Item 11

Emission Reductions During FPP's Remaining Years of Operation

2019-10-14 EUC Meeting

Matt Weldon

Purpose

Discuss opportunities for minimizing emissions from FPP operations in its remaining years of operation.

Topics:

- “Self-Committing” concerns
  - Touching a topic sometimes voiced during citizen communication
- Motivation
- Opportunity in current market conditions
- Discuss a cost target for GHG emissions reduction
- Information request

What is the take away?

- The dramatic market changes of the last few years have created a an opportunity to make the rhetoric of “clean TX NG” more substantive
- The market is very competitive near FPP’s marginal operating cost points
  - Any one day of operation avoided equates to many thousands of tons of CO2 emission reduction, and on many days the forfeited revenue could be very low
  - Reduction in the # of days FPP runs appears among the most effective, immediate, and low cost options available to the city
- Consider FPP operation changes in the context of GHG emissions reduction goals and the recently declared climate emergency

Regarding Coal Plant “Self-Committing” Concerns

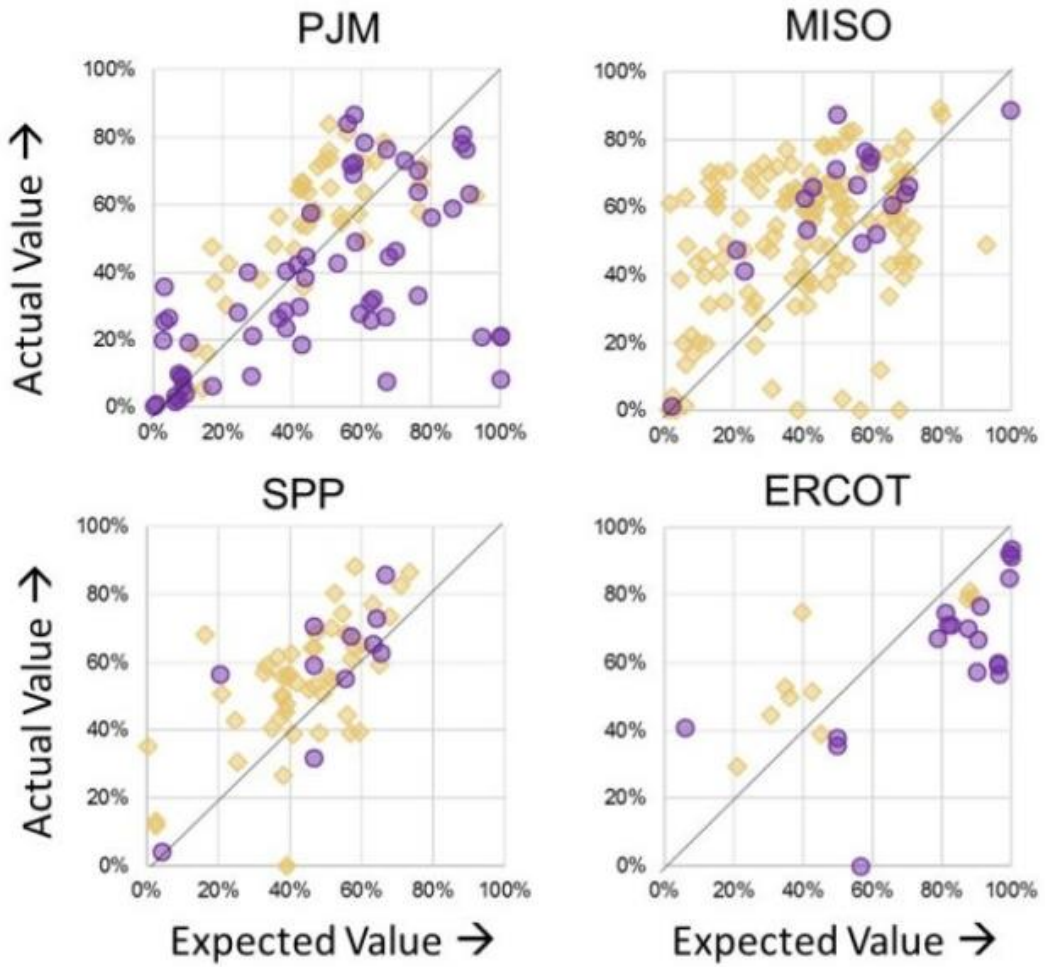
- “Self-Committing”: deployment of a power plant even though the market price of electricity alone is too low to justify its operation

- “The Billion-Dollar Coal Bailout Nobody Is Talking About: Self-Committing In Power Markets”
  - Joe Daniel, Union of Concerned Scientists, senior energy analyst with the Climate & Energy program at UCS
  - https://blog.ucsusa.org/joseph-daniel/billion-dollar-coal-bailout-nobody-is-talking-about

Regarding Coal Plant “Self Committing” Concerns

Monopoly Owned Coal Units

Merchant Owned Coal Units



- "FPP is not a particularly bad actor. Almost all of the coal plants in ERCOT operate rationally save for a few Muni/Coop plants, like J.K. Spruce, Oklaunion, JT Deely, and San Miguel, which all operated uneconomically for extended periods of times. FPP, however, didn’t even get flagged as a possible bad actor.”
  - per Joe Daniel in an Email to Matt Weldon, 2019/6/5
  - FPP is not a “bad actor” in terms of leading to rate payer overcharge

The actual vs expected value of several large utilities. You would expect the dots to fall along the diagonal line, but monopoly owned plants tend to overgenerate.

