OPA Review of LADWP 2022 SLTRP, Issued July 2023, for DWP Board

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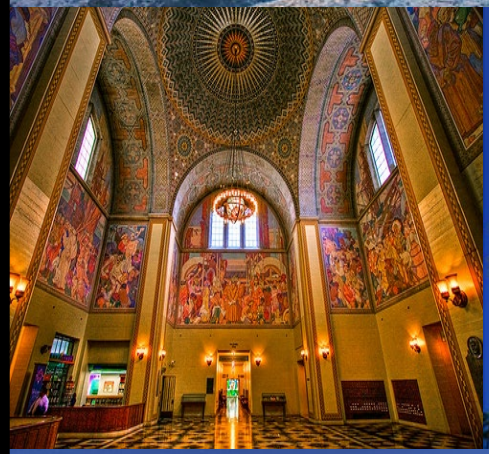
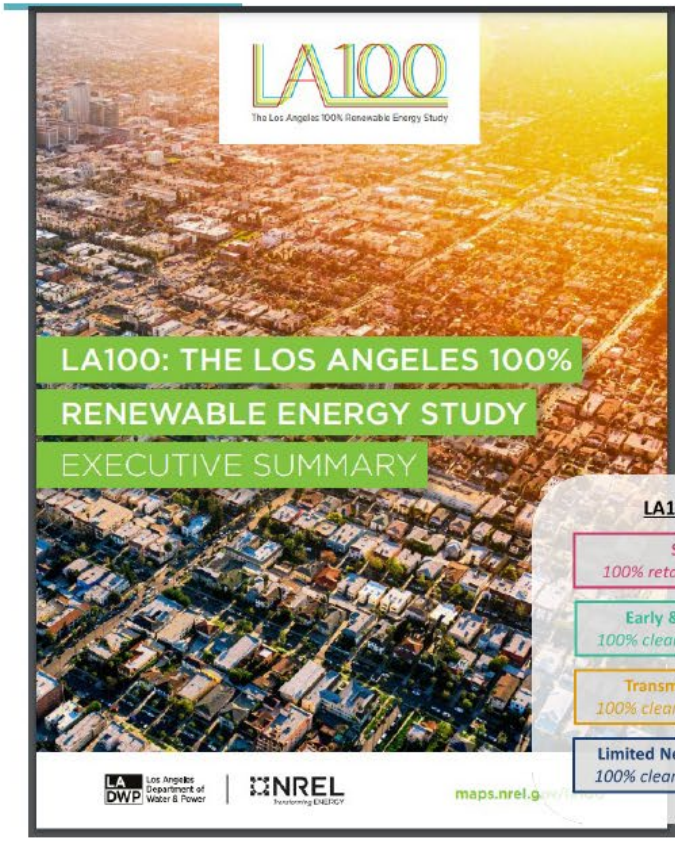




OPA/RPA Review of LADWP's 2022 Strategic Long-Term Resource Plan (SLTRP)

- The OPA commissioned The Brattle Group to assist in monitoring and developing a review of LADWP's 2022 SLTRP, which was released in July 2023.
  - The following slides are primarily based on the attached Brattle review, which focused on rate impacts.
- The 2022 SLTRP focused on 3 paths to 100% GHG-free power generation by 2035.
  - The California SB100 case of GHG-free retail sales to customers by 2045 is a reference (roughly 90% GHG-free power generation).

