City Commission
Work Session Minutes

March 23, 2023 at 1:00 p.m.

City Hall, Commission Chambers
401 S. Park Avenue | Winter Park, Florida

Present

Mayor Phil Anderson, Commissioners Marty Sullivan, Sheila DeCiccio, Kris Cruzada, and Todd Weaver; City Manager Randy Knight; City Attorney Kurt Ardaman and City Clerk Rene Cranis.

Also Present

Executive Advisor Michael Mount and Principal Advisor Diana Prkacin, Quanta Technology.

1) Call to Order

Mayor Anderson called the meeting to order at 1:01 p.m.

2) Discussion Item(s)

a. Renewable Energy Study Update

Principal Advisor Diana Prkacin gave a presentation on the results of the renewable energy study.

Purpose: next steps for the Clean Energy Plan – Ms. Prkacin explained that the team listened to input from city staff and the Utility Advisory Board (UAB) to understand what mix of energy, time frame and costs would be included in the Clean Energy Plan.

Definition Overview – key terms were discussed and differences between net-zero carbon, zero carbon, and carbon energy were defined.

Scenarios - three base targets were defined in the study scope: 100% renewable by 2050, 100% net-zero carbon by 2050 and 80% renewable by 2035. Ms. Prkacin reviewed different scenarios for 100% renewable by 2050. Only high and expected forecasts were included in the study, along with variations of what natural gas fuel pricing would be, expectations for growth of distributed solar and storage, adaptation of electric vehicles, and wreck pricing.

Assumptions and Forecasts – Ms. Prkacin spoke about supply sources for current state load generation (residential, commercial and streetlight), components used to develop annual energy needs based on 10-year plans from other utilities, expected low and high forecasts for residential distributed solar, distributed solar on rooftops, vacant land owned by the city and forecasts of EV charging loads for residential and local business customers.

In reference to generation assumptions, Ms. Prkacin explained that solar and green hydrogen, coupled with battery storage, are the best fit for the city. She spoke about the maturity and viability of these technologies and the potential for the city to have partial ownership of each.

Commissioner Sullivan asked for clarification between green hydrogen and battery storage. Ms. Prkacin explained that green hydrogen and battery storage are comparable in some ways, and gave examples of those similarities. Commissioner Weaver asked about geothermal uses and Mr. Mount explained that on a utility scale, there are no viable geothermal resources that would allow for large generators to be built. He added that currently there are new technologies for geothermal energy that have been contracted, or are in testing phases, that may be viable for Florida in the future.

Forecast Generation – the team looked at individual categories of single-family homes, multi-family dwellings, commercial buildings and city assets, to determine if the buildings can be energy neutral. They spoke about timelines and forecasts for target load reduction for each based on EV, solar, and battery storage.

Method – the team planned objectives and assumptions based on feedback, initial load distributed energy sources, and EV forecasts to develop the city's IRP. Ms. Prkacin spoke about the probabilistic integrated resource planning tool (pIRP) that was used to devise future generation portfolios, and uncertainty analysis. Portfolios were identified and evaluated by defining scenarios the described future conditions such as various high, medium and low adaptation rates for EV, PV, and gas pricing. Baseline assumptions and least cost expansion plans were identified for each scenario, and the best performing portfolios (typically the lowest cost with highest reliability) were selected from those results.

In response to questions on battery capacity for homes from day to overnight, Mr. Mount explained the two ways batteries are rated: peak and energy capacity. He explained that only if a battery has sufficient energy capacity, is it able to give a home energy all night long.

Results – Mr. Mount spoke about the 15 scenarios in the study based on the three base targets. He highlighted expectations and percentages that were used to determine different potential outcomes, and identified three likely scenarios based on those results.

Mayor Anderson noted that he asked to see net zero carbon in the study because he equated it to the OUC definition. He explained that in OUC's case, going from 94% to 100% carbon free was a 26% premium of additional installed capacity, as they continue to use 5% natural gas and 1% nuclear. He said discussion needs to be held on whether 100% for 2050 is the right target for the city. He feels that options 1A or 3A are best fit for the city and spoke on how OUC achieved net zero carbon. Discussion followed on the differences between OUC and Winter Park, as well as potential to reach 100% renewable energy.

Scenario 1A: 100% renewable by 2050 – Mr. Mount reviewed the scenario and highlighted key elements and assumptions including cost of debt generation, weighted cost of capital, load forecast. He presented a graph indicating how the city meets capacity requirements on a year by year basis. He spoke about issues related to energy capacity for solar, batteries and other technologies such as green hydrogen to achieve 100% renewable by 2050. In-depth discussion was held on the following topics: green hydrogen technology, solar production, capacity and energy requirements, virtual power plants, and cost impacts. In addition, the commission discussed the year 2042 as a possible interim target date when some future technologies maybe become more affordable. (Added as amended in 4/12/23 meeting).

After discussion, Mr. Mount continued to review elements of Scenario 1A such as annualized cost of energy, levelized cost of energy, and various other elements.

Scenario 3A- Mr. Mount noted that in this timeline the city would reach 80% renewable by 2035 followed by 100% renewable by 2050, however, after 2035 the assumption is the same. He reviewed key elements such as annual total capacity additions by technology, levelized cost of energy, Present Value Revenue Requirements (PVRR) results and a summary of financial results for PVRR and levelized cost of energy.

Roadmap/Next Steps - recommendations focused on four areas within the roadmap such as financial, studies, technology and purchases. These were identified by the following timelines: short term (next 3 mo.), mid-term (next 18 mo.) and long term (next 48 mo.). Mr. Mount reviewed the primary focus, timeframe, suggested actions, and projects for each target area. (See attached presentation for reference).

Mayor Anderson referenced pg. 42 of the power point presentation on energy sources, which outlines what happens over a 24-hour cycle and where power comes from in a 24-hour day. He noted that it may be beneficial to refine this information to show residents where their power is coming from. Mr. Mount explained how the model for this data was analyzed.

In response to questions regarding time of use (TOUs), Mr. Knight explained that currently the city doesn't benefit from a TOU meter, because the city is not a generator. He explained that the only way this would benefit the city, would be to convince residents into not running electricity for the one hour in the month that the peak for that month is calculated. Discussion followed on TOU peak loads, fuel costs elements and impacts.

Commissioner Sullivan addressed comments on the study that were circulated by Mayor Anderson. Some of the topics reviewed included: energy efficiency opportunities, battery and solar cost reduction efficiency curve, battery plus PV numbers, distributed batteries as part of the city's power plan, assumptions, escalation of prices at 3% and how it relates to inflation, rise in cost per megawatt hour in 2035, and city ownership in power generation and storage of battery assets.

After reviewing Mayor Anderson's comments, Commissioner Sullivan noted that the city has been looking at renewable energy for the past two and a half years, and urged the city to hire staff with the appropriate skills/knowledge to move this effort forward. Discussion followed about hiring a consultant in lieu of a full-time employee, and Commissioner Sullivan suggested using a consultant initially, before moving forward with a full-time employee.

Mayor Anderson added that UAB Chair, Michael Poole, suggested developing a business plan for this effort and do a direct hire as suggested by Commissioner Sullivan. Commissioner Sullivan concurred and discussion followed on special assessments, the PACE program, and grant opportunities to fund the position. Ms. Eby noted that the city is not part of the initial cusp of block grants received by the state due to population size. She said additional grants are anticipated that the city may be able to benefit from.

Commissioner Sullivan said he has three requests, amending the Sustainability action plan with the results of this study and address the plan as a "targeted program" for the city, not an aspirational plan and resolve to work for renewable energy for the city including staffing.

Commissioner Weaver asked about concessions for the city to put a solar generation plant on a property in Orange County. Discussion followed on the development of brown fields and solar farms, classification and build costs. Further discussion was held on parameters for developing the business plan for this effort, the undergrounding project and related revenue assumptions and expenses. Mayor Anderson asked the consultants to develop a 30-year forecast business model. Mr. Mount suggested meeting with staff to identify other relevant elements in order to determine more accurate estimates for the model. Discussion continued on identifying which scenario (1A and 3A) and benchmarks is best for the city, recommendations and feedback from the Sustainability and UAB boards.

Mr. Mount addressed Mayor Anderson's comments on the study and said most comments will be addressed within the scope of work and budget, and will result in changes and revisions to the study. He identified elements that are not in the scope and said once revisions are done a report will be given to Ms. Eby on status of each comment.

3) Adjournment

The meeting adjourned 3:23 pm

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Mayor Phillip M. Anderson

ATTEST:

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City Clerk Rene Cranis

QUANTA TECHNOLOGY

A QUANTA SERVICES COMPANY

MARCH 23, 2023

City of Winter Park Final Report Presentation

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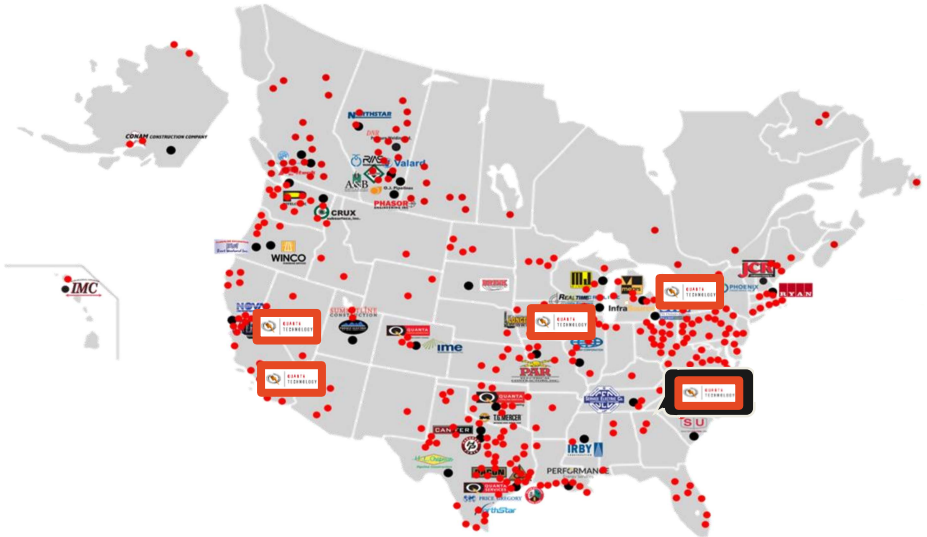
Quanta Technology Overview

We are an independent technology, consulting, and testing company serving a wide range of utility customers.

- Headquartered in Raleigh, NC, and part of Quanta Services (Fortune 300).
- Supporting offices in IL, CA, and Canada.



- Nearly 300 consultants and industry expe
- Expertise in electric power and energy in gas and water systems, and solutions.
- Serving numerous IOUs, and municipaliti and distribution, protection, distribution a renewables, grid resiliency.

