Expanding Metering and Telemetry Options

Revised Technical Straw Proposal

August 16, 2013

Table of Contents

Table of Contents

1   Introduction

The ISO has established technical and business revenue metering and telemetry requirements for resources to participate in the ISO's wholesale electricity markets. Revenue metering allows the ISO to acquire interval resource data for use in the ISO's settlement and billing process. Telemetry allows the ISO to monitor the resource performance in real-time. The revenue metering and telemetry requirements, initially developed for the monitoring and measurement of traditional large generating resources, have changed to accommodate smaller renewable resources as market participants. The ISO recognizes that an opportunity exists to facilitate market participation by an even greater number of distributed energy resources, including dispatchable demand response, energy storage, distributed generation and non-generating resources. For this reason, and in response to stakeholder requests, the ISO is examining how it can expand current metering and telemetry methods while still adequately monitoring and measuring resource participation in the ISO's market.

Real-time monitoring and control of participating generators are vital aspects in the daily operation of the transmission grid under the ISO's control. After the fact metering is essential to ensure accurate market transaction settlements.   The ISO needs to maintain adequate metering and telemetry requirements, but also recognizes the need to accommodate smaller and distributed resources that need to aggregate to meet the ISO's minimum capacity requirements.

With input attained from earlier stakeholder working group meetings, The ISO is advancing five proposals to expand metering and telemetry options for resources participating in the ISO wholesale energy markets. The ISO has divided the proposal into two phases based on the relative complexity and maturity of the technologies involved.

The ISO proposes to include the following proposals in phase 1:
1. Use of internet for telemetry and ISOME meter data bridging to the ISO energy communication network (ECN).
2. Use of internet for telemetry and ISOME meter data transport directly to the ISO.
3. Expand the use of inter-control center communications protocol (ICCP) as an allowable option for the exchange of real time monitoring and control data to the ISO energy management system for telemetry only.

4. Expand the ability for resources to submit settlement quality meter data to the ISO.
5. Remove RIG aggregator resource ownership and location limitations

The ISO plans to implement phase 1 proposals starting in the first quarter of 2014

The ISO proposes to include the following proposal in phase 2:

1. Use of data concentrators to provide distributed energy resource aggregation, data concentration and control signal disaggregation services.

The ISO plans to refine the scoping of the phase 2 proposal in parallel with phase 1 initiative efforts while assessing the time and effort needed to further develop and advance it to an ISO stakeholder policy process. Results of the assessment will be used to determine a schedule for implementation.

While not resolving all stakeholder issues identified issues, the ISO developed these proposals with the aims of maximizing the means for emerging resources to comply with existing metering and telemetry requirements but also minimizing the scope of the ISO market participant's implementation efforts.

2   Background and Overview

In 2012, the ISO facilitated a series of working group meetings to obtain feedback from attendees on their experience and issues with current metering and telemetry requirements. The workshops included market participants, meter installation companies and technical solution providers with working knowledge of current ISO metering and telemetry requirements. Several participants had experience in other organized wholesale electricity markets and shared differences among independent system operators and regional transmission operators in metering and telemetry requirements as well as information about data concentrator service provider models currently employed at other ISO/RTOs.

At the working sessions, participants discussed and evaluated additional configuration options for metering and telemetry to reduce barriers for current resource participation and support emerging business models suited to smaller resources, often interconnecting at the distribution level. These exploratory meetings provided a platform for the ISO to learn about different stakeholder perspectives on perceived barriers to meet existing ISO requirements.

2.1 Working Session Issue Summary

Meeting participants discussed current ISO revenue metering and telemetry requirements for participating generators, participating load, metered sub systems and proxy demand resources (PDR)[1] along with aggregation models currently used for distributed resource visibility. As a result of these discussions, the working group participants documented and published a detailed list of issues for consideration. The detailed list is available at the following website link: http://www.caiso.com/Documents/IssueSummary-MeteringTelemetryWorkshop.pdf . The following table provides a summarized view of these issues and their relation to both metering and telemetry requirements:

| Identified ISO opportunity	Issue detail	Impact to:	
		Metering	Telemetry
Enable service providers to represent resource owners	ISO has limited aggregation capabilities: RIG Aggregator requirements limit who can offer aggregation services. Requirements do not recognize authorized agent of resource owner	✓	✓
Expand Data concentration options	RIG Aggregation is the only data concentration concept currently allowed for telemetry. SC metered entities is the only data concentration concept allowed for metering.	✓	✓
Develop measurement and control signal for multi-location aggregations of a regulation resources	ISO need to consider using and defining indirect regulation signaling, including disaggregation of signal.		✓
Provide additional options to enable fail-over	RIG failover is not available for non-ICCP connections to EMS.		✓
Provide additional protocol and security options	Protocol and secure transport options are limited – ECN is required	✓	✓
ISO Business Practices need to support new business scenarios	ISO applies same business practices for all size/types of resources. Emerging business scenarios may not be supported without requiring exemptions.	✓	✓
Need to consider use of non-revenue metering concepts (enablement of micro-grids, virtual power plants, and smaller distributed resources.)	ISO has not defined method to measure participation of all variations of aggregated resources.	✓	

Table 1 - 2 Issues Summary

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[1] A Load or aggregation of Loads capable of measurably and verifiably providing Demand Response Services pursuant to a Proxy Demand Resource Agreement