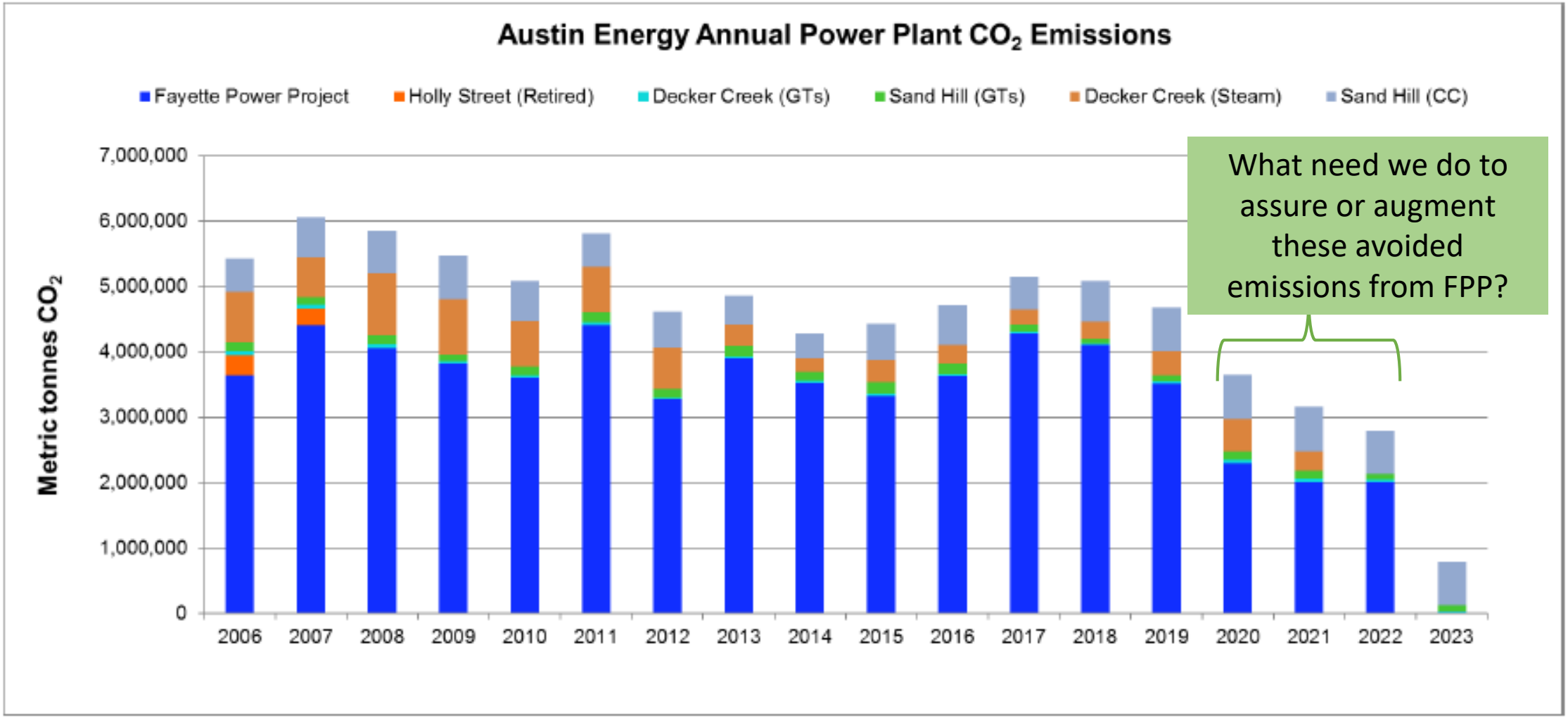
Source: https://blog.ucsusa.org/joseph-daniel/the-coal-bailout-nobody-is-talking-about

What Value Does the City of Austin (CoA) Place on GHG Emission Reduction?

- Green house gas (GHG) emission reductions are clearly important to the city. City council has passed many relevant resolutions, including:
  - Goal to reduce emissions from all city assets (20140828-157), city wide net zero 2050 goal (20140410-024), Austin Community Climate Plan reaffirming 2050 goal (20150604-048), endorsement of carbon pricing at federal level (20180426-037), and most recently the climate emergency" resolution
  - Austin Energy Resource, Generation and Climate Protection Plan to 2027, *Vision* "The City Council affirms its continued interest in achieving the City's climate protection goal of reducing emissions as quickly as possible." -Austin City Council, August 17, 2017
- AE is on a good path of no/low carbon electric generation additions, with a proximate round of generation planning ongoing
- AE is progressing on commitment to closure of the CoA's portion of the Fayette Power Plant (FPP) in 2022.

Until FPP closes (at least Austin's portion), it remains the largest single emission source over which the City of Austin has influence

