BEFORE THE PUBLIC UTILITIES COMMISSION OF THE

STATE OF CALIFORNIA

Order Instituting Rulemaking on the Commission's Proposed Policies Governing Restructuring California's Electric Services Industry and Reforming Regulation	R.94-04-031 (Filed April 20, 1994)
Order Instituting Investigation on the Commission's Proposed Policies Governing Restructuring California's Electric Services Industry and Reforming Regulation	I.94-04-032 (Filed April 20, 1994)

PERMANENT STANDARDS FOR METERING AND METER DATA USED IN DIRECT ACCESS

Submitted to the

California Public Utilities Commission

By

Permanent Standards Working Group

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Dated: July 29, 1998

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I. Executive Summary

In California Public Utility Commission (CPUC) Decision 97-12-048, the CPUC ordered the creation of a Permanent Standards Working Group (PSWG) to review the interim standards approved in the decision and recommend what permanent standards should be approved by the Commission. The PSWG met and worked intensively from February through July 1998. In the following report, the PSWG recommends permanent requirements for meter and meter-related data. All recommendations included in this report were voted through by at least two-thirds of the eligible voting membership, not including abstentions and absences. Although the PSWG achieved unanimity on most issues, there were areas without 100 percent agreement. If provided, party(ies) alternative positions to the majority recommendation are included in the text. All recommendations include the list of entities who voted to adopt the recommendation, entities who voted against, and entities who abstained.

The PSWG report includes recommendations in the following areas:

- Meter Equipment
- Meter Communications
- Meter Data Management and Meter Reading
  - ⇒ Including rules for validating, editing, and estimating meter usage data
- Meter Installation, Maintenance, Testing, and Calibration
  - ⇒ Including classifications of different levels of meter workers

The following table summarizes the Appendices containing PSWG's agreements. The levels of agreements are noted. Several recommendations are unanimous. The PSWG requests that the CPUC consider issuing a decision more rapidly on these items. Such an action would enable the market to benefit quickly from the PSWG's work.

Recommendations on What CPUC Should Approve

The PSWG recommends that the CPUC approve, as stated, all recommendations in the report and the Appendices that have no alternative positions. For those areas where not only consensus, but where unanimous agreement was reached, the PSWG requests that the CPUC consider issuing a decision more rapidly on these uncontested items.

Recommendations on Areas Needing Guidance from The CPUC

The PSWG requests that the CPUC review recommendations that have an alternative position (in *italics* in the text) and seek guidance or otherwise decide how to proceed based upon the information provided.

Table I: Summary of Appendices and PSWG's Agreements

Appendix	Description	Recommended CPUC Action
A	Requirements for Meter Products Used in Direct Access • Including C12.18 for type 2 optical ports • CPUC website for DA-compliant meters	Approve/adopt
B	Requirements for Meter Communications in DA • C12.19 • KYZ Output • KYZ Consumer Protection • Visual Meter Read • Meter Password Authorization	 • Review alternative positions • Approve/adopt • Approve/adopt • Review alternative positions • Approve/adopt
C	Requirements for Meter Data Management and Meter Reading in Direct Access • MDMA Business Function • Subcontracting MDM Function • Subcontracting meter programming to MDMA • MDMA Technical/Business Support • MDM Performance Standards • MDM Performance Exemption • EDI Implementation • New MDM Transactions • Meter Specific Information Flow	 • Approve/adopt • Approve/adopt • Approve/adopt • Approve/adopt • Approve/adopt • Approve/adopt • Approve/adopt • Approve/adopt • Approve/adopt
C-VEE	Requirements for Validating, Editing, and Estimating Monthly and Interval Data in Direct Access • Interval VEE • Monthly VEE	 • Approve/adopt • Review alternative positions
D	Requirements for Meter Installation, Maintenance, Testing, and Calibration in Direct Access • Worker certification	Approve/adopt • Review comments
E	Future of PSWG	Review alternative positions

Meter Equipment

The interim standards approved by the Commission specified that a meter must be equivalent to a meter that the utility uses, be Independent System Operator (ISO) compliant, or meet the ANSI standards recommended in the Meter and Data Communication Standards (MDCS) report filed with the CPUC on July 25, 1997. Using the interim standards as a starting point, the PSWG identified issues requiring additional clarification and a list of ANSI standards to recommend as permanent requirements. PSWG also recommends testing and certification processes for new meters, locking hardware and sealing hardware, and requirements for any repair or modification of a meter.

The PSWG unanimously recommends the CPUC approve Appendix A for meter hardware requirements. (Appendix A, Sections I through VI)

Meter Communications

In D.97-12-048, the Commission expressed a desire that meters used for direct access have an open architecture to allow interoperability to take place. In turn, interoperability of equipment would allow customers to choose from multiple service providers without having to replace equipment. However, having universal interoperability and interchangeability between the meter and data retrieval technologies is not feasible without constraining technological alternatives. It would be unrealistic to mandate that a single meter be used for the all the communication technologies currently in the marketplace. The PSWG agreed that the only area where universal interoperability and interchangeability could be realistically achieved at this time was at the interface between the meter and hand-held devices using an optical port.

The PSWG recommends that, if pulse output is used, it be contact pulses (KYZ) and ESPs inform customers if new meters will be incompatible with the customers' energy management systems. (Appendix B, Sections II.1. and II.2.)

It is possible to enable different devices to communicate with each other through a common data format. This would create a foundation for manufacturers to develop equipment that can communicate with other manufacturers' equipment. The PSWG recommends ANSI C12.19 - The Utility Industry Data Device Table (Appendix B, Section I.1.) as a data format that will allow interoperability to develop. Also see alternative positions and comments in text.

To ensure the retrieval of minimal information at the meter and allow the customer to read the meter, PSWG recommends that meters must have a visual display on the meter. See alternative positions in text. (Appendix B, Section III.)

To ensure the integrity of meter usage information, only authorized persons should have access to read, update, reset, or reprogram the meter. The PSWG unanimously recommends three levels of access: (1) full read, write, and reprogram, (2) reset and updating for meter reading and billing functions, and (3) read only. The ESP has the responsibility for assigning passwords to the appropriate parties. (Appendix B, Section

IV.)

Meter Data Management and Meter Reading

The PSWG reviewed the existing definitions and standards for meter data management agents established in CPUC D.97-12-048. The current definitions require an MDMA to perform all functions of Meter Data Management and Meter Reading. The PSWG defined both functions and unanimously recommends that an MDMA may subcontract functions such as meter reading. In addition, an MSP may contract with an MDMA to reprogram meters remotely. (Appendix C, Sections I. and II.)

The PSWG reviewed the standards for validating, editing, and estimating (VEE) interval data established by the CPUC and added modifications and enhancements based on market experience. In addition, PSWG developed VEE rules for monthly data. The PSWG near unanimously adopted these rules, and the PSWG recommends that the CPUC approve the VEE rules in Appendix C-VEE, effective 90 days after the decision.

Based on recent operational experience of MDMAs, the PSWG unanimously recommends that MDMA data availability performance tracking begin with the second billing cycle and that the five day availability standard be reduced to 99.0 percent. (Appendix C, Section V.)

The PSWG reviewed the recent work by Utility Industry Group (UIG) on a national standard meter usage data exchange. The PSWG recommends a process to review the EDI standards and develop a consistent statewide implementation plan to migrate to EDI. A near unanimous recommendation is for EDI implementation planning to occur by January 1, 1999, and for implementation to be completed no later than December 31, 1999. (Appendix C, Section VII.1.)

Meter Installation, Maintenance, Testing, and Calibration

The CPUC established an interim process for the certification of Meter Service Providers and sought recommendations for uniform standards for testing and maintaining meters used for direct access. The interim certification process is entity-based not worker-based and does not include the different skill levels required for different meter installations. The PSWG started with the meter worker classes developed in the fall of 1997 by UDCs, MSPs, and ESPs, and sent to Commissioner Advisor Bob Lane as a joint parties recommendation. The group made additional refinements to the worker classes. The PSWG unanimously recommends standards for five classes of meter work and meter workers. In addition, the PSWG developed and unanimously recommends a set of procedures that workers must follow when installing or removing a meter. (Appendix D, Sections I. and II.)

The PSWG developed a process of worker certification whereby an MSP may issue certifications for meter worker classes 1-3. However, prior to issuing certifications, the MSP must have its training materials and program approved by the CPUC or a CPUC-designated entity. Certification for meter worker classes 4(A), 4(B), and 5 requires a practical exam administered by the CPUC-designated entity(ies). The PSWG

recommends the certification process in Appendix D. See text for comments. (Appendix D, Section I.)

In the Commission Decision D.97-12-048, the Commission recognized that there needs to be a program to test and maintain meters on a regular basis. Meters will be tested dependent upon the amount of financial risk to the market associated with metering inaccuracy. Therefore, meters with higher usage will be tested more often. In brief, meters either will be individually tested annually, biennually, or as a group based upon statistical sampling. The PSWG unanimously recommends that the CPUC approve the meter testing maintenance and calibration requirements in Appendix D. (Appendix D, Sections III through V.)

Security

The PSWG discussed security issues and refers work done here to the Data Quality and Integrity Working Group (DQIWG) for incorporation in their report. (Appendix F)

Future of PSWG

The PSWG categorized several subject areas and determined that some will require immediate ongoing work and some will only need to be addressed infrequently. PSWG recommends that the Commission formally approve the recommendations for the various subject areas in Appendix E of this report. Also see alternative positions in text.

II. PSWG History and Organization

II.1. History/Regulatory References

CPUC Decision 97-12-048 ordered the creation of the PSWG and directed it to review the interim standards approved in the decision and to recommend what permanent standards should be approved by the Commission. The decision also ordered the PSWG to indicate whether other standards are expected in the future and recommend a process for reviewing possible future changes to the permanent standards. Within 180 days of the initial workshop, the PSWG was to file proposed permanent standards with the CPUC.

Consistent with that order, the Energy Division convened a workshop on January 29, 1998. The PSWG created a structure in which participation was inclusive, open, and equitable. The PSWG agreed that the scope of the group was to:

- Review interim, national, and Utility Distribution Company (UDC) standards--in progress or completed--and make recommendations to the CPUC
- Propose an ongoing process for standards selection
- Clarify functional requirements and business processes

The following evaluation criteria were applied in the selection of standards/requirements for the Direct Access Marketplace:

- Be consistent with RSIF and DQI data requirements
- Be consistent with direct access rules
- Meet safety, accuracy, and reliability consistent with the current UDC standards for meter reading or, higher, if business requirements demand
- Address interoperability and open architecture
- Promote customer choice
- Allow market innovation
- Prevent metering from being a barrier to changing suppliers
- Support cost-effective and efficient business processes
- Be feasible to implement
- Address the minimum functional/business requirements
- Promote statewide uniformity

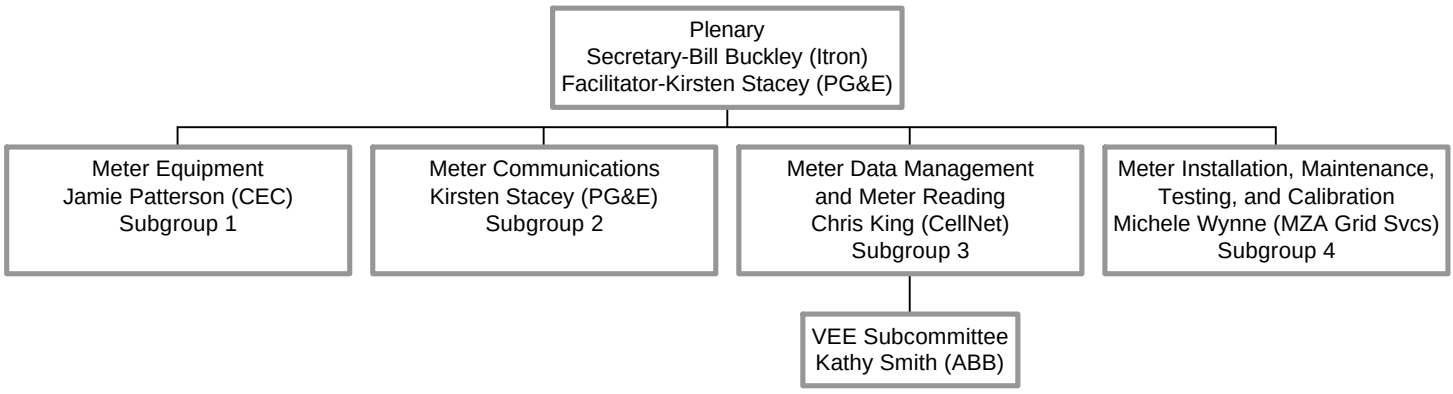
II.2 Organization/structure/meeting frequency

The PSWG established four subgroups, each dealing with a different technical area of review. The Meter Data Management subgroup also created a technical subcommittee to address validating, editing, and estimating of usage data. The four subgroups are:

1. Meter Equipment Subgroup—Chair, Jamie Patterson (CEC)
2. Meter Communications Subgroup—Chair, Kirsten Stacey (PG&E)
3. Meter Data Management & Meter Reading—Chair, Chris King (CellNet)
   Validating, Editing, and Estimating Subcommittee—Chair, Kathy Smith (ABB)
4. Meter Installation, Maintenance, Testing, and Calibration—Chair, Michele Wynne (MZA Grid Services)

A separate subcommittee, chaired by Augie Nevolo (EPRI), was created to investigate the issues of national coordination and the ongoing review of evolving standards that may apply to California and to suggest a process for changing applicable standards after permanent standards are approved by the CPUC. (See Appendix E)

The group agreed that the Plenary (full PSWG membership) would address unresolved issues, vote on final recommendations, address questions or requests from the subgroups, and review business requirements. The facilitator for the PSWG Plenary was Kirsten Stacey (PG&E) and the secretary was Bill Buckley (Itron). The four subgroups met once every two weeks for half a day each. Once a month, the PSWG Plenary convened to monitor overall progress and vote through the items recommended by the subgroups for the CPUC's approval. Additionally, several side groups held conference calls and/or worked on issues via the Internet.



