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GOVERNMENT OF PUERTO RICO
PUBLIC SERVICE REGULATORY BOARD
PUERTO RICO ENERGY BUREAU

IN RE: REQUEST FOR PROPOSALS FOR TEMPORARY EMERGENCY GENERATION	**CASE NO. NEPR-AP-2020-0001** **SUBJECT:** SECOND MOTION TO SUBMIT SUPPLEMENTAL FILING

PETITIONERS' SECOND MOTION TO SUBMIT SUPPLEMENTAL FILING

TO THE HONORABLE PUERTO RICO ENERGY BUREAU:

COME NOW, Comité Diálogo Ambiental, Inc., El Puente de Williamsburg, Inc. - Enlace Latino de Acción Climática, Comité Yabucoeño Pro-Calidad de Vida, Inc., Alianza Comunitaria Ambientalista del Sureste, Inc., Sierra Club and its Puerto Rico chapter, Mayagüezanos por la Salud y el Ambiente, Inc., Coalición de Organizaciones Anti-Incineración, Inc., Amigos del Río Guaynabo, Inc., Campamento Contra las Cenizas en Peñuelas, Inc., CAMBIO Puerto Rico, and Unión de Trabajadores de la Industria Eléctrica y Riego (collectively, "Petitioners"),

1. Petitioners respectfully request that the Energy Bureau add the following attached documents to this docket:

A. Declaration Of Agustín A. Irizarry Rivera In Support Of Petitioners' Supplemental May 20th Filing.

B. Declaration Of Chelsea Hotaling In Support Of Petitioners' Supplemental May 20th Filing.

C. April 7th Letter of Support for Joint Petition for Intervention and Motion for Reconsideration from Environmental Defense Fund.

D. May 8, 2020 Letter of Support from Dr. Carmelo Garcia, PhD., Professor of Chemistry at University of Puerto Rico, Humacao.

E. May 8, 2020 Declaration By Ángel Figueroa Jaramillo In Support Of Petitioners Supplementary Filing. This Declaration was filed in Spanish on May 8th; this is the English translation.

2. Regulation 8815 Section 7.1(d) prohibits the Energy Bureau from approving any contract resulting from this RFP, if it conflicts with the Integrated Resource Plan or would result in unreasonable profit margins. As detailed throughout Petitioners' filings, PREPA's RFP will interfere with the Integrated Resource Plan by diverting scarce PREPA resources into rental contracts for short-term fossil fuel units that PREPA does not even need. Those contracts will pay unconscionable profits for fossil fuel units that would be turned off most or all of the time. PREB should issue an order stating that no temporary generation contracts will be approved unless

PREPA can demonstrate a need for these units, **after** it immediately takes action on more cost-effective methods to serve summer peak load:

- Incorporate the forecasted effects of COVID-19 into PREPA's summer 2020 load forecast.
- Provide a justification for PREPA's claimed need for 650 MW of operating reserves.
- Schedule calls or meetings with all large customers to discuss load management options and scheduled use of their approximately 234 MW of self-generation units. Provide a publicly available report on the results of these meetings.
- Continue to provide publicly available reports on progress of repairs of all generation units currently offline, especially Costa Sur Unit 5, with thorough explanation for any delays.
- Provide documentation with details and criteria used to determine the inoperability or lower capacity factors of PREPA generation units below name plate capacities.

3. As detailed below, PREPA and the shortlisted bidders may be moving forward with acquisition of temporary generators, even as the justification for these temporary units falls apart.
4. On April 15, 2020, Ángel Figueroa Jaramillo, President of UTIER, publicized six photos he had received of General Electric gas-fired turbines

arriving at the Port of San Juan. True and accurate copies of the five photographs are attached as Exhibits A-E.

https://twitter.com/jaramilloutier/status/1261333944026488833?s=20

https://twitter.com/jaramilloutier/status/1261333953845305350?s=20

5. The photographs show numerous containers being unloaded. A close-up photograph of one container shows that this is from GE Aero Packaging Hungary. It is labeled as "Generator Trailer".

6. GE has a major manufacturing facility in Veresegyhaz, Hungary, which produces a line of trailer-mounted, aeroderivative gas turbine generators.[1]

7. GE markets these generators as "a base load bridge to permanent power installations or for generating backup power supporting natural disaster relief."[2] This is the type of generation resource that PREPA claims, but has not yet demonstrated, that it needs for the thirty days between mid-July and the re-opening of Costa Sur Unit 5 in mid-August.

8. Petitioners respectfully request that the Energy Bureau require PREPA to provide any information it has on these generators. Any agreement by PREPA to rent these generators, whether written or unwritten, would violate Regulation 8815, would incompatible with this proceeding, and

[1] GE, *Fast, Flexible Power Aeroderivative Product and Service Solutions* at 8, 14, https://www.ge.com/content/dam/gepower-pgdp/global/en_US/documents/product/aeroderivative-products-services-brochure.pdf.
[2] *Id.* at 8.

would require the Energy Bureau to reiterate the obligations PREPA must fulfill before it can spend ratepayer funds.

9. The public has only been given shreds of information about which companies are on PREPA's shortlist.[3] PREPA must provide a publicly available report on the current status of the RFP. If PREPA or bidders have acquired any temporary generation units without Energy Bureau approval, then the public deserves a thorough explanation and accounting for these units.

Wherefore, the Petitioners respectfully requests the Energy Bureau to paralyze the RFP proceeding, to investigate and request PREPA to provide the current status of the RFP process and information about the arrival of new generators, and order PREPA to immediately take action on more cost-effective methods to serve summer peak load.

[3] https://newsismybusiness.com/new-fortress-energy-short-listed-for-prepa-temporary-power-generation-bid/

Respectfully submitted, in San Juan, Puerto Rico, on this day May 20, 2020.

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*The Puerto Rico Supreme Court is currently not accepting *pro hac vice* applications during its closure due to the Covid-19 pandemic. Once the Court reopens, *pro hac vice* applications will be submitted, if appropriate. Counsel Raghu Murthy and Jordan Luebkemann have been granted permission to appear before the Puerto Rico Energy Bureau *pro hac vice* previously in another docket [CEPR-AP-2018-0001].

CERTIFICATE OF SERVICE

I hereby certify that on May 20, 2020, we have filed this Motion via the Energy Bureau's online filing system, and sent to the Puerto Rico Energy Bureau Clerk and legal counsel to: secretaria@energia.pr.gov, astrid.rodriguez@prepa.com, jorge.ruiz@prepa.com, n-vazquez@aeepr.com, c-aquino@prepa.com, and kbolanos@diazvaz.law.

Respectfully submitted on this day May 20, 2020.

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EXHIBIT A

Declaration Of Agustín A. Irizarry Rivera

GOVERNMENT OF PUERTO RICO
PUBLIC SERVICE REGULATORY BOARD
PUERTO RICO ENERGY BUREAU

IN RE: REQUEST FOR PROPOSALS FOR TEMPORARY EMERGENCY GENERATION	**CASE NO. NEPR-AP-2020-0001** **SUBJECT:** DECLARATION IN SUPPORT OF PETITIONERS' SUPPLEMENTAL May 20th FILING

DECLARATION OF AGUSTÍN A. IRIZARRY RIVERA IN SUPPORT OF PETITIONERS' SUPPLEMENTAL May 20th FILING

I, Agustín A. Irizarry-Rivera, of legal age, engineer by profession and professor in the Electrical and Computer Engineering Department at the University of Puerto Rico Mayaguez Campus, and resident of San Germán, Puerto Rico, declare the following:

BACKGROUND & QUALIFICATIONS

1. I described my background and qualifications in detail in Paras. 1-7 of my May 8th Declaration.[1]
2. I have reviewed the documents filed by PREPA in this docket on May 7, 2020.[2] I am providing this declaration to provide my analysis of some of those documents.

PREPA Has Not Justified the Need for Temporary Generation

[1] https://energia.pr.gov/wp-content/uploads/2020/05/2020-05-08-AP20200001A34-Motion-to-submit-supplemental-filing.pdf PDF pp. 30-32
[2] https://energia.pr.gov/wp-content/uploads/2020/05/2020-05-07-Motion-in-Compliance-with-Bench-Order-Entered-on-April-30-2020-NEPR-AP-2020-0001.pdf

3. On PDF p. 194, PREPA's April 29th letter to EPA seeking extension of its No-Action Assurance, PREPA reports load-shedding events that occurred in the months following the January 2020 seismic events. However, these events do not support PREPA's claim for temporary generation, for several reasons.
4. First, there are a number of reasons for PREPA to shed load. PREPA does not state that these load-shedding events were due to the loss of system wide capacity, energy, or ancillary services that Costa Sur plant normally would have provided or if it is the result of a transmission or distribution outage that caused a regional generation deficiency resulting in load shedding. An example is the May 11, 2020 event that affected the south west of Puerto Rico an event caused by transmission lines failure.
5. Nor does PREPA state that the proposed temporary generation units would have resolved these issues.
6. Without specific information on these load shedding events, they don't on their own support an argument for temporary generation.
7. Besides, if PREPA is unilaterally deciding to shed load to resolve any issues, then certainly a mutual agreement with large customers to manage load would be an even better solution.
8. PREPA's alarmist statements on load-shedding do not square with the statements of PREPA's own Executive Director, that the system has never

worked better and that the number of customers offline is lower than ever.[3]

PREPA Has Numerous Options, More Cost-Effective Than Temporary Generation, To Ensure Adequate Operating Reserves

9. I calculate the least cost per kWh from the temporary generation to be 21.91 cents/kWh. This calculation assumes PREPA will indeed use 90% of the generation 24/7 during the period of the contract and that the emergency generators can operate 24/7 at 90% generation for months, a very unlikely scenario. Since the temporary generation is described as fixed price the unit price is likely to be higher. At 21.91 cents/kWh this still is very expensive in comparison to generation cost during 2020 of approximately 16 cents/kWh. The 16 cents/kWh is an estimate directly obtained from the fuel and energy adjustments clause plus 1 cent/kWh for generation operation cost, typical of PREPA operation.
10. PREPA's charts on PDF pp. 212-217 rely on the assumption that PREPA needs 650 MW of operating reserves.[4]
11. That level of operating reserves is unnecessary. PREPA has operated with operating reserves of 300 MW or even lower in the past precisely for economic reasons, to save money, when oil prices were high.[5]

[3] "Puerto Rico and COVID-19: Impact on the Grid" Webinar, week of April 13th. https://app.gotowebinar.com/unified/index.html#/webinar/1512009214340290315/attend/3214130180151987728

[4] See 20200505r1 Generation Outage Schedule Analysis Temporary Generation RFP PREPA PREB. In each "Data" tab, PREPA adds 650 MW to the "Load Forecast" estimate to arrive at the "Required Total Reserve."

[5] E.g. El Nuevo Dia, February 19, 2018: "La AEE reduce más de 30% de su reserva", https://www.elnuevodia.com/noticias/locales/nota/laaeereducemasde30desureserva-2400005/

12. The worst-case scenario, detailed on PDF p. 212, occurs if Aguirre Unit 2 and Costa Sur Unit 5 are both out for the entirety of the year. In that unlikely scenario, PREPA needs between 123 and 218 MW of reserves to achieve 300 MW operating reserves.[6] Petitioners have noted several other options at PREPA's disposal to provide those reserves.

13. For example: PREPA's letters to COR3 and FEMA argue that temporary generation is necessary because PREPA only has EPA authorization to run MATS-impacted units until April 30th.[7] That is no longer true: EPA has extended that authorization through August 14th or the re-opening of Costa Sur Unit 5, whichever is sooner.[8]

14. Of course, PREPA should not abuse the EPA authorization by running the MATS-impacted units without proper emission control measures. PREPA should run existing units, to both ensure a reasonable reserve at a reasonable cost, AND must monitor emissions, must independently verify the quality of fuel being used, particularly its sulphur content, prior to burn the fuel, and minimize pollution. PREPA should also diligently report the results of its fuel test and environmental protection activities to

[6] See 20200505r1 Generation Outage Schedule Analysis Temporary Generation RFP PREPA PREB, tab "Data Ag2 CS5 Out". One could also subtract 350 MW from each of the "Maximum Reserve Deficiency Per Month" figures in the chart on PDF p. 212.

[7] PREPA's March 2, 2020 letter to COR3 stated "...at present, PREPA is using nine peaking units as a stopgap measure to replace 26% total of Puerto Rico's electrical generation capacity that was lost due to the Costa Sur plant damage directly caused by the earthquakes. ...three of these base generators, that produce 150 MW, are not EPA compliant and the emissions waiver for these units ends April 30, 2020. After this date, the generators will be taken off line due to this Federal requirement putting a further burden onto Puerto Rico's power production..." PDF p. 10

[8] It is notable that EPA, after reviewing all information from PREPA, has determined that the most likely scenario is that Costa Sur 5 will reopen on August 14th. PREPA's filing makes it clear that this re-opening would negate any need for temporary generation.

both the competent authorities and to the public, particularly to communities directly impacted by its operation, e.g, neighbor communities to its generation plants.

15. Under the current EPA authorization, PREPA could add 167 MW of capacity by bringing into service:

    a. four 21 MW units (Yabucoa 1-2, CS 1-1, Vega Baja 1-1 and Jobos 1-1)[9]

    b. Cambalache 1-1 (83 MW). UTIER President Ángel Figueroa Jaramillo testifies that this unit could be returned to service for $16 million.[10]

As detailed above, this is only a short-term solution through the restoration of Costa Sur Unit 5 on August 15th, to be used only if PREPA demonstrates it is necessary to meet summer peak load. These generation units should be operated in a way that minimizes public health risk, particularly during the COVID-19 crisis as there is scientific evidence of the causal link of increased death rates from COVID-19 in communities exposed to air pollution[11]. PREPA should not be exempted from complying

[9] President Figueroa Jaramillo explained that these unit could be returned to service. May 8th Declaration of Ángel Figueroa Jaramillo, para. 12(e)

[10] May 8th Declaration of Ángel Figueroa Jaramillo, para. 12(d)

[11] Exposure to air pollution and COVID-19 mortality in the United States. Xiao Wu, Rachel C. Nethery, Benjamin M. Sabath, Danielle Braun, Francesca Dominici. medRxiv 2020.04.05.20054502; doi: https://doi.org/10.1101/2020.04.05.20054502 . The study found that, "A small increase in long-term exposure to PM2.5 leads to a large increase in COVID-19 death rate, with the magnitude of increase 20 times that observed for PM2.5 and all-cause mortality. The study results underscore the importance of continuing to enforce existing air pollution regulations to protect human health both during and after the COVID-19 crisis." The specific findings demonstrate that, an increase of only 1 ug/m3 in PM2.5 is associated with a 15% increase in the COVID-19 death rate, at a 95% confidence interval. https://projects.iq.harvard.edu/covid-pm. Particulate matter is emitted by electric power plants, motor vehicles and other sources of air contamination.

with measures such as monitoring emissions, performing independent verification of the fuel quality and sulfur content prior to combustion preparing reports on these issues, and otherwise minimizing emissions from the operating units / plants and providing access to information to the public, especially fence line communities and the agencies with jurisdiction.

Thinking ahead, PREPA must begin planning now to ensure that distributed renewables, storage, energy efficiency, and demand response options are available to satisfy next summer's peak load. Numerous parties to the Integrated Resource Planning process laid out several steps that could be taken relatively quickly and at low cost to incorporate these resources and take advantage of the biggest untapped virtual power plant in the world: the distributed solar and storage already installed on the island.[12]

16. Finally, PREPA could execute agreements with its largest customers to manage load at peak times, or for those customers to operate their self-generation units at peak times. In the immediate aftermath of the January 2020 seismic events, large customers turned to self-generation units, lowering PREPA load by about 234 MW.[13]

[12] Local Environmental Organizations' Legal Brief, CEPR-AP-2018-0001, pp. 27-29. https://energia.pr.gov/wp-content/uploads/2020/03/Local-Environmental-Organizations-Legal-Brief.pdf. Local Environmental Organizations' Reply Brief, Docket CEPR-AP-2018-0001, pp. 3-6. https://energia.pr.gov/wp-content/uploads/2020/04/2020-04-20-LEO-Reply-Brief_final.pdf

[13] Puerto Rico Electric Power Authority, Presentation for Evid. Hr'g Panel A at Slide 15 (Feb. 3, 2020). https://app.box.com/s/fuvsx24ceblv64drlskvohiru8thsywt

CERTIFICATION

I, Agustín A. Irizarry Rivera, of legal age, engineer and resident of San Germán, Puerto Rico, CERTIFY that the contents of my declaration are known to me and are the truth according to the best of my abilities and reasonable knowledge. The information has been gathered in good faith; but I cannot guarantee the truthfulness of information gathered from third parties.

