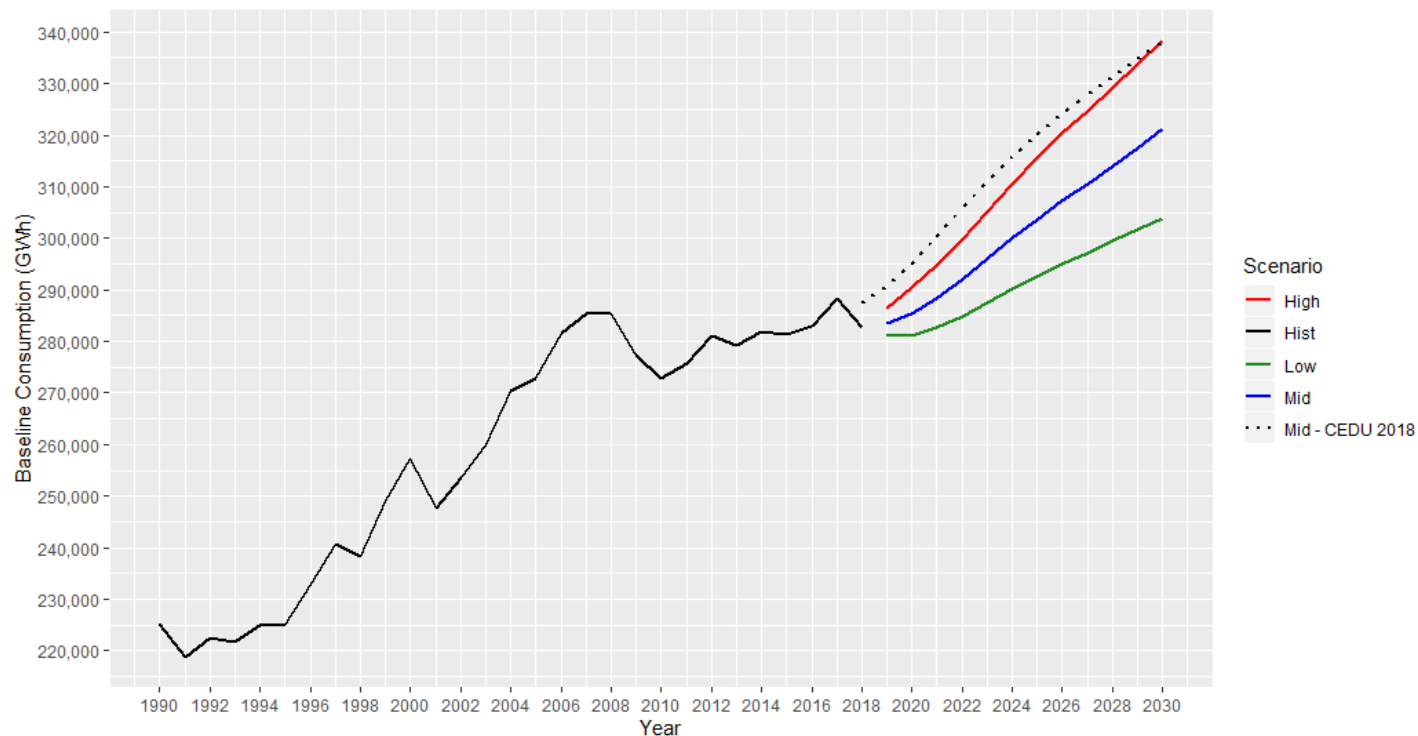
| Sector | Mid | Mid CEDU 2018 | High Demand | Low Demand |
|--------------------|-------|------------------|-------------|------------|
| Residential | 1.63% | 0.38% | -0.24% | 2.53% |
| Commercial | 1.83% | 0.37% | 0.34% | 3.12% |

- PG&E and SCE distribution and revenue requirements adjusted upwards based on wildfire mitigation
- SDG&E rates include estimated impacts of 2019 GRC Phase 1 decision



State Baseline Consumption Results

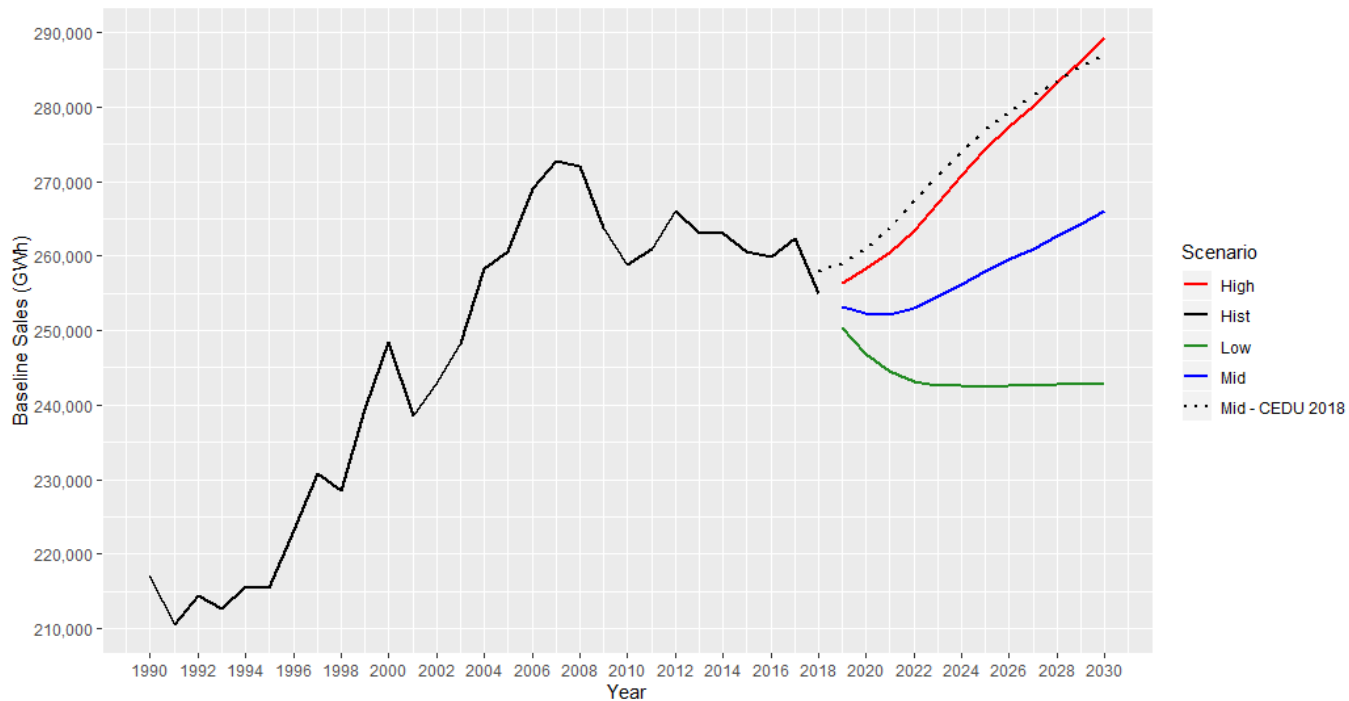
Mid case reaches 320 TWh by 2030; 1.1% average annual growth 2019-2030 vs. 1.4% in CEDU 2018 Mid Case