2.2   Architecture Working Group Summary

The working group participants established an architectural working team to propose an architecture framework that addressed issues with existing ISO metering and telemetry approaches. This team identified the following proposed "to be" architectures for metering and telemetry:[2]
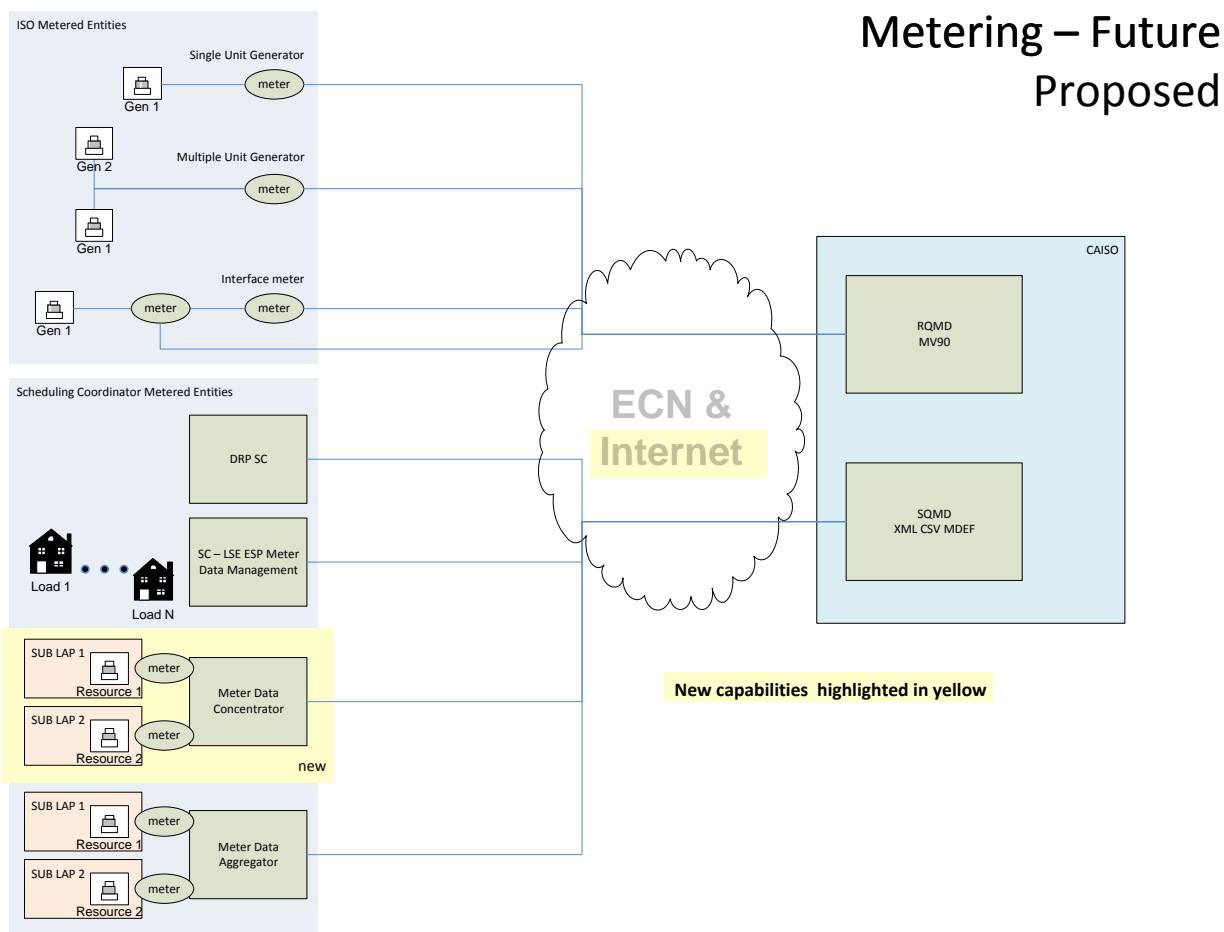
Figure[3] **1 – 2 Metering Architectural Overview**

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[3] Figure is only an architectural illustration for metering and does not fully represent ISO metered entity requirements.
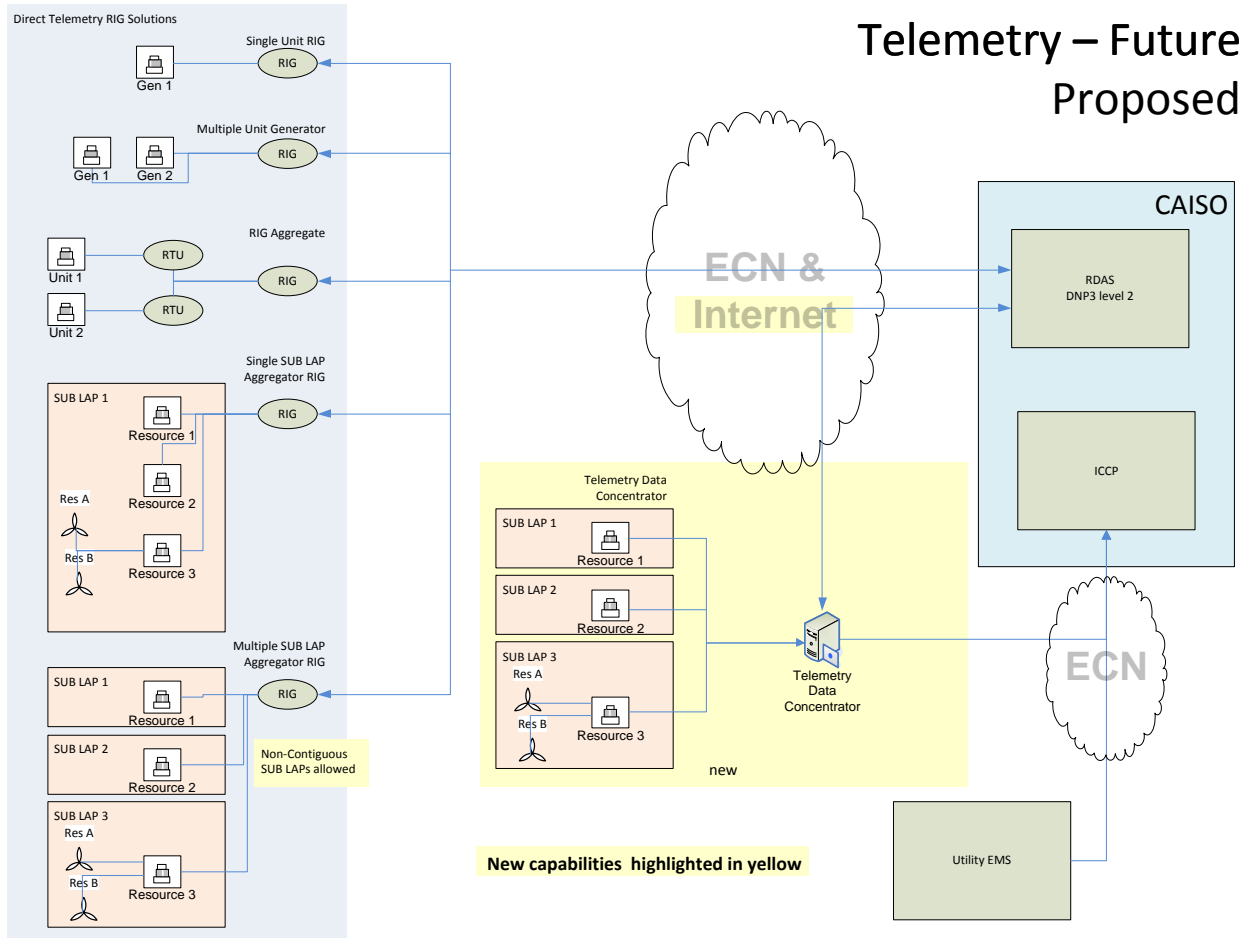
Figure[4] **2 – 2 Telemetry Architectural Overview**

