

Appendix F

Technology Advancement

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Appendix F: Technology Advancement

Despite major reductions in emissions and corresponding improvements in air quality, the San Joaquin Valley continues to face difficult challenges in meeting the federal ambient air quality standards. Achieving attainment of EPA's increasingly stringent ambient air quality standards will require the development and implementation of transformative zero/near-zero emissions technology over the coming decades.

On March 18, 2010, the District Governing Board approved the Technology Advancement Program, a strategic and comprehensive program to identify, solicit, and support technology advancement opportunities. The program's primary goal has been to advance technology and accelerate the deployment of innovative clean air technologies that can bring about emission reductions as rapidly as practicable. To date the District has undergone four rounds of Request for Proposals (RFPs) resulting in the successful demonstration of numerous innovative technologies.

The Technology Advancement Program (TAP) represents a significant step forward in the District's efforts to attain ever-tightening federal air quality standards and fulfill our public health mission. The Technology Advancement Program's primary goal is to advance technology and accelerate the deployment of innovative clean air technologies that can bring about emission reductions as rapidly as practicable. To address the Valley's needs with respect to both ozone and PM_{2.5}, which are largely driven by NO_x emissions, the Technology Advancement Program has placed a particular focus on NO_x emissions reduction technologies. The Technology Advancement Program is implemented through a coordinated and collaborative process that engages technology developers and potential end-users through:

- Grant funding for technology advancement projects in the San Joaquin Valley through competitive processes
- Integration of technology advancement goals into existing grant programs
- Comprehensive outreach to identify potential technology and demonstration partners
- Ongoing review and feedback on new technologies
- Building partnerships with other agencies
- Building local capacity for research and development in the San Joaquin Valley

To date, the District has completed four Technology Advancement Program competitive funding RFPs, receiving over 130 proposals for clean technology demonstration projects through these RFPs. In total, the District has approved 34 of the proposed projects for total funding of over \$11 million, with successful demonstrations of zero emissions yard trucks, electric composting, ultra-low NO_x biogas engines, and other technologies.

F.1 TECHNOLOGY FOCUS AREAS

The District has structured the Technology Advancement Program to encourage participation within three focus areas. These focus areas represent the current needs of the Valley; they also reflect the types of proposals previously received by the District within this and other programs. Throughout implementation of this *2016 Plan for the 2008 8-Hour Ozone Standard (2016 Ozone Plan)* and future air quality plans, the District will continue to evaluate and, if necessary, update these technology focus areas to address the Valley's air quality challenges.

F.1.1 Renewable Energy

Renewable energy projects focus on overcoming the barriers that prevent the use or adoption of zero-emission renewable energy sources or reduce emissions from renewable energy systems to make them cleaner than comparable non-renewable alternatives.

F.1.2 Waste Solutions

Zero and near-zero emission technologies that minimize or eliminate emissions from waste management systems and processes, including waste-to-fuel systems, such as dairy digesters and other bio-fuel applications.

F.1.3 Mobile Sources

Zero and near-zero emission technologies with emphasis on goods and people movement, off-road equipment, and agricultural equipment.

F.2 DISTRICT ACTION TO PROMOTE THE USE OF NATURAL GAS TECHNOLOGY FOR GOODS MOVEMENT

Heavy-duty trucks are the largest source of NO_x emissions in the Valley, and attaining the health-based ozone and particulate standards will require significant additional reductions in truck emissions through the development and implementation of advanced truck technology. Additionally, reducing emissions from heavy-duty trucks will provide significant health benefits for communities in the Valley and throughout the state, particularly those communities located near major freight corridors.

Much of the state's investment in recent technology development and demonstration efforts has focused on electrification. Although there have been significant advances in battery and fuel cell electric vehicle technologies, pursuing the advancement and deployment of clean natural gas heavy-duty vehicles and other more readily available and suitable near-zero emission technologies will help the Valley address our significant air quality challenges in a faster manner than solely relying on electrification technology due to current range limitations. Near-zero natural gas truck technology is already available commercially for limited applications and has the potential to reduce emissions. With additional advances in technology in the near term, near-zero

emissions natural gas truck technology could be expanded to more applications, serving as a vital component of the strategy to bring transformational change to the goods movement sector.