State Baseline Sales Results

0.5% average annual growth 2019-2030 vs. 0.9% in CEDU 2018 Mid Case; AAPV is now added to baseline self-generation forecast; faster PV growth in near-term vs long-term





Statewide Baseline Mid Case Sales Results

| CAGR Years | Residential | Commercial | Industrial | Mining | AGWP | TCU | Street Lighting |
|------------|-------------|------------|------------|--------|-------|-------|-----------------|
| 2019-2025 | 0.51% | 0.28% | -0.32% | -1.25% | 0.89% | 0.55% | -0.54% |
| 2025-2030 | 1.50% | 0.16% | -0.21% | -2.30% | 1.16% | 0.74% | -0.69% |
| 2019-2030 | 0.96% | 0.23% | -0.27% | -1.73% | 1.01% | 0.64% | -0.60% |

vs. CEDU 2018

- Residential and commercial previously grew at 1.7 and 0.9% annually in CEDU 2018
- Decreasing PPH and slower growth in commercial floorspace
- Increasing rates also contribute to slower growth in forecast

Planning Area Results





PG&E Input Summary

Econ

- Increasing rates
- Less households add in near-term
- Larger decline in employment in 2021 and slower growth compared to CEDU 2018

PV Energy

- 2019-2030 CAGR of 8.7%
- Reaches 19,000 GWh by 2030

LDEV

- 6,300 GWh of consumption by 2030

MDHD

- 500 GWh by 2030



PG&E Baseline Sales Results

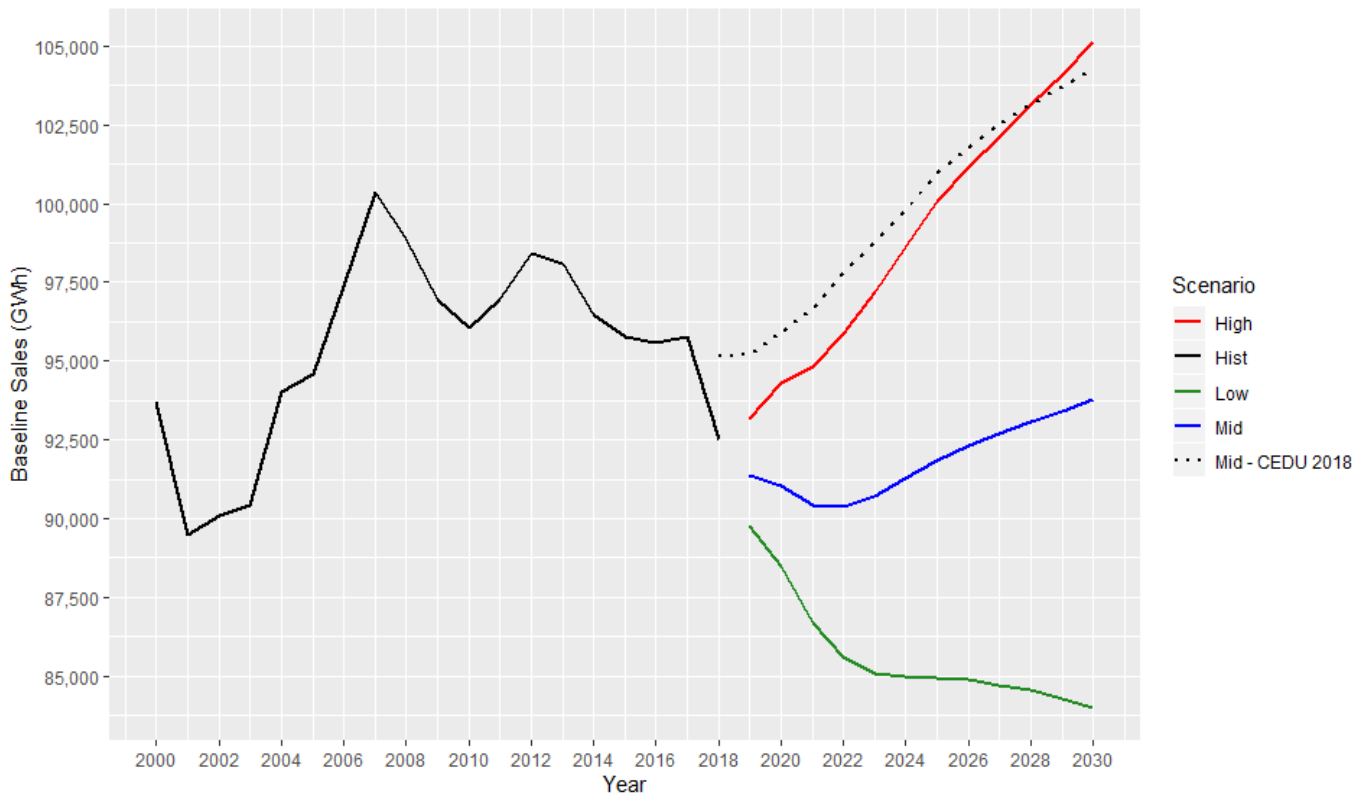
| CAGR Years | Residential | Commercial | Industrial | Mining | AGWP | TCU | Street Lighting |
|------------------|-------------|------------|------------|--------|-------|-------|-----------------|
| 2019-2025 | 0.21% | 0.21% | -0.91% | -2.26% | 0.61% | 0.67% | -0.54% |
| 2025-2030 | 1.52% | -0.12% | -0.92% | -4.10% | 1.08% | 0.78% | -0.69% |
| 2019-2030 | 0.80% | 0.06% | -0.91% | -3.10% | 0.82% | 0.72% | -0.60% |

vs. CEDU 2018

- Residential and commercial sales for 2030, 17% and 12% lower
- AGWP slighting higher due to increased demand from crop production and municipal water supply plus cannabis cultivation
 - Nearly 600 GWh of attributed to cultivation by 2030



