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INDEPENDENT REVIEW OF RESOURCE GENERATION PLAN

Overview of Methodology and Assumptions (Version 1)

AUSTIN ENERGY®

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Background

Austin Energy's ("AE") 2014 Resource Plan update identifies potential retirements and additions to its generation fleet.

- In particular, the 2014 Resource Plan projects the construction of a new combined cycle gas unit with a nominal rating of 500 MW by the beginning of 2018 ("Gas Plant").
- As part of its plan, AE committed to sponsoring this independent economic, financial and environmental review of a new Gas Plant and other options.
- Austin City Council awarded the contract to perform the independent review to the Navigant team which includes two subcontractors: Quality Power, LLC and Energy Utility Group, LLC.

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Scope of Work

The purpose of this presentation is to present the key input assumptions we have developed for our independent review.

» The Navigant team is performing this independent review of the Gas Plant and other alternative portfolios.

» An overview of our scope of work includes:
  – Gas Plant costs (capital and operating costs) and performance characteristics.
  – Projected operation and dispatch of the gas plant facility.
  – Impact to revenue, cost and associated risks in the AE load zone under different market scenarios and different portfolios.
  – Alternative resource portfolios to a Gas Plant.
  – Analyze indirect and non-modeled impacts.
  – Analysis and recommendations to the Council.

» The Navigant team has developed the assumptions to use in the review.

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2015 Generation Plan Summary

Our review focuses primarily on the addition of a Gas Plant or alternative resources. We assume AE pursues the other elements of it's plan.

Action	Capacity	Resource	Description	Timing
Retire	735 MW	Natural gas (ST)	Decker Steam Unit	2018
	602 MW	Coal	AE's share of the Fayette Power Project	By end of 2023
Add	500 MW	Natural gas (CC)	The Gas Plant at Sand Hill Energy Center or Decker	By beg. of 2018
	100 MW	Demand Response/Demand-Side Management	Incremental	By 2025
	450 MW (minimum)	Wind	Contracts for coastal and western wind resources	By 2025
Maintain	800 MW	Energy efficiency and Demand Response	Current goal	By 2020
Increase	950 MW (minimum)	Solar	• Reaching the City's goal of 200 MW of local solar including at least 100 MW of customer-sited local solar • Adding 600 MW of utility-scale solar from its RFP • Assuming the full build-out of the announced 150 MW of solar power currently contracted with Recurrent Energy	By 2025
Obtain	30 MW (minimum)	Thermal and electrical storage	Local	by 2025

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Austin Energy in the Electric Reliability Council of Texas (ERCOT)[1]

To assess financial and environmental impacts to AE, modeling all of ERCOT market is critical.

- AE is fully integrated into the nodal market operated by ERCOT.
- ERCOT serves as the balancing authority and maintains reliability.
- ERCOT operates wholesale power markets to ensure reliability of the transmission grid at the most economical dispatch of individual resources across the grid - it is a financial, not a physical market that ensures reliability of the transmission grid.
- AE buys and sells all of the energy needed to serve it's load through the ERCOT nodal market.
- AE's generation competes with other resources in ERCOT to sell electricity and ancillary services[2] which generates revenues for AE.
- ERCOT's nodal market is an energy only market. Changes to the ERCOT system impact the cost of load to AE. Reduction in the amount of supply of resources to meet customer demand (e.g., generator retirement) tends to increase the volatility of wholesale market prices which may attract investment in new generation additions.
- For these reasons, Navigant models the entire ERCOT system which includes AE.

[1] The ERCOT Independent System Operator (ISO) is the independent, not-for-profit 501(c)(4) organization responsible for the reliable transmission of electricity across Texas' interconnected 40,000+ mile power grid.

[2] Generator revenue in ERCOT is overwhelmingly derived from energy prices under both scarcity and non-scarcity conditions. Ancillary service payments are a small contributor. *2014 State of the Market Report for the ERCOT wholesale Electricity Markets* Potomac Economics, Ltd.

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Note on Terminology

To clearly articulate our review, we established the following terminology to differentiate between market scenarios and alternative resource portfolios.

