



January 23, 2023

VIA FEDEX DELIVERY

Ms. Terri Bordelon
Louisiana Public Service Commission
Records Division
602 N. Fifth St.
Galvez Bldg, 12th Floor
Baton Rouge, LA 70802
Fax: 225-342-0877

Re: LPSC Docket No. I-36181, Entergy Louisiana LLC, *In re: 2021 Request to Initiate Integrated Resource Planning Process Pursuant to the General Order (Corrected) in Docket No. R.-30021, dated April 20, 2012.*

Dear Ms. Bordelon:

Enclosed please find the one (1) original and three (3) copies of the Sierra Club's Comments on Entergy Louisiana's Draft 2023 Integrated Resource Plan, in the above-referenced proceeding. If you have any questions or require any additional information, please do not hesitate to contact me.

Respectfully submitted,

Joshua Smith
Sierra Club
2101 Webster St., Suite 1300
Oakland, CA - 94612-3011
(415) 977-5660
joshua.smith@sierraclub.org

**BEFORE THE
LOUISIANA PUBLIC SERVICE COMMISSION**

ENTERGY LOUISIANA LLC,
In re: 2021 Request to Initiate Integrated
Resource Planning Process Pursuant to the
General Order (Corrected) in Docket No. R.-
30021, dated April 20, 2012.

Docket No. I-36181

**SIERRA CLUB'S COMMENTS ON ENTERGY LOUISIANA'S
DRAFT 2023 INTEGRATED RESROUCE PLAN**

January 23, 2023

Developed with the Assistance of the Applied Economics Clinic

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SIERRA CLUB COMMENTS

Sierra Club appreciates the opportunity to submit these comments on Entergy Louisiana LLC's ("Entergy" or "ELL") October 21, 2022 Draft 2023 Integrated Resource Plan.¹ Sierra Club has been engaged in this and other IRP processes across the country, and welcomes the Louisiana Public Service Commission's ("LPSC" or "Commission") attempt to facilitate a more public and transparent IRP process, which can serve the benefit of reducing long-term costs and risks to Louisiana ratepayers. Sierra Club thanks Entergy for providing information and assisting the stakeholders in understanding the Company's planning objectives and modeling for this Integrated Resource Plan ("IRP"). Sierra Club has identified the following suggestions and concerns.

I. ENTERGY SHOULD CORRECT ISSUES RAISED IN EARLIER COMMENTS.

A. Entergy continues to assume self-build only resources but it is likely to procure PPAs—especially for renewable energy and storage.

Entergy has sought power purchase agreements ("PPAs") in the past and is going to seek competitive bids for new resources, especially renewables and storage. Yet, the Company only modeled new resources as "self-build" assets that would be put in rate base. This disadvantages resources that would be cheaper under a PPA. In our initial comments, we pointed out that by assuming all resources were self-builds, Entergy likely overstated the cost of renewable energy and storage options. The modeling in the IRP optimizes based on costs and should have the best market intelligence available. PPA's allow the developer (and by extension the buyer) to benefit

¹ These comments were developed with the assistance of Tyler Comings and Tanya Stasio of the Applied Economics Clinic.

from the Investment Tax Credit (“ITC”) or Production Tax Credit (“PTC”) felt immediately in the price, whereas regulated utilities must “normalize” the credit, i.e. recover it slowly over the entire life of the project.

In the Company’s Draft 2023 IRP, it responded to this concern by stating that: “the type and timing of capacity is what the model is solving for, not the optimal ratio of PPA/ownership. The portfolios are indicative of what types of resources would be preferred under certain conditions.”² However, the financing structure and timing of costs to ratepayers are different between a rate-based resource and a PPA for the same resource—resulting in different NPV calculations. While modeling cannot ever fully mirror reality, it should do so as close as reasonably possible; and the Company is likely to seek out PPAs for renewables and storage.

B. The Company has still not addressed the costs of converting new gas units to hydrogen.

In Sierra Club’s comments on Entergy’s initial assumptions, we raised concerns that Entergy was planning large-scale gas plant installations with the assumption that these units would use hydrogen fuel. Our main concern was that the costs of running these units on hydrogen has not been addressed. In the Draft IRP, Entergy offered inadequate support for this, simply re-stating that: “‘Gas + Hydrogen’ resources include costs to incorporated [*sic*] hydrogen-capability in natural gas units, but not costs required to burn hydrogen.”³ As an initial matter, this explanation appears to only refer to capital costs of building a plant that is hydrogen-capable

² Entergy Louisiana 2023 Integrated Resource Plan (Draft Report), p. 106 [hereinafter “Draft ELL 2023 IRP”].

