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RE: Red Gate Power Plant – PSD-TX-1322-GHG

Dear Ms. Cox:

These comments are submitted on behalf of Sierra Club and its 600,000 members, including over 21,000 members in Texas. The comments address the proposed *Draft Prevention of Significant Deterioration Preconstruction Permit for the South Texas Electric Cooperative, Inc. – Red Gate Power Plant* (Draft Permit). The South Texas Electric Cooperative, Inc. (STEC) proposes to construct the Red Gate Power Plant (Red Gate) as a new 225 MW (nominal) electric power plant in Edinburg, Hidalgo County, Texas. These comments are based off of publicly available materials, including the September, 2014 Statement of Basis (SOB) prepared by EPA Region 6 (the Region), the Draft Permit, the permit application (Application) and the applicant's June 7, 2013 response to information requests (June Revision). The deadline to submit public comments is October 17, 2014.

According to the applicant, the Red Gate plant is needed to "meet the generation needs of South Texas to limit exposure of STEC member load to temporary price spikes." (Application Cover Letter.) The proposed project would consist of twelve new Wartsila 18V50SG natural gas fired reciprocating internal combustion engines (RICE) and auxiliary equipment. The nominal generating capacity of the facility would be approximately 225 MW. The draft permit includes a permitted greenhouse gas (GHG) emission rate for the RICEs of 1,145 lb CO_2/MWhr (gross) with no limit on the number of operating hours per year. The total annual project emissions are 1,036,615 tpy CO2e. (Draft Permit, p.6-7.)

Red Gate is subject to greenhouse gas (GHG) prevention of significant deterioration (PSD) regulations. New construction projects that are expected to emit at least 100,000 tpy of total GHGs on a CO_2e basis, or modifications at existing facilities that are expected to increase total

GHG emissions by at least 75,000 tpy CO_2e, are subject to PSD permitting requirements. Red Gate will result in new GHG emissions of up to 1,036,334 tons per year (tpy) of CO_2e. Red Gate would emit GHGs at a rate far greater than 100,000 tpy CO_2e; therefore, the project is subject to PSD review for all pollutants emitted in a significant amount. The Texas Commission on Environmental Quality (TCEQ) will issue a permit for non-GHG criteria pollutants.

1. The Region Must Consider Incorporating Energy Storage into the Project as an Alternative in Step 1 of the BACT Analysis

The proposed RICE units do not constitute the best available control technology (BACT) to meet the stated purpose of the project. The stated purpose of the Red Gate plant can be better achieved at much lower emissions if energy storage units are incorporated into the project. The Region must consider in Step 1 of the BACT analysis whether alternatives that incorporate energy storage could provide functionally equivalent operation at a lower emission rate. Sierra Club recommends that the Region consider two additional alternatives that were not considered in the Application or the SOB: (1) replacing all of the 12 RICE units with an energy storage unit or units; and (2) replacing some of the 12 RICE units with an energy storage unit or units (i.e. a hybrid energy storage-RICE alternative).

a) Energy Storage Meets the Project Purpose

According to the Application, an infusion of wind powered generation into the Energy Reliability Council of Texas (ERCOT) grid has introduced significant variability to the power supply. (Application at ES-1.) The proliferation of cheap marginally priced wind in Texas, combined with the variability of that generation, has reduced reserve margins in the region. In response, ERCOT proposed to increase pricing caps. The Public Utility Commission of Texas increased the System Wide Offer Cap to $9,000 /MWh beginning in 2015, while ERCOT implemented by the order of the PUC a new Operating Reserve Demand Curve, an energy adder at times of scarcity. This new pricing may ease the stress on the available reserves, but it creates a risk for STEC members during temporary periods where demand exceeds STEC's current resource capacity. If STEC cannot meet its own demand, it could be forced to pay much higher rates during price spikes.

STEC's proposed solution to this problem is to build 12 RICE units. Although RICE units provide flexibility and quick start capabilities, they are extremely inefficient and highly polluting compared to other sources of generation such as renewable energy or combined-cycle natural gas units. STEC is apparently willing to accept this poor efficiency in order to have the flexibility and availability of the RICE units. STEC also noted that water supply is an issue at the site. (June Revision at 2.) However, STEC and the Region failed to consider that modern energy storage units are expressly designed to address the problem STEC faces in Texas.[1]

Given the project purpose, as defined by the Applicant, to provide temporary peaking capacity to avoid price spikes in ERCOT, the Applicant and the Region should have considered non-emitting or lower-emitting energy storage units to replace some or all of the proposed Wartsila 18V50SG units. There are several types of energy storage technologies available that a project developer can tailor to meet site-specific needs and constraints. Proven storage technologies include batteries, compressed air energy storage (CAES), pumped hydro, and

[1] http://energystorage.org/energy-storage/technology-applications/flexible-peaking-resource

flywheels.[2] Many of these technologies are modular, which allows for scaling up the resource to meet the site-specific need. The technologies can also be paired with traditional thermal generating units or renewable generation to provide an independent source to charge the storage and to provide other backup services. However, even when paired with a traditional generating unit, the total emissions of the facility would be much lower than the proposed project because the energy storage component has a very low marginal cost and would therefore discharge zero-emission or very low-emission power before needing to rely on any reserve combustion generated power.

