Appendix B

Results from the Second Industry Stakeholder's Workshop (May 21, 2003)

B.1 Stakeholder Workshop Description

A workshop was organized and hosted by the Advanced Power and Energy Program at UCI to garner help from industrial stakeholders to develop accurate DG implementation scenarios and to adequately consider technologies of interest to the stakeholders. The workshop was characterized as follows:

Workshop Title:	***Distributed Generation Implementation Scenarios for Air Quality Impacts in the South Coast Air Basin – Part II***
Workshop Date/Time:	Wednesday, May 21, 2003, 9:00am to 4:30pm
Workshop Location:	Advanced Power and Energy Program, University of California, Irvine

The purpose of this workshop was to: (1) provide you with an update on the project conducted by APEP on the air quality impacts of DG in the South Coast Air Basin of California, (2) receive final feedback and guidance from the DG community on the DG implementation scenarios, and (3) accept critique from the community and modify program direction, approach, and DG implementation scenarios appropriately.

The discussion topics of this workshop included:

(1) update on the DG implementation scenario development approach,
(2) description of the DG implementation scenarios developed to date,
(3) examples of air quality impacts,
(4) feedback and critique on the scenario development approach, and
(5) feedback and critique of the actual scenarios developed.

The agenda for the workshop was (discussion/presentation leader in parentheses):

9:00am Introductions/Agenda Review (Prof. Scott Samuelsen)
9:15am Program Overview and Update (Dr. Jack Brouwer)
9:30am DG Implementation Scenarios Development Approach (Dr. Marc Medrano, Dr. Jack Brouwer)
9:45am Discussion of DG Implementation Scenarios Development Approach
10:15am Break
10:30am DG Scenarios Developed to-date (Dr. Marc Medrano, Dr. Jack Brouwer)
11:30am Discussion of DG Implementation scenarios developed to-date
12:00pm Lunch
1:00pm Sample Air Quality Modeling Results (Prof. Donald Dabdub, Mr. Marc Carreras)
1:45pm Discussion of Air Quality modeling results
2:00pm Breakout Sessions (Prof. Scott Samuelsen – red; Dr. Jack Brouwer – green;
Dr. Marc Medrano – yellow)
Scenario Development Strategy (30 minutes)
Scenarios themselves (30 minutes)
Air Quality Issues (30 minutes)
3:30pm Break

3:45pm Summary of Breakout Sessions
Reports from red, green, and yellow breakout sessions (15 minutes each)
4:30pm Adjourn

List of organizations participant in the second Stakeholder workshop are presented in Table B-1.

Table B-1. List of organizations that attended the DG industry stakeholder workshop held at UCI on May 21, 2003

Organization
City of Santa Monica
SCAQMD
Flex Energy
US EPA
Southern California Edison
Blue Scape Environmental
LADWP
STM/CTI
ARB
CEC
PG&E
FuelCell Energy
Caterpillar, Inc
DE Solutions
UCI
Capstone Turbine Corp.
EPRI
PROBE
Coalition for Clean Air
APEP
GE Global Research Center
Sempra Utilities
Combined Energy Systems
T&D Planning, Communication and CPUC Regulation
UC Berkeley
Xenergy
Alliance Power
GE Power Systems

B.2 Recommendations to Definitely Include

- Obtain SCE data, LADWP data, and SCPPA data on current installed DG and trends to both benchmark and check our estimates for DG adoption rates and technology mix.
- Construct a Business as Usual scenario based on the above data.
- Make sure ammonia emission factors are consistent with AQMD's regulations.
- Check CEC "requirement" for percentage of renewable energy in mix of electricity production and include this level in the scenarios.
- Divide the DG into those that are permitted (under SCAQMD rules) and those that are certified (under CARB rules).
- For permitted sources, consider the type of engine technology (different emissions profiles):
    - Lean burn: for large projects, can afford SCR, usually gas turbines, higher efficiency (~39%)
    - Rich burn: smaller projects, three way catalyst, lower efficiency (~34%) (Note: AQMD standard same for both, kg/kw-hr; few lean projects)
- Look to the source test data of AQMD for emissions levels.
- Spanning scenarios should include a mix of technologies (vs. heavily MTG weighted).
- The "realistic" technology mix should definitely include more internal combustion engines (ICE) and gas turbines (GT) and less fuel cells (FC) and hybrids in technology mix.
- Consider that use of averages in the generation of power per cell may reflect an unrealistic specification of DG. As a result, specific cells may need to accommodate instances of specific DG sizes.
- Consider a spanning scenario that is almost 100% ICE and MTG.