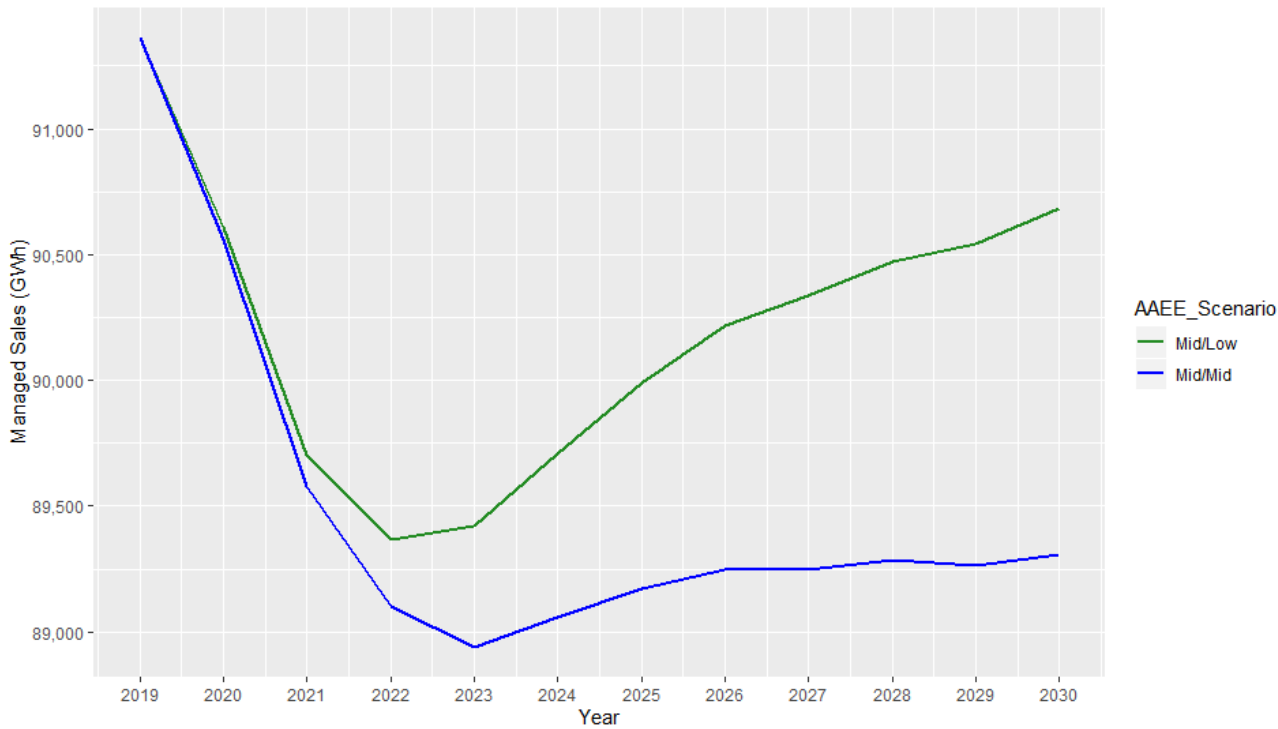
PG&E Baseline Sales Results



- Sales grows at 0.2% annually, 2019-2030 in Mid Case
- Slower than CEDU 2018 at 0.8%
- PV energy grows at nearly 18% per year through 2021



PG&E Managed Sales Results



AAEE Impacts

- 6,000 GWh of savings by 2030 in Mid-Mid
- 3,300 GWh in Mid-Low
- Sales decreased by 4.8% in 2030 Mid-Mid



SCE Input Summary

Econ

- Increasing rates
- Less decline in employment in 2021

PV Energy

- 2019-2030 CAGR of 9%
- Reaches 13,700 GWh by 2030

LDEV

- 4,800 GWh of consumption by 2030

MDHD

- 5 GWh in 2019 to 445 GWh by 2030 in Mid Case



SCE Baseline Sales Results

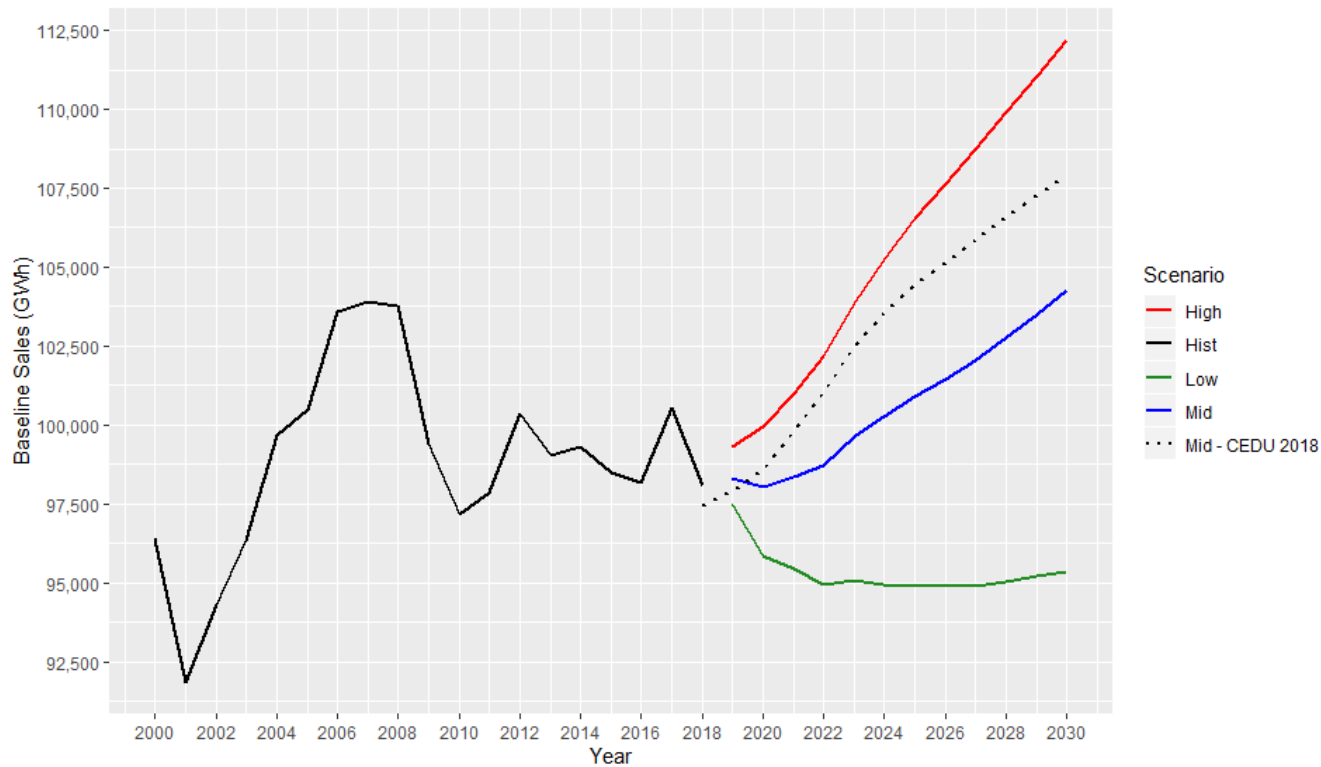
| CAGR Years | Residential | Commercial | Industrial | Mining | AGWP | TCU | Street Lighting |
|------------|-------------|------------|------------|--------|-------|-------|-----------------|
| 2019-2025 | 0.70% | 0.27% | 0.20% | -0.99% | 0.92% | 0.51% | -0.54% |
| 2025-2030 | 1.41% | 0.23% | 0.22% | -1.95% | 1.02% | 0.73% | -0.69% |
| 2019-2030 | 1.02% | 0.25% | 0.21% | -1.43% | 0.96% | 0.61% | -0.60% |

vs. CEDU 2018

- Cannabis adds 600 GWh of additional demand by 2030 to AGWP
- Residential and commercial 2030 forecasts down 6 and 7%, respectively



