

# **Business Requirements Specification**

### **Circular Scheduling Market Rule**

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Owner: Krovvidi; Sai

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# Table of Contents

| 1. |            | INTRODUCTION  | 4          |
|----|------------|---|------------|
|    | 1.1        | Purpose   | 4          |
|    | 1.2        | 2 References  | 5          |
| 2. |            | DETAILS OF BUSINESS NEED/PROBLEM  | 6          |
|    | 2.1        | Description   | 6          |
| 3. |            | BUSINESS PROCESS IMPACTS  | 7          |
|    | 3.1        | HIGH LEVEL BUSINESS PROCESS   | 7          |
|    |            | 3.1.1 Description   | 7          |
|    | 3.2        | 2 JUSTIFICATION   | 7          |
| 4. |            | BUSINESS REQUIREMENTS   | 8          |
|    | 4.1        | BUSINESS PROCESS: MANAGE INTERCHANGE SCHEDULING - CAS   | 9          |
|    |            | 4.1.1 Business Requirements   | . 10       |
|    | 4.2        | 2 BUSINESS PROCESS: MANAGE MQS – CRR SETTLMENT RULE   | . 15       |
|    |            | 4.2.1 Business Requirements   | . 15       |
|    | 4.3        | BUSINESS PROCESS: MANAGE BILLING AND SETTLEMENTS – CIRCULAR SCHEDULE RULE   | . 19       |
|    |            | 4.3.1 Business Requirements   | . 19       |
| 5. |            | APPENDIX A: CIRCULAR SCHEDULING MARKET RULE EXAMPLES  | . 23       |
|    | 5.1<br>SAI | EXAMPLE 1: ALL CIRCULAR SCHEDULE; IMPORT/EXPORT SCHEDULED IN THE IFM AND HASP; IMPORT AND EXPORT ARE THE BY MARKET.       | не<br>. 23 |
|    | 5.2<br>DIF | 2 EXAMPLE 2: ALL CIRCULAR SCHEDULE; IMPORT/EXPORT SCHEDULED IN THE IFM AND HASP; IMPORT AND EXPORT ARE FFERENT, BY MARKET | . 24       |
|    | 5.3        | B EXAMPLE 3: ALL CIRCULAR SCHEDULE; IMPORT SCHEDULED IN THE IFM AND EXPORT SCHEDULED IN HASP                              | . 25       |
|    | 5.4        | EXAMPLE 4: AN IMPORT SCHEDULE SERVING BOTH LOAD AND EXPORT  | . 26       |

| California ISO<br>Shaping a Renewed Future  | Technology | Template Version: | 2.8       |
|---|------------|-------------------|-----------|
|   |            | Document Version: | 1.0       |
| Circular Scheduling Market Rule Business Requirements Specification -<br>Planning |            | Date Created:     | 3/18/2013 |

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|   |            | Document Version: | 1.0       |
| Circular Scheduling Market Rule Business Requirements Specification -<br>Planning |            | Date Created:     | 3/18/2013 |

# 1. Introduction

### 1.1 Purpose

The purpose of this document is to capture and record a description of what the Users and Business Stakeholders of the project wish to obtain by providing high-level business requirements. This document establishes the basis for the agreement between the initiators and implementers of the project. The information in this document serves as input to determining the scope of Information Systems projects and to all Business Process Modeling and System Requirements Specifications efforts.

These requirements will serve as the initial set of business unit requirements for the appropriate software application/systems development effort. It is understood that additional requirements and systems analysis may produce "To Be" Business Process Models, System Requirements Specifications, and Use Cases to serve as the set of requirements documents used by the development teams to buy, modify, or build the necessary software and hardware systems. The Business Unit(s) involved in the project will have an opportunity to review and approve all requirements documentation produced.