As an example, three CAES units in Texas already have acquired a signed Interconnection Agreement within ERCOT. These technologies use a small amount of natural gas to run their turbines, and therefore are not zero-emission, but they will emit significantly less greenhouse gases then a traditional natural gas plant. Indeed, the EPA itself has approved PSD GHG permits for several CAES units. The Region issued a final permit for the Apex Bethel Energy Center in March 2014, another final permit for the Apex Matagorda Energy Center in April 2014, and a final permit for Chamisa CAES at Tulia in March 2014.[3] Clearly the Region is familiar with the commercial availability of the technology, having issued three permits in the past year.

The permitted limits of the CAES facilities in Texas, which will serve essentially the same function as the Red Gate plant, are dramatically lower than the proposed limit of 1,145 lb CO_2/MWhr (gross) for the Red Gate plant.

- The GHG BACT limit for the 270 MW Chamisa facility is 575 lbs CO2/MWh on a gross electrical output basis on a 12-operating month rolling average basis.[4]
- The GHG BACT limits for both of the 317 MW Apex Bethel Energy plant and the Apex Matagora plant are 558 lbs CO2/MWH (net) for both trains on a 365-day rolling average.[5]

These limits for permitted CAES facilities are nearly half the proposed limits for the proposed Red Gate plant. The CAES projects will also provide nearly the same size generation as the 250 MW Red Gate plant. Other storage technologies, such as batteries, could provide even lower GHG emission rates.

b) Energy Storage is Technically Feasible to Meet the Project Purpose

The Region must consider modern energy storage units in step 1 of the BACT analysis. Energy storage is a zero-carbon or low-carbon alternative that can meet most, if not all, peaking capacity needs. If, as the Applicant states, the purpose of the project is to provide temporary peaking capacity to hedge against ERCOT price spikes, then energy storage units may provide that service with far lower emissions. Energy storage is particularly attractive for a system such as STEC's where a high amount of low-marginal cost wind is frequently available. Any excess

[2] http://energystorage.org/energy-storage/energy-storage-technologies
[3] http://yosemite.epa.gov/r6/Apermit.nsf/AirP
[4] Attachment 1. Chamisa CAES Statement of Basis, Prepared by Region 6 February 2014. Available at: http://yosemite.epa.gov/r6/Apermit.nsf/AirP.
[5] Attachment 2, APEX Bethel Energy Center, LLC Statement of Basis, Prepared by Region 6 November 2013 at page 12. Available at: http://yosemite.epa.gov/r6/Apermit.nsf/AirP; Attachment 3, APEX Matagora Energy Center, LLC Statement of Basis, Prepared by Region 6 January 2014 at page 12. Available at: http://yosemite.epa.gov/r6/Apermit.nsf/AirP

generation or low-cost generation from wind during non-peak periods could be used to charge the energy storage units. In turn, when wind is constrained or loads exceed supply, the energy storage units can respond within seconds or milliseconds to provide capacity.

In its June Response (p.2), STEC provided a list of the technical requirements that it considered to meet the project purpose. That list is:

- Power generation output of at least 220MW but not exceeding 240MW
- High plant efficiency over the operating range of the generators
- Generation output turndown to at least 10MW
- Quick start capability to ramp from 0% Output to 100% in 10 minutes or less
- Low water usage
- Must serve peaking loads at all times of the day and night
- Capability to serve as a "Black Start Plant" for the ERCOT system
- Performance in high ambient temperature conditions

Energy storage units can meet each of these criteria with zero or near-zero emissions.

Generation Output – Energy storage units can be built in a wide variety of sizes. Many are small and modular, allowing the user to size the project to particular needs. Energy storage can also be paired with natural gas fired thermal units to provide extra peaking capacity while maintaining a lower overall emissions profile and fast response time. For example, PowerSouth's McIntosh Power Plant currently includes four natural-gas fired combustion turbines and a 110 MW Compressed Air Energy Storage (CAES) unit.[6] The plant is specifically designed to meet peaking needs, similar to the Red Gate facility, though the total plant size is much larger when the attached thermal combustion units are included. Other similarly sized plants include the recently permitted Apex and Chamis CAES plants in Texas, which will be between 270-317 MW.

