Minutes from meeting of IRP Stakeholder Technical Advisory Group (STAG)
Meeting 4 – August 9, 2023

Overall takeaways:

1. Ascend Analytics presented an example of what scenario results look like coming out of the model. These results were illustrative only.
2. Ascend Analytics and Strategen Consulting presented the suggested inputs and assumptions feeding into the model, namely related to GWP's load forecast, future energy prices, and local resource potential.
3. Strategen Consulting presented the results of a STAG scenario preference survey conducted between last meeting and this meeting, which intended to finalize details about STAG's scenario 1 and create a high-level vision for STAG scenario 2. From this presentation, STAG discussed potential directions to take for STAG scenario 2 and ultimately coalesced around one idea.
4. STAG's two proposed scenarios are:
    a. A 100% clean energy by 2035 scenario that integrates City Council's various clean energy goals, with a focus on local resources. The scenario will model accelerated electrification compared to GWP's scenarios.
    b. A 90% by 2035, 100% by 2042 scenario that models a long-duration energy storage project built in Glendale during the IRP period. The scenario will take a "middle path" on local resource assumptions, falling between STAG's first scenario and GWP's baseline.

Presentation from Ascend Analytics on example modeling results:

1. See the accompanying PowerPoint PDF for the slides presented by Ascend Analytics.
2. Ascend presented an example of what results of the modeling process look like, using an illustrative run they completed over the past week. They described that:
    a. The model displays the resources that will be built in every year.
    b. At minimum, I twill take 5-7 years of building new resources to get to a zero-carbon portfolio, given that there's a limit to how quickly you can build new resources. In reality, it is likely to take longer than that because of the administrative components of building new projects.
    c. The model comes up with two different views on capacity for the entire portfolio:
        i. Accredited capacity: Accredited capacity gets at the idea that resources only contribute a portion of their full potential to meeting demand. It captures a resource's potential to meet demand and maintain reliability during times of peak demand. As you add more solar, you can meet 100% of demand from solar during the day. But at night, new solar projects aren't doing anything for you. That means you can't just build all solar or all wind; you have to have some diversity in resources. It also means you can't just build all 4-hour batteries, because at some point you'd experience a point of flat peak load that would extend for a longer duration, in which another 4-hour battery wouldn't do a lot to help you.
            1. The accredited capacity slide shows the coal-fired Intermountain Power Project (black) retiring. It also shows that new resources begin being built fairly early. New storage and new hydrogen show up.

2. When looking at accredited capacity, it should always be above the black line displayed in the chart.

ii. Nameplate capacity: Nameplate capacity doesn't consider the way that a resource contributes to meeting reliability requirements. It reflects the maximum potential output of a resource under ideal conditions.

d. These results only show the outputs of the capacity expansion model, which tells us how we build resources. The next steps would be to:

i. Test the reliability of the portfolio. This allows Ascend to see whether the assumptions they made about resources' accrediting capacity are correct. If they run the reliability model and find it doesn't meet reliability requirements in the future, it tells them they've overestimated the accredited capacity of the resources. They would then go into the capacity expansion model and adjust the accredited capacity down and examine results. This is a continual loop that they iterate on until the portfolio meets reliability requirements.

ii. See how the portfolio will be run on an hourly basis through 2035 or 2045. This will determine the hours in which GWP will use resources like gas, H2, etc. and identify if there are hours in which GWP is running gas where they could reduce emissions by doing something else. It will also allow them to see where transmission gaps are showing up in the system. Costs are also an output here; it allows GWP to see how much it's spending on fuel and purchasing on energy when they're short.

3. Questions and discussion points among the STAG related to this presentation included:

a. Contracted vs. GWP-developed resources:

i. When the model shows resources being built, does that mean GWP is building that resource or is it just purchasing the energy?

1. Ascend responded that GWP has two options: 1) build the resource itself, or 2) someone else builds it and GWP buys energy from them. In general, the assumption is that someone else will build the project and GWP will buy power from them.

ii. Does contracting for projects take less work than GWP developing projects itself?

1. GWP responded that there have been at least two contracts recently that were in negotiations for two years, but in which the contracts ultimately fell out, meaning contracting is not always easy.
2. GWP shared that it typically seeks a power purchase agreement (PPA, a contract to purchase energy from a project) through a joint project with other utilities, which allows it to build a bigger project. In most cases, it partners with LADWP because the two utilities' needs are similar. While this partnership can help GWP develop bigger projects and lower its costs, it also means that GWP may be beholden to these partners.
3. GWP shared that the initial part of contracting (which includes requests for proposals, analysis of potential project locations and transmission capacity, etc.) is relatively easy. The challenging part is in the contract

agreement phase, when commercial operation dates are decided and partners set specific terms.
4. There are milestones and updates built into contracted projects so the developers are held accountable and GWP gets regular updates on progress.

iii. Does GWP put performance guarantees in its contracts?
1. GWP used the example of geothermal contracts and explained that some of their providers' projects aren't performing as expected. In this case, GWP is discussing these shortfalls with developers and initiating a renegotiation process.

b. Resource capacity
i. What is capacity factor?
1. Ascend responded that capacity factor is how much energy a resource produces compared to the maximum theoretical potential it has. For solar, the sun is up for about 1/3 of the hours in a day, meaning solar might get roughly a 30% capacity factor. For the other sixteen hours of the day, you might get zero energy produced from solar.

ii. Can you clarify accredited capacity compared to nameplate capacity?
1. Ascend responded that nameplate capacity reflects a resource's maximum generation potential. Accredited capacity considers when the resource generates energy compared to Glendale's energy demand. In the long run, delivering energy in the middle of the day isn't very useful (because GWP experiences peak demand in the evening). When you transition to a zero-carbon system, delivering energy when the sun is down (like 5-9 p.m.) becomes very valuable. So accredited capacity is determined by a resource's ability to contribute energy during a stressful time in the system.

c. Resource selection
i. Is hydrogen considered clean?
1. Ascend responded that hydrogen is generally considered to be clean energy because it releases no carbon emissions. Since City Council's clean energy goal is about reducing carbon emissions (rather than all criteria air pollutants), hydrogen would meet that definition.