One class of circular scheduling involves the delivery of market import and export schedules by a single party that, possibly in combination with segments in multiple balancing authority areas (BAAs), have the source and sink in the same BAA. Because the power scheduled for export from the ISO would be returned on transmission outside the ISO back to the point where the import was originally scheduled into the ISO, these circular schedules would not produce an actual flow of power. However, a market participant could profit from the circular schedule by earning the price difference between the points at which the energy was scheduled to be imported to and exported from the ISO. The market participant could also profit from Congestion Revenue Rights (CRR) that are impacted by the circular schedule. Circular schedules have the potential to exacerbate unscheduled flows on the ISO interties by introducing market schedules across the interties that will not produce any actual flow of energy. The incorrect modeling of flows on the ISO'S interties, may produce a sub-optimal unit commitment. Circular schedules can also make it more difficult for ISO operators to manually manage congestion if needed in real time since the ISO may not get congestion relief (or a reduction in actual flows) if it has to curtail one or both parts of circular schedule.

The circular scheduling market rule initiative addresses development of market rules to alleviate operational concerns and market efficiency issues caused by the circular schedules. Specifically, the proposal:

- 1. Identifies one type of circular schedule.
- 2. Imposes settlement rules to reduce the financial incentive significantly to submit a circular schedule.
- 3. Applies the CRR claw-back rule to the circular schedule.

Under the proposal, other types of scheduling practices that could be construed as circular scheduling will be addressed through ongoing market monitoring and potential FERC enforcement.

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|---|------------|-------------------|-----------|
|   |            | Document Version: | 1.0       |
| Circular Scheduling Market Rule Business Requirements Specification -<br>Planning |            | Date Created:     | 3/18/2013 |

### **1.2 References**

All references represent external requirements documents or stakeholder requests developed and submitted by the Business Units.

1. Policy-related documents, including the Draft Final Proposal and stakeholder comments are located on the "Circular Scheduling" Stakeholder Initiatives web page at:

http://www.caiso.com/informed/Pages/StakeholderProcesses/CircularScheduling.aspx

2. FERC filings and orders, including Tariff Amendment on Settlement Rules for Circular Scheduling is located on the "Circular Scheduling" Stakeholder Initiatives web page at:

http://www.caiso.com/informed/Pages/StakeholderProcesses/CircularScheduling.aspx

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|---|------------|-------------------|-----------|
|   |            | Document Version: | 1.0       |
| Circular Scheduling Market Rule Business Requirements Specification -<br>Planning |            | Date Created:     | 3/18/2013 |

# 2. Details of Business Need/Problem

### 2.1 Description

| Business Opportunity/Problem Statement -        |   |  |  |  |
|---|---|--|--|--|
| What:   | Establish automated settlement rules to remove financial incentives for<br>creating circular schedules. This will alleviate operational concerns and<br>market efficiency issues caused by circular schedules.  |  |  |  |
| When:   | Circular scheduling has been a potential problem since ISO start-up.  |  |  |  |
| Why do we have this opportunity/problem:        | One class of circular scheduling involves the delivery of market import and<br>export schedules by a single party that, possibly in combination with<br>segments in multiple balancing authority areas (BAAs), have the source and<br>sink in the same BAA. |  |  |  |
|   | Circular schedules would not produce an actual flow of power. The ISO has operational and market concerns that can result from circular scheduling, including:  |  |  |  |
|   | <ul> <li>These schedules have the potential to exacerbate unscheduled<br/>flows on the ISO's interties by introducing market schedules that<br/>will not produce any actual flow of energy.</li> </ul>  |  |  |  |
|   | <ul> <li>Increasing congestion management costs that are imposed on<br/>other market participants.</li> </ul>   |  |  |  |
|   | <ul> <li>Circular schedules can also make it more difficult for ISO operators<br/>to manually manage congestion if needed in real time.</li> </ul>  |  |  |  |
|   | <ul> <li>Market participant could profit from circular schedules by earning<br/>the price difference between the points at which the energy was<br/>scheduled to be imported to and exported from the ISO.</li> </ul>                                       |  |  |  |
|   | <ul> <li>The market participant could also profit from Congestion Revenue<br/>Rights (CRR) impacted by the its circular schedule.</li> </ul>  |  |  |  |
| Who does this<br>opportunity/problem<br>impact: | Market Participants; CAS, MQS, Settlements, Price correction systems; Legal   |  |  |  |