Other storage facilities demonstrate a high level of flexibility and generation output. Another example is AES's Laurel Mountain facility in West Virginia, which pairs 98 MW of wind generation with the equivalent of 64 MW of integrated battery-based storage resource.[7]

High Plant Efficiency – Many energy storage units do not use fuel, and therefore the efficiency of the units exceeds the proposed natural gas units over the operating ranges. A 100% battery energy storage plant could operate at zero emission. CAES plants use only a small amount of fuel to heat the compressed air as it expands. Even if a hybrid plant is considered, the overall efficiency of the plant would still increase compared to the current proposal because much of the generation supply would be provided with a less or no fuel storage unit.

Generation Output Turndown – Energy storage units provide greater turndown flexibility than the proposed natural gas units. Battery units are instantly available and have no p-min (i.e. they can turndown to any output). Other types of energy storage technology have comparable or better turndown efficiencies to the proposed RICE units. Dresser-Rand, the manufacturer of the

[6] http://www.powersouth.com/mcintosh_power_plant
[7] See, Attachment 4. Available at: http://www.aesenergystorage.com/wp-content/uploads/2014/03/FINDING_THE_HIDDEN_MEGAWATTS_FINAL.pdf

PowerSouth CAES unit, has noted that the 110 MW CAES unit can turndown to 10 MW[8], which is the same criteria identified by STEC. Energy storage units actually provide greater flexibility because, unlike thermal units, they can "go negative" and act as load in times of overgeneration.

Quick Start – Many types of energy storage units – such as battery - can ramp in less than one second.[9] Other technologies such as CAES systems are designed to reach full capacity within 10 minutes.[10] Energy storage units are also better than thermal units at cycling because they do not incur the thermal and mechanical penalty associated with quickly ramping up or down. The quick start capabilities also do not produce excess emissions in startup, and therefore there is no emission penalty during quick ramps. In contrast, STEC noted in its Application that the RICE units will not achieve full emissions control until approximately 30 minutes. (Application at ES-1.) This means that during periods of quick-ramp, the proposed Red Gate plant would produce higher emissions. The Region must consider this emissions penalty in comparing the RICE units to storage options.

Low Water Usage – Most storage technologies do not require any substantial water usage because the energy is stored either as compressed air, chemically in batteries, or other methods that do not require steam generation.

Serving Peaking Loads at Any Time of Day or Night – Energy storage units have a high level of availability 24 hours per day. For example, the Laurel Mountain battery storage unit described above has a 95% availability rating.[11] The intermittent availability of wind or solar resources, which STEC cited as a concern, does not affect energy storage.

Black Start – Black start refers to the initial power supply required to rebuild a power grid after a full blackout. Dedicated, 100-percent-reliable power sources are needed to provide this emergency energy, since standard plants themselves require some electricity for startup operations. A 2011 study by the Boston Consulting Group found that for many storage technologies, including CAES, black starts are both technically feasible and in some instances economical when compared to diesel backup.[12] For the Red Gate plant, energy storage by itself could provide the necessary black-start capabilities. Similarly, a hybrid configuration of RICE units and storage would clearly provide black start capability because both the storage components and the RICE components could provide black start capability.

Performance in High Ambient Temperatures – Energy storage typically does not suffer a penalty from high temperature environments. For example, CAES output is not affected by temperature.[13]

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[8] See, Attachment 5, Dresser Rand CAES Document at page 3. Available at: https://www.dresser-rand.com/literature/general/85164-10-caes.pdf

[9] See, Attachment 6, CESA Presentation at page 34. Available at: http://www.storagealliance.org/sites/default/files/Presentations/VDE%20Keynote%20Janice%20Lin%202014-03-26%20FINAL.pdf

[10] See, Attachment 5, Dresser Rand CAES Document at page 3. Available at: https://www.dresser-rand.com/literature/general/85164-10-caes.pdf (page 4)

[11] http://energystorage.org/energy-storage/case-studies/frequency-regulation-services-and-firm-wind-product-aes-energy-storage

[12] See, Attachment 7, Boston Consulting Group "Revisiting Energy Storage" 2011, at page 7-8. Available at: http://www.abve.org.br/downloads/bcg_-_revisiting_energy_storage.pdf

[13] See, Attachment 5, Dresser Rand CAES Document at page 3. Available at: https://www.dresser-rand.com/literature/general/85164-10-caes.pdf (page 5)

Overall, energy storage or a hybrid energy storage-RICE unit design, offers all of the technical attributes identified by STEC for Red Gate. Replacing any or all of the proposed 12 RICE units will improve the overall GHG emissions profile of the entire plant. Energy storage also provides more flexibility to allow STEC to match the wind generation of ERCOT and protect its members from price spikes.

