

# **CleanPowerSF 2022 Integrated Resource Plan**

## **Portfolio Analysis Initial Results**

**October 5, 2022**

- Presentation Updates
- Key Terms
- What is an IRP?
- IRP Assumptions and Analysis
- IRP Results
- IRP Evaluation
- Conclusions and Recommendations



# Presentation Updates

Date	Presentation Update
9/21/2022	Base Case Modeling Results Released
9/21/2022	95% Time Coincident Case Modeling Results Released
9/28/2022	90% Time Coincident Case Modeling Results Released
9/28/2022	Mayor's EV and Building Decarbonization Targets Met Case Modeling Results Released
9/28/2022	Local Resource Procurement Case Modeling Results Released
9/28/2022	Comparison of Conforming Portfolios
10/5/2022	Portfolio Evaluation and Staff's Recommended Preferred Conforming Portfolio Summary

# Key Terms

- **Portfolio:** collection of generation resources used to serve electricity demand.
- **Conforming Portfolio:** the specific mix of electric generation resources that meet CPUC requirements.
- **Alternative Portfolio:** a portfolio developed using CleanPowerSF assumptions.
- **Baseline Resources:** resources that are existing or contracted to come online within the planning horizon and assumed to be fixed in each portfolio.
- **Scenario:** variations on a future state or objective that may influence the resources included in a portfolio.
- **Sensitivity Analysis:** an analysis that involves changing one assumption to understand its influence on the portfolio.



# WHAT IS AN IRP?

# What is an Integrated Resource Plan (IRP)?

- An IRP is an energy planning tool to support achieving policy goals and meeting regulatory requirements.
- State law requires retail sellers of electricity to develop an IRP that evaluates electricity supply and demand and identifies energy resource options that can deliver reliable and cost-effective energy to customers.
- CCA IRPs are reviewed and certified by the California Public Utilities Commission (CPUC), every two years.

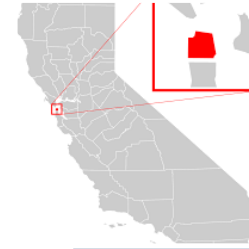


# Integrated Resource Plan Portfolios



## Conforming Portfolio

- ✓ Uses inputs and assumptions provided by the CPUC
- ✓ Accounts for statewide goals and targets
- ✓ Minimal flexibility to incorporate local electrification goals and targets



## Alternative Portfolio

- ✓ Uses inputs and assumptions determined by CleanPowerSF
- ✓ Accounts for local goals and targets:
  - Transportation electrification
  - Building decarbonization
- ✓ Provides flexibility to incorporate community preferences

# CleanPowerSF's IRP Components

- Customer **demand forecast**, with sensitivity analysis for expected changes in demand
- Analyze portfolios for meeting CleanPowerSF's **renewable and GHG reduction targets and investing locally**
  - All energy supplied being 100% renewable & GHG-free by 2025
  - Scenarios examining alternative resource mixes and accelerated decarbonization targets
- Optimize around a portfolio that achieves program goals and delivers **competitively priced energy products**



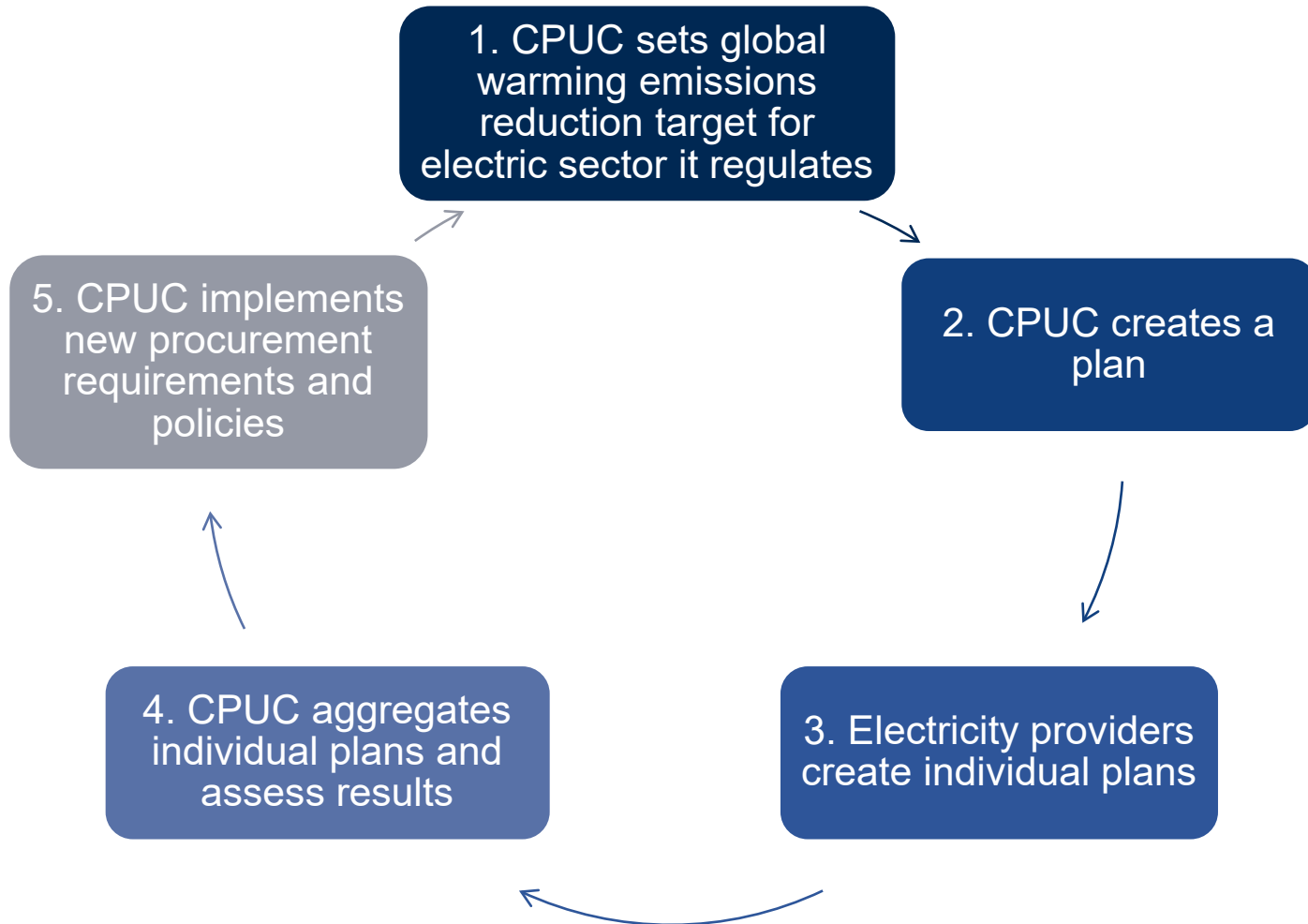


# What does the CPUC do with IRPs?

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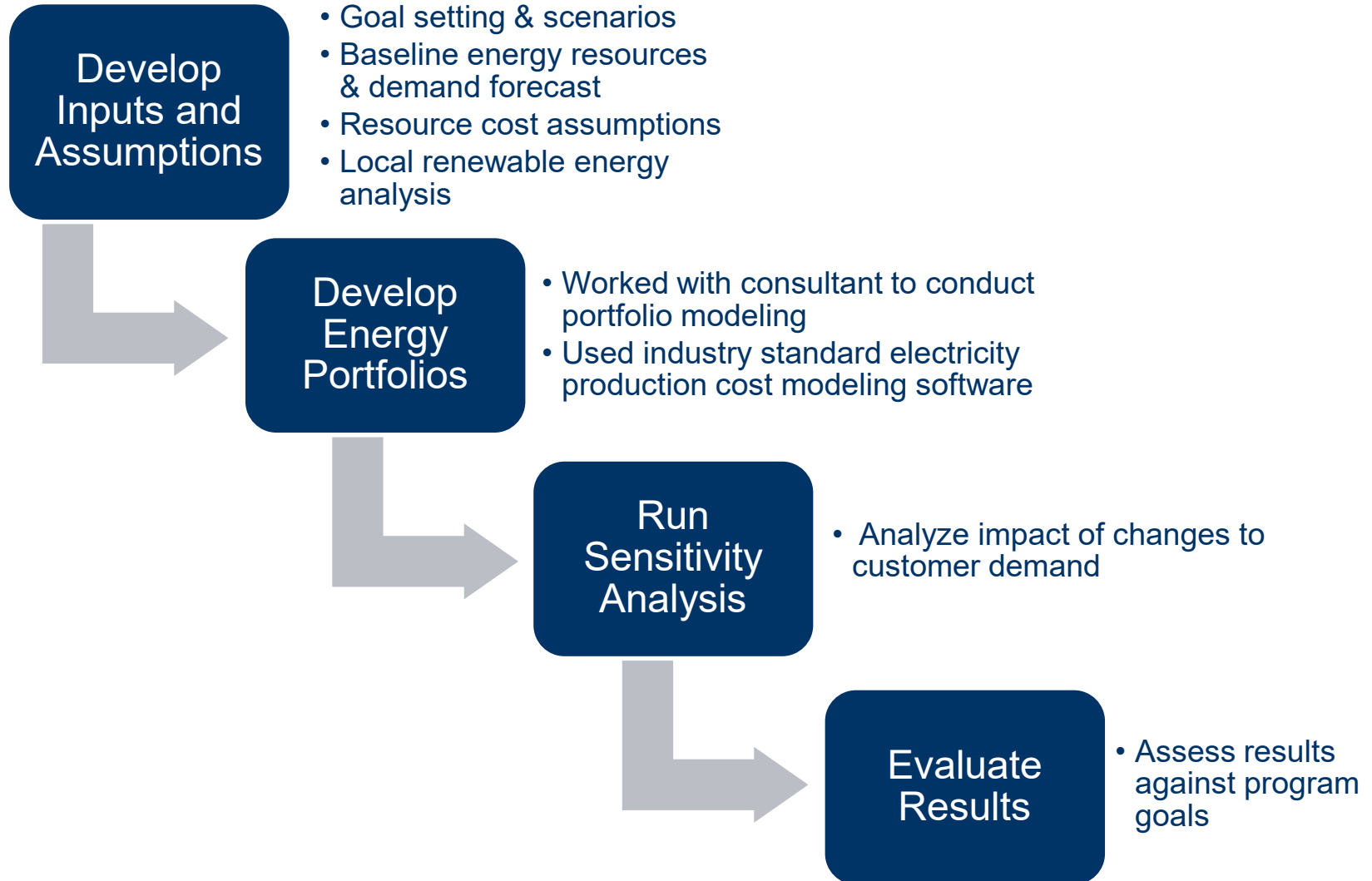
1. Before each electricity provider begins their IRP analysis, the CPUC sets a greenhouse gas (GHG) emissions reduction target for the CPUC-regulated electricity sector.
2. The CPUC performs electricity grid modeling to determine the amounts and types of new resources (e.g., wind, solar, and batteries) that are necessary to achieve the GHG emissions reduction target while meeting future electricity needs. This modeling is used to develop an overall plan for the CPUC-regulated electricity sector.
3. Electricity providers, like CleanPowerSF, create individual IRPs, illustrating how they plan to reduce GHG emissions as part of the CPUC plan.
4. The CPUC collects all the individual plans from jurisdictional electricity providers and develops what it calls a **“Preferred System Portfolio”** (PSP). The CPUC then compares their original plan (in Step 2) to this new plan to make sure that it will still meet its goals if the CPUC-jurisdictional electricity providers all follow their individual plans.
5. Lastly, the CPUC brings all this planning to life by implementing new procurement requirements and policies that support the development of new clean energy projects and overall grid reliability.

# CPUC's Integrated Resource Planning Process



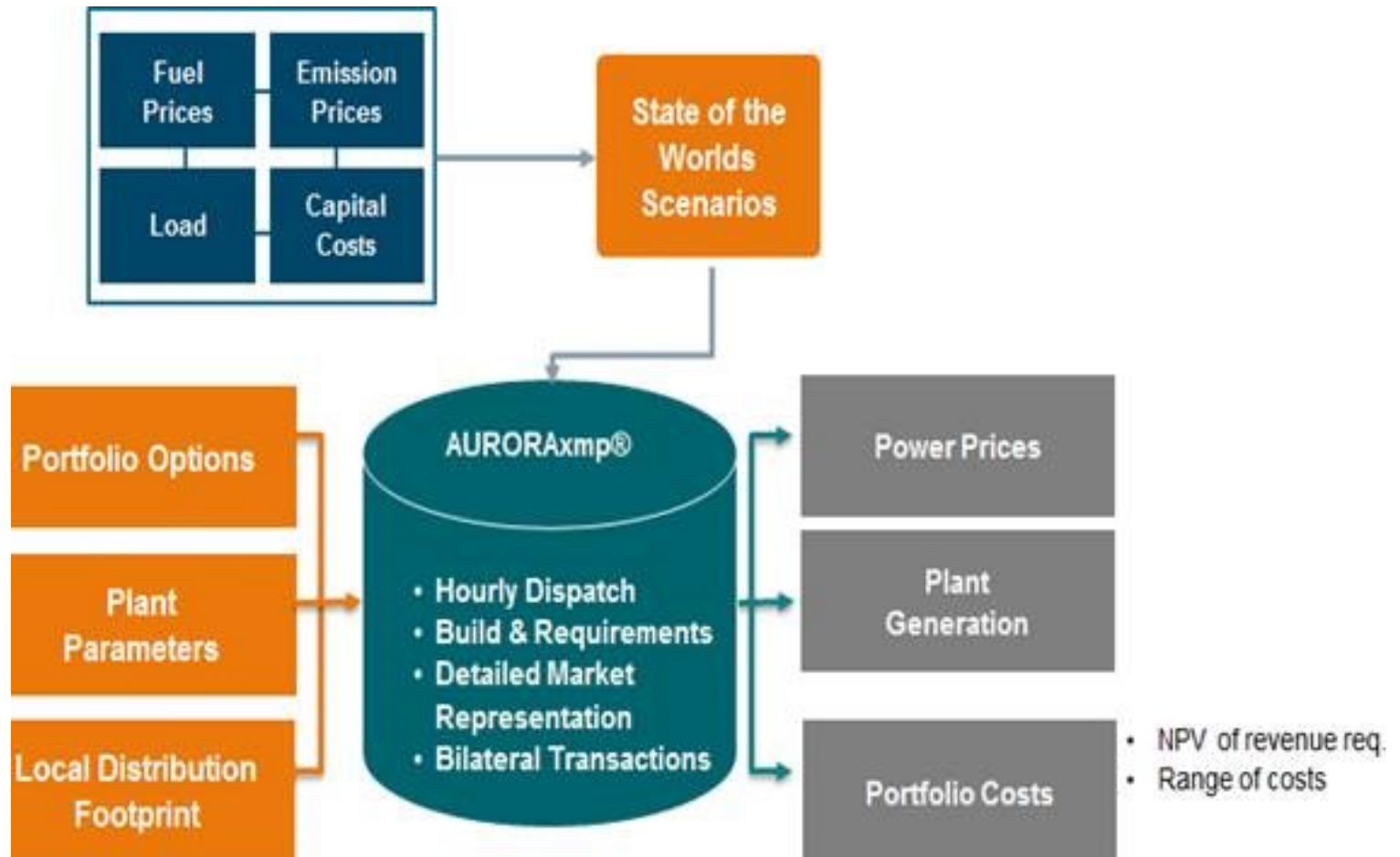
# **IRP ASSUMPTIONS & ANALYSIS**

# Analytical Process



# Portfolio Analysis Methodology

Developing the energy portfolios requires the key inputs, algorithms, and outputs illustrated below.





# CPUC-required and CleanPowerSF-specific IRP Assumptions

The CPUC requires retail sellers to use a common set of assumptions in developing their IRPs to support aggregation and “apples-to-apples” comparisons of all IRPs.

## CPUC-required Assumptions

- Annual retail sales forecast through 2035 from State Integrated Energy Policy Report (IEPR)
- Load modifiers (i.e., demand-side changes to load like electrification, energy efficiency, behind-the-meter solar)
- Emissions accounting methodology

## CleanPowerSF-specific Assumptions

- Hourly customer demand shape (must equal IEPR retail sales forecast)
- Existing renewable resource availability
- Project specific (e.g., local project) costs
- Minimum portfolio reliability requirements



# CPUC GHG Emissions Target Requirements for IRPs

- CleanPowerSF is required to submit a Preferred Conforming Portfolio to the CPUC under two 2035 statewide GHG emissions targets: 30 and/or 25 million metric tons (MMT).
- CleanPowerSF is planning to perform better than its proportional share of both GHG emissions targets (below); it is permitted to submit one Preferred Conforming Portfolio as part of its individual 2022 IRP filing.
- Assigned targets are calculated based on CleanPowerSF's proportional share of statewide electricity usage and represent CleanPowerSF's allotted portion of the 2035 GHG emissions targets.

<b>CleanPowerSF 30 MMT CO2 Benchmark</b>	<b>CleanPowerSF 25 MMT CO2 Benchmark</b>
<b>0.340 MMT CO2</b>	<b>0.272 MMT CO2</b>



# Additional CleanPowerSF-specific IRP Portfolio Requirements

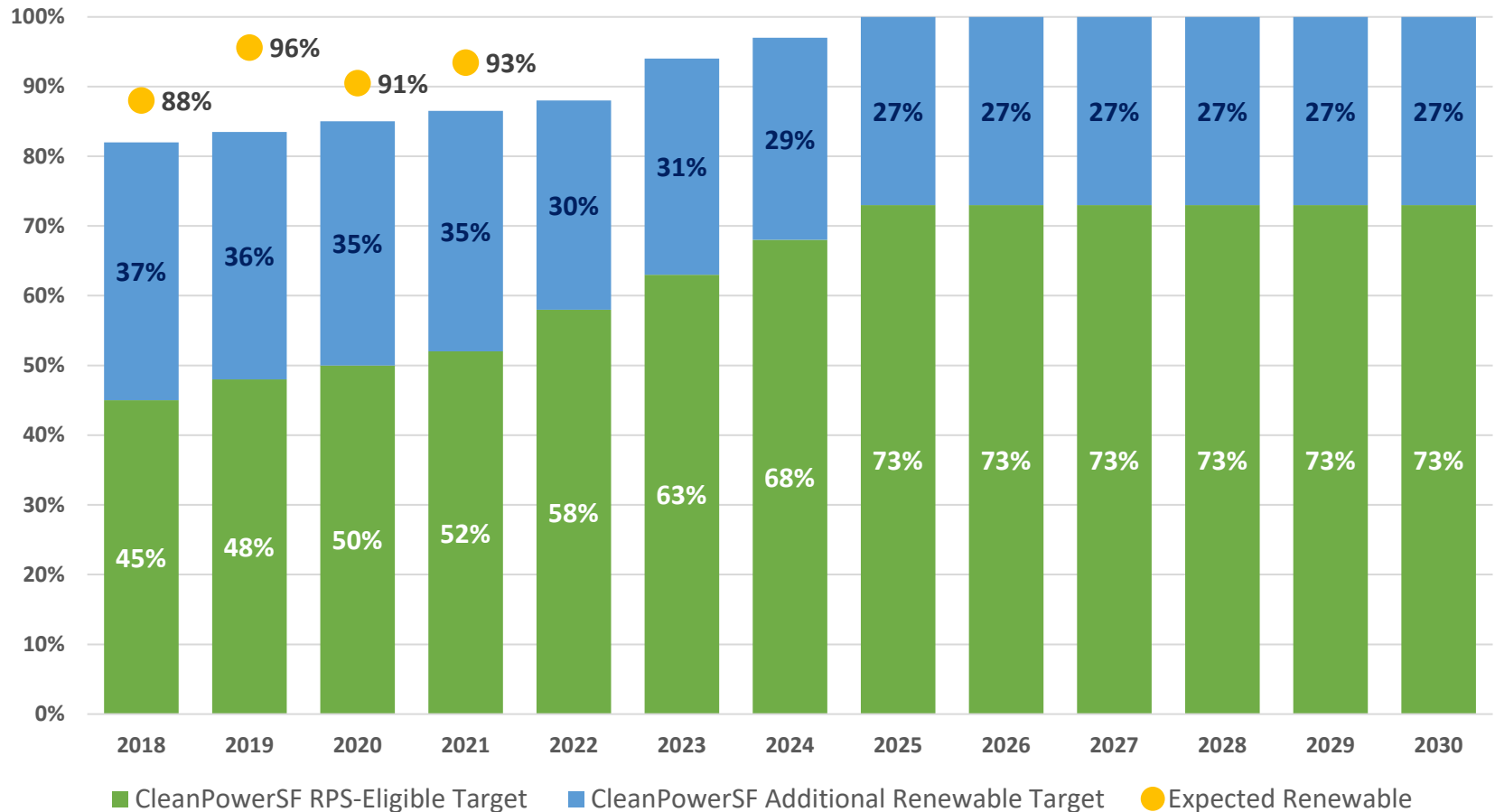
- CleanPowerSF required that all portfolios developed in its IRP meet the following additional requirements:
  - ✓ Be 100% Greenhouse Gas Free by 2025
  - ✓ Be at least 73% RPS-eligible renewable by 2030
  - ✓ Meet at least 60% of projected Resource Adequacy obligation with long-term resources
  - ✓ Include 85.6 MW of local solar, 150 MW of local storage, and 50 MW local geothermal
  - ✓ Prioritize energy from California
  - ✓ New renewable resources not already under contract may be developed as soon as 2026 (project lead times)
  - ✓ Limit large hydro purchases to CleanPowerSF's proportional share of statewide hydro availability
  - ✓ Provide long-term rate and financial stability; remain cost competitive with PG&E rates