B.3 Recommendations to Consider

- Should consider increased adoption of opportunity-fueled DG
- Should consider more displaced emissions—we include for CHP, opportunity fuels, port, but not for any displaced electricity currently—we will consider a spanning case that includes electricity displacement—significant caveat: studies to-date have not shown an actual proven in-basin displacement
- Add start-up emissions for peak power spanning scenarios. This in challenging since we do not have a data source, but we will consider a spanning case where these are estimated.
- Recognize that some gas turbine NO_X control may be $SCONO_X$ (non-ammonia) versus SCR (potential ammonia slip) and will not contribute to the ammonia slip emissions
- Penetration may be too low—check current permitting records from AQMD (use SCE, LADWP, Muni interconnect data to check)
- Think about the DG duty cycle—most current DG projects are operating base loaded and using the grid for peaking (this is especially the case when not exporting power, when using CHP)
- Consider utility rates, demand charges, etc. in analyses of duty cycle

- The 2007 standards may drive more FC adoption, but, ICEs and GTs will still dominate (in terms of MW capacity) without any violation of standards (most of these will be permitted by SCAQMD vs. certified by CARB)
- Consider demand reduction, energy efficiency, and energy saving methods that can be coupled with DG—introduce these into the scenarios to see what impact taking credit for energy savings methodologies may have—spanning scenario or uncertainty analysis.
- Think about a hydrogen economy scenario.
- Think about a high spark-spread scenario.
- Consider the additional benefit of installed DG that lowers the peak demand. Is there a large emissions benefit associated with easing the load during peak time in existing plants (e.g., peaking plants in the basin)?
- In the spanning scenarios, develop a database that could provide a capability to estimate the impacts of a specific set of DG installation conditions.
- Land use and sector spatial distributions are more appropriate than population growth.

B.4 Recommendations to Reject

- Develop an overall statistical index for air quality
- Suggest expanding the project to consider other sources beyond DG. AQMD is about to put a plan for 2003, using similar tools to forecast air quality concentrations.

B.5 APEP Actions

1. Work on effective presentation formats for both reports and presentations.
2. Obtain SCE data, LADWP data on DG installations, and check our numbers versus the observed current trends
3. Contact Southern California Public Power Authority (SCPPA) to obtain data on DG.
4. Make sure ammonia emission factors are consistent with AQMDs regulations.
5. Check CEC "requirement" for percentage of renewable energy in mix of electricity production.
6. Divide the DG into those that are permitted (under SCAQMD rules) versus those that are certified (under CARB rules).
    a. Obtain and use current BACT standards for appropriate, permitted equipment.
    b. Use CARB certified emissions rates for 2003, 2007 or measured emissions (if lower than CARB standards) for the certified equipment.
7. Use technology mixes in the spanning scenarios.
8. Consider a "spanning" case that includes more displaced emissions.
9. Include more ICE, GT and less FC and hybrid in the technology mix.
10. Add start-up emissions for peak power spanning scenario.
11. Think about actual size of DG units and how this affects the spatial distribution (distinct sizes should be included for some, especially larger, DG).

B.6 Raw Workshop and Discussion Notes

B.6.1 Previous Workshop Review

- Edan Prabhu: Opportunity Fuels: Are they included?