To address this gap, the District adopted its *Action Plan for Promoting the Use of Natural Gas Technology for Goods Movement in the San Joaquin Valley* (Action Plan)¹. The Action Plan is a multifaceted plan for promoting the deployment of near-zero emissions natural gas vehicles and infrastructure in the San Joaquin Valley. The elements of the Action Plan are:

1. Support policy changes and legislation that help create a market for development, promotion, and deployment of near-zero emissions natural gas technology.
2. Increase outreach efforts to communicate benefits and encourage transition to natural gas technology by Valley fleet operators.
3. Provide additional incentives for natural gas vehicles and infrastructure.
4. Promote technology advancement for near-zero emissions natural gas technologies through the District's Technology Advancement Program.
5. Continue to evaluate and support, as appropriate, the development and deployment of hydrogen fuel cell technology in the heavy-duty truck sector.

F.3 FUTURE DEMONSTRATION PROJECTS

In 2016, the District expects to open its fifth competitive solicitation for proposals, with three million allocated towards this solicitation. In addition to directly funding demonstration projects, the District actively seeks opportunities to collaborate with technology innovators in seeking additional funding. As an example of this effort, the District is working with technology vendors and suitable end-users to form collaborative project proposals for active, and soon to be opened, funding opportunities from Cap-and-Trade Auction Proceeds². The District is taking an active role to ensure the Valley receives its fair share of funds from this source.

Moving forward, District staff will continue to search for opportunities to support projects that build the air quality technology research and demonstration capacity of colleges and universities in the Valley. This emphasis will improve the ability of local institutions to engage in future clean-technology projects that are specifically suited to the Valley's needs. To accomplish this, staff has adapted the Technology Advancement Program

¹ San Joaquin Valley Air Pollution Control District. (2015, May 6). *Item Number 5: Review and Approve Action Plan for Promoting the Use of Natural Gas Technology for Goods Movement in the San Joaquin Valley*. http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2015/May/StudySession/final/05.pdf

² California Air Resources Board. (2015, July 28). *Cap-and-Trade Auction Proceeds*. Retrieved on August 19, 2015 from <http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/auctionproceeds.htm>

scoring criteria so that projects that incorporate local colleges and universities will score additional points in the selection process, and has had ongoing outreach to local institutions to improve their understandings of the program's needs.

F.4 INTERAGENCY COLLABORATIVE EFFORTS

In addition to projects selected through the request-for-proposals process, the District has partnered with other air quality agencies in the state to demonstrate new and emerging technologies.

F.4.1 Restaurant Charbroiler Technology Partnership

Emission Control Device Manufacturers, Restaurants, and South Coast Air Quality Management District (South Coast)

Existing Rule 4692 achieves significant emissions reductions from chain-driven charbroilers. A variety of technologies for capturing emissions from under-fired charbroilers have been developed or improved in recent years. Under-fired charbroiler technologies are still un-tested in real-life applications and need further evaluation and demonstration at Valley restaurants before these technologies can be considered for amendments to Rule 4692. Technological feasibility issues and logistical issues such as the need to modify hoods and exhaust systems and reinforce roof supports in addition to the purchase, installation, maintenance, and labor costs must all be evaluated.

During the summer of 2015 the Governing Board approved \$750,000 to fund the Restaurant Charbroiler Technology Partnership (RCTP) program which provides funding for restaurants to install particulate control systems for under-fired charbroilers as demonstration projects to assess their feasibility and effectiveness. This information will assist in evaluating potential amendments to Rule 4692. The first demonstration unit funded under the RCTP program started operation in September 2015. Several additional projects are expected to be funded in the near future.