2.3   Business Scenario Working Group Summary

The working group participants also established a business scenario team to identify emerging "participation" business scenarios that current ISO metering and telemetry requirements or business practices may not support. The team identified the following business scenarios[5] for consideration in developing proposals to refine options for complying with ISO revenue metering and telemetry requirements:

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4   Figure is only an architectural illustration for telemetry and may not fully represent ISO telemetry requirements.

5   Business scenarios are specific to participation scenarios and do not represent ISO business scenarios. Additional business scenario detail provided by the working group available at http://www.caiso.com/Documents/Expanding%20metering%20and%20telemetry%20options%20-%20business%20scenario%20working%20group

1. Concentration
2. Flexible Aggregations
3. Calculated Aggregations
4. Statistical Aggregations
5. Sub-metering
6. Shared Participation

3 Completed Expanding Metering and Telemetry Option Stakeholder Engagement

The table below summarizes stakeholder activities completed in 2012 for "Expanding Metering and Telemetry Options". All documents referenced in the table from working sessions and working group meetings including stakeholder comments, notes and presentations are available on the ISO website at the following link:

http://www.caiso.com/informed/Pages/StakeholderProcesses/ExpandingMetering-TelemetryOptions.aspx

Activity	Date
Working Session 1 – presentation of current requirements, future model considerations and development of issues with current metering and telemetry requirements.	August 23, 2012
Working Group Session 2 – review of issues summary, development of solution characteristics and obtain input for proposal/solution development. Working groups developed.	October 9, 2012
Issue summary posted	October 9, 2012
Architecture Working Group Conference Calls	Bi weekly October – December 2012
Business Scenario Working Group Conference Calls	Bi weekly October – December 2012
Stakeholder Conference Call – Review 2012 working group results discuss 2013 stakeholder initiative scope and process	February 6, 2013

Table 1 – 3 Prior Stakeholder Activities

4   ISO objective and scope of the Expanding Metering and Telemetry Option Technical Stakeholder Initiative

The ISO has scoped this initiative in two phases based on relative complexity and maturity of the technologies involved. This approach is intended to help implement less complex efforts more quickly while analysis and stakeholder effort continues on more complex issues. During the initiative process of finalizing proposals through stakeholder review and comment, the ISO may perform a proof of concept (POC) on individual proposals to evaluate their feasibility for implementation. Upon successful completion of a proposals POC the initiative process will continue with full implementation, inclusive of applicable revision updates to the ISO's Business Practice Manuals and tariff development (if required).

Phase 1 will focus on adding flexibility and potentially lower cost options for market participants to meet requirements. Phase 1 will include options covering:

- ✓ Alternative communication transport
- ✓ Additional protocol options
- ✓ Expanding ISO Metered Entity (ISOME) provisions
- ✓ Removing RIG Aggregator limitations

Phase 2 will concentrate on defining roles and responsibilities of a new accepted service capability for concentrating metering and telemetry data from multiple distributed energy resources within a central data center (data concentrator). The ISO anticipates this effort will be more complex to implement, and will require additional stakeholder input for development.

5   Proposals – Phase 1

5.1   Use of Internet for Telemetry and ISOME Meter Data transport

5.1.1   Use of Internet for Telemetry and ISOME Meter Data bridging to the CAISO Energy Communication Network (ECN)

Problem Statement:

The ECN, absent an exemption or exception, is the secure communication transport required for meter data and direct telemetry. Stakeholders have expressed concern that obtaining a direct ECN connection is often cost prohibitive or unavailable for remote and/or smaller distributed energy resources. Non-recurring installation costs are variable and can reach tens of

thousands of dollars due to site specific interconnectivity issues. Additionally, recurring monthly costs range from $240 to $400 based on the requested level of service.