2022 Strategic Long-Term Resource Plan (SLTRP)

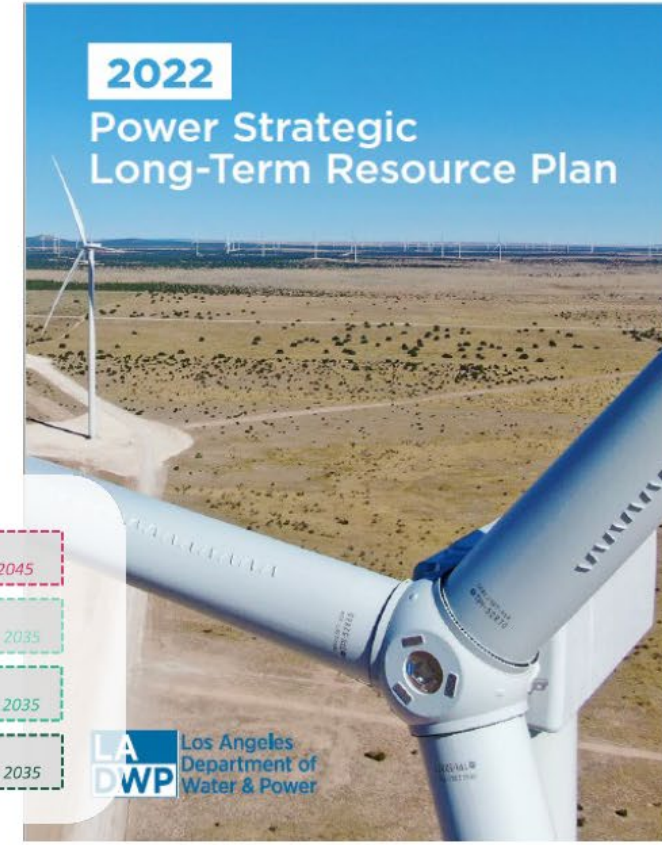


LA100 Study

- SB 100 — *100% retail sales by 2045*
- Early & No Biofuels — *100% clean energy by 2035*
- Transmission Focus — *100% clean energy by 2045*
- Limited New Transmission — *100% clean energy by 2035*

2022 SLTRP

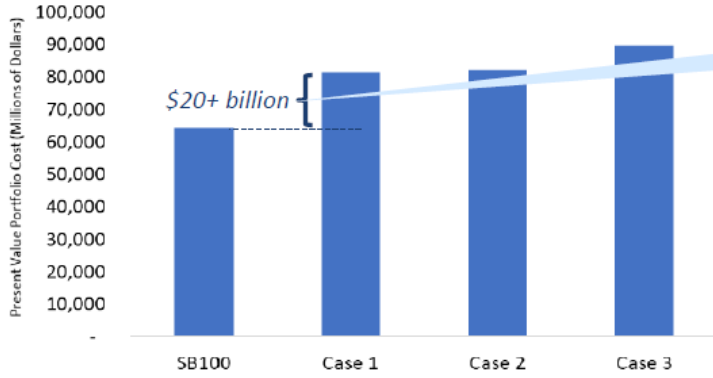
- SB 100 — *100% retail sales by 2045*
- Case 1 — *100% clean energy by 2035*
- Case 2 — *100% clean energy by 2035*
- Case 3 — *100% clean energy by 2035*



Bill Impact Analysis: Sneak Peek

Brattle analyzed rate and bill impacts for the four SLTRP Cases (LADWP recommended Case 1 to the Board).

Net Present Value of Total Costs by SLTRP Case ($ millions)



	SB100	Case 1	Case 2	Case 3
2030 RPS	60%	80%	90%	90%
Clean Energy Penetration 2035	80%	100%	100%	100%
Clean Energy Penetration 2045	90%*1	100%	100%	100%
Average Annual Rate Increase (%)*2	4.8%	7.7%	7.7%	8.3%

$20+ billion is more than 4x of LADWP's Power System fiscal year budget ($4.9 million for FY 2021-22). The average burden per LADWP customer (~1.6 million customers) would be over $12,500.

Estimated Range for Monthly Bill in 2035 (Single Family Home Customers Average)*3,4

Current Bill	2035 Bill Range		
	SB100	Cases 1 & 2	Case 3
$144	$200 – $350	$300 – $500	$300 – $550
Ratio*5	1.4x – 2.4x	2.1x – 3.5x	2.1x – 3.8x

2035 bill estimate range rounded to the nearest $50.

LADWP's GHG emission from power plants today is ~7 MMT. A 10% difference of GHG emission in 2045 is about 0.7 MMT, or 0.2% of the 2020 California economy-wide emission (~370 MMT).

*1: SB100 achieves 100% clean energy by 2045 based on retail sales, or approximately 90% generation.
*2: Compound Annual Rate through 2035.
*3: Range based on four different calculation methods (Methods) for estimating the bill. See appendix for further details.
*4: Single family home customers assumes 700 kWh of monthly consumption.
*5: Ratio = 2035 Bill / Current Bill ($144) and will be the same for Apartment customers (which assumes 300 kWh of monthly consumption).

Source: 2022 Power Strategic Long-term Resource Plan (SLTRP).

The assumed cost and rate/bill impact may warrant further discussion.