CO_2 Emissions History and Forecast



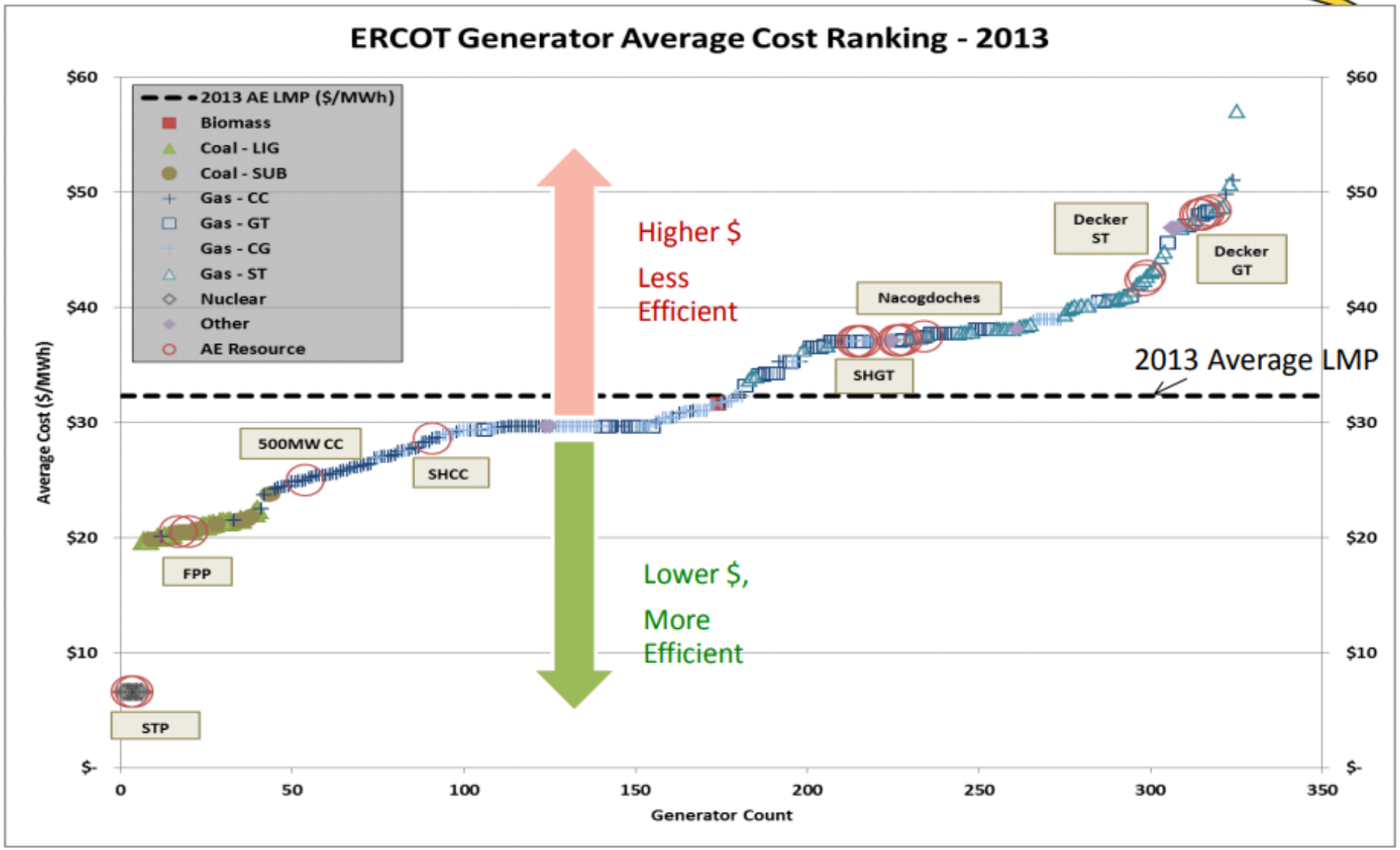
Plant CO_2 Emissions will decrease from about 5M tons per year to .8M tons after Decker & FPP retirements slated for 2020-21 and 2023 respectively

- Slide taken from November 2018 EUC meeting materials

Average marginal cost ranking of ERCOT generators from 2013

- Presented by AE in August 2015 to CoA City Council
- Presented in the context of justification for a new gas plant - a more efficient generation resource that would be lower in offer stack
- No renewable sources are shown in this graphic but would appear earliest, before the STP power plant, if presented
- FPP offer price is early in the stack

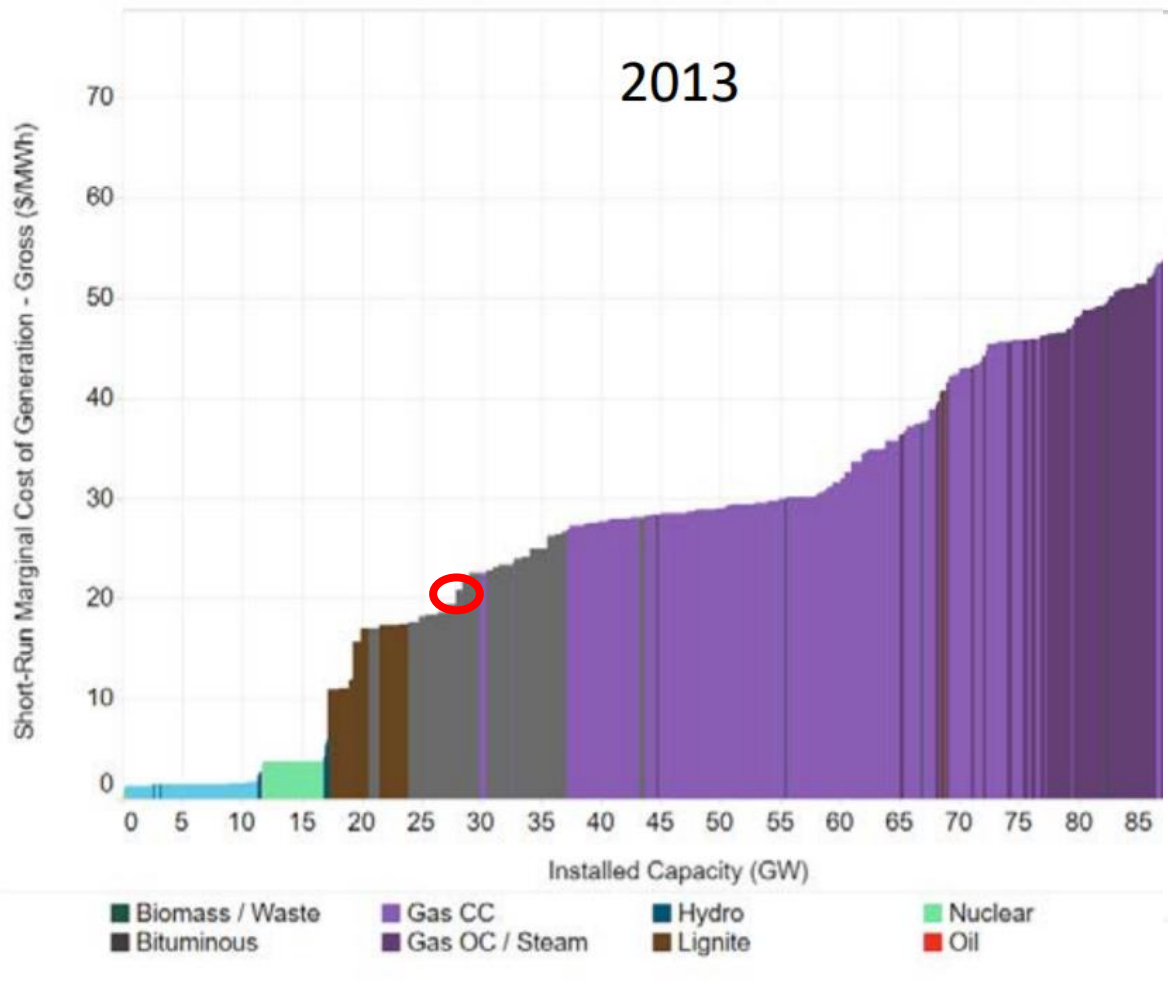
New Resources displace Higher Cost Gas Resources