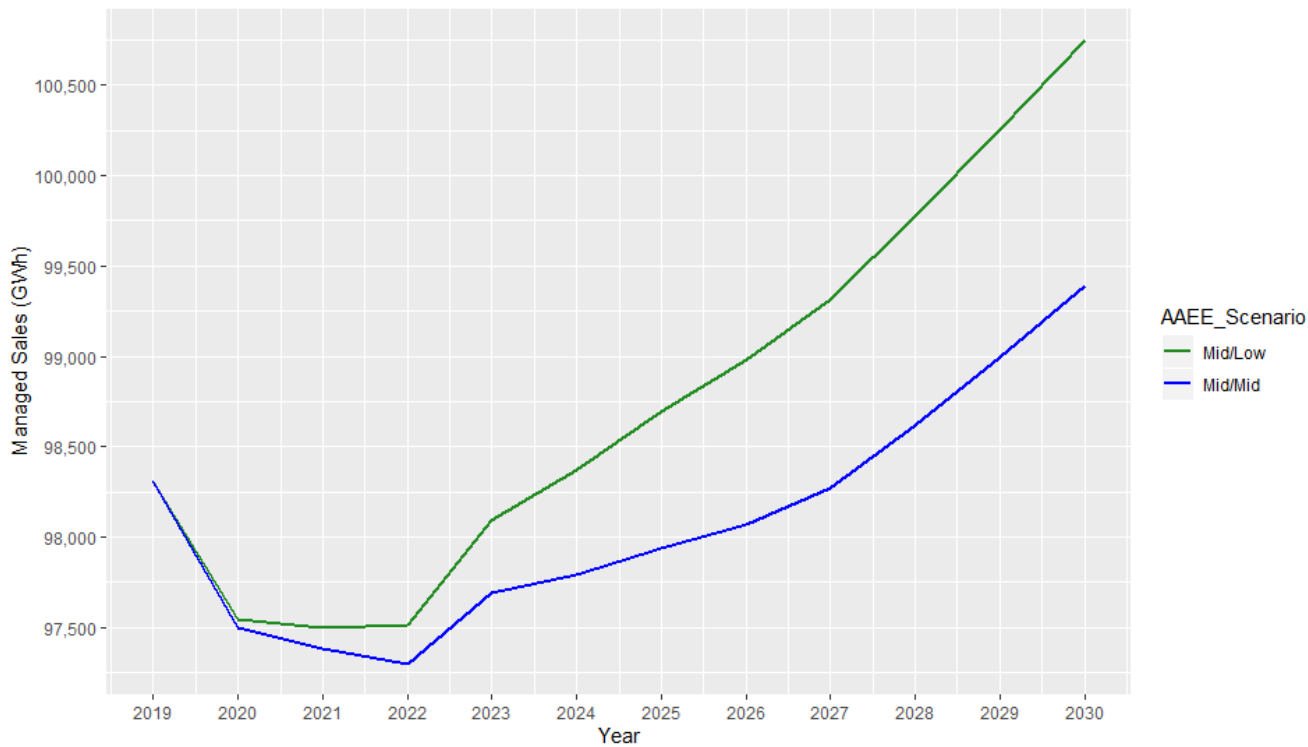
SCE Baseline Sales Results



- Mid sales grows at 0.5% vs 0.9% in CEDU 2018
- 104 TWh by 2030
- 4% lower than CEDU 2018



SCE Managed Sales Results



AAEE Impacts

- 4,800 GWh of savings by 2030 in Mid-Mid
- 3,500 GWh in Mid-Low
- Mid-Mid 4.7% percent lower than baseline in 2030



SDG&E Input Summary

Econ

- Decrease in employment in 2021 along with slower growth in long-term
- Household additions dip in 2020
- Rates see modest growth vs. CEDU 2018 with flat/declining

PV Energy

- 2019-2030 CAGR of 7%
- Reaches 4,300 GWh by 2030

LDEV

- 1,350 GWh of consumption by 2030

MDHD

- 2 GWh in 2019 to 129 GWh by 2030 in Mid Case



SD&GE Baseline Sales Results

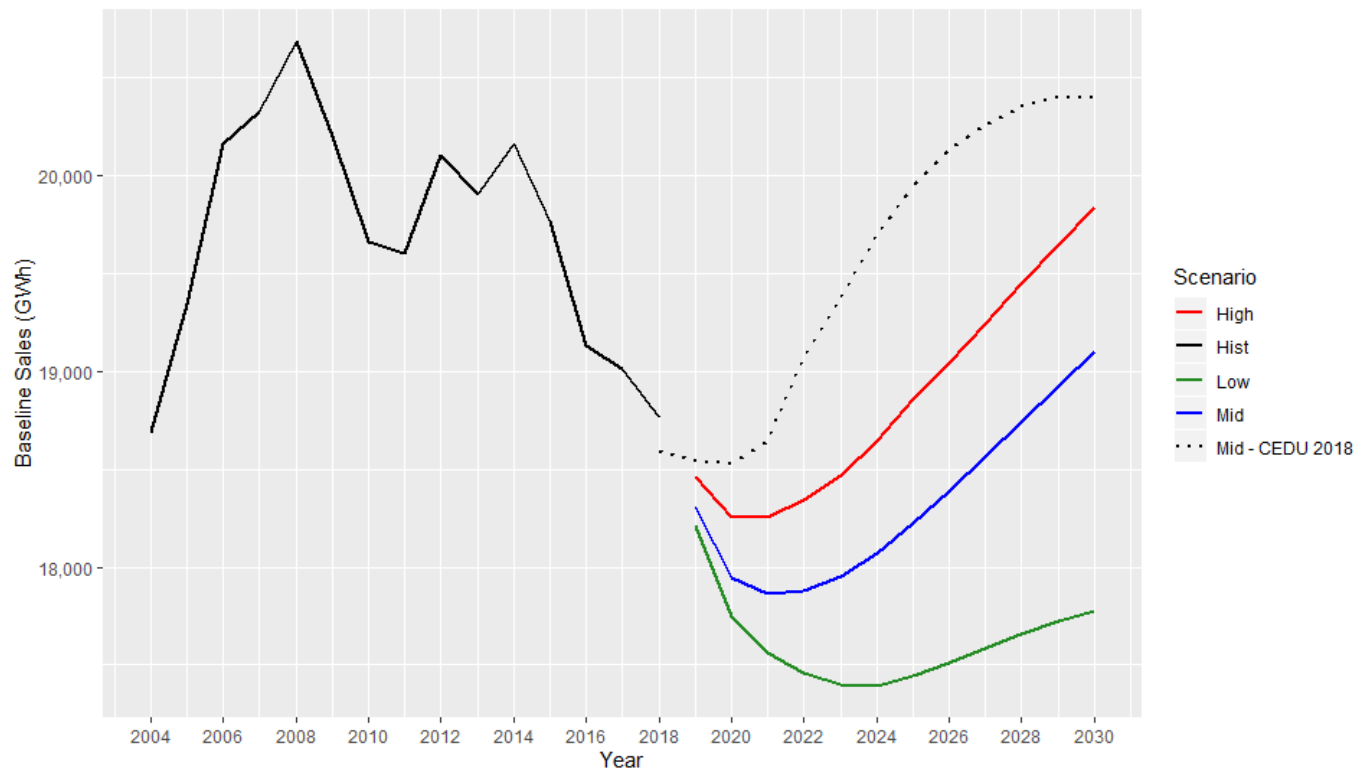
| CAGR Years | Residential | Commercial | Industrial | Mining | AGWP | TCU | Street Lighting |
|------------|-------------|------------|------------|--------|-------|--------|-----------------|
| 2019-2025 | -0.49% | 0.27% | -0.89% | -0.05% | 2.43% | -0.26% | -0.54% |
| 2025-2030 | 2.85% | -0.07% | -0.35% | -0.23% | 2.31% | 0.05% | -0.69% |
| 2019-2030 | 1.02% | 0.11% | -0.64% | -0.13% | 2.37% | -0.12% | -0.60% |