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## **3. Business Process Impacts**

#### 3.1 High Level Business Process

#### 3.1.1 Description

This initiative impacts the following business processes:

- **Manage Interchange Scheduling** Modifications to CAS to enable identification of circular schedules for a single e-tag. Vendor (MCG) software is required to be modified.
- **Manage MQS** Modify claw-back engine to define and include CRR claw-back value for circular schedules. Vendor (Siemens) software is required to be modified.
- Manage Billing and Settlements Include a new settlement market rule to negate the incentive to submit bids that would lead to circular schedules.

#### 3.2 Justification

One class of circular scheduling involves the delivery of market import and export schedules by a single party that, possibly in combination with segments in multiple balancing authority areas (BAAs), have the source and sink in the same BAA.

Circular schedules would not produce an actual flow of power. The ISO has operational and market concerns that can result from circular scheduling, including:

- These schedules have the potential to exacerbate unscheduled flows on the ISO's interties by introducing market schedules that will not produce any actual flow of energy.
- Increasing congestion management costs that are imposed on other market participants.
- Circular schedules can also make it more difficult for ISO operators to manually manage congestion if needed in real time.
- Market participant could profit from circular schedules by earning the price difference between the points at which the energy was scheduled to be imported to and exported from the ISO.
- The market participant could also profit from CRRs impacted by its circular schedule.

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|---|-------------------|-------------------|-----------|
|   |                   | Document Version: | 1.0       |
| Circular Scheduling Market Rule Business Requirements Specification -<br>Planning |                   | Date Created:     | 3/18/2013 |

## 4. Business Requirements

The sections below describe the Business Processes and the associated Business Requirements involved in the project. These may represent high level functional, non-functional, reporting and/or infrastructure requirements. These business requirements directly relate to the high level scope items determined for the project.

It is to be noted that the ISO cannot articulate every possible trading scheme in its tariff. For scheduling practices that go beyond a specifically-defined pattern, the ISO believes that such conduct can be addressed through application of FERC's current policies for market monitoring and enforcement of FERC Rule 1c.2 (18 C.F.R. § 1c.2). Nevertheless a specific class of schedule can be defined based on objectively identifiable behavior, through a market rule applicable to the ISO's current market structure.

The ISO's proposal defines market rules regarding the circular schedules and establishes automated settlement rules to remove financial incentives for creating circular schedules. <u>The settlement rule would apply only to schedules involving a single scheduling coordinator</u>.

The major implementation efforts include:

- 1. Identify the circular schedules for the single SC with Single e-tagged schedule with source/sink in the same BAA (CAISO or any other BAA).
- 2. Exclude the loop schedule that has DC intertie segment; If the transmission segment on the DC intertie were excluded and the remaining energy schedules still include a closed loop of energy schedules between the ISO controlled grid and one or more BAAs, then the settlement rule will apply.
- 3. Exclude Pseudo-tie schedule; Delivery of energy from a pseudo-tie generating unit to the BAA with which the pseudo-tie becomes associated will not be subject to the proposed settlement rule. If after excluding the pseudo tie(s) from the circular schedule, the resulting hypothetical schedule would have an associated e-Tag reflecting a source and a sink in the same BAA, then the schedule is not excluded.
- 4. Exclude "Open intertie" or "isolated intertie" schedule; Delivery of energy during an "isolated intertie" or "open intertie" condition will not be considered a circular schedule. If after excluding the segment(s) which temporarily (a) serve a load or (b) deliver power from a generating unit that has become isolated from the BAA because of an outage; the resulting hypothetical schedule would have an associated E-Tag reflecting a source and a sink in the same BAA, then the schedule is not excluded.
- 5. Exclude the "Wheeling through" transactions; Transactions which include the use of the CAISO controlled grid for the transmission of energy from a resource located outside the CAISO controlled grid to serve a load located outside the transmission and distribution system of a participating Transmission Owner. If after excluding the segment(s) which involve a wheeling-through transaction, the resulting hypothetical schedule would have an associated E-Tag reflecting a source and a sink in the same BAA, then the schedule is not excluded.
- 6. Create circular scheduling payload with import and export schedules and MWs.
- 7. Build settlement rule that applies to a circular schedule, settle the Import to the ISO at the lower of LMPs at scheduling points for scheduled import and export MW quanitites. Rules will be specified in this section of the document for market priority across market settlements and imbalance allocations.
- 8. Apply CRR claw-back rule to an SC that submits a circular schedule that contributes to congestion on a path for which that SC holds CRRs.CRRs on both the import and export paths subject to claw-back for the SC's schedule that is identified as circular schedule segment at import or export point. This has to be evaluated at the portfolio-level along with the virtual bids when the claw-back is imposed.
- 9. Monitor Multi-SC circular schedule through MAD process.

