GWP 2024 Integrated Resource Plan

Townhall 4

November 16, 2023

Welcome!

- Who here has attended any previous IRP townhalls?
- Who here has attended ***all*** previous townhalls?

Townhall reminders!

- We have translators available in Armenian and Spanish. Please ask if you know someone who may need translation help.
  - Look out for the nametags!
- Please hold any questions on presentations until the Q&A portions.
- We'll try to create opportunities for as many folks to contribute as possible, so please allow space for other perspectives.
- Please use a microphone when speaking so the recording equipment can hear you.

Integrated Resource Plan process overview

1. GWP and a Stakeholder Technical Advisory Group (STAG) made up of 13 Glendale community members developed 6 future energy scenarios to model.

2. Ascend Analytics tested these strategies in their model to see how they compare on reliability, sustainability, and affordability.

3. GWP and STAG were presented these results and discussed implications.

4. Based on the results, GWP chose a "preferred portfolio" of resources it recommends developing.

5. GWP is now presenting the selection to the public and will present it to City Council on December 5th for approval.

How has community input been integrated into the IRP so far?

- STAG considered community input provided at townhalls in all phases of its scenario development. Its scenarios integrated:
  - Heavy emphasis on customer resources (rooftop solar, energy efficiency, demand response)
  - Preference for local renewables
  - Clean energy timelines that exceed California's 2045 mandate
- In response to community feedback at townhall 3, Ascend and GWP added a third community scenario to the IRP modeling, for a total of 6 scenarios.
- Ascend also conducted social cost of carbon analyses for all scenarios based on community interest.