We offer a full spectrum of services in the follo

- Grid modernization and business strategy
- Advanced metering infrastructure
- Smart water and gas solutions
- Non-revenue water
- Leak detection, pressure monitoring
- Transmission and distribution
- Asset operations
- Protection and control
- Transportation electrification
- Renewables integration
- Energy storage
- Grid resiliency

Agenda

01. Purpose

02. Definition overview

03. Scenarios

04. Current state

05. Assumptions and for

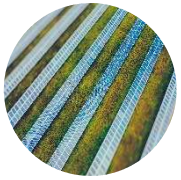
06. Method:

07. Results

08. Roadmap

Purpose: Next Steps for a Clean Energy Plan

Which mix of energy? What timeframe? What cost?

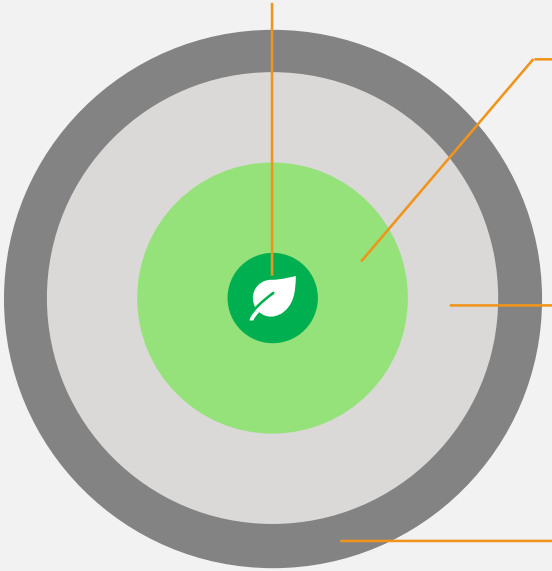





To support clean energy in the City of Winter Park.

Definition Overview

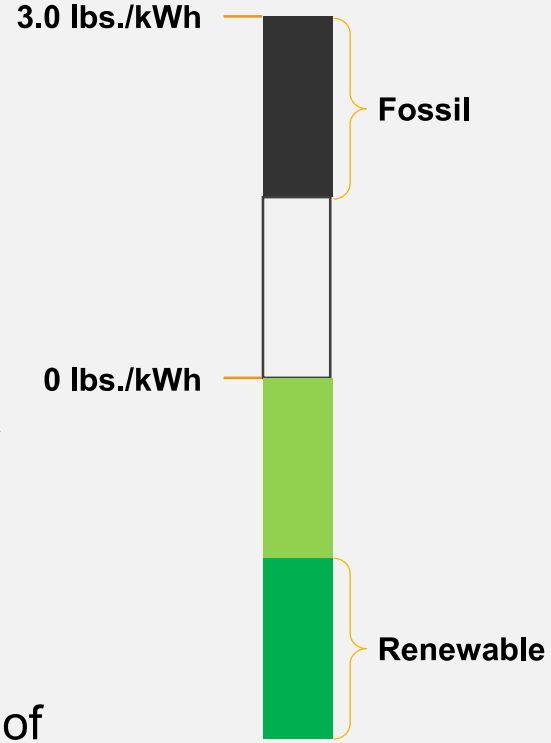
Renewable energy
Wind, solar, ocean energy, geothermal, hydro, green hydrogen



Zero carbon
Renewable energy + nuclear

Net-zero carbon
Purchased offsets for ownership of carbon producing plants

Carbon Purchased offsets for ownership of carbon producing plants



Outline of Three Base Targets Defined in Study Scope

Scenario Element	Targets		
	100% Renewable Scenario 1	Net-Zero Carbon Scenario 2	80% Renewable Scenario 3
2050 renewable target	100%		
2050 net-zero carbon target		100%	
2035 renewable electric target			80%

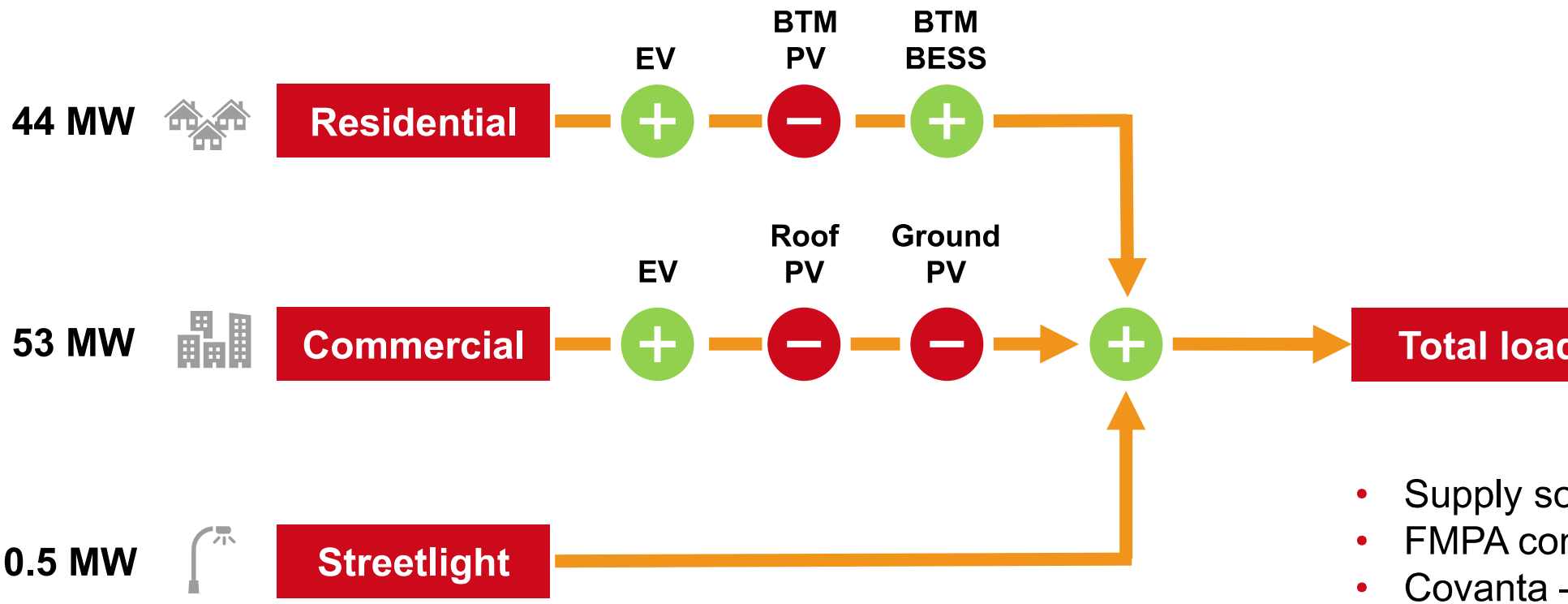
Electric consumption forecasts do include charging requirements for forecasted EV adoption but do not include building electrification (e.g., changing space and water heating from gas to electric appliances).

Three Base Targets – Each Expanded with Multiple Scenarios

Scenario Count	1	2	3	4	5	6	7	8	9	10	11	12	1
							Scenarios						
Scenario Element	100% Renewable by 2050						Net-Zero Carbon by 2050					80% Ren	
	1A	1B	1C	1D	1E	1F	2A	2B	2C	2D	2E	3A	3
2050 renewable target	**100%**	100%	100%	100%	100%	100%	**-**			-	-	**100%**	10
2050 net-zero carbon target							**100%**	100%	100%	100%	100%		
2035 renewable energy target												**80%**	80
Load forecast	**Expected**	High	Expected	Expected	Expected	Expected	**Expected**	High	Expected	Expected	Expected	**Expected**	Expe
Natural gas fuel price forecast	**Expected**	Expected	Expected	Expected	High	Low	**Expected**	Expected	Expected	High`	Low	**Expected**	Expe
Distributed solar + storage	**Expected**	High	Low	Expected	Expected	Expected	**Expected**	High	Low	Expected	Expected	**Expected**	Expe
Electric-vehicle growth	**Expected**	High	Low	Expected	Expected	Expected	**Expected**	High	Low	Expected	Expected	**Expected**	Expe
REC pricing	**N/A**	N/A	N/A	N/A	N/A	N/A	**Expected**	Low	High	Expected	Expected	**N/A**	N
Developer cost of capital for generation	**8.00%**	8.00%	8.00%		8.00%	8.00%	**8.00%**	8.00%	8.00%	8.00%	8.00%	**8.00%**	
CWP cost of debt for generation				3.50%									3.5

Most likely scenarios

Current State – Load and Generation



- Supply sc
- FMPA cor
- Covanta -
- Clean foo

MW is peak load in 2021; energy consumption was 421 GWh

Forecasts and Assumptions

Developed expected and high-energy forecasts

For CWP annual energy needs based on 10-year plans from other utilities

Developed expected high

For CWP distributed solar a

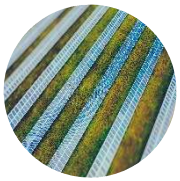
Developed expected, low, and high forecasts

For distributed solar on rooftops and vacant land owned by CWP

Developed fo EV charg

For CWP cust employees of

Assumptions: Generation



Energy source	Wind	Solar	Ocean	Geothermal	Biofuels	Green hydrogen
Mature technology	☑	☑	R&D	☑	☑	Likely 2035
Viable for location		☑			Limited	☑
Resident owned		☑				
CWP owned		☑				☑
CWP Purchase Potential	☑	☑	☑			☑

Solar and green hydrogen are the best fit for City of Winter Park, coupled with battery

* Not considered generation

Forecast: Generation

City of Winter Par

Single family homes

- Energy neutral
- Timeline based on conservative EV adoption rates

Multi-family dwellings

- Consumer
- Rooftop solar to support EV
- Energy neutral difficult to achieve

Commercial buildings

- Consumer
- Energy neutral difficult to achieve
- Rooftop solar + parking lot solar to support EV

Governmental buildings

- Consumer
- Energy neutral difficult to achieve on some buildings may be possible for others
- Timeline based on roof replacement

Single Family Home Forecasts: Target Reduced Load

Generation

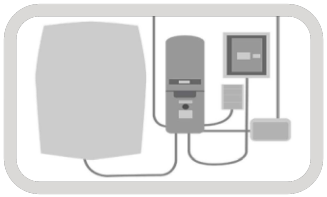
Consumption

Modeling includes three different scenarios for rooftop PV.

Overall contribution was load increase due to customer adoption rates.

Rooftop PV

- 10,415 – 20,830 kWh/year
- 500 sq. ft. -1,000 sq. ft.



- 13.5 kWh Powerwall battery
- 10.5 kWh maximum usable

15,500 kWh / year

3,850 kWh/year

EV charging

Back-Up Grid Power

Overflow

City of Winter Park Assets: Target Load Reduction

Generation

Consumption

- 20,830 – 208,300 kWh/year
- ~ 270 sq. ft./spot
- 4-40 spots
- 1000 -10,000 sq. ft.