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#### Out of scope:

Multi-SC circular schedules and Individual but not linked e-tags that reveal circular schedules will not be addressed at automated settlement rule. They will be monitored by the ISO. <u>The settlement rule would apply only to schedules involving a single scheduling coordinator</u>.

#### 4.1 Business Process: Manage Interchange Scheduling - CAS

A new business process has to be created within CAS to identify the specific class of circular schedules that can be defined based on objectively identifiable behavior. The CAS is expected to incorporate changes to its software to be able to create a new circular scheduling payload with import and export schedules and MWs. This new circular scheduling payload will be consumed by MQS and Settlements in the downstream.

The business process must include the following steps:

- 1. Identify the circular schedules for the single SC with Single e-tagged schedule with source/sink in the same BAA (CAISO or any other BAA).
- 2. Exclude the loop schedule that has DC intertie segment; If the transmission segment on the DC intertie were excluded and the remaining energy schedules still include a closed loop of energy schedules between the ISO controlled grid and one or more BAAs, then the settlement rule will apply.
- 3. Exclude Pseudo-tie schedule; Delivery of energy from a pseudo-tie generating unit to the BAA with which the pseudo-tie becomes associated will not be subject to the proposed settlement rule. If after excluding the pseudo tie(s) from the circular schedule, the resulting hypothetical schedule would have an associated e-Tag reflecting a source and a sink in the same BAA, then the schedule is not excluded.
- 4. Exclude "Open intertie" or "isolated intertie" schedule; Delivery of energy during an "isolated intertie" or "open intertie" condition will not be considered a circular schedule. If after excluding the segment(s) which temporarily (a) serve a load or (b) deliver power from a generating unit that has become isolated from the BAA because of an outage; the resulting hypothetical schedule would have an associated E-Tag reflecting a source and a sink in the same BAA, then the schedule is not excluded.
- 5. Exclude the "Wheeling through" transactions; Transactions which include the use of the CAISO controlled grid for the transmission of energy from a resource located outside the CAISO controlled grid to serve a load located outside the transmission and distribution system of a participating Transmission Owner. If after excluding the segment(s) which involve a wheeling-through transaction, the resulting hypothetical schedule would have an associated E-Tag reflecting a source and a sink in the same BAA, then the schedule is not excluded.
- 6. Create circular scheduling payload with import and export schedules and MWs.

| California ISO<br>Shaping a Renewed Future  | Technology | Template Version: | 2.8       |
|---|------------|-------------------|-----------|
|   |            | Document Version: | 1.0       |
| Circular Scheduling Market Rule Business Requirements Specification -<br>Planning |            | Date Created:     | 3/18/2013 |

