



*Making  
Renewables Part of  
an Affordable and  
Diverse Electric  
System in  
California*



# Commonwealth PIER Renewables Mini-Grid Program Project 1.1 Planning & Analysis Critical Project Review Meeting

## Minutes

Thursday, February 27, 2003  
2:00 p.m. – 4:45 p.m.

CH<sub>2</sub>MHill Governmental Affairs Office  
1215 K Street, Suite 1240  
Conference Room  
Sacramento

**Facilitators:**

Pat Lilly, Project Director, Itron, Inc.  
Zhiqin Zhang, George Simon /Energy  
Commission

**Type of Meeting:**

Critical Project  
Review (CPR)

**Attendees:**

**CEC:** George Simons, Zhiqin Zhang, Demy Bucaneg, Jr., and Prab Sethi. **Davis Energy:** Ron Davis, Tony Visnesky **CDF:** Mark Rosenberg, Liam Duan  
**CE Project Team:** Pat Lilly, Itron; Bill Kitto, CH<sub>2</sub>Mhill; Julie Gray, Commonwealth Energy, Fred Soroushian, CH2Mhill, David Hanna, Itron; Keith Rutledge, REDI; Hank Zaininger, ZECO, and Eliza-Jane Whitman, IEUA  
**TAC Members:** Christy Herig, NREL; Robert Yinger, SCE; Robert Ooten, OCSD; Peter West, Energy Trust of Oregon (RPAC Guest) **Via Teleconference:** Jennifer Harvey, NYSERDA; Debra Reinhart, University of Central Florida; Kurt Roos, USEPA.

### ----- Agenda Topics/Discussion -----

**\*\* Please note that these minutes/notes are intended to *summarize* the presentation/meeting. Please review the CPR Presentation slides, found on the PIER Website: [www.pierminigrid.org](http://www.pierminigrid.org) for a full review of the presentation.**

#### **Project 1.1 Critical Review Meeting Initiated at 2:11 p.m**

##### ***Welcome and Self Introduction***

Pat Lilly introduced the meeting and asked that everyone in attendance to introduce themselves, including those TAC members participating via teleconference from the East Coast.

George Simons of the CEC briefly mentioned the importance of the T&D modeling aspect of this project.

## ----- Agenda Topics/Discussion ----- (Continued)

### ***Project 1.1 – Program Planning & Analysis Overview***

As the meeting began slightly later than scheduled, Pat Lilly gave a very brief overview of the goals and objectives of the project, the assessment results to date, expected Program planning and analysis benefits and reviewed the current Project 1.1 Program Planning and Analysis schedule.

#### **Commonwealth Project 1.1 Program Planning and Analysis Objectives:**

- Define Mini-Grid within S. California
- Estimate Current/Future Market Potential
- Estimate T&D Impacts of Market Penetration Levels
- Prioritize Candidate Sites for RD&D Pilot Projects
- Develop M&E Plans for Pilot Projects and Overall Program

#### **Expected Project 1.1 Program Planning and Analysis Benefits:**

- Estimate Technical and Market Potential within Mini-Grid
- Identify the Benefits of Mini-Grid Concept
- Prioritized List of Pilot Projects Meeting Overall Program Goals and Objectives
- Plans to Ensure Optimal Linkage of Pilot Projects
- Program Evaluation Plans

#### **Project 1.1 Program Planning and Analysis Results To Date:**

- Determine Local Mini-Grid & GIS Map
  - Multiple Iterations: Resources/T&D System
- Chino Basin Biogas & BI-PV Inventory / Technical Potential
  - WWTF / Landfills / Dairy Waste
  - Public / Private Sector Non Residential BI-PV
- Renewable Generation Profiles
  - Biogas and PV distributed generation
- Mini-Grid T&D Base Case

----- Agenda Topics/Discussion ----- (Continued)