The Office of Ratepayer Advocates (ORA) provided an e-mail website, administered by Jim Price, for an "e-mail exploder" for distribution of documents. E-mails sent to this exploder were distributed to all PSWG members and other subscribers who were interested in the process. On June 29, 112 individuals were subscribed to the exploder representing 64 organizations. This communication tool greatly enhanced information exchange and allowed entities, who could not participate in the PSWG by attending meetings, to stay informed of developments that might affect them.

The editing process took place over a two week period. The first week, all PSWG participants who were interested, met in San Francisco for all day editing sessions. Participants included entities such as ORA, SDG&E, General Electric, eT Communications, TeCom, Itron, CellNet, PG&E, SCE, CEC, Sierra Pacific, Enron, Phaser, Southern Companies, LADWP, First Point etc. During the second week, editing took place electronically. The new edited version was posted with revisions marked frequently throughout the two week period.

Overall the process was intense and included active input from a minimum of 25 different entities including meter service providers (MSPs), meter data management agents (MDMAs), meter manufacturers, energy service providers (ESPs), Utility Distribution Companies (UDCs), employee representative groups, consumer representatives, and municipal utilities.

II.3 Voting Rules and Membership

On February 29, 1998, the PSWG adopted the following voting and membership rules:

Rule #1 - A quorum consists of a minimum of 50% of the total qualified voting members.

Rule #2 - Meeting attendees may speak to the group only when recognized by the facilitator. Side discussions will not be allowed. Sarcasm is not permitted and is subject to censure.

Rule #3 - Final recommendations to the CPUC will be decided by a two/thirds majority vote of the qualified voting membership. The final report will include a list of everyone who voted and will include any submitted minority reports. The word "consensus" will not be used.

Rule #4 - There will be a single vote for each entity.

Rule #5 - To maintain voting membership, an entity must have representatives at two of the last three meetings. The three meetings will include the current or most recent meeting.

Rule #6 - Membership is open to stakeholders and interested parties (firms or entities, not individuals) defined as manufacturers, government entities, trade organizations, consumer advocacy groups, consultants, utilities, employee organizations and ESPs, MDMAs, UDCs, MSPs. Eligibility for membership is subject to challenges at the PSWG meeting. Consultants can vote only if representing an entity.

Rule #7 - To accommodate parties' desires, a simple majority of parties in attendance is required to approve modification of meeting dates or locations, or other minor issues. These issues are called motions of convenience.

Rule #8 - The four subgroups will have the same voting and membership rules as the PSWG Plenary.

Rule #9 - A two/thirds majority of qualified voting members is required to change Procedures or Voting Rules.

Rule #10 - Proxies are not permitted for non attendees of meetings. However a proxy is permitted for a voting member who attends a meeting, in the event that the member's absence is temporary from that meeting. Such proxies will be submitted to the chair in writing, designating the person who is to vote on behalf of the qualified member exercising the proxy privilege.

Rule #11- A minimum notification of 14 calendar days in advance is required for meeting notifications that will include meeting location, meeting dates, and how to contact the host. Notification will consist of either posting the meeting announcement to the ORA WEB page or to the E-Mail exploder (pswg@dra1.cpuc.ca.gov)

Rule #12 - A minimum notification of 7 calendar days in advance is required for advance meeting agendas. Agendas will include items that are to be voted on. Any agenda is subject to the approval and changes of the membership at the meeting. Notification will consist of either posting the meeting agenda to the ORA WEB page or to the E-Mail exploder. (pswg@dra1.cpuc.ca.gov)

Rule #13 - The Roberts Rules of Order will only be utilized at the facilitator's discretion for handling difficult, or contentious issues. If conflicts occur between these rules and Roberts Rules of Order, these rules will prevail.

Rule #14 - When voting, the qualified members may vote "Yes," "No," or "Abstain." Providing comments or reasons, by the entity voting, is optional. A written minority report or reasons for any vote may be included with the majority report.

Rule #15 - When calculating the two thirds majority, "abstain" votes will not be included (this takes precedence over "eligible voting membership" in rule #3.)

III. Meter Equipment

The PSWG reviewed the applicable national standards and recommended which performance standards should be required for direct access metering. Appendix A identifies the following requirements for direct access meter products including:

- Standards for meter hardware
- Certification and testing requirements for meter products
- Registration and centralized database of DA compliant meter types
- Stickers, sealing and locking hardware
- Labeling manufacturing date on new meter products
- Requirements for rebuilt, retrofit, and repaired meter products

Table 1 of Appendix A shows the standards that the PSWG recommends as minimum performance, accuracy, and safety requirements for all direct access meters and metering equipment to be installed in California. Table 1 also shows additional clarification for tests for ANSI C12.1 [Code for Electricity Metering] and C12.20 [Accuracy Class Meters].

Table 2 of Appendix A shows the standards that the PSWG recommends not be required for any DA meters or metering equipment to be installed in California. These standards are either not performance based standards, are obsolete, or are applicable only to meters and metering equipment that are no longer sold or manufactured.

Below is a description of standards PSWG recommends for the CPUC's approval as permanent standards:

ANSI C12.1-1995 Code for Electricity Metering:
This is the basic accuracy, safety, and performance requirement standard for meters and metering equipment. The ANSI C12.1 standard (as well as ANSI C12.20) left open to interpretation many details that could be defined by purchasers. The PSWG therefore recommends the standard be used in accordance with the requirements of Appendix A, Section II. These additional requirements in Section II of Appendix A are currently or will be required for all UDC meter purchases. Some meters that have not met the requirements of Section II have failed to operate accurately in past meter performance trials within the State.

ANSI C12.7-1993 Requirements for Watt-hour Meter Socket:
The PSWG recommends that meter sockets not be required. But, if a meter is socket mounted, then the socket and the associated meter shall meet the requirements of ANSI C12.7. This is to ensure the accuracy and safe installation of socket mounted meters.

ANSI C12.8-1981 (R1997) Test Blocks and Cabinets for Installation of Self-Contained A-Base Watthour Meters:
This is a safety standard for the unique requirements of A-Base meters. This standard ensures that A-Base meters do not represent an electrical hazard.

ANSI C12.9-1993 Test Switches for Transformer-Rated Meters:
This standard is a safety standard intended to encompass the dimensions and functions of test switches for proper marking and installation.

ANSI C12.10-1997 Electromechanical Watthour Meters:
This standard defines the configuration, accuracy, and performance requirements of electromechanical meters and complements ANSI C12.1-1995.

ANSI C12.11-1987 (R1993) Instrument Transformers for Revenue Metering, 10 kV BIL through 350 kV (0.6 kV through 69 kV NSV):
This standard defines accuracy and performance requirements for Instrument Transformers for metering. This standard will ensure that UDCs continue to install the same accurate metering instrument transformers as they currently install for their own metering needs.

ANSI C12.13-1991 Electronic Time-of-Use Registers for Electricity Meters:
This standard defines accuracy and performance requirements for Time-Of Use (TOU) Registers for Electricity Meters. This standard only applies to meters that have TOU Registers.

ANSI C12.18-1996 Protocol Specification for ANSI Type 2 Optical Port:
The PSWG recommends that optical ports not be required. If a meter has an optical port that is physically identical to an ANSI Type 2 optical port, then the optical port shall

meet all the requirements of ANSI C12.18. Other optical port types are exempt from this requirement.

ANSI C12.20-1997 0.2% and 0.5% Accuracy Class Electricity Meters:
This standard adds additional accuracy and performance requirements to ANSI C12.1 for the class of meters defined in this standard that would otherwise not be covered. The ANSI C12.20 standard (as well as ANSI C12.1) left open to interpretation many details that could be defined by purchasers. The PSWG therefore recommends for purchasing consistency in California, the standard be used in accordance with the requirements of Section II in Appendix A. These additional requirements are currently or will be required for all UDC meter purchases. Some meters that have not met the requirements of Section II have failed to operate accurately in past meter performance trials within the State.

ANSI C37.90.1-1989 (R1994) Surge Withstand Capability (SWC) Test:
This safety standard adds performance requirements to ANSI C12.1 and ANSI C12.20.

ANSI 57.13-1978 (R1987), ANSI 57.13.1-1981 (R1992), ANSI 57.13.2-1991, and ANSI 57.13.3-1983 (R1991) Instrument Transformers:
These are accuracy and safety performance standards to be used in conjunction with ANSI C12.11. This standard will ensure that UDCs continue to install the same accurate metering instrument transformers as they currently install for their own metering needs.

Applicable FCC Regulations:
Meters and associated equipment shall meet all applicable FCC regulations.

PSWG Recommendation: Approve the standards and requirements in Appendix A. (Appendix A, Section I. through VI.)

IV. Interconnection, Open Architecture, and Interoperability

Decision 97-12-048 includes considerable discussion on open architecture and interoperability. The issue is complex and required significant discussions by the PSWG. First the meter communications subgroup created Diagrams A and B to visually describe how meter and meter data systems are interconnected and identify potential areas where interoperability would be feasible. The diagrams are intended to show the connections between functions and layers of possible interoperability. The boxes in both diagrams describe functions, not specific equipment types.

Diagram A shows there are two possible places (represented by small circles) to have open architecture. The first is between the MDM and retail market participant. The second is between the meter and meter reading system. The various connections between the meter, meter mount, and communication device are grouped together in the ellipse and further detailed in the following boxes:

(1) Communication Mechanism
(2) Physical Communication Connection
(3) Meter Device Data Format

(4) Physical Communication Device

Box (1) Communication Mechanism: a communication technology by which information is transported to and from a meter. This includes communication protocol, speed, and medium. The protocol includes 'handshaking' and data format. The speed determines how fast the data are transmitted. The medium is the environment in which the data are transmitted. Examples of these communication technologies are radio, microwave, power line carrier, phone, satellite, cellular, cable, etc.

Box (2) Physical Communication Connection: a gateway through which data or information is transmitted. The connection may be different for each communication technology and is established when communication devices need to communicate or transmit data among each other. Some of the existing physical connections as seen on meters and meter devices are optical port, phone jack, antenna, wires, etc.

Box (3) Meter Device Data Format: data format which defines how data is organized when transported through its gateway to its receiving ends. This data format may be the same as the device data table format inside a meter or meter device or it may be different. This data format is different from the communication protocol of data bits in which each byte or group of data bits is transmitted.

Box (4)Physical Communication Device: the physical hardware of the communication device. The Meter Equipment Subgroup addressed this box and agreed that if the communication device is included within the meter the combined meter / communication device needs to be tested and certified accordingly.

The PSWG agreed not to recommend a standard for Box (1)[1]. The Meter Communications Subgroup focused its discussions on Boxes (2) and (3) and standards (ANSI C12.18 and ANSI C12.19.)

[1] Except for standards defining the Type 2 optical port on the meter, when optical meter reading is used.

Diagram A

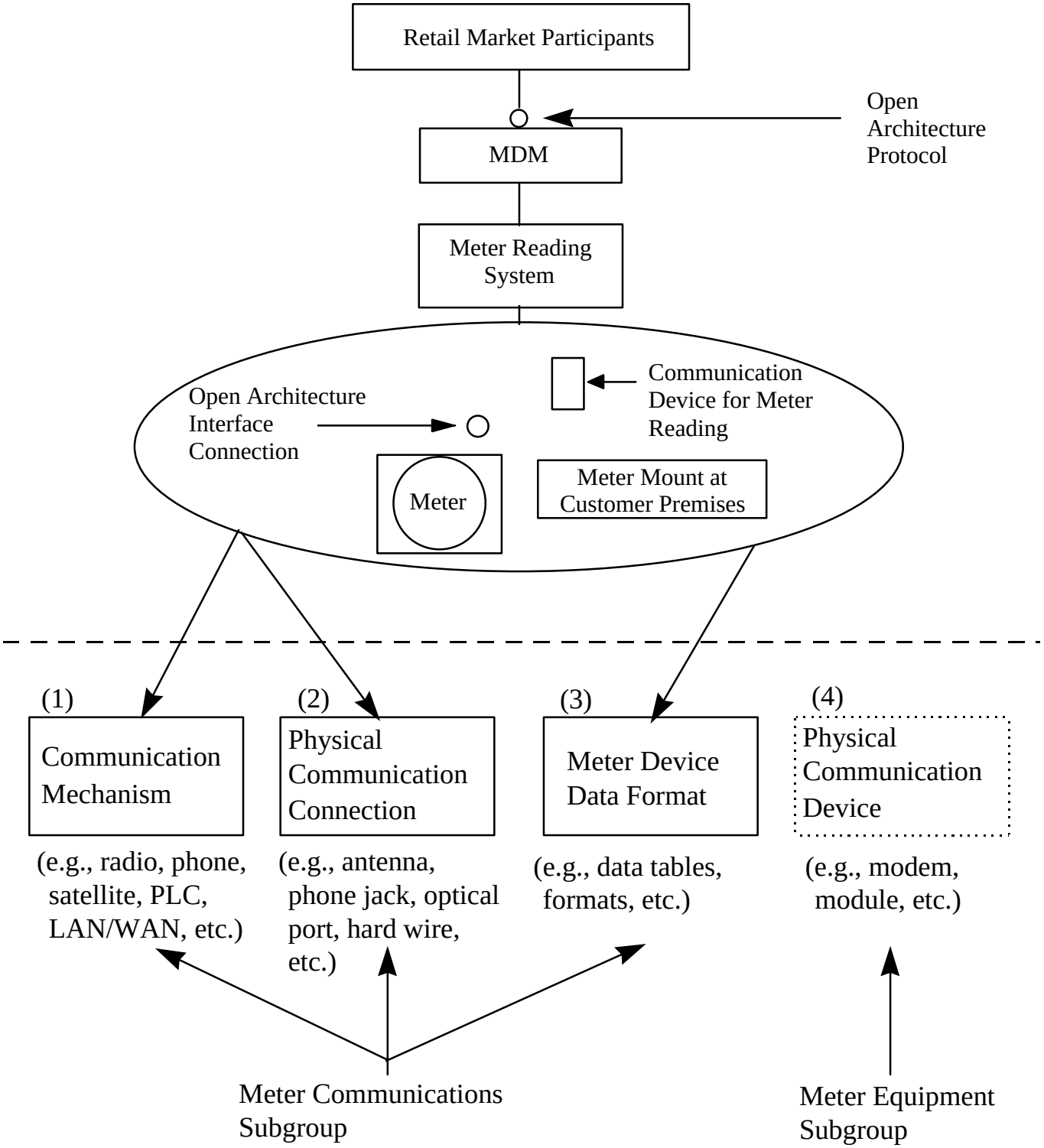

Retail Market Participants
Open Architecture Protocol
MDM
Meter Reading System
Communication Device for Meter Reading
Open Architecture Interface Connection
Meter
Meter Mount at Customer Premises
(1)
Communication Mechanism
(e.g., radio, phone, satellite, PLC, LAN/WAN, etc.)
(2)
Physical Communication Connection
(e.g., antenna, phone jack, optical port, hard wire, etc.)
(3)
Meter Device Data Format
(e.g., data tables, formats, etc.)
(4)
Physical Communication Device
(e.g., modem, module, etc.)
Meter Communications Subgroup
Meter Equipment Subgroup