Presentation from Ascend Analytics on modeling inputs and assumptions forecasted by their team:

1. See the accompanying PowerPoint PDF for the slides presented by Ascend Analytics.
2. Ascend presented three central inputs going into its model:
   a. Glendale's load forecast (how much energy demand will be in the future)
   b. Market prices for energy
   c. Costs for various energy resources
3. Load forecast:
   a. There are two components of the forecast that work in tandem but affect different parts of modeling outcomes:

i. Energy (measured in gigawatt-hours, GWh)
    1. This measures total energy demand in Glendale over an entire year. Right now Glendale is at 1,000 GWh (one million MWh).
    2. Ascend's forecast is based on the California Energy Commission. On average, CEC forecasts Glendale's load will grow at about 2.4%/year. That's higher than a typical load forecast sees (usually would be in 1-1.5% range and 2% is high).
    3. Starting in 2035, it's anticipated that EV purchases will be a big factor in load growth. (No new gas gars are being sold in California after that point.)
    4. For the base load forecast used in all scenarios, Ascend will use what the CEC is forecasting. But in addition to that, they'll run sensitivity analyses on all scenarios to see what would happen if electrification is higher than what the CEC forecasts.
ii. 1-in-10 peak
    1. This 1-in-10 peak measures the energy demand Glendale is statistically expected to experience once every ten years. This is what GWP really needs to make sure it covers. It measures what the greatest demand is that GWP would ever have to serve for a minute or an hour of the day.
    2. Right now Glendale is in the mid-300s MW range. Over the next 20ish years, expect that to get to 450 MW.
    3. That fact means GWP will have to build new resources to cover that peak demand, because what it has to meet the 380 MW average isn't enough to cover 450 MW.

b. Using the CEC base load forecast as a baseline, Ascend then integrated GWP's energy efficiency performance to arrive at a near-final load forecast.
    i. Usually, standard energy efficiency performance is about 1% of retail sales saved per year. GWP averages ~1.8%/year.
    ii. Over time, that 1.8% adds up to more and more MWh saved. That may have a small impact on peak demand (the 1-in-10), but more likely it will just save overall energy use throughout the day.
    iii. GWP's energy efficiency goals are developed by a third party every four years. GWP's current target of 1.86% in savings came from an analysis that third party did, which determined that percentage was the maximum achievable savings GWP could get. The utility may not fully achieve anything above that number.
    iv. While there isn't a hard limit on how much energy efficiency GWP could achieve, it gets harder and harder to save energy after implementing the low-hanging fruit. There are only so many times you can switch from incandescent to LED lightbulbs or install heat pumps.

4. Market prices for energy
    c. Ascend's Market Intelligence team has put together estimates for how much it will cost GWP to buy power on the open market, in nominal dollars, going into the future.
        i. These prices only reflect the cost to purchase energy, not the price to develop projects.

ii. These prices do reflect incentives/tax credits, including those provided through the Inflation Reduction Act.
iii. The prices are averaged across hours, but there is wide variation in hourly prices. At some hours, prices may go to $0/MWh, and sometimes up to $200/MWh.

d. Ascend's forecasting framework considers a handful of categories of information:
    i. *Policy assumptions:* These assumptions consider how policy requirements (like California's renewable portfolio standard, 100% clean energy mandate, and requirement of no new gas-powered vehicles by 2035) impact demand for energy in California and the supply of energy being provided.
    ii. *Resource buildout:* These assumptions reflect expectations around the buildout or retirement of energy resources, for instance whether certain nuclear plants are being retired, or the state's plans for building new transmission.
    iii. *Price formation:* These assumptions reflect the supply and demand dynamics in energy markets. They consider the resources available to meet demand and how much it costs to do so with different resources (e.g., renewables have a very low cost to supply energy from the system's perspective, compared to a gas plant where you have to pay for fuel prices for all energy generated). Weather predictions also have a significant impact here, as that impacts both load and supply.
    iv. *Fundamental anchors:* The fundamental anchors keep us from straying too far away from a future we think is realistic. We analyze market forwards. We attempt to characterize uncertainty by displaying a range of prices throughout the future that encompass unexpected outcomes (what would it mean for prices to be very low or very high?).
    v. All this information ultimately results in the forecasting outputs. We get outputs of how market prices will move day-to-day, hour-to-hour, and minute-to-minute. We're able to see where prices are high throughout the day or low throughout the day.

e. Overview of market price trends:
    i. In the early years of the forecast, a rapid buildout of renewables depresses prices. That energy has essentially no cost to the system, which pushes average prices down through 2030.
    ii. In the early 2030s, California utilities have to increasingly think about 2035 and 2045 clean energy goals. The need to change system operations to meet those goals results in price increases.
        1. Utilities won't be able to run natural gas all the time and will have to transition to renewable fuels (which are more expensive than natural gas).
        2. The California Air Resource Board (CARB) carbon price placed on carbon-emitting resources also begins to go up exponentially, impacting prices.
    iii. In mid-late 2030s, prices again decline and level out (lower than present-day levels) through 2045.