# Program Annual Power Content Targets and Progress to Date

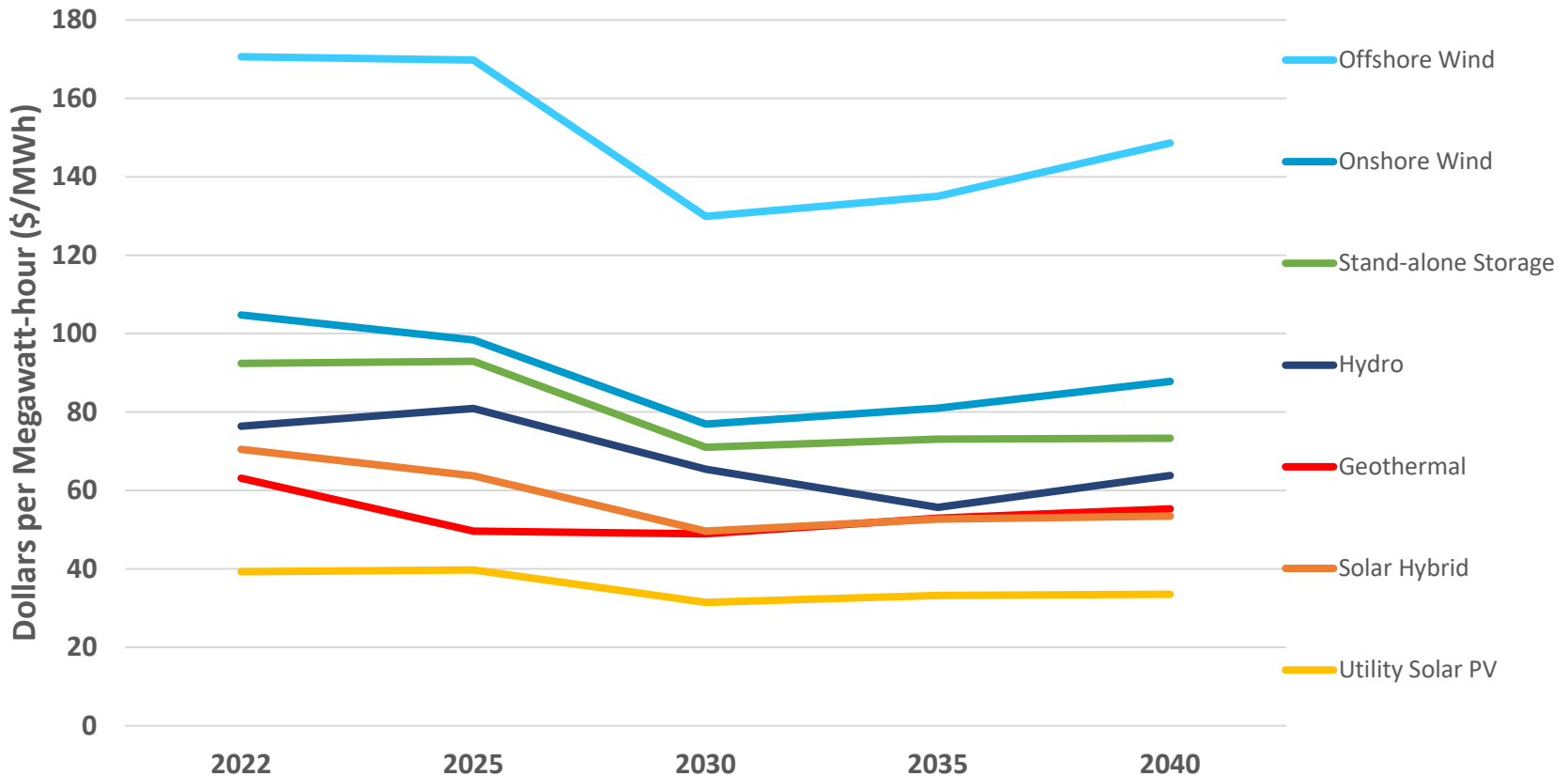
50% RPS-eligible renewable by 2020; 100% renewable by 2025





# Energy Resource Cost Assumptions

## Levelized Cost of Energy (\$/MWh)



\*Source: Siemens PTI, NREL, HIS, EIA, EPA. Includes Capital Cost, Interconnection Cost, Investment Tax Credit, Periodic Replacement and Augmentation



# Baseline Resources for Conforming and Alternative Portfolios

	Resource Technology	Total Capacity (MW)
Local Baseline Resources	Solar PV	85.6
	Storage	150.0
	Geothermal	50.0
	<b>Subtotal</b>	<b>285.6</b>
Non-Local Baseline Resources	Solar PV	282.0
	Wind	110.4
	Storage	138.9
	Geothermal	19.3
	<b>Subtotal</b>	<b>550.6</b>
	<b>Total</b>	<b>836.2</b>

# CleanPowerSF IRP Modeling: Four Portfolios

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## 1. Base Case: CleanPowerSF Goals by 2025

- ✓ 100% renewable by 2025
- ✓ Local resource prioritization



## 2. CleanPowerSF Goals and Time Coincidence by 2030

- ✓ 100% renewable by 2025
- ✓ Resource generation meets customer usage in real time
- CleanPowerSF analyzed the resource needs to meet both 90% and 95% time coincidence by 2030**
- ✓ No system purchase 5-10pm
- ✓ Local resource prioritization



## 3. CleanPowerSF Goals and Mayor's EV and Building Decarbonization Targets MT

- ✓ 100% renewable by 2025
- ✓ Local resource prioritization
- ✓ Emission-free trips originating in, ending in, or passing through San Francisco by 2040
- ✓ Decarbonization of existing buildings by 2040



## 4. CleanPowerSF Goals and Local Resource Procurement

- ✓ 100% renewable by 2025
- ✓ Local content floor of 50% by 2030

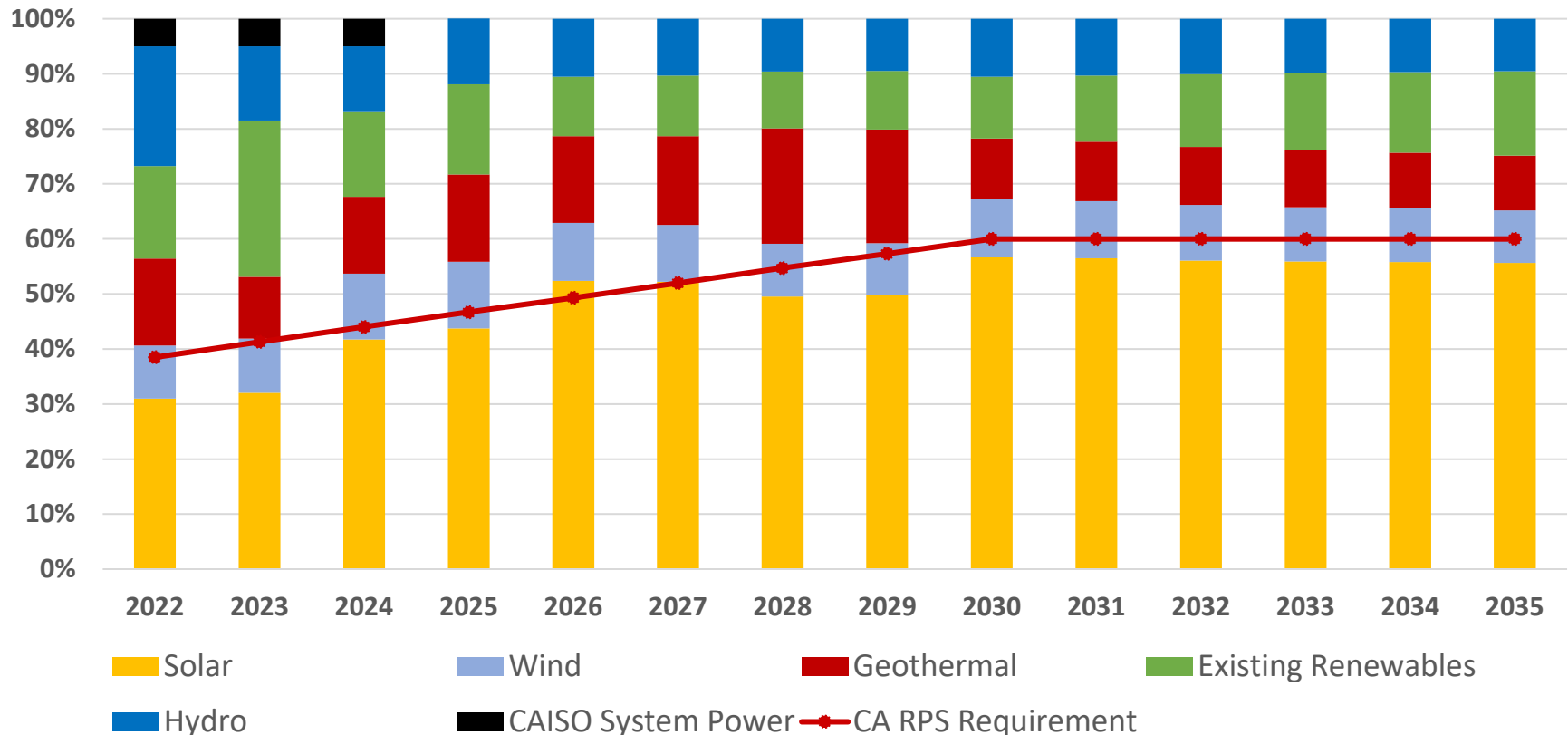
Conforming Portfolio

# **INITIAL RESULTS**

# **BASE CASE PORTFOLIO**

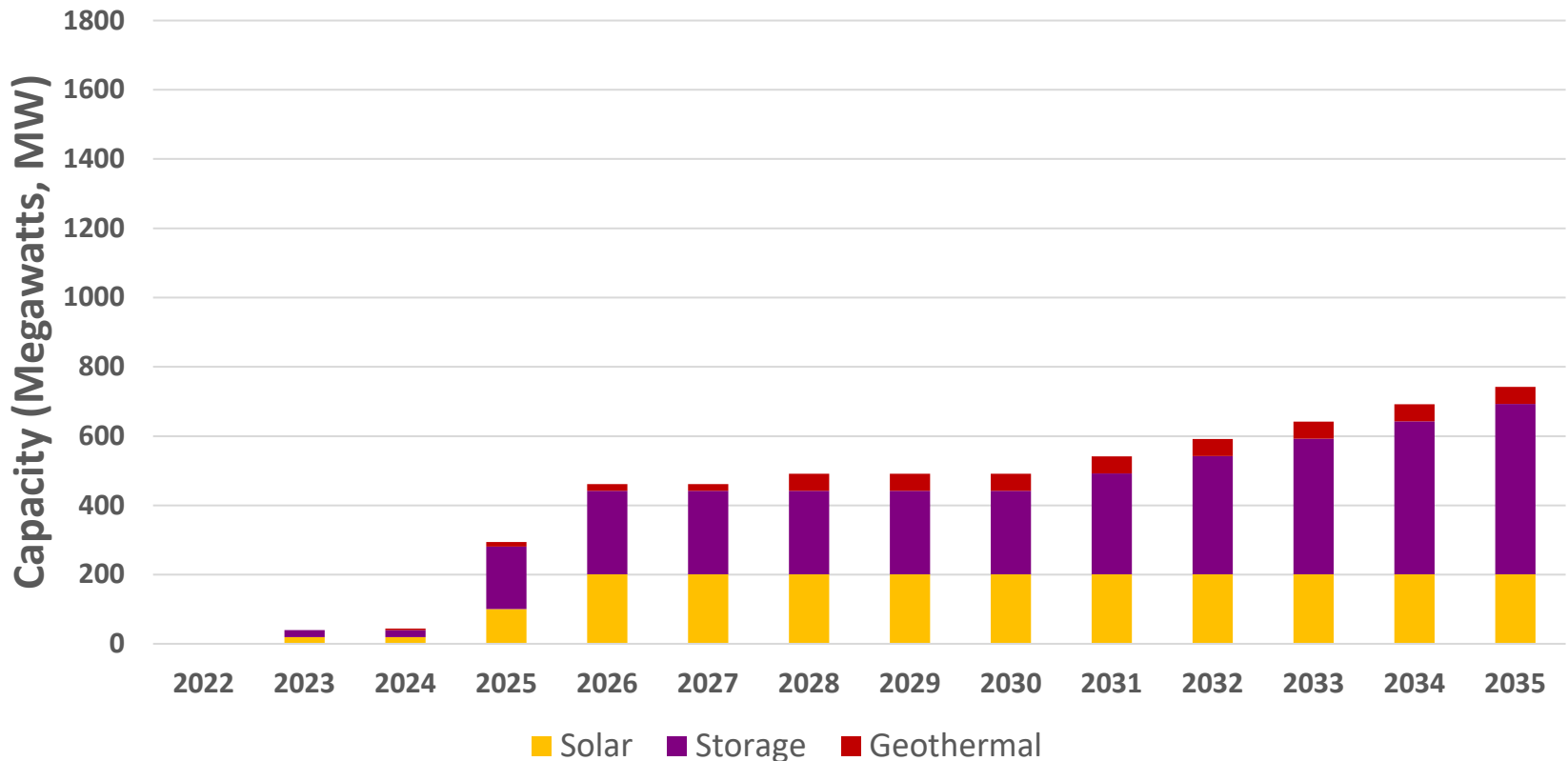
# Base Case Portfolio Results: Portfolio Energy Content

The energy supply in the Base Case portfolio includes a diverse mix of generating technologies, with Solar being the most dominant of the technology types in all years of the planning horizon.



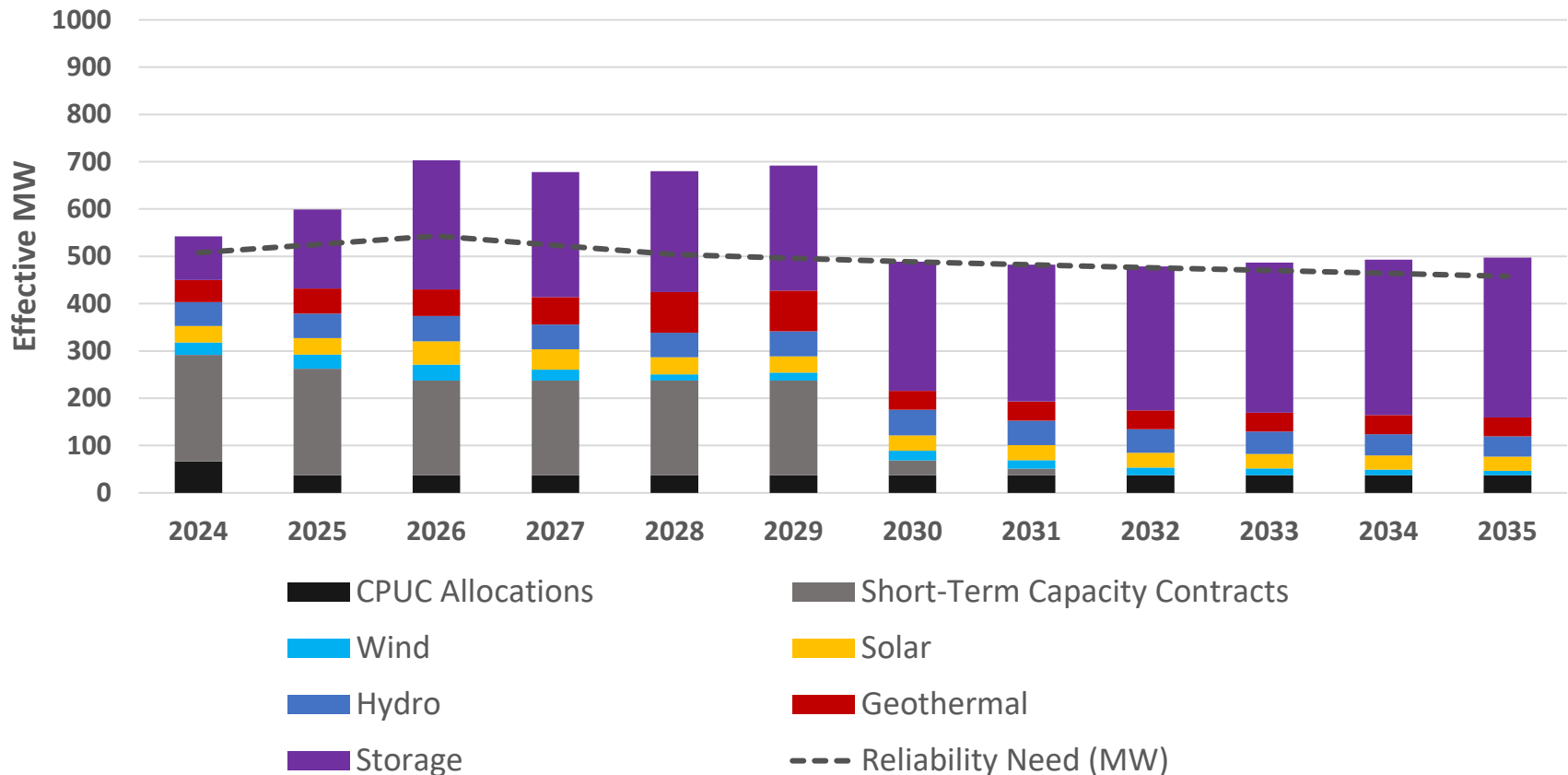
# Base Case Portfolio Results: New Resource Capacity Build (2022-2035)

The Base Case portfolio calls for 742 MW of new resource capacity by 2035, including 6 MW of new solar, 340 MW of new solar paired with storage (hybrid), 49 MW of new geothermal, and 347 MW of standalone storage.