- Our review entails modeling the entire ERCOT market and key assumptions such as natural gas prices, changes to the generation mix. In addition, we model alternative resource portfolios.
- To delineate this difference we use the following terminology:
  - **Scenario**: means a broader ERCOT market scenario (e.g., high solar or high gas price) that is independent of Austin Energy's generation planning.
  - **Portfolio**: means variations in Austin Energy's generation plan (e.g., 500 MW of solar in lieu of 500 MW Gas Plant).

Modeling Methodology and Analysis Metrics

Our modeling methodology employs industry standard methods and tools and assumptions developed by the Navigant team.

» Navigant's ERCOT model in PROMOD calculates the wholesale power cost to the AE load zone and the generator revenue for each portfolio. Fixed and finance costs of each portfolio are calculated and added to the PROMOD costs for a total cost impact.
  – To address exposure to risk we assess the impacts of each portfolio against 4 different market scenarios that cover a range of risks.
  – We assess 7 different portfolios based on Austin Energy's 500+ Resource Plan that cover construction of a Gas Plant or alternative resource portfolios.

» Our analysis will consider the following metrics:

Metric	Analysis Methodology
Cost	Calculated directly from modeling results.
Maintain rate competitiveness	Evaluate impact on rates of the portfolios.
Exposure to Risk	Evaluate spread of outcomes between market scenarios.
Renewable Generation	Calculate share of load served by renewables.
CO_2 Emissions	Calculate total impact of portfolio on CO_2 emissions.
Water Usage	Calculate the water usage of generation units.
Local Economic Impacts	Estimate the economic impacts in Austin.

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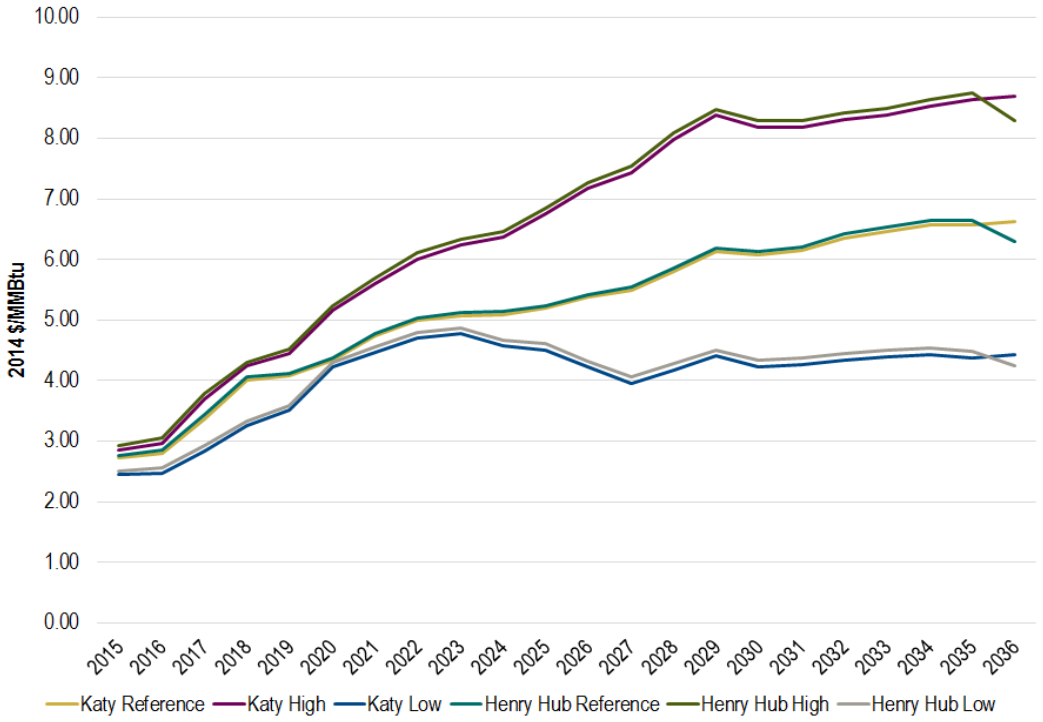
Natural Gas Price Forecasts

Natural Gas prices are the single largest driver of risk and changes in the cost of Austin Energy's market purchases.