Today, May 20, 2020, in San Germán, Puerto Rico.

_____

Agustín A. Irizarry-Rivera, Ph.D., P.E.

EXHIBIT B

Declaration Of Chelsea Hotaling

GOVERNMENT OF PUERTO RICO
PUBLIC SERVICE REGULATORY BOARD
PUERTO RICO ENERGY BUREAU

IN RE: REQUEST FOR PROPOSALS FOR TEMPORARY EMERGENCY GENERATION	**CASE NO. NEPR-AP-2020-0001** **SUBJECT:** DECLARATION IN SUPPORT OF PETITIONERS' SUPPLEMENTAL MAY 20TH FILING

DECLARATION OF CHELSEA HOTALING IN SUPPORT OF PETITIONERS' SUPPLEMENTAL MAY 20TH FILING

I, Chelsea Hotaling, of legal age, declare the following:

BACKGROUND & QUALIFICATIONS

1. I am a Senior Analyst at Energy Futures Group, a consulting firm that provides specialized expertise on energy efficiency and renewable energy markets, program design, power system planning, and energy policy. I have assisted in the review of multiple Integrated Resource Plans ("Plans") across multiple states. I have reviewed planning models based on multiple models including EnCompass, AURORA, PLEXOS, PowerSimm, PROSYM, SERVM, and System Optimizer and have had formal training on the EnCompass planning model. I hold a B.S. in Accounting and Economics from Elmira College, an MBA from Clarkson University, and an M.S. in Data Analytics and Environmental Policy and Governance from Clarkson University.

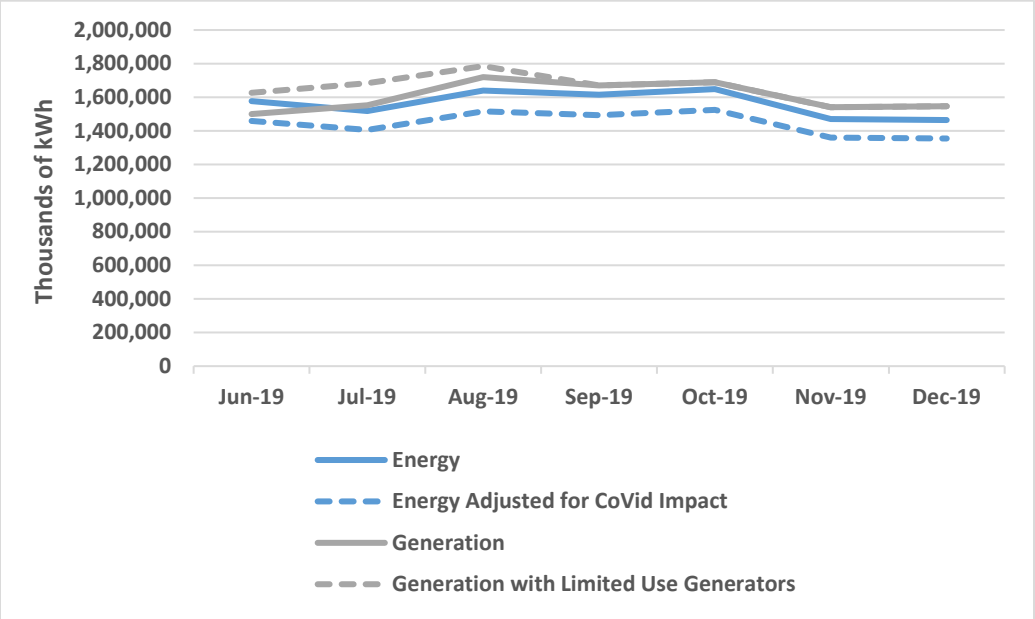
COMPARISON OF PROJECTED ENERGY AND GENERATION FOR THE REMAINDER OF 2020

2. I have prepared a comparison of PREPA's projected energy and generation for the remainder of 2020, based on 2019 monthly data reported by PREPA.[1]
3. I adjusted the data to account for the current outage of Costa Sur Units 5 and 6. I incorporated an assumption that Costa Sur Unit 5 will return online in the beginning of August.
4. I also incorporated an assumption that Aguirre Unit 2 would return online in the beginning of June.
5. Next, I assumed that PREPA's MATS-limited generators[2] would be online until mid-August, in accordance with the recent EPA No-Action Assurance extension letter.
6. Next, I incorporated the effects of COVID-19, through an assumption that energy will be lowered by 7.5%. This is based on a memo produced by Itron that looked at COVID-19 impacts across several ISOs in North America.[3] This is a more conservative estimate than the 9-10% decrease that PREPA's

[1] Retrieved from https://aeepr.com/es-pr/investors/Paginas/Financial-Information.aspx
[2] Limited use generators included in this analysis are San Juan 7 (100 MW) and Palo Seco 1 (85 MW). This analysis also assumes that the Vega Baja peaker (21 MW) and the Aguirre GT (21 MW) return to service and operate until the middle of August.
[3] Latest Trends in Estimated Load Impacts of COVID-19 Mitigation Policies. Itron. Retrieved from https://www.itron.com/solutions/what-we-enable/analytics/forecasting/covid

Executive Director, Mr. Jose Ortiz, confirmed in a webinar on the COVID-19 impacts.[4]

7. Based on these assumptions and PREPA's reported 2019 energy and generation data, I predict that PREPA will have sufficient resources to fulfill energy needs for the remainder of 2020:



The figure above indicates that with limited use generators operating until the middle of August, PREPA has enough generation to meet the projected energy requirements for the remainder of the year. Furthermore, when the impact of COVID-19 on energy needs is considered, PREPA has a larger surplus of generation for the remainder of the year.

[4] "Puerto Rico and COVID-19: Impact on the Grid" Webinar, week of April 13th. Retrieved from https://app.gotowebinar.com/unified/index.html#/webinar/1512009214340290315/attend/321413018015198772

ESTIMATION OF RATEPAYER IMPACT FROM PREPA'S RENTAL OF TEMPORARY GENERATION

8. I prepared an estimation of the ratepayer impact from PREPA's rental of 500 MW of temporary generation units for a contract length of eighteen-months.

9. I prepared two estimates, assuming that the units would operate at an 80% and 90% capacity factor.

10. Based on the 80% capacity factor assumption, I estimate that PREPA will pay $1.49B to rent these temporary units over eighteen months. These costs include the cost of capital and fuel for operating the units. If PREPA eventually obtains FEMA and insurance reimbursement for 75% of these costs, then ratepayers will have to pay $372M for this eighteen-month rental.

CERTIFICATION

I, Chelsea Hotaling, of legal age, CERTIFY that the contents of my declaration are known to me and are the truth according to the best of my abilities and reasonable knowledge. The information has been gathered in good faith; but I cannot guarantee the truthfulness of information gathered from third parties.

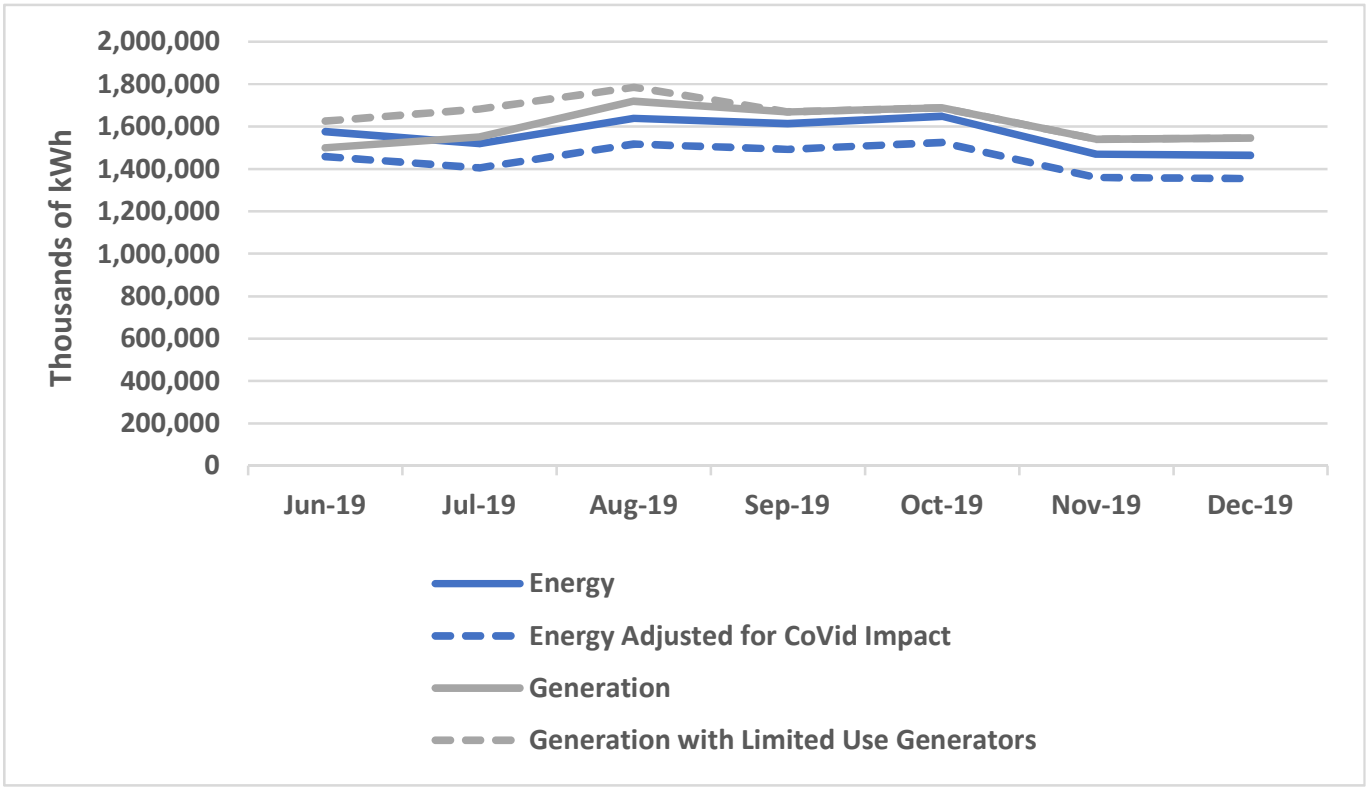
Today, May 20, 2020, in *Morristown, New York.*

Chelsea Hotaling

Chelsea Hotaling

2019 Losses	10.73%	Covid-19 Impact	-7.50%

Total Energy	Projected Date	Energy	Energy Adjusted for CoVid Impact	Generation	Generation Less Energy Adjusted for Covid Impact	Generation with Limited Use Generators
1,408,387						
1,444,003						
1,493,677		1,493,677	1,381,651	NA		
1,576,711	June-20	1,576,711	1,458,458	1,499,932	41,474	1,626,326
1,518,888	July-20	1,518,888	1,404,971	1,552,056	147,085	1,682,808
1,639,406	August-20	1,639,406	1,516,451	1,719,790	203,340	1,785,166
1,614,205	September-20	1,614,205	1,493,140	1,669,901	176,762	1,669,901
1,648,469	October-20	1,648,469	1,524,833	1,688,492	163,659	1,688,492
1,470,034	November-20	1,470,034	1,359,781	1,540,551	180,770	1,540,551
1,464,357	December-20	1,464,357	1,354,530	1,545,804	191,275	1,545,804
1,336,715						
1,136,610						
1,501,822						


Thousands of kWh
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Energy
Energy Adjusted for CoVid Impact
Generation
Generation with Limited Use Generators

PREPA response to LEO ROI from Case CEPR-AP-2018-0001, filed May 1, 2020
Generation reported in millions kWh

	Gross Gen	Net Gen	Tech Loss	NonTech Loss	Tech Loss	Nontech Loss
2019	18430.6	17,753.00	8.18%	2.55%	1,451.50	452.5
					0.081761	0.02548865

Generation (kWh in thousands)
MWH

	2020	2019	2019 Without Costa Sur	With Aguirre Unit 2	With Limited-Use Generation
March	1,416,438	1,481,281			
April		1,471,107	1,196,107		
May		No Data	-		
June		1,652,188	1,377,188	1,499,932	1,626,326
July		1,704,312	1,429,312	1,552,056	1,682,808
August		1,735,426	1,597,046	1,719,790	1,785,166
September		1,685,537	1,547,157	1,669,901	1,669,901
October		1,704,128	1,565,748	1,688,492	1,688,492
November		1,556,187	1,417,807	1,540,551	1,540,551
December		1,561,440	1,423,060	1,545,804	1,545,804

	MW
COSTA SUR 5	388
COSTA SUR 6	393

Costa Sur Historical Generation				**Costa Sur 5**	**Costa Sur 6**	
				388	393	782
	GWh			0.49680143	0.50319857	
			Avg. Per Month			
2018	3300	3,300,000	275,000	136,620.39	138,379.61	

*Aguirre Unit 2 offline since April 2019		Aguirre 1	Aguirre 2	
		450	450	900
Aguirre Unit 2 back in service	June	0.5	0.5	
Aguirre Unit 2 MW	450			
Aguirre 1&2 2018 Net Generation (MWH)	2,945,857			
Aguirre 2 Net Generation (MWH)	1,472,929			
Aguirre 2 Average Monthly	122,744.04			

Limited Use MW	185
Vega Baja GT1-2	21
Aguirre GT 2-2	21
Total	**227**
Capacity Factor	**80%**

Month		Days	Hours	Hours at CF	Monthly Generation
6/1/2020	6/30/2020	29	696	556.8	126393.6
7/1/2020	7/31/2020	30	720	576	130752
8/1/2020	8/31/2020	15	360	288	65376
9/1/2020	9/30/2020	29	696	556.8	
10/1/2020	10/31/2020	30	720	576	
11/1/2020	11/30/2020	29	696	556.8	
12/1/2020	12/31/2020	30	720	576	

Natural Gas I

https://atb.nrel.gov/electricity/2019/index.html?t=cg

Take me to:

Inputs
Calculated

Current Costs

Techno-Economic Cost and Performance Parameters

Net Capacity Factor (%)	Gas-CT-AvgCF	7% *
	Gas-CT-ConstantCF	30% **
	Gas-CC-AvgCF	51% *
	Gas-CC-ConstantCF	87% **
	Gas-CC-CCS-AvgCF	51% *
	Gas-CC-CCS-ConstantCF	87% **
Annual Energy Production (kWh/kW)	Gas-CT-AvgCF	587
	Gas-CT-ConstantCF	2,628
	Gas-CC-AvgCF	4,494
	Gas-CC-ConstantCF	7,621
	Gas-CC-CCS-AvgCF	4,494
	Gas-CC-CCS-ConstantCF	7,621
Heat Rate (MMBtu/MWh)	Gas-CT-AvgCF	9.82
	Gas-CT-ConstantCF	9.82
	Gas-CC-AvgCF	6.45
	Gas-CC-ConstantCF	6.45
	Gas-CC-CCS-AvgCF	7.53
	Gas-CC-CCS-ConstantCF	7.53
CAPEX ($/kW)	Gas-CT-AvgCF	$919
	Gas-CT-ConstantCF	$919
	Gas-CC-AvgCF	$927
	Gas-CC-ConstantCF	$927
	Gas-CC-CCS-AvgCF	$2,292
	Gas-CC-CCS-ConstantCF	$2,292
Construction Financing Cost ($/kW)	Gas-CT-AvgCF	$20
	Gas-CT-ConstantCF	$20
	Gas-CC-AvgCF	$20
	Gas-CC-ConstantCF	$20
	Gas-CC-CCS-AvgCF	$50
	Gas-CC-CCS-ConstantCF	$50
Overnight Capital Cost ($/kW)	Gas-CT-AvgCF	$899
	Gas-CT-ConstantCF	$899
	Gas-CC-AvgCF	$906
	Gas-CC-ConstantCF	$906
	Gas-CC-CCS-AvgCF	$2,242
	Gas-CC-CCS-ConstantCF	$2,242
Fixed Operation and Maintenance Expenses ($/kW-yr)	Gas-CT-AvgCF	$12
	Gas-CT-ConstantCF	$12
	Gas-CC-AvgCF	$11
	Gas-CC-ConstantCF	$11
	Gas-CC-CCS-AvgCF	$34
	Gas-CC-CCS-ConstantCF	$34
Variable Operation and Maintenance Expenses ($/MWh)	Gas-CT-AvgCF	$7
	Gas-CT-ConstantCF	$7
	Gas-CC-AvgCF	$3
	Gas-CC-ConstantCF	$3
	Gas-CC-CCS-AvgCF	$7
	Gas-CC-CCS-ConstantCF	$7
Fuel Costs ($/Mcf)	Gas-CT-AvgCF	$3
	Gas-CT-ConstantCF	$3
	Gas-CC-AvgCF	$3
	Gas-CC-ConstantCF	$3
	Gas-CC-CCS-AvgCF	$3
	Gas-CC-CCS-ConstantCF	$3
Fuel Costs ($/MWh)	Gas-CT-AvgCF	$32
	Gas-CT-ConstantCF	$32
	Gas-CC-AvgCF	$21
	Gas-CC-ConstantCF	$21
	Gas-CC-CCS-AvgCF	$25
	Gas-CC-CCS-ConstantCF	$25

Finance

Weighted Average Cost of Capital (WACC) (Nominal) (%)	Gas-CT-AvgCF	5.3%
	Gas-CT-ConstantCF	5.3%
	Gas-CC-AvgCF	5.3%
	Gas-CC-ConstantCF	5.3%
	Gas-CC-CCS-AvgCF	5.3%
	Gas-CC-CCS-ConstantCF	5.3%

Grid Connection Costs

Grid Connection Costs (GCC) ($/kW)	Gas-CT-AvgCF	$0
	Gas-CT-ConstantCF	$0
	Gas-CC-AvgCF	$0
	Gas-CC-ConstantCF	$0
	Gas-CC-CCS-AvgCF	$0
	Gas-CC-CCS-ConstantCF	$0
Grid Feature Costs ($/kW)	Gas-CT-AvgCF	$0
	Gas-CT-ConstantCF	$0
	Gas-CC-AvgCF	$0
	Gas-CC-ConstantCF	$0
	Gas-CC-CCS-AvgCF	$0
	Gas-CC-CCS-ConstantCF	$0
Onshore Spur Line Costs ($/kW)	Gas-CT-AvgCF	$0
	Gas-CT-ConstantCF	$0
	Gas-CC-AvgCF	$0
	Gas-CC-ConstantCF	$0
	Gas-CC-CCS-AvgCF	$0
	Gas-CC-CCS-ConstantCF	$0

LCOE

Levelized Cost of Energy ($/MWh)	Gas-CT-AvgCF	$146
	Gas-CT-ConstantCF	$63
	Gas-CC-AvgCF	$38
	Gas-CC-ConstantCF	$32
	Gas-CC-CCS-AvgCF	$67
	Gas-CC-CCS-ConstantCF	$53
Overnight Levelized Cost of Energy ($/MWh)	Gas-CT-AvgCF	$111 This is similar to the LCOE used in the TCDB (Transparent Cost Database)
	Gas-CT-ConstantCF	$30
	Gas-CC-AvgCF	$16
	Gas-CC-ConstantCF	$11
	Gas-CC-CCS-AvgCF	$42
	Gas-CC-CCS-ConstantCF	$28

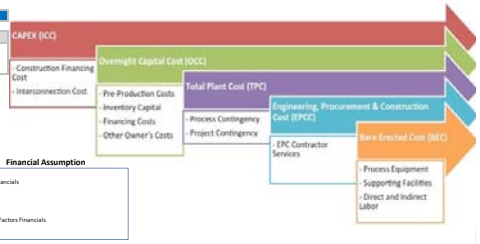
Basis Year: 2017

Natural Gas Technologies

Gas-CT	Combustion Turbine
Gas-CC	Combined Cycle
Gas-CC-CCS	Combined Cycle with carbon capture sequestration

Financial Assumptions:

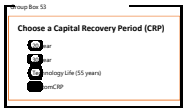
Inflation Rate	2.5%
Capital Recovery Period (Years)	30
Interest Rate Nominal - Mid	3.7%
Calculated Interest Rate Real - Mid	1.2%
Interest During Construction - Nominal	3.7%
Rate of Return on Equity Nominal - Mid	9.0%
Calculated Rate of Return on Equity Real - Mid	6.4%
Debt Fraction - Mid	60.0%
Tax Rate (Federal and State)	25.7%
WACC Nominal - Mid	5.3%
WACC Real - Mid	2.7%
Depreciation Period	15
Construction Finance Factor	1.022
Present Value of Depreciation	0.686
Project Finance Factor	1.109
Capital Recovery Factor (CRF) Nominal - Mid	6.7%
Capital Recovery Factor (CRF) Real - Mid	4.9%



Financial Assumption

Group Box 53

Choose a Capital Recovery Period (CRP)



Construction Duration yrs	3*	
Year Index	Capital Fraction*	Accumulated Interest
0	80%	1.014
1	10%	1.042
2	10%	1.071

*Gas technologies can also have construction schedules less than 3 years

*MACRS yr	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Depreciation Fraction	0.0500	0.0950	0.0855	0.0770	0.0693	0.0623	0.0590	0.0590	0.0591	0.0590	0.0591	0.0590	0.0591	0.0590	0.0591	0.0295
Depreciation Factor	0.9499	0.9023	0.8571	0.8142	0.7734	0.7346	0.6978	0.6629	0.6297	0.5981	0.5682	0.5397	0.5127	0.4870	0.4626	0.4394

*Gas technologies may also have 20-year depreciation periods

Technology-Specific Variables

	New Install (Y/N)	Heat Rate (MMBtu/MWh)	Minimum Plant Load (%)	Outage Rates (%) Forced	Outage Rates (%) Planned	Emissions (lbs/MMBtu) SO2	Emissions (lbs/MMBtu) NOx	Emissions (lbs/MMBtu) Hg	Emissions (lbs/MMBtu) CO2	Spinning Reserve Capability	Quick Start Capacity (%)	Quick Start Cost ($/MW)	Quick Start CCS (Y/N)
Gas-CT	Y	9.820	0%	3%	5%	0.0098	0.15	0	117.0	83%	100%	0	N
Gas-CC	Y	6.450	0%	4%	6%	0.0033	0.02	0	117.0	50%	35%	0	N
Gas-CC-CCS	Y	7.525	0%	4%	6%	0.0033	0.02	0	11.7	50%	35%	0	Y

Source: Regional Energy Deployment System (ReEDS) Model Documentation: Version 2016 (http://www.nrel.gov/docs/fy17osti/67067.pdf)

2016 annual Capacity Factor taken from EIA Electric Power Annual/Monthly (http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_6_07_a)
The Constant CF represents investment into a new plant that is assumed to run more than the fleet-wide average. Constant CF values are from EIA's LCOE tables at https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf.
Overnight Capital Cost used here is the Capital Cost taken from AEO (which is an Overnight Capital Cost plus a defined transmission cost) with the material price index removed.

Note: For future projections, low, mid, and Constant refer to the resulting low, mid, and Constant LCOE projections.

Techno-Economic Cost and Performance Parameters

Future Projections

Basis Year

Net Capacity Factor (%)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Gas-CT-AvgCF - Low	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Gas-CT-AvgCF - Mid	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Gas-CT-AvgCF - High	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Gas-CT-HighCF - Low	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
Gas-CT-HighCF - Mid	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
Gas-CT-HighCF - High	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
Gas-CC-AvgCF - Low	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%
Gas-CC-AvgCF - Mid	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%
Gas-CC-AvgCF - High	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%
Gas-CC-HighCF - Low	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%
Gas-CC-HighCF - Mid	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%
Gas-CC-HighCF - High	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%
Gas-CC-CCS-AvgCF - Low	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%
Gas-CC-CCS-AvgCF - Mid	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%
Gas-CC-CCS-AvgCF - High	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%
Gas-CC-CCS-HighCF - Low	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%
Gas-CC-CCS-HighCF - Mid	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%
Gas-CC-CCS-HighCF - High	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%

Annual Energy Production (kWh/kW)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Gas-CT-AvgCF - Low	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587
Gas-CT-AvgCF - Mid	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587
Gas-CT-AvgCF - High	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587	587
Gas-CT-HighCF - Low	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628
Gas-CT-HighCF - Mid	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628
Gas-CT-HighCF - High	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628
Gas-CC-AvgCF - Low	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494
Gas-CC-AvgCF - Mid	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494
Gas-CC-AvgCF - High	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494
Gas-CC-HighCF - Low	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621
Gas-CC-HighCF - Mid	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621
Gas-CC-HighCF - High	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621
Gas-CC-CCS-AvgCF - Low	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494
Gas-CC-CCS-AvgCF - Mid	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494
Gas-CC-CCS-AvgCF - High	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494	4,494
Gas-CC-CCS-HighCF - Low	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621
Gas-CC-CCS-HighCF - Mid	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621
Gas-CC-CCS-HighCF - High	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621	7,621

Heat Rate (MMBtu/MWh)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Gas-CT-AvgCF - Low	9.82	9.76	9.70	9.63	9.57	9.51	9.45	9.39	9.32	9.26	9.20	9.14	9.08	9.01	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08
Gas-CT-AvgCF - Mid	9.82	9.76	9.70	9.63	9.57	9.51	9.45	9.39	9.32	9.26	9.20	9.14	9.08	9.01	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08
Gas-CT-AvgCF - High	9.82	9.76	9.70	9.63	9.57	9.51	9.45	9.39	9.32	9.26	9.20	9.14	9.08	9.01	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08
Gas-CT-HighCF - Low	9.82	9.76	9.70	9.63	9.57	9.51	9.45	9.39	9.32	9.26	9.20	9.14	9.08	9.01	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08
Gas-CT-HighCF - Mid	9.82	9.76	9.70	9.63	9.57	9.51	9.45	9.39	9.32	9.26	9.20	9.14	9.08	9.01	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08
Gas-CT-HighCF - High	9.82	9.76	9.70	9.63	9.57	9.51	9.45	9.39	9.32	9.26	9.20	9.14	9.08	9.01	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08
Gas-CC-AvgCF - Low	6.45	6.44	6.42	6.41	6.39	6.38	6.36	6.35	6.33	6.32	6.30	6.29	6.28	6.26	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28
Gas-CC-AvgCF - Mid	6.45	6.44	6.42	6.41	6.39	6.38	6.36	6.35	6.33	6.32	6.30	6.29	6.28	6.26	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28
Gas-CC-AvgCF - High	6.45	6.44	6.42	6.41	6.39	6.38	6.36	6.35	6.33	6.32	6.30	6.29	6.28	6.26	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28
Gas-CC-HighCF - Low	6.45	6.44	6.42	6.41	6.39	6.38	6.36	6.35	6.33	6.32	6.30	6.29	6.28	6.26	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28
Gas-CC-HighCF - Mid	6.45	6.44	6.42	6.41	6.39	6.38	6.36	6.35	6.33	6.32	6.30	6.29	6.28	6.26	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28
Gas-CC-HighCF - High	6.45	6.44	6.42	6.41	6.39	6.38	6.36	6.35	6.33	6.32	6.30	6.29	6.28	6.26	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28
Gas-CC-CCS-AvgCF - Low	7.53	7.52	7.52	7.52	7.51	7.51	7.51	7.51	7.50	7.50	7.50	7.50	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49
Gas-CC-CCS-AvgCF - Mid	7.53	7.52	7.52	7.52	7.51	7.51	7.51	7.51	7.50	7.50	7.50	7.50	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49
Gas-CC-CCS-AvgCF - High	7.53	7.52	7.52	7.52	7.51	7.51	7.51	7.51	7.50	7.50	7.50	7.50	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49
Gas-CC-CCS-HighCF - Low	7.53	7.52	7.52	7.52	7.51	7.51	7.51	7.51	7.50	7.50	7.50	7.50	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49
Gas-CC-CCS-HighCF - Mid	7.53	7.52	7.52	7.52	7.51	7.51	7.51	7.51	7.50	7.50	7.50	7.50	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49
Gas-CC-CCS-HighCF - High	7.53	7.52	7.52	7.52	7.51	7.51	7.51	7.51	7.50	7.50	7.50	7.50	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49	7.49

CAPEX ($/kW)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Gas-CT-AvgCF - Low	$919	$918	$916	$923	$912	$905	$887	$879	$874	$869	$864	$860	$855	$852	$849	$845	$842	$840	$836	$833	$830	$829	$827	$825	$823	$820	$820	$817	$816	$813	$812	$810	$808	$800
Gas-CT-AvgCF - Mid	$919	$918	$916	$923	$912	$905	$887	$879	$874	$869	$864	$860	$855	$852	$849	$845	$842	$840	$836	$833	$830	$829	$827	$825	$823	$820	$820	$817	$816	$813	$812	$810	$808	$800
Gas-CT-AvgCF - High	$919	$918	$916	$923	$912	$905	$887	$879	$874	$869	$864	$860	$855	$852	$849	$845	$842	$840	$836	$833	$830	$829	$827	$825	$823	$820	$820	$817	$816	$813	$812	$810	$808	$800
Gas-CT-HighCF - Low	$919	$918	$916	$923	$912	$905	$887	$879	$874	$869	$864	$860	$855	$852	$849	$845	$842	$840	$836	$833	$830	$829	$827	$825	$823	$820	$820	$817	$816	$813	$812	$810	$808	$800
Gas-CT-HighCF - Mid	$919	$918	$916	$923	$912	$905	$887	$879	$874	$869	$864	$860	$855	$852	$849	$845	$842	$840	$836	$833	$830	$829	$827	$825	$823	$820	$820	$817	$816	$813	$812	$810	$808	$800
Gas-CT-HighCF - High	$919	$918	$916	$923	$912	$905	$887	$879	$874	$869	$864	$860	$855	$852	$849	$845	$842	$840	$836	$833	$830	$829	$827	$825	$823	$820	$820	$817	$816	$813	$812	$810	$808	$800
Gas-CC-AvgCF - Low	$927	$920	$913	$907	$900	$894	$880	$873	$870	$866	$863	$860	$855	$852	$849	$846	$843	$841	$838	$835	$832	$830	$828	$826	$825	$822	$821	$818	$817	$814	$812	$811	$809	$800
Gas-CC-AvgCF - Mid	$927	$920	$913	$907	$900	$894	$880	$873	$870	$866	$863	$860	$855	$852	$849	$846	$843	$841	$838	$835	$832	$830	$828	$826	$825	$822	$821	$818	$817	$814	$812	$811	$809	$800
Gas-CC-AvgCF - High	$927	$920	$913	$907	$900	$894	$880	$873	$870	$866	$863	$860	$855	$852	$849	$846	$843	$841	$838	$835	$832	$830	$828	$826	$825	$822	$821	$818	$817	$814	$812	$811	$809	$800
Gas-CC-HighCF - Low	$927	$920	$913	$907	$900	$894	$880	$873	$870	$866	$863	$860	$855	$852	$849	$846	$843	$841	$838	$835	$832	$830	$828	$826	$825	$822	$821	$818	$817	$814	$812	$811	$809	$800
Gas-CC-HighCF - Mid	$927	$920	$913	$907	$900	$894	$880	$873	$870	$866	$863	$860	$855	$852	$849	$846	$843	$841	$838	$835	$832	$830	$828	$826	$825	$822	$821	$818	$817	$814	$812	$811	$809	$800
Gas-CC-HighCF - High	$927	$920	$913	$907	$900	$894	$880	$873	$870	$866	$863	$860	$855	$852	$849	$846	$843	$841	$838	$835	$832	$830	$828	$826	$825	$822	$821	$818	$817	$814	$812	$811	$809	$800
Gas-CC-CCS-AvgCF - Low	$2,292	$2,269	$2,245	$2,222	$2,199	$2,175	$2,123	$2,096	$2,076	$2,057	$2,038	$2,021	$2,001	$1,987	$1,973	$1,957	$1,943	$1,929	$1,914	$1,899	$1,886	$1,875	$1,863	$1,852	$1,842	$1,828	$1,819	$1,806	$1,797	$1,784	$1,773	$1,762	$1,751	$1,726
Gas-CC-CCS-AvgCF - Mid	$2,292	$2,269	$2,245	$2,222	$2,199	$2,175	$2,123	$2,096	$2,076	$2,057	$2,038	$2,021	$2,001	$1,987	$1,973	$1,957	$1,943	$1,929	$1,914	$1,899	$1,886	$1,875	$1,863	$1,852	$1,842	$1,828	$1,819	$1,806	$1,797	$1,784	$1,773	$1,762	$1,751	$1,726
Gas-CC-CCS-AvgCF - High	$2,292	$2,269	$2,245	$2,222	$2,199	$2,175	$2,123	$2,096	$2,076	$2,057	$2,038	$2,021	$2,001	$1,987	$1,973	$1,957	$1,943	$1,929	$1,914	$1,899	$1,886	$1,875	$1,863	$1,852	$1,842	$1,828	$1,819	$1,806	$1,797	$1,784	$1,773	$1,762	$1,751	$1,726
Gas-CC-CCS-HighCF - Low	$2,292	$2,269	$2,245	$2,222	$2,199	$2,175	$2,123	$2,096	$2,076	$2,057	$2,038	$2,021	$2,001	$1,987	$1,973	$1,957	$1,943	$1,929	$1,914	$1,899	$1,886	$1,875	$1,863	$1,852	$1,842	$1,828	$1,819	$1,806	$1,797	$1,784	$1,773	$1,762	$1,751	$1,726
Gas-CC-CCS-HighCF - Mid	$2,292	$2,269	$2,245	$2,222	$2,199	$2,175	$2,123	$2,096	$2,076	$2,057	$2,038	$2,021	$2,001	$1,987	$1,973	$1,957	$1,943	$1,929	$1,914	$1,899	$1,886	$1,875	$1,863	$1,852	$1,842	$1,828	$1,819	$1,806	$1,797	$1,784	$1,773	$1,762	$1,751	$1,726
Gas-CC-CCS-HighCF - High	$2,292	$2,269	$2,245	$2,222	$2,199	$2,175	$2,123	$2,096	$2,076	$2,057	$2,038	$2,021	$2,001	$1,987	$1,973	$1,957	$1,943	$1,929	$1,914	$1,899	$1,886	$1,875	$1,863	$1,852	$1,842	$1,828	$1,819	$1,806	$1,797	$1,784	$1,773	$1,762	$1,751	$1,726