Parking lot PV

Land PV

Rooftop PV

- 20,830 – 83,320 kWh/year
- 1000 -4000 sqft

Battery sized to charge solar and discharge to EV

EV charging

Back-Up Grid Power

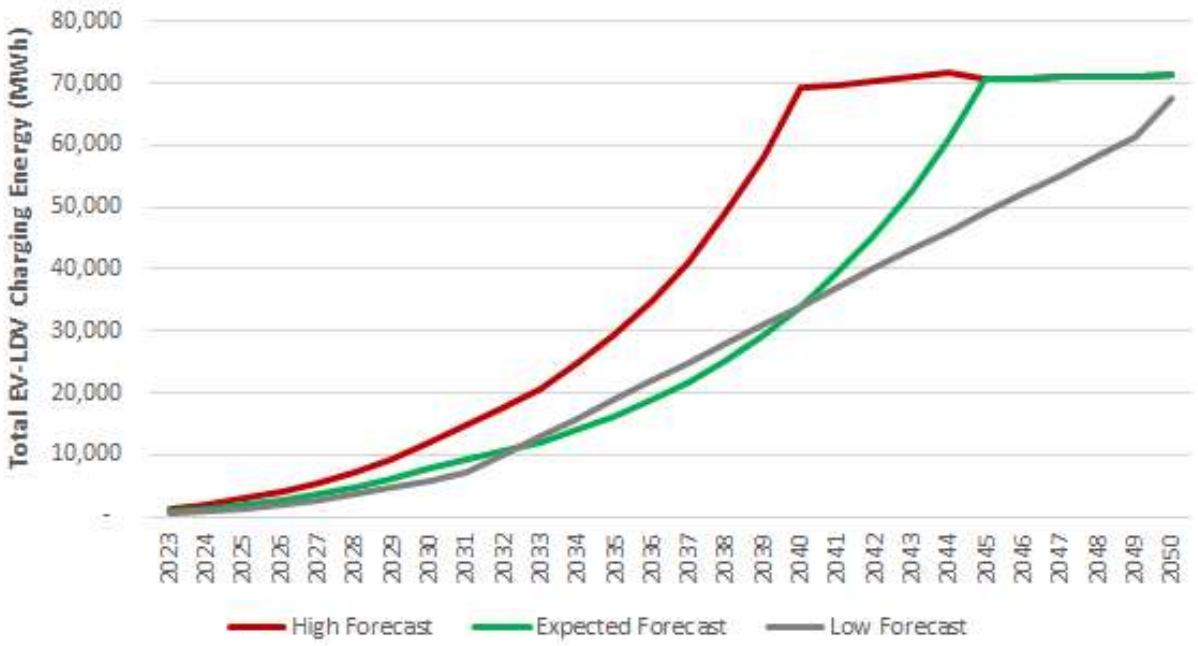
Overflow

- 5-20 EV chargers/building
- 19,250-77,000 kWh/year

Modeling was not segme

Overall contribution wa

Forecast: Resident and Commuter EV-LDV Charging



- **EVs are forecasted to cli maximum of 95% of regi vehicles.**
- **Customers purchasing e vehicles will likely obtai Powerwall or similar cha storage, and likely roofto**
- **Forecast was developed average** in the TYSP that
  - IOUs:
  - Munis:

Maximum Distributed Energy: You Are Still Buying Power

City of Winter Park ass

Single family homes

Energy Neutral
- Energy neutral
- All SFH's powered by solar
- Rooftop solar maximized

Multi-family dwellings

Consumer
- Rooftop Solar to support EV
- Reduced Energy

Commercial buildings

Consumer
- Conservation
- Rooftop solar maximized
- Carport solar

Governmental buildings

Energy Neutral
- Conservation
- Rooftop solar maximized
- Carport Solar

Method: Key Steps in the Development of CWP IRP

Method: How Portfolios are Identified and Evaluated

1	Define scenarios so they describe a range of plausible future conditions.
2	Identify baseline assumptions for each scenario.
3	Run least cost-expansion plan for each scenario.
4	Develop a list of possible portfolios based on results.
5	Adjust portfolios as needed.
6	Select the best performing portfolio, and identify no-regret, or limited regret strategies across the future scenarios.

The Following Slides Primarily Focus on the Three Most Likely Scenarios

Scenario Count	1	2	3	4	5	6	7	8	9	10	11	12	1
							Scenarios						
Scenario Element	100% Renewable by 2050						Net-Zero Carbon by 2050					80% Ren	
	1A	1B	1C	1D	1E	1F	2A	2B	2C	2D	2E	3A	3
2050 renewable target	**100%**	100%	100%	100%	100%	100%	**-**			-	-	**100%**	10
2050 net-zero carbon target							**100%**	100%	100%	100%	100%		
2035 renewable energy target												**80%**	80
Load forecast	**Expected**	High	Expected	Expected	Expected	Expected	**Expected**	High	Expected	Expected	Expected	**Expected**	Expe
Natural gas fuel price forecast	**Expected**	Expected	Expected	Expected	High	Low	**Expected**	Expected	Expected	High`	Low	**Expected**	Expe
Distributed solar + storage	**Expected**	High	Low	Expected	Expected	Expected	**Expected**	High	Low	Expected	Expected	**Expected**	Expe
Electric-vehicle growth	**Expected**	High	Low	Expected	Expected	Expected	**Expected**	High	Low	Expected	Expected	**Expected**	Expe
REC pricing	**N/A**	N/A	N/A	N/A	N/A	N/A	**Expected**	Low	High	Expected	Expected	**N/A**	N
Developer cost of capital for generation	**8.00%**	8.00%	8.00%		8.00%	8.00%	**8.00%**	8.00%	8.00%	8.00%	8.00%	**8.00%**	
CWP cost of debt for generation				3.50%									3.5

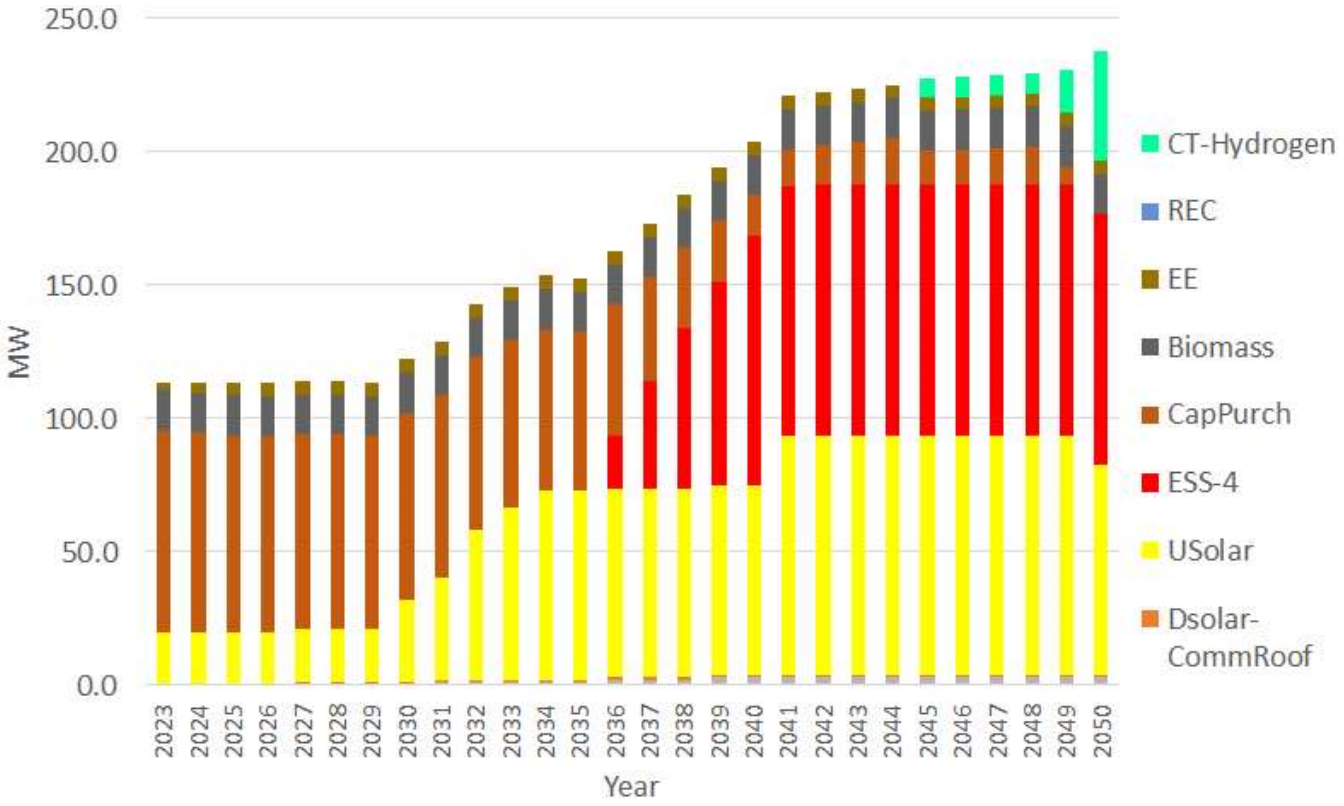
Most likely scenarios

Scenario 1A: 100% Renewable by 2050

Scenario Element	Value
2050 renewable target	100%
2050 net-zero carbon target	
2035 renewable energy target	
Load forecast	Expected
Natural gas fuel price forecast	Expected
Distributed solar + storage	Expected
Electric-vehicle growth	Expected
REC pricing	N/A
Developer cost of capital for generation	8.00%
CWP cost of debt for generation	

Expected load fore
per year based on

Scenario 1A: 100% Renewable by 2050
Annual Total Capacity Additions by Technology



- Generation additions include substantial solar, and batteries a some biomass.

- Combustion Turbines (CT) fueled with Gre Hydrogen is added c in last five years.