Cost, Rates, and Bill Impacts

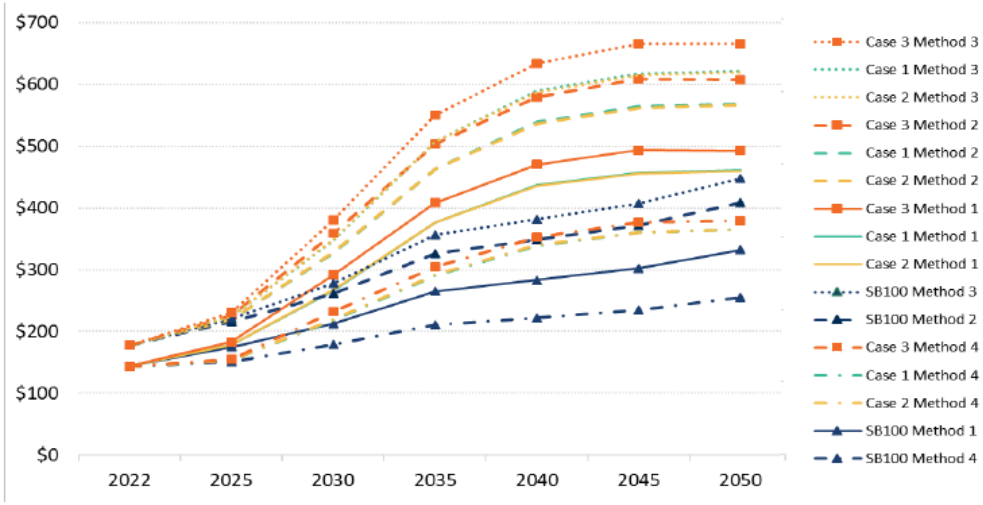
- The 100% 2035 case with the least cost (Case 1) is $20 billion (net present value) more than the SB100 case (~90% clean by 2045). The SB100 case defines the industry standard in California.
  - Case 1 is $20 billion for the last 10% GHG reduction.
  - The $20 billion difference is about 4x larger than LADWP's FY21/22 budget of $4.9 billion.
  - The impact on rates (average, compounded) for 2022-2035 from:
    - ✓ a modest 4.8% per year for the SB100 case
      - 2.3% above LADWP's rate modeling long-term inflation assumption of 2.5%/yr, to
    - ✓ a larger 7.7% per year for Case 1 or 2, and 8.3% for Case 3
      - 5.2% to 5.8% above LADWP's rate modeling long-term inflation assumption of 2.5%/yr.
  - This means 2035 bills will increase 1.4x to 2.4x for SB100, and 2.1x to 3.5x for Case 1 or 2. Case 3 is up to 3.8x. (See Brattle p. 5.)
- The sustained escalation in Cases 1-3 rates and bills is *not reasonable*.
  - Better goal attainment, at lower cost, is likely achievable.

RESIDENTIAL BILL ANALYSIS

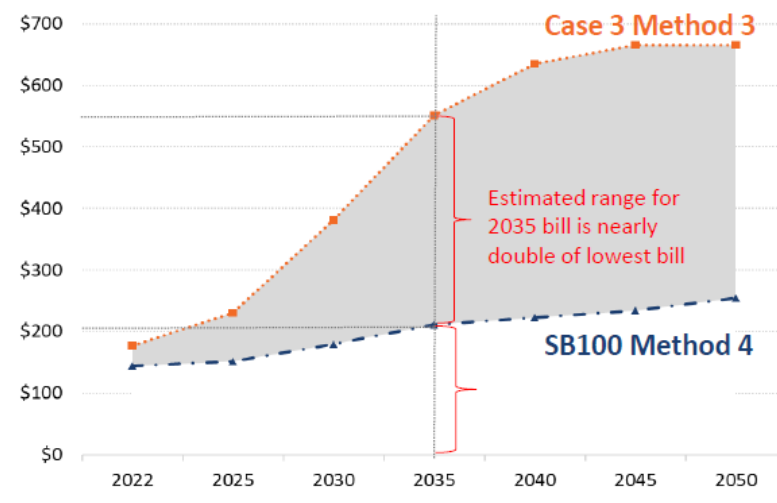
Single Family Home - 2/2

- Monthly bills by Case and by Method have a wide uncertainty band.
  - Case 3 Method 3 leads to the highest bill while SB100 Method 4 has the lowest.
- The uncertainty band (grey area) is larger than the actual bill.