Construction Financing Cost ($/kW)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Gas-CT-AvgCF - Low	$20	$20	$20	$20	$20	$20	$19	$19	$19	$19	$19	$19	$19	$19	$19	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$17
Gas-CT-AvgCF - Mid	$20	$20	$20	$20	$20	$20	$19	$19	$19	$19	$19	$19	$19	$19	$19	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$17
Gas-CT-AvgCF - High	$20	$20	$20	$20	$20	$20	$19	$19	$19	$19	$19	$19	$19	$19	$19	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$17
Gas-CT-HighCF - Low	$20	$20	$20	$20	$20	$20	$19	$19	$19	$19	$19	$19	$19	$19	$19	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$17
Gas-CT-HighCF - Mid	$20	$20	$20	$20	$20	$20	$19	$19	$19	$19	$19	$19	$19	$19	$19	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$17
Gas-CT-HighCF - High	$20	$20	$20	$20	$20	$20	$19	$19	$19	$19	$19	$19	$19	$19	$19	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$17
Gas-CC-AvgCF - Low	$20	$20	$20	$20	$20	$19	$19	$19	$19	$19	$19	$19	$19	$19	$19	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$17
Gas-CC-AvgCF - Mid	$20	$20	$20	$20	$20	$19	$19	$19	$19	$19	$19	$19	$19	$19	$19	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$17
Gas-CC-AvgCF - High	$20	$20	$20	$20	$20	$19	$19	$19	$19	$19	$19	$19	$19	$19	$19	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$17
Gas-CC-HighCF - Low	$20	$20	$20	$20	$20	$19	$19	$19	$19	$19	$19	$19	$19	$19	$19	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$17
Gas-CC-HighCF - Mid	$20	$20	$20	$20	$20	$19	$19	$19	$19	$19	$19	$19	$19	$19	$19	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$17
Gas-CC-HighCF - High	$20	$20	$20	$20	$20	$19	$19	$19	$19	$19	$19	$19	$19	$19	$19	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$17
Gas-CC-CCS-AvgCF - Low	$50	$49	$49	$48	$48	$47	$46	$46	$45	$45	$44	$44	$44	$43	$43	$43	$42	$42	$42	$41	$41	$41	$41	$40	$40	$40	$40	$39	$39	$39	$39	$38	$38	$38
Gas-CC-CCS-AvgCF - Mid	$50	$49	$49	$48	$48	$47	$46	$46	$45	$45	$44	$44	$44	$43	$43	$43	$42	$42	$42	$41	$41	$41	$41	$40	$40	$40	$40	$39	$39	$39	$39	$38	$38	$38
Gas-CC-CCS-AvgCF - High	$50	$49	$49	$48	$48	$47	$46	$46	$45	$45	$44	$44	$44	$43	$43	$43	$42	$42	$42	$41	$41	$41	$41	$40	$40	$40	$40	$39	$39	$39	$39	$38	$38	$38
Gas-CC-CCS-HighCF - Low	$50	$49	$49	$48	$48	$47	$46	$46	$45	$45	$44	$44	$44	$43	$43	$43	$42	$42	$42	$41	$41	$41	$41	$40	$40	$40	$40	$39	$39	$39	$39	$38	$38	$38
Gas-CC-CCS-HighCF - Mid	$50	$49	$49	$48	$48	$47	$46	$46	$45	$45	$44	$44	$44	$43	$43	$43	$42	$42	$42	$41	$41	$41	$41	$40	$40	$40	$40	$39	$39	$39	$39	$38	$38	$38
Gas-CC-CCS-HighCF - High	$50	$49	$49	$48	$48	$47	$46	$46	$45	$45	$44	$44	$44	$43	$43	$43	$42	$42	$42	$41	$41	$41	$41	$40	$40	$40	$40	$39	$39	$39	$39	$38	$38	$38

Overnight Capital Cost ($/kW) *

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Gas-CT-AvgCF - Low	$899	$898	$896	$903	$892	$885	$868	$860	$855	$850	$845	$842	$836	$833	$831	$827	$824	$821	$818	$815	$812	$811	$808	$807	$805	$802	$802	$799	$798	$796	$794	$792	$790	$782
Gas-CT-AvgCF - Mid	$899	$898	$896	$903	$892	$885	$868	$860	$855	$850	$845	$842	$836	$833	$831	$827	$824	$821	$818	$815	$812	$811	$808	$807	$805	$802	$802	$799	$798	$796	$794	$792	$790	$782
Gas-CT-AvgCF - High	$899	$898	$896	$903	$892	$885	$868	$860	$855	$850	$845	$842	$836	$833	$831	$827	$824	$821	$818	$815	$812	$811	$808	$807	$805	$802	$802	$799	$798	$796	$794	$792	$790	$782
Gas-CT-HighCF - Low	$899	$898	$896	$903	$892	$885	$868	$860	$855	$850	$845	$842	$836	$833	$831	$827	$824	$821	$818	$815	$812	$811	$808	$807	$805	$802	$802	$799	$798	$796	$794	$792	$790	$782
Gas-CT-HighCF - Mid	$899	$898	$896	$903	$892	$885	$868	$860	$855	$850	$845	$842	$836	$833	$831	$827	$824	$821	$818	$815	$812	$811	$808	$807	$805	$802	$802	$799	$798	$796	$794	$792	$790	$782
Gas-CT-HighCF - High	$899	$898	$896	$903	$892	$885	$868	$860	$855	$850	$845	$842	$836	$833	$831	$827	$824	$821	$818	$815	$812	$811	$808	$807	$805	$802	$802	$799	$798	$796	$794	$792	$790	$782
Gas-CC-AvgCF - Low	$906	$900	$894	$887	$881	$874	$861	$854	$851	$848	$844	$841	$836	$833	$831	$828	$825	$823	$820	$817	$814	$812	$810	$808	$807	$804	$803	$800	$799	$797	$795	$793	$791	$783
Gas-CC-AvgCF - Mid	$906	$900	$894	$887	$881	$874	$861	$854	$851	$848	$844	$841	$836	$833	$831	$828	$825	$823	$820	$817	$814	$812	$810	$808	$807	$804	$803	$800	$799	$797	$795	$793	$791	$783
Gas-CC-AvgCF - High	$906	$900	$894	$887	$881	$874	$861	$854	$851	$848	$844	$841	$836	$833	$831	$828	$825	$823	$820	$817	$814	$812	$810	$808	$807	$804	$803	$800	$799	$797	$795	$793	$791	$783
Gas-CC-HighCF - Low	$906	$900	$894	$887	$881	$874	$861	$854	$851	$848	$844	$841	$836	$833	$831	$828	$825	$823	$820	$817	$814	$812	$810	$808	$807	$804	$803	$800	$799	$797	$795	$793	$791	$783
Gas-CC-HighCF - Mid	$906	$900	$894	$887	$881	$874	$861	$854	$851	$848	$844	$841	$836	$833	$831	$828	$825	$823	$820	$817	$814	$812	$810	$808	$807	$804	$803	$800	$799	$797	$795	$793	$791	$783
Gas-CC-HighCF - High	$906	$900	$894	$887	$881	$874	$861	$854	$851	$848	$844	$841	$836	$833	$831	$828	$825	$823	$820	$817	$814	$812	$810	$808	$807	$804	$803	$800	$799	$797	$795	$793	$791	$783
Gas-CC-CCS-AvgCF - Low	$2,242	$2,219	$2,196	$2,174	$2,151	$2,128	$2,077	$2,050	$2,031	$2,012	$1,993	$1,977	$1,958	$1,943	$1,930	$1,914	$1,900	$1,887	$1,872	$1,858	$1,845	$1,834	$1,823	$1,811	$1,802	$1,788	$1,780	$1,766	$1,758	$1,745	$1,734	$1,723	$1,712	$1,688
Gas-CC-CCS-AvgCF - Mid	$2,242	$2,219	$2,196	$2,174	$2,151	$2,128	$2,077	$2,050	$2,031	$2,012	$1,993	$1,977	$1,958	$1,943	$1,930	$1,914	$1,900	$1,887	$1,872	$1,858	$1,845	$1,834	$1,823	$1,811	$1,802	$1,788	$1,780	$1,766	$1,758	$1,745	$1,734	$1,723	$1,712	$1,688
Gas-CC-CCS-AvgCF - High	$2,242	$2,219	$2,196	$2,174	$2,151	$2,128	$2,077	$2,050	$2,031	$2,012	$1,993	$1,977	$1,958	$1,943	$1,930	$1,914	$1,900	$1,887	$1,872	$1,858	$1,845	$1,834	$1,823	$1,811	$1,802	$1,788	$1,780	$1,766	$1,758	$1,745	$1,734	$1,723	$1,712	$1,688
Gas-CC-CCS-HighCF - Low	$2,242	$2,219	$2,196	$2,174	$2,151	$2,128	$2,077	$2,050	$2,031	$2,012	$1,993	$1,977	$1,958	$1,943	$1,930	$1,914	$1,900	$1,887	$1,872	$1,858	$1,845	$1,834	$1,823	$1,811	$1,802	$1,788	$1,780	$1,766	$1,758	$1,745	$1,734	$1,723	$1,712	$1,688
Gas-CC-CCS-HighCF - Mid	$2,242	$2,219	$2,196	$2,174	$2,151	$2,128	$2,077	$2,050	$2,031	$2,012	$1,993	$1,977	$1,958	$1,943	$1,930	$1,914	$1,900	$1,887	$1,872	$1,858	$1,845	$1,834	$1,823	$1,811	$1,802	$1,788	$1,780	$1,766	$1,758	$1,745	$1,734	$1,723	$1,712	$1,688
Gas-CC-CCS-HighCF - High	$2,242	$2,219	$2,196	$2,174	$2,151	$2,128	$2,077	$2,050	$2,031	$2,012	$1,993	$1,977	$1,958	$1,943	$1,930	$1,914	$1,900	$1,887	$1,872	$1,858	$1,845	$1,834	$1,823	$1,811	$1,802	$1,788	$1,780	$1,766	$1,758	$1,745	$1,734	$1,723	$1,712	$1,688

Fixed Operation and Maintenance Expenses ($/kW-yr)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Gas-CT-AvgCF - Low	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12
Gas-CT-AvgCF - Mid	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12
Gas-CT-AvgCF - High	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12
Gas-CT-HighCF - Low	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12
Gas-CT-HighCF - Mid	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12
Gas-CT-HighCF - High	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12	$12
Gas-CC-AvgCF - Low	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11
Gas-CC-AvgCF - Mid	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11
Gas-CC-AvgCF - High	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11
Gas-CC-HighCF - Low	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11
Gas-CC-HighCF - Mid	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11
Gas-CC-HighCF - High	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11	$11
Gas-CC-CCS-AvgCF - Low	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34

Gas-CC-CCS-AvgCF - Mid	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34
Gas-CC-CCS-AvgCF - High	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34
Gas-CC-CCS-HighCF - Low	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34
Gas-CC-CCS-HighCF - Mid	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34
Gas-CC-CCS-HighCF - High	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34	$34

Variable Operation and Maintenance Expenses ($/MWh)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Gas-CT-AvgCF - Low	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7
Gas-CT-AvgCF - Mid	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7
Gas-CT-AvgCF - High	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7
Gas-CT-HighCF - Low	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7
Gas-CT-HighCF - Mid	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7
Gas-CT-HighCF - High	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7
Gas-CC-AvgCF - Low	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3
Gas-CC-AvgCF - Mid	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3
Gas-CC-AvgCF - High	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3
Gas-CC-HighCF - Low	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3
Gas-CC-HighCF - Mid	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3
Gas-CC-HighCF - High	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3	$3
Gas-CC-CCS-AvgCF - Low	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7
Gas-CC-CCS-AvgCF - Mid	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7
Gas-CC-CCS-AvgCF - High	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7
Gas-CC-CCS-HighCF - Low	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7
Gas-CC-CCS-HighCF - Mid	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7
Gas-CC-CCS-HighCF - High	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7