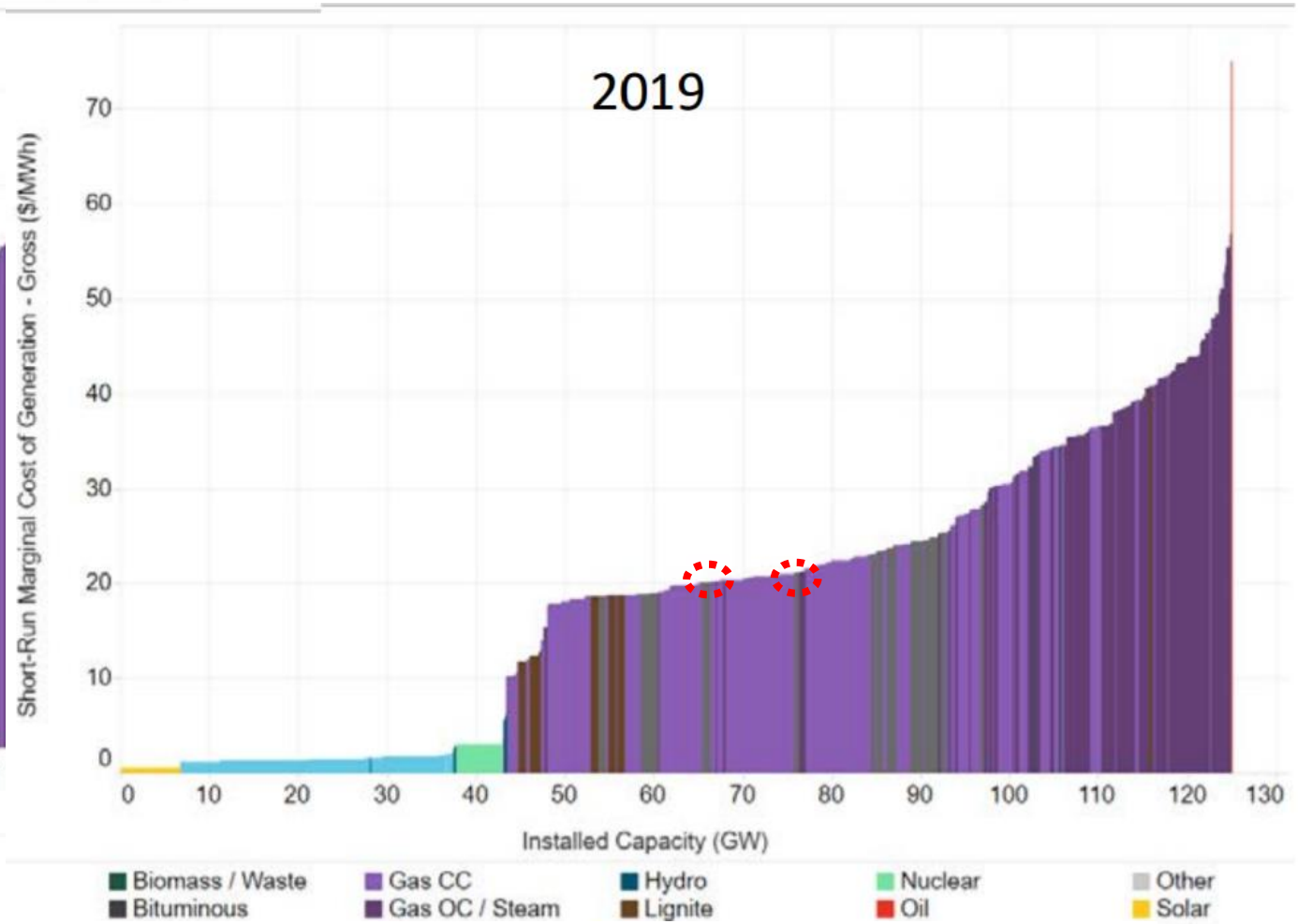


- Having units in the most efficient position within ERCOT keeps energy prices low for AE customers

