Nuria de las Casas

From:	Nuria de las Casas
Sent:	Tuesday, July 22, 2014 9:45 AM
To:	'Magee, Melanie'
Cc:	Mona Johnson (mjohnson@camsesparc.com); Gary Clark; Matthew Lindsey (mlindsey@camstex.com)
Subject:	Victoria Power Station GHG PSD Permit Application Update
Attachments:	2014-07-18 Victoria Expansion GHG Perform Rvw.pdf
Categories:	Victoria

Good morning Melanie,

Thank you for your time in reviewing the Victoria Power Station application. I am attaching to this email the revised calculations using a compliance margin of 10% instead of 12.3%. The 12.3% margin that we used in developing our application was consistent with the guidance provided by our consultant, based on other applications that they reviewed at the time of application submittal. Therefore, we assumed this was an industry standard. However, in order for the Victoria project to meet an output based CO_2 limit closer to which Austin Energy has agreed, we will have to apply the 10% compliance margin as proposed by them.

Victoria's steam turbine is a General Electric, Model D5 tandem compound, reheat steam turbine that was originally installed in 1963. The STG was designed for normal inlet throttle steam conditions of 1,800 psia and 1,000 ^{o}F and had a design rating of 160 MW. The steam turbine is coupled with a 60 Hz, hydrogen-cooled generator rated at 212 MVA.

Steam turbines of this vintage were very robust and conservatively designed with multiple inner casings and thick sections. Newer steam turbines combine highly developed steam path technology, advanced sealing features, compact turbine sections and a broad portfolio of last-stage buckets. Because newer units have less mass to warm during the startup process, they are able to come up to full load more quickly than the Victoria steam turbine. The startup process for any steam turbine cold-cold start is necessarily long and highly controlled to avoid damage to the equipment. Start times for the Victoria steam turbine are constrained by the elements shown in the table below. The time required for each of these elements varies with the length of time from the previous shutdown and with ambient temperature conditions which determine the amount of cooling (a cold-cold start in the winter takes longer than a summer cold-cold start). Typical starting and warming times for a cold-cold start are shown below.

Gas turbine start and initial loading	0.5 hours
HRSG & steam line warm-up	1.5 hours
Steam turbine pre-warm (OEM constraints)	4.0 hours
Steam turbine heat-soak (OEM constraints)	2.0 hours
Steam turbine loading (OEM constraints)	1.5 hours

As noted, Original Equipment Manufacturer (OEM) operating instructions are the major time constraints during startup and are directed at minimizing thermal stresses on the rotor as well as other conditions that may lead to destructive vibrations and rubs due to shell/rotor misalignment caused by differential heating of the casing and differential expansion between the casing and the rotor. In addition to the immediate effects of improper warmup, rotor life can be significantly shortened by failure to maintain temperature rise to within OEM recommended guidelines.

I hope this information is sufficient and resolves all open issues. Please let me know should you need additional clarification.

Thank you

Nuria de las Casas
(617) 599-0303

From: Magee, Melanie [mailto:Magee.Melanie@epa.gov]
Sent: Friday, July 18, 2014 11:43 AM
To: Nuria de las Casas
Subject: RE: A few notes to help with your analysis

Nuria,

Reflecting on our conversation, I wanted to make sure your review also includes a technical discussion on why Victoria's older steam turbine (with date of construction) would be less efficient than the one Austin Energy plans to use in their proposed project. I think this is going to be an important point to understand. Please remember that Austin Energy and Victoria will more than likely be on public notice at the same time. I think this would be confusing to see two permits that appear so similar and to have a difference in BACT limits. This may result in comments. In your discussions with the company, I think it would be helpful to stress the need to be as close as possible to Austin's proposed limit and if not, then we are going to need a technical explanation for the difference in your projects.