Fuel Costs ($/MMBtu)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Gas-CT-AvgCF - Low	$3.39	$3.34	$3.02	$3.04	$2.91	$2.90	$3.01	$3.16	$3.32	$3.40	$3.42	$3.42	$3.41	$3.40	$3.41	$3.45	$3.49	$3.50	$3.54	$3.55	$3.55	$3.56	$3.57	$3.57	$3.57	$3.57	$3.59	$3.63	$3.65	$3.68	$3.72	$3.75	$3.76	$3.81
Gas-CT-AvgCF - Mid	$3.39	$3.34	$3.20	$3.33	$3.28	$3.33	$3.49	$3.71	$3.93	$4.00	$4.01	$4.08	$4.08	$4.11	$4.10	$4.25	$4.31	$4.35	$4.38	$4.45	$4.46	$4.46	$4.48	$4.55	$4.53	$4.57	$4.63	$4.72	$4.79	$4.85	$4.92	$5.06	$5.15	$5.24
Gas-CT-AvgCF - High	$3.39	$3.34	$3.53	$3.85	$3.97	$4.06	$4.30	$4.63	$4.97	$5.32	$5.44	$5.69	$5.77	$5.82	$5.87	$6.03	$6.09	$6.26	$6.35	$6.45	$6.52	$6.60	$6.58	$6.81	$6.84	$6.93	$7.12	$7.10	$7.21	$7.42	$7.72	$7.98	$8.15	$8.42
Gas-CT-HighCF - Low	$3.39	$3.34	$3.02	$3.04	$2.91	$2.90	$3.01	$3.16	$3.32	$3.40	$3.42	$3.42	$3.41	$3.40	$3.41	$3.45	$3.49	$3.50	$3.54	$3.55	$3.55	$3.56	$3.57	$3.57	$3.57	$3.57	$3.59	$3.63	$3.65	$3.68	$3.72	$3.75	$3.76	$3.81
Gas-CT-HighCF - Mid	$3.39	$3.34	$3.20	$3.33	$3.28	$3.33	$3.49	$3.71	$3.93	$4.00	$4.01	$4.08	$4.08	$4.11	$4.10	$4.25	$4.31	$4.35	$4.38	$4.45	$4.46	$4.46	$4.48	$4.55	$4.53	$4.57	$4.63	$4.72	$4.79	$4.85	$4.92	$5.06	$5.15	$5.24
Gas-CT-HighCF - High	$3.39	$3.34	$3.53	$3.85	$3.97	$4.06	$4.30	$4.63	$4.97	$5.32	$5.44	$5.69	$5.77	$5.82	$5.87	$6.03	$6.09	$6.26	$6.35	$6.45	$6.52	$6.60	$6.58	$6.81	$6.84	$6.93	$7.12	$7.10	$7.21	$7.42	$7.72	$7.98	$8.15	$8.42
Gas-CC-AvgCF - Low	$3.39	$3.34	$3.02	$3.04	$2.91	$2.90	$3.01	$3.16	$3.32	$3.40	$3.42	$3.42	$3.41	$3.40	$3.41	$3.45	$3.49	$3.50	$3.54	$3.55	$3.55	$3.56	$3.57	$3.57	$3.57	$3.57	$3.59	$3.63	$3.65	$3.68	$3.72	$3.75	$3.76	$3.81
Gas-CC-AvgCF - Mid	$3.39	$3.34	$3.20	$3.33	$3.28	$3.33	$3.49	$3.71	$3.93	$4.00	$4.01	$4.08	$4.08	$4.11	$4.10	$4.25	$4.31	$4.35	$4.38	$4.45	$4.46	$4.46	$4.48	$4.55	$4.53	$4.57	$4.63	$4.72	$4.79	$4.85	$4.92	$5.06	$5.15	$5.24
Gas-CC-AvgCF - High	$3.39	$3.34	$3.53	$3.85	$3.97	$4.06	$4.30	$4.63	$4.97	$5.32	$5.44	$5.69	$5.77	$5.82	$5.87	$6.03	$6.09	$6.26	$6.35	$6.45	$6.52	$6.60	$6.58	$6.81	$6.84	$6.93	$7.12	$7.10	$7.21	$7.42	$7.72	$7.98	$8.15	$8.42
Gas-CC-HighCF - Low	$3.39	$3.34	$3.02	$3.04	$2.91	$2.90	$3.01	$3.16	$3.32	$3.40	$3.42	$3.42	$3.41	$3.40	$3.41	$3.45	$3.49	$3.50	$3.54	$3.55	$3.55	$3.56	$3.57	$3.57	$3.57	$3.57	$3.59	$3.63	$3.65	$3.68	$3.72	$3.75	$3.76	$3.81
Gas-CC-HighCF - Mid	$3.39	$3.34	$3.20	$3.33	$3.28	$3.33	$3.49	$3.71	$3.93	$4.00	$4.01	$4.08	$4.08	$4.11	$4.10	$4.25	$4.31	$4.35	$4.38	$4.45	$4.46	$4.46	$4.48	$4.55	$4.53	$4.57	$4.63	$4.72	$4.79	$4.85	$4.92	$5.06	$5.15	$5.24
Gas-CC-HighCF - High	$3.39	$3.34	$3.53	$3.85	$3.97	$4.06	$4.30	$4.63	$4.97	$5.32	$5.44	$5.69	$5.77	$5.82	$5.87	$6.03	$6.09	$6.26	$6.35	$6.45	$6.52	$6.60	$6.58	$6.81	$6.84	$6.93	$7.12	$7.10	$7.21	$7.42	$7.72	$7.98	$8.15	$8.42
Gas-CC-CCS-AvgCF - Low	$3.39	$3.34	$3.02	$3.04	$2.91	$2.90	$3.01	$3.16	$3.32	$3.40	$3.42	$3.42	$3.41	$3.40	$3.41	$3.45	$3.49	$3.50	$3.54	$3.55	$3.55	$3.56	$3.57	$3.57	$3.57	$3.57	$3.59	$3.63	$3.65	$3.68	$3.72	$3.75	$3.76	$3.81
Gas-CC-CCS-AvgCF - Mid	$3.39	$3.34	$3.20	$3.33	$3.28	$3.33	$3.49	$3.71	$3.93	$4.00	$4.01	$4.08	$4.08	$4.11	$4.10	$4.25	$4.31	$4.35	$4.38	$4.45	$4.46	$4.46	$4.48	$4.55	$4.53	$4.57	$4.63	$4.72	$4.79	$4.85	$4.92	$5.06	$5.15	$5.24
Gas-CC-CCS-AvgCF - High	$3.39	$3.34	$3.53	$3.85	$3.97	$4.06	$4.30	$4.63	$4.97	$5.32	$5.44	$5.69	$5.77	$5.82	$5.87	$6.03	$6.09	$6.26	$6.35	$6.45	$6.52	$6.60	$6.58	$6.81	$6.84	$6.93	$7.12	$7.10	$7.21	$7.42	$7.72	$7.98	$8.15	$8.42
Gas-CC-CCS-HighCF - Low	$3.39	$3.34	$3.02	$3.04	$2.91	$2.90	$3.01	$3.16	$3.32	$3.40	$3.42	$3.42	$3.41	$3.40	$3.41	$3.45	$3.49	$3.50	$3.54	$3.55	$3.55	$3.56	$3.57	$3.57	$3.57	$3.57	$3.59	$3.63	$3.65	$3.68	$3.72	$3.75	$3.76	$3.81
Gas-CC-CCS-HighCF - Mid	$3.39	$3.34	$3.20	$3.33	$3.28	$3.33	$3.49	$3.71	$3.93	$4.00	$4.01	$4.08	$4.08	$4.11	$4.10	$4.25	$4.31	$4.35	$4.38	$4.45	$4.46	$4.46	$4.48	$4.55	$4.53	$4.57	$4.63	$4.72	$4.79	$4.85	$4.92	$5.06	$5.15	$5.24
Gas-CC-CCS-HighCF - High	$3.39	$3.34	$3.53	$3.85	$3.97	$4.06	$4.30	$4.63	$4.97	$5.32	$5.44	$5.69	$5.77	$5.82	$5.87	$6.03	$6.09	$6.26	$6.35	$6.45	$6.52	$6.60	$6.58	$6.81	$6.84	$6.93	$7.12	$7.10	$7.21	$7.42	$7.72	$7.98	$8.15	$8.42

Fuel Costs ($/MWh)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Gas-CT-AvgCF - Low	$33	$33	$29	$29	$28	$28	$28	$30	$31	$31	$31	$31	$31	$31	$31	$31	$32	$32	$32	$32	$32	$32	$32	$32	$32	$32	$33	$33	$33	$33	$34	$34	$34	$35
Gas-CT-AvgCF - Mid	$33	$33	$31	$32	$31	$32	$33	$35	$37	$37	$37	$37	$37	$37	$37	$39	$39	$39	$40	$40	$41	$41	$41	$41	$41	$42	$42	$43	$43	$44	$45	$46	$47	$48
Gas-CT-AvgCF - High	$33	$33	$34	$37	$38	$39	$41	$43	$46	$49	$50	$52	$52	$52	$53	$55	$55	$57	$58	$59	$59	$60	$60	$62	$62	$63	$65	$64	$65	$67	$70	$72	$74	$76
Gas-CT-HighCF - Low	$33	$33	$29	$29	$28	$28	$28	$30	$31	$31	$31	$31	$31	$31	$31	$31	$32	$32	$32	$32	$32	$32	$32	$32	$32	$32	$33	$33	$33	$33	$34	$34	$34	$35
Gas-CT-HighCF - Mid	$33	$33	$31	$32	$31	$32	$33	$35	$37	$37	$37	$37	$37	$37	$37	$39	$39	$39	$40	$40	$41	$41	$41	$41	$41	$42	$42	$43	$43	$44	$45	$46	$47	$48
Gas-CT-HighCF - High	$33	$33	$34	$37	$38	$39	$41	$43	$46	$49	$50	$52	$52	$52	$53	$55	$55	$57	$58	$59	$59	$60	$60	$62	$62	$63	$65	$64	$65	$67	$70	$72	$74	$76
Gas-CC-AvgCF - Low	$22	$22	$19	$20	$19	$19	$19	$20	$21	$21	$22	$21	$21	$21	$21	$22	$22	$22	$22	$22	$22	$22	$22	$22	$22	$22	$22	$23	$23	$23	$23	$24	$24	$24
Gas-CC-AvgCF - Mid	$22	$22	$21	$21	$21	$21	$22	$24	$25	$25	$25	$26	$26	$26	$26	$27	$27	$27	$27	$28	$28	$28	$28	$29	$28	$29	$29	$30	$30	$30	$31	$32	$32	$33
Gas-CC-AvgCF - High	$22	$22	$23	$25	$25	$26	$27	$29	$31	$34	$34	$36	$36	$36	$37	$38	$38	$39	$40	$40	$41	$41	$41	$43	$43	$43	$45	$45	$45	$47	$48	$50	$51	$53
Gas-CC-HighCF - Low	$22	$22	$19	$20	$19	$19	$19	$20	$21	$21	$22	$21	$21	$21	$21	$22	$22	$22	$22	$22	$22	$22	$22	$22	$22	$22	$22	$23	$23	$23	$23	$24	$24	$24
Gas-CC-HighCF - Mid	$22	$22	$21	$21	$21	$21	$22	$24	$25	$25	$25	$26	$26	$26	$26	$27	$27	$27	$27	$28	$28	$28	$28	$29	$28	$29	$29	$30	$30	$30	$31	$32	$32	$33
Gas-CC-HighCF - High	$22	$22	$23	$25	$25	$26	$27	$29	$31	$34	$34	$36	$36	$36	$37	$38	$38	$39	$40	$40	$41	$41	$41	$43	$43	$43	$45	$45	$45	$47	$48	$50	$51	$53
Gas-CC-CCS-AvgCF - Low	$25	$25	$23	$23	$22	$22	$23	$24	$25	$25	$26	$26	$26	$25	$26	$26	$26	$26	$27	$27	$27	$27	$27	$27	$27	$27	$27	$27	$27	$28	$28	$28	$28	$29
Gas-CC-CCS-AvgCF - Mid	$25	$25	$24	$25	$25	$25	$26	$28	$30	$30	$30	$31	$31	$31	$31	$32	$32	$33	$33	$33	$33	$33	$34	$34	$34	$34	$35	$35	$36	$36	$37	$38	$39	$39
Gas-CC-CCS-AvgCF - High	$25	$25	$27	$29	$30	$31	$32	$35	$37	$40	$41	$43	$43	$44	$44	$45	$46	$47	$48	$48	$49	$49	$49	$51	$51	$52	$53	$53	$54	$56	$58	$60	$61	$63
Gas-CC-CCS-HighCF - Low	$25	$25	$23	$23	$22	$22	$23	$24	$25	$25	$26	$26	$26	$25	$26	$26	$26	$26	$27	$27	$27	$27	$27	$27	$27	$27	$27	$27	$27	$28	$28	$28	$28	$29
Gas-CC-CCS-HighCF - Mid	$25	$25	$24	$25	$25	$25	$26	$28	$30	$30	$30	$31	$31	$31	$31	$32	$32	$33	$33	$33	$33	$33	$34	$34	$34	$34	$35	$35	$36	$36	$37	$38	$39	$39
Gas-CC-CCS-HighCF - High	$25	$25	$27	$29	$30	$31	$32	$35	$37	$40	$41	$43	$43	$44	$44	$45	$46	$47	$48	$48	$49	$49	$49	$51	$51	$52	$53	$53	$54	$56	$58	$60	$61	$63

Finance

Assumptions

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Inflation Rate	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Interest Rate Nominal - Low	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%
Interest Rate Nominal - Mid	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%
Interest Rate Nominal - Constant	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%
Calculated Interest Rate Real - Low	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%
Calculated Interest Rate Real - Mid	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%
Calculated Interest Rate Real - Constant	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%
Interest During Construction - Nominal	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%
Rate of Return on Equity Nominal - Low	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Rate of Return on Equity Nominal - Mid	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Rate of Return on Equity Nominal - Consta	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Calculated Rate of Return on Equity Real -	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%
Calculated Rate of Return on Equity Real -	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%
Calculated Rate of Return on Equity Real -	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%
Debt Fraction - Low	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
Debt Fraction - Mid	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
Debt Fraction - Constant	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
Tax Rate (Federal and State)	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%	25.7%
WACC Nominal - Low	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
WACC Nominal - Mid	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
WACC Nominal - Constant	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
WACC Real - Low	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%
WACC Real - Mid	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%
WACC Real - Constant	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%
Capital Recovery Factor (CRF) Nominal - L	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%
Capital Recovery Factor (CRF) Nominal - M	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%
Capital Recovery Factor (CRF) Nominal - C	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%
Capital Recovery Factor (CRF) Real - Low	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%
Capital Recovery Factor (CRF) Real - Mid	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%
Capital Recovery Factor (CRF) Real - Cons	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%

Weighted Average Cost of Capital (WACC) (Nominal) (%)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Gas-CT-AvgCF - Low	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Gas-CT-AvgCF - Mid	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Gas-CT-AvgCF - High	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Gas-CT-HighCF - Low	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Gas-CT-HighCF - Mid	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Gas-CT-HighCF - High	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Gas-CC-AvgCF - Low	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Gas-CC-AvgCF - Mid	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Gas-CC-AvgCF - High	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Gas-CC-HighCF - Low	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Gas-CC-HighCF - Mid	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Gas-CC-HighCF - High	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Gas-CC-CCS-AvgCF - Low	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Gas-CC-CCS-AvgCF - Mid	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Gas-CC-CCS-AvgCF - High	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Gas-CC-CCS-HighCF - Low	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Gas-CC-CCS-HighCF - Mid	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Gas-CC-CCS-HighCF - High	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%

rid Connection Costs

Grid Connection Costs (GCC) ($/kW)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Gas-CT-AvgCF - Low	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Gas-CT-AvgCF - Mid	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Gas-CT-AvgCF - High	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Gas-CT-HighCF - Low	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Gas-CT-HighCF - Mid	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Gas-CT-HighCF - High	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Gas-CC-AvgCF - Low	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Gas-CC-AvgCF - Mid	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Gas-CC-AvgCF - High	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Gas-CC-HighCF - Low	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Gas-CC-HighCF - Mid	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Gas-CC-HighCF - High	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

G

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Gas-CC-CCS-AvgCF - Low	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Gas-CC-CCS-AvgCF - Mid	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Gas-CC-CCS-AvgCF - High	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Gas-CC-CCS-HighCF - Low	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Gas-CC-CCS-HighCF - Mid	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Gas-CC-CCS-HighCF - High	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

LCOE

Levelized Cost of Energy ($/MWh)