Monthly Bill Estimates for Single Family Home Customers (All Methods and Cases)



Monthly Bill Estimates for Single Family Home Customers (Range)

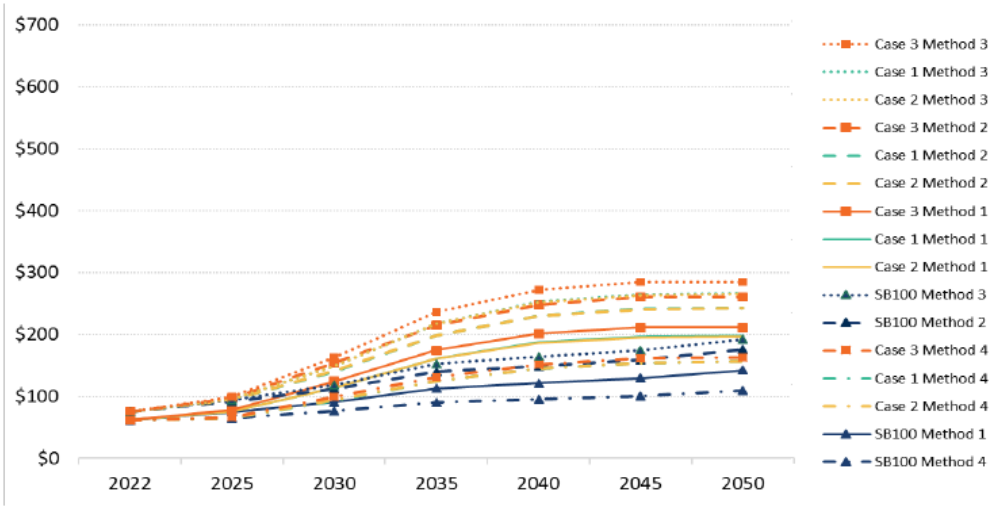


Notes: Single family home customers are assumed to consume 700 kWh per month.

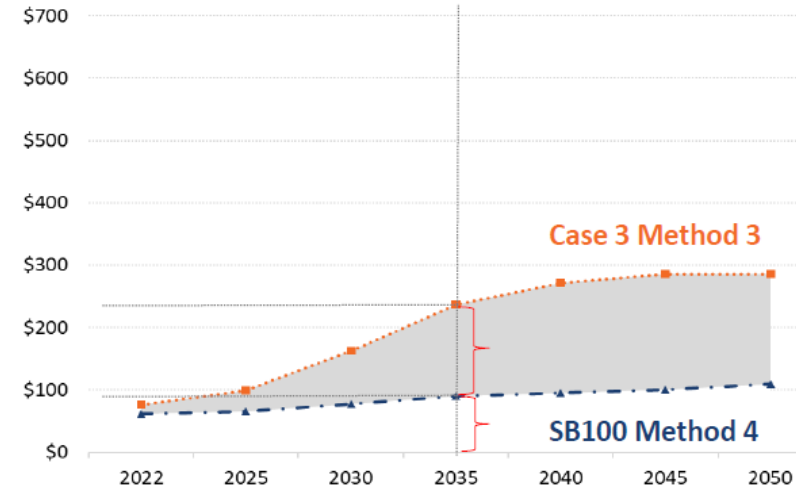
Apartments - 2/2

- Monthly bill estimates for apartment customers are less than a half of that for single family home customers.
  - The observed trend (e.g., 2035 range is nearly double of the lowest bill estimates) is the same.

Monthly Bill Estimates for Apartment Customers (All Methods and Cases)



Monthly Bill Estimates for Apartment Customers (Range)



Notes: Apartment customers are assumed to consume 300 kWh per month.