5. Cost for energy resources

a. Overview of Ascend's resource cost forecasting
    i. Ascend bases its forecasting for the cost of new resources based in part on public forecasts, like the National Renewable Energy Laboratory Annual Technology Baseline (ATB). But this isn't necessarily a perfect estimate of what it would cost for GWP to procure resources—it only considers the cost to build, not the offtake structure to procure.
    iv. Another reason Ascend doesn't only rely on NREL is because Ascend works with utilities in CA and across the country on procuring new resources, meaning they have a good idea of what the going rate is for solar projects in Southern California, for instance.
    v. They anchor their forecast in cost expectations (from NREL, other companies' forecasts), then update them based on what they see from actual utility offers. Sometimes that means adjusting NREL's forecasts up because they're overly optimistic. Sometimes it means adjusting them down because what is available today is lower than what their forecast put out.
    vi. These costs do consider incentives like the Inflation Reduction Act.
b. Energy storage costs:
    vii. Right now, Ascend is seeing 4-hour standalone lithium-ion batteries going for $15/kW-month, which is about double what they saw four years ago. In 2019, projects were going for $8/kw.
        1. This dynamic reflects impacts from supply chain issues, Covid, project delays, etc.
    viii. In the near term, Ascend thinks there will be technology improvements in the ability to build new Li-ion batteries, which will result in prices coming down.
    ix. But in the longer term, they don't anticipate technology innovation will keep pace with inflation. Only moderate improvements will be able to made in how much more efficiently projects can be run and technology can be improved.
        1. That results in prices for both 4-hour and 8-hour Li-ion batteries increasing slightly from present day by 2050.
c. Solar, wind, and geothermal costs:
    i. A similar story holds for solar and wind. In early years, prices come down with technology improvements. For solar, that has to do with tariff policy and improvements in building more efficient solar panels.
    x. In the long run, only so many improvements can be made to solar and wind projects before arriving at the maximum for how well new facilities can be built. Inflation kicks in and nominal prices can't keep up, which results in prices increasing slightly from present through 2050.
    xi. Geothermal is a different story, because we're not necessarily getting better at building it in the way we are with storage, solar, and wind. It's already almost twice as expensive as solar/wind and is anticipated to get more and more expensive over time.
f. These cost curves show the price of signing a power purchase agreement (PPA) in any given year. So in 2023, let's say you'd pay $40/MWh for solar—you'll pay that price over

the entire lifetime of the contract because it doesn't adjust over time. If you sign a deal in the 2030s, we would say you'd get a slightly lower cost per MWh.

i. This might suggest that it could be economically advantageous to buy more solar in the early 2030s when prices are expected to be cheapest, but this might not be possible for GWP because they have reliability and clean energy requirements to meet that could require them to procure solar earlier than that.

2. Questions and discussion points among the STAG related to this presentation included:
    a. Load forecast:
        i. Some STAG members noted that the amount of electric vehicles (EVs) in Glendale seems to be growing exponentially. They asked whether the IRP team knows this adoption as a percentage of customers or knows Glendale's EV adoption compares to the state or country overall.
            1. The IRP team responded that it didn't have these numbers.
        ii. One member asked how a higher load affects electricity rates and whether it might increase it. The IRP team responded that the relationship between load and rates is complex, but usually more load can lead to lower rates because the utility can split the cost of its system over more units of energy.
        iii. One member asked how customer education can help reduce GWP's 1-in-10 peak load (for instance, incentivizing customers to adjust their usage to do laundry or charge vehicles during the day). Another member raised a concern that customer programs to shift demand might disadvantage low-income customers who may not be able to take advantage of incentives and could be penalized for using energy at peak times of day.
        iv. Some members asked how GWP's peak periods impact the price for electricity, and whether lower electricity costs in the middle of the night stem from lower demand.
            1. Ascend responded that in the future that dynamic won't be the case. In another 5-7 years, it's expected that power will be cheaper in the middle of the day compared to overnight because of solar generation.
    b. Market price forecast:
        i. One member asked how uncertainty around market prices is considered in the model, given that, in 10 years, price forecasts might be very different.
            1. Ascend responded that its software simulates 50-100 distinct futures, compared to other software that does less. The result is a range of uncertainty in prices and other model variables. The model then simulates a range about those variables which represents the most likely outcome.
            2. The member suggested it would be helpful if uncertainty or the range could be shown graphically.
    c. Energy resources:
        i. One member asked if GWP has any plans for distributed storage resources, such as through virtual power plants (VPPs) or other means.
            1. GWP explained that the term VPP is used as a catch-all when talking about aggregating different types of resources that aren't commonly

used (like load control mechanisms, storage, smaller generation sources, etc.). GWP noted there's a wide range in how VPP programs function and said it sees potential in VPPs.

Presentation by Strategen Consulting on other modeling inputs, assumptions, and analyses:

1. See the accompanying PowerPoint PDF for the slides presented by Strategen Consulting.
2. Strategen presented about the modeling inputs and assumptions that have been determined by both GWP and Ascend (not based on Ascend's forecasting). These assumptions relate to anticipated customer adoption of distributed energy resources (DERs) and the potential for developing utility-owned solar and storage in Glendale, based on local land availability. Strategen also presented on how the social cost of carbon will be considered in the modeling process.
3. Questions and discussion points among the STAG related to this presentation included:
    a. Distributed energy resources (DERs)
        i. Why have only 3% of GWP's customers adopted solar, which is low compared to the state average?
            1. GWP responded that the state average is skewed by customer adoption in investor-owned utility (IOU) territory. As of 2021, roughly 2.6% of GWP's customers had solar. The average for publicly owned utilities (POUs) in California is roughly 4.7%. But for IOUs it's 18% adoption.
                a. These utilities typically see the highest customer solar adoption because their rates are much higher than GWP (meaning customers have a greater financial incentive to adopt).
            2. Glendale's distribution of single family and multifamily homes may also not be the same as other areas, which GWP said can limit solar adoption. Glendale has 24,000 single family homes, but 54,000 multifamily units or condos who might not be able to adopt solar unless their landowner or Homeowners Association allows them to.
        ii. One member noted that GWP's pathway to 10% solar adoption would be different than IOUs, which can allocate the cost of achieving that goal back into customers' rates. In contrast, GWP has little money available today to achieve the 10% goal and would have to come up with it to get that shift.
        iii. One member shared that they see huge upward potential for demand response programs in Glendale, given that the Franklin demand response program didn't put much attention on renters. If incentives for renters are a focus, there could be much greater demand response gains.
        iv. One member wanted to better understand the assumption behind remaining potential residential solar adoption. After 20 years, how saturated is Glendale with solar and how many more homes do we honestly think will buy in? The member noted that for their home, solar is not a good choice.
            1. GWP replied that a lot of the decision on whether to have solar installed on your house comes down to how expensive your energy is.
            2. GWP shared that as it's been hearing more at townhalls about multi-family residents' interest in solar, it's started to look into a few options. There is a program LA uses that might be able to help Glendale. The

state also has a program, but only for investor-owned utilities. Some existing programs for multi-family units are very complex in that they require property owners to show they actually experienced a certain percentage decrease in energy use/demand for them to get an incentive.