http://www.austintexas.gov/edims/document.cfm?id=237149, slide # 41

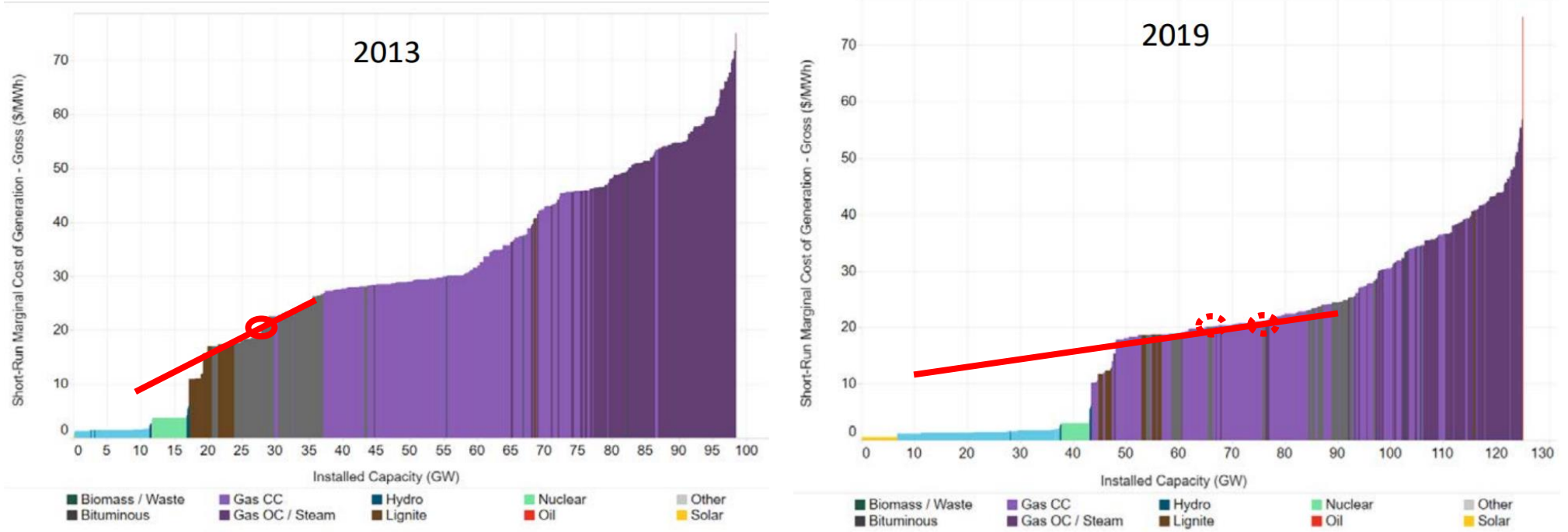
ERCOT Generation Stack comparison 2013-2019





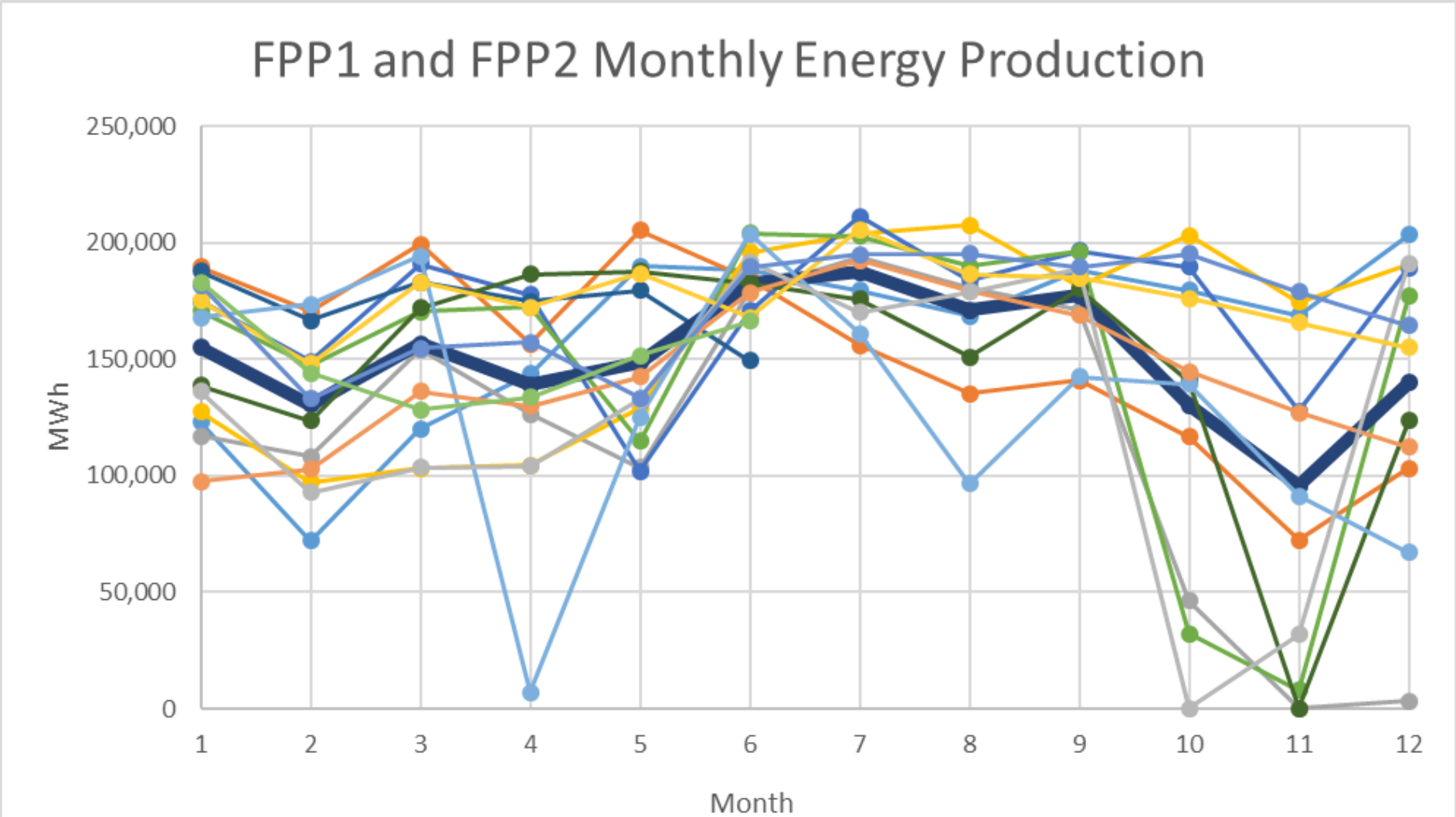
- At the July 2019 EUC meeting AE provided Generation Stack figures for several years showing the effect of the decline in NG prices and subsequent market response of reordering generator deployment due to change in relative strike price of many natural gas units. Two years are reproduced here.
- Approximate position that FPP typically occupies in generation stack based on its ~$20+/MWh marginal operation cost - marked with red circles