B.6.2 Scenarios

- Tod O'Conner: SCAPA: Pasadena, Glendale, DWP
- Keith Davidson: Did you consider "displacement of emissions" from existing sources as a result of DG; Jack: NO! Should look at this on at least a sensitivity basis.
- Tod O'Conner. Renewable Portfolio policy requires that the 20% of new power must come from renewables by 2017 with 1 % per year. Jack: we have spanning cases that will capture.
- SCE: Spanning, should consider concentrated emissions in east part of basin? Jack; have done uniform, and population growth based—effectively concentrates emissions.
- Keith Davidson: Is characterization information available? Jack: yes. Will present subsequently. Nexus (Keith), NREL, APEP data, and others all used in the compilations.
- Tod O'Conner: Scenario 16. Will you consider MTG-CHP to DG-CHP? Jack: yes.
- Edan Prabhu: Wants basis that most opportunity fuels are spoken for. Between now and 2010 could be opportunity fuels, and throwing them out may miss a huge opportunity. Jack: We most definitely do no throw out. Most likely early adopters. Edan: Use of opportunity fuels could have a significant improvement on air quality. Jack: Most true. That is way we consider offsets. Chino is one example that will benefit (although not on our list).

B.6.3 Scenarios Presentation

- What about emissions of CO—they are included, but not presented here.
- What about O_3 (produced in the basin as a result of NO_X and VOC emissions, and leads to additional PM (secondary organic aerosols).
- Land-Use Data Extraction:
  - Do you have the definitions of low-density versus medium- to high-density residential? yes.
- Approach for Realistic Scenarios:
  - How many i,j,k are you considering (i = 1 to 6 sectors, j = 1 to 5 size classes, k = 1 to 994 cells)
  - How are the $e_{l,k}$ defined (use of literature sources, APEP data, and degradation rate, date of installation, etc.)—we need to do some more work here, especially w.r.t. degradation, date of installation.
- Edison provides interconnect data to CPUC—very useful for benchmarking data, this is reported on a sector basis—data is available for sector type, size type, building type, etc. (Stephanie Hamilton).

- Rich-burn, lean-burn division may be required for the ICEs (Mills, AQMD).
- Looks like ICE technology estimate may be low (Stephanie Hamilton).
- Can we use APEP results to determine the optimal scenario for DG installations – perhaps not "optimal," but certainly identify trends that will improve or reduce air quality.
- Current estimates are low for ICE technology penetration, too high for MTGs.
- Where do estimates come from (the market studies presented earlier).
- Given the widely accepted belief that high temperature fuel cells are more applicable to stationary power, the estimates for HT fuel cells seem too low compared to LT fuel cells. (Steve Torres)
- Very impressed, very intelligent, thoughtful and well laid out process. (Edan Prabhu)
- Are the emissions profiles related to the DG types available? – Yes.
- Need to determine where to install actual units of particular size (cannot just use average data) – Keith Davidson.
- Should have a much larger fraction of DG power represented by larger gas turbine and ICEs (since a couple of larger units will have much more significant impacts) – Mosen Nazemi.
- Are units that do not meet 2003 or 2007 standards going to be allowed to be installed (CARB standards, or SCAQMD permit is required)
    - Are we comparing apples to apples?
    - BACT applies for larger units – jurisdiction of AQMD.
    - Non-permit size—CARB regulations apply.
    - District has jurisdiction over permitted units and ICEs need only BACT or Lowest Achievable Emission Rate (LAER).
- Since current law requires 2003 and 2007 for DG, why consider anything else? (Steve Torres)
- Matter of jurisdiction—permitted sources fall under BACT (AQMD jurisdiction), non-permitted under CARB (Certification).
- Maybe we should divide technologies as those that are permitted versus those that fall under CARB certification law—have a separate estimate for growth/adoption rate of permitted versus certified sources—although moving together, definitely NOT the same (VERY IMPORTANT suggestion—Mosen Nazemi—many in audience agree with this approach).
- Hybrid numbers seem way too high for next ten years, ICEs are under represented. (Keith Davidson).
- Try to use census data for 2001—just released this week.
- DG mix is controversial—seems inconsistent with intuition—but it resulted from studies—we need your feedback to justify a better mix of technologies—base this on your experience and available trends today.
- Edan Prabhu mentioned having some interconnect data, working with SCE on a project with Mark Rawson and Joe Simpson.