Don't Over-Focus on Decarbonizing Power Sector

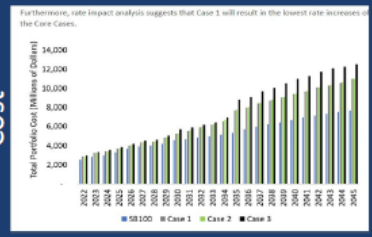
- How does the incremental $20 billion cost of making the last 10% reduction in power sector GHG compare to making investments in other sectors, like transportation or building electrification? The Brattle analysis says $400 to nearly $1000 per metric tonne for Case 1 versus SB100, a factor of at least 10x higher than current valuations of GHG savings.
- There are key common risks for rate impacts from uncertain load forecasts and new technologies. Timing will strongly affect costs.
  - Conservation and residential PV adoption (less load) versus building electrification and EV adoption (more load) have offsetting load and rate impacts, which are difficult to forecast beyond three to four years.
  - Do we want to make large investments earlier in GHG reduction using current technologies?
  - Do we want to make large investments earlier in long duration (seasonal) storage? New technologies now in demonstration stage will mature 2028-2032. California's focus is creating larger scale opportunities for innovation and partnership now.
  - When faced with high technology uncertainty, which directly affects load growth or shrinkage, history tells us we are poor predicters of leading technologies and adoption rates.
- A huge ferment of innovation exists worldwide on GHG reduction technology in all sectors.
  - Before making very large-scale commitments on GHG that crowd-out lower costs for 30 years to come, DWP should regularly assess and step into new technology at lower cost and better efficiency. Publish cost per tonne of carbon reduced in plans.
  - Racing to go 100% GHG free in the power sector means foregoing the benefits of this innovation effort.

Incremental Cost of GHG Reduction

- The incremental GHG emission reduction cost*1 of the SLTRP Cases (compared to the SB100 Case) are around ***$1,000/Metric Ton.***
  - The costs of SB100 vs Cases 1 to 3 is an order of magnitude or more above current valuations of GHG savings.

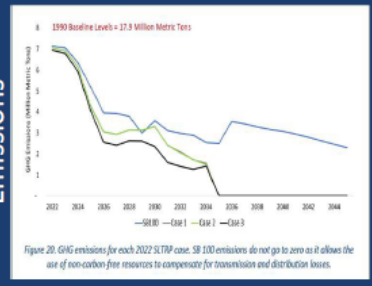
SLTRP Data*2

Cost



Total cost difference between SLTRP Core Cases (Cases 1 & 3) and SB100.

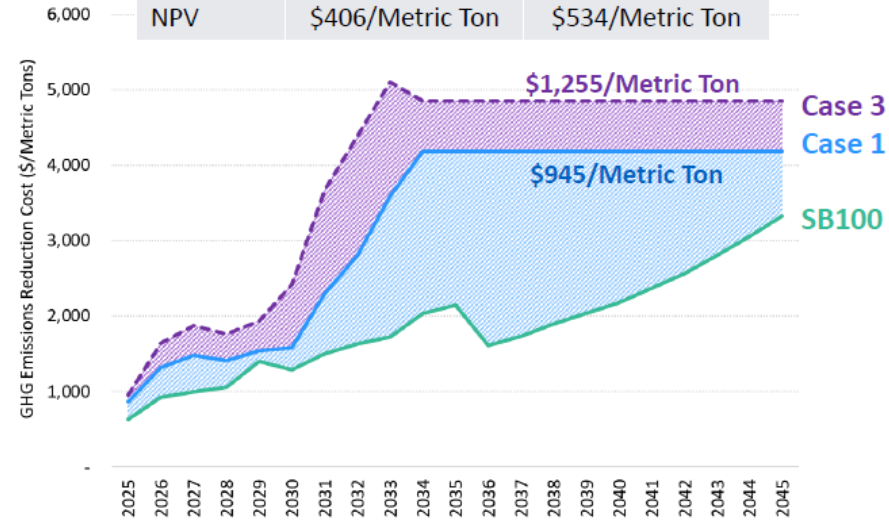
Emissions



Total GHG Emission Reduction difference between SLTRP Core Cases (Cases 1 & 3) and SB100.

Incremental Cost of GHG Reduction (2025-2045)

$/T Delta	Case 1	Case 3
Nominal	$945/Metric Ton	$1,255/Metric Ton
NPV	$406/Metric Ton	$534/Metric Ton