#### 4.1.1 Business Requirements

| ID#           | Business Feature  | Requirement<br>Type | Business<br>Unit(s)<br>Affected | Potential<br>Application(s)<br>Impacted |  |
|---------------|---|---------------------|---------------------------------|---|--|
| CS-<br>BRQ001 | System shall create a list of all circular schedules by identifying schedules with:   | Core                | PSTO                            | CAS                                     |  |
|               | (a) Single scheduling coordinator (SC)  |                     |                                 |   |  |
|               | (b) Single E-Tagged schedule  |                     |                                 |   |  |
|               | (c) An associated E-Tag reflecting a source<br>and sink in the same Balancing Authority<br>Area (BAA). This BAA could be CAISO or<br>any other BAA.   | Tariff<br>30 5 5 1  |                                 |   |  |
|               | System shall associate, for each of the circular schedules identified above:  |                     |                                 |   |  |
|               | <ul> <li>(a) Import/tie generator and export resource<br/>IDs belonging to the single SC</li> </ul>   |                     |                                 |   |  |
|               | (b) Time interval   |                     |                                 |   |  |
|               | (c) Scheduled MW  |                     |                                 |   |  |
| CS-           | DC Interties  | Core                | PSTO                            | CAS                                     |  |
| BRQ002        | System shall examine the circular schedules and<br>exclude those:   |                     |                                 |   |  |
|               | Schedules which include a transmission segement on a DC intertie.   |                     |                                 |   |  |
|               | The DC interties are:   |                     |                                 |   |  |
|               | <ul> <li>(a) Pacific DC Intertie between NOB and<br/>Sylmar.</li> </ul>   | Tariff              |                                 |   |  |
|               | (b) Intermountain DC line between IPP and<br>Adelanto.  | 30.5.5.2            |                                 |   |  |
|               | The above list of DC lines should be configurable.  |                     |                                 |   |  |
|               | Caveat:   |                     |                                 |   |  |
|               | If after excluding the DC intertie segment from the circular schedule, the resulting hypothetical schedule would have an associated E-Tag reflecting a source and a sink in the same BAA, the System shall <u>not exclude</u> this circular schedule. |                     |                                 |   |  |

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|   | Planni  | ng   |                     |                   |                                 |                     |                                |
| ID#   | Business Feature  |  | Requirement<br>Type |                   | Business<br>Unit(s)<br>Affected | Pote<br>App<br>Impa | ential<br>lication(s)<br>acted |
| CS-   | Pseudo-ties   |  | Core                |                   | PSTO                            | CAS                 |                                |
| BRQ003  | System shall examine the circular schedules and<br>exclude those:   |  |                     |                   |                                 |                     |                                |
|   | Schedules which include pseu CAISO.   | do-ties into the   |                     |                   |                                 |                     |                                |
| The list of pseudo-ties should be configurable.     |   | Tariff   |                     |                   |                                 |                     |                                |
|   | Caveat:   |  | 30.5.5.2            |                   |                                 |                     |                                |
|   | If after excluding the pseudo ti<br>schedule, the resulting hypoth<br>have an associated E-Tag refl<br>sink in the same BAA, the Sys<br>such a circular schedule. | e(s) from the circular<br>etical schedule would<br>ecting a source and a<br>tem shall <u>not exclude</u> |                     |                   |                                 |                     |                                |

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| Circular Scheduling Market Rule Business Requirements Sp<br>Planning |   | pecification -  | D                   | ate Created: |                                 | 3/18/2013          |                                |
| ID#  | Business Feature  |   | Requirement<br>Type |              | Business<br>Unit(s)<br>Affected | Pote<br>App<br>Imp | ential<br>lication(s)<br>acted |
| CS-  | Open or Isolated interties  |   | Core                |              | PSTO                            | CAS                | 3                              |
| BRQ004   | System shall examine the circ<br><u>exclude</u> those:  | ular schedules and  |                     |              |                                 |                    |                                |
|  | <ul> <li>Schedules which are used in delivery of energy during "isolated intertie" or "open intertie" conditions</li> <li>That is, schedules which are used to (a) serve a load that has temporarily become isolated from the BAA or (b) deliver power temporarily from a generating unit that has become isolated from the BAA because of an outage.</li> <li>Open tie conditions are not considered here because tags are curtailed to zero.</li> </ul> |   | Tariff<br>30.5.5.2  |              |                                 |                    |                                |
|  | <i>Caveat:</i><br>If after excluding the segment<br>(a) serve a load or (b) deliver<br>generating unit that has becor<br>BAA because of an outage; th<br>hypothetical schedule would h<br>Tag reflecting a source and a<br>BAA, the System shall <u>not exc</u><br>schedule.  | (s) which temporarily<br>power from a<br>ne isolated from the<br>e resulting<br>ave an associated E-<br>sink in the same<br>clude such a circular |                     |              |                                 |                    |                                |
|  | Business Rule:  |   |                     |              |                                 |                    |                                |
|  | Stranded load and stranded g<br>are taken from Master File (fla   | enerator resources<br>ig).  |                     |              |                                 |                    |                                |