F.4.2 Zero-Emission Commercial Lawn and Garden Equipment Demonstration

California Air Resources Board (ARB)

The Cordless Zero-Emission Commercial Lawn and Garden Equipment Demonstration Program, with funding support from ARB, provided eligible cordless zero-emission commercial lawn and garden equipment to commercial landscape professionals (participants) who conduct business within the Valley. The cordless zero-emission lawn and garden equipment was required to be designated commercial-grade and used by commercial landscape professionals to complete multiple small to large gardening tasks over an eight-hour workday period. Eligible equipment included, but was not limited to, lawn mowers, edgers, trimmers/brush cutters, hedge clippers, blowers/vacuums, sweepers, and chainsaws.

The District opened a Request for Applications on August 20, 2012. Participating equipment manufacturers/vendors (technology demonstrators) were responsible for providing the equipment; training to participants on the safe and efficient operation of the equipment and maintenance; and providing materials necessary for daily operation. The participants were to use the equipment in real-world settings to verify equipment durability and performance, battery capacity, and battery charge time. In addition, the participants were responsible for providing monthly data and feedback to the District and technology demonstrators and may have the opportunity to keep the equipment upon submittal of all required data and information for the program. The Cordless Zero-Emission Commercial Lawn and Garden Equipment Demonstration Program successfully ended in June 2013 with a total of 4 technology demonstrators, 60 participants and 445 pieces of equipment for in-use testing. The program demonstrated the performance and durability of electric equipment in non-residential applications to accelerate market acceptance and build upon the progress already made in the residential sector.

F.4.3 Natural Gas-Fired, Fan-Type Central Furnaces with Reduced NO_x Emissions

South Coast Air Quality Management District

South Coast conducted a demonstration project focused on prototype natural gas-fired fan-type central furnaces with reduced NO_x emissions. South Coast released a program opportunity notice for this demonstration project in February 2010, which solicited a number of proposals from furnace manufacturers and gas industry technology developers in partnership with furnace manufacturers. This technology assessment of reduced NO_x central furnaces was initiated with the November 2009 amendment of South Coast Rule 1111 (NO_x Emissions from Natural Gas-fired, Fan type Central Furnaces). The District co-funded this technology assessment with the SCAQMD and Southern California Gas Company (SoCal Gas). The District provided \$50,000, SCAQMD provided \$1 million, and SoCal Gas provided \$450,000 in funding. The technology assessment project was completed in the first quarter of 2014.

The goal of this technology assessment was to demonstrate reduced NO_x furnaces capable of meeting an emissions goal of 14 nanograms NO_x per joule of useful heat. Based on the results of the furnace demonstration project, the technology required to meet new NO_x standards would be available by 2015. As a result of the study findings, the District amended Rule 4905 in January 2015 and incorporated more stringent NO_x emissions limits for units subject to the rule and expanded applicability to include units installed on commercial buildings and on manufactured homes.

F.4.4 Vision for Clean Air: A Framework for Air Quality and Climate Planning

South Coast Air Quality Management District and California Air Resources Board

While the District's air quality challenges are significant, many aspects of those challenges are not unique, and they are not isolated to the boundaries of the Valley air basin. Strategies for reducing emissions in the Valley are enhanced through

partnerships and collaborations with other air districts and state agencies. The District seeks out opportunities for such collaborations to build strong relationships and even stronger attainment strategies.

In 2011, ARB, with the assistance of the District and South Coast AQMD, developed the *Vision for Clean Air: A Framework for Air Quality and Climate Planning*. The goal of this collaboration was to draft a common vision for mobile and stationary source strategies that integrate the need to meet federal air quality standards for PM_{2.5} and ozone, the need to reach California's greenhouse gas goals, and the need to reduce public exposure to toxics (e.g. diesel particulates). This collaborative effort took advantage of the efficiencies inherent in dealing with these three issues as inter-dependent problems with inter-dependent solutions.

Through the *Vision for Clean Air* effort, the three agencies have been evaluating pollutant reductions needed to meet overlapping air quality requirements for 2019, 2023, 2035, and 2050. These reductions depend on the integration of transformative measures and emerging technologies (including zero- and near-zero emission goods movement) with long-range planning and control strategies. Critical to the attainment of targets will be the evaluation of the potential policies, legislation, infrastructure, and efficiencies that will ensure that South Coast, the Valley, and California are prepared to meet the long-term goals.