³ Draft ELL 2023 IRP, p. 101.

but there is no inclusion of the costs of infrastructure needed to provide the fuel itself, or the costs of buying that fuel. Hydrogen is a nascent technology, and as we understand it, would require upgrades to individual units and Entergy's gas transmission system. Moreover, we are not aware of any utility-scale power plants burning a significant amount of hydrogen in the United States. We also have concerns with the potential increase in upstream emissions of using hydrogen produced from steam-methane reformation (i.e., grey hydrogen), which, as we understand, is the only commercially available hydrogen in the region.⁴ In fact, in a recent proposal in Texas to construct a 1.2 GW combined cycle plant capable of co-firing hydrogen, Entergy admitted that the full lifecycle emissions from burning grey hydrogen could be 30 percent higher than burning gas alone.⁵ But at a minimum, the Company should estimate the

⁴ See Cornell University, "Touted as clean, 'blue' hydrogen may be worse than gas, coal, researchers say," *ScienceDaily*, (Aug. 12, 2021), available at <https://www.sciencedaily.com/releases/2021/08/210812161902.htm>;

Robert W. Howarth, Mark Z. Jacobson. "How green is blue hydrogen? Energy Science & Engineering," (Aug. 12, 2021), <https://doi.org/10.1002/ese3.956>;

James Burgess, "Blue hydrogen 20% worse for GHG emissions than natural gas in heating: study," *S&P Global* (Aug. 12, 2021), available at <https://www.spglobal.com/commodity-insights/en/market-insights/latest-news/natural-gas/081221-blue-hydrogen-20-worse-for-ghg-emissions-than-natural-gas-in-heating-study>;

Cara Bottoroff, "Hydrogen: Future of Clean Energy or a False Solution?" *Sierra Club*, (Jan. 4, 2022), available at <https://www.sierraclub.org/articles/2022/01/hydrogen-future-clean-energy-or-false-solution>;

Thomas K. Blank, and Patrick Molly, "Hydrogen's Decarbonization Impact for Industry," *Rocky Mountain Institute*, (Jan. 2020), available at https://rmi.org/wp-content/uploads/2020/01/hydrogen_insight_brief.pdf.

⁵ See Exhibit A, Entergy Texas Response to PUCT Staff Request for Information 6-1, Application of Entergy Texas, Inc. to Amend Its Certificate of Convenience and Necessity to Construct Orange County Advanced Power Station, Pub. Util. Comm'n of Tex. Docket No. 52487 (see attached).

costs for all necessary hydrogen fuel infrastructure and all variable costs associated with hydrogen, including the fuel itself. While we cannot know these costs with certainty, we are certain that they will not be zero.

C. The Company should test earlier retirement of its units—especially with the pending Good Neighbor Plan and the Inflation Reduction Act.

As explained in Sierra Club’s initial comments, Entergy should consider earlier retirement of its coal units, as the options modeled were limited. There are two additional reasons that have occurred recently that should cause Entergy to re-consider early retirement: 1) the EPA’s proposed Good Neighbor Plan that regulates ozone transport; and 2) the signing of the Inflation Reduction Act (which we address later).

The proposed Good Neighbor Plan is the latest iteration of clean air transport rules that address how upwind polluters contribute to downwind ozone levels. The new rule would lead many coal units that are currently lacking in the most effective nitrogen oxide control, selective catalytic reduction (“SCR”), to either install those controls or retire. The Good Neighbor Plan requires 25 upwind states, including Louisiana, to reduce their nitrogen oxide emissions at power plants to avoid interfering with other states’ abilities to meet the 2015 ozone National Ambient Air Quality Standard, which is set at a level requisite to protect public health.⁶ The EPA has issued a proposed federal implementation plan (“FIP”) for the 25 states which requires

⁶ See U.S. EPA, “Good Neighbor Plan for 2015 Ozone NAAQS,” (Aug. 26, 2022), *available at* <https://www.epa.gov/csapr/good-neighbor-plan-2015-ozone-naaqs>. California is only required to reduce industrial emissions while Tennessee, Alabama and Delaware are only required to reduce power plant emissions. Twenty-two other states, such as Oklahoma, are required to reduce both power plant and industrial emissions.

them to participate in an allowance trading program for ozone season (May through September) starting in 2023; and imposes a daily NOx emission limit commensurate with SCR starting in 2027. In other words, the rule will effectively force SCR installation on coal units larger than 100 MW otherwise those units need to “find other means of compliance, or retire.”⁷ This would force coal owners to decide between a major emission control investment or retirement. Entergy acknowledges the proposed plan in the draft IRP but stops short of evaluating the units’ futures until the rule is finalized (which is expected in April 2023).