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Modeling results

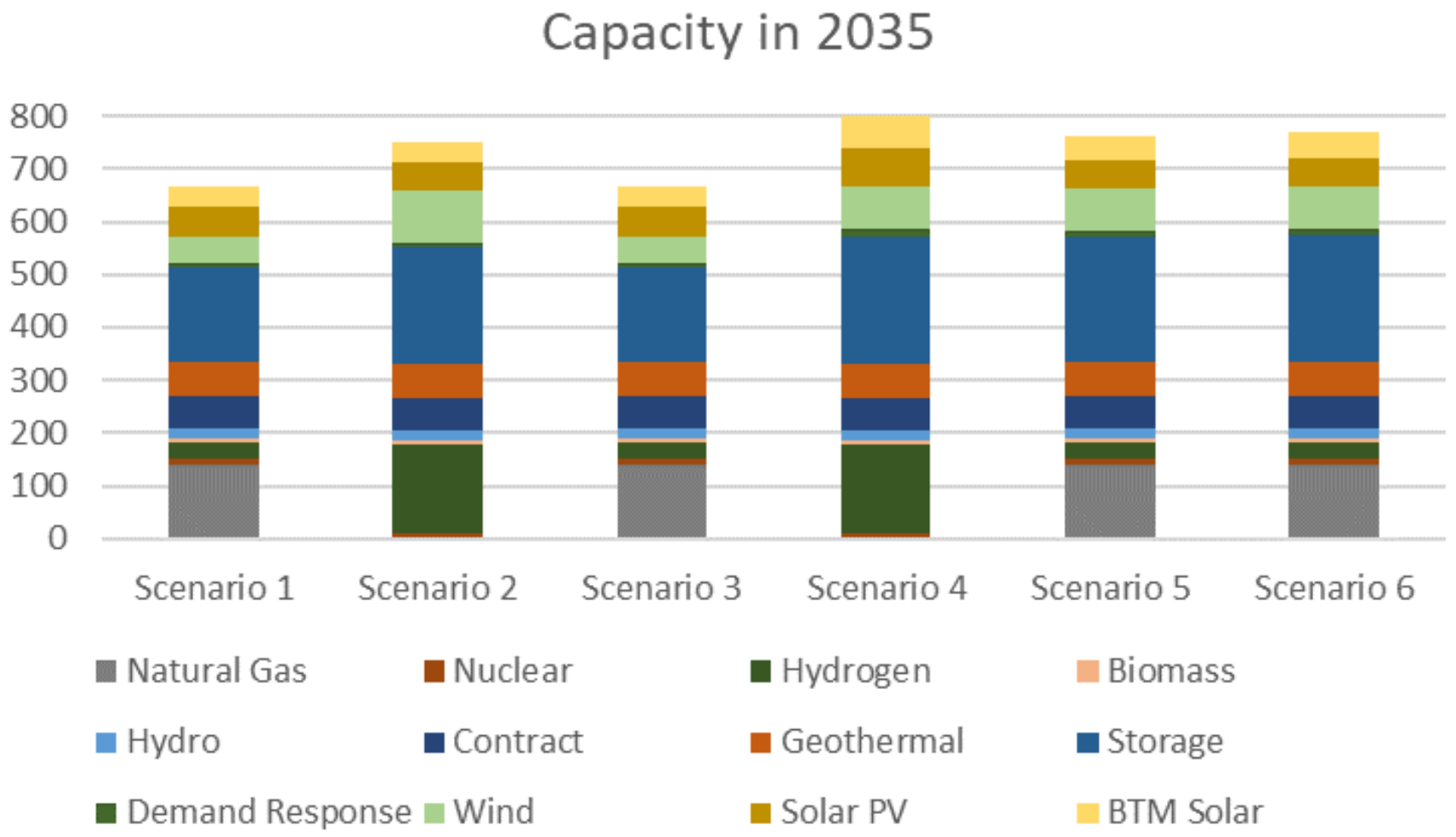
Summary of scenarios

	Scenario	100% clean energy date	Meets CA mandate	Meets Glendale goal	Key features
1	*CA policy*	2045	X		• Serves 91% of load with clean energy • Keeps existing natural gas resources with reduced use
2	*Glendale 2035 goal*	2035	X	X	• Transitions natural gas to hydrogen in 2035 • Increases utility scale renewables early
3	*CA policy – with offsets*	2045	X		• Relies on REC purchases for 10% of the clean energy mandate
4	*Local resources + accelerated electrification*	2035	X	X	• Integrates all City Council goals for clean energy and distributed energy resources (DERs) • Modeled accelerated electrification and energy efficiency • Highest assumptions on DERs and local resource potential
5	*Gradual decarbonization path*	2042 (with 90% by 2035)	X		• High DER and local resource potential assumptions • Natural gas replace by hydrogen in 2042 • Magnolia retires in 2038
6	*Moderate transition to carbon free*	2040 (with 90% by 2035)	X		• High DER and local resource potential assumptions • Natural gas replaced in 2040 • Renewables and storage added to fill resource needs earlier

Summary of model results

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Costs in $M Net Present Value (2024 - 2045)	CA Policy	Carbon Free 2035	CA Policy w/Offsets	Carbon Free 2035 - High DER	Carbon Free 2042 - Magnolia Retire 2038	Carbon Free 2040
New Resource Capital Costs	$535	$1,296	$491	$1,145	$897	$867
Operating Costs	1,073	970	1,098	1,086	1,131	1,142
Total Costs	**1,608**	**2,267**	**1,589**	**2,231**	**2,027**	**2,009**
TOTAL with Social Cost of Carbon	1,918	2,490	1,917	2,440	2,278	2,274
Cost per MWh	$93.97	$129.80	$92.88	$130.40	$118.48	$117.41
Cumulative Carbon Emissions (Tons)	2,597,041	1,642,076	2,765,838	1,434,151	1,816,241	2,035,232
GHG Emission Reductions from Generation in 2035 compared to 2024	67%	100%	63%	100%	72%	71%
% Clean in 2035	91%	109%	84%	129%	103%	95%

2035 resource mix



Key finding 1

A transition to a clean energy system relies on technical progress.