Definitions

Revenue requirement

Required utility revenue needed to pay for all capital, operational and maintenance costs

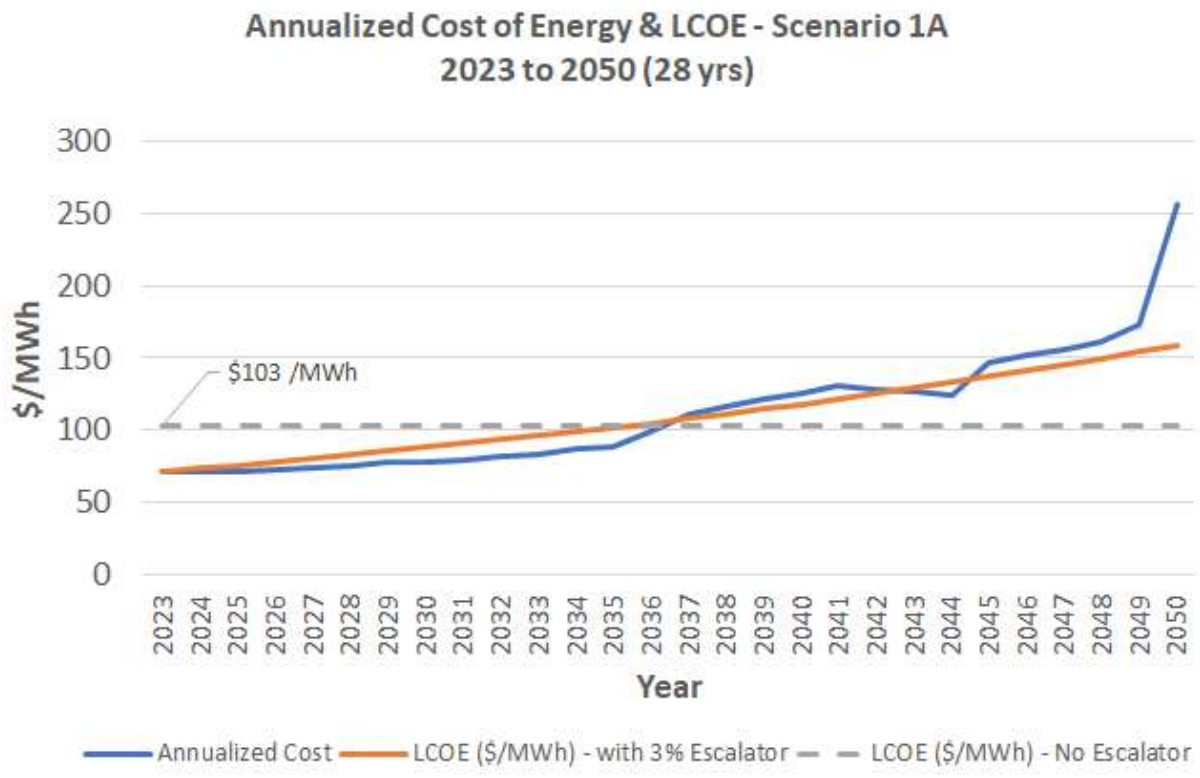
Present value of revenue requirement

The annual revenue requirement after it has been discounted to a common based year

Levelize cost of ene

The present valu stream of ann energy costs div the stream of ann consume

Scenario 1A: 100% Renewable by 2050
Annualized Cost of Energy and LCOE

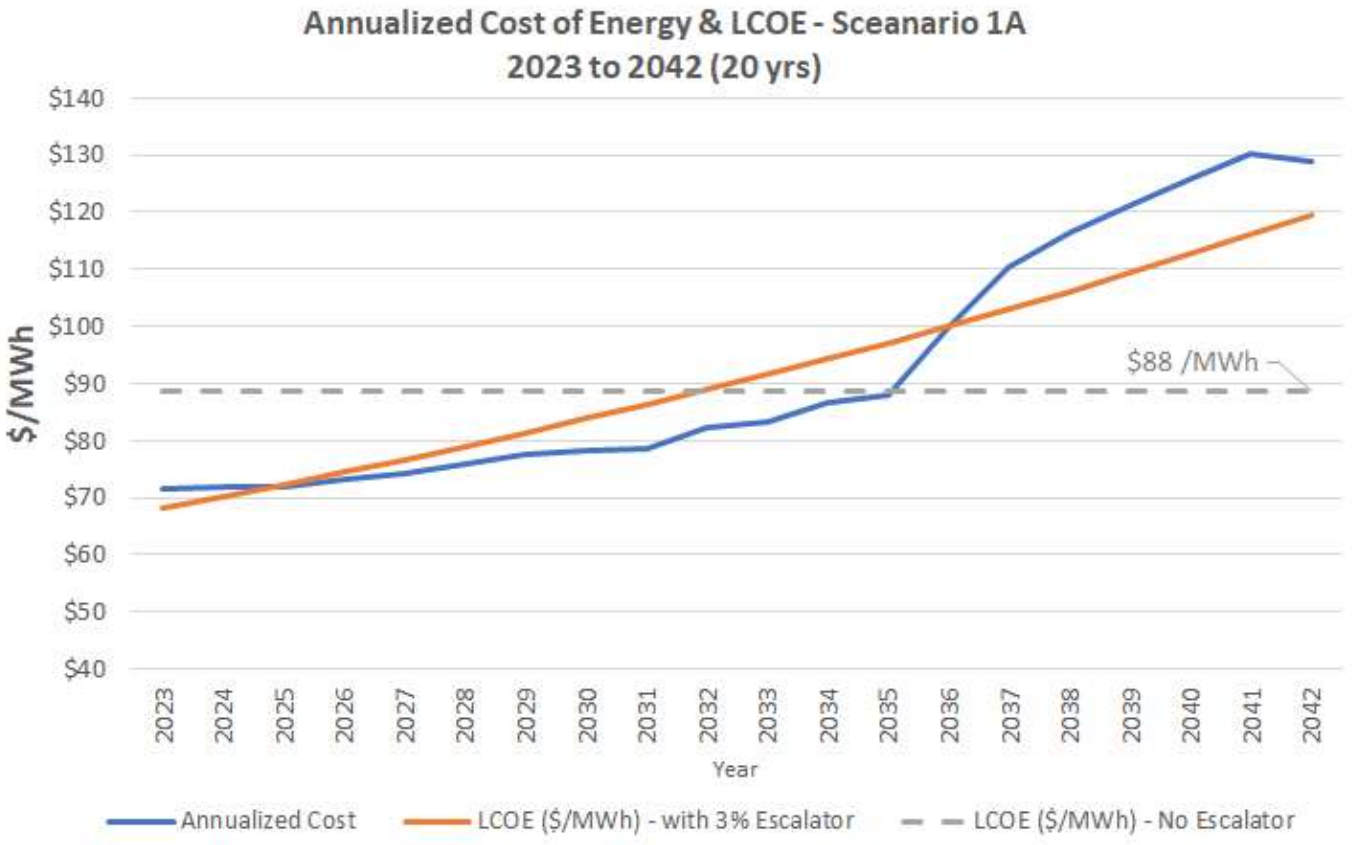


Graph shows three versio
of the same costs:

1. The actual annual cos
2. The levelized cost of
   the dashed gray line.
3. The LCOE assuming
   escalation in the oran

**The green hydrogen CT
added in the last six yea
increase in annual cost
renewable contribution
hydrogen CT addition is**

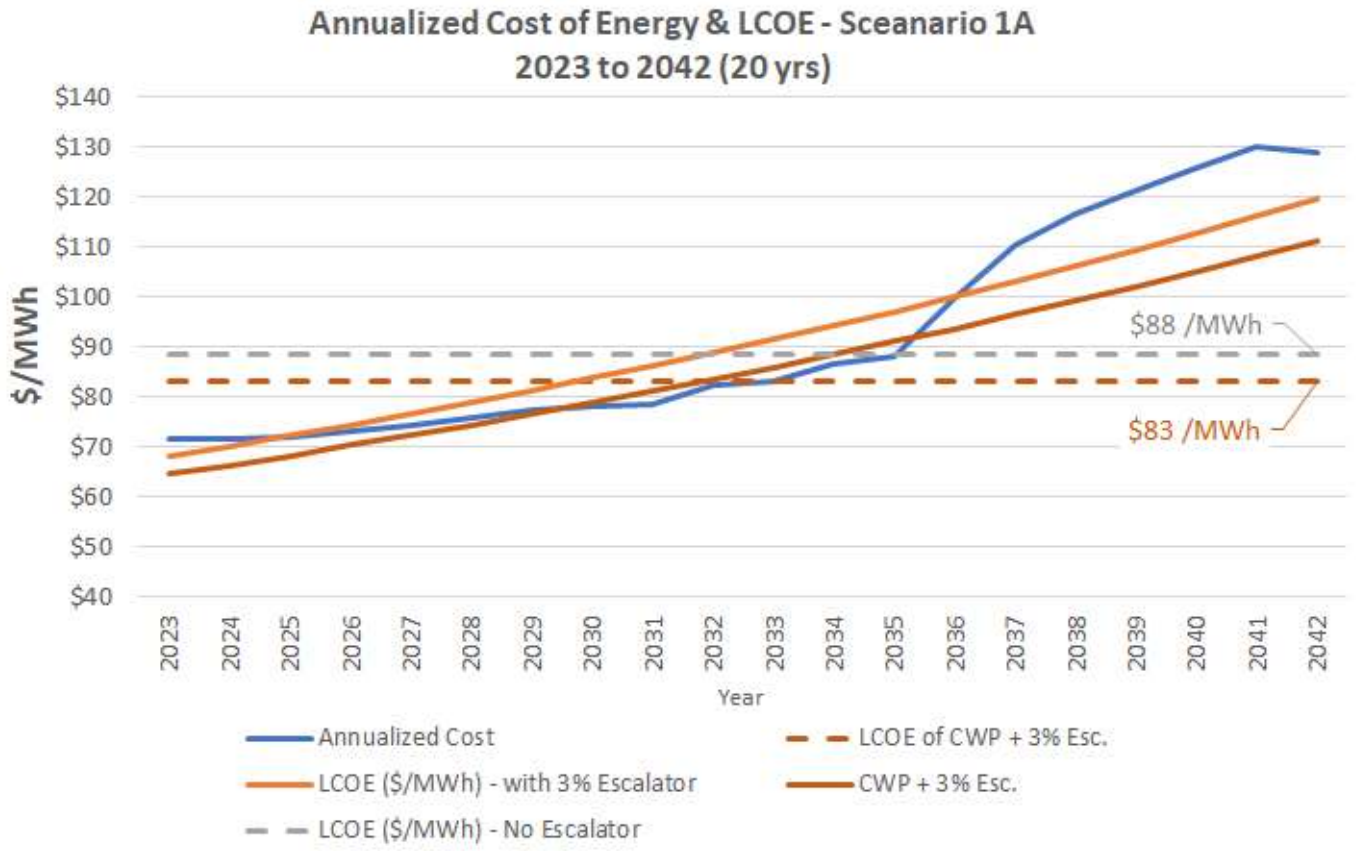
Scenario 1A: 100% Renewable by 2050
Using Only the First 20 Years of Results to 2042



By removing the
years when the g
hydrogen CT is a
remaining actual
LCOE costs are
significantly redu

By the last year i
chart, 2042, the r
contribution reac

Scenario 1A: 100% Renewable by 2050
With Projected CWP Current Costs and First 20 Years of Result



For the first 20 years of scenario 1A are c only $5/MWh or 0.5 c above the projected CWP's current fossil portfolio.