» Our analysis uses Navigant's 2015 natural gas price forecast in our Base market scenario.[3]

» We developed a high and a low natural gas price forecast that were informed by the Energy Information Administration's (EIA's) low and high gas resources cases for use in analysis of risk.



Source: Navigant (reference) and EIA/Navigant high and low

[3] Details of Navigant's outlook for Natural Gas prices is is available in Navigant's March 2015 *Oil & Gas Market Notes*.

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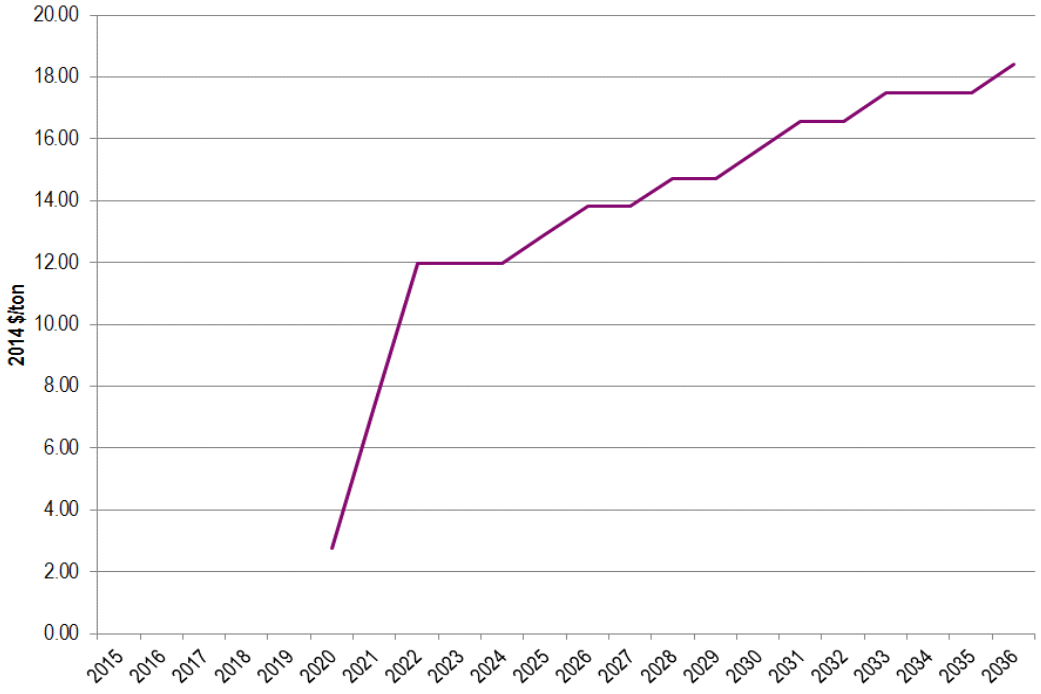
Clean Power Plan (CPP) and Carbon Allowance Price Forecast

To model the impacts of the CPP and future carbon prices, we assume carbon allowance pricing begins in the 2020-2022 time-frame

- The EPA recently released the Clean Power Plan (CPP) that limits state CO_2 emissions beginning in 2022. Navigant's reference case was released prior to the final rule and has the policy beginning in 2020 assuming a cap-and-trade market.
- Navigant projects carbon allowance prices to be low in 2020 and 2021 and then rise throughout the forecast.



Source: Navigant

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Market Scenarios

Navigant developed four ERCOT market scenarios to assess risk for each of the alternative portfolios. The scenarios address uncertainty of natural gas prices and impact of increased grid-tied solar PV.