ERCOT Generation Stack comparison 2013-2019



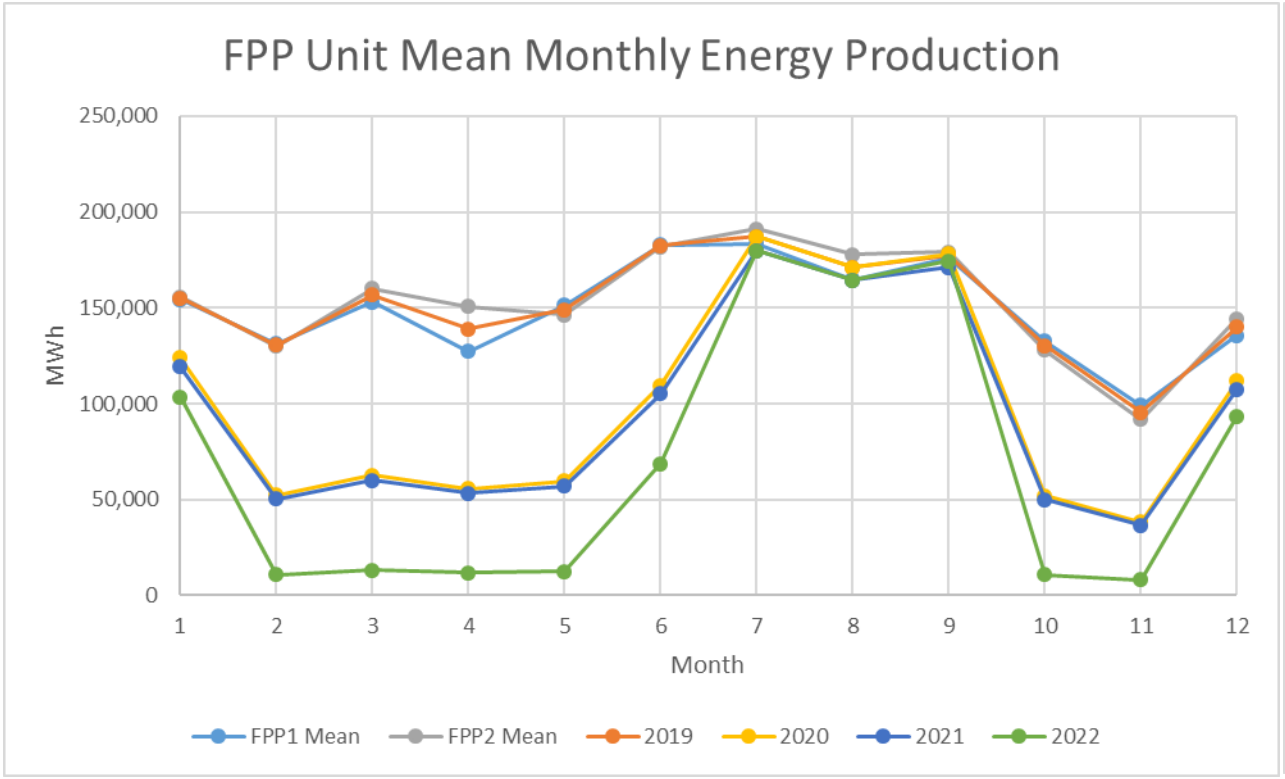
- Lines added to highlight the slopes of the typical cost curves to draw attention to important developments from 2013 to the present:
  - FPP is typically followed by natural gas generators, rather than other coal generators
  - The cost slope of 2019 is very low (competitive), so a small cost change may reorder deployment
- This signifies that there are clearing prices at which the emission burden of FPP may be avoided at little to no cost to the ERCOT market or AE rate payers.
  - For example, when ~ 68GW of power is needed, the clearing price might match the FPP offer price. If so, FPP operates but generates no net revenue. At a slightly higher price, FPP would not run, but NG plants would deploy in its stead with ~ <1/2 the overall emissions burden and with superior primary pollutant performance as well.