In addition to meeting all of the technical specifications identified by STEC in the Application, energy storage would also provide additional benefits and ancillary services.[14] The ability to act as both generation and load provides greater grid flexibility. The marginal cost of providing peaking service is also much lower than a low-efficiency gas plant as proposed by STEC. When taken together, the generation benefits and ancillary services make energy storage coast competitive with simple-cycle peaking units.

Neither the Applicant nor the Region considered either a full energy storage facility or a hybrid energy storage-RICE facility. BACT step 1 requires the permitting agency to identify "all available control technologies." Energy storage technology could feasibly meet the business purpose of the Applicant to provide peaking capacity, reliability, and integration of renewable resources. It is also commercially available, as demonstrated by the projects referenced above, as well as numerous other storage projects not addressed. The Region must include energy storage as an identified technology for providing energy services for purposes of its BACT analysis.

2. Incorporating Energy Storage Does Not Constitute a Redefinition of the Source.

Including (1) energy storage and/or (2) hybrid energy storage-RICE as available control technology alternatives does not constitute "redefining the source." A requirement to consider energy storage would not change the underlying business purpose of the facility, nor would it require a completely different fuel source. The Environmental Appeals Board recently reminded permitting agencies that they must carefully consider projects that include cleaner fuels or operating configurations. "The Board has cautioned that permitting authorities should not simply dismiss alternative control options, such as cleaner fuels, as constituting redesign, thereby creating an 'automatic BACT off-ramp' from further consideration of the option." *La Paloma Energy Center*, 16 E.A.D. ___, 26 (EAB 2014) The permitting authority must make a case-specific assessment about the feasibility of incorporating energy storage into the design of the Red Gate plant.

Incorporating energy storage into the plant design would increase the overall fuel efficiency and reduce emissions of the plant. Incorporation of energy storage would reduce the air pollution emissions per unit of electricity generated without changing the fundamental purposes of the plant. *See e.g.*, PSD Permitting Guidance for Greenhouse Gases at 30 ("EPA recommends that permitting authorities consider technologies or processes that not only maximize the energy efficiency of the individual emitting units, but also process improvements that impact the facility's energy utilization assuming it can be showing that efficiencies in energy use… lead to reductions in emissions from the facility.").

The applicable law requires that BACT limits be established based on the maximum degree of pollution reduction achievable with a number of specified methods, including cleaner and innovative production processes and cleaner fuels. 42 U.S.C. § 7479(3) (BACT includes

[14] http://www.aesenergystorage.com/advancion/advantages/

"available methods, systems, and techniques, including clean fuels, fuel cleaning or treatment or innovative fuel combination techniques for control of the air contaminant."); 40 C.F.R. § 52.21(b)(12) (same). As a matter of policy, EPA has generally not required a permittee to consider an inherently lower polluting process or practice that would "redefine the design of the source," which EPA's NSR Manual defines as requiring a completely different process but not requiring changes to the applicant's preferred design to make it less polluting. NSR Manual at B.13-.14.

Thus, the "redefining" policy does not shield an applicant from having to alter its design to use a cleaner process. As the Seventh Circuit held, discussing the clean fuels provision in the BACT definition but equally applicable to the cleaner production processes component of the BACT definition, there must be some adjustment allowed to an applicant's design or the BACT definition's requirement to consider cleaner processes, fuels, and methods to reduce pollution would be rendered meaningless. *Sierra Club v. EPA*, 499 F.3d 653, 656 (7th Cir. 2007) ("Some adjustment in the design of the plant would be necessary in order to change the fuel source… but if it were no more than would be necessary whenever a plant switched from a dirtier to a cleaner fuel the change would be the adoption of a 'control technique.' Otherwise 'clean fuels' would be read out of the definition of such technology."); see also *In re Desert Rock Energy Company, LLC,* PSD Appeal Nos. 08-03 through 08-06, Remand Order at 63 n.60 (EAB, Sept. 24, 2009) (*quoting Sierra Club*, 499 F.3d at 655); PSD Guidance for Greenhouse Gases at 26 (noting that the redefining policy "does not preclude a permitting authority from considering options that would change aspects (either minor or significant) of an applicant's proposed facility design in order to achieve pollutant reductions…").