Market Scenario	Rationale
1. Base scenario	• Developed from Navigant's reference case.
2. Low natural gas price scenario	• Developed utilizing the EIA's low and high gas resources cases • Reflects the volatility of gas prices and the uncertainty of key drivers in the natural gas market, such as shale gas supply.
3. High natural gas price scenario	
4. High solar scenario	• Adds ~8.3 GW of utility-scale solar PV in lieu of new gas fired generation.

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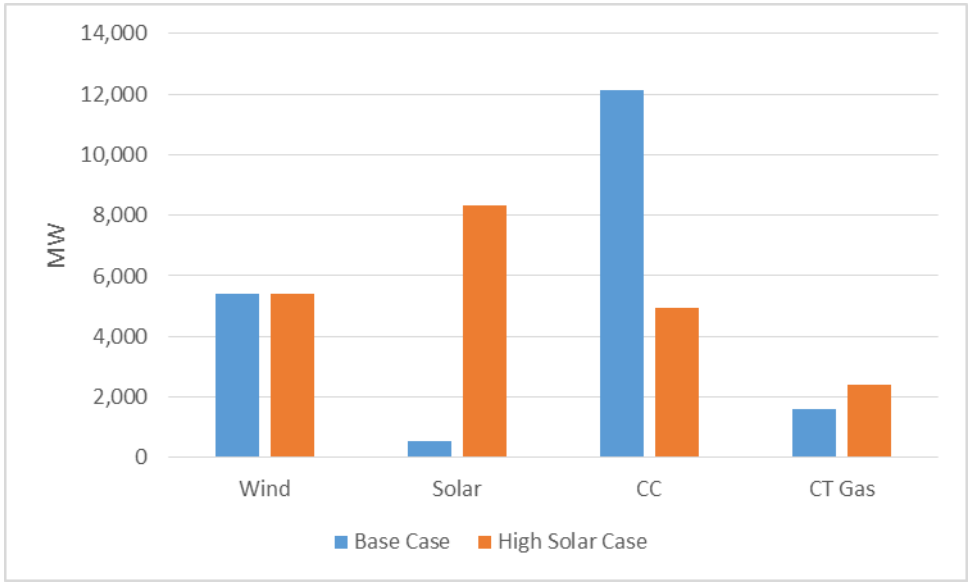
Scenarios to Address the Future ERCOT Generation Mix

To assess market risks to each portfolio our analysis will look at a high solar scenario in which much of the new gas development in ERCOT is replaced with grid tied solar PV.

ERCOT New Installed Capacity by Technology



Source: Navigant

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Gas Plant Assumptions

We developed independent assumptions for the 500 MW Gas Plant.

- We assume the brown-field development of a modern, highly efficient natural gas combined cycle project designed to the best available air emissions control technology ("BACT") standard at either the Decker Creek or Sand Hill Energy Center sites.
- Capital costs: Range from $700- 900 per kW installed based on recent engineering reports and independent review and discussions with vendors. Brownfield development lower than costs of a similar plant on a greenfield site.
- Plant Characteristics:
  - Nominal Capacity: 500 MW
  - Heat Rate: ~6,600 BTU/KWh HHV
  - Variable O&M: $3.50/MWh
  - Forced Outage Rate: 2%/Year
  - Ramp Rate: 50 MW/hr
  - Variable costs (fuel, emissions and O&M) will be calculated by the PROMOD model.
  - Fixed costs (cost of debt and fixed O&M) will be calculated assuming 100% debt financing for 30-years at ~5%
- Assumptions:
  - Sites can accommodate a gas plant without significant additional investment in natural gas or transmission capacity (existing infrastructure will be used)
  - New gas plant will use 65% percent less water compared to current steam units. Decker can accommodate the Gas Plant without significant additional investment for water, Sand Hill requires some investment to deliver grey water from South Austin Regional Water Treatment Plant. Water use described in more detail in the appendix.
  - Decker: Cooling Water intake system will be reused and existing water treatment facility will be utilized
  - The combined cycle plant is 40% more efficient than current steam units. It will be the one of the most efficient combined cycle plant in the country
  - New gas plant will use 65% percent less water compared to current steam units
  - Proven availability of 98% (8585 hours per year) or higher

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Alternative Resource Assumptions

Each portfolio we developed is a mix of market purchases of alternative resources which include solar, wind, storage and demand response

Solar

- Single-axis tracking grid-tied solar PV tends to generate during peak periods.
- Assume ~$1,130/KW installed costs and $0.25/KW-yr for operating costs (projected price curve in following slides).
- Assumes the investment tax credit (ITC) drops to 10% at end of 2016. Post 2016 we assume Austin Energy will own new solar.