b. Utility-owned resource potential
    i. Why isn't geothermal feasible to develop in Glendale?
        1. Strategen shared that there are no geothermal resources in the LA basin, which (along with land availability) makes geothermal not possible.
        2. The member suggested looking at deep geothermal to see if that was an option. Strategen noted that cost for deep geothermal may be prohibitively expensive.
    ii. Why isn't the covering of certain structures with solar panels (like Verdugo Wash or others) is being looked at in this IRP?
        1. GWP responded that it doesn't have sole purview over the Wash, the freeway, and some other resources, which would require LA to be involved. There are no talks being held on this option, to their knowledge.
        2. The member suggested that space could be better used.
    iii. One member commented that, even though the Scholl Canyon landfill is not being considered for immediate development because of land settling, there are sections of the landfill that have been close for a while, as well as parts of the hillside, that could be developed. This member noted they wanted GWP to look at these options deeper.
        1. GWP responded that it is considering lots of options and some projects have to take time to be rated. It also said installations of solar in that area might require upgrades to the distribution system.
            a. The member clarified why solar would require distribution upgrades when there will be a biogas plant already in that area.
        2. GWP responded that the size of the power plant doesn't require a significant upgrade, but that power plant plus additional solar might push the distribution system beyond its limit.

Presentation by Strategen Consulting recapping STAG scenario 1 and presenting potential ideas for STAG scenario 2:

1. See the accompanying PowerPoint PDF for the slides presented by Strategen Consulting.
2. Strategen presented a recap of where STAG is with its two scenarios. The presentation included some results from a scenario preference survey sent to members prior to this meeting in which they agreed upon specifics of their scenario 1 and high-level elements of scenario 2.
3. See the appendix below for the results of the scenario preference survey.
4. Questions and discussion points among the STAG related to this presentation included:
    a. Long-duration energy storage:

iv. What could it mean if STAG chose to assume LDES is available a few years sooner than anticipated?
    1. Ascend responded that could mean LDES is available for development in 2030, compared to 2035 or 2040 (for example).
v. Why is LDES tied to the natural gas power plant in the example scenario Strategen gave?
    1. Strategen responded that this example was just illustrative to show how various scenario elements could be married together. That example could get an answer to whether LDES would be sufficient to cover for a fossil fuel unit if it were retired. Replacing the power plant with an LDES project might also be advantageous for space availability.

d. Affordability:
    i. Are any scenarios being run prioritizing keeping rates down?
        1. Strategen and GWP responded that yes, GWP's third scenario will look at achieving California clean energy policy (100% by 2045) at the lowest possible cost, which may include greater use of renewable energy credits (RECs) than other scenarios. This is the affordability/lowest cost scenario.
    ii. One member noted that in townhalls, not many members of the public are likely familiar with the topics STAG has been talking about. They noted that the first question the public might ask on scenarios is how will this affect my rates?
        1. Other members responded that most feedback received at townhalls has tended to be focused on environmental impacts.
        2. GWP responded that it doesn't yet know what the rate impacts of the scenarios will be because we haven't run the model.
        3. Ascend responded that part of the IRP outcome is a simplistic rate impact analysis, but this doesn't include entire projections on what ratepayers will pay.

c. Hydrogen:
    i. How efficient is hydrogen actually, and how efficient would it be to deliver it to Glendale?
        1. GWP responded that the only discussion of bringing hydrogen to the LA basin is the one SoCalGas is having. It is seeking guidance on the rate impact of projects to build hydrogen infrastructure.

4. Ideas exchanged related to STAG's second scenario included:
    a. One member shared they'd like STAG 2 to be as different as practical from any other scenarios so we can see a wide range of difference.
    b. One member shared they don't see much value in integrating the early retirement of fossil resources in STAG 2 because those resources are unlikely to run frequently and forcing their retirement may tie GWP's hands behind its back.
    c. Several members shared that they felt strongly that scenario 2 not have the same high assumptions around customer resource adoption as STAG scenario 1, expressing skepticism that GWP could reach the high assumptions in STAG scenario 1. They suggested a more moderate approach.

d. Although multiple members preferred a quicker clean energy timeline and more ambitious assumptions around customer resource adoption, they ultimately accepted a more moderate scenario (between STAG 1 and GWP's scenarios) as a compromise so that everyone in STAG could have at least one STAG scenario they supported.

Outcomes of the meeting:

1. STAG ultimately decided on a second scenario that will achieve 90% clean energy by 2035 and 100% clean energy by 2042. The scenario will take more moderate assumptions on local resource potential (both customer-sited and utility-owned) than STAG 1, meaning finding assumptions between GWP's baseline and STAG 1. The scenario will also model the development of a long-duration energy storage project in Glendale.
2. Strategen will present STAG's two proposed scenarios at the upcoming townhall to gather community feedback. From there, STAG will consider this feedback and finalize its two scenarios at the next meeting.

Appendix: Results of STAG scenario preference survey (sent to members between meetings 3 and 4)

Note that questions begin with number 4 as the first three questions were introductory questions to gather respondents' names, etc.

Introduction

Question 4: Do you have any questions on the GWP scenarios?

- Why is biogas excluded from all three scenarios? There has been lots of talk of transmission constraints, and n-1-1. It seems to me that these 2 items should lead to some minimum amount of local generation / demand response. I think it would be useful to project minimum local sources by yr and season. It looks to me that we are not allowing for sufficient dispatchable local resources.
- Will the model give the best and worst case scenarios? The slow adoption of Solar by residents over the years which is currently, expecting a growth to 10% a large task. We have to think about old infrastructure and not every home is viable for solar installations.
- Under CA Mandate - lowest cost scenario.... Please clarify if 100% zero-carbon excludes the use of partial-carbon renewables (particularly biomass). If CA will allow renewable biogas/biomass after 2045, then I would like to see a scenario model that includes that resource.
- What are the Ascend assumptions based on? Is the NREL Annual Technology Baseline part of the assumptions? Why are the 3 GWP scenarios presented when we were told that these are not set in stone and that community input could change them? (Scott Mellon said)
- Shouldn't we have as many scenarios for 2035 as for 2045?
- In the "Clean energy delivered to Glendale" row, am I correct in assuming that "zero-carbon" and "clean" mean the same thing? A question I've been meaning to ask regarding all scenarios: I'm aware that a lower cost is generally more desirable, but does GWP have a cost beyond which it

feels that it cannot go? In other words, does GWP have market data that suggests customers would not accept a rate increase beyond a certain amount?