- Long Duration Storage (multi-day)
  - Able to shift variable generation over several days
  - Not yet commercially available
  - Some pilot projects are being planned with small capacities
  - Installation requires large amount of land – (Form Energy states 3MW per acre)
- Medium Duration storage (Eight to ten-hours)
  - Commercially available but not yet widely installed
  - Shifts variable generation from low demand to high demand hours within a day
- Clean Firm Generation (Dispatchable)
  - Most promising technologies are Green Hydrogen, CCUS, Renewable Natural Gas, and Small Modular Reactors
  - Not yet commercially available
  - Of the possible options, Green Hydrogen is considered the most likely and most cost-effective, but requires infrastructure and technical advancement

Clean dispatchable generation

Hydrogen powered CTs or ICEs

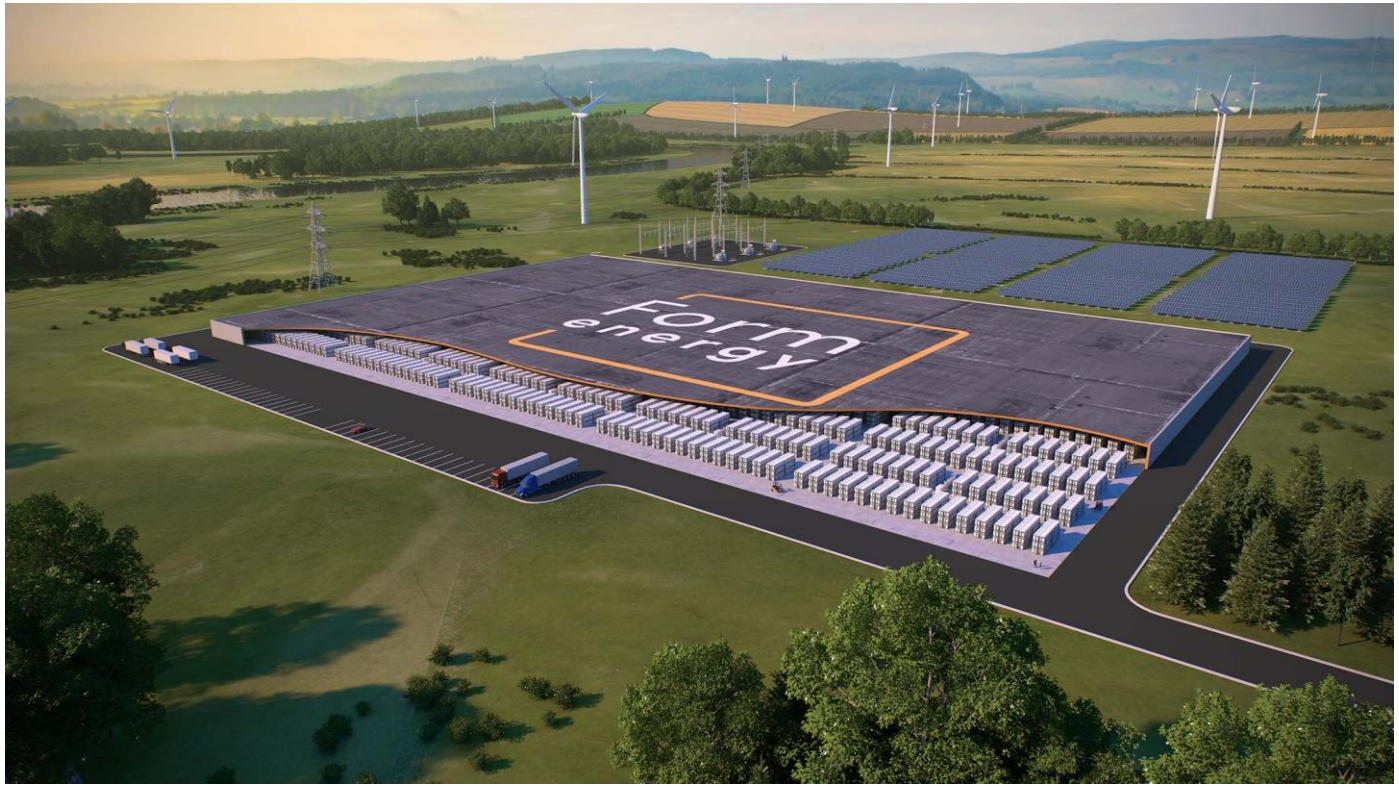
- IPP will be one of the first hydrogen facilities in the world when it comes online
- Provides carbon-free, fully dispatchable generation
- Large losses occur when transforming renewable energy to hydrogen and then back to clean power
- Infrastructure is needed to get hydrogen to the power plants