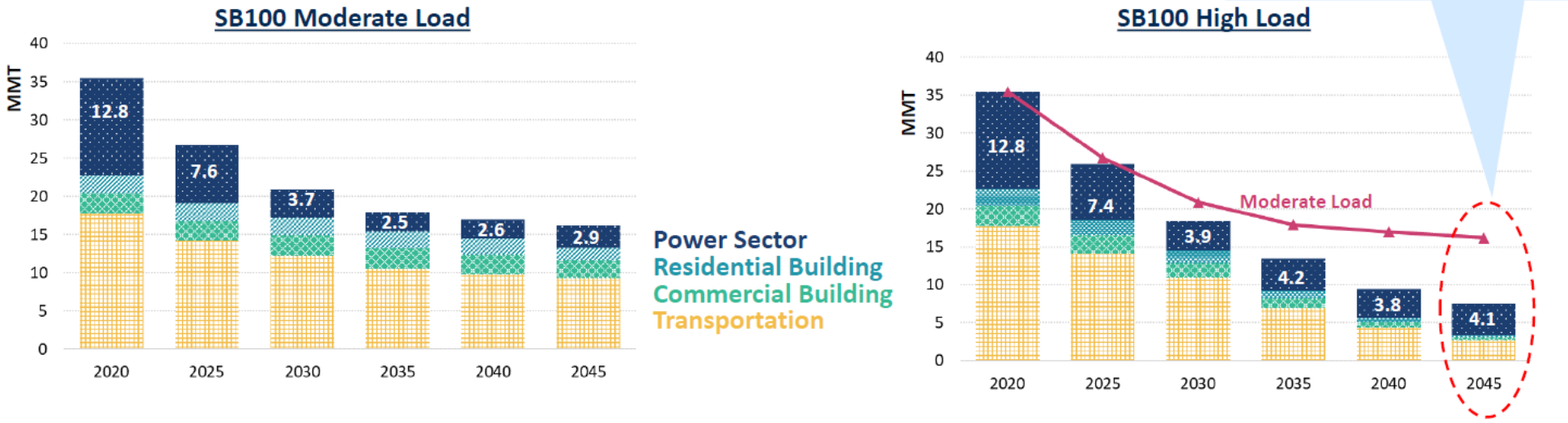
*1: Calculated as the total cost difference (SLTRP Core Case minus SB100) divided by total emission reduction difference (SLTRP Core Case minus SB100) for years 2025 through 2045.
*2: Data taken from Figure 20 and Figure 21 of the 2022 SLTRP Final Report.

Annual GHG Emissions for All Sectors

- For the SB100 Scenarios, GHG emission from the power sector stalls after 2035.
  - The all-sectors' annual GHG emission for High Load (with higher electrification for transportation and buildings) in 2040 and after is about half of that of Moderate Load.
  - This is largely from reduction in transportation but also in building sectors. Power sector emissions increase slightly.
  - The associated cost is about $20-$30/T, which is about 15% to 20% of the estimated long-run cost.

Annual GHG Emission by Sector for SB100 Moderate and High Load (2020-2045)

Electrification of other sectors lead to significantly lower total GHG emission with slight increase in power sector emission.



Sources: Data from NREL study report, Chapter 8, Appendix A, https://www.nrel.gov/docs/fy21osti/79444-8.pdf.

*"Plans are Worthless, But Planning is Essential"**

- Stay flexible. Stay agile. Getting to our GHG goals requires:
  - Making core investments in areas that are likely to have the least regrets, like key transmission and distribution opportunities.
  - Partnering to spread the risk of new major projects like transmission projects in new corridors, or long duration/seasonal storage, will reduce transmission stress for goals of 90% to 100% clean after 2030.
  - Adapting to uncertainties in loads, technology adoption, and new technology cost and performance. The pace of change is very hard to predict beyond even 2028.
  - Thinking more "out of the box" on opportunities as well as risks.
- LADWP is doing well through its evolving, annual, planning efforts along with existing and potential partnering ventures and industry innovation.

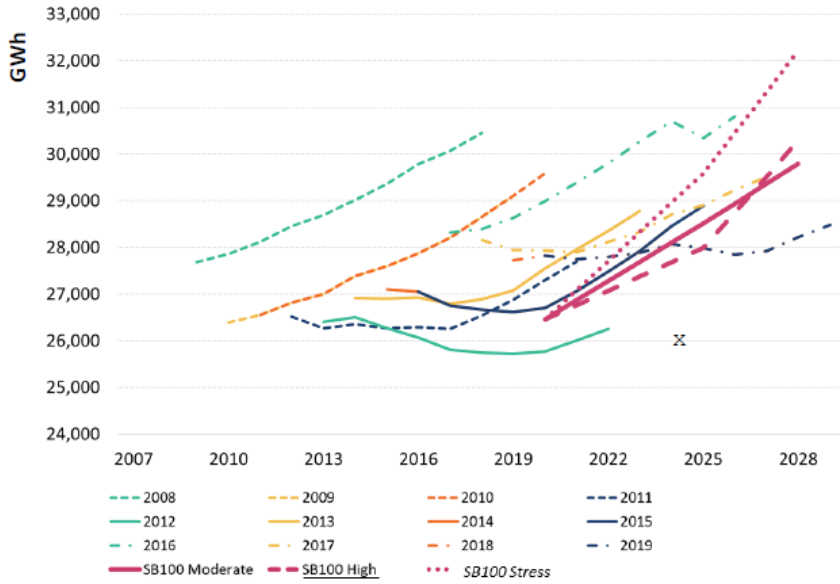
*President Eisenhower cited this Army aphorism, in similar form, multiple times. https://quoteinvestigator.com/2017/11/18/planning/

