Expanding Metering and Telemetry Options Technical Stakeholder Initiative

Draft Straw Proposal

April 18, 2013

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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, however, recognizes that an opportunity exists to further facilitate market participation by a greater number of distributed energy resources, including dispatchable demand response, energy storage, distributed generation and non-generating resources, using emerging technologies. For this reason and in response to stakeholder requests, the ISO is examining how it can expand current metering and telemetry methods while still 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. Metering and telemetry requirements need to be upheld in a manner that accommodates smaller and often distributed resources that are often aggregated to meeting ISO's minimum capacity requirements which may be as low as .01 MW.

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

Beginning with Phase 1, an ISO stakeholder review process will be conducted to obtain input on the proposals and guidance on the priority in which these proposals will be implemented. The ISO will then develop the implementation plan and schedule based on internal resource and funding availability. The ISO expects that some proposed options can be implemented by the end of 2013. While the final proposal developed in this stakeholder initiative will address issues that can be resolved with technical solutions, the ISO will document others that require changes

or enhancements to current ISO policies or programs to be addressed in separate ISO stakeholder initiatives.

Phase 2 proposals will continue to be developed in parallel with Phase 1. The proposals for Phase 2 will be documented and advanced to the ISO stakeholder process by the end of 2013 for expected implementation in 2014.

While not resolving all stakeholder issues identified issues, the ISO developed these proposals with the aims of maximizing the means for resources to comply with existing requirements but also minimizing the scope of effort to implement. Additionally, the ISO developed the proposals with the goal of supporting participation by emerging resources in the ISO markets.

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 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 and understand 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 in the development of proposals. The detailed list is available at 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:
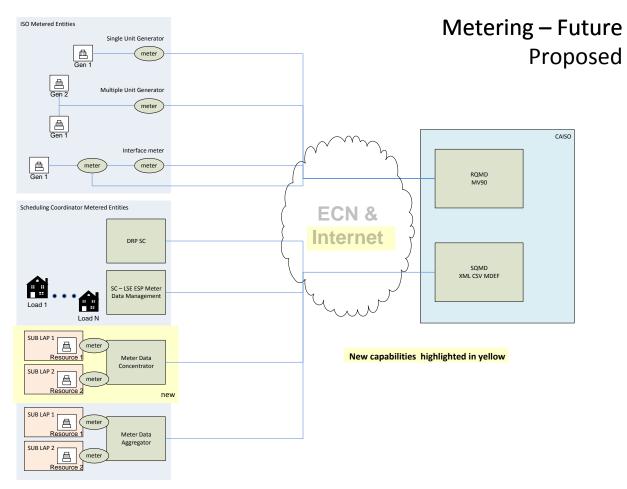
Identified ISO opportunity	Issue detail	Impact to:	
		Metering	Telemetry
Enable service providers to represent resource owners	RIG Aggregator qualifications limits who can offer aggregation and/or data concentrator services. Authorized agent of resource owner not recognized	✓	✓
Expand Data concentration options	RIG Aggregation is the only data concentration concept currently allowed. Only data concentration concept allowed for SC metered entities	✓	✓
Development of measurement and control signal for multi-location aggregations of a regulation resources	Indirect regulation signaling, including disaggregation of signal, needs to be considered and potentially defined	✓	✓
Additional options to enable fail-over	RIG failover is not available for non-ICCP connections to EMS.		✓
Additional protocol and security options	Protocol and secure transport options are limited – ECN is required	✓	✓
ISO Business Practices need to support new business scenarios	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.)	Measurement method for requlation participation of an aggregated resource is not defined	✓	

Table 1 - 2 Issues Summary

2.2   Architecture Working Group 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

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 may not be supported by current ISO metering and telemetry requirements or business practices. 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 engagements 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's objective is to develop and obtain input on the proposals expanding options to meet current metering and telemetry technical requirements that will resolve identified issues while supporting emerging business scenarios. The initiative is for the review and refinement of technical proposals. While the ISO will not be addressing issues that require changes to current ISO policies or programs, these issues will be document so that they may be addressed in separate policy stakeholder initiatives.

The ISO proposes to scope 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 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 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 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.
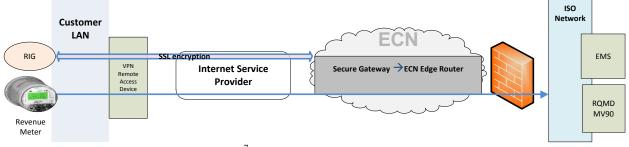
Proposed Solution:

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 will maintain 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.

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

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.

Illustration:

Figure[7] 1 – 5 Internet bridging to ECN

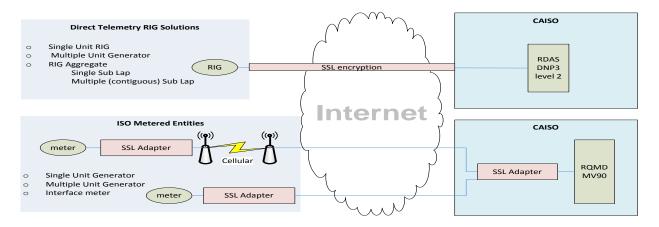## 5.1.2 Use of Internet for Telemetry and Meter Data transport directly to the CAISO with SSL

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.