Nuclear Small Modular Reactors (SMRs)

- Small design compared to traditional reactors
- Provides carbon-free, fully dispatchable generation
- Costs will likely be higher than hydrogen

Long duration storage

- Form Energy is developing a 100-hour Iron-air battery
- Currently plan for small pilots with multiple utilities
- ESS is developing a 12-hour Iron flow battery, also in the pilot stage
- Long duration storage provides dispatchable capacity by shifting generation over many hours
- The down-side of long duration storage are:
  - Low efficiency; roughly 50 – 60% efficient
  - High land requirements; cells cannot be stacked



Key finding 2

A full transition requires replacement of Grayson 9, ICEs and Magnolia with firm, clean options.

- Retirements of in-basin natural gas resources create reliability challenges for GWP
- GWP is required to maintain operational reserves based on the N-1-1 contingency planning
  - In 2035, peak load is projected to be 416 MW
  - For N-1-1, GWP can rely on 100 MW from the SWAC line, remaining capacity must be local
  - Remaining resources add up to 376
- GWP must add 416 – 376 = **40 MW** of local capacity to meet load growth

N-1-1 Resource Contribution	
SWAC line (without STS)	113
DR	8
City Solar	10
Magnolia	35
ICE	54
Grayson 9	48
Eland Solar and Storage	25
Energy Storage	75
Scholl's Canyon	8
Total Resources	**376**

Key finding 3

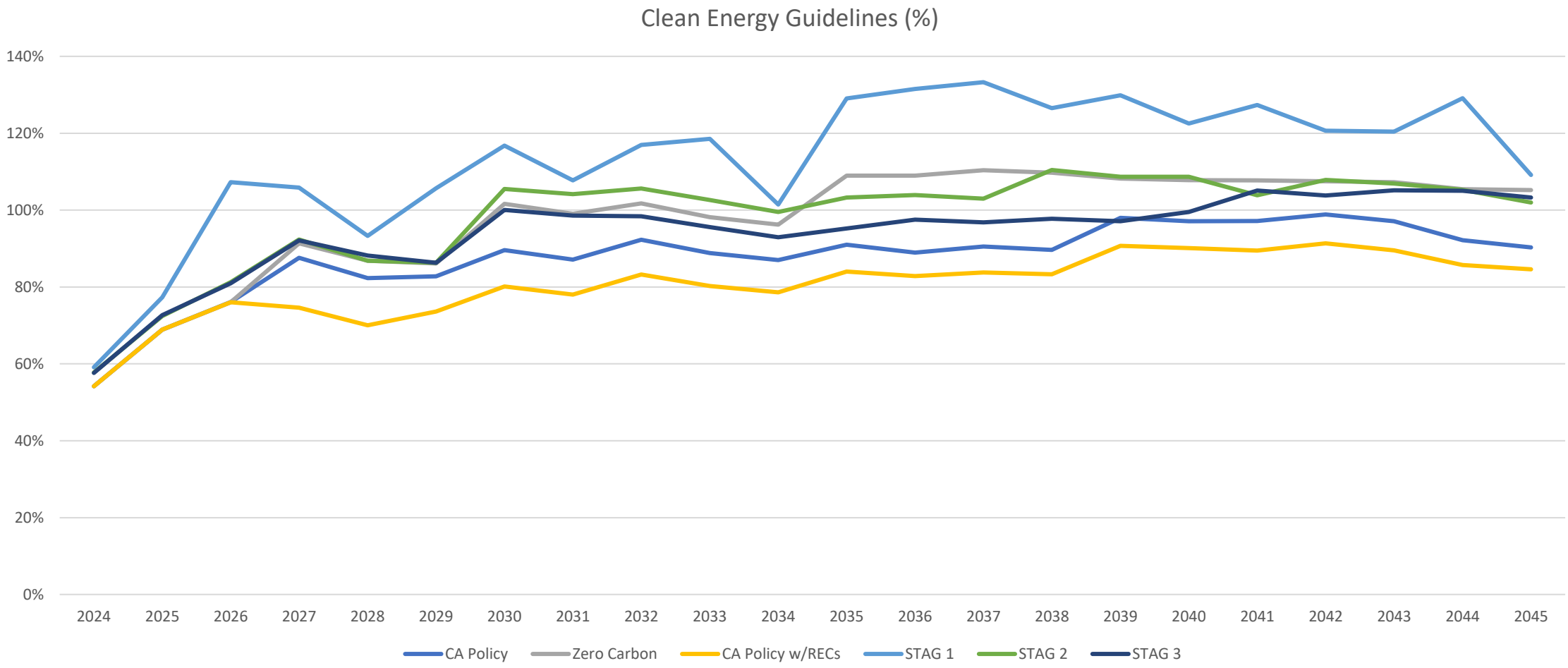
Based on the projected resource costs and market outlook, the capacity expansion model selects geothermal, storage, hydrogen generation, and wind.