- I had hoped to hear from Brendon following our discussion at the last meeting. I have significant questions on the parameters that can be modeled. My interest is to see how two high level scenarios could be modeled. The first being a Practical Scenario which would contrast the two Clean Scenarios by testing when a practical approach selecting confirmed or contracted clean options could reliably achieve the Clean Energy Mandate. The second being an Idealized Scenario which would contrast the Affordable Scenario by testing the cost and timing of an ideal approach selecting the most progressive options to achieve the Clean Energy Mandate.
- I think we should recommend an interim 2030 target for the Glendale Clean Energy Goal of 85%. I think that we should consider setting maximum allowable RECs in the CA Mandate lowest cost scenario. I don't know how we could set this, but it will sure up this scenario from abuse.
- I need to see percentages, cost, and kind of renewables proposed by STAG like Ascend did in 2019 for the 100% clean by 2030 report.

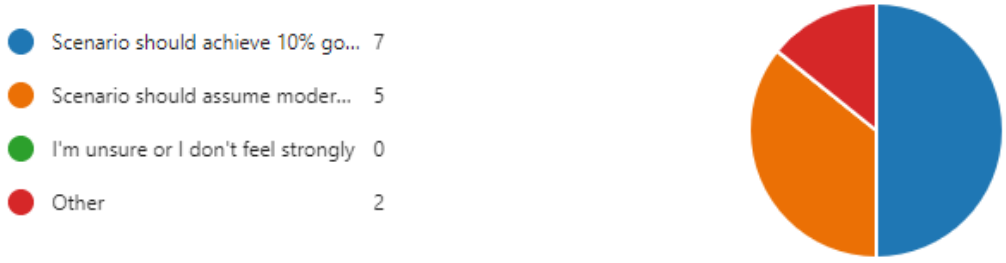
STAG scenario 1

Question 5: How should scenario 1 consider the City Council goal to have 10% of GWP customers adopt solar and energy storage systems by 2027? (Note: 3% of customers currently have rooftop solar.)

Options provided:

- Scenario should achieve 10% goal (rapid adoption)
- Scenario should assume moderately rapid adoption (e.g., 7% of customers)
- I'm unsure or I don't feel strongly
- Other (please specify)

Results:



"Other" responses:

- Fraction of customers should not be the goal, but MWh & emissions reductions should be the goal
- What policies do other municipalities use to achieve 10%? Would implementing those policies achieve the same level of adoption?

Question 6: How should scenario 1 consider the City Council goal to develop 100 MW of distributed energy resources (customer solar and storage, energy efficiency, demand response) in Glendale? (Note: This would amount to roughly 30% of Glendale's total peak demand. GWP currently has roughly 30 MW of DERs in its system.)

Options provided:

- Scenario should achieve 100 MW goal
- Scenario should achieve 75 MW
- Scenario should achieve 50 MW
- I'm unsure or I don't feel strongly
- Other (please specify)

Results:

"Other" responses

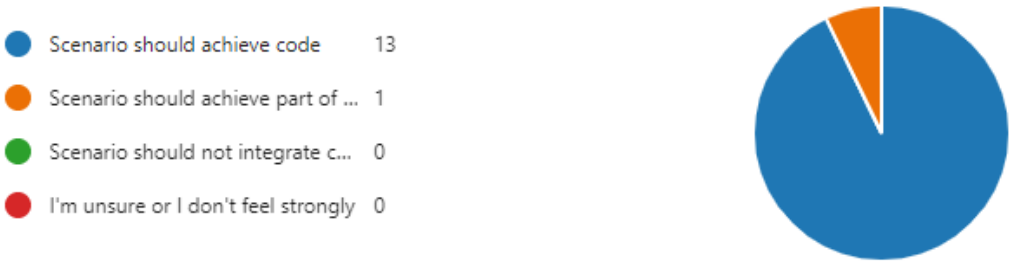
- 100 MW goal with details on policies that would facilitate achievement.

Question 7: How should scenario 1 consider the reach code adopted by City Council that requires new buildings be completely electrified, with accompanying solar installations and EV charging capacity?

Options provided:

- Scenario should achieve code
- Scenario should achieve part of code (specify which part in question 10)
- Scenario should not integrate code
- I'm unsure or I don't feel strongly

Results:



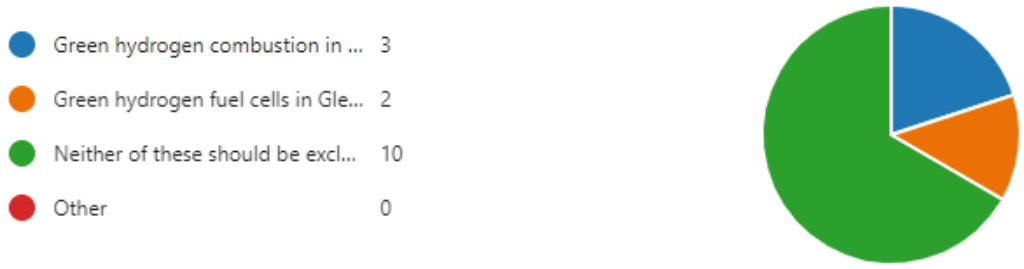
Question 8: Should any of the following resources be excluded from being used *in Glendale* in scenario 1 to provide dispatchable energy with high renewable usage?

Note that: 1) coal is not listed as it is being phased out of GWP's portfolio; 2) new biogas is not listed as it is already excluded; 3) nuclear and geothermal are not listed as they are infeasible for local development; and 4) new and existing natural gas is not listed as it will need to be phased out in this scenario to meet the established 2035 goal.