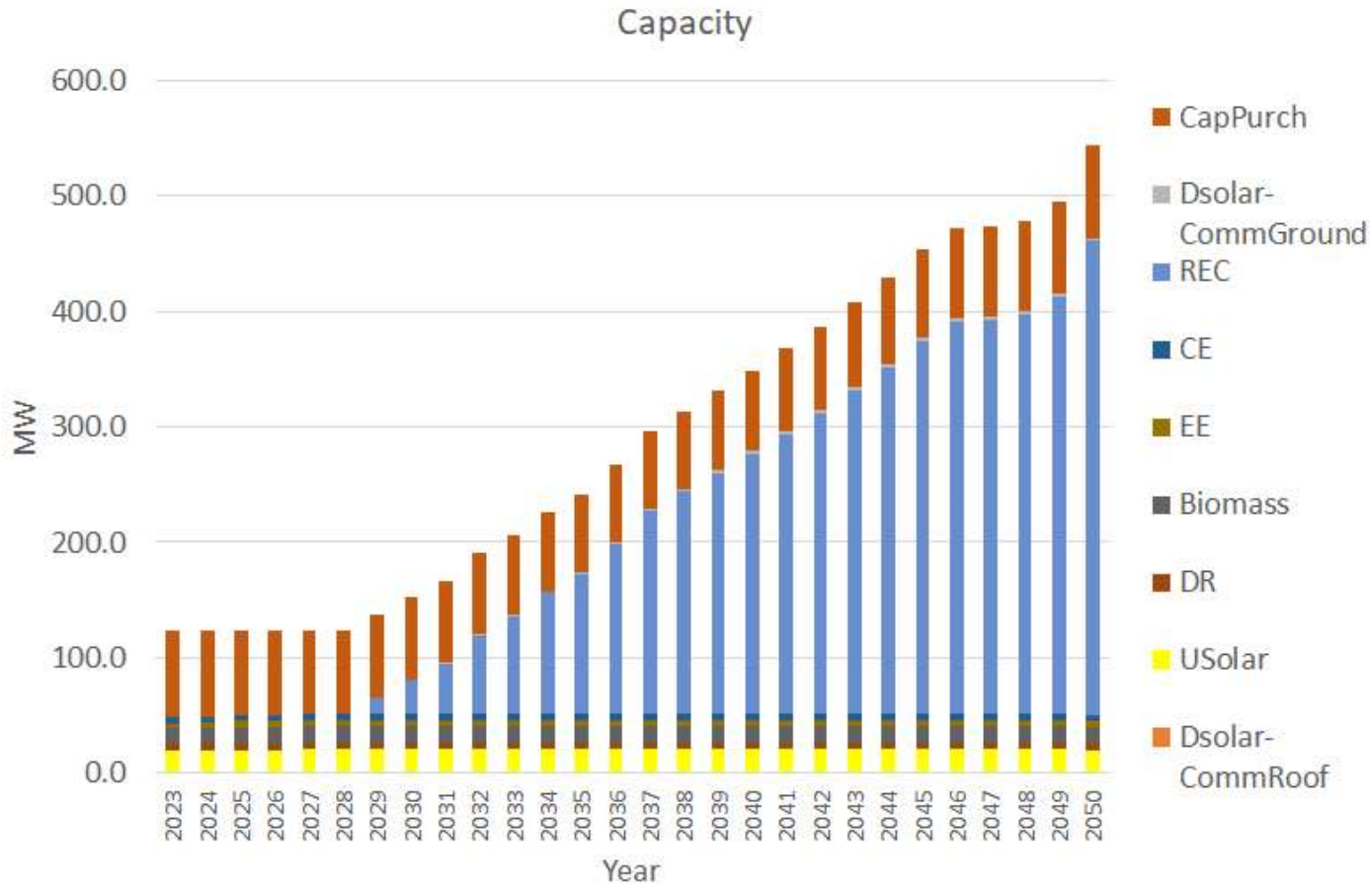
By the last year in th 2042, the renewable reaches 71%.

Conservative because Technology expects C costs will likely escala than 3% annually.

Scenario 2A: 100% Net Zero by 2050

Scenario Element	Value
2050 renewable target	
2050 net-zero carbon target	100%
2035 renewable energy target	
Load forecast	Expected
Natural gas fuel price forecast	Expected
Distributed solar + storage	Expected
Electric-vehicle growth	Expected
REC pricing	N/A
Developer cost of capital for generation	8.00%
CWP cost of debt for generation	

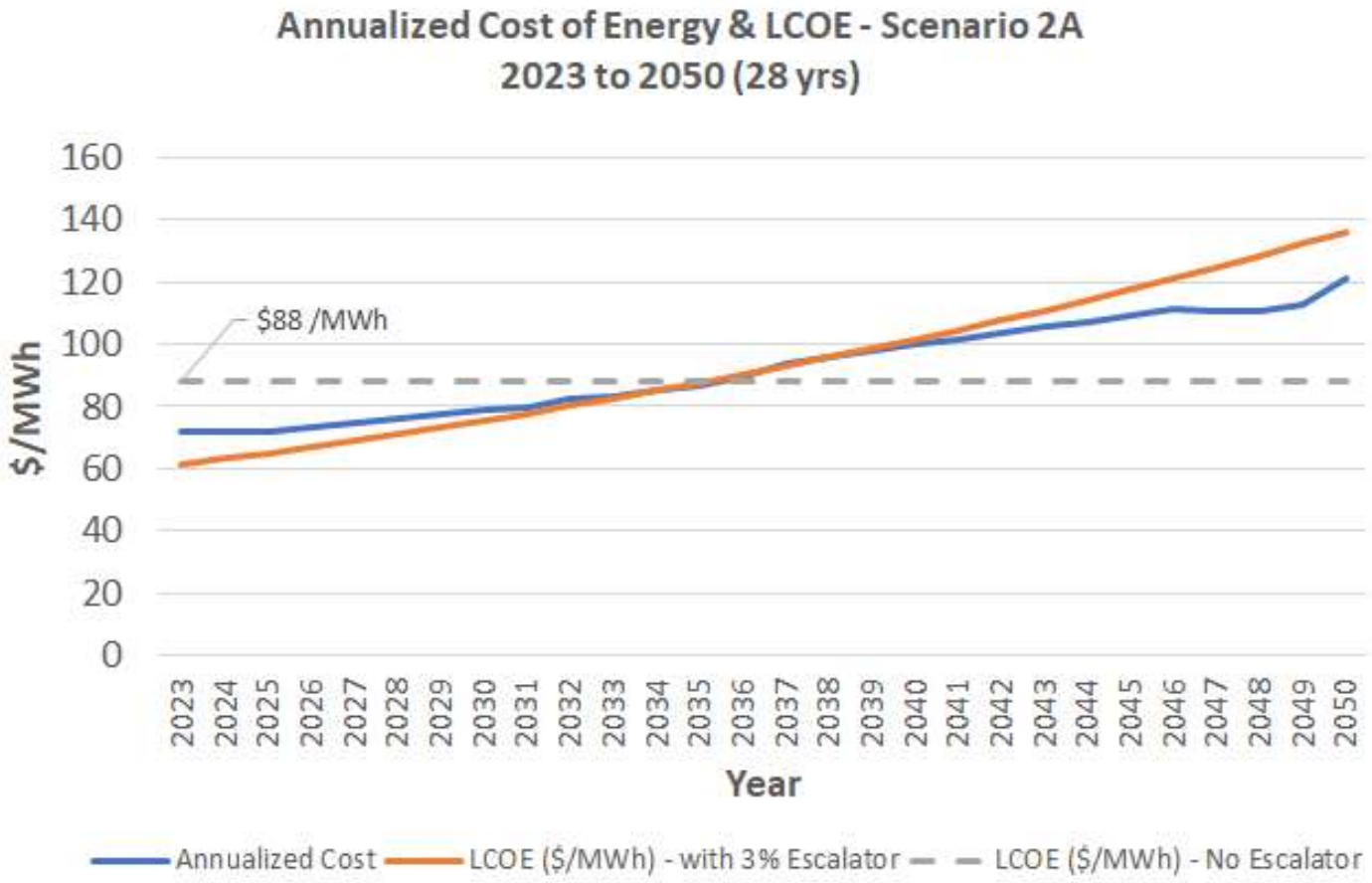
Scenario 2A: Net Zero Carbon by 2050
Annual Total Capacity Additions by Technology



Generation techno
selected by the m
net zero scenario
carbon producing

However, renewab
credits are used to
use of fossil fuels.

Scenario 2A: Net Zero Carbon
Annualized Cost of Energy and LCOE



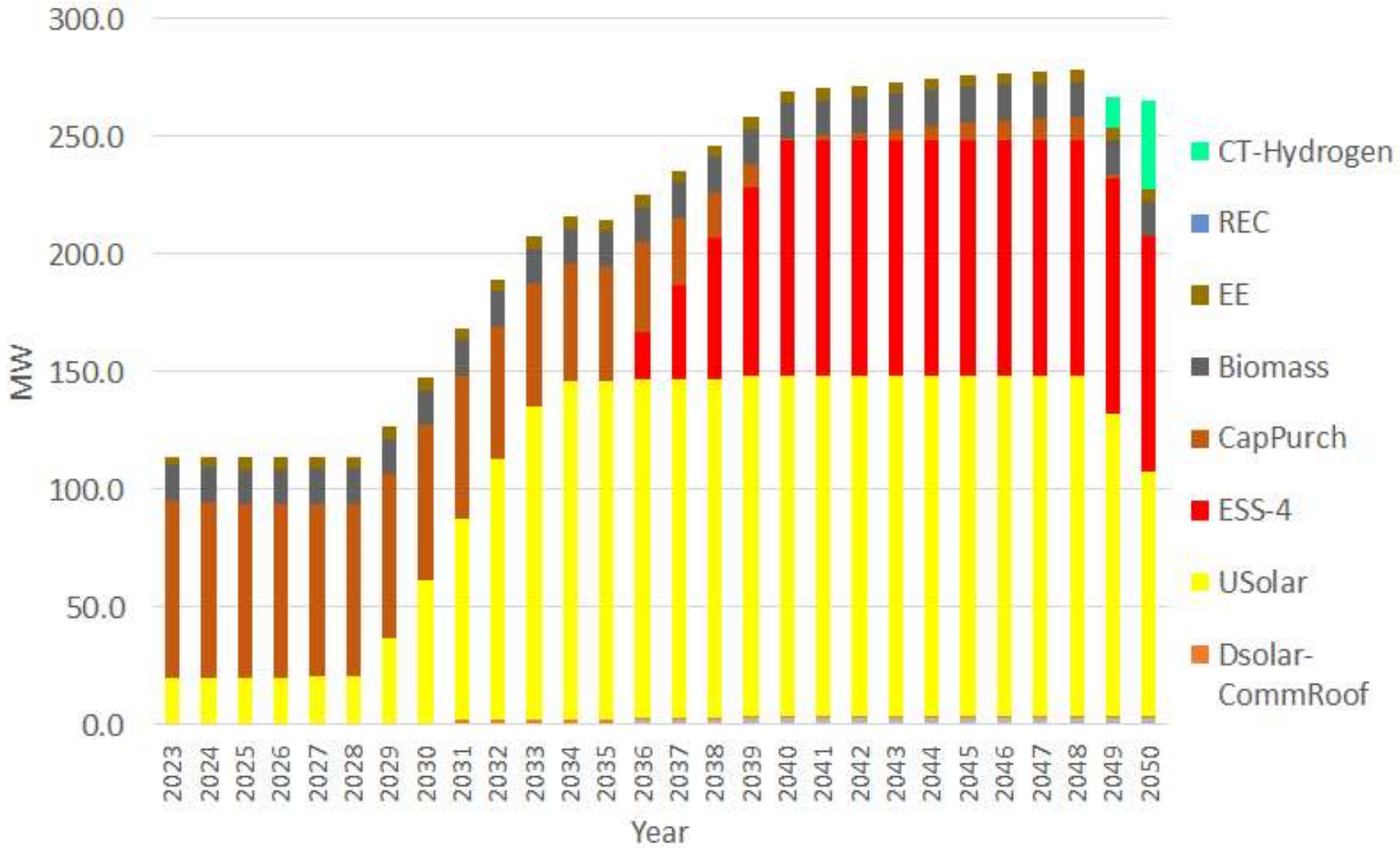
The $88/MWh LCO
this 28-year, net-ze
analysis are much
the $146/MWh for
analysis of Scenar