The Company could be faced with a new retirement versus retrofit decision for these units shortly. The Company acknowledges that the rule’s impact would be significant, requiring a 75 percent decrease in NOx emissions from its coal units.⁸ As a result, Entergy claimed that the following units would likely require SCR if the rule were finalized: Nelson 6, Big Cajun II Unit 3, Little Gypsy 2, Little Gypsy 3, Ninemile 4, and Ninemile 5.⁹ The Company acknowledges that allowances are likely to be a costly option due to “a far more constrained NOx emission allowance market than has existed to date under the CSAPR Program.”¹⁰

⁷ U.S. EPA, *Regulatory Impact Analysis for Proposed Federal Implementation Plan Addressing Regional Ozone Transport for the 2015 Ozone National Ambient Air Quality Standard*. p. ES-7,8, available at <https://www.epa.gov/system/files/documents/2022-03/ria-for-proposed-fip-addressing-regional-ozone-transport-for-the-2015-ozone-naaqs.pdf>.

⁸ Draft ELL 2023 IRP, p. 68.

⁹ *Id.*

¹⁰ *Id.*

The costs of SCR are substantial, at roughly \$250-300 per kW for upfront capital costs¹¹ (e.g. \$125-150 million for a 500 MW unit)—not including the rate of return for the rate-based SCRs and operating costs that ratepayers would be charged. Despite these massive costs and implications on its coal fleet, the Company has decided to wait and see if the rule is finalized. A long-term resource decision needs to account for regulatory risks, to the best of the planner’s abilities and given the knowledge available at the time of that decision. But this is not effective long-term planning as this type of regulation was foreseeable and could have been addressed in the draft IRP. The Company should conduct an evaluation of the coal units’ futures under the Good Neighbor Plan in its final IRP.

D. Public Health Impacts

Electricity generation through the burning of fossil fuels has undeniable negative impacts on public health. Under the Commission’s IRP Rule, utilities “shall account for environmental impacts and shall discuss the plans to meet environmental regulatory requirements at existing resources subject to such requirements.”¹² To protect the communities Entergy serves, and also account for the environmental impacts of its fleet, it is increasingly important for Entergy to include quantified health impacts in its assessments of its portfolio options in this IRP process. Although Entergy has stated that the IRP does not consider or attempt to identify specific locations for the resource types included in the optimized portfolio, evaluations of the current

¹¹ U.S. Energy Information Administration (EIA), *Assumptions to the Annual Energy Outlook 2022: Electricity Market Module*, Table 8, p. 23, available at <https://www.eia.gov/outlooks/aeo/assumptions/pdf/electricity.pdf>.

¹² LPSC, Integrated Resource Planning Rules for Electric Utilities in Louisiana § 7(d).

fleet and analysis of the public health impacts within its IRP should be part of the company's portfolio evaluations. Entergy should quantify and analyze the comparative public health impacts from air pollution, namely SO₂, NO_x, PM, and mercury emissions, of each of the portfolios it considers in its IRP and evaluate the public health cost that various air pollutants have on public health, especially in environmental justice communities.

In the selection of a preferred portfolio, Entergy can and should incorporate public health costs into its assessments. Entergy's customers and other Louisianans bear the consequences of the ongoing decision to remain reliant on fossil fuels, which, beyond burdening customer bills, pollute air and waterways and negatively impact public health. Fossil fuel combustion is one of the main sources of harmful air pollutants, exposure to which contributes to increased instances of asthma attacks, respiratory infections, hospital admissions, missed school days and work days, and a variety of other health problems.¹³ To comply with the Commission's IRP Rule, Entergy's IRP must "consider[] all relevant costs," including environmental costs.¹⁴ Air pollution contributes significantly to increased morbidity and mortality, and existing modeling tools can be used to translate and monetize air pollution into social cost estimates.¹⁵

¹³ See, e.g., U.S. EPA, Sulfur Dioxide Basics, *available at* <https://www.epa.gov/so2-pollution/sulfur-dioxide-basics> (summarizing public health harms from SO₂); *see also* EPA, Ground-level Ozone Basics, *available at* <https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics#effects> (summarizing public health harms from ozone).

