

SUMMARY OF EMISSIONS CONTROLS AVAILABLE FOR NO_x AND PM FROM LARGE STATIONARY SOURCES IN THE WESTERN UNITED STATES

Statement of Work

A few general comments are appropriate at this time with respect to some basic considerations. Based on the overall objectives of the project, the following observations are made:

- Main focus is on NO_x and PM control technologies.
- To expedite project evaluation, priority can be given to those large source categories that account for more than 100 tons per year of emissions.
- Due to the broader objectives of this project (e.g., addressing emission reductions for the WRAP region), retrofitable technologies represent the primary focus of the effort.
- In addition to the main focus in the bullets above, we believe that a comprehensive assessment must expand that strict criteria to include the following considerations:
 - Identification of multi-pollutant technologies (e.g., combinations of NO_x, PM, Hg and/or SO₂), that may have a role in addressing overall control strategies and policy,
 - Assessment and discussion of technologies that may not lend themselves to retrofits, but that may be important options in specific cases,
 - Assessment and discussion of inter-pollutant control impacts (see Table 1 below, which shows a qualitative example of the potential inter-technology impacts on the various pollutants under consideration), to ensure that a narrow view of a given technology based on its cost and performance alone, does not lead to future poor strategies or policy,
 - Assessment and discussion of cross-media impacts (e.g. ammonia in flue gas adsorbed in ash making it difficult to recycle/dispose),
 - Assessment and discussion of “commercial” vs. “emerging” technologies (e.g. evaluation of a technology must include a sound assessment of its status of development, incentives, barriers and projected time frame to commercial availability),
 - Assessment and discussion of control technologies categorized by their suitability to both source and fuel categories.
 - Differentiation between the 9-state region covered by the Grand Canyon Visibility Transport Commission (GCVTC), pursuant to EPA’s regional haze rule, and the 13-state western region will be made if there are instances where particular control technologies can only be applied to sources not found within the 9-state region.

Based on these considerations, in order to achieve the project objectives the successful REI shall undertake the following general tasks:



1. Review and summarize the WRAP Stationary Source Inventory, as well as more recent and relevant data bases to determine the number/type of stationary sources >100 tpy and what air pollution control devices are currently installed on those sources.
2. Survey and document the available range of technologies per the criteria above.
3. Conduct an evaluation of the technologies and summarize the results. This includes all the pertinent parameters discussed above.
4. Prepare a final document (final report) that addresses all the important criteria and issues listed, and is presented in a format that is most helpful for WRAP personnel to use efficiently.

Table 1. Qualitative relative impacts from multi-pollutant technologies.

GENERIC TECHNOLOGY OPTIONS and INTER-POLLUTANT IMPACTS					
BROAD TECHNOLOGY CATEGORIES	POLLUTANT				
	NO_x	SO₂	PM	Hg	CO₂
FUEL SPECS (SO₂)	?	+	?	+/-	?
FUEL SWITCH (i.e., COAL/GAS)	+	+	+	+	+
COMBUSTION	+	?/+	?	?	?/+
POST-COMBUSTION					
NO_x	+	?/+	?/-	?	?/-
SO₂	?/+	+	?/+	+	-
PM	?	?	+	?/+	?
Hg	?	?	+	+	?

NOTES: (+) Positive Impact, (-) Negative Impact, (?) No or Unknown Impact

Task 1. Inventory of Stationary Sources in the WRAP Region

This task is a data-gathering task. It involves a review of the WRAP Stationary Source Inventory, as well as other recent and relevant data bases to determine the number/type of stationary sources >100 tpy and the type/performance of air pollution control devices currently installed on those sources. REI shall conduct this analyses by cross-referencing several available sources of information, such as, in addition to the WRAP database, EPA, EIA, FERC, UDI, etc. These organizations all compile various data and information and will be tapped to cross-reference and ensure the most accurate “picture” possible. Given the time constraints of this project, significant gathering of specific data by direct contacts with individual sources is impossible. However, for a few of the most significant sources, such an approach shall be undertaken if sufficient data are not available from the identified databases.