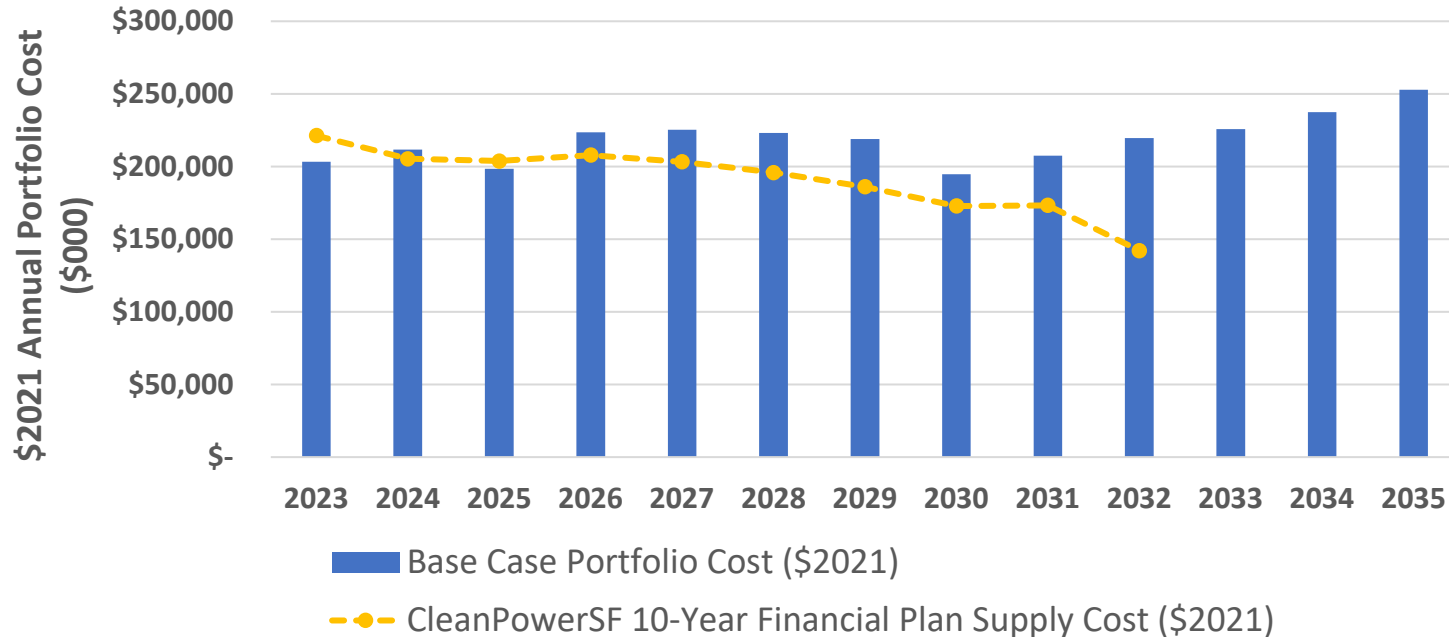
# Base Case Portfolio Results: Contributions to Electric Grid Reliability

The Base Case portfolio will meet CleanPowerSF's share of system reliability needs with a small amount of short-term capacity purchases required in 2030 and 2031.





# Base Case Portfolio Results: Portfolio Cost

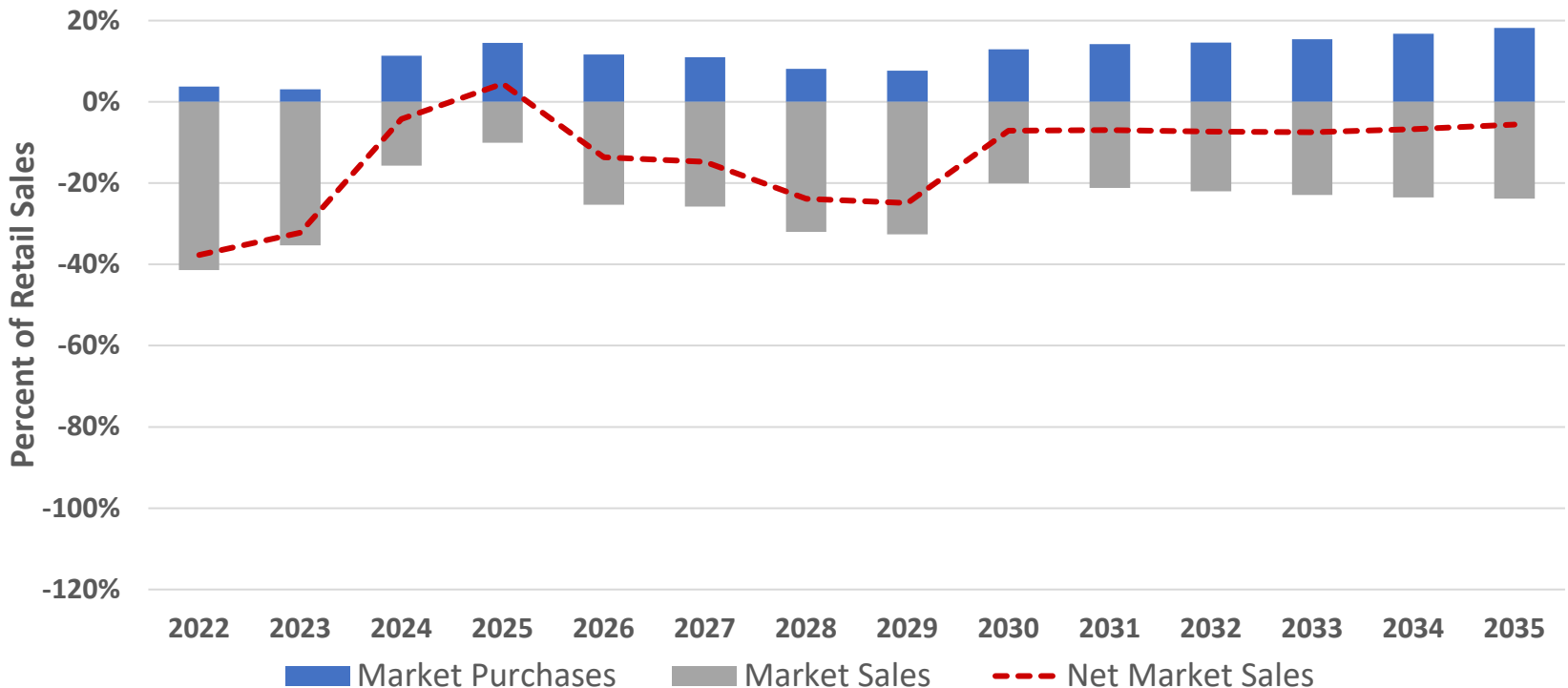


This graph compares the Base Case Portfolio costs to CleanPowerSF's forecasted supply costs in its 2021 10-year financial plan. The graph shows that starting in 2026, the Base Case will increase the cost of energy in the portfolio relative to the 10-year plan. Notably, the market price forecast has increased since the 10-year plan was developed, and new build project costs are up due to inflationary and supply chain issues. The total projected revenue requirement in 2021 dollars for the Base Case portfolio would be \$1.72 billion vs. \$1.57 billion projected in the 10-year financial plan during the 2023-2032 period (9.8% increase).



# Base Case Portfolio Results: California ISO Market Purchases & Sales

The buildout required for the Base Case portfolio results in California ISO electricity market purchases and sales to balance CleanPowerSF’s supply and demand, represented as a percentage of CleanPowerSF’s annual retail sales. This information serves as a measure of portfolio market exposure as more purchases and sales on the wholesale electricity market means greater portfolio exposure to market price volatility.



\*Does not include line losses

Conforming Portfolio

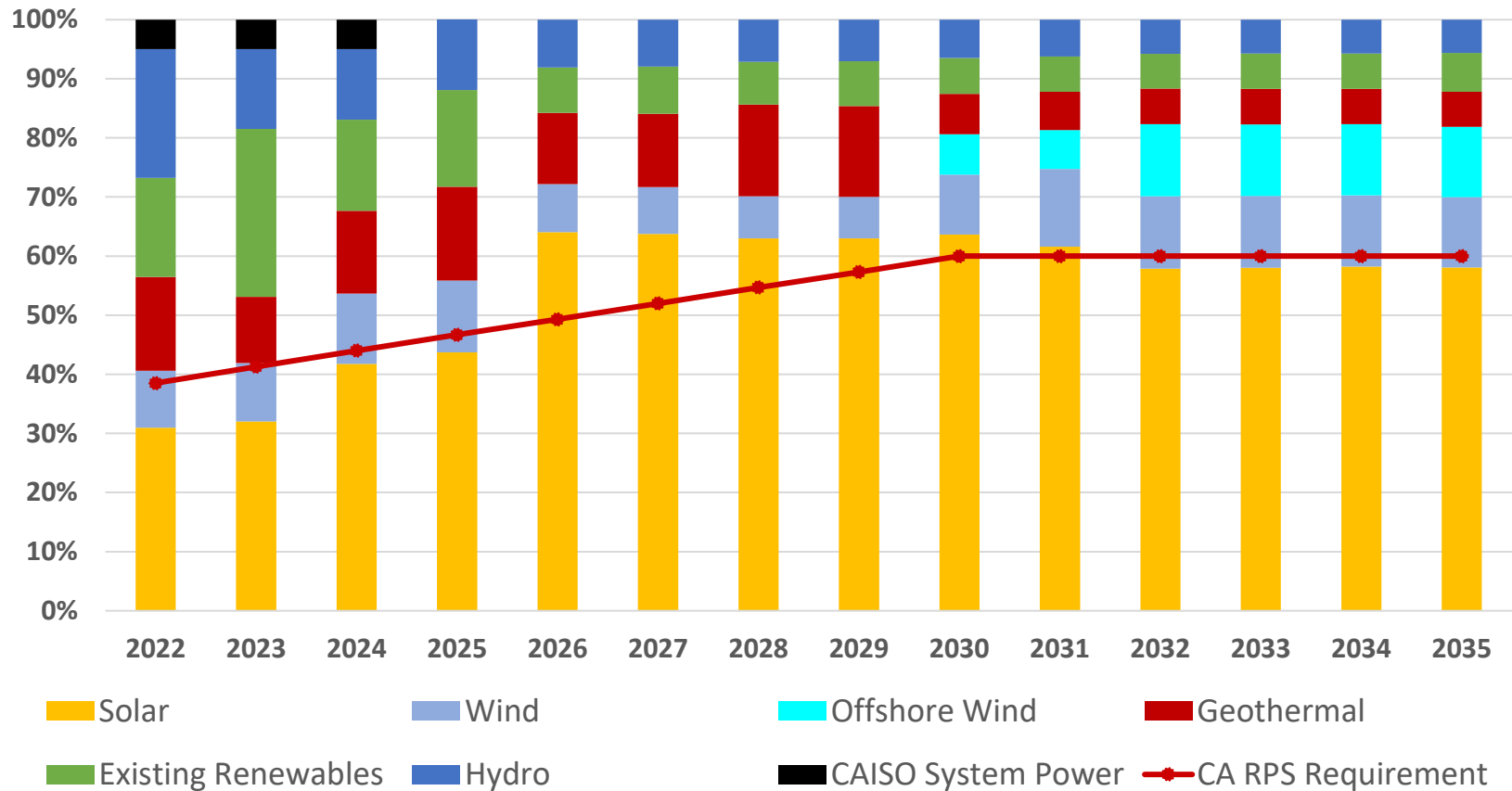
# **INITIAL RESULTS**

## **95% TIME COINCIDENT**

## **PORTFOLIO**

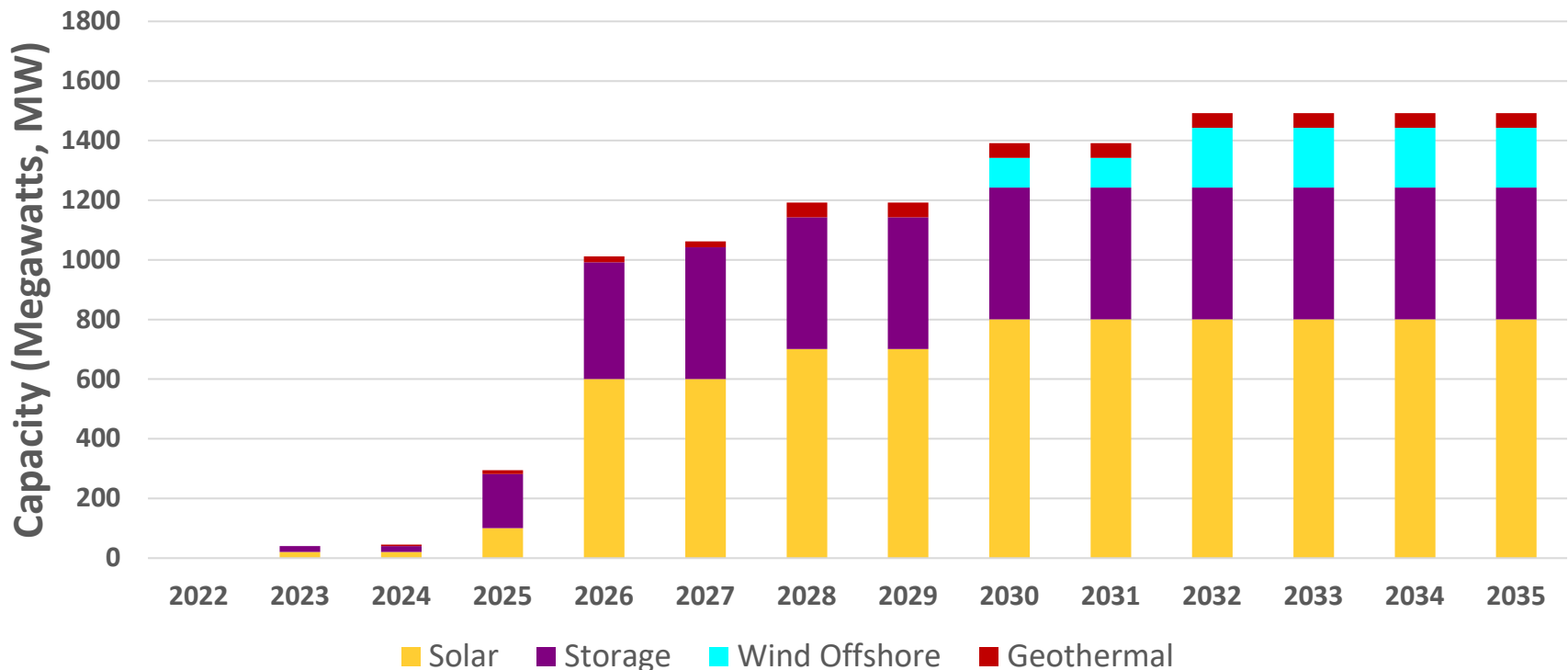
# 95% Time Coincident Portfolio Results: Portfolio Content

The energy supply in the 95% Time Coincident portfolio requires more new renewable energy supply, including offshore wind generation beginning in 2030.



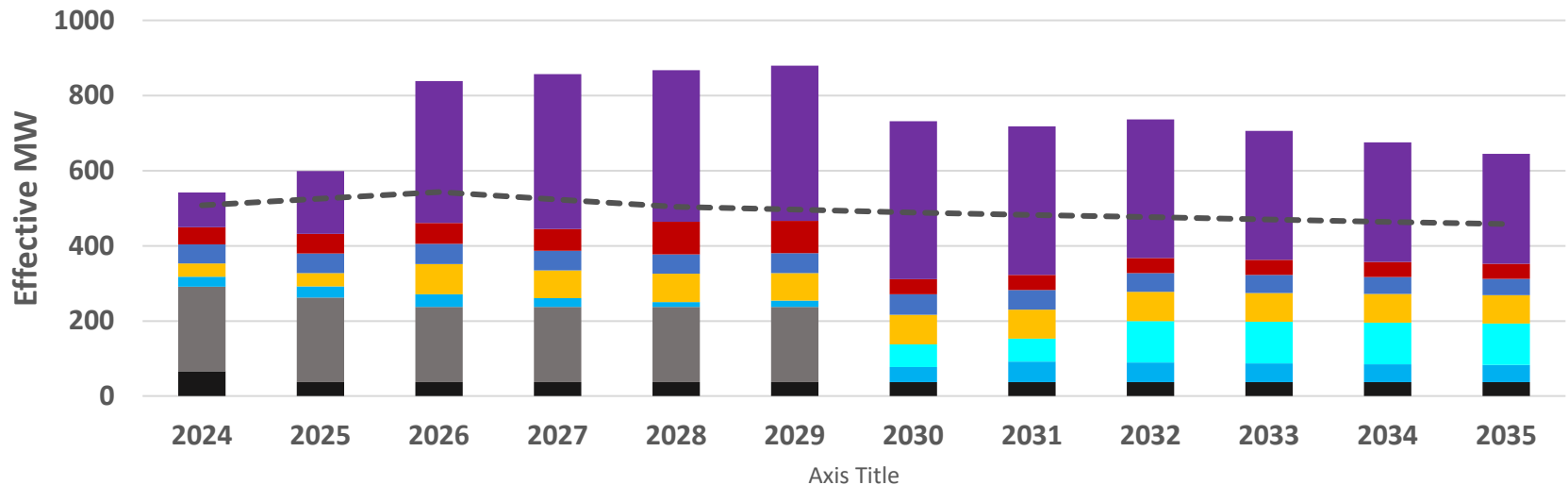
# 95% Time Coincident Portfolio Results: New Resource Capacity Build (2022-2035)

The 95% Time Coincident portfolio calls for 1,692 MW of new resource capacity by 2035, including 306 MW of new solar, 790 MW of new solar paired with storage (hybrid), 147 MW of standalone storage, 200 MW of new offshore wind, and 49 MW of new geothermal.



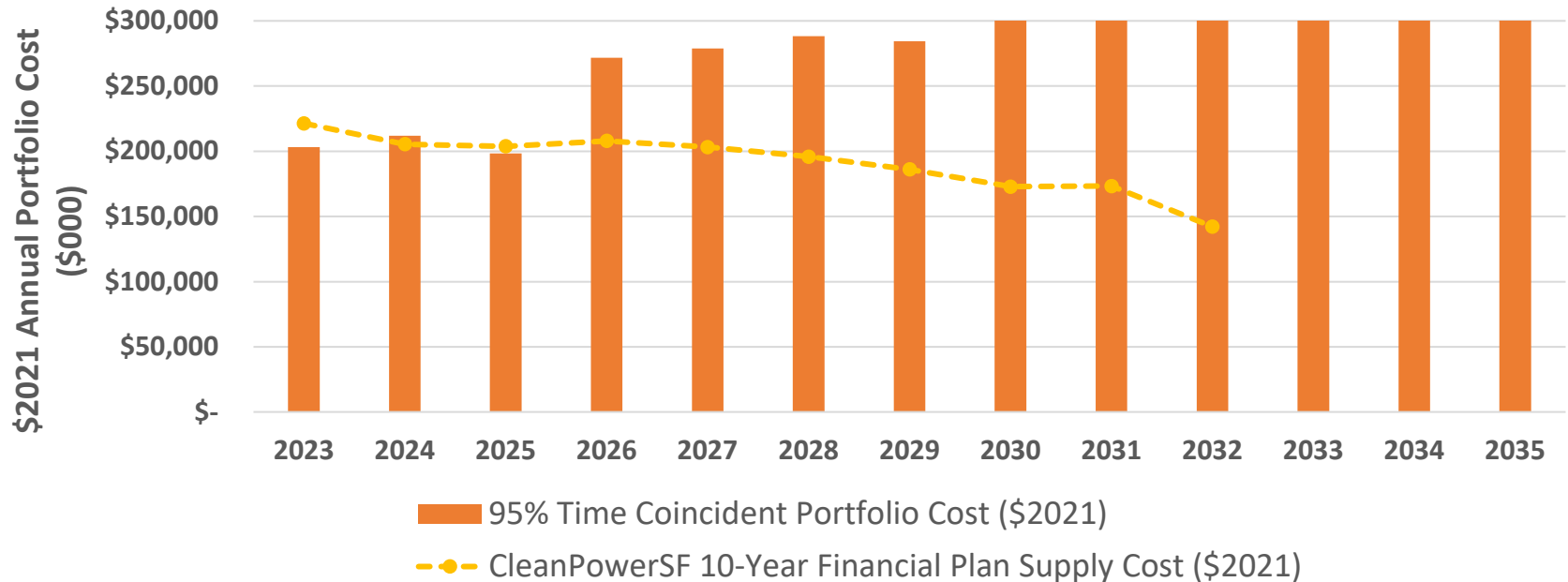
# 95% Time Coincident Portfolio Results: Contributions to Electric Grid Reliability

Due to the significant amount of new resources required, the 95% Time Coincident portfolio will exceed CleanPowerSF's share of system reliability needs in all years of the planning horizon.