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| ID#  | Business Feature   |  | Requirement<br>Type        |                   | Business<br>Unit(s)<br>Affected | Pote<br>App<br>Impa | ential<br>lication(s)<br>acted |
| CS-<br>BRQ005  | <ul> <li>Wheeling-through Transaction</li> <li>System shall examine the circlexclude those:</li> <li>Schedules which involve a whitransaction satisfying following</li> <li>(a) Source and sink of the same BAA.</li> <li>(b) SCs of such schedule to the ISO stating that is only for the purpose – Based on a configurer resource IDs.</li> <li><sup>1</sup> Transactions which include the controlled grid for the transmission resource located outside the CAR serve a load located outside the to distribution system of a participate Owner.</li> <li>Caveat:</li> <li>If after excluding the segmentary wheeling-through transaction, hypothetical schedule would he tag reflecting a source and a BAA, the System shall not exception.</li> </ul> | ions<br>ular schedules and<br>eeling-through <sup>1</sup><br>g conditions:<br>e schedules are in the<br>s provide attestation<br>the wheling-through<br>e of serving the load.<br>able list of export<br>use of the CAISO<br>an of energy from a<br>SO controlled grid to<br>ransmission and<br>ing Transmission<br>(s) which involve a<br>the resulting<br>have an associated E-<br>sink in the same<br>clude such a schedule | Core<br>Tariff<br>30.5.5.2 |                   | PSTO                            | CAS                 |                                |

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| Circular Scheduling Market Rule Business Requirements Sp<br>Planning |   |   | pecification -      | Date Created:                   |                     | 3/18/2013                      |
| ID#  | Business Feature  |   | Requirement<br>Type | Business<br>Unit(s)<br>Affected | Pote<br>App<br>Impa | ential<br>lication(s)<br>acted |
| CS-<br>BRQ006  | System shall pass the informa<br>circular schedules for use by c<br>applications. | tion on all identified<br>Iownstream      | Core                | PSTO                            | CAS                 | , Integration                  |
|  | Business Rule:  |   |                     |                                 |                     |                                |
|  | System shall create a new pay<br>identified circular schedule, ind<br>to –        | vload for each<br>cluding but not limited |                     |                                 |                     |                                |
|  | (a) Single E-Tag ID ("Tag<br>CISO_CCG000419W                                      | Info"; Example –<br><b>W01_CISO</b> )     |                     |                                 |                     |                                |
|  | (b) Import Resource ID /  | Tie Generator ID                          |                     |                                 |                     |                                |
|  | (c) Export Resource ID  |   |                     |                                 |                     |                                |
|  | (d) Time Interval   |   |                     |                                 |                     |                                |
|  | (e) Circular Scheduled M  | W   |                     |                                 |                     |                                |
|  | (f) Circular Flag   |   |                     |                                 |                     |                                |

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| Circular Scheduling Market Rule Bu<br>Planni | Date Created: | 3/18/2013         |     |

### 4.2 Business Process: Manage MQS – CRR Settlment Rule

The ISO proposes to adjust the revenue from the CRRs of a CRR holder where the Scheduling Coordinator representing that CRR holder has:

- (a) Submitted bids which results in a circular schedule; and
- (b) The resulting schedule(s) impacts the value of the CRRs in the DAM held by that CRR holder.

Such adjustment or CRR claw-back will occur if the following circumstances are all met:

- 1. A portion of the E-Tag that uses the ISO controlled grid relates to a schedule in the IFM.
- 2. The scheduled MW on the portion of the E-Tag using the ISO controlled grid has a positive PTDF on a congested transmission element, where that congestion is measured in the direction of the CRR; and
- 3. The CRR holder would receive payments from CRRs on the congested transmission element.