vs. CEDU 2018

- Slower growth in residential and commercial
 - 2030: 13% and 6% lower, respectively
- AGWP sees effects of cannabis cultivation
 - Additional 150 GWh by 2030



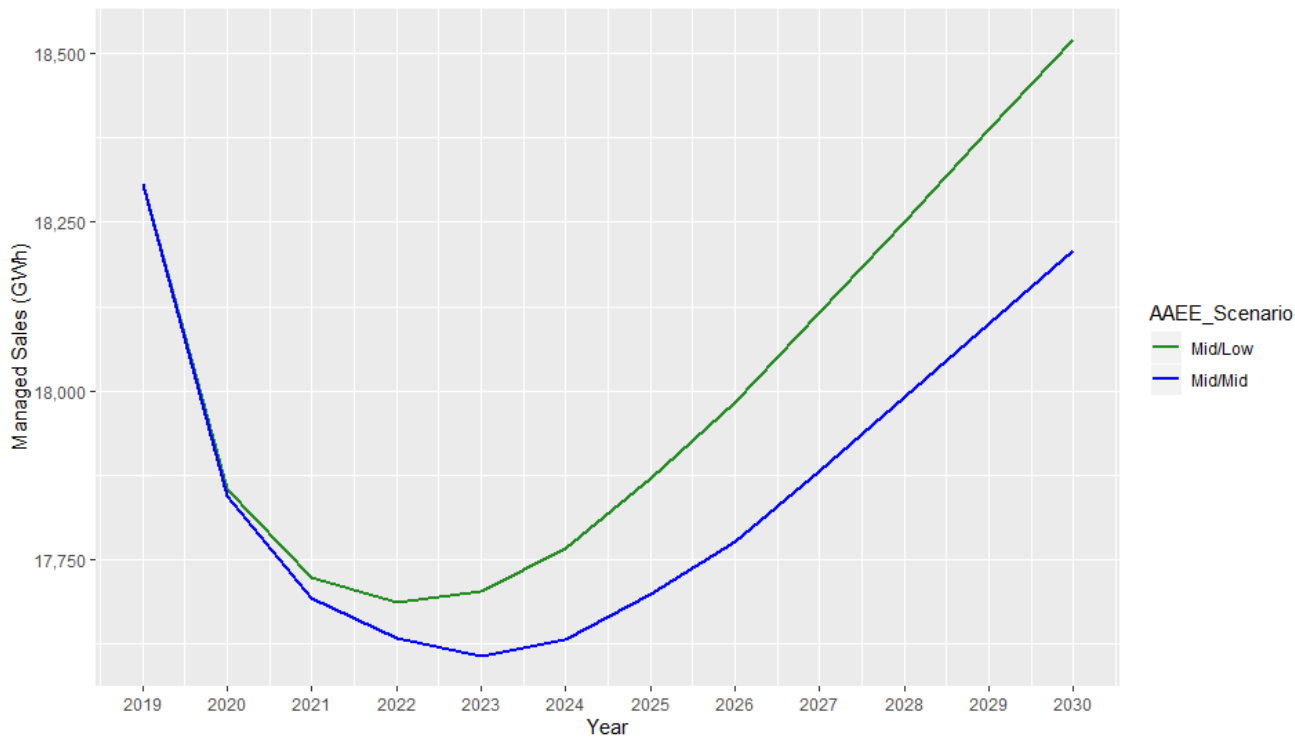
SD&GE Baseline Sales Results



- Mid case sales grows at 0.4% annually
- 6% less than CEDU 2018 in 2030, ~19,000 GWh
- Faster PV adoption in mid-term



SD&GE Managed Sales Results



AAEE

- Mid-Mid reaches 18,200 GWh by 2030
- 5% reduction in sales compared to baseline
- 900 GWh of AAEE by 2030 in Mid-Mid
- 600 GWh in Mid-Low



LADWP Input Summary

Econ

- Increased rates compared to CEDU 2018
- Larger decrease in 2021 employment and slower growth