Options provided:

- Green hydrogen combustion in Glendale (assuming truly green), for instance in Wartsila units
- Green hydrogen fuel cells in Glendale (assuming truly green)
- Neither of these should be excluded
- Other (please specify)

Results:



Question 9: It seemed at Wednesday's meeting that the group was interested in a 'high electrification' assumption that would result in Glendale having increased electricity demand in the short term, relative to Ascend's/GWP's baseline assumptions. How should that assumption be considered in this, or the other, STAG scenario?

Options provided:

- It should be part of STAG scenario 1 (blue)
- It should be part of STAG scenario 2 (orange)
- It should apply to both STAG scenarios
- It should apply to one scenario, but I don't care which
- I don't think we should use a high electrification assumption

Results:

Question 10: In addition to the elements described here, is there anything else you're interested in seeing tested in STAG scenario 1?

- I am concerned that all sources or local generation have already been eliminated except green H2. I don't understand why geothermal & nuclear have been excluded or how we can meet demand without them.
- I really don't think my points are being covered. It's ok to assume high electrification/adoption in any scenario - but you must also run scenarios that model moderate and severe underperformance. This is critical to quantifying the estimates. So, my answers above support only the high adoption scenario, but I would rather retract my answers than not include a scenario about what happens to reliability and cost if we underperform on internal generation.
- Increased demand reduction. Community solar initiatives. Plans for multi-unit PV incentives.
- 30% EV adoption by 2028 and then leveling off
- In the process of filling out this survey, I've come to think of STAG scenario 1 as "the City Council Scenario." What would it look like if all of City Council's goals were met? So I would add anything that Council has made a goal that isn't already included in this scenario.
- I am more interested in understanding the capabilities of the models to contrast the existing three scenarios.
- What is the impact of progressively more expensive fossil fuel prices to customer behaviors as well as how that impacts GWP.
- The willingness to use GWP reserve funds to finance the cost of the Clean Energy goal ahead of the CA mandate.
- Can we talk about emerging technologies that could be feasible in the STAG #4 please?

STAG scenario 2

Question 11: STAG scenario 1 has a high-level vision of large customer contributions to clean energy goals and maximized local resource potential in Glendale.

What high-level vision might you like to see tested in STAG scenario 2? (Note that taking some time to think through this vision can help otherwise disjointed preferences come together in a coherent 'version of the future' that we can test.)

- Clean, local generation. Allow all sources and allow the model to select lowest cost
- Not sure yet
- Utility Owned Solar and Energy Efficiency
- How about 85% by 2035, 93% by 2040, 100% by 2045? I think we should seriously consider including biogas/biomass renewables in our scenario - at least until 2045 (which is the end-frame of this IRP, anyway). The point is to compare rosy outlooks with another scenario that takes advantage of time and available resources. From those comparisons, we can all make better decisions about cost, adoption rates, timing of resource availability, etc.
- Assume customers are not going to be willing to contribute much to clean energy goals.
- Large utility based contribution to solar energy (if possible via the ongoing phased projects and consultation.
- We need to shoot for the cleanest options and research the best resources. Cost considerations for climate catastrophes, Health, agricultural production and property values.
- Maximize distributed solar
- I would like to see the following tested: 1. 20 MW of wind-onshore locally 2. 30% penetration of Solar-PV Rooftop C&I with the use of IBIS powerNEST (https://ibispower.eu/powernest/). 3. Total solar-PV residential use of 50 MW. 4. 10% reduction in energy use from energy efficiency, pricing that encourages efficiency, and demand response.
- If scenario 1 leans into Council's goals, perhaps scenario 2 could be something in between Council's goals and GWP's baseline.
- Thinking of STAG Scenario 1 as my Idealized Scenario, STAG Scenario 2 would empathize reliability and minimal assumptions to create a practical model to reach the Clean Energy Mandate.
- What are thresholds needed for incentives to trigger faster and wider adoption of clean energy alternatives?
- I prefer to test both scenarios with the same assumptions and run the model again and test both scenarios with opposite assumptions - low customer adoption, and contribution and even higher levels of electrification from EVs.
- A less ambitious time frame like we selected: 95% in 2035 and 100% in 2040

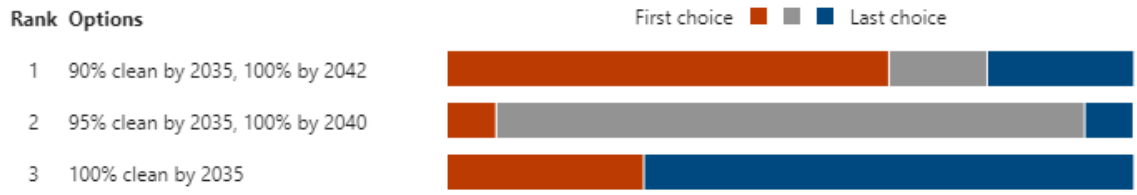
Question 12: The clean energy timeline used in scenario 2 should be... (please rank these options)

Options provided:

- 90% clean by 2035, 100% by 2042
- 95% by 2035, 100% by 2040
- 100% clean by 2035

Results (overall group ranking):

Results (portion of STAG who selected each option as first, second, or last choice):



Details:

- 64% of STAG put “90% clean by 2035, 100% by 2042” as their first choice (9 people)
- 86% of STAG put “95% clean by 2035, 100% by 2040” as their second choice (12 people)
- 71% of STAG put “100% clean by 2035” as their third choice (10 people)

Note: The order of these three options was shuffled in the survey for each respondent so as not to bias the responses.

Question 13: If you feel *very* strongly that scenario 2 should use a timeline different than the options above, please list your recommendation here. Please recall that 2 GWP scenarios will be run with a 2045 timeline and 2 will be run with a 2035 timeline (one STAG, one GWP).

Please only list a recommendation here if you absolutely cannot live with one of the options in the previous question.

- 85% by 2035, 93% by 2040, 100% by 2045
- One should be 2037/2038
- Scenario 2 should be a hybrid timeline. Together GWP and the STAG are running two 2045 and two 2035 timelines. The hybrid timeline should be a combination of the two. I would like to propose the following: an aggressive 60% by 2028 and then the California 2045 timeline after.
- I would like the scenario to test the timeline not assume a timeline.