+ Solar is not selected by the capacity expansion models due to the heavy build out of solar in California which has pushed market prices lower during solar hours. Ascend added solar per the scenario requirements by replacing a portion of wind with solar.

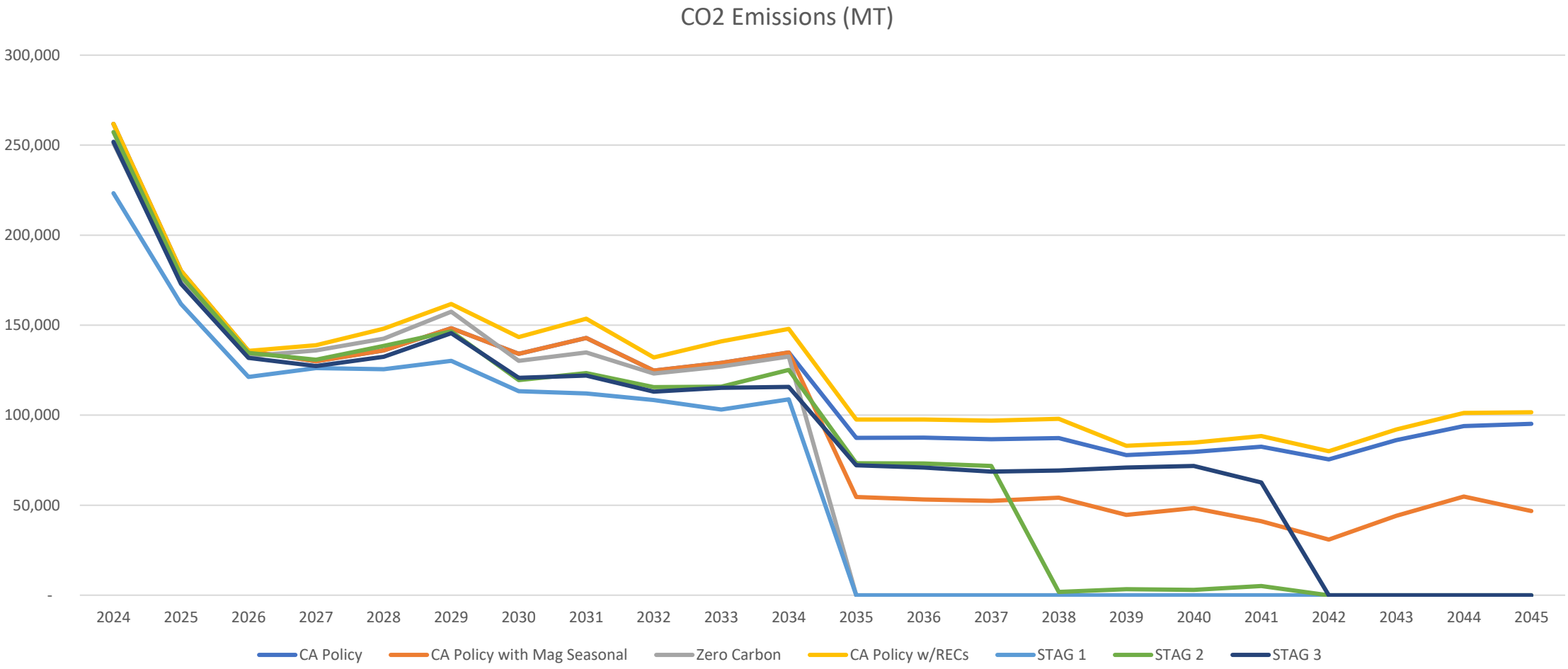
+ Geothermal was selected as soon as possible in all scenarios due to its capacity and high RPS contribution.

