Combustion Turbine Briefing Paper and Q and A

Background:
In 2004, the California Independent System Operator (CAISO) – the nonprofit agency that monitors and oversees California's energy grid and electric reliability –outlined the key steps necessary to closing the Hunter's Point and Potrero power plants.

As conditions for closing these older, polluting plants, this "Action Plan" -- prepared and adopted by the CAISO -- requires the completion of a series of transmission upgrades and reliability projects that CAISO views necessary to maintain electric reliability. That plan identifies the replacement and improvement of energy infrastructure necessary for CAISO to release Hunters Point and Potrero from their Reliability Must Run (RMR) contract obligations.

Recently, San Francisco approved the construction of a Transbay Cable from Pittsburg to the City, which will further improve electric reliability and transmission into the City in the future.

But transmission improvements, while important, are not enough to guarantee the City's future electric reliability while shutting down the last baseload power plant in San Francisco. CAISO has confirmed, as recently as April 2008, that it requires, within the City, replacement energy infrastructure with dispatchable, controllable generation.

The CTs are identified in the Action Plan as the infrastructure necessary for CAISO to release the Potrero Plant RMR.

The City has reached an agreement with Mirant on a set of terms for closure and redevelopment of Potrero upon the removal of RMR, and the parties are in negotiations to memorialize such terms in a full closure agreement.

Q and A:

Why are the CTs needed?

- They provide 190 MWs of flexible, controllable, quick-start gas-fired generation
- They replace 206 MW of slow-start, controllable gas-fired generation and 156 MW of quick start diesel-fired generation
- ISO needs flexible, controllable, quick-start capacity on the SF Peninsula to ensure reliability

The CTs provide quick-start, controllable generation, with nominal 145 MW capacity (3 CTs) proposed for the in-City site and nominal 45 MW (1 CT) proposed at the Airport site.

The Potrero Power Plant provides 206 MW of relatively slow starting but controllable generation (Unit 3), and three 52 MW quick-start, controllable peaking generation units (Units 4, 5, and 6).

TransBay Cable is a 53-mile 400 MW high voltage direct current transmission line underneath the Bay between PG&E substations in the Cities of Pittsburg and San Francisco that is now under construction.

The ISO has stated as recently as April 2008 that it needs "reliable," "in-city" generation to replace Potrero. The CTs are the only near-term projects that meet that criteria, while emitting less pollution into the Bayview.

The Transbay Cable is a transmission project that meets reliability needs for later years, in addition to the generation projects in the "Action Plan." CAISO reiterated, in July 2007, that the Transbay Cable alone does not meet the criteria to remove RMR from Potrero.

Can we build renewables to replace Potrero?

- Renewable resources are intermittent, and not dispatchable and controllable
- CAISO does not "count" intermittent generation as equivalent to firm, dispatchable generation
- CAISO views peaking capacity like the proposed CTs as compatible with the development of renewables

To replace Potrero, CAISO has stated that they require reliable, dispatchable and controllable generation that is available at any time of the day or night.

The primary renewable generation technologies that can be commercially deployed in San Francisco are solar photovoltaic and off-shore wind.

San Francisco's 2 MW of operating municipal solar PV, and 5 MW municipal solar PV currently in the bid process demonstrate the feasibility of siting, constructing, and operating solar PV in San Francisco. Off-shore wind, though commercially deployed in other regions, has yet to be implemented on the West Coast.

CAISO discounts the capacity value of these renewable resources since they are intermittent generation that cannot be counted on around the clock and are not controllable given their "fuel" source. Therefore, even if the City could build hundreds of MW of solar, solar is not considered "reliable," one of the main criteria for replacement generation for Potrero.

The CAISO views the proposed CTs as supporting the development of renewables in California. As detailed in the California ISO's November 2007 report on integrating renewable resources, as California increases its proportion of renewable resources, particularly wind, the California ISO needs increased flexibility from other resources, including fast starting fossil fuel generation resources. The portfolio of future California

resources must reflect this need for very flexible generation resources to assist with the integration of large amounts of intermittent resources.