Question 14: How would you like to consider the high-level assumptions we agreed on for STAG's scenario 1 in scenario 2? There are several options:

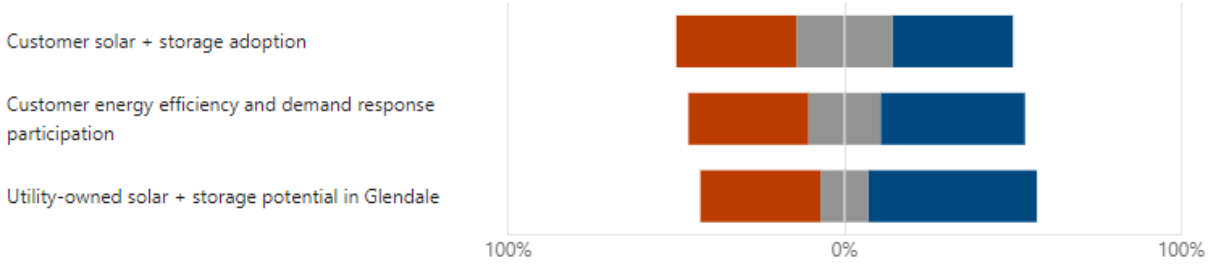
We can apply the same assumptions we will use in the STAG 1 scenario (informed by your selections above).
We can apply the same baseline assumptions being developed by Ascend that will be used in GWP's scenarios.
Or we can apply middle-ground assumptions, which would fall between GWP's estimates and the STAG 1 scenario.

Options provided:

STAG was asked to select either 'baseline,' 'middle-ground,' or 'same as STAG 1' assumptions for the following three scenario elements:

- Customer solar + storage adoption
- Customer energy efficiency and demand response participation
- Utility-owned solar + storage potential in Glendale

Results:



Details (note these may not equal 100% due to rounding):

- Customer solar + storage adoption
    - Baseline assumptions: 36% (5 people)
    - Middle ground assumptions: 29% (4 people)
    - Same as STAG 1 assumptions: 36% (5 people)
- Customer energy efficiency and demand response participation
    - Baseline assumptions: 36% (5 people)
    - Middle ground assumptions: 21% (3 people)
    - Same as STAG 1 assumptions: 43% (6 people)
- Utility-owned solar + storage potential in Glendale
    - Baseline assumptions: 36% (5 people)
    - Middle ground assumptions: 14% (2 people)
    - Same as STAG 1 assumptions: 50% (7 people)

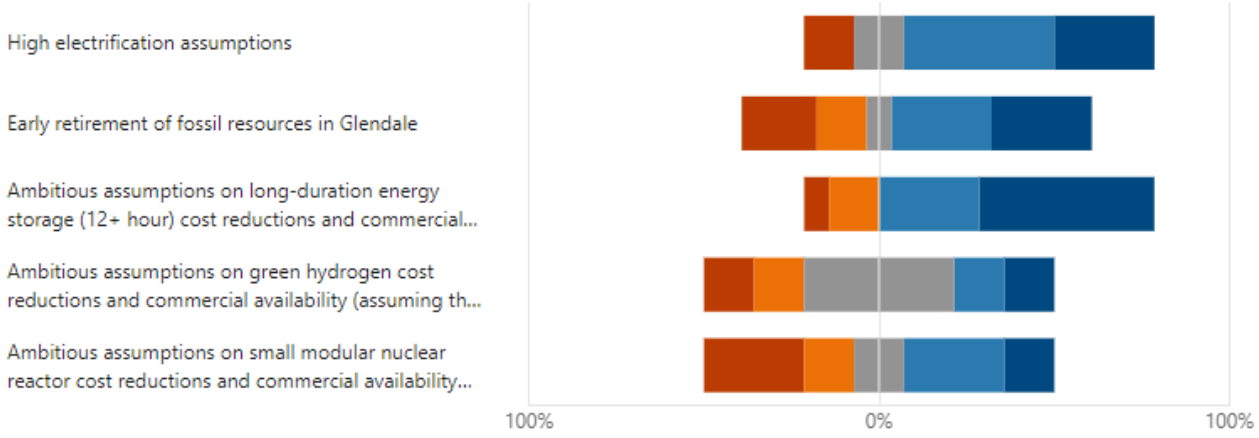
Question 15: How interested are you in seeing the following elements in STAG scenario 2?

Options provided:

STAG was asked to select either 'actively opposed,' 'moderately opposed,' 'neutral,' 'interested,' or 'very interested' for the following three scenario elements:

- High electrification assumptions
- Early retirement of fossil resources in Glendale
- Ambitious assumptions on long-duration energy storage (12+ hour) cost reductions and commercial availability
- Ambitious assumptions on green hydrogen cost reductions and commercial availability (assuming the hydrogen is actually green)
- Ambitious assumptions on small modular nuclear reactor cost reductions and commercial availability (for procurement outside Glendale, not inside)

Results:



Details (note these may not equal 100% due to rounding):

- High electrification assumptions
  - Actively opposed: 14% (2 people)
  - Moderately opposed: --
  - Neutral: 14% (2 people)
  - Interested: 43% (6 people)
  - Very interested: 29% (4 people)
- Early retirement of fossil resources in Glendale
  - Actively opposed: 21% (3 people)
  - Moderately opposed: 14% (2 people)
  - Neutral: 7% (1 person)
  - Interested: 29% (4 people)
  - Very interested: 29% (4 people)
- Ambitious assumptions on long-duration energy storage
  - Actively opposed: 7% (1 person)
  - Moderately opposed: 14% (2 people)

    - Neutral: --
    - Interested: 29% (4 people)
    - Very interested: 50% (7 people)
- Ambitious assumptions on green hydrogen
    - Actively opposed: 14% (2 people)
    - Moderately opposed: 14% (2 people)
    - Neutral: 43% (6 people)
    - Interested: 14% (2 people)
    - Very interested: 14% (2 people)
- Ambitious assumptions on small modular nuclear reactors
    - Actively opposed: 29% (4 people)
    - Moderately opposed: 14% (2 people)
    - Neutral: 14% (2 people)
    - Interested: 29% (4 people)
    - Very interested: 14% (2 people)

Question 16: Should any of the following resources be excluded from being used *in Glendale* in scenario 2 to provide dispatchable energy with high renewable usage?