The purchase of in
renewable energy
continued purchas
energy through 20

Scenario 3A: 100% Renewables by 2035 then 100% by 2050

Scenario Element	Value
2050 renewable target	100%
2050 net-zero carbon target	
2035 renewable energy target	80%
Load forecast	Expected
Natural gas fuel price forecast	Expected
Distributed solar + storage	Expected
Electric-vehicle growth	Expected
REC pricing	N/A
Developer cost of capital for generation	8.00%
CWP cost of debt for generation	

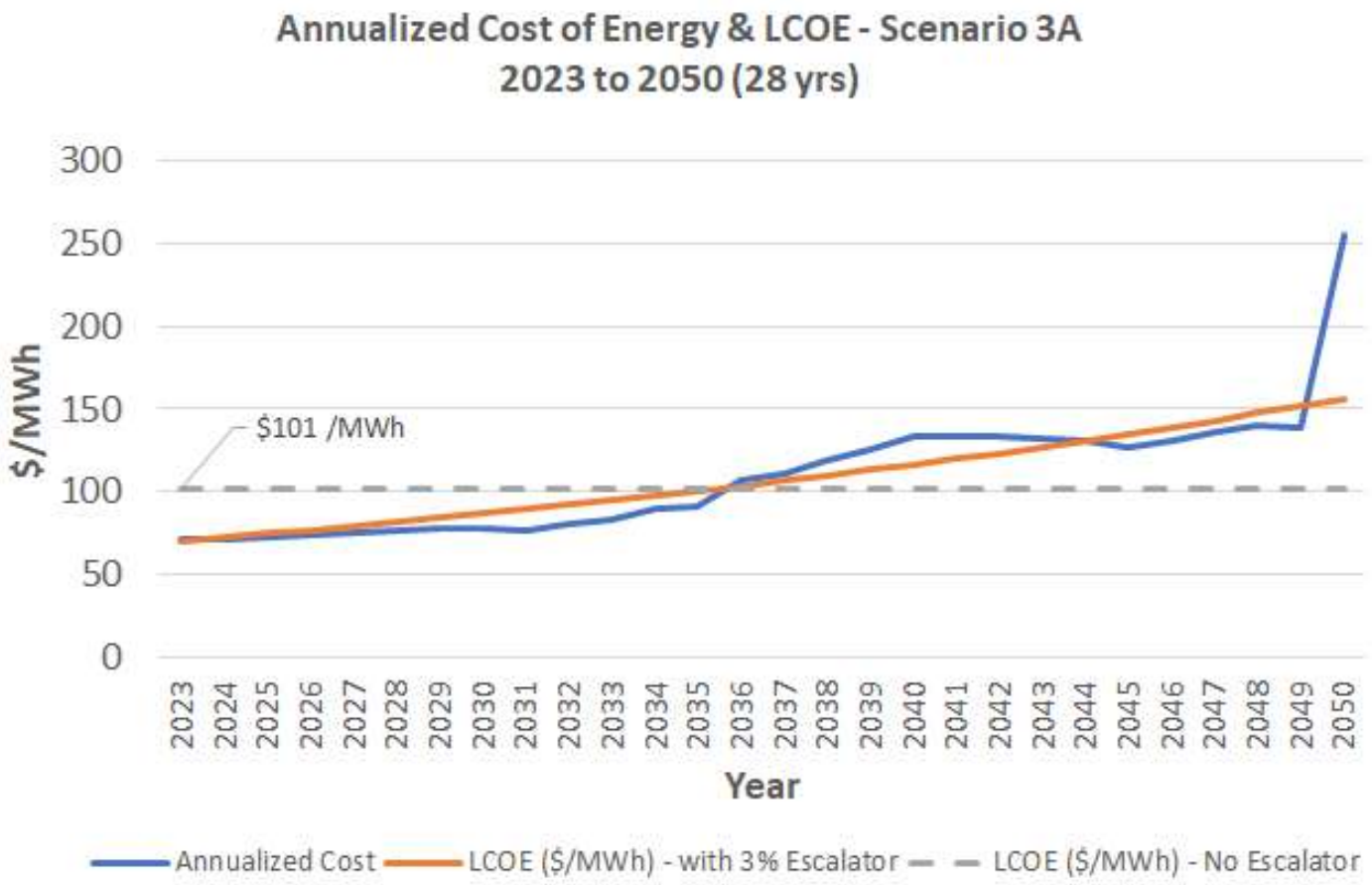
Scenario 3A: 80% Renewables by 2035
Annual Total Capacity Additions by Technology



Generation techno
selected by the m
80% renewable sc
are identical to tho
for the scenario 1A

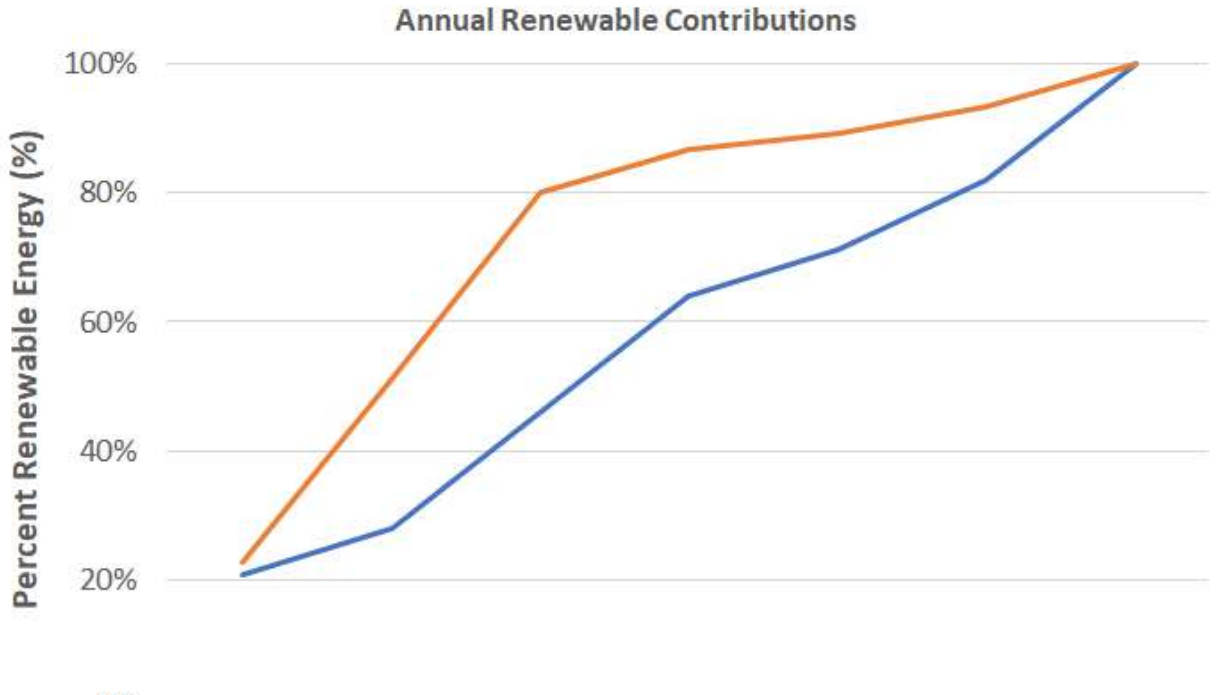
**However, renewa
batteries are just
more rapid pace
green hydrogen
pushed out to th
years.**

Scenario 3A: 80% Renewables Annualized Cost of Energy and I



As with scenario 1
hydrogen CT is a
moved out to the
years, lowering t
below Scenario 1

Renewable Supply: 100% Longer Timeline vs. 80% Shorter Time



	2025	2030	2035	2040	2042	2045	2050
Scenario 1A - 100% Renewable by 2050	21%	28%	46%	64%	71%	82%	100%
Scenario 3A - 80% Renewable by 2035	23%	51%	80%	87%	89%	93%	100%

80% target by
aggressive and
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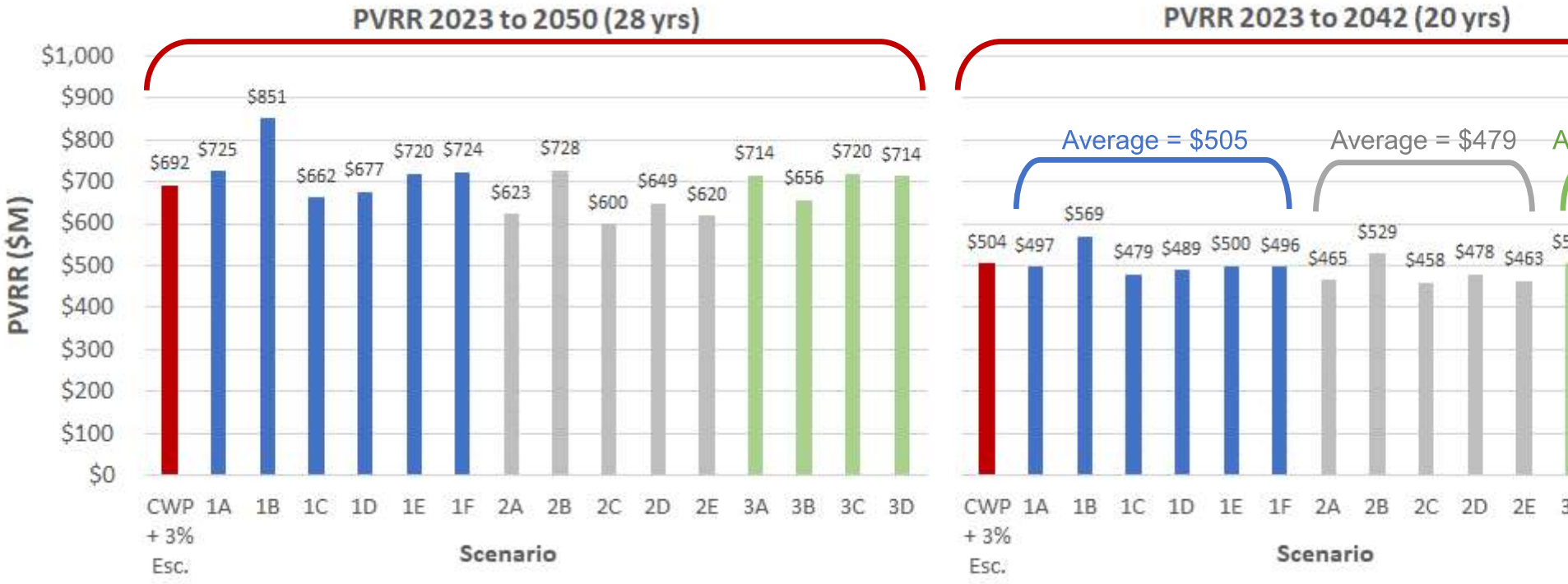
achieve goals