- CPUC Allocations
- Short-Term Capacity Contracts
- Wind
- Offshore Wind
- Solar
- Hydro
- Geothermal
- Storage
- - - Reliability Need (MW)

# 95% Time Coincident Portfolio Results: Portfolio Cost

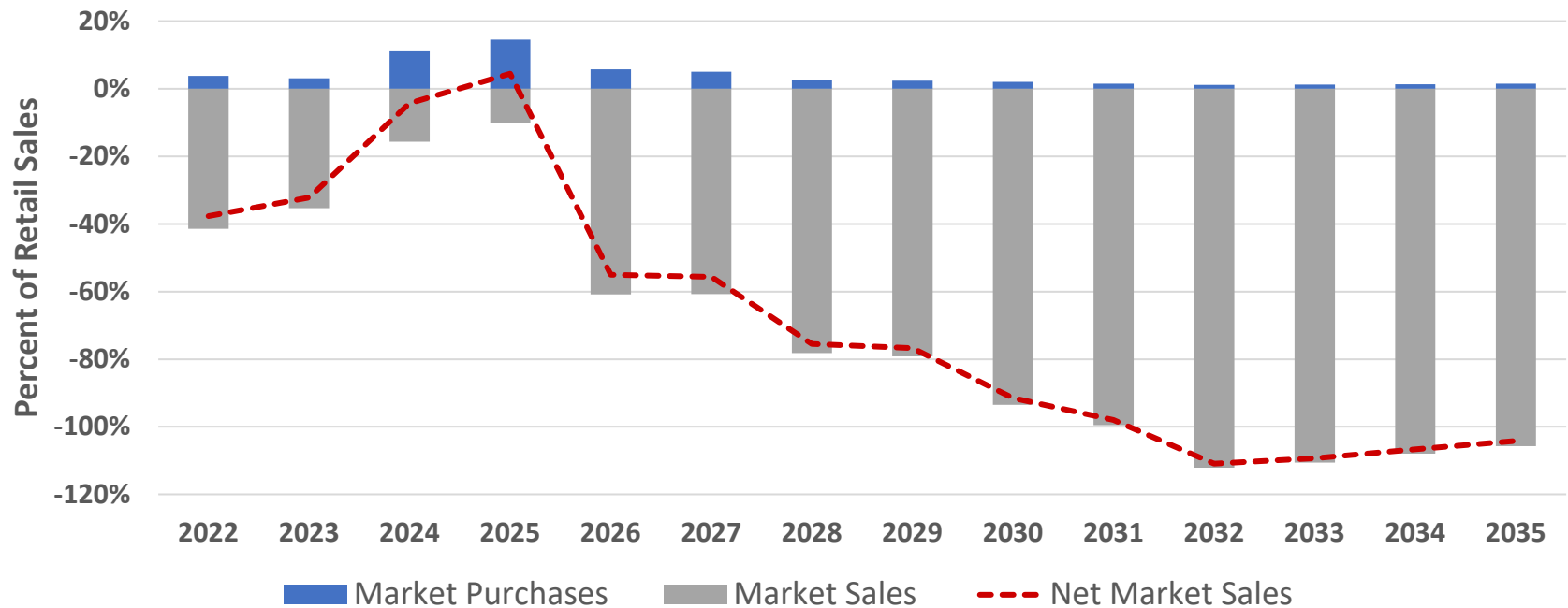


This graph compares the Time Coincident Portfolio costs to CleanPowerSF's forecasted supply costs in its 2021 10-year financial plan. The graph shows that starting in 2026, the Time Coincident case will increase the cost of energy in the portfolio relative to the 10-year plan. Notably, the market price forecast has increased since the 10-year plan was developed, and new build project costs are up due to inflationary and supply chain issues. The total projected revenue requirement in 2021 dollars for the Time Coincident portfolio would be \$2.20 billion vs. \$1.57 billion projected in the 10-year financial plan during the 2023-2032 period (40.2% increase).



# 95% Time Coincident Portfolio Results: California ISO Market Purchases & Sales

The buildout required for the 95% Time Coincident portfolio relies on California ISO electricity market sales to balance CleanPowerSF's supply and demand, represented in this graph as a percentage of CleanPowerSF's annual retail sales. This information serves as a measure of portfolio market exposure as more purchases and/or sales on the wholesale electricity market means greater portfolio exposure to market price volatility. By design, this portfolio relies minimally on California ISO for supplying CleanPowerSF's forecasted demand. However, it relies significantly on the California ISO to absorb excess supply generated by the portfolio.



\*Does not include line losses



To better understand the trade-offs between portfolio time coincidence and affordability, CleanPowerSF analyzed the resource needs required to meet a 90% time coincident target by 2030.

***New!***

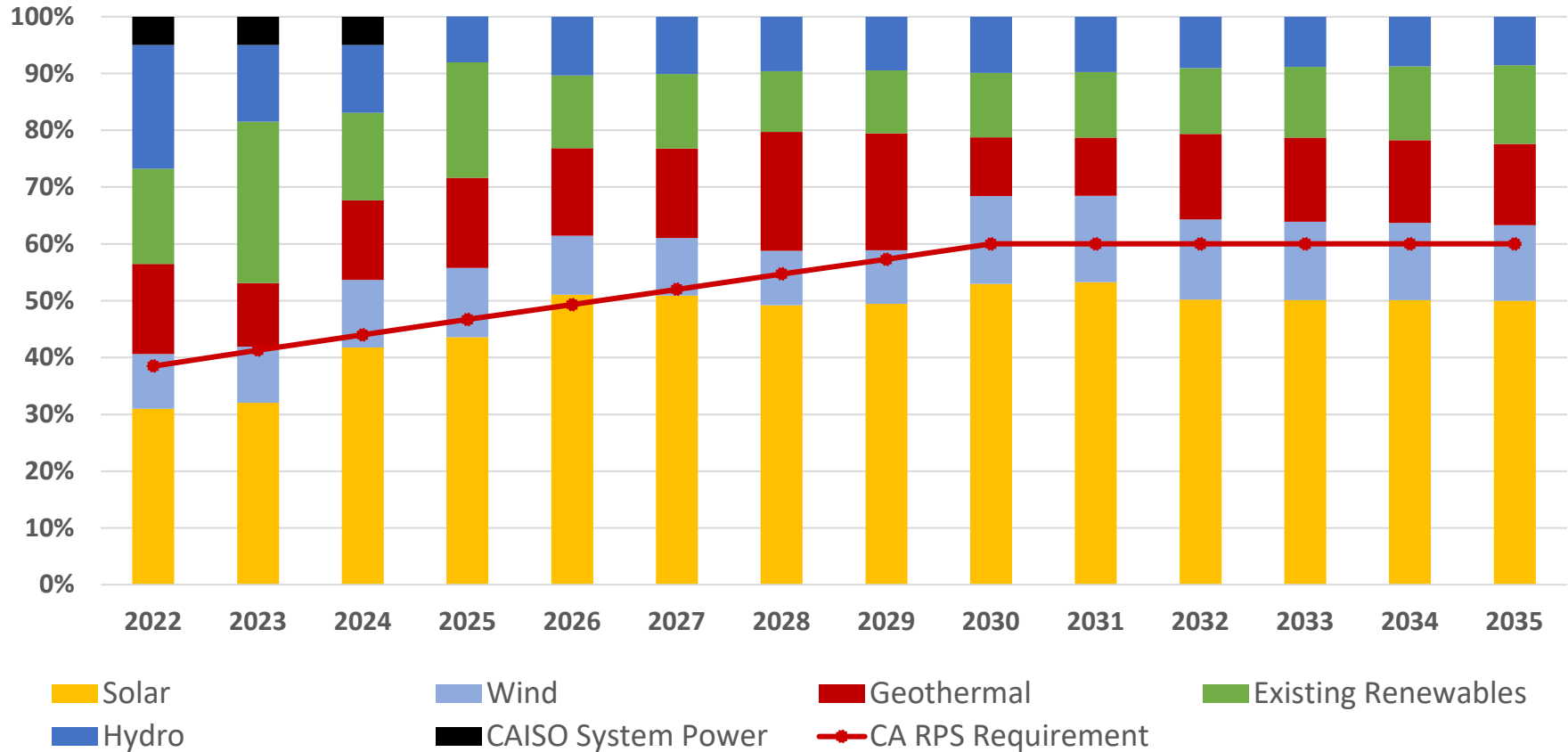
Conforming Portfolio

**INITIAL RESULTS**

**90% TIME COINCIDENT  
PORTFOLIO**

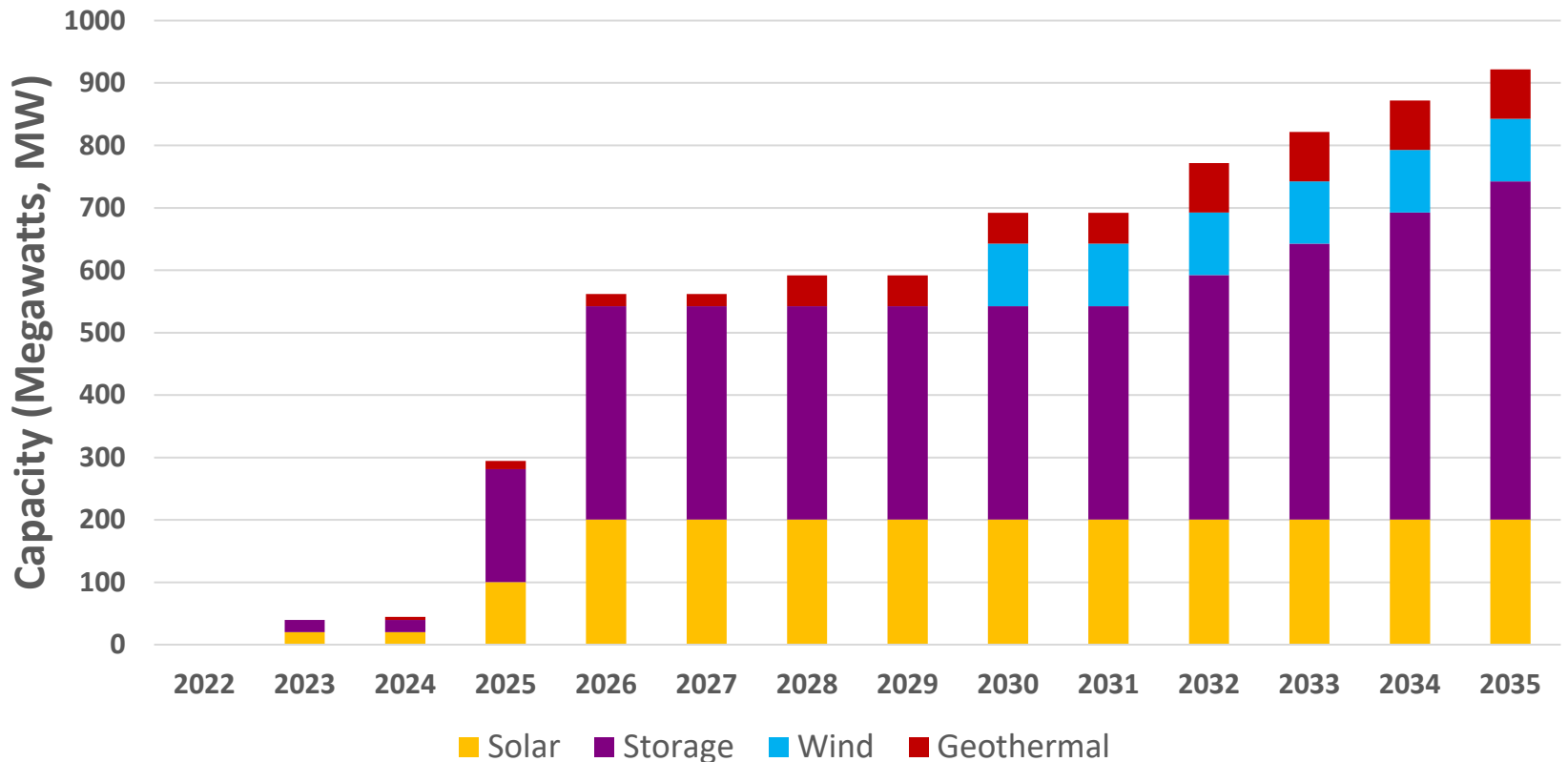
# 90% Time Coincident Portfolio Results: Portfolio Content

The energy supply in the 90% Time Coincident portfolio provides a diverse energy mix, with solar generation accounting for 50% of the energy supply beginning in 2026.



# 90% Time Coincident Portfolio Results: New Resource Capacity Build (2022-2035)

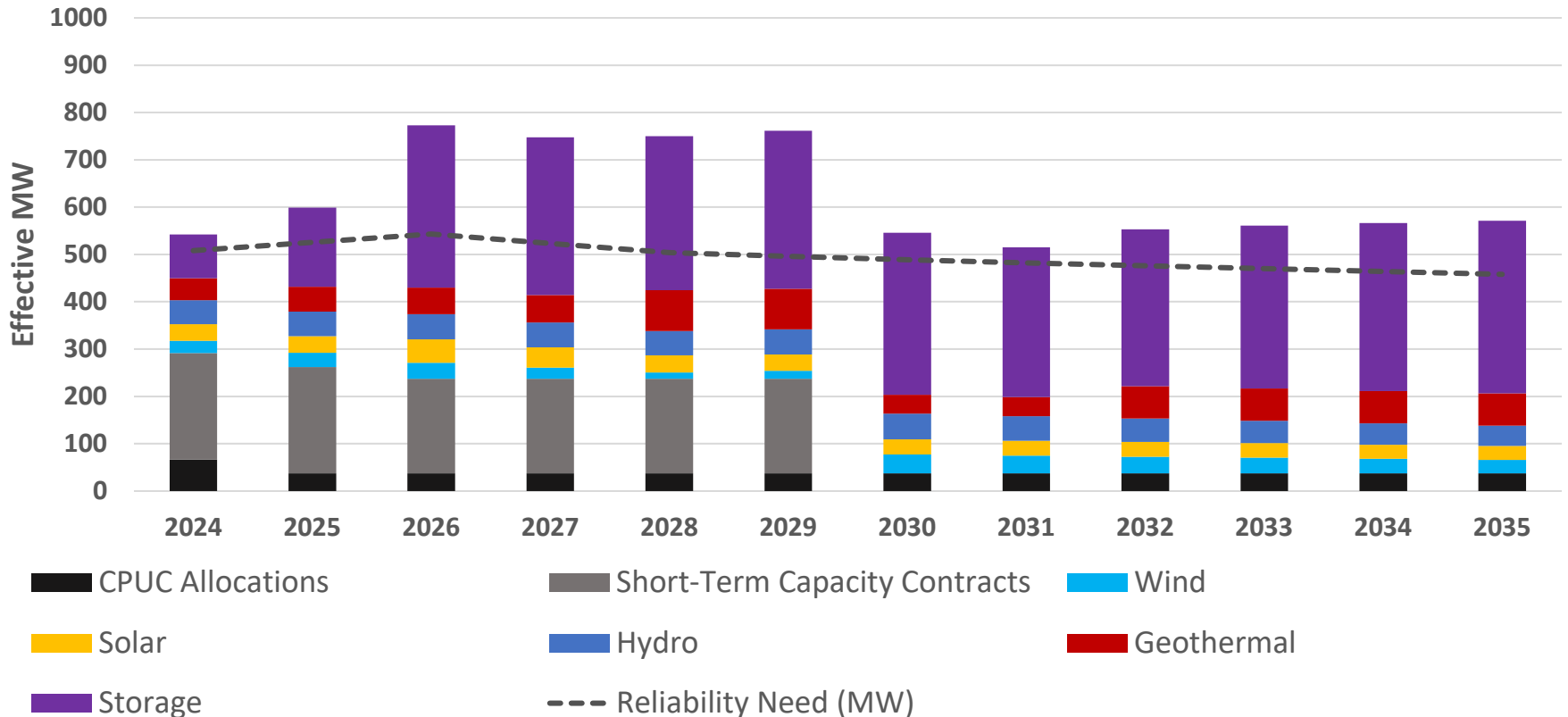
The 90% Time Coincident portfolio calls for 922 MW of new resource capacity by 2035, including 6 MW of new solar, 340 MW of new solar paired with storage (hybrid), 397 MW of standalone storage, 100 MW of new onshore wind, and 79 MW of new geothermal.



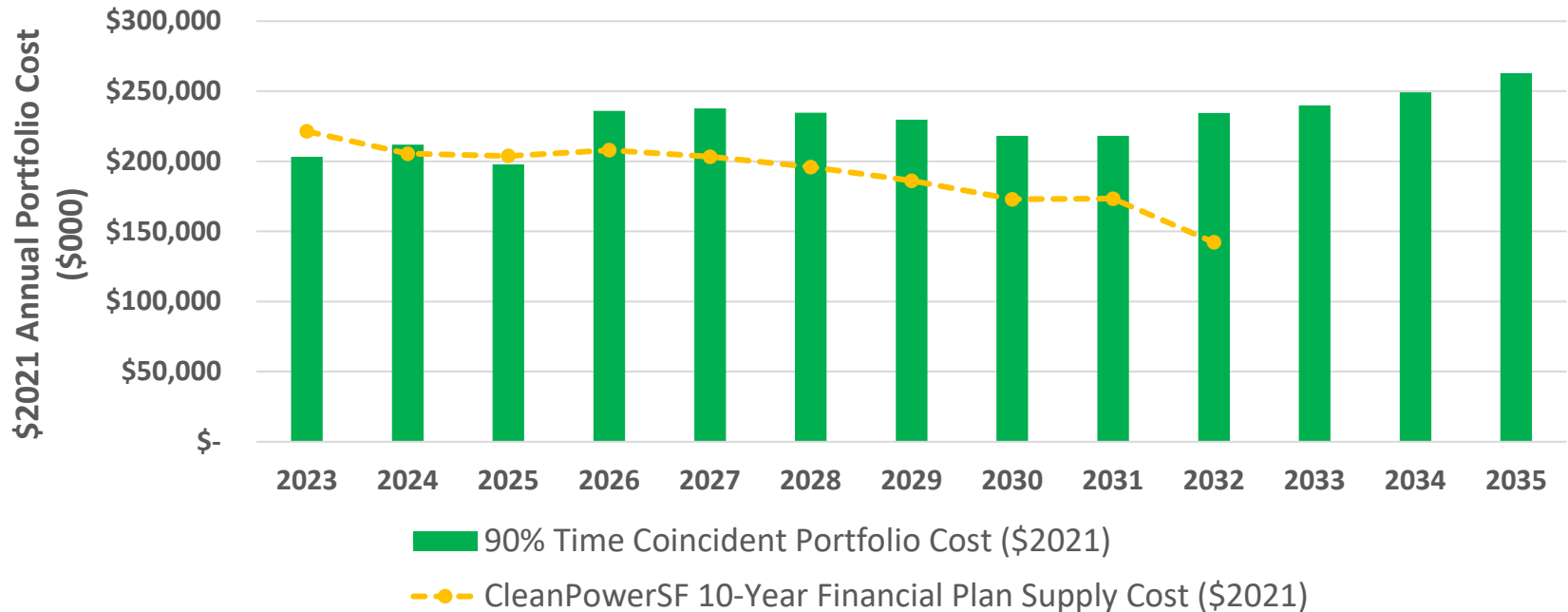


# 90% Time Coincident Portfolio Results: Contributions to Electric Grid Reliability

Due to the significant procurement of energy storage, the 90% Time Coincident portfolio will exceed CleanPowerSF's share of system reliability needs in all years of the planning horizon.



# 90% Time Coincident Portfolio Results: Portfolio Cost

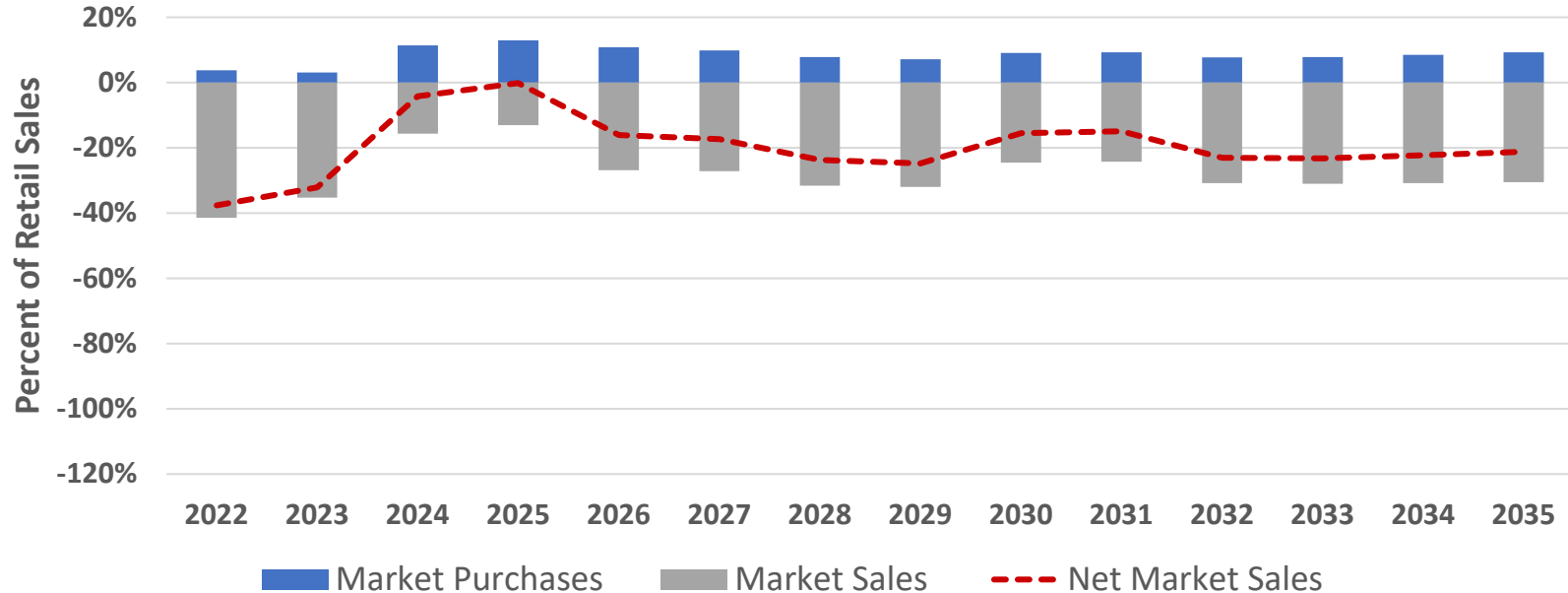


This graph compares the 90% Time Coincident Portfolio costs to CleanPowerSF's forecasted supply costs in its 2021 10-year financial plan. The graph shows that starting in 2026, the 90% Time Coincident case will increase the cost of energy in the portfolio relative to the 10-year plan. Notably, the market price forecast has increased since the 10-year plan was developed, and new build project costs are up due to inflationary and supply chain issues. The total projected revenue requirement in 2021 dollars for the 90% Time Coincident portfolio would be \$1.80 billion vs. \$1.57 billion projected in the 10-year financial plan during the 2023-2032 period (14.4% increase).