The Environmental Appeals Board recently considered this question with respect to Sierra Club's recommendation to consider a hybrid solar energy-natural gas plant. The Board ultimately determined that site-specific constraints eliminated a hybrid alternative. However, the Board noted that the Region cannot reject a hybrid design proposal out of hand, and instead must take a "hard look" at the underlying business purpose of the project and the site-specific constraints that might exist.

> The Region's explanation comes very close to suggesting that adding supplemental solar power generation is always redesign if the applicant does not propose it in the first place. Such a bright line, "automatic BACT off-ramp" approach is not consistent with the NSR Manual, the GHG Permitting Guidance, or Board precedent, all of which suggest that a case-specific assessment of the situation be made in concluding that a proposed control option would redefine a particular source.

La Paloma Energy Center, 16 E.A.D. ___, 29 (EAB 2014). In contrast to the *La Paloma* recommendation to consider solar power, energy storage is not a fuel; rather, it is a design of the project that would allow the Applicant to meet the project needs with lower or zero fuel combustion, and therefore lower or zero emissions of GHG and other pollutants. The size, modularity, and flexible capabilities of energy storage units match the stated technical requirements of STEC. The Region must, at a minimum, consider energy storage as an available technology in step 1 of the BACT analysis, and it may only reject energy storage if it makes a detailed, site-specific showing that the cleaner process does not constitute BACT.

3. The Proposed Operating Hours Are Too High

The Draft Permit Section III.A.2.c provides that each RICE unit may operate up to 8,760 hours, including periods of startup and shutdown. The Draft Permit Section III.A.4.c further provides that each engine can startup and shutdown up to 730 times per year (twice a day, every day). These operating limits are inconsistent with the stated purpose of the project and would allow excessive emissions.

The Application states that emissions are "conservatively based" on 8,760 hours of operation per year. (Application at ES-2.) This calculation provides an extreme definition of "conservative." The project's stated purpose is to provide generation to avoid "temporary" price spikes during periods of excess demand. Operating the facility full-out every hour of the year cannot meet any possible definition of "temporary." Rather, the proposed operating limits (or rather lack of any limit) would allow STEC to operate the Red Gate plant full-out for the entire year, which would essentially make the plant a baseload facility. If STEC wants to build a baseload facility, there are much cleaner and more efficient options. Combined cycle natural gas plants have recently been permitted as low as 830 lbs CO2e/MWh (net).[15] Such a limit is more than a 25% reduction in permitted emissions. If STEC wants to build and operate a baseload power plant, then it must conduct a BACT analysis to determine the maximum degree of emissions reductions for that type of project.

Operating a baseload plant is clearly not the purpose of the Red Gate plant. The Application repeatedly states that the plant is intended to provide peaking capacity to avoid market price spikes. Nevertheless, the Draft Permit does not include any operating limit. The Applicant cannot have it both ways. STEC cannot define extremely narrow operating parameters related to startup, ramp times, and flexibility needs on one hand, and on the other hand put an overall operating limit on the facility that is literally too high to ever exceed. *See Pio Pico Energy Center,* 16 E.A.D.___, 67 (2013) ("Sierra Club's fear that applicants and permit issuers could so narrowly define the source type they consider in step 2 as to make all other control technologies infeasible is well taken"). The operating limit in the permit must have the same rational basis in the business purpose of the facility as the technical requirements put forward by the Applicant. As stated by STEC, that business purpose is to provide "temporary" peaking capacity during periods of price spikes.

The Region should require STEC to provide data and information to support the number of hours that it anticipates such "temporary" price spikes will occur. The operating limit of the Red Gate plant should then be set at that limit, with an appropriate cushion to provide headroom. Sierra Club expects that the actual cumulative duration of the price spikes will likely be less than 100 hours, and certainly less than 1,000 hours. A recent trade news article documented that one of the most severe price spikes in 2013 lasted for only 15 minutes on September 3, 2013.[16] Even if one assumes that price spikes will become more frequent or longer in duration, it is hard to envision a scenario where STEC would need to operate the Red Gate plant for more than a few hundred hours each year. Without a clear, site-specific explanation as to the number of hours that

[15] Florida Power and Light Port Everglades Hollywood, FL. Hybrid solar-natural gas plants in California are permitted t even lower rates.

[16] http://info.acclaimenergy.com/energyinsiderblog/bid/101760/ERCOT-RT-Prices-Hit-New-High-Energy-Risk-Management-Questions-Raised

the facility will need to run to meet the Applicant's stated business purpose, the Region should set the operating limit at 250 hours for each RICE unit.

Sierra Club appreciates the opportunity to provide these comments. To the extent the Region modifies its BACT review to consider energy storage in later steps of the BACT analysis, Sierra Club requests the opportunity to review that analysis and provide additional comments.

Sincerely,

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