Proposed Solution:

The ISO has negotiated with its current ECN service provider to provide an option to obtain telecommunications access (both to and from) the ECN through the internet. This service option will be available for resources with direct telemetry and meter data communication requirements. Unless necessary to implement this proposal, all other information security requirements would remain effective as set forth in the ISO's Information Security Requirements for the ECN.[6]

This proposal will allow for the use of the internet to provide direct telemetry and meter data from a resource site or remote intelligent gateway (RIG) aggregator to the ISO's ECN. The proposal eliminates the need for a resource to obtain direct ECN connectivity but the ISO will maintain an SSL encryption requirement for telemetry data. Use of this option will require the installation of a Virtual Private Network (VPN) remote access device that would be managed by the ECN service provider in order to obtain connectivity to the ISO secured network.[7]

Illustration:
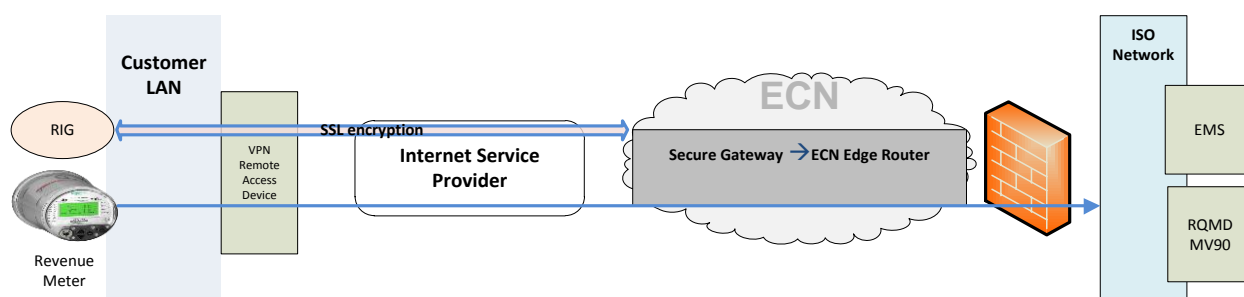
Figure[8] **1 – 5 Internets bridging to ECN**

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[6] See "CAISO Information Security Requirements for the Energy Communication Network (ECN)", http://www.caiso.com/177d/177d93982c5c0.html,

[7] The VPN remote access device connects to secure gateways and ensures authentication, authorization and encryption of the connection through the internet. The ECN service provider manages and maintains these secure gateway(s) and maintains the security of the ECN, including gateway exchange points.

[8] Figure is only an illustration and may not fully represent ISO requirements.

5.1.2 Use of Internet for Telemetry and ISOME Meter Data transport directly to the CAISO

Problem Statement:

The ECN, absent an exemption or exception, is the secure communication transport required for submitting meter data and direct telemetry to the ISO. Stakeholders have expressed concern that obtaining a direct ECN connection is often cost prohibitive or unavailable for remote and/or smaller distributed energy resources. Stakeholders have expressed the need to use a secure, lower cost option that allows them to avoid the ISO ECN connection requirement. Non-recurring installation costs are variable and can reach tens of thousands of dollars due to site specific interconnectivity issues. Recurring monthly costs range from $240 to $400 based on the requested level of service. Additionally, optional use of the internet for direct telemetry precludes a resource from participating in the ISO's regulation market and limits the amount of Spinning Reserve and Non-Spinning Reserve the resource may provide.

Proposed Solution:

This proposal will allow for the use of the internet as a communication method of real time direct telemetry data and ISO metered entity meter data from a resource site or RIG aggregator to the ISO.   This proposal eliminates the need for a resource to obtain ECN connectivity. Telemetry data will maintain the requirement to have SSL encryption with PKI security including the use of a digital certificate. There will be no encryption requirement for the provision of meter data to the ISO over the internet. Unless necessary to implement this proposal, all other information security requirements would remain effective as set forth in the ISO's Information Security Requirements for the ECN.

Illustration:
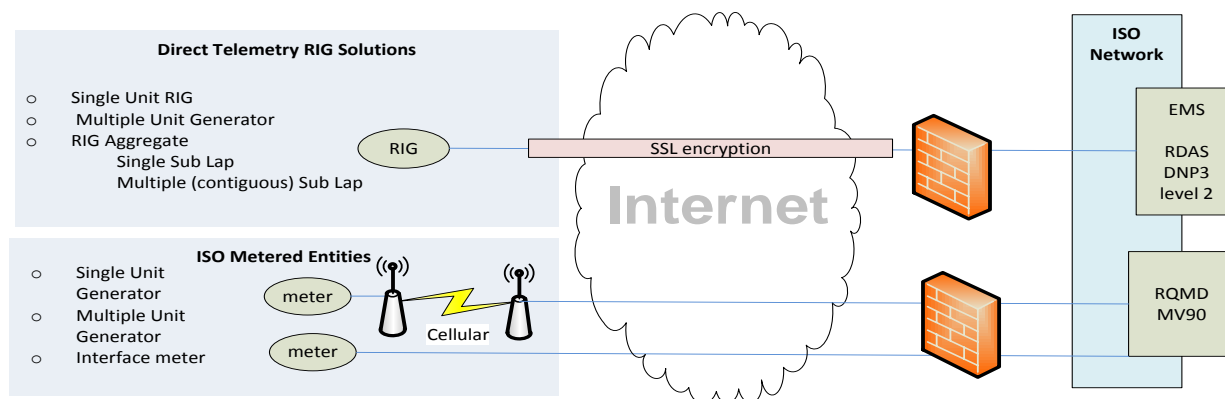
Figure[9] **2 – 5 Internet Data Transport**

Applicability for 5.1.1 and 5.1.2:

Option 5.1.1 would meet ISO metered entity communication requirements for all resource sizes. Option 5.1.2 - providing use of internet without SSL encryption - would be available to meet ISO metered entity communication requirements only for resources that are less than 10 MW in aggregate or individually, as shown in Table 1 - 5.

ISO metered entity option	<10 MW/ Resource	≥ 10 Mw/ Resource
Option 5.1.1	Y	Y
Option 5.1.2	Y	N

Table 1- 5 Internet Option Meter Data Applicability

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9 Figure is only an illustration and may not fully represent ISO requirements.

Use of either option to provide direct telemetry would be available for resources less than 400 MW in size for participation in all services, as shown in Table 2 – 5, with additional limitations for resources certified to provide spinning reserve and regulation.