# 90% Time Coincident Portfolio Results: California ISO Market Purchases & Sales

The buildout required for the 90% Time Coincident portfolio relies on California ISO electricity market purchases and sales to balance CleanPowerSF's supply and demand, represented in this graph as a percentage of CleanPowerSF's annual retail sales. This information serves as a measure of portfolio market exposure as more purchases and/or sales on the wholesale electricity market means greater portfolio exposure to market price volatility. By design, this portfolio relies minimally on California ISO for supplying CleanPowerSF's forecasted demand. However, it also relies on the California ISO to absorb excess supply generated by the portfolio.



\*Does not include line losses

Alternative Portfolio

# **INITIAL RESULTS**

# **MAYOR'S EV AND BUILDING**

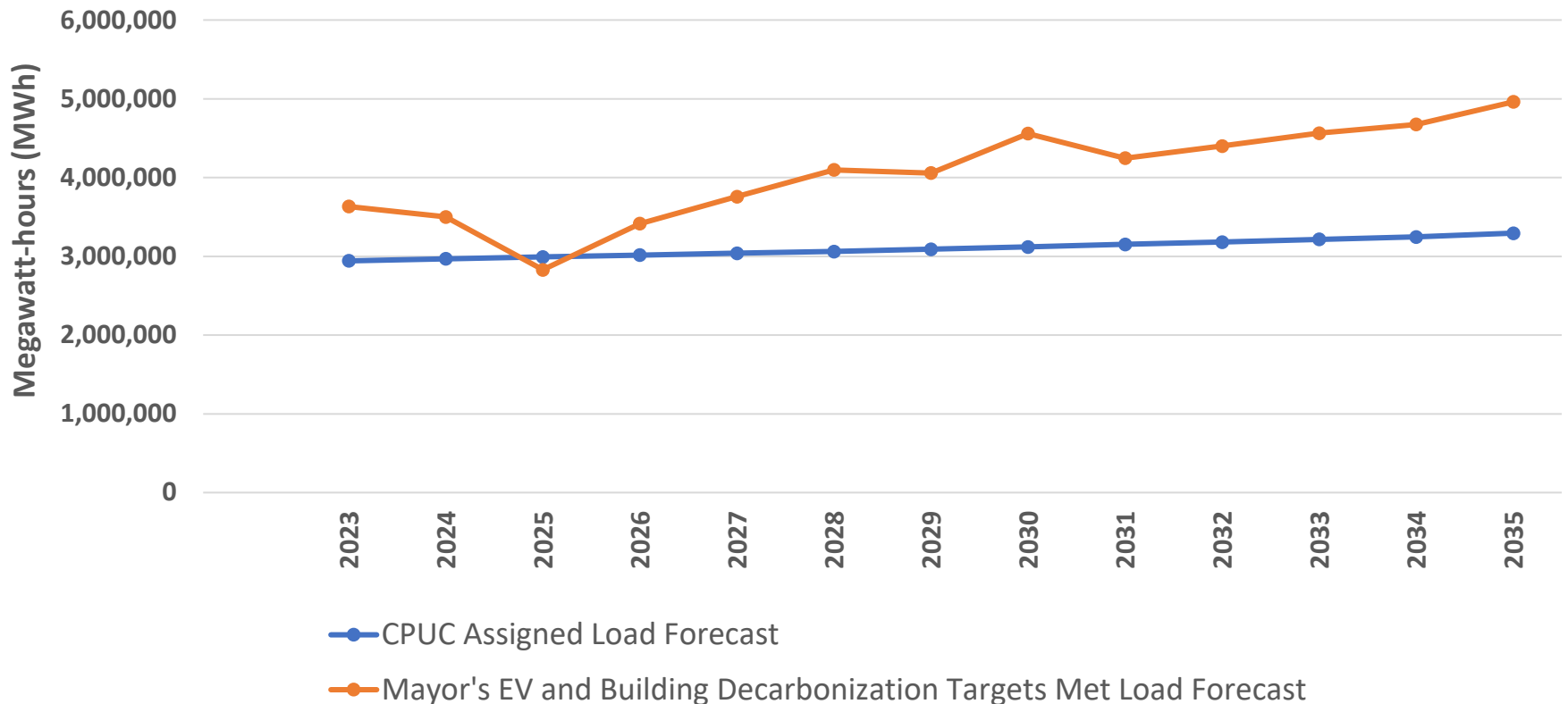
# **DECARBONIZATION TARGETS**

# **MET PORTFOLIO**



# Mayor's EV and Building Decarbonization Targets Met Portfolio: Load Assumptions

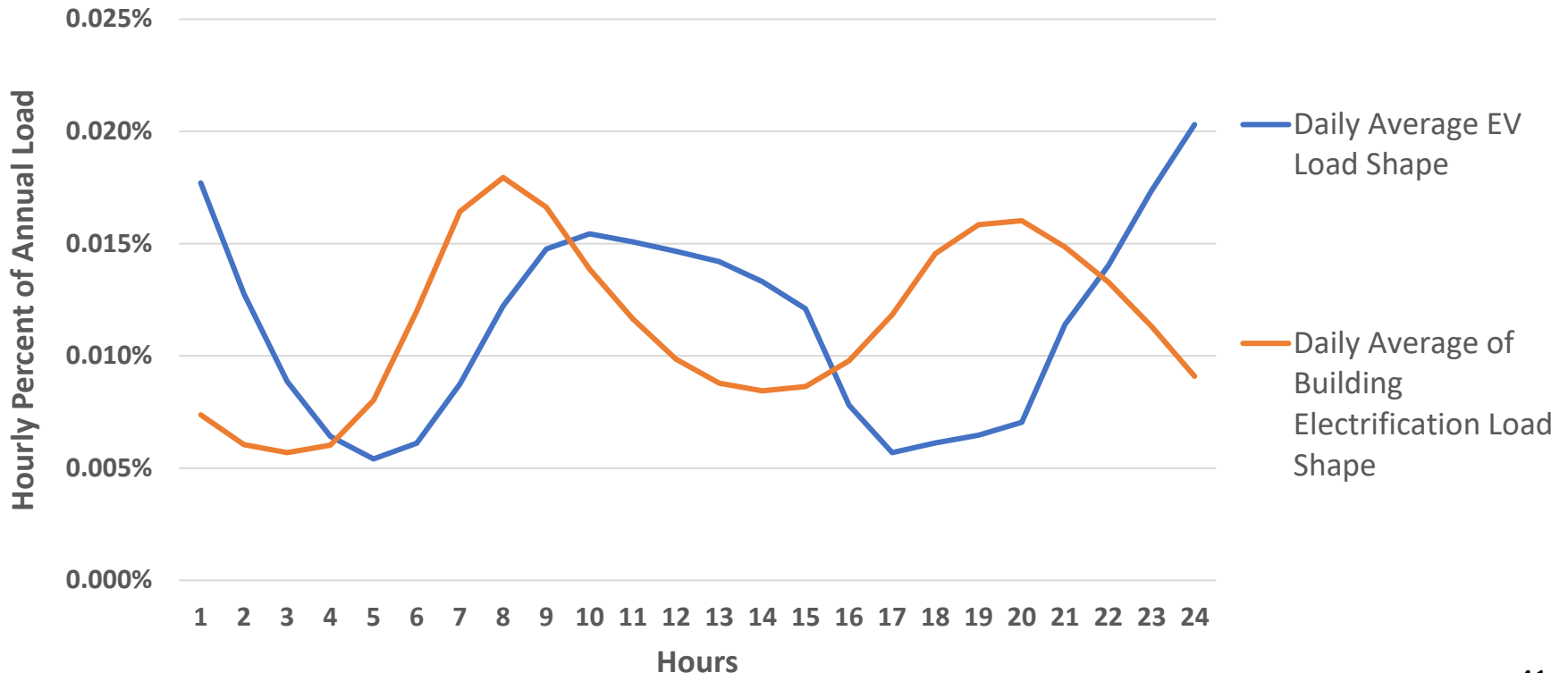
Alternative Portfolios allow for the use of inputs and assumptions that deviate from CPUC requirements. The annual estimated increase in electricity usage resulting from the Mayor's EV and Building Decarbonization Targets Met by 2040 averages 30% higher than CleanPowerSF's assigned load forecast.





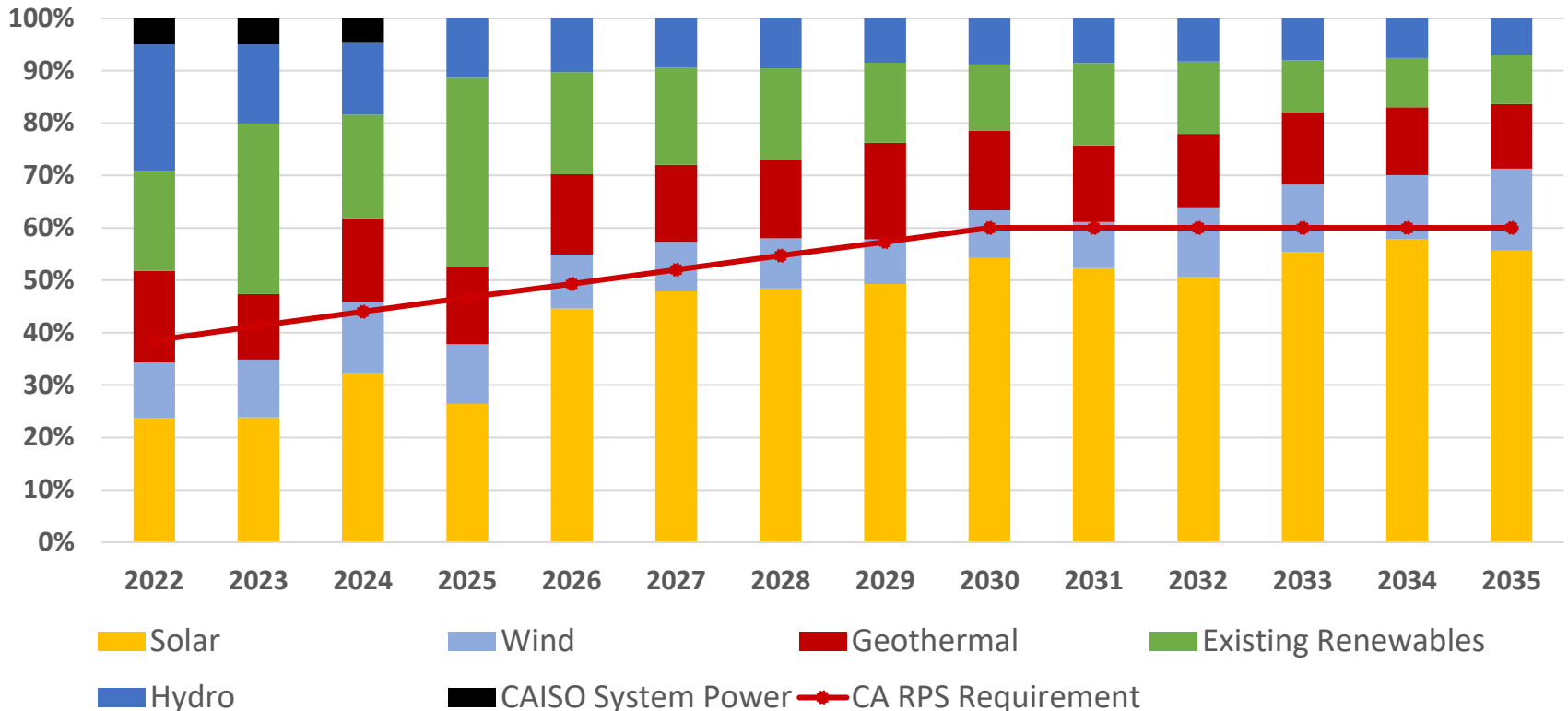
# Mayor's EV and Building Decarbonization Targets Met Portfolio: Load Shape

- Load shapes for electric vehicle charging and building electrification demand are provided by the CPUC
- Electric vehicle charging is highest during the middle of the day and increases again in the middle of the night
- The building electrification shape illustrates higher electricity demand (e.g., space heating/cooling and cooking) in the mornings and evenings.



# Mayor's EV and Building Decarb. Targets Met Portfolio Results: Portfolio Content

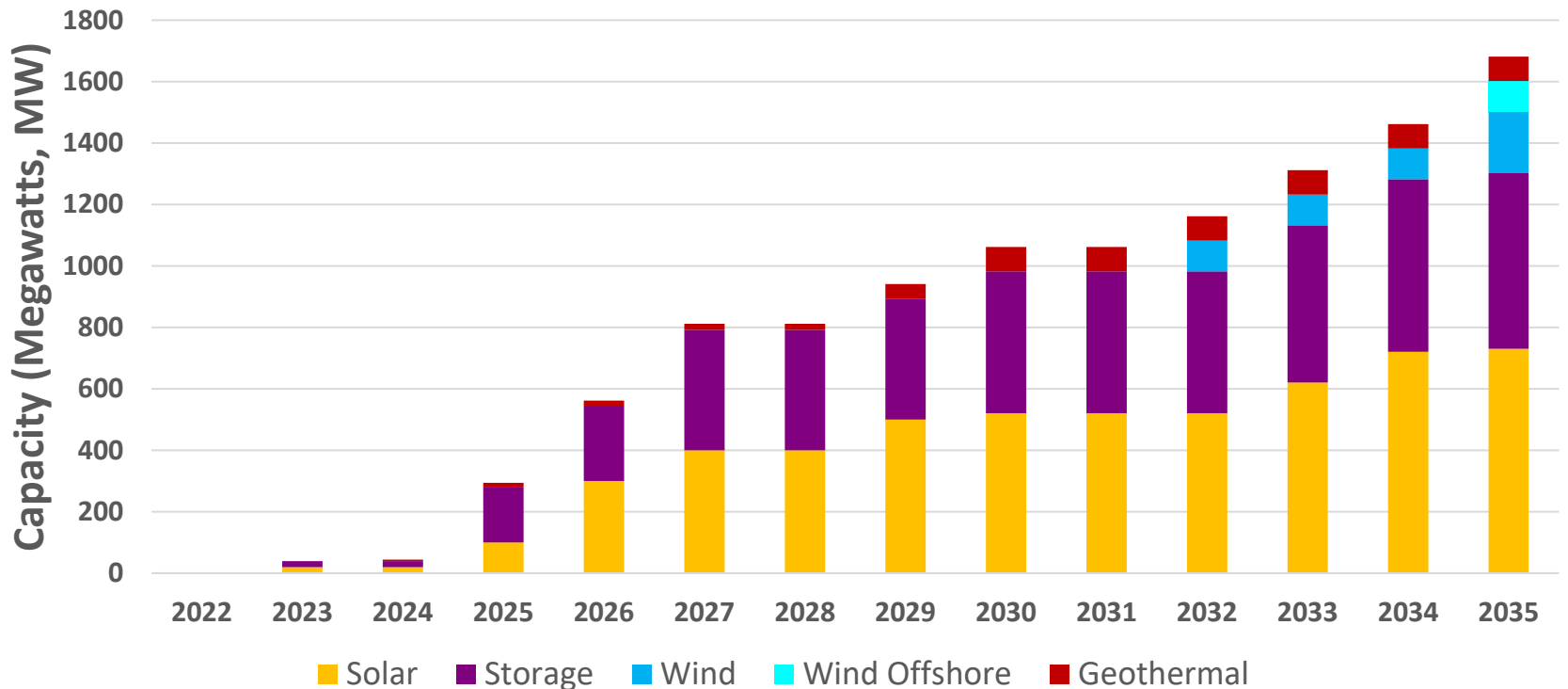
The energy supply in the Mayor's EV and Building Decarbonization Targets Met portfolio provides a diverse energy mix, with more new renewable capacity beyond 2025 to serve increasing electricity usage.





# Mayor's EV and Building Decarbonization Targets Met Portfolio Results: New Resource Capacity Build (2022-2035)

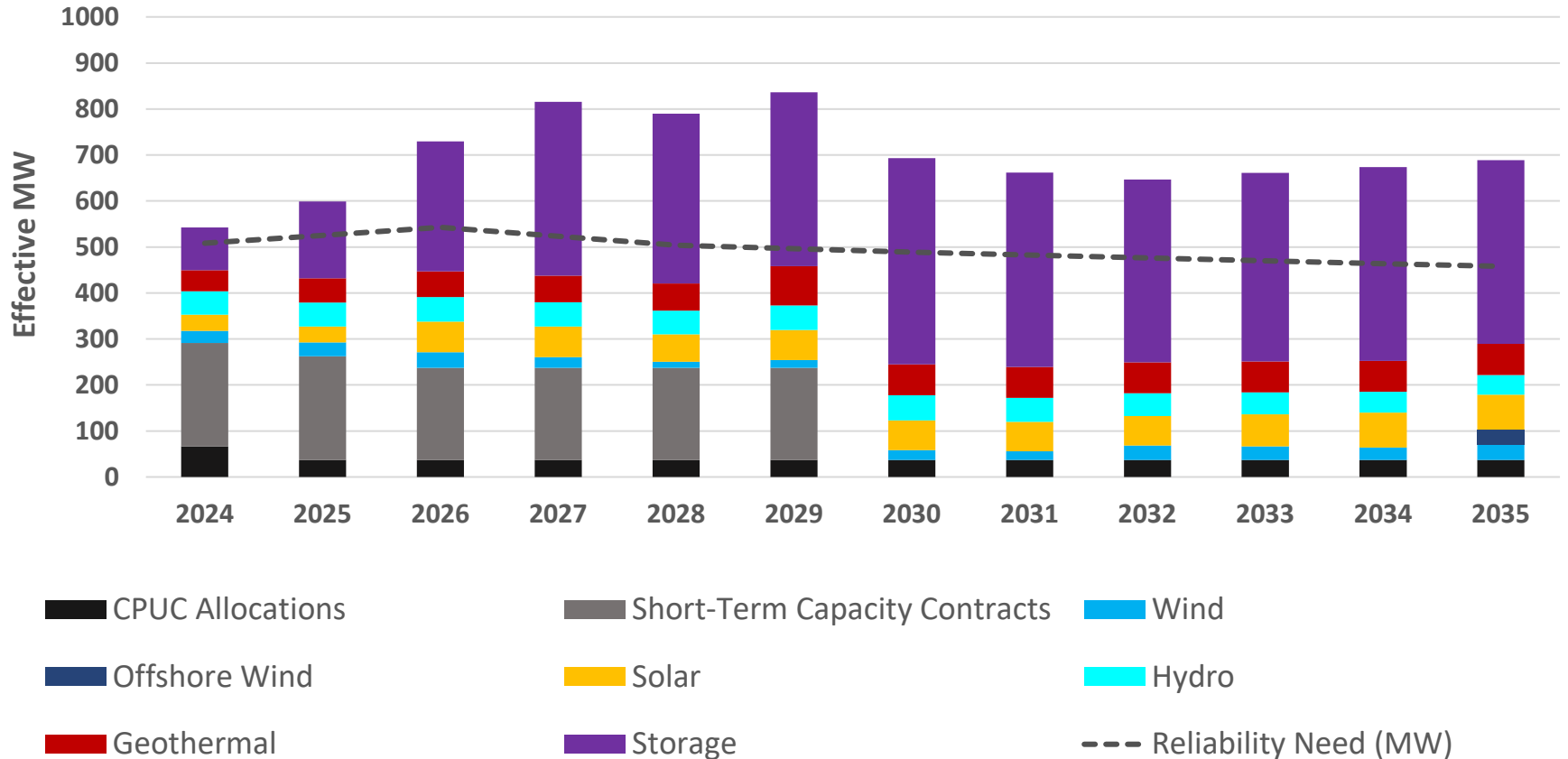
The Mayor's EV and Building Decarbonization Targets Met portfolio calls for 1,682 MW of new resource capacity by 2035, including 206 MW of new solar, 850 MW of new solar paired with storage (hybrid), 247 MW of energy storage, 200 MW of new onshore wind, 100 MW of new offshore wind, and 79 MW of new geothermal.