Diagram B is for illustrative purposes and clarification. It is a further elaboration of the diagram on page 11 of the CPUC Decision D97-12-048. The Meter Communications Subgroup agreed not to identify or recommend standards for every interface level (numbers 1 through 5 in Diagram B).

Interface (1) represents the data communications interface between the key market participants (ESPs, UDCs, Customer, etc.) and the MDMA. Data Communications and data format issues at this interface were assigned to the Meter Data Management and Meter Reading Subgroup (Subgroup 3).

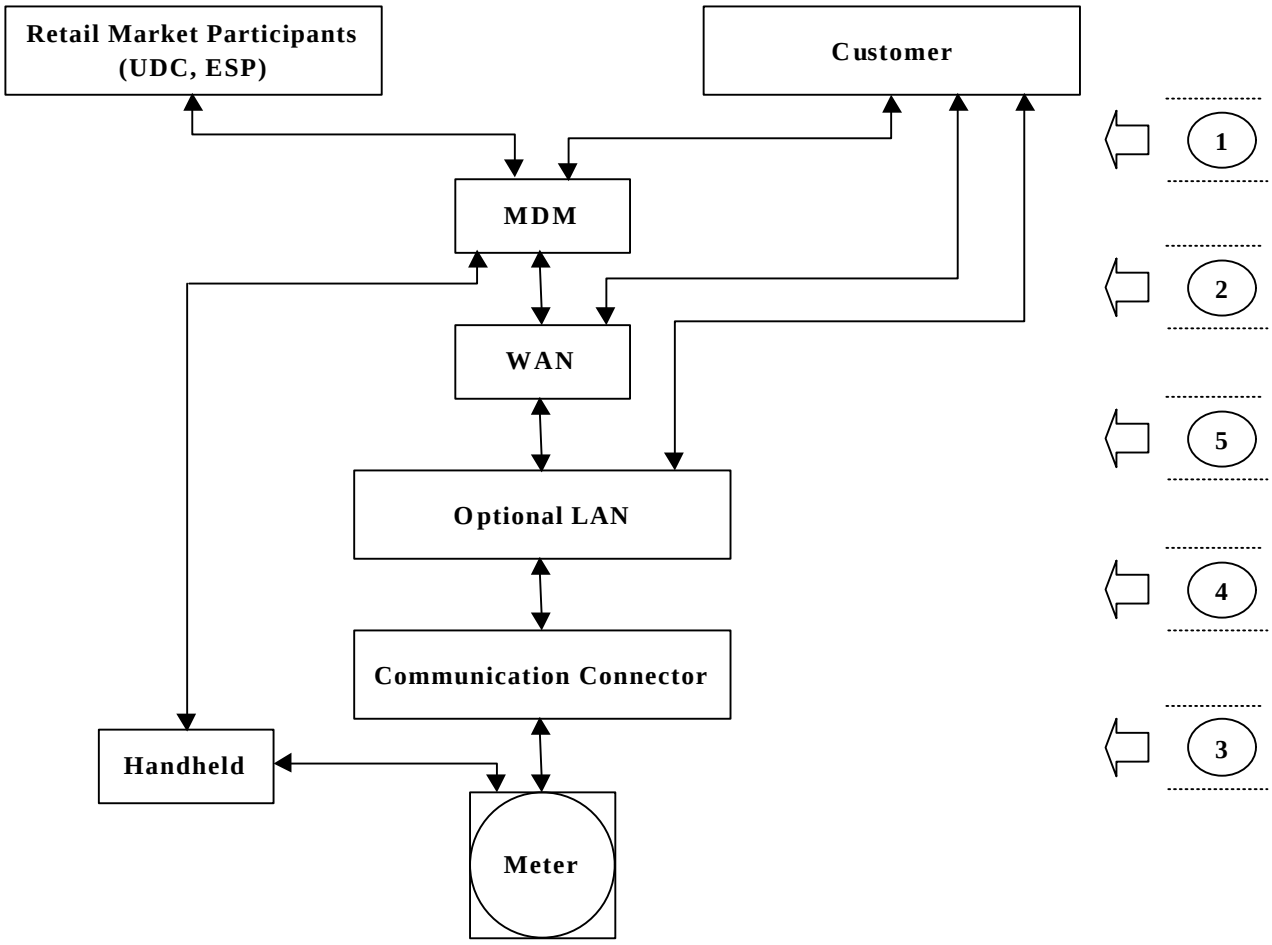
Interface (2) represents the data communications interface between the MDM / Meter Reading function and the Wide Area Network (WAN) System employed. The PSWG decided that it was not necessary to identify data communications standards for this interface. Since this interface is currently within a bundled function, PSWG did not explore any standards. However, if the CPUC elects to unbundle the Meter Reading function from the Meter Data Management function, this interface possibly should be revisited..

Interface (5) represents the data communications interface between the particular WAN technology employed and the Local Area Network technology employed, which served the customer meter. The PSWG agreed that it was not necessary to identify data communications standards for this interface, since there were many potential WAN / LAN configurations possible depending on the communications mechanisms. This is an optional interface.

Interface (4) represents the data communications interface between the particular LAN technology employed (or WAN if LAN is not employed) and the meter communications module. Data Communications and data format issues at this interface were assigned to the Meter Communications Subgroup (Subgroup 2). This is an optional interface.

Interface (3) represents the interface between the meter and the communications modules that connects to the meter reading system (handheld / LAN / WAN). This interface was assigned to the Meter Communications Subgroup (Subgroup 2).

Diagram B



With these diagrams, the group then looked at Decision 97-12-048 which states (findings of fact #9) "[t]he goal of direct access is to facilitate customer choice" and (findings of fact #10) "[o]pen architecture serves as the vehicle for allowing interoperability to take place".

"Interoperability is the ability of dissimilar devices or systems to communicate between each other in such a way that the characteristics of the device or system providing the service to the user of the data are transparent. …In order for different metering systems to communicate with each other, consideration must be given to an open architecture standard. … Open architecture serves as the vehicle for allowing interoperability to take place. Interoperability in turn enables customers to choose from multiple suppliers of electric services the providers that best meet their needs." [2]

[2] CPUC Decision 97-12-048, page 9.

The PSWG discussed the degree of interoperability feasible for direct access, and focused on many existing standards, but not all, to achieve a level of interoperability. After several discussions, the PSWG came to the following conclusions:

- A degree of interoperability is possible and could be achieved at system levels.
- Interchangeability of all discrete components across technologies is not feasible.
- Technology-specific interchangeability requires specifying a standard at every interface and is not practical for all technologies at this time.
- Adoption of some existing communication standards allows some interchangeability within a technology and provides a foundation for the adoption of future communication standards.

The group discussed whether interoperability at the MDM server through the current mandated data format was sufficient such that no further standards are needed. However, the closer interoperability is to the point of measurement, the easier it is for a customer to switch ESPs. Therefore, PSWG elected to define a level of interoperability at interface 3 of Diagram B. Additionally, the PSWG determined that if a standard is mandatory for an interface it cannot be embedded in another interface.

In conclusion, the PSWG recommends that interoperability should be available in the following four areas:

1) MDM:-Output data format. The group recommended migration to Electronic Data Interchange (EDI), a national data format. (Appendix C, Section VII.)
2) Data format tables: - The meter device data format (Box #3 of diagram A) provides a basic interoperability-functional continuity for the market place.-PSWG recommends ANSI C12.19. (Appendix B, Section I.1.)
3) Handshake: Physical communication device Boxes #1 and #2 of Diagram A connect the device and provide the handshake- PSWG recommends ANSI C12.18 for Type 2 optical ports. (Appendix A, Table.I-1)
4) Visual display- PSWG recommends that the meter must have a visual kilowatt hour display. (Appendix B, Section III.)

Alternative Position (by ORA) (Submitted with no editing)

ORA Minority Comments. Re: ORA Vote for IEEE 1397 Architectural Reference model

At the Plenary meeting on June 11,1998, after a prolonged discussion, a vote was held regarding the application of IEEE 1397 Architectural Reference model. The discussion was based on a presentation originally proposed by Bill Rush (Institute of Gas Technology). The purpose of this reference model was to provide a broader generic model representation of the components and

interfaces needed to describe the points where standards can serve to define interoperability.

The ensuing vote defeated the proposal to have the reference model included as a recommendation of the ORA voted for the reference model's inclusion. The prevailing view among PSWG participants was that the two Diagrams, (shown as Diagram A & B respectively in Section III-Interconnection, Open Architecture & Interoperability) conveyed sufficient information to describe a system and its common interface points.

It is ORA's opinion that the inclusion of the IEEE 1397 Architectural Reference model helps to convey a greater technical description to current and future component and systems developers. This understanding can then impact the specific areas where future technical innovation can achieve various levels of interoperability and greatly contribute to customer choice.

The models used by the PSWG identified as Diagrams A & B are a subset of this broader conceptual model and do not contain any reference to the Open System Interconnection (OSI) model. For clarification, the OSI model is an industry standard (used by both ANSI and IEEE) that defines data communication services, in the form of seven distinct layers. The basis for unbundling a technology into these different layers is to allow changes in any one given layer without impacting the remainder of the model. In this way, interoperability can be greatly improved versus not defining a technology based on this OSI reference model.

The section in the PSWG report addressing ANSI C12.18 Optical Port Standard (Section IV.1.1) defines interchangeability at specific layers (physical, data-link and application layers). Unfortunately, nowhere do Diagrams A & B provide any reference to the functions or definitions of these layers or any architectural context . The PSWG diagrams are incomplete in describing a complete communications model that is included in the IEEE reference model. These incomplete specification may result in additional barriers to entry for other providers to facilitate customer choice.

Additionally, the usefulness of this model is the ability to further define future functions and identify interoperability problems at specific points. The model provides a greater framework for addressing specific points where interoperability can be extended to interchangeability. The CPUC has indicated in D.97-12-048 that interoperability is a desire. This understanding helps greatly in addressing product innovation and enable further possible customer choice - a CPUC defined objective of direct Access.

The absence of having a more complete reference model, such as is afforded by the IEEE 1397 architectural model, only means that the PSWG report is lacking a more complete set of technical specifications addressing the issues of interoperability based on industry-recognized OSI standards, thus contributing to a reduction of system compatibility and , ultimately, reduced customer choices.

V. Meter Communications

The PSWG addressed the communication between the meter and the meter reading device and how to facilitate this communication for all settlements. The goal was to provide the customer options without imposing undue expense on the market participants or precluding product innovation. The PSWG identified applicable ANSI standards and made recommendations for requirements to enhance interoperability. The PSWG also made recommendations for requirements regarding meter display, contact output (KYZ), and meter passwords.

Communications Standards for Direct Access

The PSWG reviewed and discussed existing communication standards that would enable a wide number of market participants to access and retrieve data from electric meters. The PSWG makes the following recommendations on meter communication standards to enhance interoperability:

V.1. ANSI C12.18 Type 2 Optical Port Standard (C12.18)

For on-site data retrieval, ANSI C12.18 defines the physical layer, data-link layer, and a portion of the application layer for a Type 2 optical port. It allows interchangeability at these three layers.

PSWG Recommendation: Make C12.18 a requirement for meters with Type 2 optical ports starting June, 1999. (Appendix A, Table I-1)

V.2. ANSI C12.19 Standard Application

The group discussed ANSI C12.19, a data format standard, as a means to achieve a minimal level of interoperability. Below is a description of C12.19, a summary of the discussions held in PSWG meetings, the PSWG recommendation, and additional comments or alternative positions.

