

BOARD MEETING DATE: September 1, 2017

AGENDA NO. 4

PROPOSAL: Execute Contract to Demonstrate Low NOx Combustion Technology on Refinery Boiler

SYNOPSIS: The 2016 AQMP identifies development and implementation of new technologies to further reduce NOx emissions from stationary combustion sources as a key strategy. It is also equally important to assess new technologies to prevent or mitigate any negative impact on air quality and public health. ClearSign Combustion Corporation recently submitted an unsolicited proposal that addresses these needs using a low NOx, non-Selective Catalytic Reduction combustion technology. Staff recommends cost-sharing the proposed project to demonstrate retrofitting their Duplex low NOx combustion technology without the use of reagents, such as ammonia or urea, on a refinery boiler. This action is to execute a contract with ClearSign to cost-share this project in an amount not to exceed \$320,000 from the Rule 1118 Mitigation Fund (54).

COMMITTEE: Technology, July 21, 2017; Recommended for Approval

RECOMMENDED ACTION:

Authorize the Chairman to execute a contract with ClearSign Combustion Corporation to conduct the demonstration of retrofitting their Duplex low NOx combustion technology on a refinery boiler in an amount not to exceed \$320,000 from the Rule 1118 Mitigation Fund (54).

Wayne Nastri
Executive Officer

MMM:FM:NB:AHB

Background

The SCAQMD region has the need to achieve significant NOx reductions in order to meet the national ambient air quality standards for ozone. NOx-emitting stationary sources regulated by the SCAQMD include RECLAIM facilities (e.g., refineries and power plants) and other combustion equipment (e.g., boilers, heaters, burners and

flares). The 2016 AQMP includes control measures to achieve NO_x reductions from new regulations on RECLAIM facilities, non-refinery flares and commercial cooking, as well as residential and commercial appliances. Although such combustion sources are already regulated with the lowest NO_x emissions levels achievable, pre-commercial, new technologies with the potential to further reduce NO_x emissions are available for varying combustion equipment.

Selective catalytic reduction (SCR) has been extensively used as an aftertreatment technology to reduce NO_x emissions from combustion equipment. SCR requires the injection of ammonia or urea that is reacted over a catalyst bed to reduce the NO_x formed during the combustion process. Challenges arise if ammonia distribution within the flue gas or operating temperature is not optimal, resulting in ammonia emissions leaving the SCR in a process referred to as “ammonia slip.”

Recently, ClearSign submitted an unsolicited proposal to demonstrate their proprietary Duplex low NO_x combustion technology without the use of reagents, such as ammonia or urea, on a refinery boiler with a target to achieve 3 ppm NO_x and lower PM emissions, achieving further reductions below the current applicable rules and BACT.

Proposal

ClearSign, in partnership with Torrance Refining Company, proposes to conduct a demonstration project by retrofitting a 291 million Btu per hour refinery gas-fired boiler with their Duplex burner technology. Previous studies of the Duplex technology installed on a small refinery heater demonstrated NO_x emissions between 2.5 ppm and 4.5 ppm. For the proposed project, the goal will be to achieve and validate 3 ppm NO_x emissions using a third-party source testing firm. The Duplex technology incorporates a high-temperature porous ceramic tile matrix on which combustion is sustained after the tile has been heated using a conventional burner. Once the proper tile temperature and system parameters have been achieved, transition from conventional burner to Duplex mode is done where combustion is fully sustained on the tile matrix. In addition to very low NO_x levels without the use of reagents, such as ammonia or urea, the Duplex technology is expected to provide other benefits such as enhanced CO oxidation, enhanced radiation heat transfer and noise reduction. This proposal is to cost-share a one-year demonstration of the Duplex burner technology.

Sole Source Justification

Section VIII.B.2 of the Procurement Policy and Procedure identifies provisions under which a sole source award may be justified. This request for sole source awards is made under provisions B.2.c: The desired services are available from only the sole-source based on the following reasons; (1) The unique experience and capabilities of the proposed contractor or contractor team; (2) The project involves the use of proprietary technology; and (3) The contractor has ownership of key assets required for project performance. In addition to provision B.2.d: Other circumstances exist which in the

determination of the Executive Officer require such waiver in the best interest of the SCAQMD. Such circumstances may include but are not limited to projects involving cost-sharing by multiple sponsors. ClearSign has developed and holds sole property and intellectual rights to the Duplex burner technology, and significant in-kind and cash cost-share will be provided by ClearSign and Torrance Refining Company, as detailed below.

Benefits to SCAQMD

The proposed project is relevant to the SCAQMD's priorities to reduce NO_x and PM emissions from stationary sources to achieve national ambient air quality standards and protect public health. The proposed demonstration of the Duplex burner technology will help support the policy objective of the 2016 AQMP of investing in strategies and technologies meeting multiple objectives regarding air quality and reducing emission impacts on local neighborhoods and disadvantaged communities. In addition, the successful demonstration of the Duplex burner technology will support control measure CMB-05 in the 2016 AQMP to identify approaches in implementing Best Available Retrofit Control Technology (BARCT) and generate further NO_x emission reductions at RECLAIM facilities.

Resource Impacts

The total estimated cost for the proposed project is \$960,000, of which SCAQMD's proposed cost-share will not exceed \$320,000 from the Rule 1118 Mitigation Fund (54), as summarized below:

Proposed Project Cost-Share

Project Partner	Total by Project Partner
ClearSign (in-kind)	\$320,000
Torrance Refinery	\$320,000
SCAQMD (<i>requested</i>)	\$320,000
Total Project Cost	\$960,000

Sufficient funds are available in Rule 1118 Mitigation Fund (54) for this proposed project. Rule 1118–Control of Emissions from Refinery Flares regulates emissions from flares used at refineries as a safety device. The rule imposes an annual limitation on sulfur dioxide emissions from flaring. If a refinery exceeds a flaring limitation in the rule, the refinery is required to pay mitigation fees to the SCAQMD, as specified in the rule. The funds are to be used to develop air quality improvement projects and fund mitigation projects.