Options 5.1.1 & 5.1.2	<400 MW/ Resource					
	EIR*	Energy Only**	Non-Spin**	Spin**	Regulation**	RIG Aggregator
Telemetry Data	Y	Y	Y	Y	Y	Y
*Meets Eligible Intermittent Resource (EIR) requirement **Resource size limitation (see Table 3-5)						

Table 2- 5 Internet Option Telemetry Applicability

Due to internet reliability concerns, the ISO is proposing to place a limit on the overall capacity certified to provide regulation services that may use an internet option for direct telemetry. Additionally, the ISO proposes to include a resource size limitation for spinning reserve and regulation to mitigate the impact of losing telemetry for any single resource.

The following table reflects these limits:

Service	Total Certified Quantity (MW)	Resource Size (MW)
Energy Only	None	<400 MW
Non-Spin	None	< 400 MW
Spin	None	$\leq$10
Regulation up	$\leq$50	$\leq$5
Regulation down	$\leq$50	$\leq$5

Table 3 - 5 Telemetry Service Limitations

The ISO proposes to reevaluate the total certified regulation quantity limits within a year of reaching the limit and reconsider all limits after gaining additional experience with resources using the internet option for direct telemetry.

The following characteristics will remain in force under the proposed options but the ISO may employ additional requirements to maintain current standard compliance as noted below:

- Security

    For option 5.1.1

    - o Employs current information security requirements, including logical and physical security, for ISO connected subscribers maintained by the ECN service provider.
    - o ECN service provider manages security, including assignment for each connection to the ECN.
    - o Requires security certificates for telemetry using DNP3 level 2 communications protocol with an SSL encryption.
    - o Unless necessary to implement this proposal, all other information security requirements remain effective as set forth in the ISO Information Security Requirements for the ECN.

    For option 5.1.2

    - o Meter data transported across a public network would be in clear text, resource owners choosing this option would be required to acknowledge, in writing, their acceptance of risk in its use.
    - o Telemetry requires security certificates using DNP3 level 2 communications protocol with an SSL encryption.
    - o Potential for multiple telemetered devices use of a single certificate depending on technology solution
    - o Unless necessary to implement this proposal, all other information security requirements remain effective as set forth in the ISO Information Security Requirements for the ECN.

- Availability

    - o Dependent upon service level for communication and internet service providers.
    - o Must meet daily and weekly meter polling failure rate requirements
    - o Must provide of data indicating signal quality for cellular option
    - o Must meet provisions to establish and maintain telemetry with the ISO Energy Management System in accordance with ISO's business practice manual for direct telemetry, RIG uptime acceptance specifications and ancillary service certification standards, when they apply.

- Redundancy
  - o Meets current communication provisions in accordance with ISO's business practice manual for direct telemetry.

The proposed options provide the following value to participants:

- Reduces setup and monthly cost of providing a direct ECN connection to the ISO for participants required to provide direct telemetry.
- Reduces setup and monthly cost of providing a direct ECN connection to the ISO for participants required to be an ISO metered entity.
- Provides resource owner the opportunity to use internet network access.
- Provides resource owner the opportunity to determine what communication method is used to access the internet.

5.2 Expand the use of Inter-Control Center Communications Protocol (ICCP) as an allowable option for the exchange of real time monitoring and control data to the EMS (telemetry only)

Problem Statement:

ISO requires that resources must have direct telemetry using DNP3 protocol over SSL. Stakeholders have expressed a need to use additional protocol options that better suit their technology platforms and business models.

Proposed Solution:

This proposal will expand the use of the Inter-Control Center Communications Protocol (ICCP) as an allowable communication protocol option for the exchange of real time telemetry data as a concentration of individual distributed energy resources similar to the current RIG aggregation model. This proposal provides an optional industry standardized communication protocol but does not eliminate the need for a direct ECN connectivity.
Unless necessary to implement this proposal, all other information security requirements remain effective as set forth in ISO Information Security Requirements for the ECN.
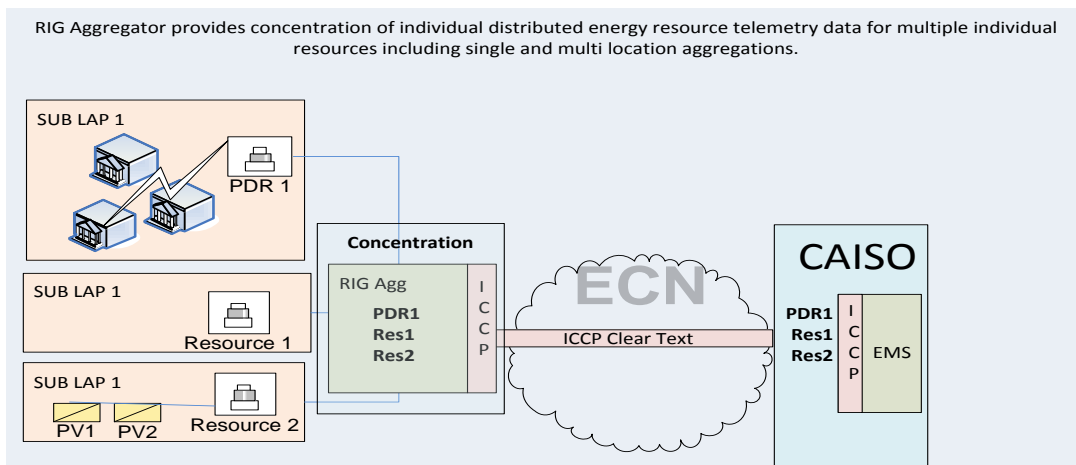
Illustration:

Figure[10] **3 – 5 ICCP Option**

Applicability:

This option is not applicable to metering and is an option only for approved entities representing multiple single-location aggregations or multi-location aggregations of a minimum size.

ICCP was established for bulk transfer of data from control centers to the ISO and was not intended for individual resource direct telemetry connections due to complexity and cost of setup and limited connectivity capabilities. Therefore, this option will be made available only to a concentration of distributed energy resources by a RIG Aggregator, inclusive of demand response providers, with greater than 10 MW of current or developing aggregated resources providing telemetry data. The ISO, in its sole discretion, will evaluate requests for use of ICCP connections based on meeting minimal applicability requirements.