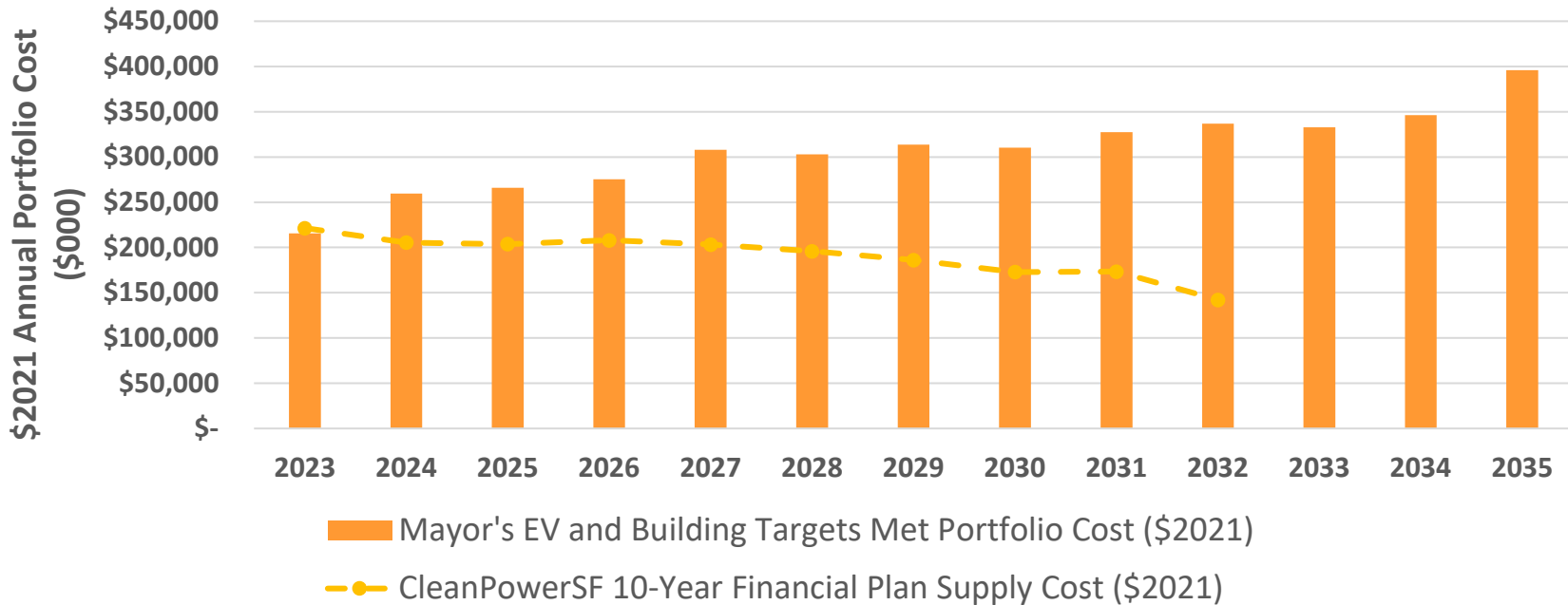
# Mayor's EV and Building Decarbonization Targets Met Portfolio Results: Contributions to Electric Grid Reliability

Due to the significant procurement of both solar and storage, the Mayor's EV and Building Decarbonization Targets Met portfolio will exceed CleanPowerSF's share of system reliability needs in all years of the planning horizon.





# Mayor's EV and Building Decarbonization Targets Met Portfolio Results: Portfolio Cost

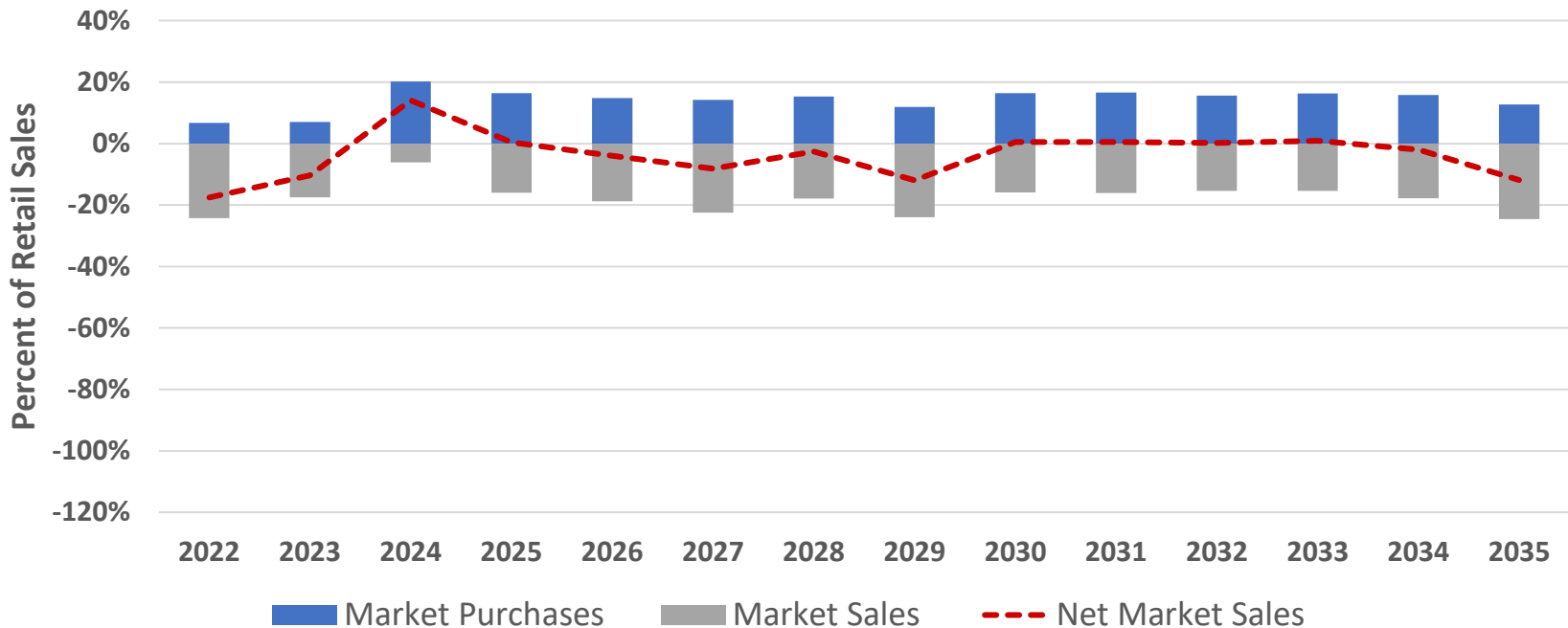


This graph compares the Mayor's EV and Building Decarbonization Targets Met Portfolio costs to CleanPowerSF's forecasted supply costs in its 2021 10-year financial plan. The graph shows that starting in 2024, the Mayor's EV and Building Decarbonization Targets Met case will increase the cost of energy in the portfolio relative to the 10-year plan. Notably, the market price forecast has increased since the 10-year plan was developed, and new build project costs are up due to inflationary and supply chain issues. The total projected revenue requirement in 2021 dollars for the Mayor's EV and Building Decarbonization Targets Met portfolio would be \$2.33 billion vs. \$1.57 billion projected in the 10-year financial plan during the 2023-2032 period (48.8% increase).



# Mayor's EV and Building Decarbonization Targets Met Portfolio Results: California ISO Market Purchases & Sales

The buildout required for the Mayor's EV and Building Decarbonization Targets Met Portfolio relies on California ISO electricity market purchases and sales to balance CleanPowerSF's supply and demand, represented in this graph as a percentage of CleanPowerSF's annual retail sales. This information serves as a measure of portfolio market exposure as more purchases and/or sales on the wholesale electricity market means greater portfolio exposure to market price volatility.



\*Does not include line losses

Alternative Portfolio

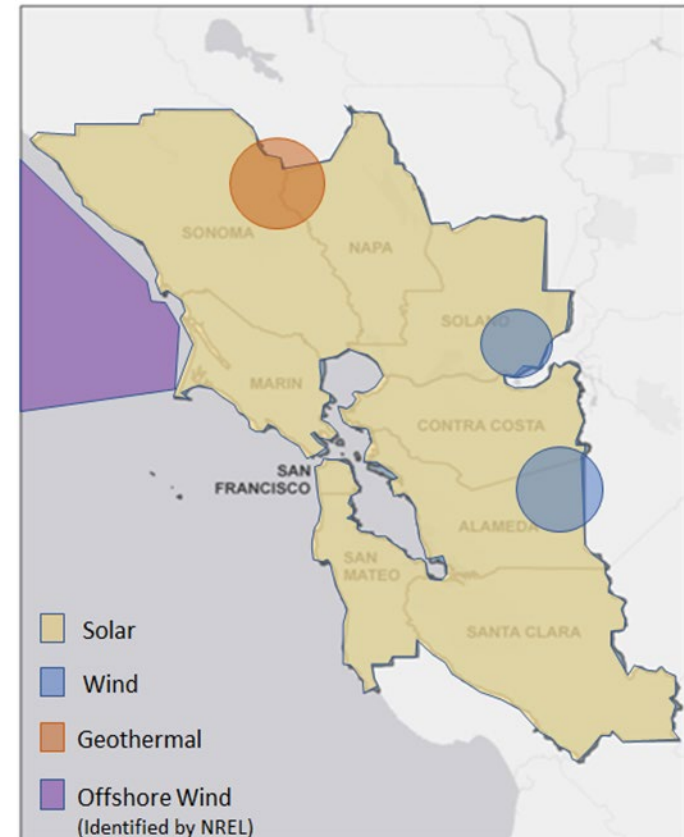
# **INITIAL RESULTS**

# **LOCAL RESOURCE**

# **PROCUREMENT PORTFOLIO**

# Local Resource Assumptions

- Local Resources are defined as resources sited in the nine Bay Area counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma.
- To meet the 50% local content target, the Local Resource Procurement portfolio includes 995 MW of local resource capacity by 2035.

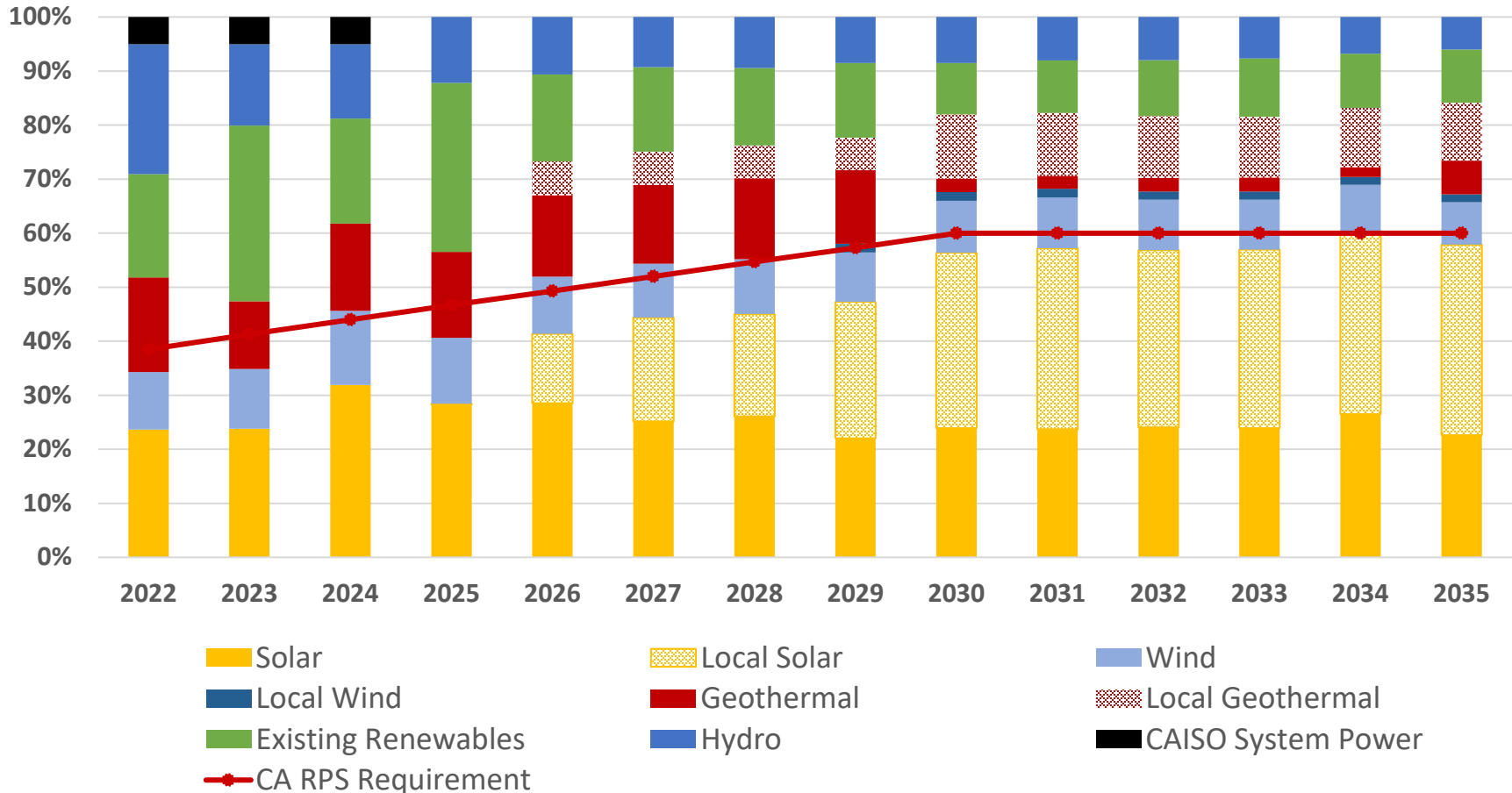






# Local Resource Procurement Portfolio Results: Portfolio Content

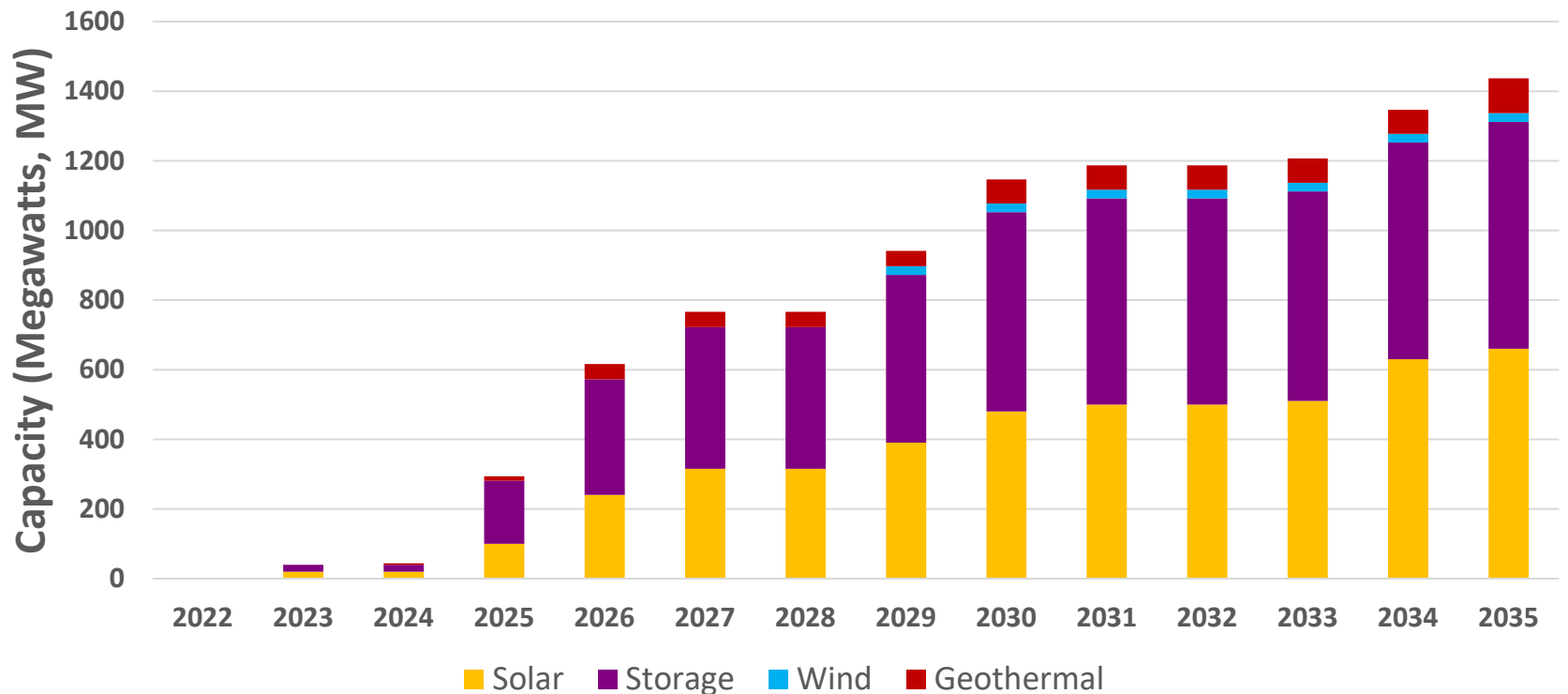
The energy supply in the Local Resource Procurement portfolio provides a diverse energy mix, with local solar, wind, and geothermal supplying 50% of total energy supply by 2030.