Are the CTs much cleaner than Potrero?

- Potrero Unit 3 ozone precursor and fine particulate matter emissions are 50% higher than the four proposed CTs taken together
- Potrero Units 3, 4, 5, and 6 ozone precursor and fine particulate matter emissions are 3 times higher than the proposed CTs taken together
- All proposed CT emissions will be fully mitigated through the purchase of offsets and a community benefits package that includes high efficiency street sweeping, tree planting, asthma education, and indoor air quality mitigation
- The proposed CTs are expected to produce 22% fewer metric tons of GHG emissions per year than Potrero Power Plant
- Unlike Potrero Unit 3, the proposed CTs do not use Bay water for cooling and do not discharge heated, polluted cooling water into the Bay
- The proposed CTs use 4 acres of land, and successful closure of the Potrero Power Plant after the removal of its RMR status will make its 27-acre site available for redevelopment

Yes. The proposed CTs would be fueled by natural gas, including state-of-the-art pollution control technologies. Pursuant to the California Energy Commission permit, the City will mitigate any remaining pollution through the purchase of offsets, high efficiency street sweeping, tree planting, and indoor air quality education and assistance programs. The in-City CTs are limited to 4000 hours of operation each per year with expected operation to not exceed 1900 to 2200 hours; the Airport CT is limited to 4,900 hours per year with expected operation to not exceed 1900 to 2300 hours.

Potrero Unit 3 is fueled by natural gas and includes selective catalytic reduction technology to reduce air impacts. Potrero Units 4, 5, and 6 use ultra low sulfur diesel fuel, and are permitted to run up to 400 hours (effective 2010). BAAQMD has not limited Unit 3's run hours; its historic run hours for 2004-2006 averaged 6686.

Even using conservative estimates (assuming 3000 annual operating hours per CT unit, which is in excess of expected hours identified as most likely in market simulation study), operation of the four CT units will produce extremely low emission rates and minimal environmental impacts. For context, according to BAAQMD data, other CTs operating in the Bay Area have historically run 300-400 hours each year.

Using BAAQMD data to compare Potrero Power Plant emissions, adjusted to reflect relevant regulatory changes, against expected emissions from the CT units, demonstrates that the CT units will produce significantly lower tonnages of ozone precursors and fine particulate matter as compared to the Potrero Power Plant.

Comparing average annual historical emissions of Potrero Unit 3 to the expected emissions from the City CTs, ozone and fine particulate precursor emissions from Potrero Unit 3 are 50% higher than the expected emissions from the CT units. Historical

emissions from the entire Potrero Power Plant are 3 times higher than expected ozone and fine particulate precursor emissions from the City CTs. The CTs are expected to produce 22% fewer metric tons of greenhouse gas emissions per year than the average yearly GHG emissions from Potrero Power Plant during 2004-2006.

Moreover, unlike the emissions from Potrero, particulate emissions from the City CT units will be mitigated through a local high efficiency street sweeping program which will target ground-level sources of emissions that contain relatively high concentrations of hazardous materials and occur at nose level where impacts are most severe. The City will also implement a community benefits package that includes tree planting, asthma education, and indoor air quality mitigation.

In addition to these air quality improvements, the proposed CTs improve water quality. The proposed CTs use recycled water for cooling and discharge water into the wastewater system. In contrast, Potrero Unit 3 is cooled by taking water in from the Bay, and discharging that heated, polluted water back to the Bay. This approach to cooling, referred to as once-through cooling, is being phased out throughout California.

Finally, the CTs only utilize 4 acres of land, compared to 27 acres being used by the Potrero Power Plant.

Can we run the CTs on methane or biofuel?
The City, with General Electric who will operate and maintain the CTs, is exploring the feasibility of such a conversion to renewable fuel.

Will changing regulations shutdown or make cleaner the Potrero plant?

- No. New BAAQMD regulations will cap the run hours of Potrero Units 4, 5, and 6 in 2010 at 400 hours, less than the 193-362 hours they ran in 2004-2006

Under new BAAQMD regulations, effective in 2010, Potrero Units 4, 5, and 6 will be restricted to 400 hours of operation per year; however, historically they have only operated 193-362 hours per year. The new regulations do not reduce community air quality impacts as measured according to historic operations. These changing regulations do not effect the run time of Potrero Unit 3.