Storage

- Assume the storage operates in the wholesale market.
- Comparing Li-ion batteries and CAES. New project orders are heavily favoring Li-Ion chemistries.
- Assume ~$1,800-2,000/KW fully installed costs for Li-ion battery storage – declining over time.
- Did not consider local distribution level applications of storage.

Wind

- Wind tends to generate during off-peak power.
- Assume ~$1,670/KW installed costs.
- The analysis assumes the production tax credit (PTC) expires at end of 2017 and that Austin Energy enters into PPAs for new wind.

Demand Response

- Demand response (DR) is a contract with customers to curtail their load during peak pricing times based on price signals from the ERCOT market.
- We assume an annual incentive of $52/KW-yr for customers to participate in the program.
- DR program shifts load from peak times to off-peak times

Note: Assumed costs in 2018 using real $2014

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Solar PV Market Trends

As prices continue to decline utility scale projects are being developed at record low PPAs and in some cases with the intent of selling power on the open market.

Key Market Trends

- The solar industry is offering more attractive power purchase agreements (PPA) to sell electricity.
- Recently NV Energy signed a PPA to buy power at ¢3.87/kWh from the 100MW Playa Solar 2 project being developed by First Solar. This price was a fixed-rate contract for 20 years.
- The best PPA price last year was ¢4.60/kWh by SunPower for the Boulder Solar project also signed by NV Energy.
- Recently Austin Energy released information pertaining to an RFP of 600MW of solar capacity with prices below ¢4.00/kWh.
- Another milestone for large scale utility solar is the 30MW Barilla Solar Project in West Texas. This project is being developed without a signed PPA. While First Solar, the developer, may eventually sign a PPA the project is moving ahead with the intent of selling the power on the open market.
- There is uncertainty on the impact to PPA prices of the ITC drop down to 10% beginning in 2017.

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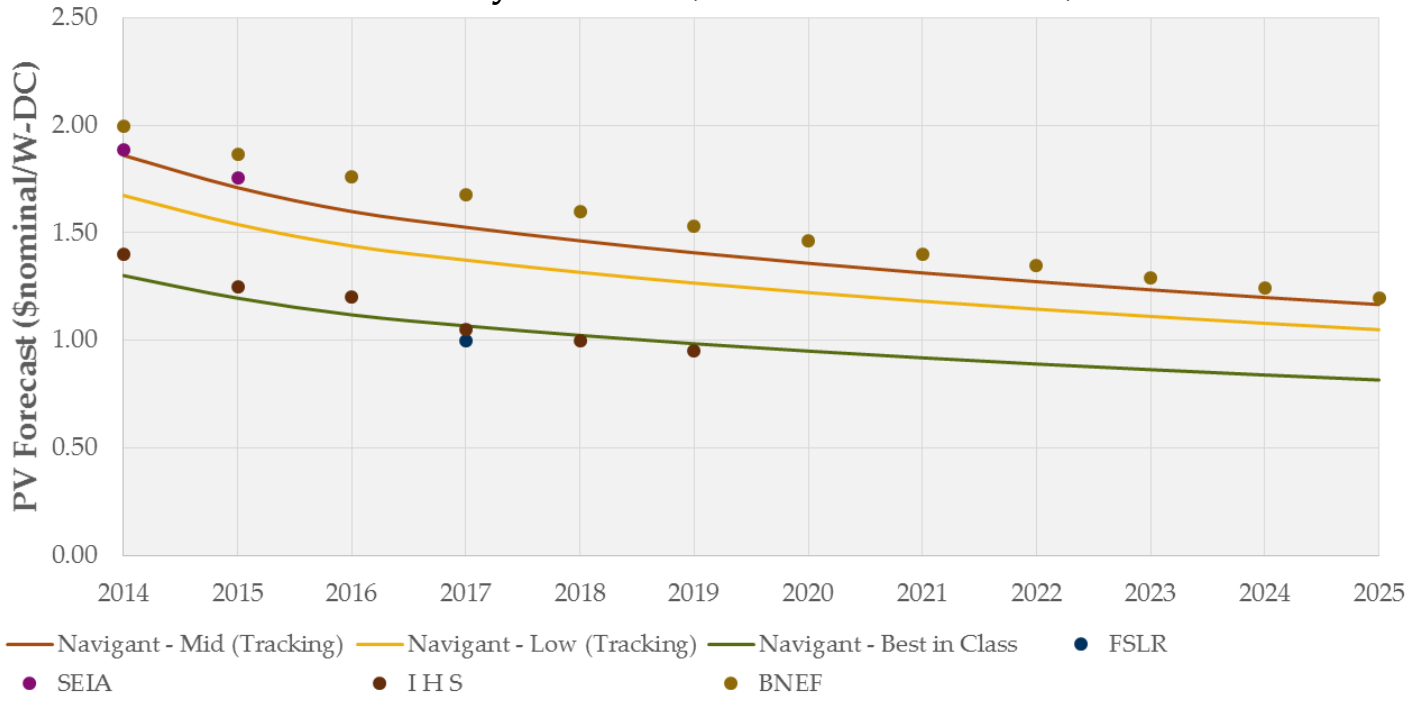
Solar Capital Cost Trajectories