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

Proposed Solution:

This proposal will allow for the use of the internet as a communication method of direct telemetry 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 but will require SSL encryption of both telemetry and 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[8] 2 – 5 Internet Data Transport

Applicability for 5.1.1 and 5.1.2:

These options would meet ISO metered entity communication requirements for all resource size and service participation.

Direct telemetry use of either option would be available for resources less than 400 MW in size for participation in all services, as shown in Table 1 – 5, with additional limitations for resources certified to provide spinning reserve and regulation.

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

	<400 MW/ Resource					
	EIR*	Energy Only**	Non-Spin**	Spin**	Regulation**	RIG Aggregator
Direct Telemetry Data	Y	Y	Y	Y	Y	Y

*Meets Eligible Intermittent Resource (EIR) requirement
**Resource size limitation (see Table 2-5)

Table 1- 5 Internet Option Applicability

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

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 2 - 5 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 remain supported by the proposed options but may employ additional requirements to maintain current standard compliance as noted below:

- Security

  For option 5.1.1

  - Employs current information security requirements, including logical and physical security, for ISO connected subscribers maintained by the ECN service provider.
  - 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 Requires security certificates for telemetry using DNP3 level 2 communications protocol with an SSL encryption.
- o Requires meter security certificates and SSL encryption of meter data
- o Potential for multiple ISO polled or 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 provisions to establish and maintain telemetry with the ISO Energy Management System (EMS) in accordance with ISO's business practice manual for direct telemetry, RIG uptime acceptance specifications and ancillary service certification standards (when applicable).

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

The following value to participants is provided by the proposed internet options:

- 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 RIG Aggregators (telemetry only)
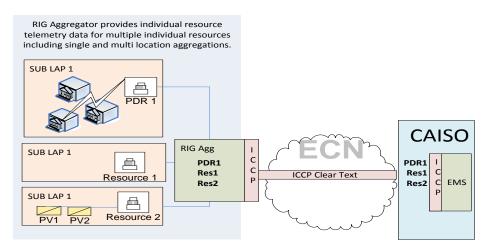
Problem Statement:

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 for real time telemetry data for resources that use a RIG aggregation model.   This proposal provides RIG Aggregators with an optional industry standardized communication protocol but does not eliminate the need for a RIG Aggregator to obtain 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[9] **3 – 5 ICCP Option**

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

Applicability:

This option is not applicable to metering and is an option only for RIG Aggregators 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 point to point individual direct telemetry connections due to complexity and cost of setup and limited connectivity capabilities. Therefore, this option will be made available only to an aggregation of resources by a RIG Aggregator, inclusive of demand response providers, with greater than 10 MW of current or developing aggregated resource telemetry data clientele.   The ISO, in its sole discretion, will evaluate requests for use of ICCP connections based on meeting minimal applicability requirements.

	Total <10 MW	Non-Spin Spin Regulation	Single Resource	RIG Aggregator		
				Multiple resources	Multiple Single-location[10] aggregations	Multi-location[11] 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 an additional 100 ICCP connections based on an impact assessment of processes and applications required to support the addition of ICCP service requests.

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[10] 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).

[11] 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).

The following characteristics remain supported by the proposed option but may employ additional requirements to maintain current standard compliance as noted below:

- Security
    - Employs current information security requirements, including logical and physical security, for CAISO 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.[12]
- Redundancy
    - Same as current ICCP over ECN exchanges.

The following value to participants is provided by the proposed option:

- 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 resources 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 resources that reflect an aggregation of distributed energy resources.

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

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. These resources may still have to comply with a set of meter characteristics, including but not limited to accuracy, meter/equipment standards, tamper resistance, clock/time accuracy, and validating, editing & estimating (VEE) method, all established 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, these resources may be required to develop and submit 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 .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 remain supported by the proposed option but 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 following value to participants is provided by the proposed option:

- Enables lower cost metering options to be developed for resources < 5 MW comprised of multiple distributed units that are < .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.[13] 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 that could be a cost-effective option to meet a 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 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 granted them authorization 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. The RIG Aggregator will need to execute an

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[13] 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.

agreement with the ISO that binds the RIG Aggregator to the applicable requirements in the ISO tariff. Resource owners will continue to remain responsible for providing direct telemetry data and maintaining its availability.

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 single or multi-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 remain supported by the proposed option but 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
    - Based on options used for communication transport from RIG

The following value to participants is provided by the proposed option:
- Potential to obtain telemetry setup and services from aggregator at lower cost.

6 Next Steps

Participants should submit written comment on the Expanding Metering and Telemetry Options Straw Proposal paper to MTOptions@caiso.com by May 2, 2013.   The ISO plans to hold a stakeholder meeting on April 24, 2013 in order to review the proposals described in this paper and stakeholder comments submitted. This meeting and stakeholder comments will provide input to developing a further refined Draft Proposal. 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. The following provides a proposed timetable for continued development of the Final Proposal and beginning of initiative implementation phase:

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 Draft Final Proposal (Phase 1 items)	July 24, 2013
Stakeholder Conference Call	August 7, 2013
Stakeholder Comments Due	August 14, 2013
Performance of individual proposal proof of concept (POC)	Q2 – Q4 2013
Final Proposal Implementation Stakeholder Meeting	Q4 2013

Appendix A

Terms used in this report	Definition
RIG Aggregator	For purposes of this paper, use of a single RIG or equivalent 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 resource with 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 many resources 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 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 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