# Local Resource Procurement Portfolio Results: New Resource Capacity Build (2022-2035)

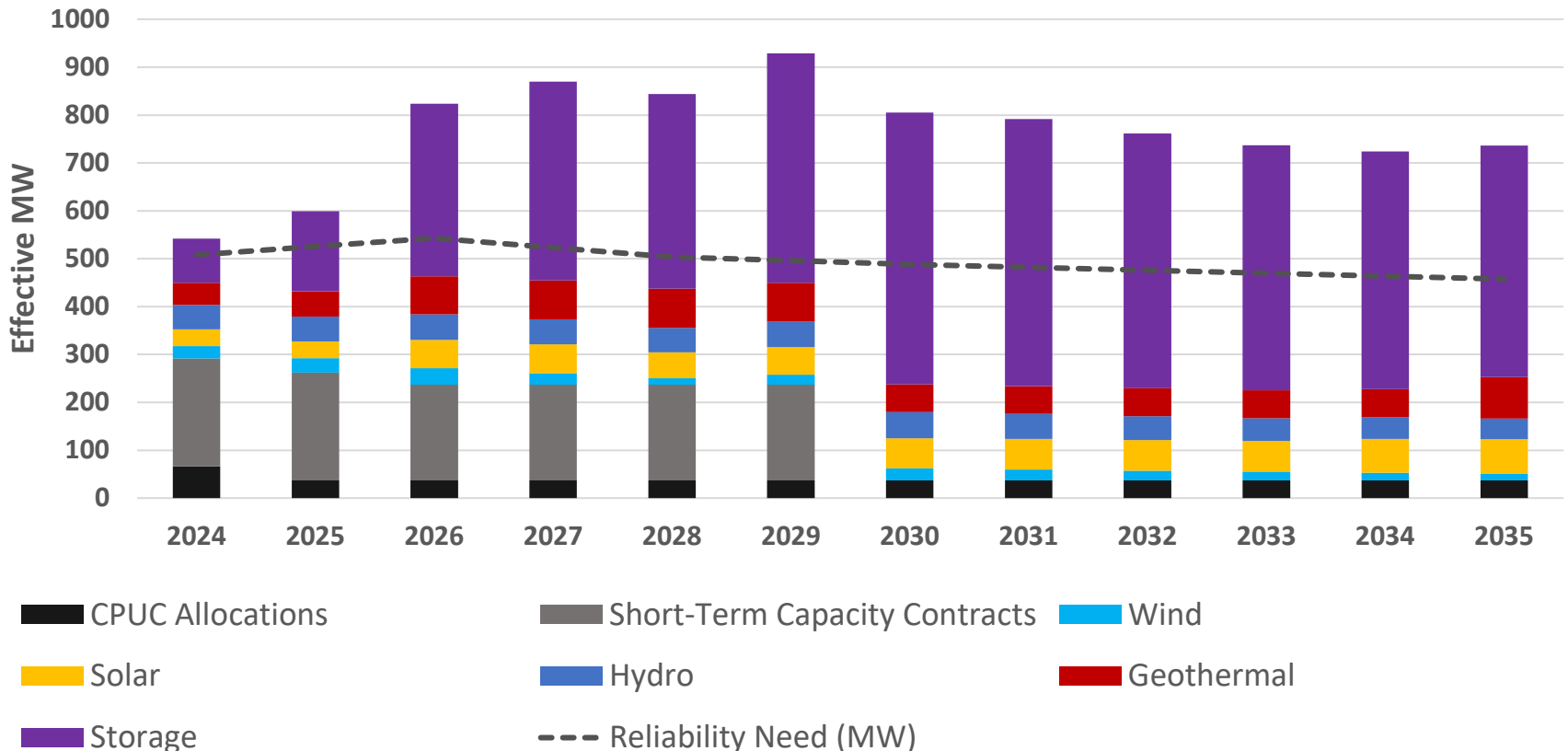
The Local Resource Procurement portfolio calls for 1,437 MW of new resource capacity by 2035, including 106 MW of new solar, 1,110 MW of new solar paired with storage (hybrid), 97 MW of standalone storage, 25 MW of new onshore wind, and 99 MW of new geothermal.





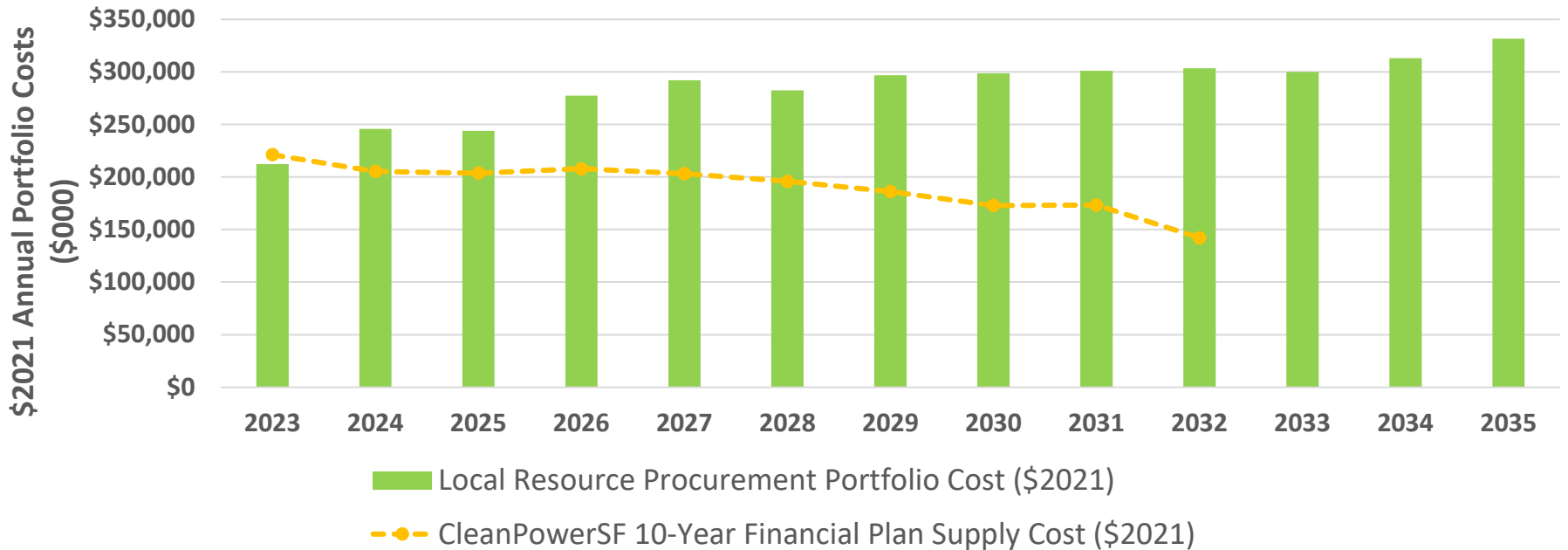
# Local Resource Procurement Portfolio Results: Contributions to Electric Grid Reliability

Due to the significant procurement of both solar-paired storage (hybrid) resources, the Local Resource Procurement portfolio will exceed CleanPowerSF's share of system reliability needs in all years of the planning horizon.





# Local Resource Procurement Portfolio Results: Portfolio Cost

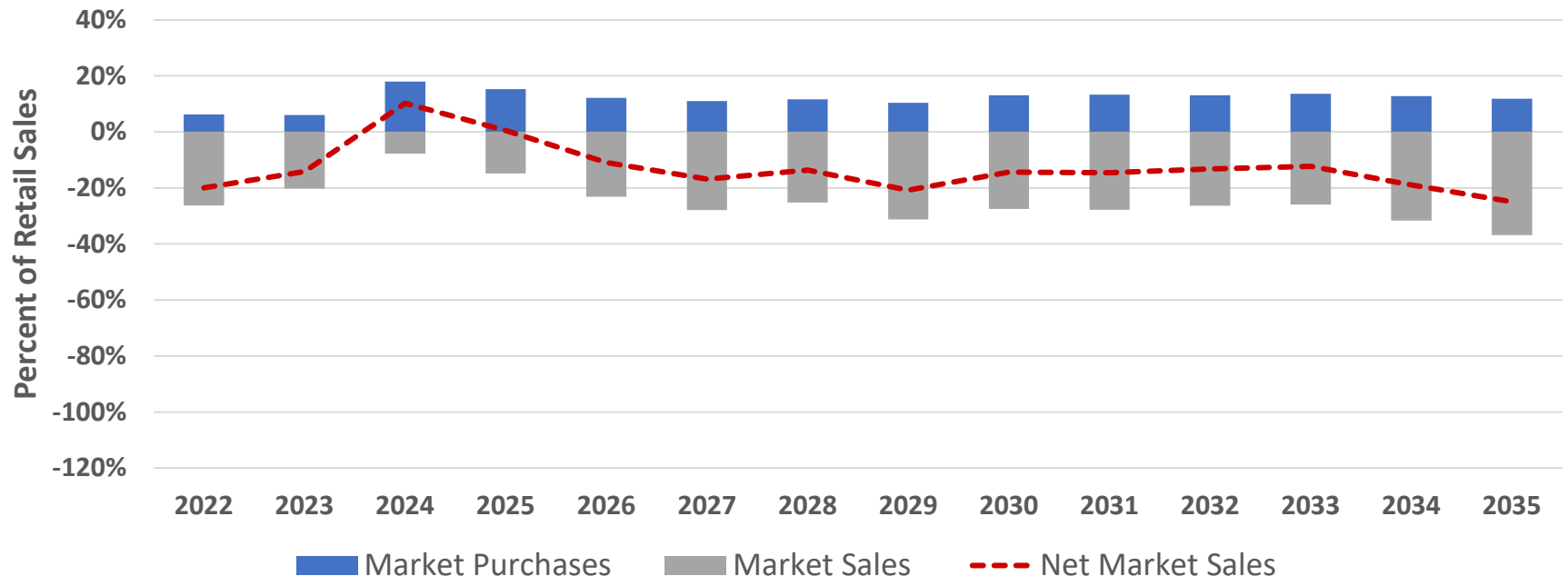


This graph compares the Local Resource Procurement Portfolio costs to CleanPowerSF's forecasted supply costs in its 2021 10-year financial plan. The graph shows that starting in 2024, the Local Resource Procurement case will increase the cost of energy in the portfolio relative to the 10-year plan. Notably, the market price forecast has increased since the 10-year plan was developed, and new build project costs are up due to inflationary and supply chain issues. The total projected revenue requirement in 2021 dollars for the Local Resource Procurement portfolio would be \$2.21 billion vs. \$1.57 billion projected in the 10-year financial plan during the 2023-2032 period (40.8% increase).



# Local Resource Procurement Portfolio Results: California ISO Market Purchases & Sales

The buildout required for the Local Resource Procurement portfolio relies on California ISO electricity market purchases and sales to balance CleanPowerSF's supply and demand, represented in this graph as a percentage of CleanPowerSF's annual retail sales. This information serves as a measure of portfolio market exposure as more purchases and/or sales on the wholesale electricity market means greater portfolio exposure to market price volatility.



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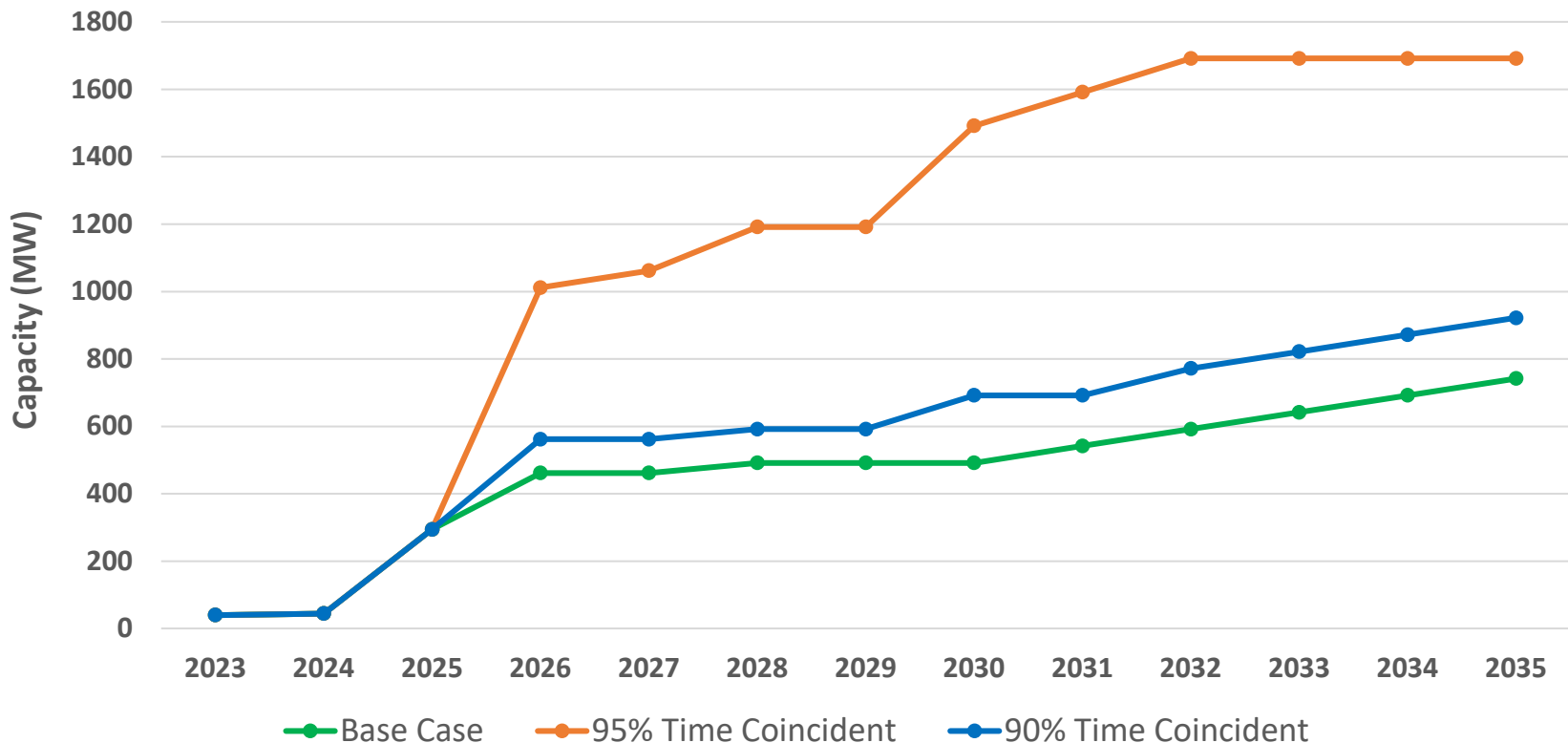
# **INITIAL RESULTS**

## **COMPARISON OF**

### **CONFORMING PORTFOLIOS**

# Comparison of Conforming Portfolios: New Resource Capacity Build

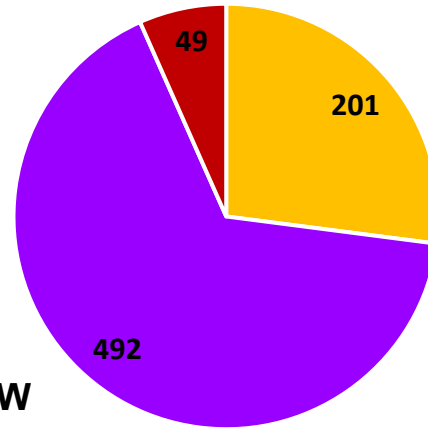
The 95% Time Coincident case (orange line) adds capacity faster than the other cases, then levels off. The Base Case and 90% Time Coincident case requires 56% and 46%, respectively, less new resource capacity than the 95% Time Coincident case by 2035.



# Comparison of Conforming Portfolios: New Resource Capacity Build by Technology (2035)

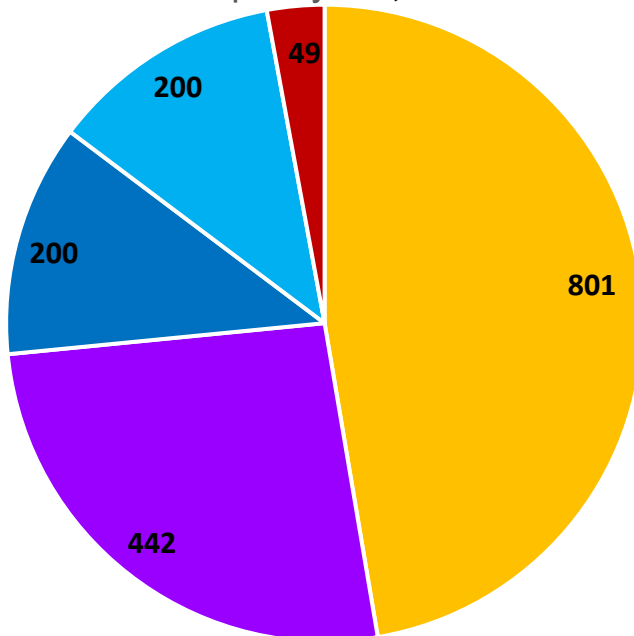
- Solar
- Storage
- Wind
- Wind Offshore
- Geothermal
- Hydro
- Existing Renewables

**Base Case 2035**  
Total New Capacity = **742 MW**

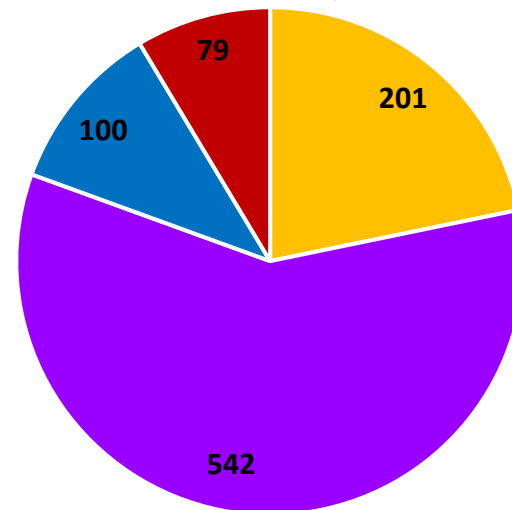


The 95% Time Coincident Case selects more than twice the capacity of the Base Case and 84% more capacity than the 90% Time Coincident Case. The 95% Time Coincident Case also selects offshore wind in 2035, while the Base Case and 90% Time Coincident portfolios include more energy storage resources to meet retail load.

**95% Time Coincident 2035**  
Total New Capacity = **1,692 MW**



**90% Time Coincident 2035**  
Total New Capacity = **922 MW**

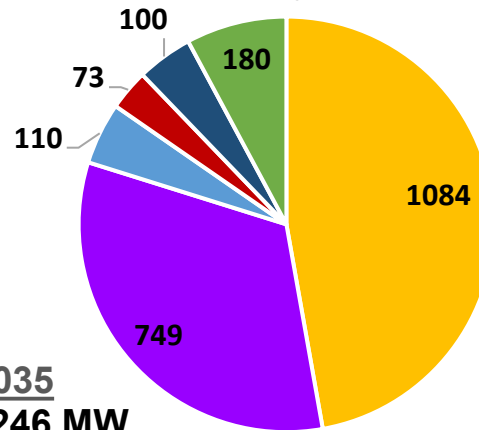




# Comparison of Conforming Portfolios: Total Portfolio Capacity by Technology (2035)

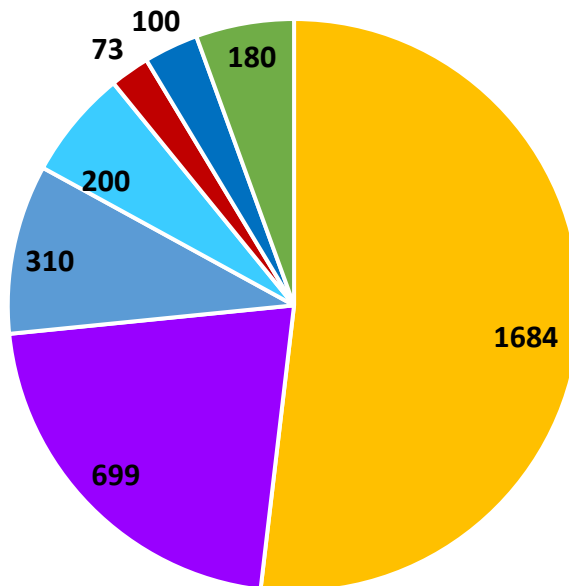
- Solar
- Storage
- Wind
- Wind Offshore
- Geothermal
- Hydro
- Existing Renewables

**Base Case 2035**  
Total Resource Capacity = **2,296 MW**

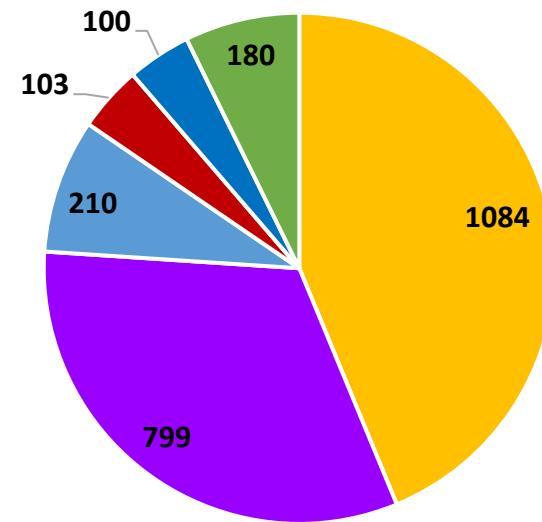


The 95% Time Coincident case requires significantly more capacity than the other two cases to meet the 95% time coincident goal (41% more than the Base Case and 31% more than the 90% Time Coincident Case), including significant amounts of new solar (+600 MW) and wind (+300-400 MW) capacity .