PV Energy

- 2019-2030 CAGR of 8%
- Reaches 1,300 GWh by 2030

LDEV

- 1,600 GWh of consumption by 2030

MDHD

- 1.5 GWh in 2019 to 130 GWh by 2030 in Mid Case



LADWP Baseline Sales Results

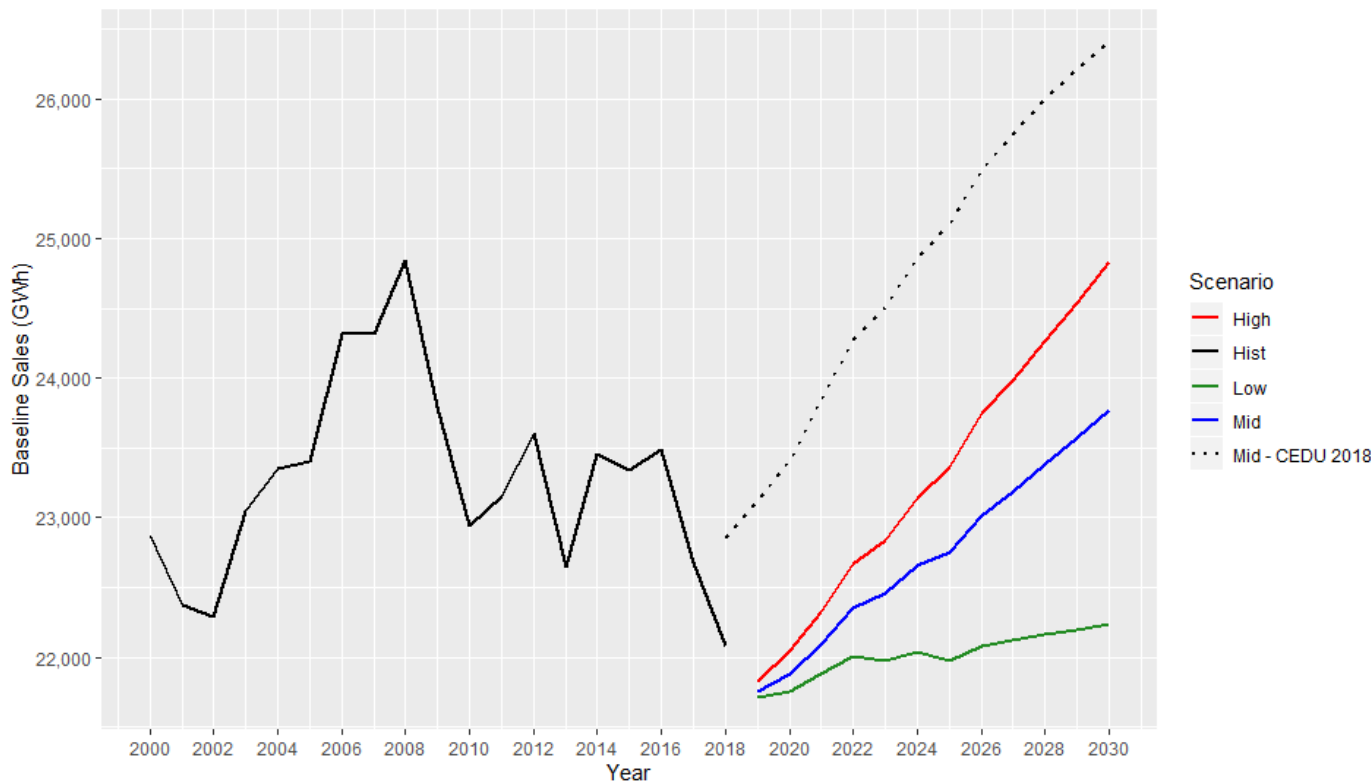
| CAGR Years | Residential | Commercial | Industrial | Mining | AGWP | TCU | Street Lighting |
|------------|-------------|------------|------------|--------|--------|-------|-----------------|
| 2019-2025 | 1.39% | 0.43% | -0.82% | -0.19% | 14.54% | 0.80% | -0.54% |
| 2025-2030 | 1.46% | 0.48% | -0.07% | -0.41% | 8.01% | 1.28% | -0.69% |
| 2019-2030 | 1.42% | 0.45% | -0.48% | -0.29% | 11.52% | 1.02% | -0.60% |

vs. CEDU 2018

- Residential and commercial sector growth reduced from 1.9 and 1% CAGR, respectively
- 2030 AGWP previously 21 GWh, now reaches 176 GWh due to cultivation



LADWP Baseline Sales Results

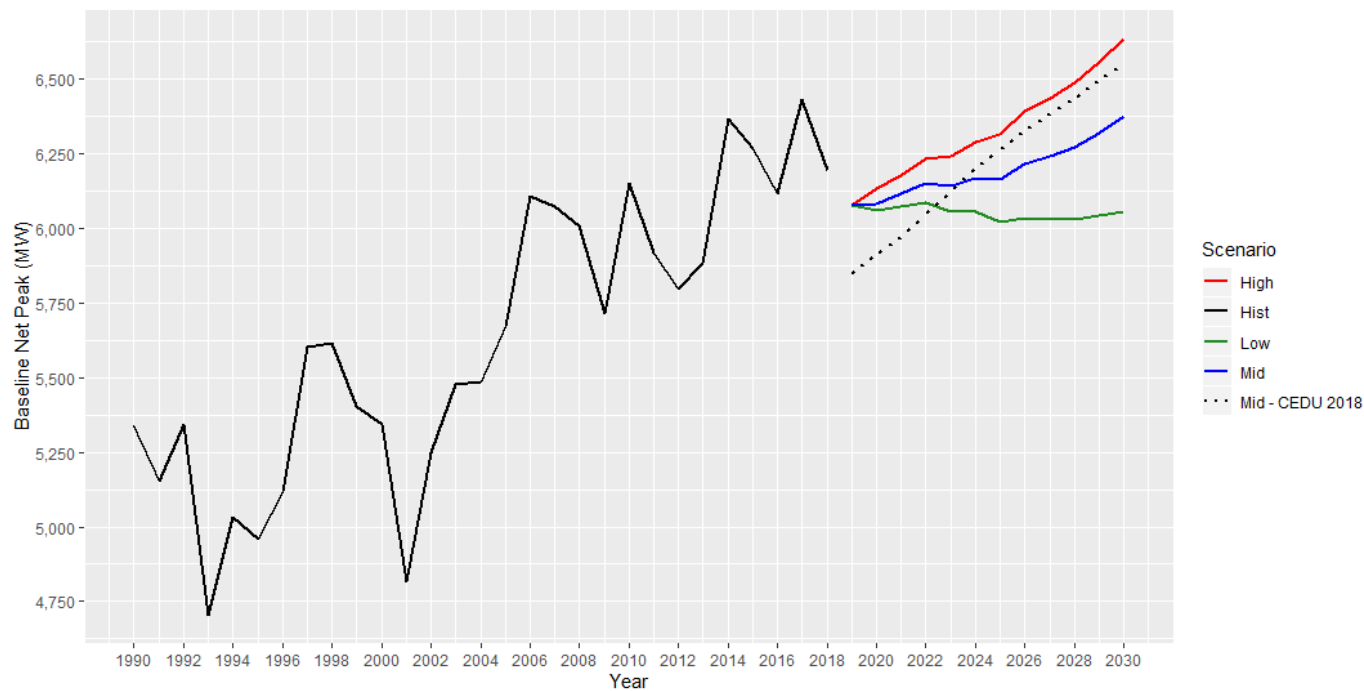


- Sales growth at 0.8% in Mid Case vs. 1.2% in CEDU 2018
- Reaches 23,800 GWh by 2030
- 2018 actual sales was far lower
- New committed savings bring forecast down a little further