Once the “downloading” of the data is completed, REI shall analyze, summarize and categorize the data into appropriate categories. These categories are envisioned to be based on the following criteria:

- Type of generating unit
- Fuel type
- Size
- Existing controls (NO_x, PM, SO₂, Hg)
- Solid waste (ash) disposal/utilization practices

The key deliverable for this task shall be this “new” database, which will form the basis for the range of sources/fuels to be considered in the identification of suitable control technologies. Any shortcomings of this database and recommendations to further improve shall be identified in the Final Report task. The analyses of the gathered data in this task shall include an assessment of its completeness, relevance to the overall WRAP objectives, as well as the most efficient and effective approaches to “make it better”. This may include exchanging data from some of the other databases, individual source contacts, data manipulation from within existing data, preparation of surveys to be sent to sources, etc.

Task 2. Survey and Documentation of Emission Control Technologies

In this task, REI shall focus on the identification and compilation of control technologies for NO_x and PM (main focus), SO₂ and Hg (secondary focus). Other pollutants such as CO, VOCs. etc. may be considered, if appropriate.

While the range of sources in the WRAP region is significant, this effort shall be predicated on two major considerations: (1) source/fuel combinations deemed not applicable from Task 1 will be eliminated from the list of applicable sources for the technology search; and (2) sources that may be identified in Task 1, but represent minor contributions to the emissions profile of the region, either due to their uniqueness or size, will be considered in a more cursory fashion, if their control technology options fall

outside of the range of the more common/available technologies. It is our expectation that case (1) will not apply in reality since any such source/fuel combinations will likely be covered by control technologies readily identified elsewhere; case (2) is mentioned here only because of the anticipation that due to the time constraints of this project some prioritization may be necessary such that “quality” does not suffer in the name of “quantity.” For example, we may differentiate between the 9-state region of the GCVTC and the 13-state western region if there are source/fuel combinations in the 13-state region that are not present in the 9-state region.

This effort shall consist mainly of literature reviews, on-line searches and personal (telephone) contacts and interviews. Due to our team’s familiarity with the subject matter, this is neither a "start-from-scratch" nor a “summarize and compile” exercise. Rather, the background of team members ensures that this effort will be driven by an intimate knowledge of these technologies and not simply an exercise in careful information “cut and paste”. The REI team members are some of the most recognized experts in the area of emission control technologies, who not only have access to and have developed their own “databases” of control technologies, but routinely participate and contribute to the information available in most sources. Hence, access to conference proceedings, major publications from DOE, EPA, EPRI, AWMA, ICAC, PowerGen, international forums, organizations such as NESCAUM, etc., are routine activities for the team members.

The key deliverable for this task shall be a document prepared by REI summarizing the findings and assessment of this initial effort. The document will include the following information on each technology or process:

- Type, fundamentals of technology or process
- Projected performance
- Costs (capital and O&M) or cost projections
- Status of development and opportunities/barriers to further development
- Applicability to category(ies) of WRAP sources as identified in Task 1
- Operational impacts
- Impacts (beneficial or negative) on other pollutants and control technologies
- Cross-media impacts (e.g., solid waste, ash quality)

This collection of information will enable REI to make recommendations with respect to those technologies or processes that require more in-depth analyses versus those which are well understood and have a significant experience base.

Task 3. Control Technology Analyses and Discussion

This task is the “heart” of the project. Essentially, this is the task where a thorough evaluation and discussion of the many technologies identified will be conducted. This effort will “call” on the expertise and extreme familiarity of the team members with the various control technologies, to address all the relevant technical, operational, cost and applicability issues of the identified technologies with respect to the WRAP sources.



As WRAP is aware, the time constraints of this phase of the project require that the successful contractor be extremely proficient in air pollution control technologies. We believe the REI team is unmatched in that respect. However, we also recognize that given the potential large number of source/technology combinations and especially the fact that we will address technologies that are at different stages of development (up to a time frame of 5-10 years), this effort will benefit from some limited direct interaction with selected technology developers and/or users to ensure the most up-to-date report possible.