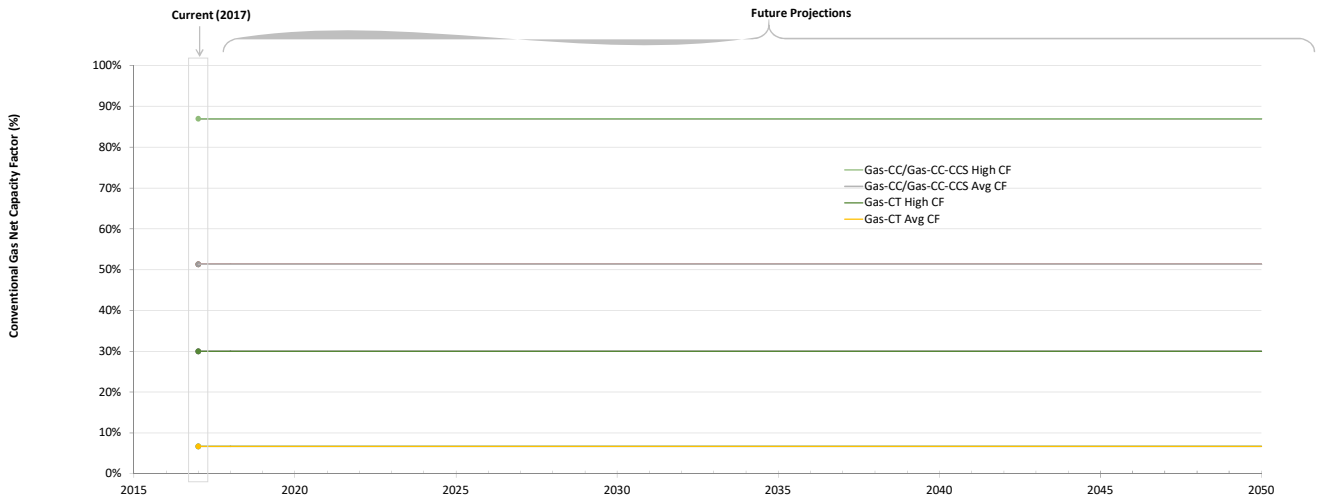
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Gas-CT-AvgCF - Low	$146	$146	$142	$143	$140	$140	$139	$139	$140	$140	$140	$139	$138	$138	$138	$138	$138	$138	$138	$137	$137	$137	$137	$137	$137	$136	$137	$137	$137	$137	$137	$137	$137	$137
Gas-CT-AvgCF - Mid	$148	$147	$145	$147	$145	$145	$144	$146	$147	$147	$146	$146	$145	$145	$145	$146	$146	$146	$146	$147	$147	$146	$146	$147	$147	$147	$147	$148	$148	$149	$149	$150	$151	$151
Gas-CT-AvgCF - High	$149	$148	$150	$153	$153	$153	$154	$156	$158	$160	$161	$162	$162	$162	$163	$164	$164	$165	$166	$166	$167	$167	$167	$169	$169	$169	$171	$171	$172	$173	$176	$178	$179	$181
Gas-CT-HighCF - Low	$64	$63	$60	$60	$59	$58	$59	$60	$61	$61	$61	$61	$60	$60	$60	$61	$61	$61	$61	$61	$61	$61	$61	$61	$61	$61	$61	$62	$62	$62	$62	$63	$63	$63
Gas-CT-HighCF - Mid	$64	$64	$62	$63	$62	$62	$63	$65	$67	$67	$67	$67	$67	$67	$67	$68	$69	$69	$69	$70	$70	$70	$70	$70	$70	$71	$71	$72	$72	$73	$73	$75	$76	$76
Gas-CT-HighCF - High	$65	$64	$66	$69	$69	$70	$71	$74	$77	$80	$80	$82	$82	$82	$83	$85	$85	$87	$87	$88	$89	$89	$89	$91	$91	$92	$94	$94	$95	$97	$99	$102	$103	$105
Gas-CC-AvgCF - Low	$38	$38	$36	$36	$35	$34	$35	$36	$37	$37	$37	$37	$37	$37	$37	$37	$37	$37	$37	$37	$37	$38	$38	$38	$37	$37	$38	$38	$38	$38	$38	$38	$39	$39
Gas-CC-AvgCF - Mid	$38	$38	$37	$38	$37	$37	$38	$39	$41	$41	$41	$41	$41	$41	$41	$42	$43	$43	$43	$43	$43	$43	$43	$44	$44	$44	$44	$45	$45	$46	$46	$47	$47	$48
Gas-CC-AvgCF - High	$39	$38	$39	$41	$42	$42	$43	$45	$47	$50	$50	$52	$52	$52	$53	$54	$54	$55	$55	$56	$56	$57	$57	$58	$58	$59	$60	$60	$61	$62	$64	$65	$66	$68
Gas-CC-HighCF - Low	$33	$32	$30	$30	$29	$29	$30	$30	$31	$32	$32	$32	$32	$32	$32	$32	$32	$32	$32	$32	$32	$32	$32	$32	$32	$32	$33	$33	$33	$33	$33	$33	$34	$34
Gas-CC-HighCF - Mid	$33	$32	$31	$32	$32	$32	$33	$34	$35	$36	$36	$36	$36	$36	$36	$37	$37	$38	$38	$38	$38	$38	$38	$39	$39	$39	$39	$40	$40	$40	$41	$42	$42	$43
Gas-CC-HighCF - High	$33	$32	$34	$36	$36	$37	$38	$40	$42	$44	$45	$46	$47	$47	$47	$48	$49	$50	$50	$51	$51	$52	$52	$53	$53	$54	$55	$55	$55	$57	$59	$60	$61	$63
Gas-CC-CCS-AvgCF - Low	$68	$67	$65	$64	$63	$63	$63	$64	$65	$65	$65	$65	$64	$64	$64	$64	$64	$64	$64	$64	$64	$64	$64	$64	$64	$64	$64	$64	$64	$64	$64	$64	$64	$64
Gas-CC-CCS-AvgCF - Mid	$68	$68	$66	$67	$66	$66	$67	$68	$70	$70	$70	$70	$70	$70	$70	$71	$71	$71	$71	$71	$71	$71	$71	$72	$71	$71	$72	$72	$73	$73	$73	$74	$75	$75
Gas-CC-CCS-AvgCF - High	$69	$68	$69	$71	$72	$72	$74	$76	$78	$80	$81	$83	$83	$83	$83	$84	$85	$86	$86	$87	$87	$88	$87	$89	$89	$89	$91	$90	$91	$93	$95	$97	$98	$99
Gas-CC-CCS-HighCF - Low	$53	$53	$50	$50	$49	$49	$49	$50	$51	$52	$52	$52	$51	$51	$51	$51	$52	$52	$52	$52	$52	$52	$52	$52	$51	$51	$51	$52	$52	$52	$52	$52	$52	$52
Gas-CC-CCS-HighCF - Mid	$54	$53	$52	$53	$52	$52	$53	$55	$56	$56	$56	$57	$57	$57	$57	$58	$58	$58	$58	$59	$59	$59	$59	$59	$59	$59	$59	$60	$61	$61	$61	$62	$63	$63
Gas-CC-CCS-HighCF - High	$54	$53	$55	$57	$58	$58	$60	$62	$64	$67	$67	$69	$70	$70	$70	$71	$72	$73	$73	$74	$74	$75	$75	$76	$76	$77	$78	$78	$79	$80	$82	$84	$86	$87

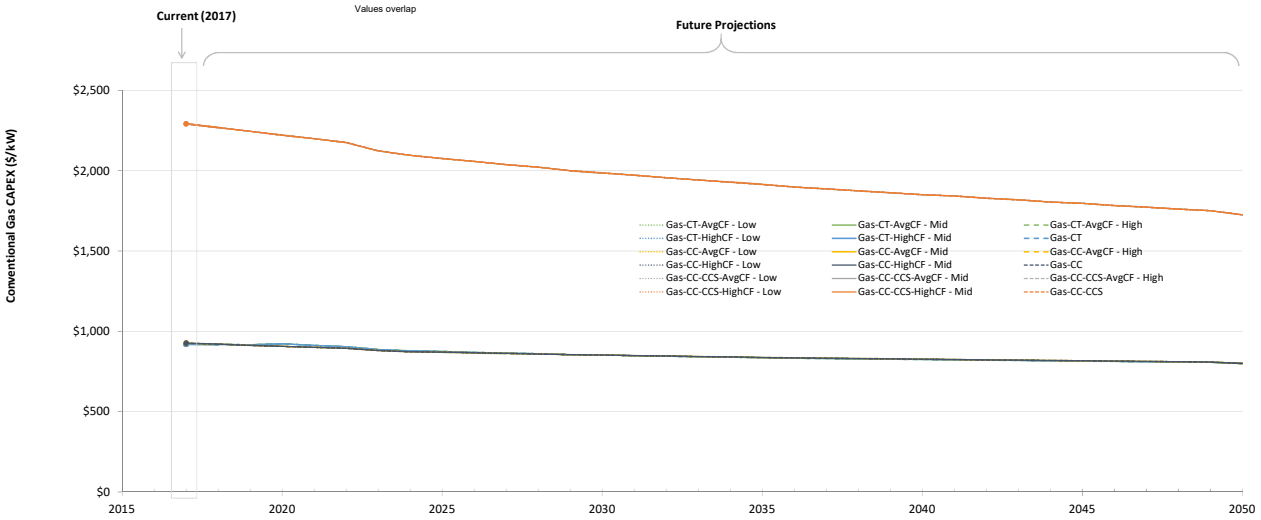
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
PVD - Low	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686
PVD - Mid	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639
PVD - Constant	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583	0.583
PFF - Low	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109	1.109
PFF - Mid	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125
PFF - Constant	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145

Depreciation Factor

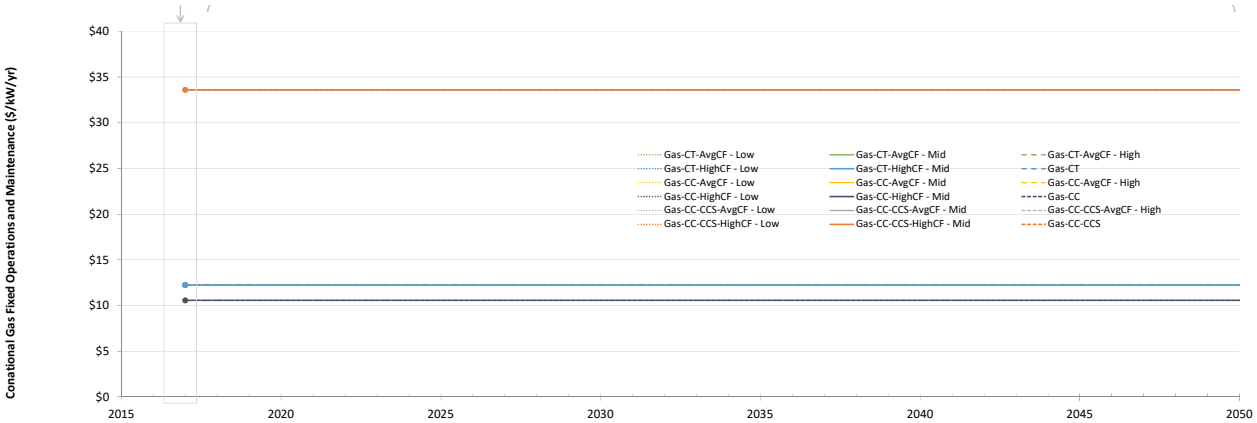
MACRS	Year (Low)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
0.0500	1	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499	0.9499
0.0950	2	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023	0.9023
0.0855	3	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571	0.8571
0.0770	4	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142	0.8142
0.0693	5	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734	0.7734
0.0623	6	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346	0.7346
0.0590	7	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978	0.6978
0.0590	8	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629	0.6629
0.0591	9	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297	0.6297
0.0590	10	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981	0.5981
0.0591	11	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682	0.5682
0.0590	12	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397	0.5397
0.0591	13	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127	0.5127
0.0590	14	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870
0.0591	15	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626	0.4626
0.0295	16	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394	0.4394

*Overnight Capital Cost used here is the Capital Cost taken from AEO (which is an Overnight Capital Cost plus a defined transmission cost).

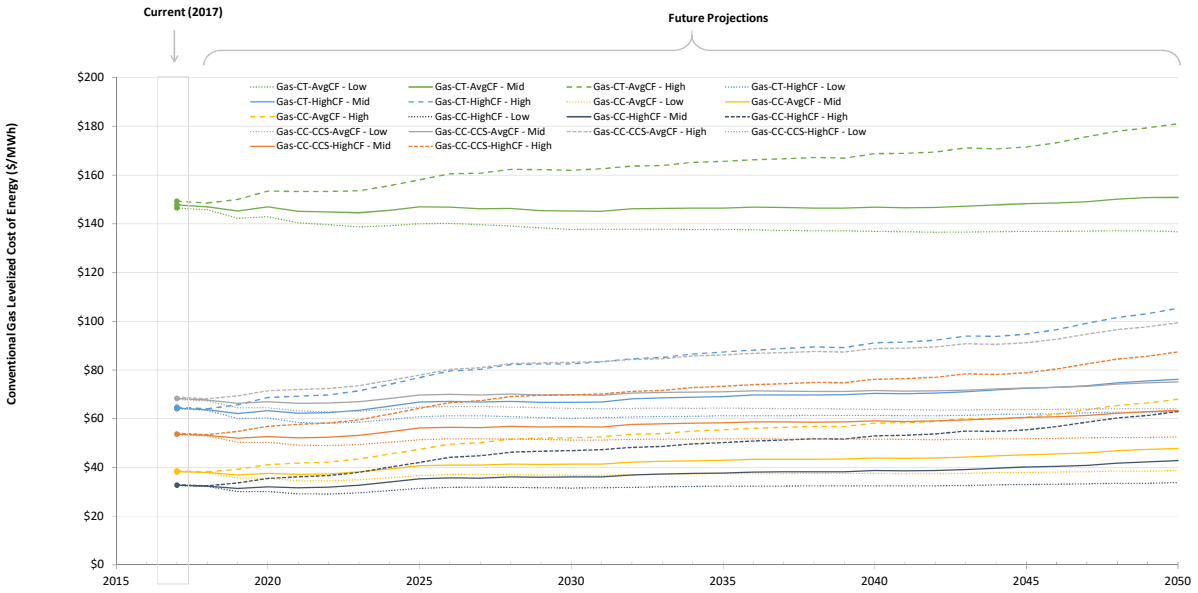




Values overlap for within each case



Values overlap for within each case



Data Sources for Default Inputs

Current Costs:

Net Capacity Factor (%)	2017 annual Capacity Factor taken from EIA Electric Power Annual/Monthly (http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_6_07_a)
Heat Rate (MMBtu/MWh)	Electricity Market Module in Assumptions to AEO 2019: Table 8.2 (converted to 2017$).
Overnight Capital Cost ($/kW)	AEO 2019 Reference Case outputs (converted to 2017$). Material price index is removed.
Fixed Operating Expenses ($/kW-yr)	Electricity Market Module in Assumptions to AEO 2019: Table 8.2 (converted to 2017$).
Variable Operating Expenses ($/MWh)	Electricity Market Module in Assumptions to AEO 2019: Table 8.2 (converted to 2017$).
Fuel Costs ($/MMBtu)	Electricity sector natural gas prices from the AEO 2019 Reference scenario.
Grid Feature Cost ($/kW)	N/A
Spur Line Cost ($/kW)	N/A

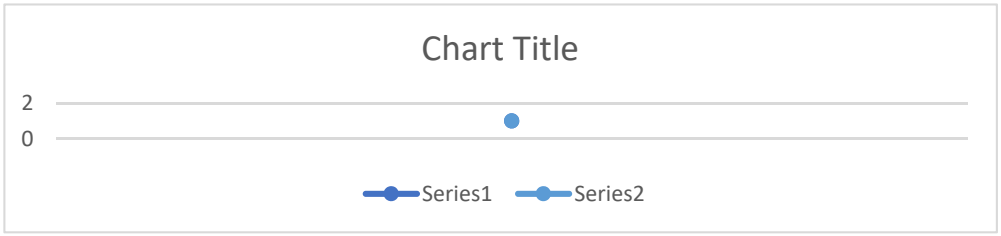
Future Projections Costs:

Net Capacity Factor (%)	2017 annual Capacity Factor taken from EIA Electric Power Annual/Monthly (http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_6_07_a)
Heat Rate (MMBtu/MWh)	Electricity Market Module in Assumptions to AEO 2019: Table 8.2 (converted to 2017$).
Overnight Capital Cost ($/kW)	AEO 2019 Reference Case outputs (converted to 2017$). Material price index is removed.
Fixed Operating Expenses ($/kW-yr)	Electricity Market Module in Assumptions to AEO 2019: Table 8.2 (converted to 2017$).
Variable Operating Expenses ($/MWh)	Electricity Market Module in Assumptions to AEO 2019: Table 8.2 (converted to 2017$).
Fuel Costs ($/Mcf)	Electricity sector natural gas prices the AEO 2019. Low cost utilizes the High Oil & Gas Resource scenario, the mid cost utilizes the Reference scenario, and the high cost utilizes the Low Oil & Gas Resource scenario.
Grid Connection Cost ($/kW)	N/A

	Case	Variable	Units	Real/Nominal	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
NREL 2019 ATB	-	Inflation	%	-	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
NREL 2019 ATB	-	GDP Deflator (2017 = 1)		-	1	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345	1.379	1.413	1.448	1.485	1.522	1.560	1.599	1.639	1.680	1.722	1.765
NREL 2019 ATB	-	GDP Deflator (2020 =1)		-	0.927	0.951	0.975	1	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345	1.379	1.413	1.448	1.485	1.522	1.560	1.599	1.639
NREL 2019 ATB	Gas-CT-AvgCF	Capex	$/kW	Real 2017$	$919.15	$917.71	$916.27	$922.84	$911.74	$904.94	$887.10	$878.85	$873.95	$869.10	$864.18	$860.42	$854.92	$851.87	$849.09	$845.20	$842.23	$839.51	$836.26	$833.05	$830.30	$828.63	$826.52	$824.51
NREL 2019 ATB	Gas-CT-AvgCF	Overnight Capital Cost	$/kW	Real 2017$	$899.11	$897.70	$896.29	$902.71	$891.86	$885.21	$867.76	$859.69	$854.89	$850.15	$845.33	$841.66	$836.28	$833.29	$830.58	$826.77	$823.87	$821.21	$818.02	$814.89	$812.19	$810.56	$808.50	$806.53
NREL 2019 ATB	Gas-CT-AvgCF	Fixed O&M	$/kW-Year	Real 2017$	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23	$12.23
NREL 2019 ATB	Gas-CT-AvgCF	Variable O&M	$/MWh	Real 2017$	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14	$7.14
		Capex	$/kW	Nominal	$919.15	$940.66	$962.66	$993.79	$1,006.39	$1,023.86	$1,028.77	$1,044.68	$1,064.82	$1,085.38	$1,106.22	$1,128.95	$1,149.78	$1,174.31	$1,199.74	$1,224.10	$1,250.30	$1,277.42	$1,304.28	$1,331.76	$1,360.54	$1,391.75	$1,422.91	$1,454.94
		Overnight Capital Cost	$/kW	Nominal	$899.11	$920.15	$941.67	$972.12	$984.45	$1,001.53	$1,006.34	$1,021.90	$1,041.60	$1,061.72	$1,082.10	$1,104.33	$1,124.71	$1,148.70	$1,173.58	$1,197.41	$1,223.04	$1,249.56	$1,275.84	$1,302.72	$1,330.87	$1,361.40	$1,391.88	$1,423.21
		Fixed O&M	$/kW-year	Nominal	$12.23	$12.54	$12.85	$13.17	$13.50	$13.84	$14.18	$14.54	$14.90	$15.27	$15.66	$16.05	$16.45	$16.86	$17.28	$17.71	$18.16	$18.61	$19.07	$19.55	$20.04	$20.54	$21.05	
		Capex	$/kW	Real 2020$	$991.69	$989.51	$987.34	$993.79	$981.85	$974.52	$955.31	$946.43	$941.15	$935.92	$930.62	$926.58	$920.66	$917.37	$914.38	$910.19	$906.99	$904.06	$900.56	$897.10	$894.14	$892.34	$890.07	$887.91
		Overnight Capital Cost	$/kW	Real 2020$	$970.06	$967.94	$965.81	$972.12	$960.44	$953.27	$934.48	$925.79	$920.63	$915.52	$910.33	$906.38	$900.59	$897.36	$894.44	$890.34	$887.22	$884.35	$880.92	$877.54	$874.64	$872.88	$870.66	$868.55

WACC	8.50%
Capital Recovery Period	1.5
Capital Recovery Factor	73.80%

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
PR Factor	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%
CAPEX X PR Factor	**$972**	**$984**	**$1,002**	**$1,006**	**$1,022**	**$1,042**	**$1,062**	**$1,082**	**$1,104**	**$1,125**	**$1,149**	**$1,174**	**$1,197**	**$1,223**	**$1,250**	**$1,276**	**$1,303**	**$1,331**	**$1,361**
ITC	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Income Tax	32%	32%	32%	32%	32%	32%	32%	32%	32%	32%	32%	32%	32%	32%	32%	32%	32%	32%	32%
Capital Recovery Factor	73.8%	73.8%	73.8%	73.8%	73.8%	73.8%	73.8%	73.8%	73.8%	73.8%	73.8%	73.8%	73.8%	73.8%	73.8%	73.8%	73.8%	73.8%	73.8%
Project Financing Factor	109%	109%	109%	109%	109%	109%	109%	109%	109%	109%	109%	109%	109%	109%	109%	109%	109%	109%	109%
Construction Financing Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Anualized CAPEX	**$796**	**$806**	**$820**	**$824**	**$837**	**$853**	**$870**	**$886**	**$905**	**$921**	**$941**	**$961**	**$981**	**$1,002**	**$1,023**	**$1,045**	**$1,067**	**$1,090**	**$1,115**
Anualized CAPEX x PR Factor	**$924**	**$935**	**$952**	**$956**	**$971**	**$990**	**$1,009**	**$1,028**	**$1,049**	**$1,069**	**$1,091**	**$1,115**	**$1,138**	**$1,162**	**$1,187**	**$1,212**	**$1,238**	**$1,264**	**$1,293**
Fixed O&M ATB x PR Factor $/kW-yr	$15	$16	$16	$16	$17	$17	$18	$18	$19	$19	$20	$20	$21	$21	$22	$22	$23	$23	$24
All-In Cost, Puerto Rico	**$939**	**$951**	**$968**	**$973**	**$988**	**$1,007**	**$1,026**	**$1,046**	**$1,068**	**$1,088**	**$1,111**	**$1,135**	**$1,158**	**$1,183**	**$1,209**	**$1,234**	**$1,260**	**$1,288**	**$1,317**
Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Energy per MW (MWh)	7884	7884	7884	7884	7884	7884	7884	7884	7884	7884	7884	7884	7884	7884	7884	7884	7884	7884	7884
LCOE	**$119**	**$121**	**$123**	**$123**	**$125**	**$128**	**$130**	**$133**	**$135**	**$138**	**$141**	**$144**	**$147**	**$150**	**$153**	**$157**	**$160**	**$163**	**$167**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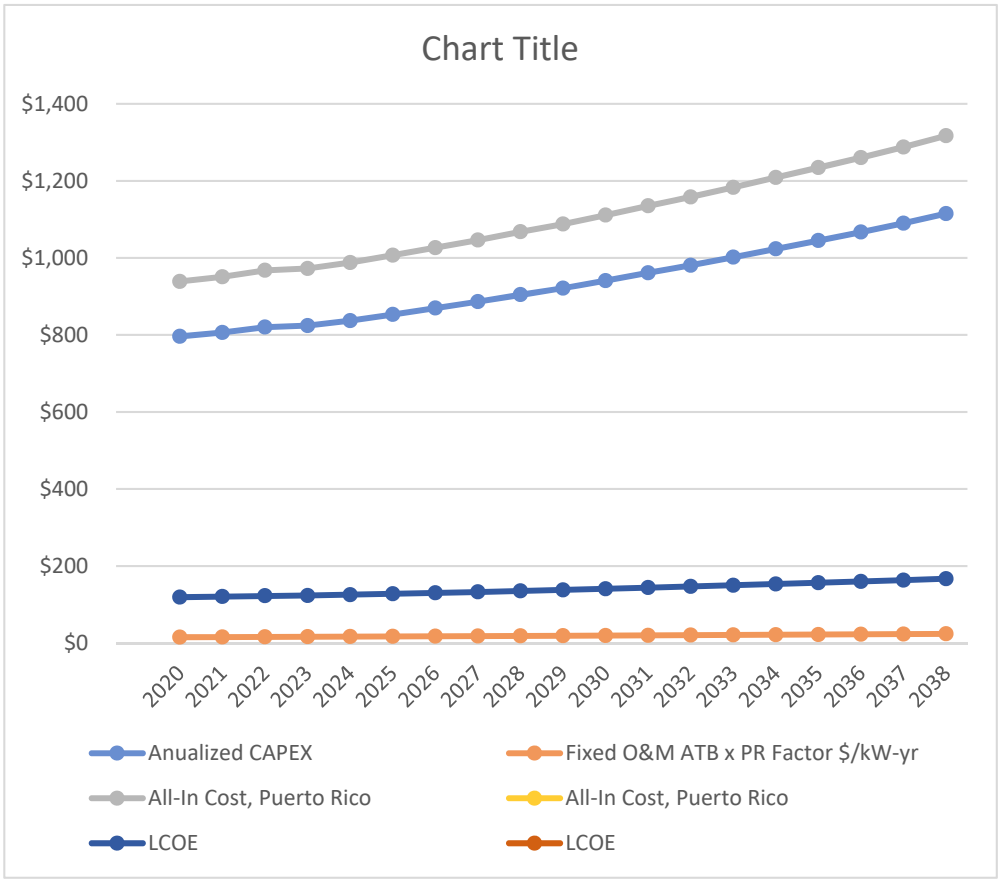
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Anualized CAPEX
Fixed O&M ATB x PR Factor $/kW-yr
All-In Cost, Puerto Rico
All-In Cost, Puerto Rico
LCOE
LCOE

Assumptions

LCOE	**$119**
Temp Gen RFP MW	**500**
FEMA Cost Cover Maximum	**75.0%**
Contract Length	**18 Months**
Diesel price per gallon	**$1.65**
Heat Rate for CT (BTU/kWH)	**14400**
Diesel fuel conversion to Btu	**137,381**
Diesel fuel conversion to MMBtu	**0.137381**
Diesel fuel cost per MMBTu	**$12.04**
Heat Rate x Fuel (MWh)	**$173.37**

Months in Contract		Days	Hours	Hours @ 90% CF	Monthly Cost	Monthly Fuel Cost	Total Cost
6/1/2020	6/30/2020	29	696	626.4	$37,299,109	$54,299,156	$91,598,265
7/1/2020	7/31/2020	30	720	648	$38,585,285	$56,171,540	$94,756,826
8/1/2020	8/31/2020	30	720	648	$38,585,285	$56,171,540	$94,756,826
9/1/2020	9/30/2020	29	696	626.4	$37,299,109	$54,299,156	$91,598,265
10/1/2020	10/31/2020	30	720	648	$38,585,285	$56,171,540	$94,756,826
11/1/2020	11/30/2020	29	696	626.4	$37,299,109	$54,299,156	$91,598,265
12/1/2020	12/31/2020	30	720	648	$38,585,285	$56,171,540	$94,756,826
1/1/2021	1/31/2021	30	720	648	$38,585,285	$56,171,540	$94,756,826
2/1/2021	2/28/2021	27	648	583.2	$34,726,757	$50,554,386	$85,281,143
3/1/2021	3/31/2021	30	720	648	$38,585,285	$56,171,540	$94,756,826
4/1/2021	4/30/2021	29	696	626.4	$37,299,109	$54,299,156	$91,598,265
5/1/2021	5/31/2021	30	720	648	$38,585,285	$56,171,540	$94,756,826
6/1/2021	6/30/2021	29	696	626.4	$37,299,109	$54,299,156	$91,598,265
7/1/2021	7/31/2021	30	720	648	$38,585,285	$56,171,540	$94,756,826
8/1/2021	8/31/2021	30	720	648	$38,585,285	$56,171,540	$94,756,826
9/1/2021	9/30/2021	29	696	626.4	$37,299,109	$54,299,156	$91,598,265
10/1/2021	10/31/2021	30	720	648	$38,585,285	$56,171,540	$94,756,826
11/1/2021	11/30/2021	29	696	626.4	$37,299,109	$54,299,156	$91,598,265
18 month total					**$681,673,374**	**$992,363,881**	**$1,674,037,255**

	18 Month Costs
Without FEMA	$1,674,037,255
With FEMA	$418,509,314

Assumptions	
LCOE	**$119**
Temp Gen RFP MW	**500**
FEMA Cost Cover Maximum	**75.0%**
Contract Length	**18 Months**
Diesel price per gallon	**$1.65**
Heat Rate for CT (BTU/kWH)	**14400**
Diesel fuel conversion to Btu	**137,381**
Diesel fuel conversion to MMBtu	**0.137381**
Diesel fuel cost per MMBTu	**$12.04**
Heat Rate x Fuel (MWh)	**$173.37**

Months in Contract		Days	Hours	Hours @ 80% CF	Monthly Cost	Monthly Fuel Cost	Total Cost
6/1/2020	6/30/2020	29	696	556.8	$33,154,764	$48,265,916	$81,420,680
7/1/2020	7/31/2020	30	720	576	$34,298,031	$49,930,258	$84,228,290
8/1/2020	8/31/2020	30	720	576	$34,298,031	$49,930,258	$84,228,290
9/1/2020	9/30/2020	29	696	556.8	$33,154,764	$48,265,916	$81,420,680
10/1/2020	10/31/2020	30	720	576	$34,298,031	$49,930,258	$84,228,290
11/1/2020	11/30/2020	29	696	556.8	$33,154,764	$48,265,916	$81,420,680
12/1/2020	12/31/2020	30	720	576	$34,298,031	$49,930,258	$84,228,290
1/1/2021	1/31/2021	30	720	576	$34,298,031	$49,930,258	$84,228,290
2/1/2021	2/28/2021	27	648	518.4	$30,868,228	$44,937,232	$75,805,461
3/1/2021	3/31/2021	30	720	576	$34,298,031	$49,930,258	$84,228,290
4/1/2021	4/30/2021	29	696	556.8	$33,154,764	$48,265,916	$81,420,680
5/1/2021	5/31/2021	30	720	576	$34,298,031	$49,930,258	$84,228,290
6/1/2021	6/30/2021	29	696	556.8	$33,154,764	$48,265,916	$81,420,680
7/1/2021	7/31/2021	30	720	576	$34,298,031	$49,930,258	$84,228,290
8/1/2021	8/31/2021	30	720	576	$34,298,031	$49,930,258	$84,228,290
9/1/2021	9/30/2021	29	696	556.8	$33,154,764	$48,265,916	$81,420,680
10/1/2021	10/31/2021	30	720	576	$34,298,031	$49,930,258	$84,228,290
11/1/2021	11/30/2021	29	696	556.8	$33,154,764	$48,265,916	$81,420,680
18 month total					**$605,931,888**	**$882,101,228**	**$1,488,033,116**

	18 Month Costs
Without FEMA	$1,488,033,116
With FEMA	$372,008,279

	90% CF	80% CF
Without FEMA	$1,674,037,255	$1,488,033,116
With FEMA	$418,509,314	$372,008,279

Chelsea Hotaling
Senior Analyst

ENERGY FUTURES GROUP

Professional Summary

Chelsea is a Senior Analyst at Energy Futures Group. Prior to joining EFG, Chelsea held a research position at Clarkson University while completing her Master's in Data Analytics and Environmental Policy & Governance. Chelsea's research focused on multi-stakeholder microgrids for resiliency. She also participated in the Reforming the Energy Vision (REV) proceedings for the Potsdam (NY) microgrid REV project. Chelsea also had an internship with Sommer Energy, LLC where she participated in stakeholder workshops for Integrated Resource Plans (IRPs), assisted with the evaluation of IRPs, and contributed to comments regarding wheeling regulations and microgrids in Puerto Rico, among other projects. Chelsea is trained to run the EnCompass model and has reviewed modeling performed using Plexos and System Optimizer. Chelsea has experience working with numerous software programs including Python, R, and Stata.