If such circumstances occur, the revenue adjustment will be a reduction in payments, or increase in charges, to the CRR holder equal to the additional net CRR revenue that otherwise would be earned from the congestion created by the circular schedule.

#### 4.2.1 Business Requirements

| ID#           | Business Feature   | Requiremen<br>t Type | Business<br>Unit(s)<br>Affected | Potential<br>Application(s)<br>Impacted |
|---------------|--|----------------------|---------------------------------|---|
| CS-<br>BRQ007 | System shall have the capability to consume the new information, which identifies circular schedules with import & export schedules and MWs. | Core                 | PSTO,<br>PSTD                   | MQS, CRRS,<br>CAS,<br>Integration       |
|               | Business Rule:   |                      |                                 |   |
|               | System shall consume a new payload from CAS for each identified circular schedule, including but not limited to –                            |                      |                                 |   |
|               | <ul> <li>(a) Single E-Tag ID ("Tag Info"; Example –<br/>CISO_CCG000419WW01_CISO)</li> </ul>  |                      |                                 |   |
|               | (b) Import Resource ID / Tie Generator ID  |                      |                                 |   |
|               | (c) Export Resource ID   |                      |                                 |   |
|               | (d) Time Interval  |                      |                                 |   |
|               | (e) Circular Scheduled MW  |                      |                                 |   |
|               | (f) Circular Flag  |                      |                                 |   |

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| Circula        | Circular Scheduling Market Rule Business Requirements Specificatio<br>Planning   |   |                           | Date (            | Created:                        | 3/18/2013                               |
| ID#            | Business Feature   |   | Requir<br>t Type          | emen              | Business<br>Unit(s)<br>Affected | Potential<br>Application(s)<br>Impacted |
| CS-<br>BRQ008  | System shall have the capab<br>the new information (payload<br>schedules with import & expo<br>Business Rule:<br>System shall consume correct<br>schedule payload from CAS   | ility to consume <u>corrections</u> to<br>), which identifies circular<br>ort schedules and MWs.<br>ctions to the new circular<br>for each identified circular  | Core                      |                   | PSTO,<br>PSTD                   | MQS, CRRS,<br>CAS,<br>Integration       |
| CS-<br>BRQ009  | System shall identify the sche<br>segments that make up the c  | eduled MW in IFM for all the<br>ircular schedule.   | Core                      |                   | PSTO,<br>PSTD                   | CRRS                                    |
| CS-<br>BRQ010  | <ul> <li>Criterion for CRR claw-back</li> <li>System shall examine if the coorditions:</li> <li>1. A portion of the E-Tagrid relates to a scheen</li> <li>2. The scheduled MW constrained the ISO control on a congested transsicongestion is measured CRR; and</li> <li>3. The CRR holder wourd CRRs on the congest</li> <li>If <u>ALL</u> of the above conditions</li> <li>The System will ensure that I payments, or increase in charto the additional net CRR reveared from the congestion of the schedule.</li> </ul> | k<br>ircular schedule satisfies <u>ALL</u><br>g that uses the ISO controlled<br>dule in the IFM.<br>on the portion of the E-Tag<br>led grid has a positive PTDF<br>mission element; where that<br>red in the direction of the<br>ld receive payments from<br>ted transmission element.<br>s are true;<br>SO imposes a reduction in<br>rges, to the CRR holder equal<br>enue that otherwise would be<br>reated by the circular | Core<br>Tariff<br>11.2.4. | 7                 | PSTO,<br>PSTD                   | CRRS                                    |
| CS-<br>BRQ011  | Mapping SCs and CRR Hold<br>System shall create the list of<br>map each of the circular sche<br>the respective:<br>(a) Scheduling coordinat<br>(b) CRR holders   | ders<br>f all circular schedules and<br>edules for the time period, <i>t</i> , to<br>fors   | Core                      |                   | PSTO,<br>PSTD                   | CRRS                                    |