Thanks, Melanie

From: Nuria de las Casas [mailto:ndelascasas@camsesparc.com]
Sent: Friday, July 18, 2014 10:18 AM
To: Magee, Melanie
Subject: RE: A few notes to help with your analysis

Thank you Melanie, I think the major difference is due to the compliance margin applied. I will talk with Victoria

thanks

Nuria de las Casas
(617) 599-0303

From: Magee, Melanie [mailto:Magee.Melanie@epa.gov]
Sent: Friday, July 18, 2014 11:14 AM
To: Nuria de las Casas
Subject: A few notes to help with your analysis

The proposed GHG PSD permit, if finalized, would authorize Austin Energy to construct an additional combined cycle unit at the SHEC in Travis County, Texas.
The existing SHEC is a natural gas-fired combined-cycle base-load power generating station that currently operates in a 1 by 1 by 1 (1 x 1 x 1) configuration with a combustion turbine, heat recovery steam generator (HRSG) equipped with duct burners, and a steam turbine. The proposed modification includes a new combustion turbine (GE.7FA.04) and new HRSG equipped with duct burners. The resulting new facility will be a natural gas-fired combined-cycle power generating station in a 2 by 2 by 1 (2 x 2 x 1) configuration that utilizes the existing combustion turbine and HRSG, the new combustion turbine and HRSG, and the existing non-modified steam turbine.[1] The SHEC retains the ability to operate the facility in either a 1 x 1 x 1 combined-cycle configuration or in a 2 x 2 x 1 combined-cycle configuration.[2]

The new units at the SHEC (along with the increased output from the existing steam turbine) will generate an additional 222 megawatts (MW) of gross electrical power near the City of Austin. The gross electrical power output is based on a combustion turbine rated at 187 MW at ISO conditions and the steam from the HRSG driving the existing steam turbine at an increased output capacity of approximately 32 MW. The SHEC will consist of the following new sources of GHG emissions:

- One natural gas-fired combustion turbine;
- One HRSG equipped with natural gas-fired duct burners; and
- Electrical equipment insulated with sulfur hexafluoride (SF_6).

Combustion Turbine

The proposed modifications will consist of one natural gas-fired combustion turbine generator, the General Electric 7FA.04. The combustion turbine will exhaust to a HRSG equipped with duct burners.

The combustion turbine will burn pipeline natural gas to rotate an electrical generator to generate electricity. The main components of a combustion turbine are a compressor, a combustor, and a turbine. The turbine will be coupled to a generator. The compressor pressurizes combustion air to the combustor where the fuel is mixed with the combustion air and burned. Hot exhaust gases then enter the turbine where the gases expand across the turbine blades, driving a shaft to power an electric generator. The exhaust gas will exit the combustion turbine and be routed to the HRSG for steam production.

HRSG with Duct Burners

Heat recovered in the HRSG will be utilized to produce steam. Steam generated within the HRSG will drive a steam turbine and its associated electrical generator. The HRSG will be equipped with duct burners for supplemental steam production. The duct burners will be fired with pipeline quality natural gas. The duct burners have a maximum heat input capacity of 681.5 MMBtu/hr per unit. The exhaust gases from the unit, including emissions from the combustion turbine and the duct burners, will exit through a stack to the atmosphere.

Normal duct-burner operation will vary from 0 to 100 percent of the maximum capacity. Duct burners will be located in the HRSG prior to the selective catalytic reduction (SCR) system.

To determine an appropriate heat rate limit for the permit, the following compliance margins are added to the base heat rate limit:

- 2.0% added for variations between as built and design conditions (design margins), including periods of operation at part load conditions,
- 5.0% for efficiency loss due to equipment degradation (performance margin), and
- 3.0% for variations in operation of ancillary plant facilities (degradation margin)

From: Nuria de las Casas [mailto:ndelascasas@camsesparc.com]
Sent: Friday, July 18, 2014 9:37 AM
To: Magee, Melanie
Subject: Got your voice answering machine

Hi Melanie,

I got your voice answering machine. If you can call me on my cell 617-599-0303 thanks

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[1] A process flow diagram of the proposed combined cycle unit is provided on page 2-6 of the application. Available at http://www.epa.gov/earth1r6/6pd/air/pd-r/ghg/austin-energy-sandhill-app.pdf

[2] A detailed process flow diagram for the existing and proposed combined cycle units is provided on page 2-6 of the application. Available at http://www.epa.gov/earth1r6/6pd/air/pd-r/ghg/austin-energy-sandhill-app.pdf