Description of C12.19

ANSI C12.19 [The Utility Industry Data Device Table]– 1997 standard is also known as IEEE1377 – 1997 and Industry Canada MC. These three documents are technically identical, developed jointly, and represent a North American standard for Utility Electric, Gas, and Water metering. For this discussion, the PSWG recommending the ANSI C12.19 version of these standards. This document provides a standard format for metering data with flexibility to meet manufacturers' needs which range from simple to complex meter design. The standard provides for new functionality not yet approved (via manufacturer's tables). The three standards bodies (ANSI, IEEE, and Industry Canada) are continuing to meet to ensure that new metering functionality is supported by the standards such that the standards are dynamic and responsive to the North American metering data needs. ANSI C12.19 is "backwards compatible" meaning that the first devices using the standard will always work with communications nodes using subsequent versions of this standard. The standard represents "metering data structure format" which is technically placed in the application

layer (Layer #7 of the OSI communications stack). This allows the data to be carried by many different communications transport mechanisms.

Summary of discussions on C12.19

The PSWG agreed that although the meter should communicate in the format specified by ANSI C12.19 it should not be required to store the data in the ANSI C12.19 format.

The discussion of ANSI C12.19 was quite extensive. The application of ANSI C12.19 alone may not provide a "plug and play" option to the marketplace (i.e., if a customer has a meter which communicates over a microwave frequency and switches to an ESP who reads meter products over the telephone, the meter product will have to be replaced or retrofitted to accommodate the new communications channel.) Additionally, ANSI C12.19 has a table which would allow a manufacturer to program some data in a manner that is proprietary. Another concern was the costs of implementing ANSI C12.19 on the market. Although a market cost evaluation was not feasible, several of the market participants are currently developing meter products compliant with C12.19.

The majority of the group agreed that ANSI C12.19 would create a degree of interoperability that would benefit the marketplace. For example, the PSWG recommended that ANSI C12.18 be approved for meter products with Type 2 optical ports. Meter products with ANSI C12.18 compliant optical ports could switch MSPs/MDMAs transparently. Additionally, telephone modem technology is consistent enough that ANSI C12.19 would also make it largely possible for customers on telephone-read meters to switch ESPs without having to replace their meters. This would also be beneficial to the UDCs in their role of providing default services.

One issue that the group grappled over was the use of ANSI C12.19 for radio frequency technologies. The majority agreed that currently ANSI C12.19 would not be compatible with all radio frequency based technologies. It would have an impact on bandwidth and response times. Also it would increase the message length, making radio frequency transmissions more expensive (unless the manufacturers change bandwidth.) In order to accommodate these challenges, the group considered exempting radio frequency technologies from compliance. The other alternative was to exempt all meter types released before March 20, 2000 for the duration of their commercial product life. This would allow time for the radio technologies to design data communications to ANSI C12.19 and continue selling their current products. The PSWG chose the second alternative.

PSWG Recommendation

Make ANSI C12.19 a requirement for new meter types released after March 20, 2000. Meter products released before that date are exempted for the duration of their commercial product life. (Appendix B, Section I.1.)

Comments and alternative positions on C12.19 (submitted with no editing)

1) Comments (by NERTEC) (submitted with no editing):

NERTEC supports ANSI C12.19 and recommends its adoption by the CPUC.

The rationale is based on NERTEC's conviction that to achieve a fluid, dynamic and deregulated energy market, a minimum of interoperability between metering devices must be obtained.

Some vendors allege that the CPUC should let the market decide which standard, technology or communication protocol (proprietary or not) is best. These vendors want the new market participants to decide whether to use proprietary technology or standard protocols on which they will provide new services.

The fact is, that deregulation of the energy market is to the benefit of the CONSUMERS. And these consumers are not concerned about standards. They are not troubled about ANSI C12.19, nor data tables. All they require is an easy access to their Energy Service Provider (ESP) of their choice. All they desire is to have the capability to change their ESP from time to time. And this means, by changing ESP, being capable, if needed, of changing the Meter Data Management Agent (MDMA), Meter Service Provider (MSP), and other related market participants. The business transfers between market participants must be done with minimum effort, so a good deal of flexibility shall be built-in the metering system. The only way to create the flexibility required to meet the objectives of deregulation is to establish a minimum level of interoperability in Automatic Meter Reading (AMR) equipment.

Achieving interchangeability among AMR products would be ideal, but most likely impossible; because of the amount of standardization required. But between incompatible proprietary products and interchangeable products, there is a whole spectrum of level of interoperability. ANSI C12.19 simply provides a structure for data definitions, format definitions and a common syntax to handle the metering data. ANSI C12.19 does not impose any communications media, in fact it has been designed for simplicity, flexibility, expandability and enables innovations. It fits very simple meters, as well as very complex meters. ANSI C12.19 assures the minimum of interoperability; it should be considered as the foundation for further standard development.

Where NERTEC disagrees with PSWG's recommendation to the CPUC, is the grandfather clause included with the recommendation. Some large AMR vendors (some of which may become approved MDMA in California) are ready to mass deploy proprietary AMR equipment; and facing this situation, NERTEC believes that the grandfather clause should be time limited such as 2 or 3 years maximum. Otherwise, this may impair the interoperability needed.

NERTEC simply wishes that when taking the appropriate decisions, that the CPUC avoids creating technology roadblocks to consumers accessing the new energy market, and promote competition in the metering business.

2) Alternative Position (by California Competition Network, Enron, Schlumberger and Cellnet) (submitted with no editing)

The California Competition Network, Enron, Schlumberger, and CellNet are against making C12.19 a mandatory requirement for all Direct Access meters, for at least four reasons.

First, it is not necessary to make the market work. To the extent such a standard is useful, market participants will drive the adoption of one. Second, it adds cost, the exact amount of which is unknown, because new functionality would have to be added to existing and new products. Third, as the majority report states, C12.19 does not achieve interoperability; it adds one aspect of standardization to the meter interface, but it does not achieve an interoperable standard. Interoperability of meters would require selection of a single communications technology (from telephone, cellular phone, PCS, two-way paging, various Network Meter Reading radio technologies, satellite, etc.) and agreement on the exact implementation of the C12.19 data formats, which, despite the standard, differ in implementation by each manufacturer. To the extent C12.19 does increase the level of standardization, there is not consensus that C12.19 is the right standard, nor even that it is an improvement. Fourth, many of the parties supporting a mandate for C12.19 on ESP-provided meters, including all of the UDCs, voted against a mandate for C12.19 on UDC-provided meters. If it is such a valuable standard for ESPs, it should be even more valuable for UDCs. Whatever reasons the UDCs had for voting that C12.19 not be applied to their own meters clearly would apply as reasons that it should not be applied to ESPs' meters. In sum: C12.19 is unnecessary, adds cost, would be a Commission-selected as opposed to market-driven solution, and has features that the UDCs unanimously agree should not be applied to their own meters.

In addition, the minority parties disagree with the majority's statement that "moving the point of interoperability closer to the customer makes it easier to switch ESPs." Ease of switching has little to do with this factor. Ease of switching depends on maximizing customer convenience and minimizing cost. Proximity of interoperability to the customer is not necessarily related to these two factors, if at all. As an example, the Internet shows that such proximity is unnecessary: it is very easy for two computers to exchange data by connecting them to the Internet and using the interoperability of the Internet; however, if you attempt to plug two computers together locally, it is much more complicated to exchange data. With the Internet, low-cost (nearly free) interoperability results from implementing standards at the system level instead of attempting to force computer makers to make devices that are compatible at the local device level. The same principle applies to meters.

For these reasons, the Commission should not impose a C12.19 mandate on the Direct Access market.

3) Comments (by ORA) (submitted with no editing)

Re: ORA Abstention Vote on ANSI C12.19 Application

At the Plenary meeting on June 11,1998, after intense debate, a vote was held regarding the application of ANSI standard C12.19 for Direct access meters. This standard specifically addresses the format and communication of data tables of metered data. The significance of the adoption of this standard is to provide yet another basic point where minimal interoperability can be achieved.

The adoption of this standard speaks to providing customer choice to consumers by providing a comparable measurement for evaluating metering equipment for direct access selection. Given this functionality, one would think this feature would have been heartily supported by the Office of Ratepayer Advocates (ORA). However, inclusive to the vote item for C12.19 application was language adopting an unlimited "grandfathering" of existing non-compliant equipment. ORA's abstention vote was based on disagreement over the issue of non compliant equipment grandfathering. ORA's position was to allow a time-limited period of , say, 2 - 3 years for metering equipment.

It is ORA's opinion that allowing an unlimited period for grandfathering equipment works contrary to the CPUC's expressed desire to achieve real customer choice via competition. The marketplace will be denied the choices if options are limited because of manufacturers decision to maintain and sell older equipment.

Competition in the new direct access markets will further be constrained because lower cost inadequate meter products will send price signals delaying the migration to newer C12.19 compliant devices. The purpose of achieving a minimum level of interoperability is also seriously compromised by allowing non-compliant meters to have an unlimited life.

ORA believes that the adoption of ANSI and other national standards is essential for the market growth and real customer choice in Direct Access in California. However, ORA's abstention vote signals its serious reservation of allowing an unlimited grandfathering of non compliant devices. ORA believes this feature will work to the detriment of introducing compliant metering devices and creates significant barriers to competition for new technology. Finally, the unlimited extension does not further the creation of any real customer choice in direct access meters. It will, instead, result in consumers paying for inefficiencies of inflexible and fundamentally obsolete equipment which will only later have to be replaced at a consumer and societal cost.

4) Comments (by ABB) (submitted with no editing):

ABB agrees with the PSWG recommendation to adopt ANSI C12.19-1997.

As a participant in the development of ANSI C12.19, ABB wishes to offer an alternate viewpoint to some of the positions presented in the report.

C12.19-1997 was expressly designed to encourage and enhance competition. The committee's goals included:

1. *To reduce the time and effort required to add new and different metering products into utility working inventories. (Individual participants considered reduced costs, but USA standards bodies are not allowed to discuss costs.)*
2. *To free service providers from the need to multiply support equipment and staff by the number of meter vendors used. This specifically includes the ability to use a single software package to perform basic meter setup/programming functions for compliant meters from multiple independent manufacturers.*
3. *To support the widest possible range of metering products under a single data structure standard. (The manufacturing participants ranged from 4 bit microprocessor advocates to those marketing re-packaged PC's as meters.)*
4. *To allow maximum freedom for innovation and product differentiation to the designers of metering equipment while meeting the needs of the utilities and other meter users.*
5. *To focus on transport independence in the data structure. Note that this standard is designed to be useful on multiple transport schemes including:*
   - *Transmit only technologies,*
   - *Optical port protocols,*
   - *Point to point and point to multi-point public and private networks such as telephone, PCS, private radio, etc.*
   - *Network (rf) technologies.*

The report indicates C12.19 does not work well for RF technology. At no time during the deliberations were the data structures modified to limit their application to any media. Rather, advocates for a wide range of technologies participated, and each actively protected their turf. Specifically:

1. *The standard was designed to collapse its structures to meet the needs of the simplest device and yet be expandable beyond any meter in production today. As a result tables that can expand to contain thousands of values easily shrink to a single variable. ABB is only aware of one formal study of this topic, performed by consultant Richard Tucker under a non-disclosure agreement. The manufacturer who commissioned the study agreed that the results could be published as long as the manufacturer's proprietary protocol was protected. In those results the standard tables saved bandwidth over the proprietary data structures without applying Users tables.*
2. *Some setup structures consume slightly more space than those in proprietary structures. Where it occurs it is for two main reasons:*
   a. *First, tables are functionally segmented. For example the demand interval size is not packed in the same table as current clock time or TOU schedule definition. This is to allow vendors the option to select only those functions that they deem marketable. The functional separation prevents them from having to reserve space in a table for functions not included. While this results in a few unused bit locations or "filler", the net result is a more adaptable standard.*
   b. *Second, functions were sized so that known desires of utilities could be accommodated. For example: the term "season" is invoked in some metering circles to change TOU schedules on a monthly basis rather than just in spring, summer, fall and winter. To support this extended use, season is expressed as a 4-bit value rather than just 2 bits. If a manufacturer deems his data structures*

more efficient than the standard tables, he may define his own structure as a manufacturer's table and still comply with C12.19

The report also implies that manufacturer's tables limit or eliminate the interoperability gained by C12.19. C12.19 includes a syntax definition which allows manufacturer unique tables to be described in a common way. While the manufacturer still has the ability to keep "secrets", those who wish to interoperate, can. Manufacturer's tables were meant to allow innovation, efficient product migration and protection of data structures the manufacturer may wish to hold proprietary. In any product, the committee anticipated both standard and manufacturer tables. Use of manufacturer's tables limits interoperability only if AMR and meter support system software continue to be written around the detailed structures of specific meters. C12.19 allows the meter user to "feel" his or her way through a new meter to find data of interest and even to modify parameters that change the way the meter performs (download a new TOU schedule, perform a demand reset, etc.). In order to do this, the software must dynamically adapt to the data structures present. Nertec and at least two other system software providers have proven this technique. These existing tools work equally as well on manufacturer's tables as on standard tables, provided the manufacturer provides a simple text file containing a C12.19 syntax description of those manufacturer's tables he wishes to allow the meter user to exercise. Thus, under C12.19, interoperability is enabled by the standard but may be limited by those manufacturers or software developers who wish to restrict it.

5) Comments (by ITRON) (Submitted with no editing)

ITRON supports the current recommendation in the PSWG report regarding ANSI C12.19.

The current recommendation allows for a smooth and non disruptive migration to implementation of this incomplete and partially flawed standard. With a 2 year holding period, ANSI Committee C12, Industry Canada, and the IEEE may be able to make corrections and improvements that are already in progress and necessary for California and competitive markets across the country.