**95% Time Coincident 2035**  
Total Resource Capacity = **3,246 MW**



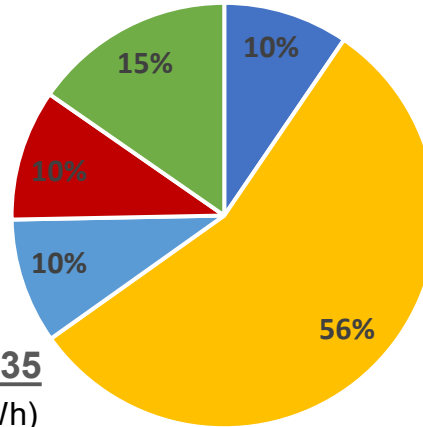
**90% Time Coincident 2035**  
Total Resource Capacity = **2,476 MW**



# Comparison of Conforming Portfolios: Energy Generated by Resource Type (2035)

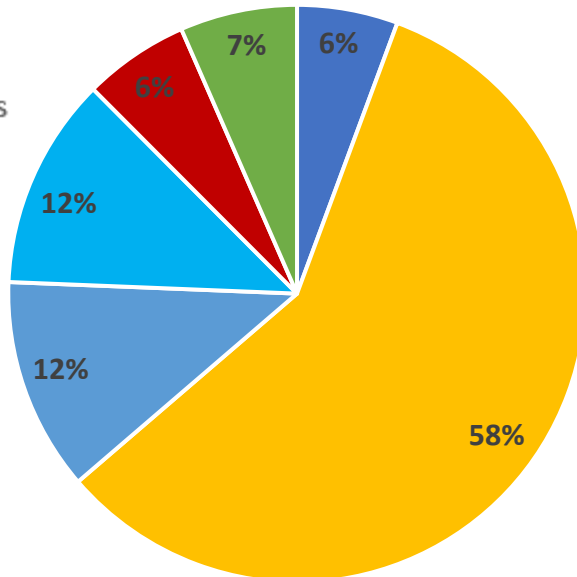
- Solar
- Storage
- Wind
- Wind Offshore
- Geothermal
- Hydro
- Existing Renewables

**Base Case 2035**  
4,060,895 megawatt-hours (MWh)

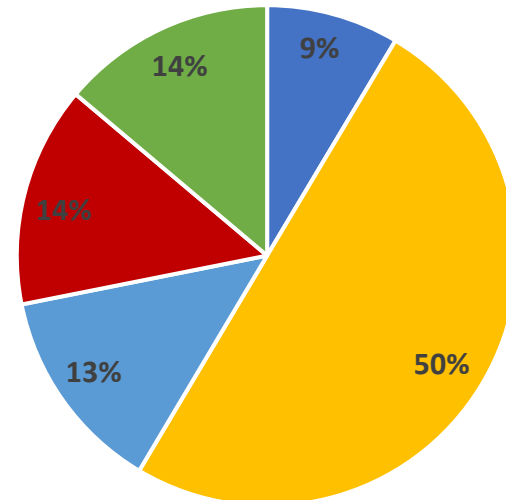


The portfolios have similar energy mixes, although the 95% Time Coincident Case generates significantly more energy annually. As a percentage of total energy supplied, the 95% Time Coincident case includes the most wind energy, both on- and offshore, while the 90% Time Coincident case includes the most geothermal generation in 2035.

**95% Time Coincident 2035**  
6,841,623 megawatt-hours (MWh)



**90% Time Coincident 2035**  
4,517,730 megawatt-hours (MWh)



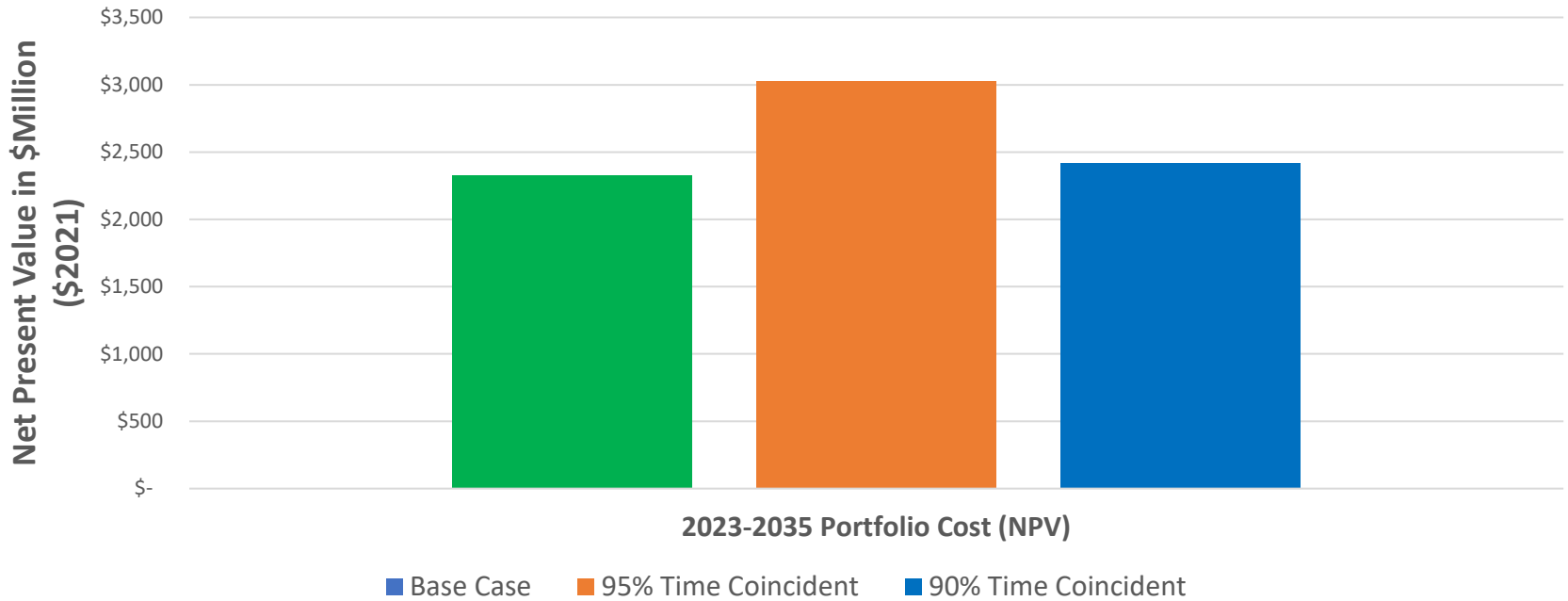
# Comparison of Conforming Portfolios: Local Investment

- All portfolios include 85.6 MW of local solar, 150 MW of local battery storage, and 50 MW of local geothermal
- This represents \$600-\$700 million commitment to local projects\*



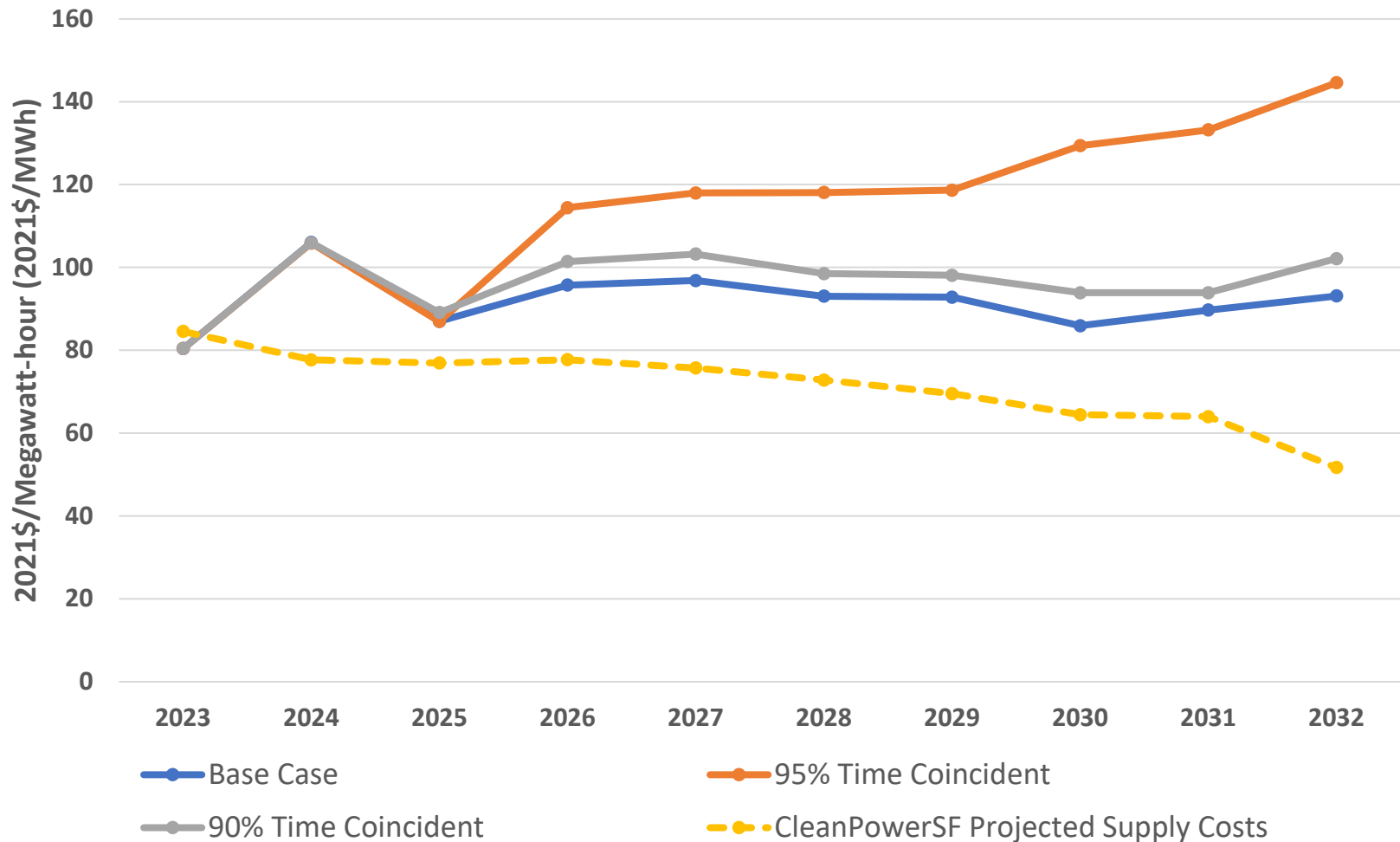
\*Estimated cost of local resource contracts through 2045.

# Comparison of Conforming Portfolios: Portfolio Costs, 2023-2035



Million\$ (2021\$)	Base Case	95% Time Coincident	90% Time Coincident
2023-2035 Portfolio Cost (NPV)	\$ 2,329	\$ 3,031	\$ 2,420
Difference from Base Case (NPV)		\$ 703	\$ 91
Difference from Base Case (%)		30%	4%

# Comparison of Conforming Portfolios: Average Portfolio Costs (2023-2032)



# IRP PORTFOLIO EVALUATION

# Integrated Resource Plan Objectives



**The Sweet Spot:  
CleanPowerSF's  
Preferred Portfolio**

# CleanPowerSF Goals and Objectives



Lead with **Affordable** and  
Reliable Service



Provide **Cleaner** Electricity  
Alternatives



Invest in **Local Renewable**  
**Projects** and **Local Jobs**

*While Providing for Long-Term Rate  
and Financial Stability*



**Balanced  
Program  
Design**

Allows  
Delivery  
Across  
Competing  
Objectives  
While  
Providing  
Financial  
Stability



# CleanPowerSF Portfolio Evaluation



Lead with **Affordable**  
and **Reliable** Service

- Portfolio Cost (\$/MWh)
- Portfolio Reliability
- Resource Diversity



Provide **Cleaner**  
Electricity Alternatives

- Portfolio Emissions
- Renewable Energy Content



Invest in **Local**  
**Renewable Projects**  
and **Local Jobs**

- \$ Invested Locally
- MW Developed Locally
- Job Development Potential

*While Providing for  
Long-Term Rate and  
Financial Stability*

- % Long-term Contracted
- Market Exposure (Net Market Purchases)

# CleanPowerSF Portfolio Evaluation: Affordable, Reliable & Diverse



Lead with **Affordable**  
and Reliable Service

- Portfolio Cost (\$/MWh)
- Portfolio Reliability
- Resource Diversity

- The Base Case Portfolio is the lowest cost in 2035 and over the 2023-2035 period.
  - In 2035, the cost of the Base Case Portfolio is estimated at \$121.2 million less annually than the 95% Time Coincident Case and \$9.9 million less than the 90% Time Coincident Case.
- The cost of the Base Case Portfolio is most inline with CleanPowerSF's 10-year financial plan through 2032, estimated at 9.8% higher in total portfolio cost.
  - Through 2032, the 90% and 95% Time Coincident Portfolios are 14.4% and 40.2%, respectively, higher than the energy portfolio costs estimated in CleanPowerSF's 10-year financial plan.

# CleanPowerSF Portfolio Evaluation: Affordable, Reliable & Diverse



Lead with **Affordable**  
and Reliable Service

- Portfolio Cost (\$/MWh)
- Portfolio Reliability
- Resource Diversity

- The 90% and 95% Time Coincident portfolios meet reliability criteria with long-term contracts, while the Base Case portfolio requires short-term capacity purchases in 2030-2031.
- The 95% Time Coincident Portfolio has the most diverse resource mix, but it also includes significantly more capacity than other cases, which drives up its cost and requires a significant amount of sales on the wholesale market.



# CleanPowerSF Portfolio Evaluation: Cleaner/More Renewable



Provide **Cleaner**  
Electricity Alternatives

- Portfolio Emissions
- Renewable Energy Content

- All portfolios achieve the City's goal of supplying 100% renewable energy by 2025.

# CleanPowerSF Portfolio Evaluation: Local Investment



## Invest in **Local Renewable Projects and Local Jobs**

- \$ Invested Locally
- MW Developed Locally
- Job Development Potential

- All of the portfolios prioritize local resources and include an equivalent amount of new local resource development.
  - All portfolios include 85.6 MW of local solar, 150 MW of local battery storage, and 50 MW of local geothermal.
  - This represents \$600-\$700 million commitment to local projects.
- CleanPowerSF will continue to prioritize local resources in its renewable energy procurement work.



# CleanPowerSF Portfolio Evaluation: Rate and Financial Stability

## *While Providing for Long-Term Rate and Financial Stability*

- % Long-term Contracted
- Market Exposure (Net Market Purchases)

- CleanPowerSF's portfolio risk management framework limits long-term contracting to ~65% of total annual portfolio energy as a means of balancing various policy objectives, including affordability, reliability, cleaner energy, and rate and financial stability.
- The ~65% long-term contracting limit prevents an overcommitted portfolio, mitigates short-term market fluctuations, and provides opportunities to benefit from emerging technologies.
- All Portfolios feature at least 56% long-term contracts (10 years or more) with new renewable resources.
  - The 95% Time Coincident Portfolio is the most long-term contracted at 149% of total retail sales in 2030, but excess long-term resources significantly exceed program long-term contracting limits.
  - The Base Case and 90% Time Coincident Portfolios are more comparably long-term contracted with 60-70% of total retail sales in 2030 and are more in-line with program risk management limits.



# CleanPowerSF Portfolio Evaluation: Rate and Financial Stability

*While Providing for  
Long-Term Rate and  
Financial Stability*

- % Long-term Contracted
- Market Exposure (Spot Market Purchases and Sales)

- We defined energy market exposure as the reliance of a portfolio on the California ISO wholesale energy market for short-term or “spot” purchases (when the portfolio has energy shortages) and sales (when the portfolio has surplus energy).
  - The Base Case Portfolio is the most reliant on market purchases and the least reliant on market sales.
  - The 95% Time Coincident Portfolio is the least reliant on market purchases and the most reliant on market sales.
  - The 90% Time Coincident Portfolio is most balanced and least reliant on both spot market purchases and sales.



# 25 MMT Preferred Portfolio Ranking (1 = best, 3 = worst)

Cases13	Base	90% Time Coincident	95% Time Coincident
<i>Lead with Affordable Service</i>			
Cost	1	2	3
Reliability	3	2	1
Diversity	3	2	1
<i>Provide Cleaner Energy Alternatives</i>			
Emissions	Equivalent		
Renewable	Equivalent		
<i>Invest in Local Projects and Jobs</i>			
Local Investment	Equivalent		
<i>Provide for Long-term Rate and Financial Stability</i>			
% Long-term Energy	1	2	3
Market Exposure	2	1	3
<b>Total</b>	<b>10</b>	<b>9</b>	<b>11</b>



# **CONCLUSIONS AND RECOMMENDATIONS**



# Preferred Portfolio Recommendation

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Staff recommends the Commission adopt the 90% Time Coincident Portfolio because it best balances CleanPowerSF program goals:

✓ **Affordable**

- The 90% Time Coincident Case has total portfolio costs comparable to CleanPowerSF's 10-year financial plan supply costs

✓ **Reliable**

- The 90% Time Coincident Case exceeds the CPUC-assigned annual reliability target and would improve the program's ability to serve demand on a real time basis

✓ **Cleaner**

- The 90% Time Coincident Case achieves City's 100% renewable goals

✓ **Supports Local Investment**

- The 90% Time Coincident Case includes an amount of local resources that is comparable to the other portfolios analyzed

✓ **Supports Rate and Financial Stability**

- The 90% Time Coincident Case provides long-term rate stability without over-building and creating unreasonable market risk

## Next Steps

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- Written comment period available at <https://www.cleanpowersf.org/resourceplan> will close at 5pm PST on Friday, October 14th.
- Staff will present IRP modeling results to the Commission on October 11<sup>th</sup>.
- Staff will return to the Commission on October 25<sup>th</sup> to seek approval and adoption of a Preferred Conforming Portfolio for submission of the IRP Compliance Filing on November 1<sup>st</sup>.

# APPENDIX



# Key IRP Terms and Acronyms

Term (Acronym)	Meaning
Analytical Modeling	Mathematical technique used for simulating, explaining, and making predictions about a complex system
California Independent System Operator (CAISO)	Organization that manages California’s bulk electricity grid, transmission lines, and wholesale energy market.
California Public Utilities Commission (CPUC)	State energy regulatory agency that oversees the IRP process for Investor-Owned Utilities (IOU), Energy Service Providers (ESP) and Community Choice Aggregators (CCA)
Capacity	The maximum output that a generator can produce, it is typically expressed in terms of megawatts (MW) or kilowatts (kW)
Capacity Factor	A measure of how much energy is produced compared to the resource’s maximum capacity over a set period time, expressed as a percentage
Demand	The amount of electricity usage met by a retail seller over a given period of time
Energy	The ability to do work
Energy Storage	A technology which captures energy produced at one time and discharges it for use at a later time
Hybrid Resources	A generator that consists of two or more paired resource types eg., solar plus battery storage



# Key Terms and Acronyms

Term (Acronym)	Meaning
Integrated Energy Policy Report (IEPR)	A biennial report issued by the California Energy Commission that contains an assessment of major energy trends and issues facing California’s electricity sector, including the demand forecast used in CleanPowerSF’s Integrated Resource Plan
Integrated Resource Planning	A process that evaluates future electricity demand and resource options over a long time horizon, typically 20 years, and optimizes the resource mix that meets set criteria at the lowest cost
Investment Tax Credit (ITC)	A federal tax credit available to investment in solar power facilities and co-located energy storage facilities
Job-years	A job creation metric which is equivalent to one full time job (2,080 working hours) for one year
Load Serving Entity (LSE)	A retail seller of electricity
Long-duration Energy Storage	Battery storage of various technology types which can discharge for 8 hours or more
Megawatt (MW)	1,000,000 watts (a unit of power demand or generating capacity)
MMT CO2	Million metric tons of carbon dioxide
Portfolio	A collection of power supply resources used to serve electricity demand



# Key Terms and Acronyms

Term (Acronym)	Meaning
Preferred Portfolio	Of the portfolios modeled, the one which best meets program goals and regulatory requirements that is approved and submitted to the California Public Utilities Commission
Preferred System Plan	The portfolio developed by the California Public Utilities Commission with an aggregation of individual IRPs of all retail sellers subject to CPUC jurisdiction that includes the CPUC's view of the optimal mix of resources for the state over the IRP planning horizon
Reliability Need	Share of resource capacity needed to meet the CAISO managed coincident peak assigned to retail sellers by the California Public Utilities Commission
Renewable Portfolio Standard (RPS)	California State program that requires a minimum amount of electricity in retail seller portfolios to come from eligible renewable energy resources
Resource Adequacy (RA)	A capacity-based regulatory program intended to ensure that there are sufficient electricity generating resources to support reliable grid operation under peak demand conditions
Revenue Requirement	The total amount of money an electricity provider collects from its customers
Sensitivity Analysis	Analysis of the impact to the portfolio caused by a change to a variable in the analytical model
System Power	Electric generation supplied by the grid at a particular time that is not associated with a specific generating facility