¹⁴ LPSC, Integrated Resource Planning Rules for Electric Utilities in Louisiana § 3(f).

¹⁵ EPA's Environmental Benefits Mapping and Analysis Program - Community Edition (BenMAP-CE) is a modeling software that enables users to estimate health impacts and economic value of changes in air quality and helps analyze the benefits that discrete air pollution reductions can have on human health and the economy. The BenMAP-CE program has been used to assess fossil fuel electricity health impacts and health-related benefits of attaining the

In addition, Entergy should consider the environmental justice implications associated with its ultimate selection of its preferred portfolio because the communities that are harmed most by persisting reliance on fossil fuel burning power plants are the communities who should benefit the greatest from reduced emissions, coal retirements, and investments in renewable energy. While we commend Entergy for taking steps to integrate the EPA EJSCREEN tool in evaluations of candidate sites, there was no indication in the 2023 IRP draft as to how the evaluations of candidate sites or environmental due diligence reviews affected decisions made by the company, no detail or analysis on what the screenings showed, or even what sites the screenings were conducted on. Entergy should consider including a summary of the findings from environmental evaluations in the next IRP and publishing copies of the full evaluation reports so that they are available to the public.

II. ENTERGY SHOULD INVEST IN ADDITIONAL RE AND STORAGE RESOURCES.

We are pleased to see that the preferred plan in the IRP adds solar PV resources. But, we remain concerned about the addition of new gas combined cycle units (and lack of costs to burn cleanly later on as discussed above) as well as the small amount and late additions of battery storage investments in the plan. The economic landscape for clean resources, particularly solar and battery resources has become even more favorable since Entergy conducted its IRP modeling. To that end, in its final IRP the Company should fully incorporate the Inflation

reductions in a variety of air pollutants, including ozone and PM_{2.5}. BenMAP-CE, *available at* <https://www.epa.gov/benmap>.

Reduction Act (“IRA”) in every modeling scenario and explore more battery storage additions, including long-duration storage.

Entergy’s preferred plan was chosen using tax credit information that is now outdated and since become more favorable to clean resource additions. In light of the change in the law and factual circumstances governing utility investment in clean energy and battery resources, Entergy must re-optimize its modeling to account for existing tax law. Signed into law in August of 2022, the IRA is a game-changing piece of legislation that is transforming the U.S. electricity sector mainly by augmenting and extending tax credits for clean energy resources. The most notable changes to existing tax credits include effectively making the production tax credit (“PTC”) available for solar PV projects; and making the investment tax credit (“ITC”) available for standalone battery storage and (after 2024) for wind. In addition, the IRA restored both the ITC¹⁶ and PTC¹⁷ to their previous maximum levels and extended their availability until 2033 (at the earliest¹⁸). These changes unequivocally make solar, wind, and battery storage more

¹⁶ See Inflation Reduction Act, Public Law 117-169 *available at* <https://www.congress.gov/117/plaws/publ169/PLAW-117publ169.pdf>. The IRA addresses two related sections of the Internal Revenue Code: it amends the existing Section 48 (which already authorized the Investment Tax Credit) to address projects commencing construction by 2024, and it also creates the new Section 48E to authorize a new, similar (but not identical) Clean Energy Investment Credit for projects to be placed in service after 2024. I refer to these two programs together as “the ITC.”

¹⁷ Inflation Reduction Act, Section 13701 (creating new Section 45Y of the Internal Revenue Code). The IRA creates the Clean Energy Production Credit program which effectively extends the PTC. As with the ITC, I refer to the original PTC and its new successor program collectively as “the PTC.”