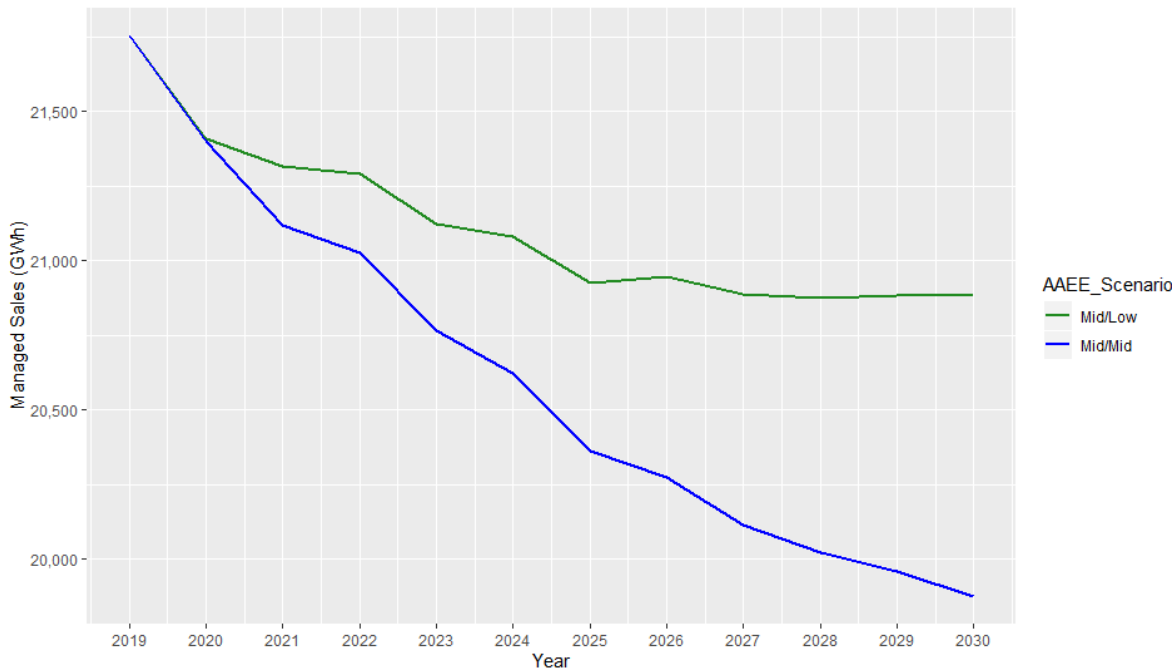
LADWP Net Peak Results

2019-2020 grows at 0.4% annually vs. 1% in CEDU 2018; reached 6,300 MW by 2030; Updated projections more aligned with LADWP IEPR forecast growth





LADWP Managed Sales Results



AAEE

- Mid-Mid AAEE reduces 2030 sales by 16%
- 19,900 GWh in Mid-Mid by 2030
- 3,900 GWh by 2030 in Mid-Mid
- Mid-Low reaches 2,900 GWh



SMUD Input Summary

Econ

- Near-term household growth is slower and total additions by 2030 is reduced
- Long-term employment is slowed along with larger 2021 dip
- Population also see slower growth

PV Energy

- 2019-2030 CAGR of 11% vs 7% in CEDU 2018
- Reaches 1,200 GWh by 2030

LDEV

- 470 GWh of consumption by 2030

MDHD

- 43 GWh by 2030 in Mid Case



SMUD Baseline Sales Results

| CAGR Years | Residential | Commercial | Industrial | Mining | AGWP | TCU | Street Lighting |
|------------|-------------|------------|------------|--------|-------|-------|-----------------|
| 2019-2025 | 0.91% | 0.54% | -0.15% | -0.10% | 3.30% | 0.48% | -0.54% |
| 2025-2030 | 1.32% | 0.65% | 0.76% | -0.28% | 3.20% | 0.61% | -0.69% |
| 2019-2030 | 1.10% | 0.59% | 0.26% | -0.18% | 3.25% | 0.54% | -0.60% |

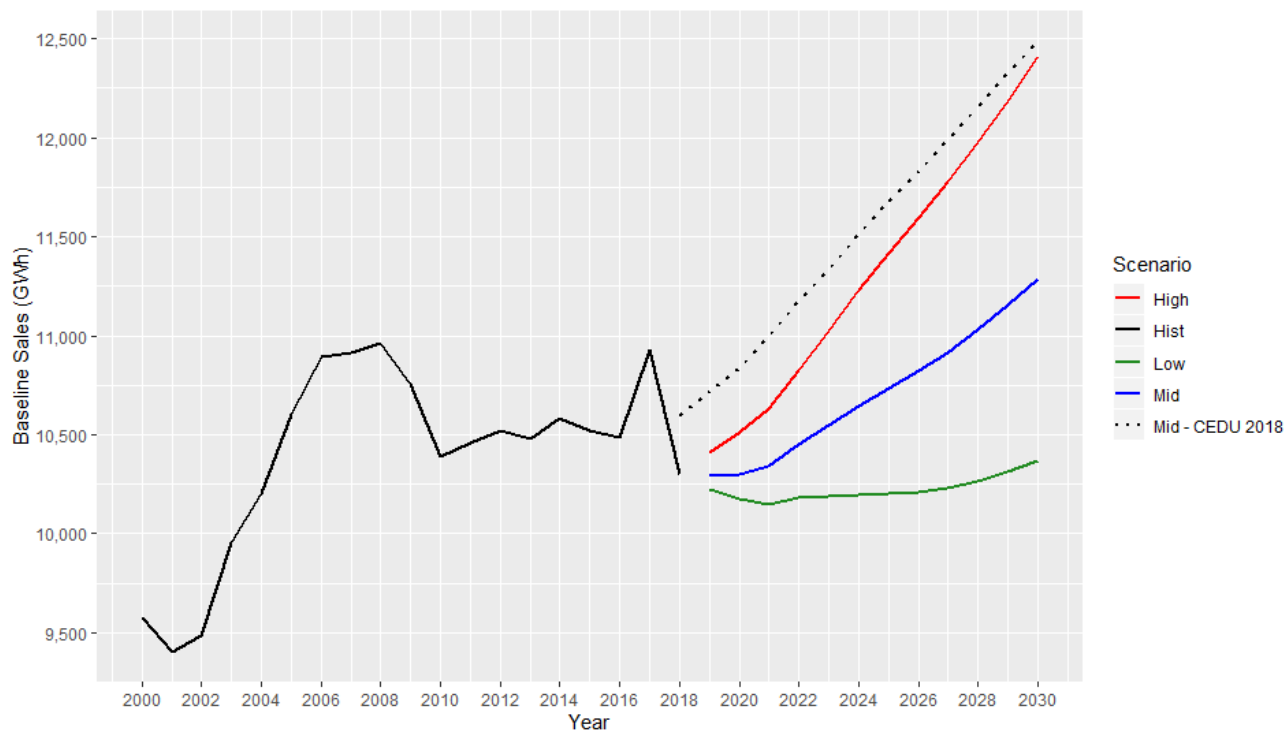
vs. CEDU 2018

- 2019-2030 residential and commercial sector growth reduced from 1.7 and 1.4% annually, respectively
- Cultivation adds ~70 GWh by 2030 to AGWP