Education

B.S., Accounting and Economics, Elmira College, 2007

MBA, Concentration in Environmental Management, Clarkson University, 2012

M.S., Environmental Policy and Governance, Clarkson University, 2019

M.S., Data Analytics, Clarkson University, 2020

Experience

2018-2019: Intern, Sommer Energy, Canton, NY

2016-2019: Research Assistant, Clarkson University, Potsdam, NY

Selected Projects

- Coalition for Clean Affordable Energy**.** Evaluation of Public Service Company of New Mexico's abandonment and replacement of the San Juan generating station. (2019 to present)
- Earth Justice. Evaluation of Puerto Rico Electric Power Authority's 2019 Integrated Resource Plan. (2019 to present)
- Minnesota Center for Environmental Advocacy. Participating in stakeholder workshops regarding Xcel Energy's integrated resource plans to meet future energy and capacity needs. (2019 to present)
- Citizens Action Coalition of Indiana. Participating in stakeholder workshops regarding Indianapolis Power & Light's integrated resource plans to meet future energy and capacity needs. Participating in stakeholders on stakeholder workshops regarding Duke Energy Indiana's integrated resource plans to meet future energy and capacity needs. Participating in stakeholder workshops

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regarding Indiana Michigan Power Company's integrated resource plans to meet future energy and capacity needs. (2019) Comments regarding Northern Indiana Public Service Company's integrated resource plans to meet future energy and capacity needs. (March 2019) Evaluation of Southern Indiana Gas and Electric's proposal to build an 850 MW gas combined cycle facility. (August 2018)

- Institute for Energy Economics and Financial Analysis (IEEFA). Evaluation of the Puerto Rico Energy Commission's proposed wheeling regulation. (March 2019) Co-author for the report Retail Choice Will Not Bring Down Puerto Rico's High Electricity Rates. (August 2018) Evaluation of the Puerto Rico Energy Commission's proposed microgrid rules. (February 2018)

Publications

Atems, B., & Hotaling, C. (2018). The effect of renewable and nonrenewable electricity generation on economic growth. *Energy Policy*, 112, 111-118.

Bird, S., & Hotaling, C. (2017). Multi-stakeholder microgrids for resilience and sustainability. *Environmental Hazards*, 16(2), 116-132.

Bird, S., Enayati, A., Hotaling, C., and Ortmeyer, T. (2017). Resilient Community Microgrids: Governance and Operational Challenges. In Energy Internet: An Open Energy Platform to Transform Legacy Power Systems into Open Innovation and Global Economic Engine, edited by Alex Q. Huang and Wencong Su. Elsevier.

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EXHIBIT C

April 7th Letter of Support for Joint Petition for Intervention
and Motion for Reconsideration from
Environmental Defense Fund

April 7, 2020

VIA E-MAIL AT: COMENTARIOS@ENERGIA.PR.GOV

Mr. Edison Avilés Deliz, P.E., Esq.
Chairman
Puerto Rico Energy Bureau
268 Muñoz Rivera Ave, Suite 202
San Juan, PR 00918

Dear Chairman Avilés Deliz:

Re: Letter of Support for Joint Petition for Intervention and Motion for Reconsideration
In re: Request for Proposals for Temporary Emergency Generators
Case No. NEPR-AP-2020-0001

The Environmental Defense Fund ("EDF"), a global non-profit corporation engaged in linking science, economics and law to create innovative, equitable and cost-effective solutions to society's most urgent environmental problems, is filing this letter of support as public comments for Comité Diálogo Ambiental, Inc., El Puente de Williamsburg, Inc.-Enlace Latino de Acción Climática, Comité Yabucoeño Pro-Calidad de Vida, Inc., Alianza Comunitaria Ambientalista del Sureste, Inc., Sierra Club and its Puerto Rico Chapter, Mayagüezanos por la Salud y el Ambiente, Inc., Coalición de Organizaciones Anti-Incineración, Inc., Amigos del Río Guaynabo, Inc., Campamento Contra las Cenizas de Peñuelas, Inc., Cambio Puerto Rico, and the Unión de Trabajadores de la Industria Eléctrica y Riego (collectively, the "Petitioners") in the referenced case before your consideration.

EDF supports the Petitioners' intervention and Motion for Reconsideration, and will not seek separate intervention in this case because our interests are aligned with Petitioners and will be sufficiently represented if the Puerto Rico Energy Bureau grants its Petition to Intervene.

As EDF has addressed in its briefs for case no. CEPR-AP-2019-0001, the Puerto Rico Electric and Power Authority ("PREPA") has not established a need for temporary emergency generation. At the conclusion of the Integrated Resource Plan hearing, the Puerto Rico Energy Bureau ordered PREPA to file an earthquake damage assessment on the Costa Sur plant within 30 days. This is

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Sacramento, CA / San Francisco, CA / Washington, DC / Beijing, China / La Paz, Mexico

the first step that should occur before PREPA issues a Request for Proposal ("RFP") to replace that generation, even on a temporary basis. As we mentioned, this RFP should be inclusive of all solutions and technologies and be open to both supply- and demand-side measures such as demand response programs, virtual power plants, and solar and storage, to ensure PREPA is procuring the least-cost solution for each service. Further, this and all future RFP processes should be administered by a Puerto Rico Energy Bureau-approved independent third party.

Moreover, as required by Act 17-2019, transparency and citizen participation shall be promoted in every process related to the electric power service in Puerto Rico. This case should not be the exception and Petitioners should be allowed to be part of a process that could have an enormous negative impact in their health, environment and capacity to pay their utility bills. In addition, the lack of a transparent process has the potential to lock consumers into infrastructure that would prevent meeting the objectives of Act 17-2019.

If you have any questions, please do not hesitate to contact me at your convenience at acarbo@edf.org.

Cordially,

/s/ Agustín F. Carbó Lugo
Attorney

c: Ruth Santiago, rstgo2@gmail.com
Padro Saadé Lloréns, pderosaade5@gmail.com
Laura Arrojo, larroyo@earthjustice.org
Jordan Luebkemann, jluebkemann@earthjustice.org
Raghu Murthy, rmurthy@earthjustice.org
Rolando Emmanuelli Jiménez, rolando@bufete-emmanuelli.com
Jessica Méndez-Colberg, jessica@bufete-emmanuelli.com
Nitza D. Vázquez Rodríguez, n-vazquez@aeepr.com
Astrid I. Rodríguez Cruz, astrid.rodriguez@prepa.com
Jorge R. Ruíz Pabón, jorge.ruiz@prepa.com
Katiuska Bolaños, kbolanos@diazvaz.law

EXHIBIT D

May 8, 2020 letter of support
from Dr. Carmelo Garcia, PhD.

08 de Mayo de 2020

Negociado de Energía de Puerto Rico
eMail a: comentarios@energia.pr.gov
larroyo@earthjustice.org

Estimado responsables de la Energía de Puerto Rico:

A mi mejor entender, constituye un mayúsculo escándalo que, a pesar de la condición de quiebra nacional en que se encuentra nuestro pueblo, el NEPR haya autorizado la Solicitud de Propuesta (RFP) de la AEE para la instalación de unos "generadores de emergencia" en varias localidades de la isla, incluyendo la comunidad de Candelero Arriba en Humacao. Si escandalosa es la propuesta de una inversión que podría fluctuar entre $70 a $1,200 millones mensuales, aún más escandaloso es el hecho de que estas negociaciones se hacen completamente a espaldas del pueblo. Es inaceptable que se pretendan tomar decisiones tan trascendental como las referentes a la salud, la educación y la energía de un país, sin que el pueblo se de por enterado.

Como residente de Candelero Arriba y educador en el área de la Ciencia, me preocupa - además - que tampoco se han hecho declaraciones por parte de la gerencia de la AEE respecto a la potencial peligrosidad de esas instalaciones cerca de la comunidades. Me uno al reclamo de los grupos ambientales y exijo que la inversión que se haga en el renglón energético, sea inicialmente para la reparación de la generatriz Costa Sur y que la política energética del país sea la sustitución del petróleo por energía solar.

Cordialmente,

Esta es una firma computadorizada
Carmelo García, PhD | Catedrático
08-MAY-2020 | 04:22 p
☎ (787) 850-9387 • 🖷 (787) 850-9422

CGR|[ACASE]´20_NEPR-Emergencia.wpd

EXHIBIT E

May 8, 2020 Declaration By Ángel Figueroa Jaramillo In Support Of Petitioners Supplementary Filing

(English translation)

GOVERNMENT OF PUERTO RICO
PUBLIC SERVICE REGULATORY BOARD
PUERTO RICO ENERGY BUREAU

IN RE: REQUEST FOR PROPOSALS FOR TEMPORARY EMERGENCY GENERATION	**CASE NO. NEPR-AP-2020-0001** **SUBJECT:** CERTIFICATION SUPPORTING SUPPLEMENTARY FILING

STATEMENT BY ÁNGEL FIGUEROA JARAMILLO IN SUPPORT OF PETITIONERS SUPPLEMENTARY FILING

TO THE HONORABLE PUERTO RICO ENERGY BUREAU:

I, Ángel Figueroa Jaramillo, of legal age, single, president of the Union of Workers of the Electricity and Irrigation Industry (UTIER, for its Spanish acronym), and a resident of Carolina, under legally sworn oath, declare the following:

1. My personal circumstances are as detailed above.
2. I started working at the Puerto Rico Electric Power Authority (PREPA) in 1988. I worked at the Central Hidro Gas as an assistant welder and mechanic in the repair and maintenance of hydro-electric units, but mainly in internal combustion turbines until in 1994. Back then, they were composed of 21 internal combustion turbines and were later reduced to 19 when those installed in Mayagüez were modernized.

3. I was part of the Complaints Committee established under the Collective Agreement from 1994 to 1996, and I was the secretary of the UTIER Negotiating Committee in the negotiation that culminated in 1999.
4. I was in office at the Secretariat of Education and Propaganda in 2000 and was elected Vice President in 2002, where I worked in the negotiation and implementation of different agreements, such as boiler washing work, removal of insulation material in the Generating Power Plants following the stipulation signed in 2004. In addition, I negotiated the reclassification of the posts of Central Generating Electricians at the beginning of the 2000.
5. As Vice President of UTIER, I was part of the negotiating committee that culminated in 2008 with the Collective Agreement and in the negotiation that began in 2012.
6. I am the current president of UTIER, a position I obtained in the union elections in 2008, and I have been reelected in 2011, 2014, 2017 and recently in 2019.
7. As part of my duties, I interact daily with all the operational, financial and technical aspects of PREPA and participate directly in the formulation of union policy for UTIER in relation to PREPA.

8. In addition, I have been a Trustee of the Board of Trustees of the Employees Retirement System of the Electric Power Authority since 2015 and have been reelected in 2016 and in June 2019.
9. I have been part of different multisector efforts in Puerto Rico and internationally, such as the Energy Dialogue Table. I am an elected member of the Board of Directors of the Association for the Right to Energy based in France. In addition, I am part of the "Queremos Sol" (We Want Sun) collective. In these efforts, I have directly engaged with public policy issues regarding renewable energy and the future of PREPA as a sustainable entity that meets the needs of the People of Puerto Rico at reasonable costs.
10. I participated and listened via telephone to what was expressed in the technical hearing held by the Energy Bureau on April 30, 2020 in regards to the request for proposals for new temporary generators made by the senior management of PREPA.
11. In light of the information provided by PREPA and the status of the repair and maintenance work of the different units of the generating fleet, the contracting of temporary generation proposed by PREPA is totally unnecessary and a waste of PREPA's scarce resources.
12. PREPA failed to adequately justify the temporary generation proposal by resorting to half-truths and substantial omissions:

a. On the impact of COVID-19 on the repair processes in Costa Sur, I am personally aware that preventive measures are being taken to prevent contagion and that this is not causing a delay in the ongoing repairs. Currently, work is being carried out in Unit 2 of the Aguirre plant and in Units 5 and 6 of the Costa Sur plant.

b. It is not true that units that are out of service, such as Unit 5, are deteriorating and may have operational problems when they are incorporated, as has happened in Unit 2 in Aguirre, because the latter was totally abandoned for almost 15 months in all measures that are used to safeguard equipment and components of the unit. As to Unit 5 of Costa Sur, all measures and protocols were established to protect the integrity of the unit for the duration of time that it has been out of service.

c. On Aguirre Unit 2, the boiler with 200 pounds of PSIG is currently on, and on May 5, the turbine was started.. Testing will continue on subsequent days. Therefore, it is not true that these works are overdue, since the day of the technical conference these works were practically finished. If there are no mishaps, it would be up and running in about a week. This unit would add 450 MW to the system.

d. In regards to Cambalache Unit 1, it is pertinent to report that in 2017, after Hurricane Maria, the company Hughes Technical Services carried out an evaluation to see what was needed to fix it and its cost. The company quoted $16 million for the repair. After this, in 2019, the company General Electric quoted the components for an NM Unit, which already includes the "upgrade", for $15 million that can produce up to 90 MW. This year, as an emergency, the company Environmental Action was hired to "sanitize" the entire unit to start the evaluation process again in order to see what auxiliary equipment was needed to put the unit to work with the GE proposal. However, two weeks ago, and abruptly, everything was canceled.

e. PREPA did not present information on all generation alternatives including peaking units that could be made available with minimal investment and in a reasonable timeframe. PREPA also uses them in emergencies, after hurricanes typically, to supply power to a region because the transmission system or the base generation has been damaged, by creating small micro grids. On June 1, 2020, we will enter the hurricane season and the 8 units described must be put into service immediately. Namely:

    i. 20 MW units that are not available because they were abandoned, today require maintenance including

cleaning, instrumentation, control, electrical and mechanical, including structure and shelter / roof repair and sanitation of areas. A maximum of 180 days is required to return to service:

1. Palo Seco 1-2 - (out of service - takes less than a month)
2. Aguirre 1-1 - (out of service)
3. Aguirre 1-2 - (came online two months ago)
4. Jobos 1-1 - (out of service and can be online in two weeks)
5. Vega Baja 1-1 - (out of service and in tests in a week)
6. Costa Sur 1-2 - (out of service for major repair)
7. Yabucoa 1-2 - (in tests delivered a month ago)
8. Costa Sur 1-1 - (they begin to repair it on Monday and will be finished in about a month)

Total: 160 MW

f. All these units, in addition to serving for emergencies and having a response of between 9 to 15 minutes and without a "time-out period" for each shot (they come back and start), it also turns out that they regulate load, frequency and voltage on the lines, which are fundamental to the system. That is not the case for the units PREPA wants to lease.

g. All of these units are already connected to the system, so interconnection is not a problem. However, connecting new generation units could be a problem by needing to synchronize the units and get connection points. PREPA has not analyzed this or explained the process, nor the time it would require and the cost.

13. As of May 5, the demand is 2,216 MW. The reserve in rotation is 432 MW. The controlled Reserve is 225 MW. Therefore, there is sufficient margin for the operation without the need for said new temporary generation units.

14. On the other hand, the event of the quakes that occurred, according to data from the Puerto Rico Seismic Network, on Saturday, May 2, 2020, including the one of 5.4 magnitude at 7:13 AM. with an epicenter in Peñuelas, did not cause damage to the Costa Sur plant. Likewise, the EcoElectrica Power Plant, whose system went offline automatically for security reasons, was back in service on the same day, Saturday, May 2, 2020, at about 12:00 P.M. Therefore, the events of May 2 in no way justify the proposed temporary generation. This was publicly admitted by PREPA itself.

15. In addition, the quakes that occurred on May 2, 2020, did not cause changes in the repair schedule for Unit 5 at Costa Sur.

16. Finally, it is worrying that these procedures before the Energy Bureau are conducted receiving testimony that is not under oath. This does not offer guarantees of the veracity and/or reliability of the testimony of PREPA officials and what it causes is that the Commissioners are misled. Furthermore, this affects the regulatory function of the Puerto Rico Energy Bureau and damages the interests of the People of Puerto Rico and the Petitioners in this case.

CERTIFICATION

For the record, I swear and sign this affidavit, the content of which is true to the best of my abilities and reasonable knowledge, for which I sign, today May 8, 2020, in San Juan, Puerto Rico.

/s/ Ángel Figueroa Jaramillo