APPENDIX C: PROJECTIONS - VARIANCE OVER TIME

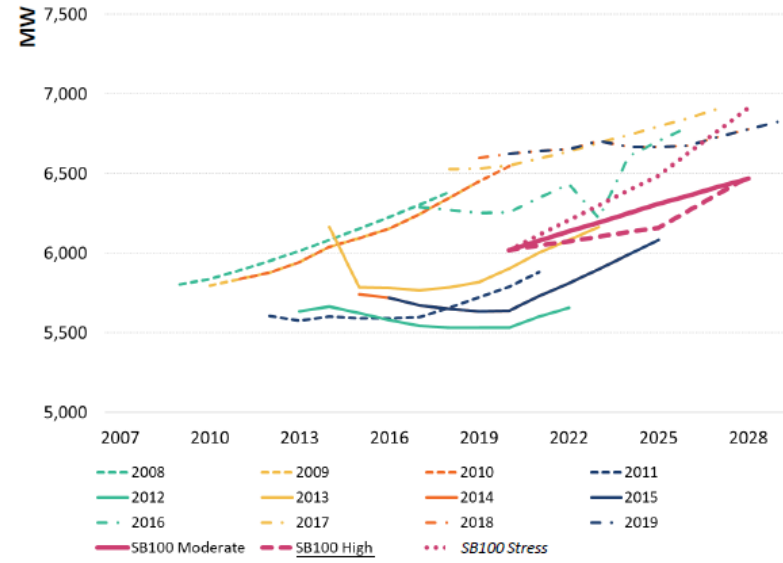
Load Projection - Variance Over Time

- Load projections by themselves are a source of uncertainty.
  - Variation of projections (both energy and peak load) changes over time.
  - Variation assumed in LA100 Study pales compared to historical observations.

Annual Energy Consumption Projections (SB100 Scenario)



Annual Peak Load Projections (SB100 Scenario)



Sources and notes : Historical load projections from FERC 714 Filings, https://www.ferc.gov/industries-data/electric/general-information/electric-industry-forms/form-no-714-annual-electric/data. City of Burbank (1,131 GWh and 301 MW, 2019) and City of Glendale (1,462 GWh and 288 MW, 2019) appear to be included in LADWP's FERC 714 Filing (27,718 GWh and 6,598 MW, 2019).

OPA Conclusions

- LADWP's next big step for GHG reduction is the IPP construction now underway, which will eliminate LADWP's last coal generation by the end of 2025.
  - Remember, LADWP generation was almost 50% coal and 26% oil & gas in the late 1980's and expects to be 0% coal by the end of 2025, with GHG dropping from 17.9 in 1990 to 2 to 4 million metric tonnes per year after 2025. That's a reduction by 77.7% to 88.8%.
  - LADWP, from 2013 to 2018, reduced the expected GHG incremental cost of coal elimination from over $100 to under $50 per metric tonne.