**Project 1.1 Program Planning and Analysis Schedule:**

| Task No. | Description  | Start Date      |          | Due Date        |          | Status (%) |
|----------|--|-----------------|----------|-----------------|----------|------------|
|          |  | Planned         | Actual   | Planned         | Actual   |            |
| 1.1.1    | Review previous CA technical and market potential assessments. | 6/5/02          | 6/5/02   | 8/4/02          | 10/31/02 | 100%       |
| 1.1.1    | “Preliminary definition” of Program mini-grid region           | 6/5/02          | 6/5/02   | 8/4/02          | 10/31/02 | 100%       |
| 1.1.2a   | Develop DB of Agricultural Facilities.                         | 6/19/02         | 7/20/02  | 09/18/02        | 02/12/03 | 95%        |
| 1.1.2b   | Develop Ag GIS report.   | 6/19/02         | 8/12/02  | 10/19/02        | 02/12/03 | 95%        |
| 1.1.3a   | Develop Landfill DB.   | 6/19/02         | 6/19/02  | 8/19/02         | 11/27/02 | 100%       |
| 1.1.3b   | Develop Landfill GIS report.                                   | 6/19/02         | 6/19/02  | 9/3/02          | 11/27/02 | 100%       |
| 1.1.4a   | Develop WWT facility DB.                                       | 6/19/02         | 6/19/02  | 8/19/02         | 11/27/02 | 100%       |
| 1.1.4b   | Develop WWT GIS report.  | 6/19/02         | 6/19/02  | 9/3/02          | 11/27/02 | 100%       |
| 1.1.5    | Develop BIPV systems DB  | 8/5/02          | 8/5/02   | 12/03/02        | 02/05/03 | 100%       |
| 1.1.6    | Develop T&D System DB  | 6/5/02          | 6/26/02  | 2/16/03         | 02/12/03 | 95%        |
|          | <b>Critical Program Review Meeting (2/27/03)</b>               | <b>01/22/03</b> |          | <b>03/08/03</b> |          |            |
| 1.1.7    | Market Assessment  | 9/13/02         | 9/13/02  | 03/11/03        |          | 50%        |
| 1.1.8    | Develop Generation Profiles                                    | 10/14/02        | 8/15/02  | 03/16/03        |          | 85%        |
| 1.1.9 a  | Conduct Power Flow Analysis (T&D Model)                        | 09/04/02        | 10/14/02 | 03/23/03        |          | 90%        |
| 1.1.9 b  | Conduct Power Flow Analysis (T&D Model)                        | 11/05/02        |          | 05/07/03        |          |            |
| 1.1.10   | Prepare Prioritized List of Projects for PV and Biogas Systems | 12/03/02        | 11/04/02 | 05/18/03        |          | 15%        |
| 1.1.11a  | Prepare Draft Rpt Outline                                      | 01/17/03        | 01/29/03 | 02/21/03        | 02/12/03 | 80%        |
| 1.1.11b  | Prepare Draft Report   | 03/08/03        |          | 06/12/03        |          |            |
| 1.1.11c  | Prepare Final Report   | 07/02/03        |          | 08/01/03        |          |            |
|          | <b>Critical Program Review Meeting (7/10/03)</b>               | <b>06/12/03</b> |          | <b>07/12/03</b> |          |            |
| 1.1.12   | Coordinate with RPAC   | 01/22/03        |          | 09/30/03        |          |            |
| 1.1.13a  | Develop M&E Plans – Project 3.2                                | 08/19/02        | 11/24/02 | 02/15/03        |          | 75%        |
| 1.1.13b  | Develop M&E Plans – Overall                                    | 05/18/023       |          | 09/30/03        |          |            |

## ----- Agenda Topics/Discussion ----- (Continued)

### ***Biogas Inventory and Technical Potential – Task 1.1.2, Task 1.1.3 and Task 1.1.4***

Bill Kitto of CH<sub>2</sub>M Hill discussed the three Commonwealth Program biogas resource inventory reports that were developed, including: 1) agricultural and food processing wastes, 2) solid waste landfill bioreactors, and 3) wastewater treatment facilities.

#### **Task 1.1.2. Agricultural and Food Processing Waste**

Key draft report topics addressed included:

- Inventoried number of animals and quantity of manure produced
- Identified potential energy production from manure
- Surveyed dairy energy use
- Inventoried food processing plants
- Identified potential food processing energy production

There was discussion on the methods of collecting dairy waste and the design of the milking and feeding areas of dairies in the Chino Basin mini-grid versus other locations, such as the N. US and Northern Europe. This discussion of waste management practices stemmed from the reported amount of corral-dried manure that is present relative to the amount of wash-water based dairy waste under the Task 1.1.2 draft report. It was mentioned that other locations have larger surface areas facilitating the collection of manure before it becomes too dry and therefore not suitable for anaerobic digestion collection purposes.

Utilization of the corral-dried manure was briefly discussed. Bill Kitto mentioned that the only likely current process for converting the low moisture/grade corral-dried manure into useful energy was believed to be gasification, but that the Program team was not promoting this technology as a potentially cost-effective option. A TAC member inquired as to the option of direct combustion of corral-dried manure, which was dismissed due to regulatory guidelines.