+ Storage, especially long-duration, was selected to boost capacity and manage renewables.

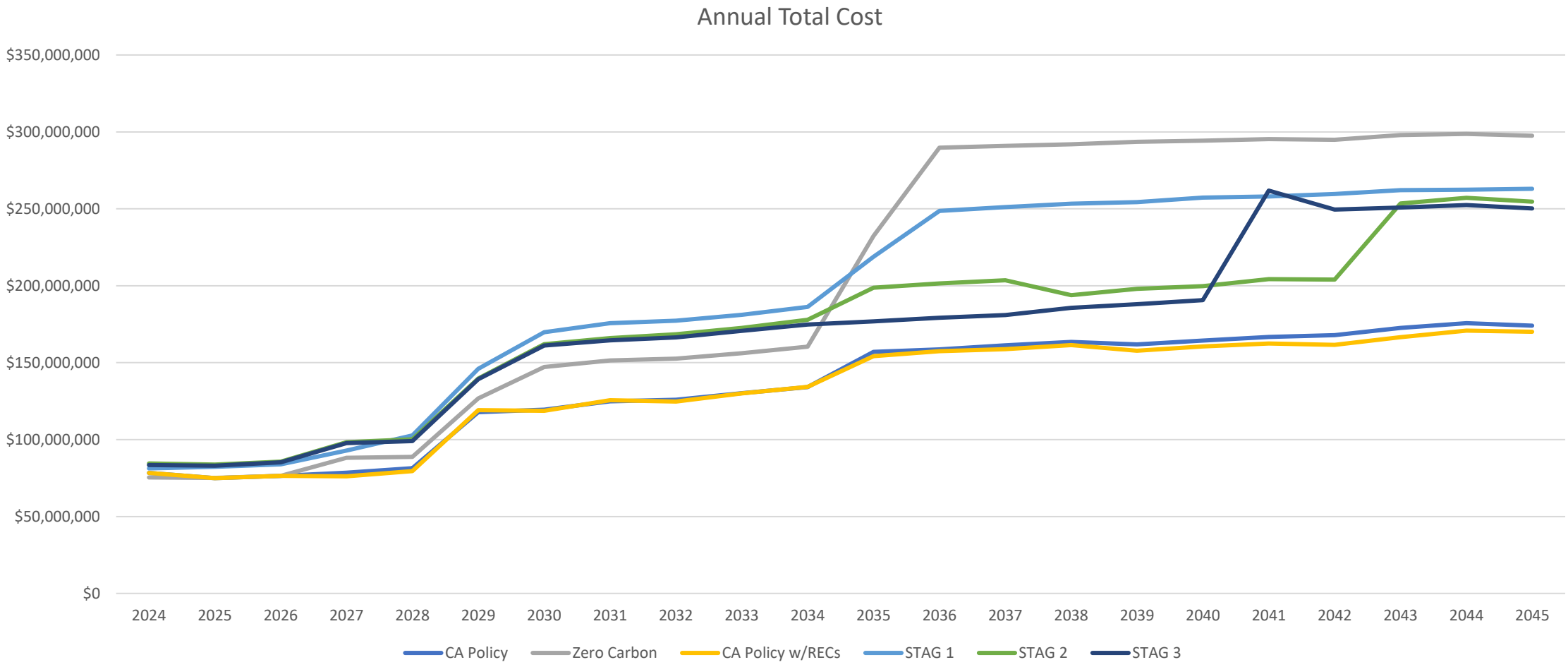
Scenarios by % clean energy



Scenarios by annual carbon dioxide emissions



Scenarios by annual total cost



Selecting a preferred scenario

STAG's scenario preferences

Costs in $M Net Present Value (2024 - 2045)	Scenario 1 CA Policy	Scenario 2 Carbon Free 2035	Scenario 3 CA Policy w/Offsets	Scenario 4 Carbon Free 2035 - High DER	Scenario 5 Carbon Free 2042	Scenario 6 Carbon Free 2040
ORIGINAL New Resource Capital Costs	$535	$1,887	$497	$1,815	$1,344	$1,363
UPDATED New Resource Capital Costs	$535	$1,296	$491	$1,145	$897	$867

- **Note:** Cost data has been updated since the STAG scenario preference survey, meaning these results cannot be interpreted to reflect current STAG preferences. These should be understood as a snapshot in time of STAG's opinion.
- Results show highest interest in scenarios 1 and 4, with scenario 5 as a backup for many.
  - Scenario 1 was the group's preference, both by the number of members listing it as their top choice and the total points allocated to it in a weighting exercise.
  - New cost information means this result may have changed somewhat.
- Key perspectives raised by STAG in this survey included:
  - A preference for relying on existing technologies to avoid risk
  - Concern about the use of RECs to achieve clean energy goals
  - Differences of opinion on the path to 100% clean energy
    - Some called for the fastest possible timeline to decarbonization, while others raised affordability concerns with a rapid timeline

GWP's preferred scenario

- The **California Policy Path** (scenario 1) is preferred by GWP. It:
  - Provides balance between sustainability, reliability, and affordability.
  - Achieves 91% clean energy serving load by 2035.
    - In line with California policy
    - Potential improvements if Magnolia operates differently