The current version of C12.19 incorporates mechanisms that describe the features of various electronic meters, but retains the memory mapped data model characteristic of earlier generation electronic meters. This results in a very complex standard that is expensive to support and has several drawbacks:

1- *ANSI C12.19, was not intended to provide, and does not insure or guarantee inter operability. C12.19 incorporates data models for only a portion of the 7th layer (applications layer) of the seven layer OSI model. No other layers of the OSI model are standardized for meter reading, except for some aspects of the optical and telephony physical layers (layer one). The benefits of the C12.19 memory mapped data model at the applications layer is limited to parsing byte mapped data.*

2- *The C12.19 Standard includes a mechanism to contain manufacturer proprietary data maps. By allowing "manufacturer specific tables," proprietary data maps can be*

accommodated by the standard although they are not usable without securing explanations or "rosetta stones" from the manufacturer.

3- *The C12.19 standard was prepared for the traditional utility monopoly market, and was not intended to address issues relating to multiple supplier access, rather it addresses issues related to single utility access to multiple meter types.*

4- *The standard limits some additional service functions from being implemented, such as single bit flags and command/response scenarios.*

5- *Some aspects of the C12.19 discussion are plain attempts to use the standard anti-competitively, i.e. to exclude suppliers from the marketplace.*

6- *As C12.19 in its current form contains mechanisms to describe memory mapped data, it imposes certain overhead in the form of minimum length data items and other constructs which increase the data transmission required to communicate information. This communication overhead carries with it the potential for longer message lengths, more expensive communication, and shorter battery life for battery powered products.*

7- *C12.19 is presently being amended by a joint IEEE/ANSI/Industry Canada series of meetings (called Table Fest). Itron is represented at these meetings and is contributing to the evolution of C12.19 to reflect advances in technology and the changing needs of the marketplace. Clearly the motivation of this meeting is to address perceived deficiencies in the current published revision of C12.19.*

THE NUMBER ONE REASON that blind adherence to C12.19 is not in the best interests of a competitive, open access market, is that it is recognized by the ANSI committee that wrote it as a standard that requires additions and modifications to reflect current technology and market conditions.

Strict adoption of the current version of C12.19 does not obtain the interoperability that the ORA is seeking, and may actually increase metering prices through a combination of restricting access to the market by many equipment vendors, and causing equipment suppliers to incur costs that must be passed along to the ultimate consumer, the utility customer.

Strict adoption of the current form of C12.19 assists those firms who already have some aspects of C12.19 in their product. They are eager to obtain a government fiat to reduce their competition. Mandatory requirement of C12.19 will stifle, not encourage competition.

Additional Communications Standards Discussed but not Recommended

ANSI C12.21 [Protocol specification for Telephone Modem] and C.12.22 [Meter Interface to Network protocol Gateway] were potentially identified for Box #2 of Diagram A. They have not been approved by ANSI.

PSWG Recommendation: ANSI 12.21 and ANSI 12.22 be reviewed when they are approved. (Appendix B, Section I.2.)

V.3. KYZ Contact Output and Consumer Protection Recommendations

PSWG Recommendation: Meters not be required to have a contact output, but if a meter has contact output it should be KYZ per ANSI C12.1. (Appendix B, Section II.1.)

It was noted that many DA customers currently have energy management systems utilizing KYZ outputs.

PSWG Recommendation: DA customers be notified by their ESP if a meter change will not be compatible with their energy management systems. (Appendix B, Section II.2.)

V.4. Visual Meter Read Requirements

Discussion:

The PSWG agreed all DA meters shall have a visual kWh display and must have a physical interface to enable on-site interrogation of all stored meter data. [VI] There are two reasons for requiring a visual meter display: 1) Consumer protection: The consumer can verify that the meter read matches the bill, and 2) Readily accessible on-site meter read and interrogation by an MDMA or UDC when another communications system fails: This would enable entities who are responsible for billing / settlements to obtain the meter read when investigating the communications failure. The PSWG agreed that the dials on a electromechanical meter are sufficient for on-site interrogation.

PSWG Recommendation: An electronic meter must have a visual display of the total kWh energy consumption as a minimum. (Appendix B, Section III.)

Alternative Position (by ABB and Nertec) (submitted with no editing):

ABB and Nertec do not believe the requirement that all meters have a local display is in the consumer's or industry's best interests. The PSWG should recommend the functional requirements necessary to make the market work, but not limit the technology based on today's products. Two reasons for local access to total kWh have been discussed - the customer's need for access to verify their bill, and the UDC's need for access if all other means of obtaining a meter reading fail. Both of these needs could be met today by different technologies. For example, a customer with a solid state meter may prefer the convenience of having a display inside their home or business, or to access the data on their PC, rather than walking outside to read their meter.

Technologies such as CEBus or LonWorks can be used to provide this capability today. A meter could have a local Type 2 optical port that complies with C12.18 and ANSI C12.19, providing standard access at the meter for the UDC to ALL meter data, not just total kWh. ABB and Nertec are not pushing either of these technologies, but desires to point out there are alternate solutions. By prescribing the technology required to meet legitimate customer and UDC needs, the PSWG is limiting product innovation and imposing additional costs on the consumer, who may need to pay for a display both on the meter and in the home or business if that is what he/she prefers.

VI. Meter Data Management/Meter Reader

The PSWG reviewed the interim standards related to meter reading and meter data management and makes the recommendations included in the following sections.

Summary of recommendations:

- Adopt more specific definitions of MDMA functions, separately defining Meter Reading and Meter Data Management
- Allow subcontracting of MDMA functions
- Allow an MSP to subcontract with an MDMA to reprogram meters remotely
- Define specific MDMA support requirements as recommended in this report
- Modify MDMA data availability performance standards to begin with second billing cycle
- Modify the five day MDMA data availability standard to 99.0 percent (99.0%) of accounts
- Recommend estimation procedures for when the MDMA is unable to deliver the data to the server within five days
- Adopt interval and monthly VEE standards
- Migrate to EDI data formats

Discussion:

VI.1. MDMA Business Functions

The PSWG discussed the functions performed by the MDMA and recommends describing them separately as meter reading (MR) functions and meter data management (MDM) functions. This will facilitate approval processes for these functions, especially if they are ever separated. Specific functions are listed in the recommendation in Appendix C, Section I.

VI.2. Subcontracting MDM Functions

Decision D.97-12-048 requires an MDMA to be accepted for all required MDM functions. This does not allow an MDM to easily subcontract functions, or for an entity to specialize in providing a specific MDM function such as meter reading. The PSWG believes that while an MDMA should retain full responsibility for all required MDM functions, it should be able to subcontract sub-functions out to other approved entities. (Appendix C, Section II.)

VI.3. MSP Ability to Subcontract Meter Programming to MDMA

The PSWG recognizes that reprogramming a meter remotely is in some cases more efficient than dispatching a technician to reprogram a meter on site. MDMAs typically have remote communications capability with the meters they read. The PSWG recommends that an MSP should be allowed to subcontract with an MDMA, with respect to its capacity as an operator of a meter communications system, to reprogram meters remotely. The MSP must retain responsible charge over meter reprogramming. (Appendix C, Section III.)

VI.4. MDMA Technical/Business Support

The PSWG discussed the need for the MDMA to provide support to ESPs and UDCs. It recommended required support levels in two areas (Appendix C, Section IV.):

- Technical and business assistance during normal business hours (8am to 5pm Pacific time) to address question and concerns on data availability, corruption and adjustments, and systems technical support.
- Technical assistance via a support pager available 24 hours a day / 365 days a year to address issues of server availability

VI.5. Meter Data Availability Performance Standard

The PSWG reviewed the current performance requirements associated with MDMA timeliness. These performance standards, as established in Decision 97-12-048, Section III, D, 3, e, Interim Standards for Meter Reading, (2) Timelines for Validated Meter Reading: (a) Interval Meter & (b) Non-Interval (Monthly) data, were developed based on current and historical business and retrieval practices. Now that the DA market is fully operational these new business practices and data retrieval functions can be better evaluated.

The particular performance standard at issue (2), (a), (iii), requires "99.99% of all usage data delivered to the MDMA server within five days of the scheduled reading date of the meter," and (2), (b), (iii) “99.99% must be available by 6:00 a.m. on the 5th working day after the scheduled meter reading date.”

The hand off between the UDC and ESP at times causes information to be delayed. This problem, related to the customer’s initial switch, will exist in the market for the foreseeable future, and skews the MDMA performance statistics. Since most problems affecting these performance standards occur during the initial switch month (commencing bill), this first month should be disregarded from the performance statistics. The tracking of these statistics for a particular account should begin after one complete billing cycle has ended. (Appendix C, Section V.)

The current timeliness performance standard of 99.99% translates to one missing account in 5,000 would cause an MDMA to be out of compliance. This has proven to be an unreasonable goal and does not reflect the current performance of the

market. The PSWG recommends modifying the 5 day performance standards to 99.0%. As technology changes and new systems and processes impact the market performance, these standards should be reviewed. (Appendix C, Section V.)

Furthermore, there are no defined procedures to address the situation when the MDMA is unable to deliver the data to the server within five days. Currently ESPs and MDMAs will do whatever is necessary to estimate the data and get it to the Scheduling Coordinator (SC). Since there are no guidelines or procedures for this, the process is inconsistent and unreliable. The PSWG recommends that this process be formalized and documented by the market participants (MDMAs, UDCs, ESPs) based on the VEE rules and be included in the VEE standards or other appropriate industry document. This needs to be done as quickly as possible. (Appendix C, Section V.)

The PSWG also discussed other situations in which the MDMA should not be penalized for being unable to read its meters in time to meet the required performance regarding the amount of estimated data. These situations include large catastrophic events and meter failures that are out of the MDMA's control.

The PSWG recommends that the CPUC approve the policy that in the event of a large catastrophe (i.e., hurricanes, earthquakes, etc.) that precludes the MDMA reading meters, the MDMA should estimate and post the data. This estimated data should be reported separately by the MDMA in its performance report, and not be included in any performance penalties assessed against the MDMA. (Appendix C, Section VI.)

The PSWG also recommends that estimated data due to meter failure where the meter is not accurately recording usage should be reported separately by the MDMA in its performance report, and not be included in any performance penalties assessed against the MDMA. (Appendix C, Section VI.)

VI.6. Electronic Data Interchange (EDI)

The PSWG's recommendations for use of EDI are for implementation of subsets of standards developed by the Utility Industry Group (UIG), and for extension of those standards to meet California's needs, through interaction with UIG. The UIG works in the interest of the utility industry to improve the methods of transferring business information through EDI, including representing utilities, their suppliers, their customers, and other interested parties as an Industry Action Group to the American National Standards Institute (ANSI) Accredited Standards Committee (ASC) X12, specifically in the standards-setting process, for their EDI business needs.

Electric end-user meter data transmission in California during 1998 uses the California Metering Exchange Protocol (CMEP), which was developed by Pacific Gas and Electric Company (through consultation with the Meter and Data Access Working Group) and whose applicability is limited to California. CMEP was

developed in order to meet the January 1, 1998 implementation date for California's electric industry restructuring. Its introduction includes the statement: "This protocol is intended for interim use while standards bodies are producing an appropriate replacement."

The PSWG recommends a migration to EDI for meter usage data following the development, by January 1, 1999, of a consistent, statewide implementation guide by all interested parties. Migration to EDI for usage data is to be completed within 12 months after completion of the guide, but no later than December 31, 1999. (Appendix C, Section VII.1.)

In addition, the PSWG recommends that EDI is the preferred standard for all new MDMA transactions. Transactions regarding meter specific information flow should also be developed using EDI. (Appendix C, Sections VII.2 and VII.3.)

VI.7. Validating, Editing, and Estimating (VEE)

The VEE subcommittee held a series of conference calls and meetings to review the Interval VEE Rules 1.3 and develop VEE rules for monthly data. Notices for all meetings and conference calls were distributed to the PSWG email exploder and website, as well as anyone who asked to be put on the mailing list. They were also announced at the joint UDC/MDMA meetings. The meetings and calls were open to all interested parties. Notes for each meeting or call were also distributed to the PSWG email exploder and website, as well as interested parties.

Several principles were developed during the course of the meetings, which apply both to the work this spring as well as to any future work:

- The rules should promote fairness in the marketplace.
- The goal of the rules is to provide quality data.
- Solutions must fit the magnitude of the problem - when evaluating. solutions, the costs must be considered against the frequency of occurrence and the quality of the data.
- Modifications to the rules should typically be required when they result in a significant improvement in the data quality.
- When modifications to the rules are made, reasonable implementation plans should be defined allowing time for all parties to comply.
- Variations for different technologies should be allowed where appropriate.

Interval Data

The group reviewed the existing rules in light of market startup, clarified the rules, and addressed situations that were not addressed previously due to time constraints. The detailed rules are included in Appendix C-VEE, Section A. Major changes and clarifications include the following:

- Spike check threshold - For very low usage customers, a valid pulse count of a few pulses may result in failing the spike check. An optional minimum threshold was added to allow MDMAs to automate checking for this condition and passing the data.
- kVARh check threshold - For very low usage customers, a valid pulse count of a few pulses may result in failing the kVARh check. An optional minimum threshold was added to allow MDMAs to automate checking for this condition and passing the data.
- Use of partial days as reference data for estimation - Days containing less than 24 hours of good interval data may be used as reference data to estimate data for other days
- Use of days containing power failure as reference data for estimation - Days in which a power failure occurred should not be used as reference data for estimation.
- Use of accurate meter readings to scale estimated intervals - When data is estimated based on historical data, and accurate meter readings or usage are available, the estimated data can be scaled based on the actual usage.
- Simplified proration algorithm (when meter clock is off) - A simpler method to prorate data when the meter clock was off is provided.
- Automating handling of irregular usage customers - Rules are provided to determine which customers have irregular usage, and how special tests can be designed and automated for those customers.
- Test mode intervals - The MDMA may report zero usage during times when a meter was in test mode. The MDMA must not report the test load. If the meter is inadvertently left in test mode, the data will be estimated.
- Clarifying interpretation of reference day selection for estimation - reference days selected as "like" days for estimation are the days chronologically closest to the day requiring estimation, whether that is in historical data or the present billing period.
- High/low usage check - The high/low usage check is always performed on the data that has passed or been verified for previous checks, with no estimated values included. It can optionally be performed on the final data, including estimated values.
- kVARh checks - kVARh checks are only required when kVARh is used for billing.