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10 Figure is only an illustration and may not fully represent ISO requirements.

	Total <10 MW	Non-Spin Spin Regulation	Single Resource	RIG Aggregator, DRP		
				Multiple distributed energy resources	Multiple Single-location[11] aggregations	Multi-location[12] aggregation
Direct Telemetry Data	N	Y	N	Y	Y	Y

Table 3 - 5 ICCP Limitations

The ISO is proposing a maximum of 100 ICCP connections by RIG Aggregators to mitigate the costs and capabilities for the use of this alternative protocol. The ISO proposes to reevaluate this limitation within a year of reaching 100 ICCP connections based on an impact assessment of processes and applications required to support the addition of ICCP service requests.

The following characteristics will remain in force under the proposed option, but the ISO may employ additional requirements to maintain current standard compliance as noted below:

- Security
    - Employs current information security requirements, including logical and physical security, for ISO connected subscribers maintained by the ECN communication provider.
- Availability
    - To increase reliability and reduce the risk associated with ICCP traffic, all ICCP communications will continue to require ECN transport.[13]
- Redundancy
    - Same as current ICCP over ECN exchanges.

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[11] For purposes of this paper, single-location aggregation refers to multiple sub-resources within a single location or facility, representing a single resource (i.e. one metered entity).

[12] For purposes of this paper, multi-location aggregation refers to multiple sub-resources, of the same resource type, geographically distributed and therefore telemetered separately, but combined, within a sub-LAP, into a single resource (e.g. proxy demand resource).

[13] See "CAISO Information Security Requirements for the Energy Communication Network (ECN)", http://www.caiso.com/177d/177d93982c5c0.html, section 4.1.

The proposed option provides the following value to participants:

- Provides an option for RIG Aggregators with the ability to exchange a large volume of real-time data and control command communication using ICCP over the ECN.

5.3 Expand the ability for resource owners to submit Settlement Quality Meter Data.

Problem Statement:

All Participating Generators, Participating Loads and Participating Intermittent Resources are required to be ISO metered entities and enter into a Meter Service Agreement. An ISO metered entity must install meters, obtain meter certification, and establish communication channels for the ISO to poll the meter. Stakeholders have expressed concern that this requirement may be burdensome for distributed energy resources and for ISO market resources that reflect an aggregation of physical distributed energy resources.

Description:

This proposal would develop a means to grant a defined set of resources the option to submit settlement quality meter data in a manner comparable to the submission of settlement quality meter data by scheduling coordinator metered entities. Owners for these resources would be required to comply with a set of established metering characteristics, including but not limited to accuracy, equipment standards, tamper resistance and clock/time accuracy. Standardized methods for accurately validating, editing & estimating (VEE) and timely submission of settlement quality meter data would be required and the responsibility of this resource owners to ensure meter data quality. The ISO would examine and develop acceptable criteria based on NAESB and ANSI standards for meter and meter equipment used to meet these characteristics and align with appropriate technical requirements defined in the ISO's business practice manual for metering. In addition, use of this option would require resource owners to develop and submit for ISO approval a quality assurance plan indicating how the entity will securely and accurately install, maintain and recalibrate measurement equipment to ensure that data being produced, collected and used in the development of submitted settlement quality meter data meets accuracy standards.

Applicability:

This option is not applicable to direct telemetry. This option is applicable to resources that are multi location aggregations with sub-resources less than 0.5 MW in capacity and less than 5 MWs in aggregated capacity.

	Total capacity <5 MW & sub-resources <.5 MW	
	Single-location aggregation	Multi-location aggregation
Metering	N	Y

Table 4- 5 SQMD Submittal Applicability

The following characteristics will remain in force under the proposed option but the ISO may employ additional requirements to maintain current standard compliance as noted below:

- Security, Redundancy
    - Same as current use of Settlement Quality Meter Data System infrastructure for submission and access to Settlement Quality Meter Data.

- Availability
    - Must meet provision of settlement quality meter data set forth in section 6.1 of the ISO's business practice manual for metering.

The proposed option provides the following value to participants:

- Enables lower cost metering options to be developed for resources less than 5 MW comprised of multiple distributed units that are less than 0.5 MW in capacity.
- Provides aggregator the ability to develop lower cost methods to obtain meter data from distributed unit endpoints and provide that data to ISO using established processes and practices in place for scheduling coordinator metered entities.

5.4 Remove RIG Aggregator resource ownership and location limitations

Problem Statement:

Currently, a RIG aggregator must be a resource owner that can enter into agreements with other resource owners.[14]   Under the ISO's business practices, the RIG must physically reside within the sub-load aggregation point (Sub-LAP) for the resources it is aggregating. These requirements limit the ability of parties to provide hosted RIG aggregation services, inclusive of demand response providers (DRP), that could be a cost-effective option to meet a distributed energy resource's direct telemetry requirements.

Description:

The ISO's direct telemetry requirements permit the use of a single RIG to provide telemetry for multiple resources, eliminating the need to install a RIG for each resource. This option has proven an effective and lower cost solution for small distributed energy resources and resources aggregated across multiple locations.

This proposal will enable third parties with the ability to provide RIG Aggregator services to resource owners that have authorized them to supply real-time data and serve as the primary means for secure communications and direct control between the owner's resource and the ISO's Energy Management System.   A RIG Aggregator providing services to resources other than those they own will need to execute an agreement with the ISO that binds the RIG Aggregator to applicable requirements in the ISO tariff and Business Practice Manual. Additionally, the RIG Aggregator will be required to provide the ISO with a signed service agent agreement for each resource owner they represent transferring RIG responsibilities to them. RIG Aggregators will be responsible for maintaining all RIG interface systems, communications access to the ISO EMS and secure availability for those resources they represent. Resource owners will continue to remain responsible for all costs and other consequences with the unavailability or inability of the RIG to exchange data with the ISO EMS. Such failure may result

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[14]   RIG Aggregator applicability, responsibility and authorization detailed in CAISO Business Practice Manual for Direct Telemetry http://bpmcm.caiso.com/Pages/BPMDetails.aspx?BPM=Direct%20Telemetry, section 15.

in penalties for failure to perform in accordance with the terms of the ISO Tariff and may include financial consequences to the resource owner.