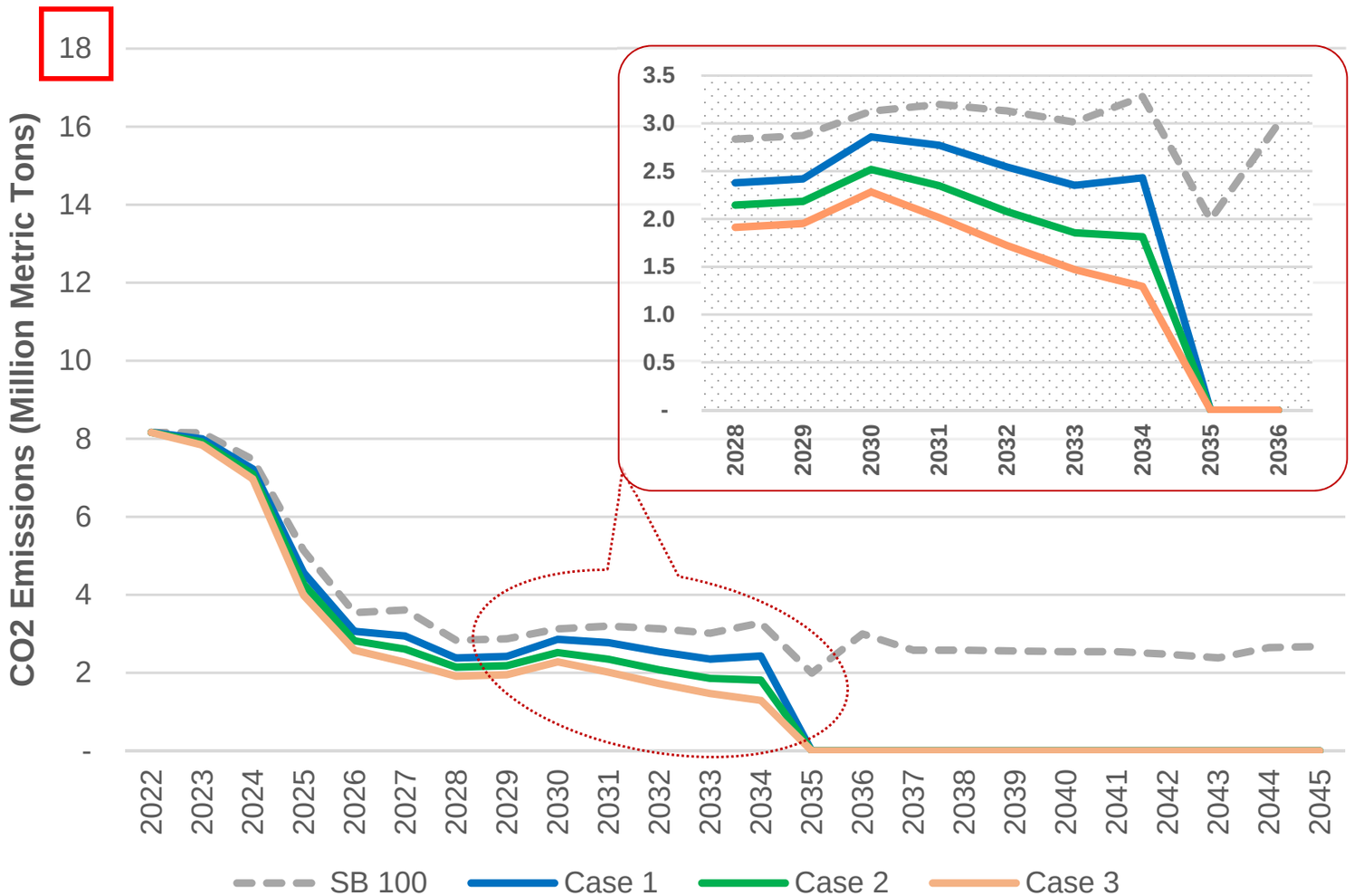
- Between 2025 and 2030, LADWP's system needs to be strengthened to manage:
  - Ever higher levels of clean resources,
  - Evolving levels of electricity use and utility sales, and
  - Avoiding early, large-scale investments in GHG reducing or storage technologies whose costs may drop, and performance may improve after 2030.
  - Moving too fast can accelerate and increase rate impacts, which would result in rate impacts that are *not reasonable*.

- The most important keys to success are largely outside LADWP's control, in transportation and building electrification. Substantial GHG savings are possible for GHG reduction investments below $50 per metric tonne.

2022 SLTRP CORE CASES

RATE OF REDUCING GREENHOUSE GAS EMISSIONS

1990 baseline levels = 17.9 MMT



- Case 1 (SB 100) has the **highest emissions**.
- Case 3 has the **lowest emissions**.
- Cases 1 to 3 **all achieve 100% carbon-free energy** through a combination of:
  - Renewables
  - Demand-side management
  - Use of renewably-derived hydrogen.

from LADWP 2022 SLTRP Board Presentation Final 09-26-22