¹⁸ Inflation Reduction Act, Section 13701 (creating new Section 45Y(d) of the Internal Revenue Code). This phase down will begin when the US electric sector reaches a greenhouse gas emissions threshold of 25 percent or less of its 2022 emissions, but the credit will remain through 2033 at the earliest. Thus, the years referenced in my sentence above could actually be later.

financially appealing for resource planners—and by extension ratepayers. But Entergy’s preferred plan is based on Portfolio 1, which assumed that the existing ITC and PTC would lapse or stay at low levels. As shown below in Table 1, the tax benefits available under the IRA are significantly greater than Entergy assumed as the basis for its preferred plan. It is also worth noting that Entergy would be entitled to a potential 10% tax credit adder if any renewable energy resources are sited in an energy community,¹⁹ and another 10% adder if the project is constructed with domestically-sourced materials.

Table 1: Changes to Tax Credits for Clean Resources

Tax credit for 2027-2033 installations	Entergy Future 1²⁰	IRA
Solar ITC	10%	30%-50%
Battery Storage standalone ITC	0%	30%-50%
Solar PTC	\$0/MWh	\$27.50-\$33/MWh
Wind PTC	\$0/MWh	\$27.50-\$33/MWh

¹⁹ An energy community is defined as being (1) a brownfield site under CERLCA; (2) an area which has or had certain amounts of direct employment or local tax revenue related to oil, gas, or coal activities and has an unemployment rate at or above the national average; or (3) a census tract or any adjoining tract in which a coal mine closed after December 31, 1999, or in which a coal-fired electric power unit was retired after December 31, 2009. *See* Inflation Reduction Act, Section 13101, 13102, 13701, and 13702.

²⁰ ELL 2023 IRP Data Filing- UPDATED. February 11, 2022, slides 35, 38; and Entergy response to Sierra Club Question 2b provided on January 13, 2023.

Entergy's preferred plan included battery storage only starting in 2041; but Future 1 used to develop this plan assumed that no ITC was available for standalone batteries, which are now eligible for a 30 percent ITC through at least 2033 (or up to 50 percent depending on location²¹ and if using domestic parts). This represents a major industry shift that needs to be accounted for in the final IRP. Battery installations were already increasing rapidly in recent years,²² and the IRA will only make these a more attractive resource option. EIA expects 20.8 GW of battery storage to be added from 2023 to 2025, with total battery capacity in the U.S. expected to reach 30 GW by 2025.²³ We recommend that Entergy assume a 30 percent ITC at a minimum for battery resources and evaluate the potential for use of retiring coal sites for new battery installations to take advantage of the additional 10 percent tax credit for energy communities.

The IRA also changes the economics of solar through two different avenues. First, the law increases and extends the solar ITC, making solar PV resources with this credit cheaper for at least the next decade. Second, and more importantly, utilities can now use the PTC for solar PV resources instead of the ITC, which will be an even cheaper option for many projects. The

²¹ For example, if Ameren located battery at the site of the retired Meramec coal plant, the battery would be eligible for a 40% ITC.

²² Vanessa Witte, *US battery storage deployment doubles in a single year*, Wood Mackenzie, (Mar. 24, 2022), available at <https://www.woodmac.com/news/opinion/us-battery-storage-deployment-doubles-in-a-single-year/>.

²³ U.S. Energy Information Administration (EIA), *U.S. battery storage capacity will increase significantly by 2025*, (Dec. 8, 2022), available at <https://www.eia.gov/todayinenergy/detail.php?id=54939>.

current PTC amount allowed by the IRS is \$27.50 per MWh.²⁴ This amount paid for solar generation over a 10-year period means it is likely that many solar developers and utilities will take advantage of this new option instead of the ITC. To that end, we recommend that Entergy assume that all new solar resources take advantage of the PTC.

For wind resources, the IRA creates policy certainty that the full PTC credit (and the ITC for offshore wind) will be available and locked in over the next decade. Historically, the PTC has lapsed and been reinstated by Congress several times, and new wind installations have fluctuated with these policy changes. However, the cyclical nature of the policy created uncertainty for onshore wind development over the medium- to long-term. This new policy certainty cultivates better medium- and long-term decision-making than the previously unpredictable—and often last-minute—changes to the PTC.

The tax credits available under the IRA also makes offshore wind more economically viable than it was previously. Moreover, the IRA explicitly directs the Department of Interior to issue requests for information for the purpose of developing offshore wind energy.²⁵ To that end, the Bureau of Ocean Energy Management plans to develop as much as 5 GW of wind capacity off the coast of Galveston, Texas and Lake Charles, Louisiana—enough to power more than 3

²⁴ The IRS has recently issued updated guidance that the inflation-adjusted, full credit in calendar year 2022 is \$27.50 per MWh (2.75 cents per kWh). *See Renewable Electricity Production Credit Amounts for Calendar Year 2022* <https://www.irs.gov/pub/irs-drop/a-22-23.pdf>.