Target 1A - 10
Renewable by
80% renewabl

PVRR Results for All 15 Scenarios Indicate that Targets are Fea

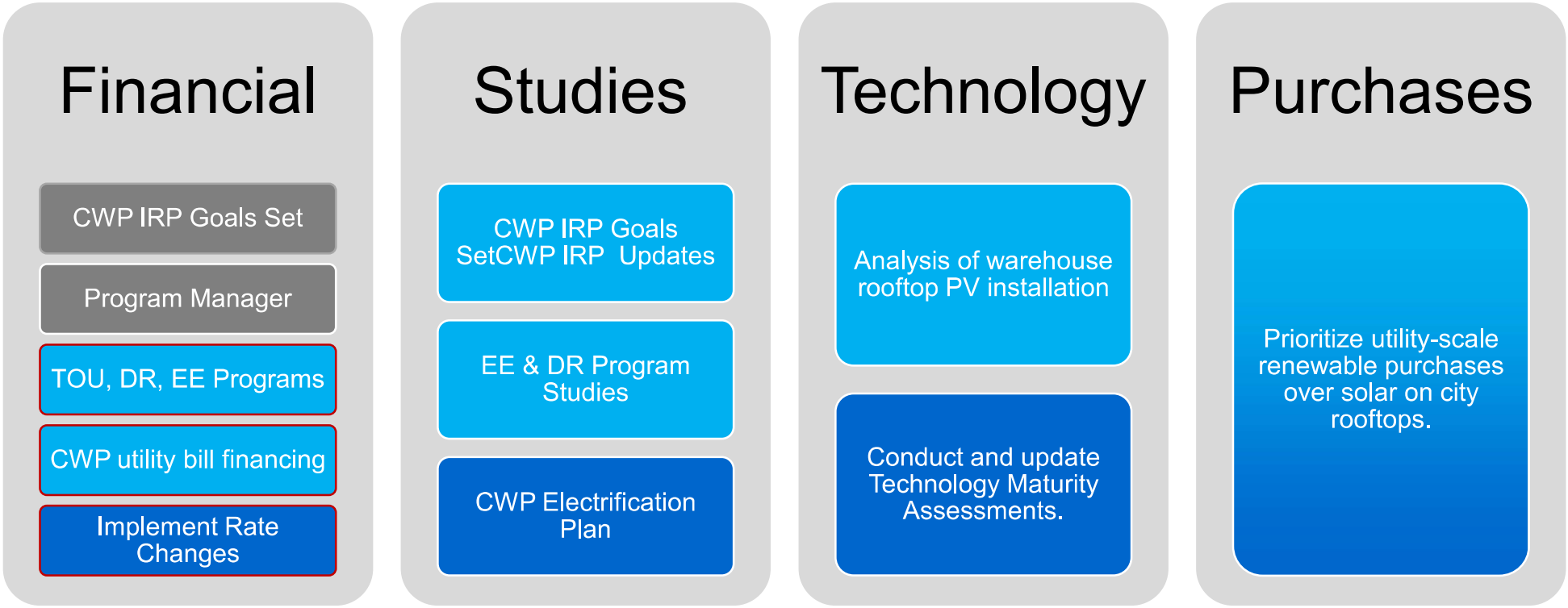
- Results for first 20 years of all scenarios are very close to the projected CWP costs.
- Results for 28 years show more variation due to technologies added in the later years of



Summary of Financial Results - PVRR and LCOE

Scenario	1A	2A	3A
PV of revenue requirements ($M)			
• Based on 20 years of costs to 2042	$497	$465	$505
• Based on 28 years of costs to 2050	$725	$623	$714
Levelized cost of energy ($/MWh), no escalation			
• Based on 20 years of costs to 2042	$88	$83	$90
• Based on 28 years of costs to 2050	$103	$88	$101

Roadmap Next Steps

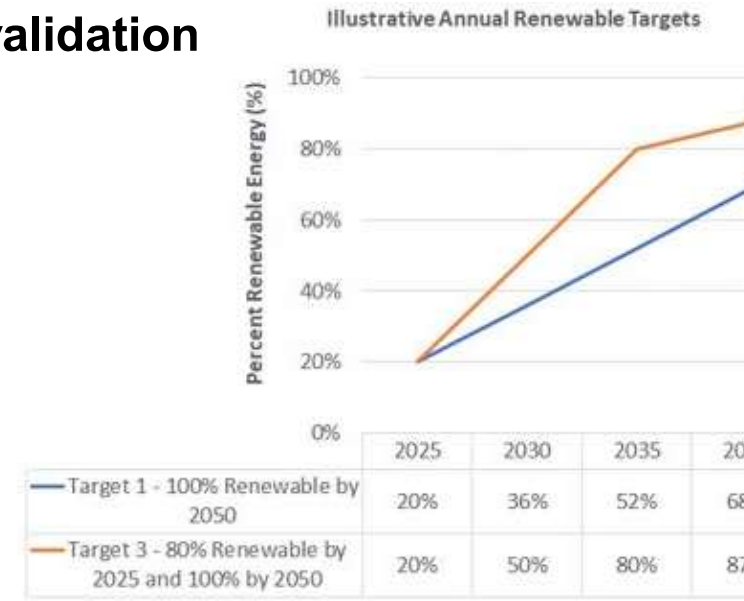


Roadmap (Short-term)

Primary focus: **Alignment, definition, goal setting/validation**

Timeframe: **May 2023 – July 2023**

Actions	Projects
• Define clear target for CWP's clean energy supply.	• Establish multiple interim targets for renewable contributions before 2050
• Start CWP IRP program.	• A program manager will likely be needed to coordinate all aspects of reaching the goal



Roadmap (Mid-term)

Primary focus: **Customer DR/energy efficiency, solar expansion with storage**

Timeframe: **August 2023 – February 2025**

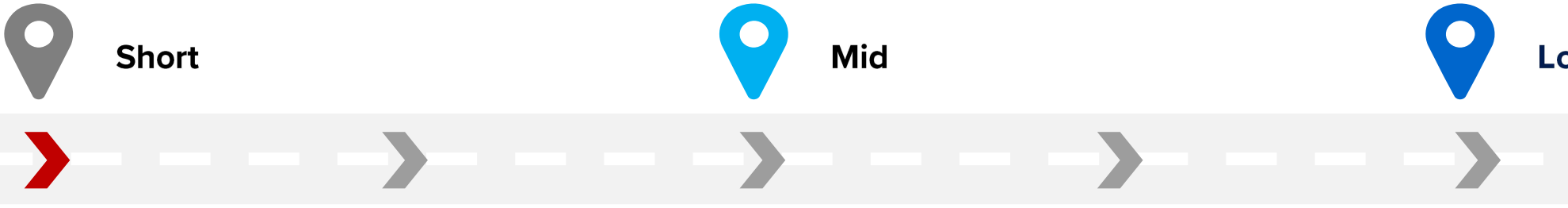
Actions	Projects
• Develop TOU, DR and EE programs	• Complete load research study for input to T programs
• Prioritize more utility-scale renewable purchases over solar on city rooftops.	• Complete a study of all CWP assets for sola incorporation and prioritization • Complete a CWP-specific EV adoption stud
• Explore CWP utility bill financing.	• Explore City financing for customer rooftop s
• Update resource plan with using new data	• Complete a revised IRP with a technology maturity assessment once EE and DR prog research are complete

Roadmap (Long-term)

Primary focus: **Implementation of Programs (EE, TOU)**

Timeframe: **March 2025 – April 2027**

Actions	Projects
• Create plan for CWP vehicle electrification	• Complete a study and plan for the electrificatio owned vehicles.
• Implement EE, DR, TOU and NEM changes	• Implement a robust set of EE and DR program • Create and implement TOU rates. • Change the NEM rate credited to customers.
• Update IRP and technology maturity assessments.	• Commit to revising and updating the CWP IRP years and update technology maturity assessm



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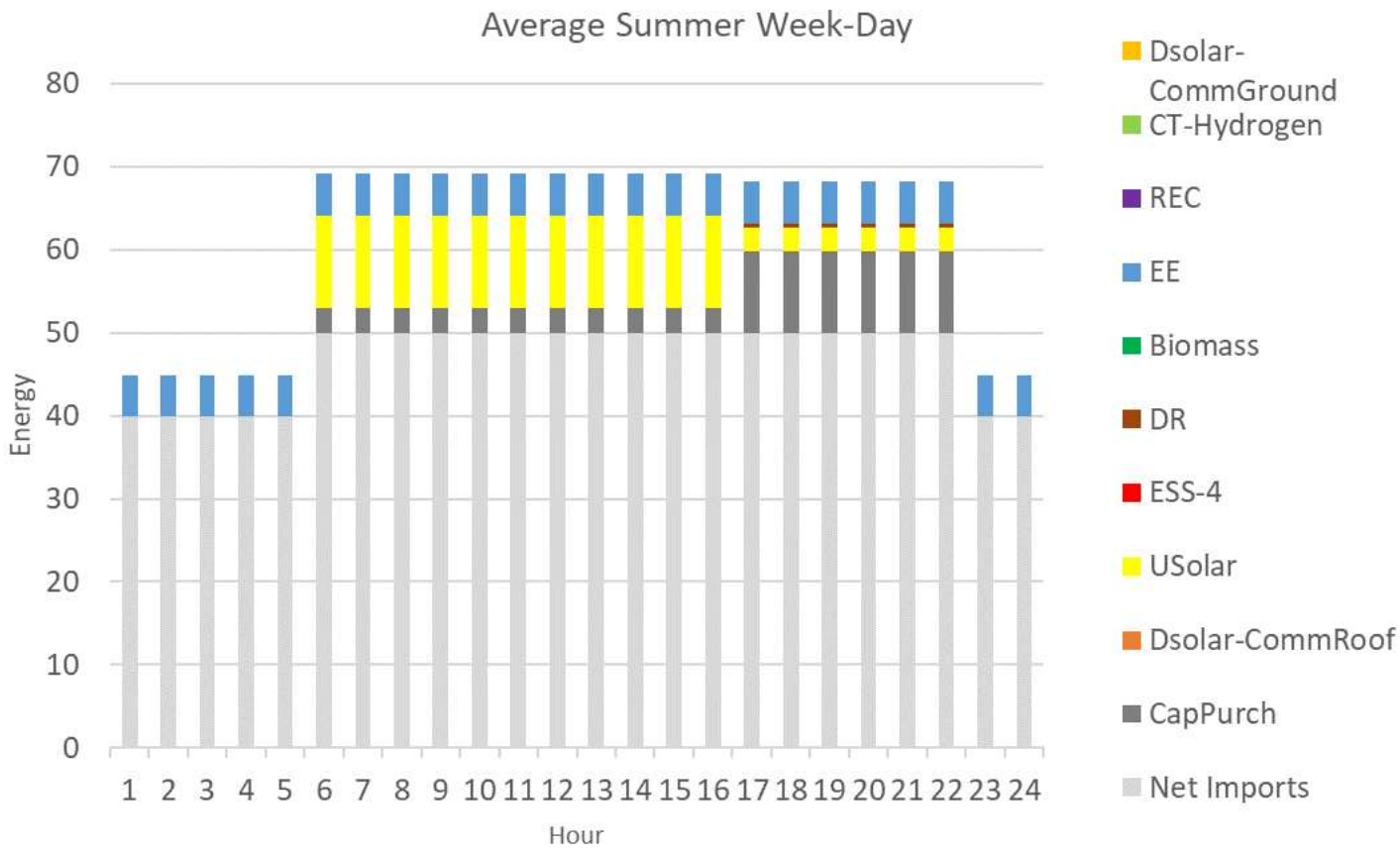
Energy Sources
Average Weekday Example – Scenario 1A, Year 2025