#### **Task 1.1.3. Solid Waste Landfill Facilities**

Key tasks discussed under Task 1.1.3 included:

- Define requirements of landfill bioreactors in Southern California
- Identify Landfills that could serve as a host for landfill bioreactor in Chino Basin study area
- Collect data on 31 landfills in Southern California
- Evaluate landfill data and identify top candidates for hosting landfill bioreactor

## ----- Agenda Topics/Discussion ----- (Continued)

In discussing the landfill bioreactor concept, Bill Kitto mentioned that during an earlier meeting that day with the PIER Renewable Program Advisory Committee one RPAC member raised a concern that the bioreactor concept would be very difficult to implement at a large full scale operating landfill.

The Top Four Landfill Bioreactor Sites recommended in the CH<sub>2</sub>MHill Draft Report include:

| <b>Landfill Name</b>   | <b>Location</b> | <b>Owner</b>             | <b>Waste In Place (Tons)</b> | <b>Waste Acceptance Rate (tons/day)</b> | <b>Potential Power (MW)</b> |
|------------------------|-----------------|--------------------------|------------------------------|---|-----------------------------|
| Badlands Disposal Site | Moreno Valley   | Riverside County         | 5,168,932                    | 1,500                                   | 15                          |
| El Sobrante            | Corona          | Western Waste Industries | 8,000,000                    | 4,900                                   | 22                          |
| Fontana (Mid-Valley)   | Fontana         | San Bernadino County     | 2,800,000                    | 3,000                                   | 8                           |
| San Timoteo            | Redlands        | San Bernadino County     | 880,000                      | 500                                     | 2                           |

### **Task 1.1.4. Waste Water Treatment Plant Inventory**

The Task 1.1.4 report addressed the following aspects:

- Identified treatment plants in study area
- Developed database for treatment plants
- Interviewed plant owners and operators
- Focused on two key areas:
  - Digestion (gas production operations and technologies)
  - Energy conversion and recovery systems

During Bill Kitto's presentation on wastewater treatment facilities, there was a brief discussion on mixing dairy waste with waste from wastewater treatment facilities. In addition, the technical potential for these three general biogas resources was discussed briefly, as well as the prioritization process for eventually selecting the biogas pilot projects that will be implemented under the Program within Emphasis Areas 2 and

## ----- Agenda Topics/Discussion ----- (Continued)

The results of the draft technical potential for biogas resources in the mini-grid were summarized as follows:

| Biogas Source                  | Minigrid Actual<br>2002 MW |
|--------------------------------|----------------------------|
| <b>Dairy Waste</b>             |                            |
| Washwater                      | 22                         |
| Dry Manure (Gasification)      | 140                        |
| <b>Food Waste</b>              | 33                         |
| <b>Landfill Bioreactor*</b>    | 12                         |
| <b>Sewage Treatment Plant</b>  |                            |
| Base                           | 2.6                        |
| Enhanced Digestion Adder       | 1.5                        |
| Advanced Energy Recovery Adder | 0.7                        |
| <b>Total</b>                   | <b>212</b>                 |

\* Landfill Bioreactor number assumes one landfill inside the Minigrid, using the average of the four landfills studied

### ***Building Integrated PV Inventory and Technical Potential - Task 1.1.5 - Objectives***

- Collect Information on PV Siting Requirements
- Evaluate Potential Public BI-PV Sites
- Evaluate Technical Potential (kW) of Non-Residential BI-PV in the Mini-Grid

#### Overview of Methodology

- Estimate Number of Facilities, Size and Energy Use
- Estimate Available Building Area (Roof, Awning, Parking Lots, and Shade Area)
- Estimate Photovoltaic Generation Potential within Mini-Grid

Keith Rutledge of REDI discussed the BI-PV inventory report that was developed. There was a brief discussion surrounding the issue of defining BI-PV as also relating to non-building installations such as shade structures and/or carports and could also include “direct” PV applications such as water pumping. Clarification was made in regard to total Public Sector building type number – 240 – as there are actually significantly more buildings per building type as shown in the report. A significant finding of the Technical Potential report is that in all but the case of hospitals the PV technical potential exists for providing all or nearly all of the facilities electrical loads from on-site BI-PV systems.

#### Overview of Results

The results of the Commonwealth Chino Basin Mini-Grid BI-PV technical potential assessment indicate that up to 526 MW (crystalline PV) may be technically achievable, with most (92%) of the potential existing within the private sector facilities. Nearly 42 MW of potential was identified in public sector buildings, based upon crystalline PV technology.