Utilities' PV system costs are becoming more attractive in the broader energy market with "Best in Class" companies able to offer lowest prices due to scale, experience, and financing.

» Based on recent prices and market activity in Texas, we assume best in class costs in our analysis. Post 2016 we assume AE would own the solar facilities.

U.S. PV Installed System Costs, 2014-2025 ($Nominal, $/W-DC)



Source: Navigant

Source: Navigant, 2015; SEIA Q2 2015; IHS, 2015; BNEF 2015; FSLR 2015

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Austin Energy Portfolios

Navigant has developed 7 portfolios with a mix of resources including the Gas Plant and alternatives which range from all power market purchases to solar, wind storage, demand response.

» The portfolio analysis is a financial assessment of the costs and benefits of alternative resource portfolios that AE can consider.

» Designed to be 500 MW nominal capacity despite varying energy production to be consistent with the 500+ plan.

Portfolio	Description
Case 1	AE current 10-year plan without the addition of a 500 MW CC
Case 2	Case 1 + 500 MW CC addition at Decker
Case 3	Case 1 + 500 MW CC addition at Sand Hill
Case 4	Case 1 + 500 MW of additional solar
Case 5	Case 1 + 500 MW of additional wind
Case 6	Case 1 + portfolio of renewable resources and DR with energy storage (200 MW wind, 200 MW solar, 50 MW DR, and 50 MW storage)
Case 7	Case with 600 MW of AE 10-year plan solar additions coming online in 2017

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Risk Analysis

- The outcome of this analysis is a set of scorecards for Austin Energy for each alternative portfolios across the 4 market scenarios.
  - These scorecards will report the results of the portfolio across the metrics considered in the analysis.
- The scorecards provide an accounting of the tradeoffs between different portfolios in each scenario and also allow for comparison between scenarios.
- This approach is designed to identify portfolios that best meet AE's range of metrics.

Illustrative Scorecard for Single Scenario

Portfolio	Minimize Costs	Rate Benchmark	Renewable Power	CO_2 Reduced	Water Use
Case 1					
Case 2					
Case 3					
Case 4					
Case 5…					

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Schedule

Sept 21st	• EUC receives Navigant analysis inputs and draft provide comments by September 25
Sept 24	• AEUOC Briefing and Discussion on RCA for up to 210 MWs solar (hearing 1)
1st – 15th	• AE will review Navigant draft results
Oct 15th	• Final Navigant Report Issued
Oct 19th	• EUC hears final draft of Navigant results
15th – 20th	• AE Provides Feedback to Navigant and develops final plan update
Oct 22th	• AE/Navigant Briefings to AEUOC with recommendation for adoption and or modifications the of 500+ plan and 600 MW solar plan, special called council meeting to adopt?