Only 4 of the above changes were considered required by the group; the rest are optional and may be implemented at the MDMA's discretion. Specific recommendations are included in Appendix C.

The group felt examples and flowcharts would be helpful to new market participants, but did not have time to develop them. Also, the checks should be reviewed for effectiveness after there is more actual market experience; checks

that don't uncover expected problems should be modified or deleted, and checks may need to be added to uncover problems not foreseen when the tests were written.

Monthly Data

The group further defined the monthly validation and estimation rules found in the Commission ruling, as well as defined estimation rules for TOU data. The rules defined include the following:

- Time check of meter reading device/system
- Time check of meter
- High/low usage check
- High/low demand check
- Time-of-Use (TOU) check
- Zero usage on active meters
- Number of dials on meter
- Number of demand decimal places
- Meter identification

The group agreed that the usage for inactive meters check was not the responsibility of the MDMA and should not be required.

Estimation rules were defined for:

- Usage
- Demand
- TOU Usage
- TOU Demand

Recommendations

General Recommendations:

1. Sanction a group to perform ongoing work through the UDC/MDMA meeting process to:
    - Clarify the rules by adding examples, flow charts, and definitions.
    - Review the rules after the market has been operational. Suggest review interval rules 4/99 and review monthly rules 6/99.
    - Put in place a change management procedure should , following the principles outlined in Section VI.7.
2. Eliminate the existing requirement to include the estimation algorithm when the data is posted. Note that data that was estimated for any

reason must always be flagged as estimated.. The MDMA must record and maintain the estimation algorithm as long as it is required to store the data (for the 3 year archive); this information will be made available upon request to the appropriate UDC or ESP. This should be reviewed when the rules are reviewed to see if it is necessary based on market experience.

3. Add an additional required code to CMEP (or other approved format) for verified data. Verified data is data which failed at least one validation check, but was determined to be valid.

Interval VEE Recommendations:

1. Adopt modifications to interval rules as outlined in section 2 of this summary and described in detail in the Interval VEE document.

Monthly VEE Recommendations:

1. Adopt monthly validation and estimation rules as outlined in section 3 of this summary and described in the Monthly VEE document. Note that if this is not done in a timely fashion it may delay the MDMAs ability to enter this market.
2. Establish a group to define rules to convert interval data to billing determinants. Monthly data validation and estimation rules would be reviewed as part of the process to determine any impact.
3. Sanction ongoing work through UDC/MDMA meeting process to:
    - Investigate validation rules for TOU demand and usage
    - Determine what is statistically valid as a minimum density requirement for rules based on similar customers.
    - Determine sample calculations for optional trend factors to incorporate climatic and demographic areas in validation and estimation.
4. Market participants will develop a standardized approach to acceptance testing for monthly data, commencing by 9/1/98.

Alternative Position (by Enron and CellNet) (submitted with no editing)

Enron Energy Service's Comments on The High/Low Range Check Procedure

In the Permanent Standards Working Group (PSWG) Report, procedures are proposed to validate monthly and interval meter data. These procedures are collectively known as the Validation, Estimating and Estimating (VEE) methods. This report identifies two separate procedures to perform high/low range checks on monthly meter data. The first procedure recommended, by PSWG, uses a simple procedure for determining the appropriate high and low limits for validating data. The first procedure for high/low checks sets the high limit to 200% of historical Average

Daily Usage (ADU) and sets the low limit to 40% of historical ADU. The current period ADU is verified to be within this range, otherwise the meter reading must be estimated.

A more complicated procedure (currently used only by PG&E) utilizes valid data ranges based of computation of the mean and standard deviation of ADU using the previous days ADU. This procedure attempts to take into account any abnormal usage patterns that are dependent upon weather, geography, etc. Current billing period ADU values are categorized according to ranges defined by the Mean ± Standard Deviation. Based on these limits, the ranges (low, medium, and high) defined are further subdivided based on ADU values for the previous and current month's billing cycle. Furthermore, this validation procedure contains parameters to adjust the scale of the validation intervals thereby controlling the error rate, i.e. the acceptance rate for monthly data.

This procedure requires a large set of data to define a reasonable statistical sample for the region and day in question. It requires that this data be available for each billing period. Only the UDCs have sufficient information in a database to calculate these important parameters needed for high/low validation. Further, the UDCs statistical sample greatly exceeds the totality of data for all direct access customers. Also, the UDCs are afforded an advantage of using both direct access and bundled customers to form the validation database. This places ESPs/MDMAs at a disadvantage were they to employ the PG&E method. Further, consistency between market participants would be compromised by allowing PG&E to use their current methods. It can be demonstrated that the two methods are inconsistent in that different validation results are obtained with each method. This is shown in the attached spreadsheet where 1 of 19 meter readings require estimation using PG&E's method. For the simpler method, none of the meter readings require estimation.

In order for ESP/MDMA to provide sufficient audit trail of information used in billing calculations, each of the procedures derived by PSWG require implementation. The complicated procedure is used for customers in PG&E's territory and the simple procedure is used for customers in all other territories.

PG&E's claim that changing the validation procedure is difficult because of systems limitation and priorities. However, for monthly data, the validation is performed in hand-held meter reading recording devices. These devices also contain last month's meter reads for the current billing cycle. These data, combined with the proposed range factors should be sufficient to implement the original high/low check proposed in the VEE document. Enron supports the adoption of a single, consistent standard for high/low range check. The adoption of PG&E's current validation method for high/low range check would be inconsistent with this objective. Permanent standards should be applicable to all market participants. {See Attachment 1 for the table submitted by Enron with no editing)

VII. Meter Worker Qualifications, Meter Installation, Maintenance, Testing, and Calibration

This section addresses the permanent standards for the installation, testing, maintenance, and calibration of meters for Direct Access. These recommendations are intended to replace the interim process established by the CPUC in D.97-12-048. The PSWG proposal, Appendix D, covers the following topics:

- Meter worker qualifications and certification
- The minimum procedures and tests to be performed during meter installation and removal
- The standards and frequency of meter testing and maintenance for direct access meters
- MSP certification

Meter Worker Qualifications

To ensure the safe and reliable installation of meters, workers need to have the appropriate training and experience for the different levels of metering work. The PSWG agreed to use as a starting point, the Meter Worker Classes that were developed in the fall of 1997 by the joint parties comprised of ESPs, MSP, and UDCs. The five levels of meter worker classes are summarized as follows:

Class 1	Installation of single phase self contained meters
Class 2	Class 1, plus installation of poly-phase self contained meters below 600 V
Class 3	Class 2, plus installation of transformer rated meters below 600 V and testing of meters with internal diagnostics
Class 4a	Class 3, plus in field testing of single phase meters up to 300 V
Class 4b	Class 4a, plus in field testing of all meters that can be installed by meter worker classes 1-4.
Class 5	Class 4b, plus installation and testing of metering transformers and equipment above 600 V.

Any worker performing direct access meter work must be certified for the class of work performed.

MSPs can issue certifications for meter worker classes 1, 2, and 3 after the CPUC, or a designated entity, has reviewed and authorized the training materials and program. This will allow the MSP to issue certification, as needed, to their workers. Because meter classes 4a, 4b, and 5 involve higher level safety and worker skills, certification will require passing a written and practical exam administered by the CPUC, or designated entity.

The specific details of the meter worker classes are described in Appendix D, Section I.A.

MSP entity certification will continue to be administered by the CPUC.

Meter Installation
The PSWG developed a set of minimum standards and procedures that must be followed during the installation and removal process. These recommendations promote consistency of the installations and enhance safety and reliability. The procedures include Safety, Meter Security and Accessibility, Site Verification, and Meter Install, and are detailed in Section II of Appendix D.

Meter Maintenance
These recommendations cover the frequency and tests required for the routine maintenance of meters. The schedule for meter maintenance recognizes that meters with high usage warrant more frequent testing. The minimum meter maintenance and testing schedule is found in Table III.1-1.

Meter System Testing
Appendix D, Section IV, describes the specific tests that must be performed.

The PSWG unanimously recommends the CPUC approve, as written, all of Appendix D as permanent standards.

Comments (by SCE & CellNet) (submitted with no editing)

SCE's Proposal for Certification of Meter Workers for Direct Access

Southern California Edison supports the meter worker classes and supports a certification process for meter workers. However, the PSWG majority proposal is missing an important element regarding the entity that reviews training materials and performs the practical tests for meter worker classes 4-5. The PSWG proposal simply states the CPUC or CPUC designated entity(ies) perform this function. SCE proposes that this be performed by an advisory board consisting of UDC and MSP representation. This proposal offers the advantage that experts in the metering industry are involved in the review process and promotes consistency in the implementation process.

SCE proposes the following be added to the PSWG recommendation to establish a process for the review of training materials and Class 4-5 meter worker tests.

The Meter Certification Advisory Board
The Meter Certification Advisory Board (MCAB) is granted authorization by the CPUC to administer the authorization process of MSPs' training programs and the certification of Meter Class 4-5 workers. The board has independent decision making ability over the safety of meter installations, however, certain issues will require CPUC approval.

I Responsibilities of the Meter Certification Advisory Board

1. *Reviewing the qualifications and training materials of MSP to perform training of meter worker classes 1-3. Once a MSP receives authorization from the MCAB it can issue individual Meter Worker Classes 1-3 certifications.*

2. *Develop and administer the exam process for Meter Worker Classes 4-5 and determine the process for maintaining certification.*
3. *Institute any changes required in the marketplace relating to safety training or procedures by MSPs and meter workers.*
4. *Manage the de-authorization process for a MSP to issue meter worker certifications and de-certification of Meter Worker Classes 4-5. The CPUC would act to resolve an appeal of any de-certification.*

II *Administration of Responsibilities*
The responsibilities of the MCAB could be performed by hiring a consultant. The MCAB will provide guidance to the consultant to implement the board's responsibilities. If a contract is needed, the board will present it to the CPUC for approval. The cost recovery of the contract would be from fees from MSPs and exam fees.

III *Appeal and Dispute Process*
The CPUC is responsible to resolve any dispute or claim that the MCAB decision were inappropriate or unfair.

IV *Membership of the Meter Certification Advisory Board*
The board consists of highly qualified persons experienced in the electrical metering field. It is necessary that these persons are considered experts to administer the standards of safe and accurate meter installation. Because metering is connected to the electric distribution facilities, representation from the UDCs is required on the MCAB. The MCAB has an equal number of MSP representatives, which are selected by a voting process from MSPs. A chair will be appointed by the CPUC.

VIII. Data Security

Direct Access will require that meter data be processed and communicated between many market players and participants. The new business environment will have many data security risks. As electric restructuring moves to electronic commerce, many of the new risks are unique to this environment. The previous integrated monopoly structure created data and data flows that were not widely shared and was difficult for non-utilities to obtain. In a restructured competitive industry, the value, accessibility, and demand for this data has dramatically increased. The methods through which this data is secured must also change.

Data security has a significant impact on data quality and integrity, and ultimately the market. As such, the perspective should be a complete market view. The Data Quality and Integrity Working Group (DQIWG) is currently evaluating market issues that address the areas of information flows, gaps and overall data integrity. PSWG recommends that the CPUC refer security policy development to the DQIWG. The issues contained in Appendix E are being forwarded to the DQIWG.

IX. Future of PSWG

The PSWG categorized the different areas of work that have been reviewed within this report and recommends that the majority of categories be addressed on a “convene as needed” basis. These would include standards for meter hardware and meter communications, meter calibration, testing and maintenance, meter worker qualifications

and meter installation. However there were other areas, electronic commerce, VEE and MDMA issues that PSWG felt needed to be further developed or calibrated and recommends they continue work in ongoing forums that have been sanctioned by the CPUC. PSWG recommends the CPUC approve Appendix E as the procedure for addressing standards in the future.

Alternative Position (by EPRI) (submitted with no editing)

Minority Report – Future of PSWG submitted by August J. Nevolo representing the Electric Power Research Institute (EPRI)

The PSWG categorized the different areas of work that have been reviewed within this report and recommended that Testing, Calibrations, Electronic Commerce, Validating Editing and Estimating usage data and MDM issues require ongoing work. It was recommended that these areas be assigned to existing ongoing committees such as the Rule 22 committee for resolution.

Several other areas including Meter Communications Standards were categorized as "convene as needed" with the recommendation that that the procedure for reconvening the PSWG would be for any stakeholder to file a petition to modify the CPUC-approved requirements. If the CPUC feels further technical expertise is not needed after receiving and reviewing comments from other entities, the CPUC will issue its decision accordingly. If the CPUC wishes market participants to seek solutions on this issue, it will order the PSWG to reconvene, discuss the issue and make recommendations within a reasonable period.