SMUD Baseline Sales Results

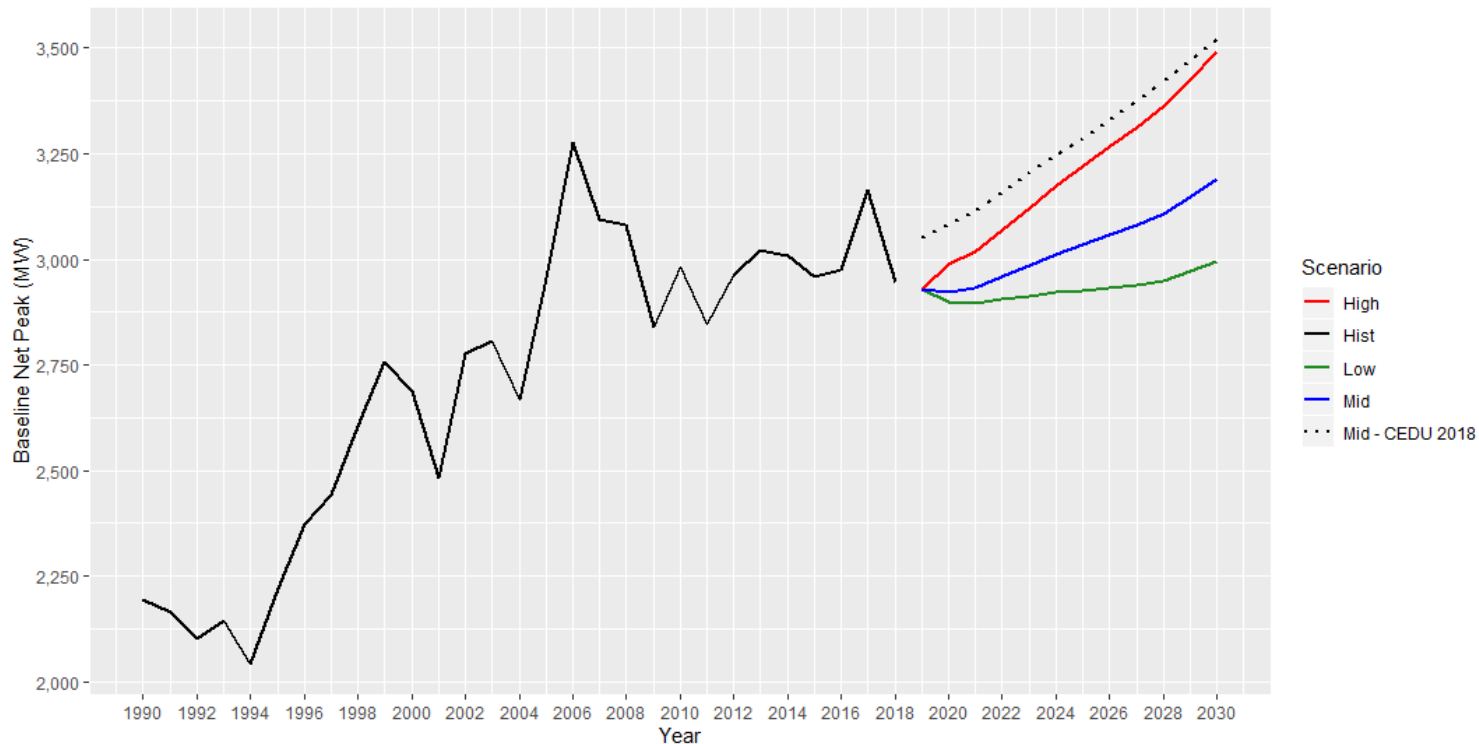
11,300 GWh by 2030 in Mid Case; 2019-2030 annual growth of 0.8% vs 1.4% in CEDU 2018





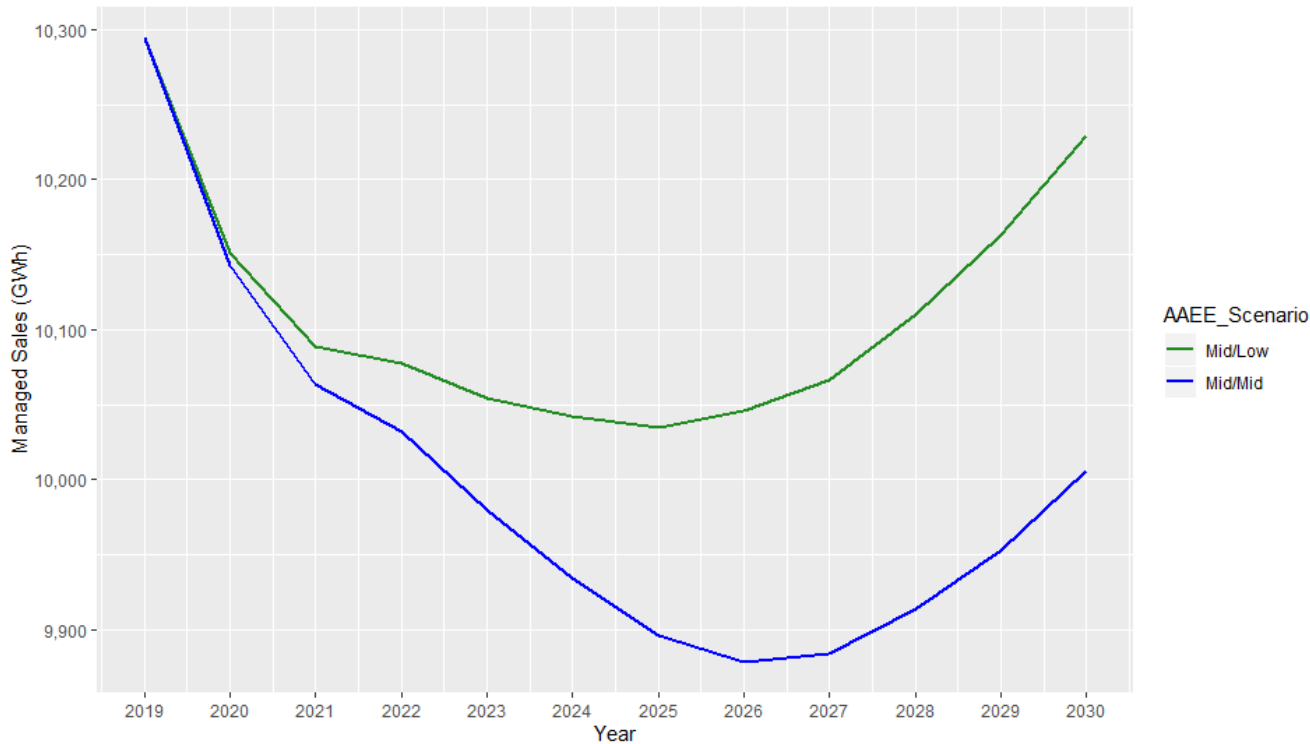
SMUD Baseline Peak Results

Reaches 3,200 MW by 2030 in Mid Case; 2019-2030 annual growth of 0.8% compared to 1.3% in CEDU 2018 Mid Case





SMUD Managed Sales Results



AAEE

- 1,300 GWh of AAEE in Mid-Mid by 2030
- Mid-Low at 1,000 GWh
- Mid-Mid declines 0.3% annually

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