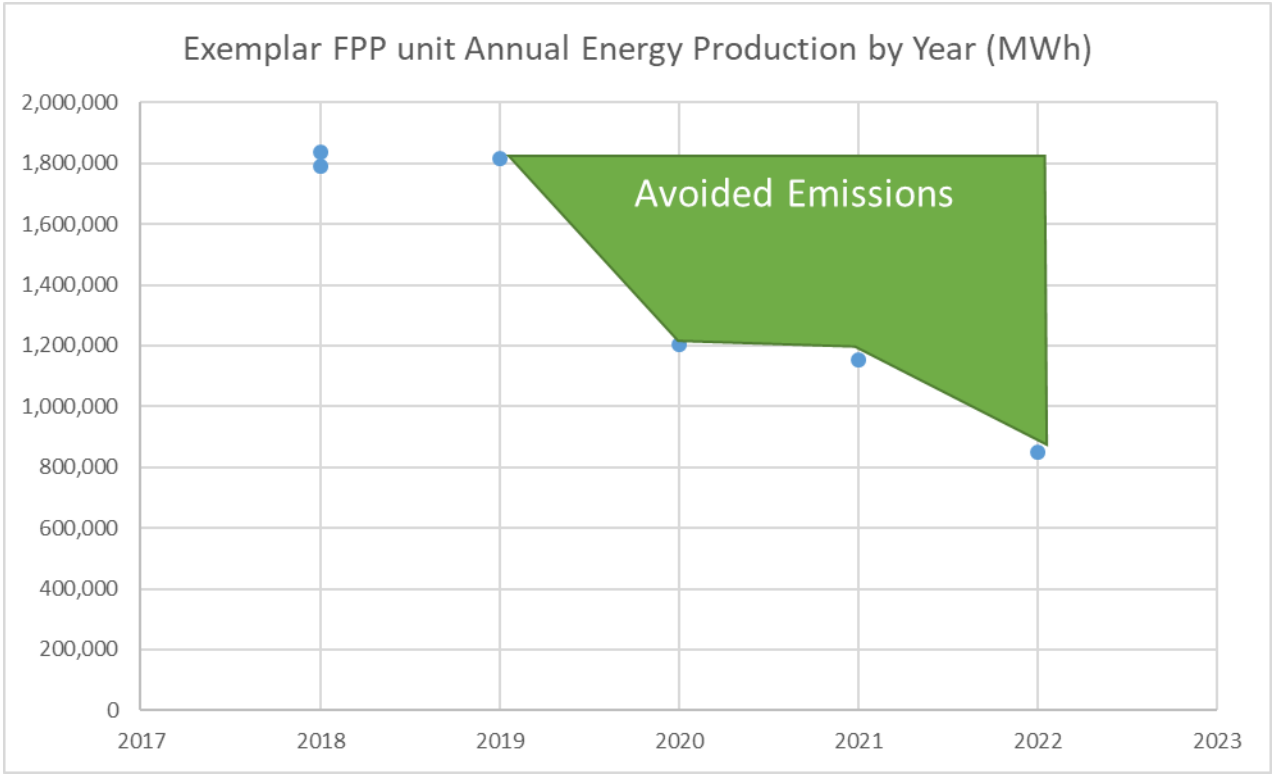
FPP Monthly Energy Production, 2014-2019