## ----- Agenda Topics/Discussion ----- (Continued)

| <b>Nonresidential Sector</b> | <b>Number of Facilities/ Establishments</b> | <b>Crystalline (kW)</b> | <b>Amorphous (kW)</b> |
|------------------------------|---|-------------------------|-----------------------|
| Public Facilities            | 240   | 42,096                  | 21,048                |
| Private Establishments       | 3,857                                       | 483,943                 | 241,972               |
| <b>Total</b>                 | <b>4,097</b>                                | <b>526,039</b>          | <b>263,020</b>        |

### Mini-Grid Biogas/PV Market Potential Assessment

Dave Hanna of Itron/RER discussed the work in progress for the mini-grid market potential assessment study.

Objectives of the Market Potential effort include:

- Estimate market potential of non-residential BI-PV and biogas
- Identify the broader market conditions
- Provide T&D Power Flow Model Input

The methodology employed involves the following:

- Estimation of Economic Potential
- Estimation of Current (2002) Market Potential
- Future (2007 & 2012) Market Potential

While the methodology to determine economic potential was being discussed, the issue of ownership models was raised. Depending on whether the establishment owner was a private entity or a public entity could make a difference on the type of system ownership that would likely be adopted, as private owners can take advantage of preferred tax treatment for Solar PV systems.

There was also a brief discussion on the development of scenarios that would provide the needed input to the T&D mini-grid power flow modeling task of the Project.

### **Mini-Grid T&D System Power Flow Modeling**

#### T&D Data Development

Hank Zaininger of Zaininger Engineering Company (ZECO) discussed in detail the process of developing the T&D system information for the Chino Basin study area and how this evolved into what is now the mini-grid area. Hank Zaininger mentioned the high level of cooperation of Southern California Edison in this process, but also cautioned that much of SCE's data is considered proprietary, particularly after the events of 9/11/01.

## ----- Agenda Topics/Discussion ----- (Continued)

The data development process involved the following T&D system parameters:

- 66/12 kV Sub Locations
- Transformer bank ratings
- Projected 2003 peak sub loads
- Relative feeder loadings at sub during hot summer conditions
- 12 kV Feeder maps
- Standard conductor size and ratings

The Commonwealth mini-grid database includes the following information:

- 9 – 66/12 kV Substations
- 72 – 12 kV feeders
- Electrical parameters suitable for load flow
- Commonwealth Mini-Grid 2003 peak load about 565 MVA

### Power Flow Model Development

Hank Zaininger discussed the process he used to develop a base case system that was representative of the system that exists in the Chino mini-grid, but that it is not an exact model of the system. This is due to the proprietary nature of much of the SCE system information.

Hank and Robert Yinger of SCE believe that the model will be useful in researching the impacts of the Program's renewable distributed generation on the T&D system.

The Base Case mini-grid T&D modeling effort included:

- Use of GE & PSLF load flow program
- FERC 715 Heavy Summer Case Transmission
- Collection/inclusion of local 66 kV sub-transmission electrical data
- Inserted Commonwealth Mini-Grid database from Task 1.1.6
- Addition of shunt capacitors to 12 kV Feeders
  - Maintain unity power factor at sub
  - Maintain 12 kV feeder voltage >97%

## ----- Agenda Topics/Discussion ----- (Continued)

- Results: projected 2003 peak load base case

George Simons mentioned that an important issue that will likely come out of this modeling is whether T&D system configurations will need to be redesigned i.e., (loop instead of existing radial) in many areas of the 12 kV system should renewable distributed generation achieve significant penetration levels over time. There was significantly more follow-on discussion on this subject.

There was some discussion on how the evaluation of renewables D.G. penetration should include a range of both conservative and optimistic results. It was believed by some that the renewables cases that are to be studied should include different mixes of biogas/PV and penetration levels, which is the Team's original plan.

Analysis of system stability was also brought up in the discussion. It was mentioned that this is not a planned research objective of the load flow evaluation. However, Mr. Zaininger mentioned that he plans to qualitatively discuss potential stability impacts on reliability for high renewable DG penetration levels within the Mini-Grid.

It appeared that the CEC and the TAC members wanted to see several study cases resulting from the power flow modeling, and the Commonwealth Program Director (Pat Lilly) mentioned that the team's resources are currently limited in this area. The budget for the load flow study was briefly discussed as a limitation to what can be explored in the T&D modeling. George Simons suggested that he and Pat Lilly discuss this issue after the meeting. Alternative resources to complete stability analysis will be explained by the Commonwealth Energy Tea, and a recommendation made prior to the Program's first CPR meeting in later June/early July.

### ***Overview, Next Steps***

Pat Lilly briefly summarized the TAC members' comments. Commission Contract Manger, Jessica Zhang mentioned that the members would need to get their comments back to her by Monday, March 10. The next meeting with TAC and RPAC will be the Critical Program Review in approximately four (4) months.

### **Project 1.1 Critical Review Meeting Concluded at 4:45 p.m.**