  - Allows GWP flexibility to adjust path towards a more aggressive carbon timeline.
    - Increased DERs may be possible, allowing GWP to build more resources locally
    - GWP will work with co-owners of Magnolia to reduce carbon emissions
  - Does not rely on emerging resources like hydrogen or long-duration storage.
    - Pipeline development in Glendale is very uncertain
    - Outlook for hydrogen may change if major pipeline is built

California policy scenario snapshot

ENHANCES ENERGY SECURITY AND RESILIENCE

OFFERS COST EFFECTIVE-SOLUTION COMPARED TO OTHER SCENARIOS

ALIGNS WITH STATE RENEWABLE PORTFOLIO STANDARD AND EMISSIONS MANDATES

LONG TERM VIABILITY AND ADAPTABLE TO FUTURE INNOVATIONS AND CHANGING ENERGY TECHNOLOGIES

GWP's action plan moving forward from this IRP

- GWP will continue procurement activities for clean resources:
  - Geothermal
  - Solar
  - Wind
  - Storage
- GWP will participate in decisions around Magnolia's emission reductions.
- GWP will continue to push for more adoption of distributed energy resources and demand response and look for innovative models to engage customers in these programs.
- GWP will learn from the Intermountain Power Plant's conversion to hydrogen.
- GWP will continue to collaborate with LADWP and the City of Burbank on transmission and renewable resource development.

Things we heard from you across this process

- High interest in customer energy efficiency, demand response, and solar and storage programs.
- High interest in improved engagement with renters and multi-family units in customer clean energy programs.
- High interest in GWP accelerating progress toward 100% clean energy.
- Desire for thinking outside the box on local resource options (e.g., virtual power plants, new locations for solar development).
- Concern about lack of transmission and what GWP is doing to overcome this challenge.