The process proposed by the PSWG is not consistent with directions provided in the CPUC mandated December 1997 decision. Decision D.97-12-048 states "The PSWG should also indicate whether other standards are expected in the future, and recommend a process for reviewing possible future changes to the permanent standards." There are several meter and data communications standards that will be approved by ANSI, IEC and IEEE that are relevant to direct access in California. ANSI C12.21 and C12.22 are in the final stages of work and will be voted on in the next few months. Likewise both the IEC and the IEEE have completed and are working on a variety of data communications standards applicable to meter communications. These include standards such as those specified in the Utility Communications Architecture (UCA™) and the Manufacturing Message Specification (MMS) – ISO 9506-1, 2 which is used in utility automation and metering applications. In addition, the Distribution Line Message Specification (DLMS) CEN/TC294 WG2/N70E a European standard similar to MMS is directly applicable to metering as are other related data communications standards that are relevant and indeed necessary to ensure interoperability of diverse metering and communications systems in California.

There was insufficient time available during PSWG deliberations to thoroughly identify technical requirements and to review meter and, in particular, data communications standards that would foster interoperability among products and systems deployed in California. More importantly, the data communications standards identified by the PSWG to date, while necessary are not sufficient to ensure a base level of interoperability, which was clearly identified in the CPUC M&DCS December, 1997 decision as a key objective.

Business reasons for continuing to review and assess and select future permanent standards the data communications area for direct access in California.

1. *One of the key reasons for deregulation and unbundling of the electric energy business in California is to foster competition, which in turn will enable the development of innovative products and services and foster customer choice. By not specifying key data communications standards at the interfaces numbered (2) through (5) in Diagram "B" of the report, to a great extent, proprietary standards will be used at these key interfaces. By continuing to examine the key technical requirements at these interfaces and selecting existing data communications standards for these interfaces, where available, the benefits of deregulation and unbundling can be achieved.*
2. *The used of proprietary standards will create a barrier to the use of innovative products and services that could be provided by vendors other than those which provided the initial product or service. In trying to market products involving interfaces that utilize proprietary standards, new vendors will need to build these products to conform multiple proprietary data communications standards increasing costs and fostering a fragmented market place.*
3. *In the deregulated electric energy market place, customers may elect to purchase energy from several ESPs. In turn the ESPs will bundle a set of billing, Meter Data Management, Meter Reading and other products and services. If the ESPs procure products and services that utilize proprietary standards, the customers will tend to be "locked-in" to these products or services. This will tend to limit any future choice the customer may have, as there will be an economic barrier to changing suppliers due to products having incompatible metering and/or data communications standards. New products and services must be procured to meet the new ESPs requirements at costs that in many cases would be unnecessary if national data communications standards were employed at key interfaces.*
4. *The market place for metering products and services will less vibrant than otherwise possible if key interfaces support multiple proprietary data communications standards. This will tend to support the Metering Meter Reading and Communications products and services vendors with a large existing base and limit the entry of new suppliers, stifling the introduction of new and possibly very innovative products and services.*

Recommendation
Form a voluntary group of participants involved in the Direct Access market place and who have participated in the PSWG process. Ideally all entities that participated in the PSWG deliberations should continue to address the issues identified above and to select recommend the adoption of appropriate standards.

Charge this group to:

1. *Identify new or changed technical requirements, which would impact the meter and data communications standards recommended by the PWSG. Assess the impact of these changes on the installed systems and systems to be installed in California based on these standards.*
2. *Identify and assess for possible implementation, new meter and data communications standards that are published or up for final approval from principal national or*

international standards committees such as IEEE, ANSI, IEC and ISO that are relevant to direct access in California.

3. *Prepare recommendations to appropriate standards bodies for enhancement of existing standards or development of new standards.*
4. *Prepare recommendations to the CPUC for the adoption of new standards when a consensus has been reached that adoption would foster a vibrant market place, be of benefit to market participants and customers.*
5. *Work with entities in other states that are actively engaged in electric energy deregulation to support the adoption of national and international metering, data format and data communications standards. Particular attention should be paid to addressing security and the adoption of security architecture with appropriate standards as energy and billing related information will be available at multiple business entities and information will be transported across public networks.*

X. Conclusion

The work completed by the PSWG is significant in many ways, but one primary aspect of its significance resides in the amount of unanimous or near unanimous agreement reached by the various participants. This level of agreement is important for at least three reasons. First, it provides clear direction to the decision making process the CPUC will be undertaking. Second, it is important because it was achieved through a tremendous amount of dialogue and reflects the thinking and cooperation of representatives from all parts of the market. And lastly it is important because the PSWG's work resulted in a speed, breadth and level of agreement that is both unusual and unparalleled in this industry.

In summary, the PSWG recommends that the CPUC take action on the following recommendations made in this report:

Meter Hardware

1. Approve the standards and requirements for DA metering hardware as detailed in Appendix A.

Meter Communications

2. Approve ANSI C12.19 as a requirement for new meter types released after March 20, 2000. Meter products released before that date are exempted for the duration of their commercial product life.

3. Approve recommendation that meters not be required to have a contact output, but if a meter has contact output it should be KYZ per ANSI C12.1.

4. Approve recommendation that ANSI 12.21 and ANSI 12.22 be reviewed when they are approved.

5. Approve requirement that DA customers will be notified by their ESP if a meter change will not be compatible with their energy management systems.

6. Approve requirement that all meters have a visual display of the total kWh energy consumption, as a minimum.

Meter Data Management/Meter Reading

7. Adopt more specific definitions of MDMA functions, separately defining Meter Reading (MR) functions and Meter Data Management (MDM) functions.

8. Approve recommendation that MDMA should be allowed to subcontract sub-functions out to other approved entities while retaining full responsibility for all required MDM functions.

9. Approve recommendation that an MSP should be allowed to subcontract with an MDMA to reprogram meters remotely while the MSP retains responsibility for meter reprogramming.

10. Approve recommended MDMA required support levels in two areas:
    - Technical and business assistance during normal business hours (8am to 5pm Pacific time) to address question and concerns on data availability, corruption and adjustments, and systems technical support.
    - Technical assistance via a support pager available 24 hours a day / 365 days a year to address issues of server availability

11. Modify MDMA data availability performance standards to begin the tracking of these statistics for a particular account after one complete billing cycle has ended.

12. Modify the 5 day MDMA data availability performance standard to 99.0%. As technology changes and new systems and processes impact the market performance, these standards should be reviewed

13. Approve recommendation to rapidly formalize and document a process for the market participants (MDMAs, UDCs, and ESPs) who do not receive data within the five days period so that data provided to schedule coordinator is estimated consistently.

14. Approve the policy that in the event of a large catastrophe (i.e., hurricanes, earthquakes, etc.) that precludes the MDMA reading meters, the MDMA should estimate and post the data. This estimated data should be reported separately by the MDMA in their performance report, and not be included in any performance penalties assessed against the MDMA.

15. Approve recommendation that estimated data, due to meter failure where the meter is not accurately recording usage, should be reported separately by the MDMA in their performance report, and not be included in any performance penalties assessed against the MDMA.

16. Adopt interval and monthly VEE standards as described in Appendix C-VEE

17. Approve recommendation for the plan to migrate to EDI for meter usage data following the definition of a consistent, statewide implementation guide, developed by all interested parties. Migration to EDI for usage data is to be completed by December 31, 1999.

18. Adopt recommendation for EDI to be the preferred standard for all new MDMA transactions. Transactions regarding meter specific information flow should also be developed using EDI.

Meter Worker Qualifications, Meter Installation, Maintenance, Testing, and Calibration

19. Approve meter worker qualifications described in Appendix D, Section I.A., including the requirement that any worker performing direct access meter work must be certified for the class of work being performed

20. Approve meter worker and MSP certification processes described in Appendix D, Sections I.B., I.C., and I.D., including a process for MSP certification of Class 1, 2 and 3 workers and a written and practical exam requirement for Classes 4(A), 4(B), and 5 workers.

21. Approve Appendix D, Section II., as the minimum requirements for procedures and tests to be performed during DA meter installation and removal, which include procedures relating to safety, meter security and accessibility, site verification, and meter installation.

22. Approve Appendix D, Section III. as the requirements for the standards and frequency of meter testing and maintenance for direct access meters.

23. Adopt Appendix D, Section IV., describing the specific tests to be performed during meter testing and calibration.

24. Approve Appendix E as the procedure for addressing future metering and meter related standards changes or needs.

Respectfully submitted,

LINDA L. AGERTER
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By_____
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On Behalf Of
THE PERMANENT STANDARDS WORKING GROUP

PSWG ATTACHMENT 1: TABLE SUBMITTED BY ENRON AS COMMENTS WITH NO EDITING

Current # Customers 19 *Yesterday # Customers =* 11

# of Days in Month 30

Meter Number	Current Usage	Current ADU	Previous Month Usage	Previous Month ADU	Yesterday Usage	Yesterday ADU	Current ADU* Old ADU	Range Check	Plugged # Range Check	Plugged # Meter Reading	PG&E (1) Check	Calculated PG&E(2) Check	PSWG Check
1	125	4.17	135	4.50	147	4.90	18.75	Low	Low	3731	OK-Low	OK-Low	passed
2	275	9.17	250	8.33	145	4.83	76.39	High	High	7475	OK-Hi	OK-Hi	passed
3	114	3.80	142	4.73	145	4.83	17.99	Low	Low	3697	OK-Low	OK-Low	passed
4	178	5.93	165	5.50	205	6.83	32.63	Medium	Medium	4888	OK-Med	OK-Med	passed
5	254	8.47	260	8.67	235	7.83	73.38	High	High	7358	OK-Hi	OK-Hi	passed
6	299	9.97	189	6.30	213	7.10	62.79	High	High	6835	FAILED	FAILED	passed
7	178	5.93	190	6.33	187	6.23	37.58	Medium	Medium	5278	OK-Med	OK-Med	passed
8	158	5.27	136	4.53	168	5.60	23.88	Low	Medium	4176	OK-Med	OK-Low	passed
9	165	5.50	140	4.67	140	4.67	25.67	Medium	Medium	4329	OK-Med	OK-Med	passed
10	235	7.83	255	8.50	187	6.23	66.58	High	High	7033	OK-Hi	OK-Hi	passed
11	218	7.27	235	7.83	200	6.67	56.92	High	High	6500	OK-Hi	OK-Hi	passed
12	110	3.67	119	3.97			14.54	Low	Low	3286	OK-Low	OK-Low	passed
13	98	3.27	105	3.50			11.43	Low	Low	2912	OK-Low	OK-Low	passed
14	85	2.83	129	4.30			12.18	Low	Low	3117	OK-Low	OK-Low	passed
15	169	5.63	110	3.67			20.66	Medium	Medium	3913	OK-Med	OK-Med	passed
16	200	6.67	168	5.60			37.33	High	High	5221	OK-Hi	OK-Hi	passed
17	147	4.90	178	5.93			29.07	Low	Low	4688	OK-Low	OK-Low	passed
18	165	5.50	201	6.70			36.85	Medium	Medium	5281	OK-Med	OK-Med	passed
19	180	6.00	135	4.50			27.00	Medium	Medium	4446	OK-Med	OK-Med	passed

	Current Usage	Current ADU	Old Usage	Old ADU	Yesterday Usage	Yesterday ADU
Sum	3353.0	111.77	3242.	108.	197	65.7

Yesterdays Mean and StDev

To Check PG&E

SWG ATTACHMENT 1: TABLE SUBMITTED BY ENRON AS COMMENTS WITH NO EDITING

	0			07	2.00	
Mean	176.47	5.88	170.63	5.69	179.27	5.98
Std. Dev	59.38	1.98	50.09	1.67	37.16	1.24
Squared		727.99		664.82		404.49

Plug Mean	5.68
Plug Stdev	1.69

	Yesterday ADU Range		Today ADU Range	
Range	**Lower**	**Higher**	**Lower**	**Higher**
Low	0.00	5.44	0.00	5.03
Medium	5.44	6.51	5.03	6.73
High	6.51	8.00	6.73	0.00

	Yesterday Plugged ADU Range	
Range	**Lower**	**Higher**
Low	0.00	4.95
Medium	4.95	6.40
High	6.40	10.00

Meter Number	Current Usage	Current ADU	Previous Month Usage	Previous Month ADU	Current* Previous	Range Check	Previous ADU^2	Current ADU^2
1	125	4.17	135	4.50	18.75	Low	20.25	17.36
2	275	9.17	250	8.33	76.39	High	69.44	84.03
3	114	3.80	142	4.73	17.99	Low	22.40	14.44
4	178	5.93	165	5.50	32.63	Medium	30.25	35.20
5	254	8.47	260	8.67	73.38	High	75.11	71.68
6	299	9.97	189	6.30	62.79	High	39.69	99.33
7	178	5.93	190	6.33	37.58	Medium	40.11	35.20
8	158	5.27	136	4.53	23.88	Low	20.55	27.74
9	165	5.50	140	4.67	25.67	Medium	21.78	30.25
10	235	7.83	255	8.50	66.58	High	72.25	61.36
11	218	7.27	235	7.83	56.92	High	61.36	52.80
12	110	3.67	119	3.97	14.54	Low	15.73	13.44
13	98	3.27	105	3.50	11.43	Low	12.25	10.67
14	85	2.83	129	4.30	12.18	Low	18.49	8.03

Parameters Calculated For Each Range

	Low	Medium	High	Sums
Number of Meters	7	6	6	19
Current Sum	27.9	34.5	49.4	111.77
Current SumSQ	115.7	198.6	413.7	727.99
Old*Current	127.8	180.4	373.4	681.63
Old Sum	31.5	31.4	45.2	108.07
Old SumSQ	144.9	170.7	349.2	664.82
Modified Mean	0.8824	1.0566	1.0692	
Modified STDev	0.6928	1.2691	1.69715	
Hi Range Factor	1.49	1.62	1.58	
Low Range Factor	0.392	0.227	0.278	