²⁵ Inflation Reduction Act, Section 33.

million homes in Entergy's service territory²⁶—which Entergy's New Orleans affiliate is already exploring.²⁷

The Company may claim that it does not have time to update its modeling to reflect these industry changes but other utilities have done just that in the midst of their IRP processes. For instance, DTE Electric had developed a preferred plan and not yet filed its IRP Michigan when the IRA was passed in August 2022. After that, DTE quickly modeled a new scenario that incorporated the impacts of the IRA tax credits, and as a result the utility chose to include more clean resources in its updated plan that was filed less than three months after the bill was passed.²⁸ DTE stated that:

The IRA tax credits were very impactful to the EnCompass optimization performed on the REFRESH scenario. We found additional amounts of solar, storage, and wind technologies to be more economic with the tax credits applied. The final PCA reflects these additional resources incorporated into the plan as early as feasibly possible to capture the value of the IRA tax credits for our customers.²⁹

Entergy has several months to update its IRP to reflect the changing economic landscape. The Company can and should address these major industry changes head on in its final IRP by incorporating the IRA tax credits.

²⁶ Request for Concurrence on Preliminary Wind Energy Areas for the Gulf of Mexico Area Identification Process Pursuant to 30 C.F.R. § 585.211(b), *available at* <https://www.boem.gov/renewable-energy/state-activities/gulf-mexico-draft-weas>.

²⁷ Entergy Partners With Offshore Wind Developer To Explore Gulf of Mexico Potential, (Sept. 23, 2022), Nola.com, *available at* https://www.nola.com/news/environment/article_2a752480-3b82-11ed-b892-1bbc5fc1d7b6.html.

²⁸ Michigan PSC, Case No. U-21193, Direct Testimony of Laura K. Mikulan, p. 91-2.

²⁹ *Id.* p. 93.

The closest the Company got to modeling the tax credits in the IRA was in its Future 2 which was intended to capture the Build Back Better legislation that was being considered by Congress at the time. The Company has since stated that “Future 2 reasonably represents a future with tax credit provisions similar to the IRA.”³⁰ While the optimized portfolio (Portfolio 2) had substantially more clean resource additions and also had lowest rate impact estimate in Entergy’s analysis³¹ it was also serving a much higher energy and capacity need because of the additional electrification assumed in Future 2. However, the preferred plan (Portfolio 1) was developed using lower energy and capacity requirements in Entergy’s Future 1. Therefore, while the Future 2 result is still instructive in showing that more clean resources can be cheaper, it should not be taken as Entergy sufficiently addressing the IRA. There is currently no model run that includes baseline assumptions for energy and capacity, as well as expanded tax credits.

III. ENTERGY SHOULD TAKE ADVANTAGE OF SECURITIZATION WHEN RETIRING FOSSIL UNITS

We are pleased that Entergy is planning to retire its coal fleet by 2030 at the latest. While we discuss reasons above why some units could be considered for an earlier date, regardless of the date we encourage the Company to consider using securitization for stranded costs at these units. Securitization is a powerful tool that enables substantial ratepayer savings through lower-cost

³⁰ Entergy Response to Sierra Club Question 2c, provided on January 13, 2023.

³¹ Draft ELL 2023 IRP, p. 131.

financing. The tool is allowed per Louisiana state law. As part of the IRA there are also federal loans for re-investing in old coal sites (among other retiring infrastructure).³²

IV. CONCLUSION

Incorporating recommendations discussed above into Entergy's IRP will help ensure that the ratepayers of Louisiana enjoy reliable and affordable service. Revising the Company's input assumptions will aid the Company in accounting for the increased risk and variability that currently exists in the utility planning landscape. Sierra Club looks forward to a continued engagement in Entergy's planning process.

Respectfully submitted this 23rd day of January 2022,



Joshua Smith
Senior Attorney
Sierra Club Environmental Law Program
2101 Webster Street, Suite 1300
Oakland, CA 94612
P: 415.977.5560
joshua.smith@sierraclub.org

³² See Energy.gov, "Energy Infrastructure Reinvestment," *available at* <https://www.energy.gov/lpo/energy-infrastructure-reinvestment>.