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Appendix

Navigant's Reference Case Natural Gas Price Forecast

- Key drivers from Navigant's forecast include:
  - Increased fuel-switching from coal to natural gas for power generation, driven by price competition and public policy
  - Price recovery for natural gas in the coming years, leading to renewed drilling and increased supply from dormant dry plays
  - Growth of shale gas as a share of total North American gas production, offsetting declines in conventional production
  - Gas prices stabilizing over the long term
  - More than 9 Bcfd of exports from North America by 2021
  - Incremental demand growth of more than 24 Bcfd in the power generation sector by 2035
- For more information, see Navigant's *North American Natural Gas Market Outlook, Year-End 2014: A View to 2035*, available at: http://www.navigant.com/~/media/WWW/Site/Insights/Energy/2015/EN_NANGMarketOutlook2014_BR_0315%20FINAL.ashx

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Decker and Sandhill Water Sources and Infrastructures

Decker Site:

- uses lake water for condenser cooling. Existing cooling water intake infrastructure will be more than adequate and could be used for new 500 MW CC project
- also has boiler water treatment facility and water storage tanks. These are more than adequate in capacity for the new 500 MW CC project and could be used.

Sandhill Site:

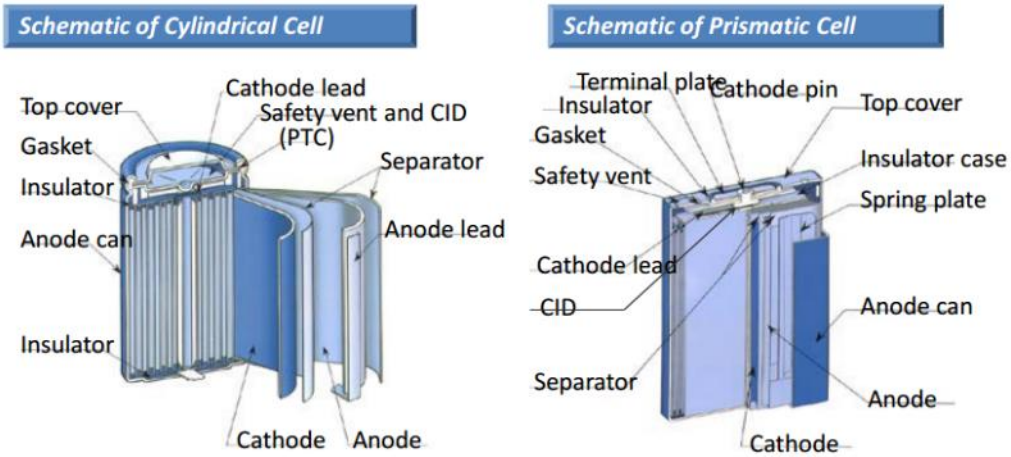
- uses cooling tower for condenser cooling and has two sources for cooling water makeup: 1. River water, and 2. Grey water from South Austin Regional Water Treatment Plant (SAR).
- does not have spare capacity for supply cooling water to the cooling tower of new 500 MW CC project.
- SAR has more lot of water to supply the new 500 MW CC project.
- does not have excess capacity for boiler water treatment facility or storage tank. AE would need to add infrastructure for treating boiler water and cooling water that could be piped in from SAR.

Alternative Technologies: Lithium Ion

Lithium ion cells are gaining market share due to a drop in price and their relatively flexible operating characteristics.