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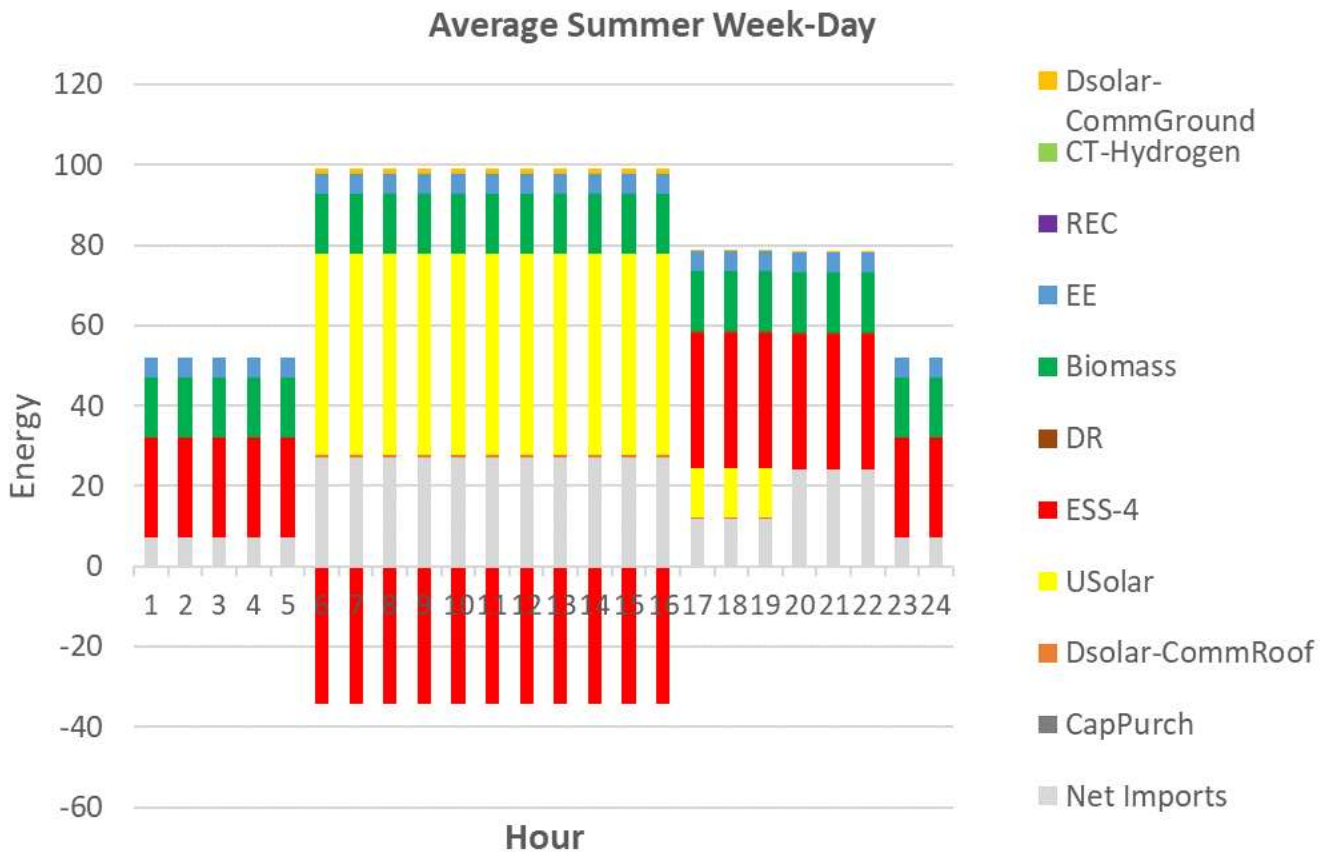
Energy Sources
Average Weekday Example – Scenario 1A, Year 2042



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Renewable Energy Study- Phil Comments rev 3-22-23

1. Seems to be a good report overall and can be a reference point to the next steps. As a reference point, it would seem that we should "adopt" either Scenario 1A or 3A, get comfortable with the data presented, and then use those charts as to select the appropriate targets. The difference between 1A and 3A seems to be how fast to get to 80% renewable.
2. I will note that the OUC definition of Net Zero Carbon in their preferred energy mix does NOT use Renewable Energy Credits BUT it does note that the benefit of Electric Vehicles offsets the carbon produced. Scenario 2 doesn't seem very useful as it relies on Renewable Energy Credits. I had hoped for a measure comparable to OUC se we could draw comparisons.
3. I have a few questions on the fundamental underlying assumptions:
    a. Does the report assume hurricane events? Page 10 "…intermittent weather-dependent resources …are not modeled" vs. page 13 "Reliance against renewable drought can be specified…"
    b. Does the assumed energy efficiency include the conversion of resistance heating to heat pumps? Is the 4% growing to 10% (by 2030) overall Energy Efficiency reasonable? Just a note that the energy efficienct revenue drop will need to be modeled.
    c. Is there a battery and solar cost reduction/efficiency curve implied? Can we see that?
    d. Table 4, page 26 regarding tech costs:
        i. Utility Scale PV PLUS Battery at $1,801 - $1,824 /kw capex
        ii. Utility Scale Battery ONLY is at $789- $3,063 /Kw capex
        iii. Utility Scale PV ONLY is at $ 1,105- $1,120.
        iv. Battery PLUS PV number seems low
        v. Is there a problem/reason?
        vi. What are the Fuel Costs and LCOE for Natural Gas? Is that relevant?
    e. Can we show a cumulative penetration of residential and commercial installations of solar, batteries, and EVs?
    f. Can we have a high level overview of our long term purchase commitments for our All-Demand (correct term?), Solar and Biomass
    g. It appears that we are including biomass in our renewable mix even though it emits carbon. Is that a "Dispatchable Energy Source" that we can rely on at night?
    h. Is there any assumption that the Distributed Batteries are part of our power system?
4. Getting a good working knowledge of the Scenarios is really important. As an example, if we hone into Scenario 1A and specifically to Figure 20 which covers 2023-2042, the following clarifications would be helpful:

a. I believe the $/MWh are in 2021 dollars for the entire table per the note at the bottom of page 39. Is that correct?
b. Does that mean that the energy cost increases over time must include the 3% escalator AND inflation? In other words, if inflation is 3%, then the compounded growth rate of energy costs would be 6%.
    i. In the 3-21-23 Board work session, it was clarified that inflation is assumed to be 2%. Is that flowing thru the projections and then present valued back by the 3.5% City Cost of Capital?
    ii. In the 3-21-23 Board work session, it was clarified that the "CWP + 3% escalation" on Figure 21 implies that the market prices from our suppliers will "escalate" at 3% because of the fuel mix changes the suppliers are pursuing. Does that mean that, in addition to inflation, suppliers such as OUC or FMPA will also be escalating their rates as they move to renewable energy?
c. Need to add a definition of "ESS-4." I am pretty sure that is Energy Storage (e.g. Batteries) but could use some clarity. Same for "BESS."
d. The dramatic rise in costs per MWh happens in 2035 at the same time a significant amount of ESS-4 become part of the power mix.
e. I believe Figure 17 implies that Scenario 1A (the blue line) achieves approx. 72% Renewables by 2042. Is that correct?
f. Trying to interpret the levelized cost concept. I think that means that our average cost per MWh from 2023 to 2042 (eg 20 years) will go up from around $73 to $88 before inflation, all in 2021 dollars. Is that right?
g. Comparing Scenario 1A (Figure 20) vs. 3A (Figure 8), 2023-2042:
    i. Looks like 1A achieves around 72% Renewable by 2042 (Figure 17) and 80% by 2045 (per section 6..3) vs 3A achieves 80% by 2035. The cost delta per the Levelized Cost increase from $88 to $90. Is that correct? Seems like a very low cost to accelerate 80% from 2045 to 2035.

5. We are assuming that we buy our power from others and the Net Present Value of Revenue Requirements represents that costs that we will pay for the power. I think that is a reasonable way to evaluate the policy commitment. However, are there instances where Winter Park should have an Ownership in the power generating (solar) or storage (batteries) assets?
6. Interestingly, the report seems to make the case that we should set policy based on a 2042 window. Am I correct in reading that the technology costs for Combustion Turbine Hydrogen by 2045-2050, a primary "dispatchable energy source" (as opposed to variable renewable energy source), is still forecasted as very expensive? And that including that energy source to displace fossil would alone increase the levelized cost of Energy from $88/MKWh (figure 20) to $103/MKWh 9 (Figure 19)?

7. Regarding next steps, I would suggest additional items:
    a. Create a high level Business proforma for 2023 to 2045 (when Scenario 1 achieves 80% Renewable).
        i. We have a good indicator of costs coming from the Quanta Report.
        ii. Need to see the Revenue and free cash flow available to support the costs. Especially the free cash flow:
            1. After the Undergrounding Project is complete
            2. After the existing Bonds are paid off.
        iii. The business proforma would synch to the energy efficiency targets with respect to revenue reduction.
        iv. Show the numbers including annual inflation assumptions
        v. Distinctly shows fixed costs related to grid connection and All Demand reserves/sources.
        vi. Allow several “what-if” rate structures.
    b. Outline a framework of evaluating Ownership of the assets vs long term purchase contracts. Specifically noting the comment on page 53 regarding rooftop vs utility scale solar/renewable
    c. Create Layman friendly slides
        i. Pg 41,42 of slide deck shows 24 hour sources and uses for a summer day. Will want to clarify the key code and also illustrate as a pie chart.
        ii. On those slides, what is difference between “CapPurch” and “Net Imports”?
        iii. Include cost curves and absorption curves for assumptions on:
            1. Utility and Residential Solar
            2. Utility Scale and Residential Batteries
            3. EV vs Internal Combustion Engine/Hybrids
        iv. Home Efficiency and Energy Audit pieces