Data provided by AE at July 2019 EUC meeting, 2014 into 2019

Exemplar Monthly and Annual Energy Production from FPP

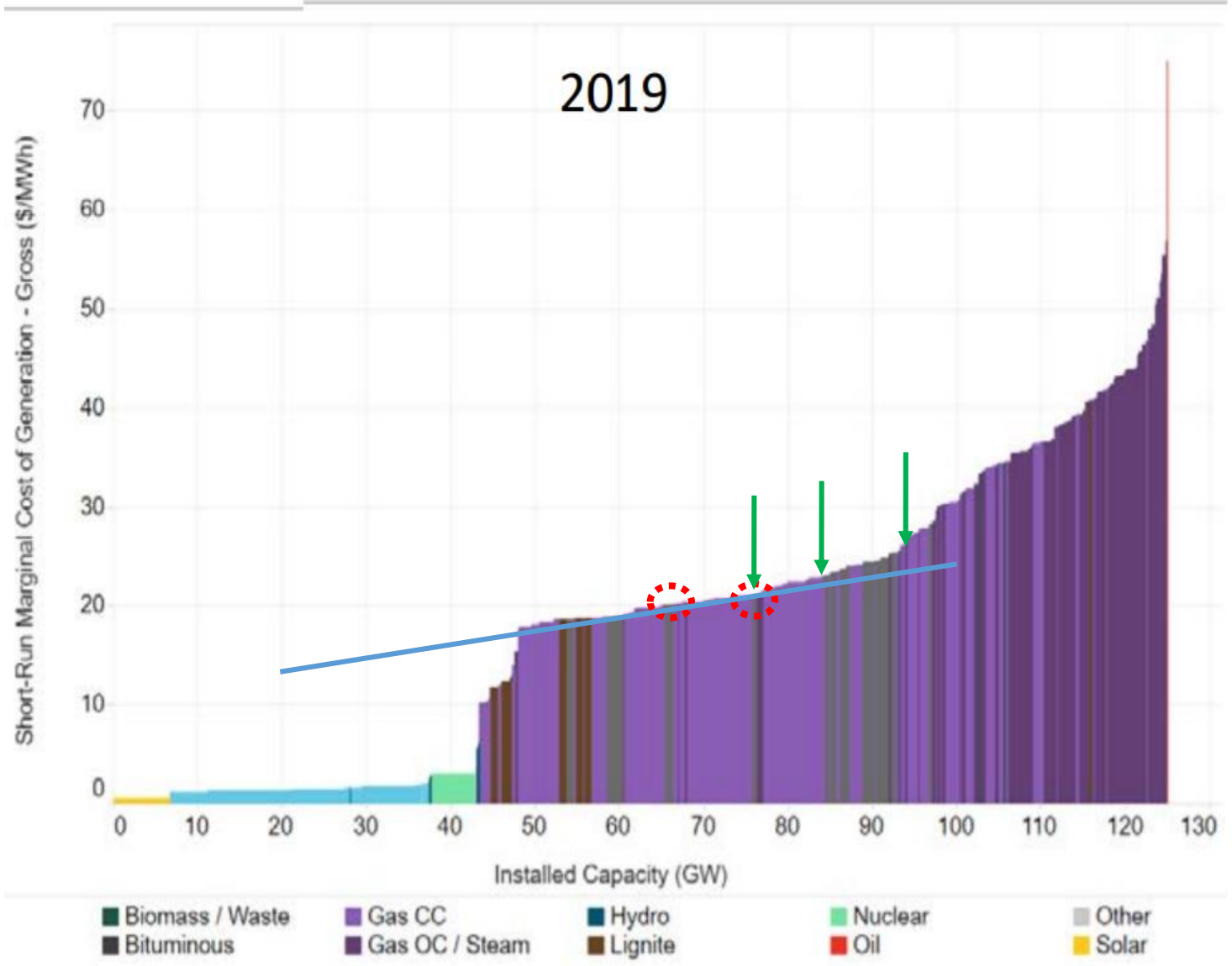




- offer price raised so FPP might run less often - possibly only when critical to serving ERCOT system needs. How much emission is avoided is dependent only on what revenue we are willing to forfeit for an outcome.
- some emissions reduction can be realized with de minimus revenue loss

ERCOT Generation Stack comparison 2013-2019

- To minimize emissions in ERCOT offer prices that favor NG plants over FPP can be made when the demand environment is favorable
- Optimal offer would be based in part on:
  - price CoA is willing to pay for the avoided emission burden
  - total system demand and how far up the generation stack the market drives deployment (season, weather, time of day)
- Arrows indicate example preferred offer plateaus to reduce emissions (favor NG generation prior to FPP or other coal generator)
  - i.e. from ~$20 to ~ $20.50 or $22 or $26/MWh, but sometimes only penny price differences can drive a change in generation stack order



What costs should be associated with emissions?

Some active benchmark valuations for a metric ton of CO2

($/Mt CO2e, metric ton of CO2 equivalent GHG potential)

US Federal Level

- The "Tax Cuts and Jobs Act" of Dec. 2017 introduced a 45Q tax subsidy for carbon sequestration: **$30** ramping to **$50**.
  - Logic would dictate that a companion carbon emission price should exist at the same level or higher.
- The EPA had established a "Social Cost of Carbon" metric in May 2013 (rev. Aug 2016) for evaluating rule makings. **$36** in 2015 rising to **$69** in 2050 (2007 dollars).
- At least 8 federal carbon pricing bills are under consideration in the 116th congress. The range of first year prices: **$15-52.** The bills typically call for a steady price ramp thereafter.*

US Regional Level

- RGGI, August, secondary futures market price: **$5.60**
- CA, Cap and Trade program, Aug 2019, minimum price: **$15.62**

City Level

- AE already uses a current "Social Cost of Carbon" valuation from the EPA in the "Value of Solar" calculation. Approximately **$40/Mt CO2e**
  - paid to a residential generator, this VOS component is reduced in proportion to the % of average generation needs AE can meet with carbon free assets – i.e. when AE's entire generation fleet is emission free, the environmental benefit portion of the VOS calculation will be $0 for this purpose.
  - ~ $0.013/kWh as currently calculated
- A price estimate implied by the closure of FPP, **<$18**
  - Using 3 figures from March 2019 ECU meeting, "Fiscal 2020 Forecast and Budget Planning", related to the FPP closure costs: bond payment, avoided operation expenses, and replacement power costs
  - Presumptions: 10 year evaluation period, net energy replacement cost over time (cost of power – operation savings) level, 2% discount rate of this net cost and the value of carbon.
  - Emission avoidance presumed - 3 million metric tonnes/year

For reference - assessing a value of $10/Mt CO2e results in ~ $10/MWh price addition to coal derived electricity

What is the take away?

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Request of Austin Energy

- Produce data set from the past year to aid evaluation of the opportunity:
  - FPP LMP clearing price data for the past year at full granularity, energy volume sold from FPP at a given price, an assessment of power plants likely occupying next position in dispatch stack and end of stack yet to be deployed.
- Identify any challenges to altering the current FPP offer price strategy and make recommendations on how to eliminate or reduce such challenges or risks
- An evaluation of the opportunities and strategies for FPP emissions to be minimized as a function of forfeited revenue (i.e. an emission price)
  - identify seasonal and situational strategies that will yield net emission reductions
  - minimize conditions leading to low or sub-optimal capacity deployment, an increase in start/stop cycles or other negative risks

Backup info

- Generator heat rate curve for FPP per DOE

From: DOE_Generator_HR_Curves_public.xlsx

Generator Name	Heat Rate Profile	Minimum Block (MMBtu/MWh)	Block 2 (MMBtu/MWh)	Block 3 (MMBtu/MWh)	Maximum Block (MMBtu/MWh)	Average Heat Rate at Min (MMBtu/MWh)		Min Cap (%)	Min Cap (MW)	Cap-2 (MW)	Cap-3 (MW)	Max Cap (MW)
Fayette Power Project 1	Coal	8,955	8,955	9,132	9,307	11,400		47.69	296	359	488	620
Fayette Power Project 2	Coal	8,955	8,955	9,132	9,307	11,400		47.61	293	356	483	615
Fayette Power Project 3	Coal	8,955	8,955	9,132	9,307	11,400		47.04	212	294	367	450
							FPP Unit 1's output capacity increments (MW)		**296**	**63**	**129**	**132**

* (from slide 14). Legislation with an initial price that rises programmatically until certain goals are achieved is a conventional wisdom. The most recent economic modeling, incorporating risk and uncertainty in damages, assigns much higher initial prices ($100-$200/MT CO2e) and rises in the medium to short term. This modeling acknowledges uncertainty and emphasizes risk aversion, so the most important GHG emissions to avoid are those first in time, as the "model suggests large costs associated with delays in pricing CO2 emissions." *Declining CO2 Price Paths,* K. Daniel, R. Litterman, G. Wagner, PNAS, Oct. 1 2019 https://doi.org/10.1073/pnas.1817444116