Can we retrofit the Potrero Power Plant to make it cleaner?

- Potrero Units 4, 5, and 6 could be retrofit to burn cleaner natural gas, but would still be 30%-40% dirtier than the proposed CTs
- Removal of RMR on remaining Potrero Unit 3 is not guaranteed
- A source of funds for any retrofit is not clear
- New permits would have to be obtained

Yes. Potrero Units 4, 5 and 6 could be retrofit to make them cleaner. There are issues that would need to be addressed. The Units are over 30 years old. The City and Mirant, who runs Potrero, would need to engage in a new permitting process with the state and work with CAISO to demonstrate that the retrofitted peakers are sufficient reliability to allow

RMR to be removed from Potrero Unit 3. Funding for this retrofit is not secure, as DWR will not hold its above-market capacity payment arrangement open to a private entity that is already under RMR status. And under the current agreement with the state the City has rights to $2.5 million of sale proceeds per CT.

Natural gas is a cleaner burning fuel, but the Mirant Peakers retrofit to burn natural gas would be 30% to 40% less efficient than the newer, proposed CTs, and would still result in a 30% to 40% higher emissions than the proposed CTs because the Mirant peakers are old technology while the City's proposed CTs are new technology.

Though discussions with Mirant have been held, the City would need to reach an agreement with Mirant that addresses issues of retrofit funding, project control, operations of the retrofitted turbines, closure of Unit 3, site cleanup and redevelopment, and security for performance of obligations.

Will the City be paid back its investment?

- The City will own and control the proposed CT project
- The Power Purchase Agreement with DWR will result in $32.5 million in annual payments until 2015
- With the proposed CTs, the SFPUC will not have to purchase capacity to meet state resource adequacy requirements for its municipal load customers

The CT contract proposal utilizes the City's tax-exempt borrowing capacity and a power purchase agreement with DWR to allow a 30+ year asset to pay for itself in 18 years. The SFPUC is being paid a capacity fee for the plant's availability in case it is needed. In addition, in 2016, the City will need to purchase or provide capacity to meet resource adequacy requirements. The CTs can provide to the City the resource adequacy needed to meet this requirement, with the avoided costs helping to repay the debt.

At decommissioning, the City will sell the turbines to finance site clean up costs.

At the end of this process, the City will be made whole and a 30+ year asset/power plant will be paid off and can be decommissioned and removed from the Bayview community.

What alternatives did the CAISO and the Energy Commission look at?

- Energy Commission considered and rejected no project, energy efficiency/demand side investments, other plant locations, Transbay Cable and renewable resources
- CAISO considered and rejected transmission, energy efficiency/demand side investments and renewable resources
- If the proposed CTs are not constructed, CAISO will continue to require Potrero Power Plant to run

The California Energy Commission conducted a thorough, CEQA-equivalent review of the proposed In-City CT project. That review included independent analysis of other technologies, fuels and other power plant locations, and an extensive public hearing and

evidentiary record development. The 2-year process resulted in the Energy Commission concluding that other locations were either infeasible or did not provide environmental benefits compared to the proposed site, and that alternative fuels and technologies are not capable of meeting the project objective of closing the existing generation within the City.

The CAISO has responded to several requests from the City, and a study the City requested from PG&E, to consider transmission, energy efficiency/demand side investments and renewable resources. Transbay Cable, a new transmission line from the East Bay to San Francisco, increased energy efficiency and demand response program expenditures, in-city renewable generation, and interconnection of existing back up generation were all presented to CAISO as alternative actions to allow removal of Potrero Power Plant must run requirements without the proposed CTs. Each time, the CAISO rejected those alternatives as not meeting the reliability requirements needed to replace Potrero Power Plant in the timeframe obtainable by the proposed CTs. CAISO will continue to require the Potrero Power Plant to run if the proposed CTs are not approved and constructed.