Metric	Current Status
Energy Density	60-240 Wh/kg
Max. Discharge Time	4-12 hrs
Cycle Life	300-25,000 cycles
Calendar Life	7-10 years
Round Trip Efficiency	90-95%
Advantages	High power density, decreasing costs
Disadvantages	Potential thermal runaway
Manufacturers	Saft, Toshiba, AltairNano, Electrovaya, Dow Kokam, LG Chem, BYD, Tesla, Alevo, and others
Typical Applications	Load Leveling, Grid Operational Support, Grid Stabilization,

Illustrative Lithium Ion Cells



Source: DOE/EPRI 2013 Electricity Storage Handbook

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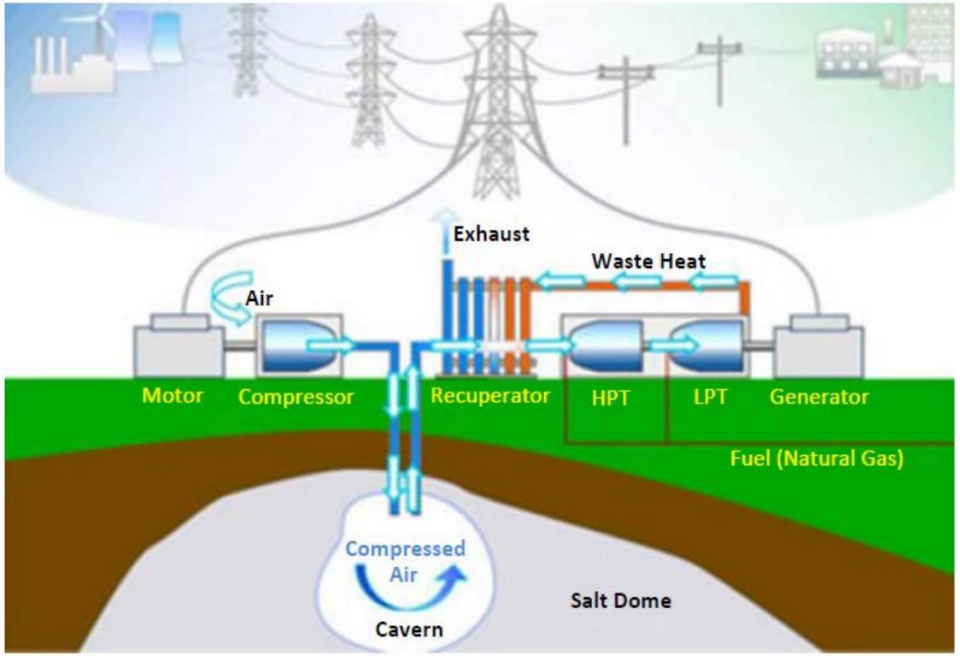
Technologies: CAES

Conventional CAES relies on large caverns for air storage, and co-fires natural gas with the air to heat it as it is decompressed.

Metric	Current Status
Max. Discharge Time	12-20 hrs
Cycle Life	7,000-12,000 cycles
Calendar Life	25-30 years
Round Trip Efficiency	50-70%
Advantages	Cost
Disadvantages	Siting limitations
Manufacturers	Dresser Rand, MAN Turbo, Hydrostor, GCX Energy (formerly SustainX and General Compression), APEX, RWE, Highview
Typical Applications	Load Leveling

Traditional CAES Layout



Source: Argonne National Laboratory

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About Navigant Consulting and the Energy Practice

Navigant Consulting (4,500 Employees)

- Core business areas: Management consulting, Economics, Financial Advisory, and Disputes & Investigations
- Publicly traded since 1996 (NYSE: NCI)
- 2014 revenue: $859.6 million
- 35 offices in North America, Europe, and Asia

Global Energy Practice

- **Our clients:** 50 largest electric and gas utilities, 20 largest independent power generators, 20 largest gas distribution and pipeline companies, leading oil & gas companies, international, federal, and state government organizations, and numerous new energy market entrants and investors.
- Our **400+ consultants** comprise the largest energy management consulting team in the industry. Our team has an average of 15 years of experience, 60% have an advanced degree, and 51% have an engineering degree.
- Our consultants serve leading energy companies to address their most complex business opportunities and challenges.
- Focused on **high value, high quality** projects.

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