Note that: 1) coal is not listed as it is being phased out of GWP's portfolio; 2) new biogas is not listed as it is already excluded; 3) nuclear and geothermal are not listed as they are infeasible for local development; and 4) existing natural gas is not listed as it is covered in the 'early fossil retirement' option in the previous question.

Options provided:

- New natural gas in Glendale (beyond what's already present and contracted)
- Green hydrogen combustion in Glendale (assuming truly green), for instance in Wartsila units
- Green hydrogen fuel cells in Glendale (assuming truly green)
- None of these should be excluded
- Other (please specify)

Results:

"Other" response:

- BESS [battery energy storage system] greater than 50 MW

Question 17: Is there anything you're interested in seeing in scenario 2 that we didn't mention here?

- I want to see nuclear (anywhere) & local geothermal
- I think that we should run a scenario of the RATEPAYER LOWEST COST THROUGH 2045 as the driver of resource adoption and timing. Let the model tell us whether it will keep costs lowest if we pay for nnMW of commercial/residential rooftop PV right now - or whether we can save costs by implementation over a longer period. Some transmission sources won't be immediately available, so the model can tell us when we can fold those into our mix (and at what cost). I know the planet is in bad shape, but I don't believe that Glendale should be zero-tolerant of carbon by 2035. We alone cannot make much difference. I know that other systems around the country/world are also trying to do their share. I just don't believe that we will keep costs down by demanding that we buy into local PV and distributed batteries immediately. Or that importing zero-carbon energy will be the least cost scenario. I'm not advocating that we buy power from 100% NG generators, but we could until 2045. I think that massive carbon reduction is the right way to go, but I think that slower adoption will result in lower costs (rather than fast adoption). I'm very interested in seeing the cost/timeline data from comparative scenarios! That's the only way we can all have a good discussion and make value choices. I think that it would have been very helpful to the STAG if we'd been presented with the head-to-tail carbon impact and technical/cost outlines for various resources. All scenarios have been presented as equal cost, equally available - and ANY carbon is demonized (as is nuclear). I think that's a mistake. It's leading to a wide range of expectations, rather than allowing us to have value discussions of these options. Even the state wants us to collect bio materials so they can compost on industrial scales - and there will be plenty of beneficial outcomes to that - including electric generation that uses 87% less carbon than NG ICE. Zero-tolerance is getting in our way of making rational cost-effective choices.
- Increased community outreach for demand response. A clear plan for rooftop solar expansion to 10% and beyond. Incentive programs to reach rooftop solar goals. New green staff leadership within GWP.
- 30% EV adoption by 2028 and then leveling off coupled with lower general energy prices and lower inflation
- Based upon the questions of the survey, I would like to develop scenarios that test new ideas not simply variations on the existing three scenarios. I see a greater benefit to testing and modeling new approaches rather than providing more detail on the established approaches.

Question 18: Is there anything we didn't ask about in this survey that you'd like the group to consider in their scenarios?

- Consider revisiting a Virtual Power Plant in the future
- We must have clear numbers for the cost of gas energy production at Grayson and Scholl. The so-called social cost of carbon needs to be considered for every source of energy. We should have 3 STAG scenarios, not 2. GWP mentioned this several times as a possibility.
- Run more scenarios.
- The 2024 and 2028 elections. Both those dates fall between the five-year IRP timeframe. Both major parties have vastly different policies on energy. It would be prudent to walk the middle path or risk being on the wrong side of federal policy if we are too aggressive one way or the other. Energy resource projects from planning to completion take time. Much can change during those dates.
- Looking at the agenda for Wednesday's meeting, I would like to have a high-level discussion of the capabilities of the models and an open discussion to coalesce ideas around new concepts. There is strong interest in developing an Idealized (or perfect world) Scenario which would have the greatest possible impact on the efficient adoption of the Clean Energy Mandates. How can a model be created that tests that feasibility? As a counterpoint to that, a reliable practical approach would be beneficial.
- Emerging technologies - which ones are nearest to implementing?

Question 19: Any other feedback for us or GWP? (It can be related to scenarios or not!)

- So long as both scenarios have weighted values for the following in the order of importance: 1. Reliability 2. Affordability 3. Sustainability
- High expectations of uncontrollable customer behavior can lead to future issues if these expectations are not met.
- Why are we not making city-sited solar a priority over the Grayson re-build? What is the plan for building out DERs on rooftops around the city? Why has it taken so long to write an RFP, evaluate proposals and hire the best consultant for this process? How can we improve communication between GWP and the public going forward?
- There are a number of STAG members who are more skilled at running fair and efficient meetings than the consultants you hired.
- GWP may want to further explore the cost benefits of expanding its use of deliverable electricity futures and similar products instead of increasing its expanding its BESS. GWP, like other companies benefit from the use futures as insurance and not for speculation. A BESS requires a significant amount of capital, is highly depreciable (including RTE and degradation), bad for the environment (both to produce and retire), and difficult to extinguish in case of a fire. Less megawatts of storage would be needed if more geothermal were acquired. Either way, solar, wind and geothermal would all require transmission. The difference is geothermal transmission would come from the south bypassing the issues from the traditional AC/DC interties. Geothermal might appear more expensive using LCOE but it delivers power thought the day. Solar and wind only can compete with the addition of a BESS. I've already mentioned why a BESS is a bad investment. Geothermal's firm and reliable power is worth the investment
- I encourage a greater focus on the development of the scenarios by noting ideas and concepts outside of the project scope in the "parking lot" and presenting those out-of-scope ideas as additional projects to be considered by Council and directed to the appropriate department to develop initiatives further.
- Given transmission issues, we must prioritize how and whether we can get to some of these goals without assuming the ability for more transmission, given amount of time and cost.