Requiring a RIG to reside within the Sub-LAP for the resources it is aggregating limits the impact of possible RIG failures to a smaller geographical area due to regional network-related connectivity outages. Stakeholders have expressed concern that this requirement may have discouraged the development of RIG Aggregator service solutions that could mitigate this risk. This proposal would eliminate this requirement with the potential for replacing it with a regional failover requirement.

Unless necessary to implement this proposal, all other RIG aggregation requirements, including technical system interface requirements for a RIG, would remain in effect as set forth in the ISO business practice manual for direct telemetry.

Applicability:

This option is applicable to RIG Aggregators representing distributed connected single or multi-resource location aggregations. The current limit of 25 resources with maximum capacity of 400 MWs per RIG, including the ECN or ISP circuit and router, are maintained.

The following characteristics will remain in force under the proposed option but the ISO may employ additional requirements to maintain current standard compliance as noted below:

- Security
    - Maintained through current options for communication transport from RIG
- Availability
    - Established as role and responsibility of RIG aggregator
- Redundancy
    - Requirements will be based on options used for communication transport from the RIG

The proposed option provides the following value to participants:

- Potential to obtain telemetry setup and services from aggregator at lower cost.

6   Proposal - Phase 2

6.1   Use of Data Concentrators to provide distributed energy resource aggregation, data concentration and control signal disaggregation services

Problem Statement:

California is experiencing rapid growth in the number of resources interconnecting at the distribution level. Enabled by lower cost advancements in technologies, these distributed energy resources (DER) are increasing in their diversity to include distributed energy production capabilities from conventional generation, solar, storage, electric vehicles, as well as, demand response. The potential exists and there is stakeholder demand for these DER technologies to play a role in the reliability of the transmission grid through wholesale market resource participation. To meet ISO's minimum resource capacity requirement of 0.5 MW, these resources must often be aggregated and may consist of large numbers of individual sub-resources which are geographically disbursed at the distribution level. For the ISO to support participating resources comprised of DER aggregations, metering and telemetry technical requirements, business practices, and the ISO tariff, must offer a platform for resource aggregators to securely manage and exchange meter and real time control data on the behalf of these resources.

Description:

This proposal would develop a data concentrator model that would interact with the ISO on the behalf of resource owners to provide meter and real time telemetry data for a number of participating generators and for aggregations of distributed resources. Other ISOs/RTOs have successfully integrated similar models which has allowed aggregators to meet requirements for meter and real time data through the provision of aggregation, data concentration and control signaling services for each distributed energy resource.

A data concentrator providing services to resources other than those they own will need to execute an agreement with the ISO that binds them to applicable requirements in the ISO tariff and business practice manuals. Additionally, the ISO will require a data concentrator to provide the ISO with a signed service agent agreement for each resource owner they represent

indicating transfer of these responsibilities to them. Data concentrators will be responsible for maintaining all interface systems, communications access to the ISO's Energy Management System and secure availability for those resources they represent. Resource owners will continue to remain responsible for all costs and other consequences with the unavailability or inability of the data concentrator to provide meter data or to exchange data with the ISO's Energy Management System. Any such failure may result in penalties under the ISO tariff and may include financial consequences to the resource owner.

The ISO is considering the adoption of a certification process for the role of data concentrators. To do so, the ISO may propose tariff provisions to recognize data concentrator entities capability and obligation to perform certain roles and responsibilities. The certification may require training, testing and demonstration of adequate credit.

Illustration:

Under this proposal, data concentrators interact with the ISO at the data concentration point to provide data for each individual resource they represent.

- Concentration: ISO maintains visibility to and interacts with individual ISO market resources at the data concentration point.
- Aggregation: Aggregations are represented to the ISO as a single ISO market resource and the ISO does not interact directly with the individual resources behind the point of concentration, mapping of any data behind that point is maintained by the data concentrator managing the aggregation.
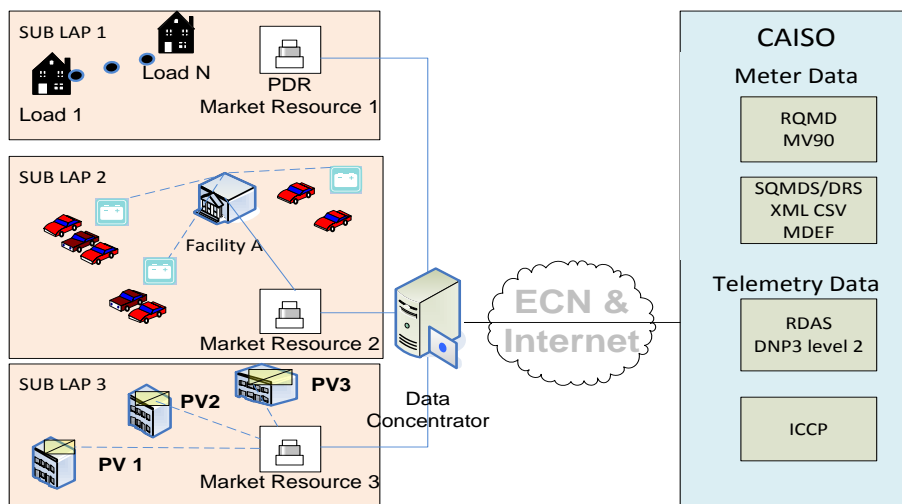
Figure[15] **6 – 1 Data Concentrator interaction**

Applicability:

This option would be applicable to meet the provision of meter data, telemetry data and control signaling for distributed energy resources comprised of single or multi-resource location aggregations. Applicability's for any phase 1 options employed to meet ISO metering and telemetry requirements for the exchange of data and interactions with the ISO are relevant and would be maintained.