15	*169*		*110*	*3.67*	*6*	*Medi*	*13.44*	*31.73*
16	*200*	*6.67*	*168*	*5.60*	*37.33*	*High*	*31.36*	*44.44*
17	*147*	*4.90*	*178*	*5.93*	*29.07*	*Low*	*35.20*	*24.01*
18	*165*	*5.50*	*201*	*6.70*	*36.85*	*Medium*	*44.89*	*30.25*
19	*180*	*6.00*	*135*	*4.50*	*27.00*	*Medium*	*20.25*	*36.00*

Meter	***Current***		***Previous Month***		***Current****	***Range***	***Previous***	***Current***
Number	***Usage***	***ADU***	***Usage***	***ADU***	***Previous***	***Check***	***ADU^2***	***ADU^2***
1	*125*	*4.17*	*135*	*4.50*	*18.75*	*Low*	*20.25*	*17.36*
2	*275*	*9.17*	*250*	*8.33*	*76.39*	*High*	*69.44*	*84.03*
3	*114*	*3.80*	*142*	*4.73*	*17.99*	*Low*	*22.40*	*14.44*
4	*178*	*5.93*	*165*	*5.50*	*32.63*	*Medium*	*30.25*	*35.20*
5	*254*	*8.47*	*260*	*8.67*	*73.38*	*High*	*75.11*	*71.68*
6	*299*	*9.97*	*189*	*6.30*	*62.79*	*High*	*39.69*	*99.33*
7	*178*	*5.93*	*190*	*6.33*	*37.58*	*Medium*	*40.11*	*35.20*
8	*158*	*5.27*	*136*	*4.53*	*23.88*	*Medium*	*20.55*	*27.74*
9	*165*	*5.50*	*140*	*4.67*	*25.67*	*Medium*	*21.78*	*30.25*
10	*235*	*7.83*	*255*	*8.50*	*66.58*	*High*	*72.25*	*61.36*
11	*218*	*7.27*	*235*	*7.83*	*56.92*	*High*	*61.36*	*52.80*
12	*110*	*3.67*	*119*	*3.97*	*14.54*	*Low*	*15.73*	*13.44*
13	*98*	*3.27*	*105*	*3.50*	*11.43*	*Low*	*12.25*	*10.67*
14	*85*	*2.83*	*129*	*4.30*	*12.18*	*Low*	*18.49*	*8.03*
15	*169*	*5.63*	*110*	*3.67*	*20.66*	*Medium*	*13.44*	*31.73*
16	*200*	*6.67*	*168*	*5.60*	*37.33*	*High*	*31.36*	*44.44*
17	*147*	*4.90*	*178*	*5.93*	*29.07*	*Low*	*35.20*	*24.01*
18	*165*	*5.50*	*201*	*6.70*	*36.85*	*Medium*	*44.89*	*30.25*

Parameters Calculated For Each Range

		Low	***Medium***	***High***	***Sums***
	# of Meters	*6*	*7*	*6*	*19*
	Current ADUSum	*22.6*	*39.8*	*49.4*	*111.77*
	Current SumSQ	*88.0*	*226.4*	*413.7*	*727.99*
	Old*Current	*104.0*	*204.3*	*373.4*	*681.63*
	Old ADU Sum	*26.9*	*35.9*	*45.2*	*108.07*
	Old SumSQ	*124.3*	*191.3*	*349.2*	*664.82*
	Modified Mean	*0.8362*	*1.0679*	*1.0692*	
	Modified STDev	*0.4496*	*1.1731*	*1.6975*	
	Hi Range Factor	*1.33*	*1.58*	*1.58*	
	Low Range Factor	*0.583*	*0.277*	*0.278*	

19	*180*	*6.00*	*135*	*4.50*	*27.00*	*Medium*	*20.25*	*36.00*

PSWG ATTACHMENT 2: LIST OF ORGANIZATIONS AND REPRESENTATIVES PARTICIPATING IN THE PSWG

Table XI below lists several organizations and their representatives who attended in one or many of the PSWG or PSWG Subgroups meetings:

Table XI: List of Organizations and Representatives Participating in the PSWG

Organization	Representative	Email Address	Phone
ABB	Ted York	Ted.k.york@ustra.mail.abb.com	919-212-5051
ABB	Ron Pate	ron.d.pate@ustra.mail.abb.com	919-212-5077
ABB	Kathy Smith	kathy.smith@ustra.mail.abb.com	919-233-5632
ABB	Patrick Corrigan	pat.m.corrigan@ustra.mail.abb.com	919-212-5071
Anderson Consulting	Rob Newman		
Applied Metering Technologies	Mario Natividad	marionat@gte.net	562-464-9555
Alta Vista Systems	Ulrike Mengelberg	ulrike@ketw.com	503-281-7891
Apsun	Sung Suh	slsuh@menlotech.com	650-324-4843
Audit Pro.	Tim Jannott	ttimebg@aol.com	415-678-2960
Calif Comp Net	Eric Woychik	estontegy@compuserve.com	510-635-2359
CEC	Lorenzo Kristov	lkristov@energy.state.ca.us	916-654-4773
CEC	Jamie Patterson	jpatters@energy.state.ca.us	916-657-4819
CEC	Mike Jaske	mjaske@energy.state.ca.us	916-654-4777
Cellnet	Andrew Madden	andrew.madden@cellnet.com	650-508-6175
Cellnet	Chris King	chrisk@cellnet.com	650-508-6017
Connext	Bill Lemon	lemonb@connext.com	206-521-2388
Coppers & Lybrend	C. Sherman Severin	csseverin@futurelearn.com	503-870-6406
CPUC / Energy Division	Theo Kemos	tsk@cpuc.ca.gov	415-703-2257
CPUC / Energy Division	Steve Roscow	scr@cpuc.ca.gov	415-703-2818
CPUC / ORA	Anthony Mazy	amazy@cpuc.ca.gov	415-703-3036
CPUC / ORA	Jim Price	scr@cpuc.ca.gov	415-703-1797
CPUC / ORA	Jay Morse	jmorse@cpuc.ca.gov	415-703-1587
CPUC / ORA	Ed Quiroz	caq@cpuc.ca.gov	415-703-2376
CPUC / ORA	Sean Casey	sfc@cpuc.ca.gov	
Cal ISO	Mark Morosky	mmoroskyu@caiso.com	
CCUE	Marc Joseph	mdjoseph@adamsbroadwell.com	650-589-1660
CCUE	Dan Chia	abjlaw@adamsbroadwell.com	650-589-1660
Data and Metering Specialties	Robert Soutner	rsoutner@aol.com	714-903-3204
Data and Metering Specialties	Poly Gomez	datameteri@aol.com	714-903-3204
Eastern Pacific Energy	Michele Wynne	mwynne@uoc.com	310-643-4416

Table XI: List of Organizations and Representatives Participating in the PSWG (continued)

Organization	Representative	Email Address	Phone
E-Mon	Tom Clayton		
E-Mon	Ken Gill	kgill@emon.com	619-483-4505
E-Mon	Arthur Hahn	emonhahn@aol.com	
E-Mon	Don Millstein	dmillstein@emon.com	215-752-2845
EES (Enron)	Cliff Pelchat	cpelchat@ees.enron.com	713-853-0409
ENRON	Mike Anderson	mike.anderson@ees.enron.com	713-853-1825
ENRON	Margaret Rostker	mrostker@gmssr.com	415-392-7900
ENRON	Lee Simmons	lsimmons@ees.enron.com	713-853-9285
EPRI	Bill Blair	bbbair@epri.com	650-855-2173
EPRI(T&NTR)	August Nevolo	anevolo@ccnet.com	415-776-8140
City of Anaheim	Ary Peck	r@www.anaheim.net	719-765-5157x5777
City of Azuza	Ed Beterbide	etbyrp@gte.net	626-812-5208x5368
City of Azuza	Clark Getty	cgetty@azuza.ca.gov	626-812-5217
County of Los Angeles	Supot Ying		626-458-3180
County of Ventura	Gerald Williams		805-654-2771
Commonwealth Energy	Bill Kirby	kirbybill@earthlink.net	714-258-0470
Duke Energy	Dan DuBose	dtdubose@duke-energy.com	
eTCommunications	Tom Chen	tchen@etcomm.com	408-557-5355
Firstpoint	Conrad Eustis	conrad_eutis@pgn.com	503-464-7016
Firstpoint	Debra Henwood	debra_henwood@pgn.com	650-577-3110
Firstpoint	Tom Norton	tlnorton@allwest.com	503-425-5142
Firstpoint	C. Sherman Severin	csseverin@futurelearn.com	503-870-6406
Firstpoint	Amos Tsikayi	Amos_Tsikayi@pgn.com	503-425-5148
GE	Pymm Chartrand	chartrpy@schrmt5.sch.ge.com	909-444-5297
GE	Warren Germer	warren.germer@edc.ge.com	603-749-8491
GE	Jack Pazdon	jack.pazdon@edc.ge.com	603-659-5739
IGT / IEEE SCC 31	Bill Rush	rushb@igt.org	847-768-0554
Inner-Tite	Jack Killoran	jfkilloran@aol.com	714-435-1193
ITRON	Bill Buckley	Bill.Buckley@itron.com	509-891-3744
LADWP	Teri Kuniyuki	tkuniy@ladwp.com	213-367-0715
LADWP	David Sweeney	dsween@ladwp.com	213-367-2529
LADWP	Mike Yamada		

Table XI: List of Organizations and Representatives Participating in the PSWG (continued)

Organization	Representative	Email Address	Phone
Landis & Gyr/Siemens	Jeff Francetic	francetic@worldnet.att.net	805-383-4171
Levy Associates	Roger Levy	rogerl47@aol.com	916-487-8559
MZA Grid Services	Michele Wynne	mwynne@uoc.com	310-643-4416
NERTEC	Paul Aubin	paul@nertec.com	514-375-0556
NERTEC	Daniel Pouliot	daniel@nertec.com	514-375-0556
New Energy Ventures	Kay Fujimura	kfujimura@newenergy.com	213-996-6155
New Energy Ventures	Bash Nola	snola@newenergy.com	
Pacificorp	Lauren Pananen	lauren.pananen@pacificorp.com	503-404-6353
Paragon	Joe Hughes	jjhughes@earthlink.net	
PG&E	Duncan Cano	ddc2@pge.com	415-973-4360
PG&E	Gary Ciardella	gac5@pge.com	415-973-1045
PG&E	D. Young Nguyen	dmn5@pge.com	415-973-1686
PG&E	Steve McCarthy	sjm8@pge.com	415-973-3611
PG&E	Tim Vahlstrom	tcv1@pge.com	415-973-1084
PG&E	Kirsten Stacey	ksm8@pge.com	415-972-5958
Phaser	Sean Beatty	spb1@cwclaw.com	415-433-1900
Phaser	Ward Camp	wcamp@mail.pnm.com	505-241-4251
Phaser	Watter Drangmeister	wally@phsr.com	505-241-2869
Phaser	Terry L. Saoler	terry@phsr.com	505-241-2653
Phaser	Ed Young	ed.young@phsr.com	909-885-8969
EMS (forQST)	Kevin Simonsen	kjsimonsen@ems-ca.com	970-259-1748
SCE	David Bernaudo	bernauda@sce.com	562-903-3122
SCE	Jerry Larson	larsonjr@sce.com	714-895-0446
SCE	Paul Nelson	nelsonpd@sce.com	626-302-8453
SCE	Jim Palma	palmaj@sce.com	626-237-0684
SCE	Greg Sheran	sherangb@sce.com	714-895-0435
Schlumberger	George Roberts	groberts@oconee.em.sld.com	770-368-3461
Schlumberger	Marc Lipski	lipski@oconee.em.sld.com	925-461-5140
SDG&E	David Geier	dgeier@sdge.com	619-684-8200
SDG&E	Steve Grady	sgrady@sdge.com	619-654-8242
SDG&E	Al Figueroa	afiguero@sdge.com	619-654-8614
SDG&E	Tom McKenna	tmckenna@sdge.com	619-654-8277
SDG&E	Leslie S. Mercado	lsabin@sdge.com	619-654-8211
SDG&E	Richard Smith	rsmith@sdge.com	619-654-9253
SDG&E	Mike Toby	mtoby@sdge.com	619-636-6819

Table XI: List of Organizations and Representatives Participating in the PSWG (continued)

Organization	Representative	Email Address	Phone
Sierra Pacific Power	Dave Jackson	dj@spp21.sppco.com	702-834-3059
SMUD	Jeff Jacobson	jjacobs@smud.org	916-732-5426
SMUD	Cam Tran	ctran@smud.org	916-732-5947
So. Cal. Gas	Joann Allen	jallen@pacent.com	213-244-5640
So. Cal. Gas	Cathy Chang	tpckc@pacent.com	213-244-4382
So. Cal. Gas	David Malane	dmalan@pacent.com	213-244-3716
So. Cal. Gas	Lenlia Nichols	lnichols@pacent.com	213-244-4382
Southern Company	Richard Tucker	richardaet@aol.com	704-888-2654
Star Data Services	Ross Coles	rcoles@itron.com	
Star Data Services	Marc Keyes	marc.keyes@itron.com	
Star Data Services	Greg Lizak	greg.lizak@itron.com	650-595-7788
State of Calif. Measurment Standards	Steven Cook	scook@cdfa.ca.gov	916-299-3043
Teldata	Jeff Havranek		
TeCom	Rick Silva	rmsilva@tecom.net	813-228-1832
Teldata	Greg Tom	gtom@cruzio.com	408-458-2327