Lessons learned for the next IRP

- GWP plans to position itself to allow for more in-depth stakeholder discussion and analysis early on in the IRP process.
- GWP will continue to enhance opportunities for community engagement, including through public townhalls and advisory groups.
- GWP plans to improve the diversity of community voices participating in IRP decision-making.
- GWP will continue to explore avenues for public transparency in future IRP.

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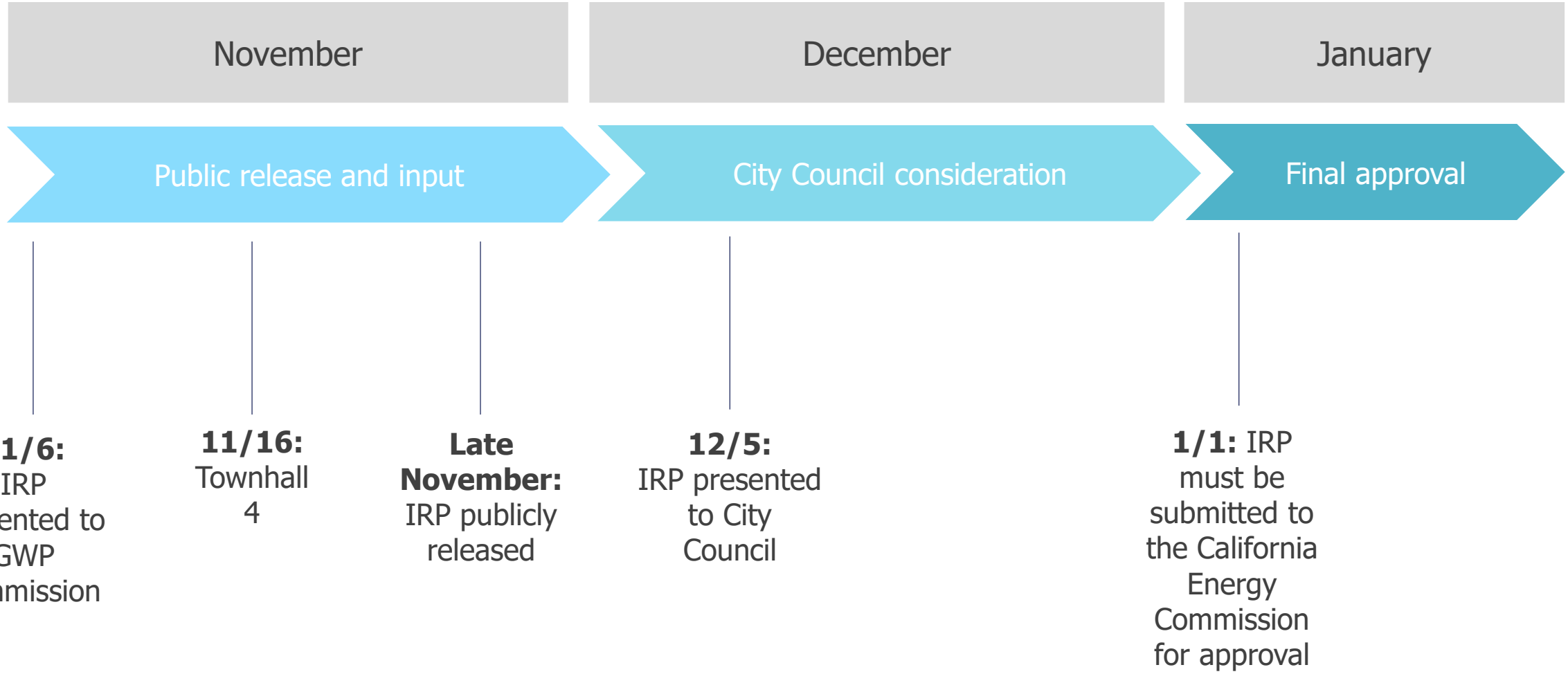
Q&A and discussion

Next steps


November
December
January
Public release and input
City Council consideration
Final approval
11/6: IRP presented to GWP Commission
11/16: Townhall 4
Late November: IRP publicly released
12/5: IRP presented to City Council
1/1: IRP must be submitted to the California Energy Commission for approval