The following characteristics will remain in force under the proposed option but may employ additional requirements to maintain current standard compliance as noted below:

- Security
    - Implementation of this proposal will include development of data concentrator security policies to minimize communication risk with data concentrators and assurance that the ISO obtains an accurate representation of the market resource comprised of a data concentrators aggregation of physical resources.
    - May include development of risk profiles based on resource sizes to allow small resources to deploy more cost effective security measures consistent with their level of risk.
    - Security requirements would be established and maintained at the aggregated or concentration points of interaction.
- Availability
    - Availability and timeliness of data provided by data concentrators would be required to meet and maintain current point to point availability standards.
    - Data concentrator provision of data would be subject to same metrics and penalties established for resource owner provision of accurate and timely data.
- Redundancy
    - Requirements will be based on options used for communication transport between the data concentrator and the ISO.
    - Regional failover capability.

The proposed option provides the following value to participants:

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15 Figure is only an illustration and may not fully represent ISO requirements for Data Concentrators.

- Potential to obtain participation services from third party at lower cost including aggregation and exchange of meter, real time monitoring and control data.
- Reduces participant and ISO metering and telemetry costs for resource participation at the distribution level.
- Enables greater number of diverse energy producing technologies the ability to meet metering and telemetry requirements for individual or aggregated ISO wholesale market participation

7 Aggregation

The ISO currently supports a remote aggregation solution for telemetry that allows multiple generating units to provide direct telemetry through a single RIG. Additionally, the ISO business practice manual for direct telemetry allows a RIG Aggregator to combine multiple physical resource locations with the same connectivity node to the grid (a Pnode) within a Sub-LAP and represent its telemetry as a single resource. Under these rules, the ISO may model multiple physical resource locations as a single market resource Pnode location.

ISO polled meter aggregations are currently limited to being aggregated at a site. Phase 1 proposal 5.3 provides a means by which an aggregation across sites or multiple physical resource locations with the same connectivity node within a Sub-Lap could be maintained for meter data aggregation purposes.

Phase I of this initiative proposes to add flexibility and potentially lower cost options for market participants to meet current metering and telemetry requirements. The ISO will continue to explore additional alternatives for metering and telemetry aggregation during phase 2 of this initiative to allow aggregation of physical resource locations with different connectivity nodes to the grid (multiple Pnodes) within a Sub-Lap to be aggregated as a single resource. For ISO market participation, these aggregated resources would require the use of generation distribution factors between the aggregated node to the individual nodes to aggregate or distribute power between Pnodes and the aggregated node. Telemetry would be required for each connectivity node (Pnode).

Further discussion on acceptable resource aggregation of single and multiple locations within a Sub-Lap, including specifics as to how they will be modeled and telemetry requirements will be part of stakeholder discussion for phase 2 data concentrator design elements.

8   Next Steps

Participants should submit written comment on the Expanding Metering and Telemetry Options Revised Straw Proposal paper to MTOptions@caiso.com by September 5, 2013.   The ISO plans to finalize phase 1 proposals and review the included phase 2 data concentrator proposal through a stakeholder conference call on August 28, 2013. Previously submitted stakeholder comments will provide input to finalizing phase 1 proposals and developing a further refined phase 2 scope. The ISO has performed and will continue to perform a proof of concept (POC) on individual proposals to evaluate their feasibility for implementation. The following provides a proposed timetable for the finalization of phase 1 proposals, and continued development of the phase 2 scope. The ISO will consider the results of the phase 2 scoping effort in order to assess the time and effort needed to develop refinements to the current data aggregation capabilities to include data concentration.

Item	Date
Post Straw Proposal (Phase1 items)	April 18, 2013
Stakeholder Meeting (Phase 1 review)	April 24, 2013
Stakeholder Comments Due	May 2, 2013
Post Revised Straw Proposal (Phase 1 items) and discussion of the scope of Phase 2	August 16, 2013
Stakeholder Conference Call	August 28, 2013
Stakeholder Comments Due	September 5, 2013
Performance of individual proposal proof of concept (POC)	Q2 – Q4 2013
Update on Phase 1 implementation Stakeholder Conference Call	October 2013

Appendix A

Terms used in this report	Definition
RIG Aggregator	For purposes of this paper, use of a single RIG or comparable ISO validated system to provide individual resources secure communications of telemetry data and direct control between the generating unit and the ISO's EMS for multiple resources to the ISO.
aggregation/aggregator	Units or locations aggregated to a single ISO resource ID. Individual unit information may be telemetered if included in the network model.
data concentration/data concentrator	Telemetry or meter data available for multiple ISO resource IDs at one point
multi-location aggregation	For purposes of this paper, refers to multiple sub-resources, of the same resource type, geographically distributed and therefore telemetered separately, but combined, within a sub-LAP, into a single ISO resource (e.g. proxy demand resource).
single-location aggregation	For purposes of this paper, refers to multiple sub-resources within a single location or facility, representing a single ISO resource (i.e. one metered entity).
Acronyms used in this document including illustrations	**Description**
ISO	California Independent System Operator Corporation
DNP3	Distributed Network Protocol (communication protocol)
ECN	Energy Communication Network (communication environment)
EIR	Eligible Intermittent Resource
EMS	Energy Management System
ICCP	Inter-Control Center Communications Protocol
ISO	Independent System Operator
MW	Mega Watts
PKI	Private Key Infrastructure (secure connection encryption layer)
RDAS	Remote Data Acquisition System
RIG	Remote Intelligent Gateway
RMDAPS	Revenue Meter Data Acquisition and Processing System
RTO	Regional Transmission Operator
RQMD	Revenue Quality Meter Data
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
Sub-Lap	A CAISO defined subset of pricing nodes within a default load aggregation point
SQMD	Settlement Quality Meter Data
SQMDS	Settlement Quality Meter Data System
SSL	Secure Sockets Layer
TCP/IP	Interface layer for transport and communications network/environment