Hence, in this task REI shall undertake such activities as appropriate and necessary. Obviously, with respect to developing/promising technologies the main challenges are typically associated with the evaluation of operational impacts and costs, as opposed to working fundamentals, applicability and even technical performance. This is where the capabilities of the REI team will “make a difference” in offering sound, experience-based judgment and recommendations.

At the start of this task, REI shall meet with WRAP in Denver to review the initial survey and technology options. At the conclusion of this task, REI shall prepare a report that will augment the information summarized in Tasks 1 and 2 for the identified sources/technologies, as well as provide more detailed documentation of the overall study and recommendations. As stated earlier we believe the final format for presenting information will best be decided through discussions between WRAP and the successful bidder (e.g., once the information and analyses are complete, “formatting” it is more of formality and therefore should be done according to WRAP preferences). We envision that individual summaries similar to the example below (Figure 1) will be desirable and that a complete compilation of all technologies in such a format would be done.

Task 4. Final Report

This task will constitute the main deliverable to WRAP, in the form of a final report. REI shall summarize in the report the activities and findings in Tasks 1-3, and include a discussion to provide WRAP with appropriate “guidance” towards the effective use of the report. A draft report shall be submitted first, eight weeks following the initiation of the project. The final report shall follow two weeks later.

In addition to the individual descriptions of technologies as discussed previously, we envision the presentation of summary tables for quick general reference by WRAP, and useful for broad, region-wide strategic or policy discussions.

Finally, the report will include a “Recommendations” section where, based on the results found, REI will discuss specific suggestions for required or desirable follow-up work to help with WRAP’s overall objectives. An area of likely opportunity for additional effort may be identified in Task 1 if it is determined that despite the various sources of information on WRAP plants, additional information is still desirable. Another area of recommendation might be how to “help” WRAP devise strategies that incorporate both

commercial, easy-to-retrofit technologies, as well as future promising technologies. Strategies that include yet-to-be-proven technologies are always complex and require a great deal of technological expertise along with more sophisticated economic analyses.

In addition to providing the Final Report, the REI team is also willing to present results of this program to the WRAP or other organizations as requested by the WRAP.

<p>TECHNOLOGY DESCRIPTION/EVALUATION FORM</p> <p>Technology:</p> <p>Developer:</p> <p>Description:</p> <p>Information Source:</p> <ul style="list-style-type: none"><input type="checkbox"/> <i>Performance:</i><input type="checkbox"/> <i>Cost:</i><input type="checkbox"/> <i>Schedule:</i><input type="checkbox"/> <i>Status:</i><input type="checkbox"/> Impacts: <p>Technology Attributes/Shortcomings:</p> <p>Development Status/Potential:</p> <p>Applicability to WRAP sources:</p>

Figure 1. Example of technology description/evaluation form.

Schedule and Milestones

Figure 2 summarizes the tasks and schedule for this project.

Task	Topic	WEEKS FROM PROJECT INCEPTION									
		1	2	3	4	5	6	7	8	9	10
1	Inventory of Stationary Sources in the WRAP Region	█	█								
2	Survey and Documentation of Emission Control Technologies	█	█	█	█						
3	Control Technology Analyses and Discussion			█	█	█	█				
4	Draft and Final Reports						█	█	█	█	█

Figure 2. Project schedule.

Milestones and deliverables (with anticipated calendar dates) for this project are as follows:

1. Project Initiation (3/3/03)
2. Compilation of updated source database (3/21/03)
3. Interim report on Stationary Source Inventory (4/4/03)
4. Submission of Draft Report to the WRAP (4/25/03)
5. Submission of Final Report to the WRAP (5/9/03)

Budget Summary

Figure 3 presents a breakdown of estimated level of effort (hours and cost) for each task. **The cost for this effort is \$49,985.** All costs are based on a Time and Materials basis.

Task	Topic	Team Hours	Team Cost
1	Inventory of Stationary Sources in the WRAP Region	52	\$4,990
2	Survey and Documentation of Emission Control Technologies	86	\$10,440
3	Control Technology Analyses and Discussion	116	\$17,220
4	Draft and Final Reports	147	\$17,335
	Total	401	\$49,985

Figure 3. Budget summary by task.