CERTIFICATE OF SERVICE

I hereby certify that on this 23rd day of January 2022, copies of the foregoing Sierra Club's Comments on Entergy Louisiana LLC Draft IRP have been served upon all other known parties of this proceeding by email.

/s/ Joshua Smith_____

ENTERGY TEXAS, INC.
PUBLIC UTILITY COMMISSION OF TEXAS
DOCKET NO. 52487

Response of: Entergy Texas, Inc.
to the Sixth Set of Data Requests
of Requesting Party: Commission Staff

Prepared By: Jonathan Alvis
Sponsoring Witnesses: Carlos Ruiz
Beginning Sequence No. WG2175
Ending Sequence No. WG2176

Question No.: STAFF 6-1

Part No.:

Addendum:

Question:

If Entergy used natural gas to produce hydrogen fuel, what would the environmental effects be compared to using natural gas as fuel? Please provide in comprehensive detail, the environmental impact across the total supply chain involved in sourcing hydrogen from natural gas, compared to the environmental impact of using natural gas as fuel.

Response:

The table below includes estimated emissions (CO₂e¹/MMBtu), including direct and indirect emissions, from natural gas combustion and from hydrogen production. The hydrogen production technologies shown include natural gas reforming without carbon capture and sequestration (“CCS”) and two versions of natural gas reforming, Steam Methane Reforming (“SMR”) and Autothermal Reforming (“ATR”). The SMR technology is shown both with and without CCS.

Source	Emission Comparison (lbs CO ₂ e / MMBtu)			
	Natural Gas	H2 SMR 0% CCS	H2 SMR 96.2% CCS	H2 ATR 94.5% CCS
Direct Emissions	117	149	6	8
Natural Gas Supply Chain	25	32	34	32
Grid Electricity		3	8	15
CO ₂ Management		0	3	2
Total	142	184	51	57

The estimates are based on the preliminary results of a Department of Energy (“DOE”)/National Energy Technology laboratory (“NETL”) study, which at the time of publication was pending peer review.¹¹ There are two adjustments that Entergy applied to

¹ CO₂e, or carbon dioxide equivalent, as defined by the Environmental Protection Agency, is a measure used to compare the emissions from various greenhouse gases based upon their global warming potential. https://sor.epa.gov/sor_internet/registry/termreg/searchandretrieve/glossariesandkeywordlists/search.do?details=&vocabName=Glossary%20Climate%20Change%20Terms.

the DOE/NETL preliminary results. The first adjustment is to reduce the emissions from the natural gas supply chain from 44 to 25 lbs CO₂e/MMBtu of delivered natural gas. This first adjustment accounts for the results of a study by Cheniere Energy (25 lbs),^[2] which used a DOE/NETL study (44 lbs)^[3] to estimate natural gas supply chain emissions but updated it with more recent data and tailored it for delivery of natural gas to the Gulf Coast. The second adjustment is to reduce the emission rate of grid electricity from 1,301 to 532 lbs CO₂e/MWh. This second adjustment accounts for the difference between the DOE/NETL assumption, which is equal to the US average emission rate of grid electricity in 2016 (1,301 lbs), and Entergy's mid-term emission rate goal (532 lbs).^[4]

Notably, direct emissions from hydrogen production with CCS are very low because of the ability to capture 95% or more of emissions. There are opportunities to substantially reduce the indirect emissions from hydrogen production, including emissions from the natural gas supply chain and emissions from electricity production used at the gas reforming facility. These opportunities include the reduction of methane emissions, the reduction of flaring, the use of electric compressors throughout the natural gas supply chain, and the use of clean electricity. With these improvements, the lifecycle emission rate of "blue hydrogen" can be substantially reduced from the estimates above.

^[1] <https://www.energy.gov/sites/default/files/2021-09/h2-shot-summit-panel2-integrated-pathway-analyses.pdf> (See page 8.)

^[2] <https://pubs.acs.org/doi/abs/10.1021/acssuschemeng.1c03307> (See page 3.)

^[3] <https://netl.doe.gov/energy-analysis/search?search=NatGas> (See "Life Cycle Analysis of Natural Gas Extraction and Power Generation," at page 76.)

^[4] <https://www.entergy.com/environment/goals/> (See "Climate Scenario Analysis and Evaluation of Risks and Opportunities," at page 34.)