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| Circular Scheduling Market Rule Business Requirements Specification<br>Planning |   |   | on - Date Created: |       |                                 | 3/18/2013                               |
| ID#   | Business Feature  |   | Requir<br>t Type   | emen  | Business<br>Unit(s)<br>Affected | Potential<br>Application(s)<br>Impacted |
| CS-<br>BRQ012   | <b>MW Flow Contribution Due</b><br>System shall compute the tot<br>all the segments of circular so<br>holder to the total MW flow or<br>IFM for the time period, <i>t</i> .<br><b>Business Rule:</b><br>The computation shall be perform<br>$F_{IFM,i,t,k} = \sum_{j \in \{J\}_{k,i}} \max(SF_{IFM,i,j,t}, V)$<br>Where;<br><i>i</i> = Binding constraint<br><i>K</i> = An entity (SC) which owns at<br><i>t</i> = Time period for which the ent<br><i>h</i> = Hour under consideration; <i>h</i><br>$SF_{IFM,i,j,t}$ is the positive PTDF<br>time t in the direction of CRRs; a<br>$MW_{j,t,k}$ Is the circular schedule | to Circular Schedules<br>al MW flow contribution from<br>chedules of the entity CRR<br>in each binding constraint, <i>i</i> in<br>med as follows:<br>0) * min( $MW_{j,t,k}$ , $CRR \_ Inj$ )<br>CRR portfolio<br>ity holds the CRR portfolio<br>$\varepsilon t$<br>of constraint i at node j during<br>and<br>e of entity k during time t | Core               |       | PSTO,<br>PSTD                   | CRRS                                    |

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| ID#   | Business Feature  |   | Requir<br>t Type          | emen                           | Business<br>Unit(s)<br>Affected   | Potential<br>Application(s)<br>Impacted |
| CS-<br>BRQ013   | CRR Claw-Back Settlement<br>System shall compute the CF<br>amount due to circular sched<br>holding CRR portfolio for the<br>Business Rule:  | a <b>Amount</b><br>RR claw-back settlement<br>ules for each of the entities<br>time period <i>t</i> .   | Core                      |                                | PSTO,<br>PSTD   | CRRS                                    |
|   | The computation is performed as<br>$CBA_{IFM,i,t,k} = \sum_{j \in \{J\}_{k,t}} F$ Where;<br>$CBA_{IFM,i,t,k} \text{ is the claw back and constraint i for time period t, \lambda_{IFM,t} \text{ is the shadow price in IF} time period t, andF_{IFM,i,t,k} \text{ is the total MW flow constraint schedules of the entity}$ | s follows:<br>$T_{IFM,i,t,k} \lambda_{IFM,t}$ nount for circular schedules for<br>TM of the congested element for<br>ontribution from all the segments<br>$T_{CRR}$ holder to the total MW flow |                           |                                |   |   |
| CS-<br>BRQ014   | System shall identify CRR cla<br>due to circular schedules, sep<br>amount for convergence bids  | aw-back settlement amount<br>parately from CRR claw-back  | Core                      |                                | PSTO,<br>PSTD   | CRRS                                    |
| CS-<br>BRQ015   | System shall pass the inform<br>settlement amount due to circ<br>the entities holding CRR port<br>use by downstream application   | ation on CRR claw-back<br>cular schedules for each of<br>folio for the time period <i>t</i> , for<br>ons, including Settlements.  | Core                      |                                | PSTO,<br>PSTD   | CRRS,<br>Integration,<br>Settlements    |
| CS-<br>BRQ016   | Price Correction Derived LI<br>The System shall not correct<br>the exports that are identified<br>schedule.<br>Business Rule:<br>This rule shall be implemented   | MP<br>the export resource LMP for<br>as part of a circular<br>ed in MQS.  | Core<br>Tariff<br>11.21.1 | I                              | PSTO,<br>PSTD,<br>Market<br>Settlement<br>Design and<br>Configurati<br>on | MQS /MAPP,<br>Settlements               |

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### 4.3 Business Process: Manage Billing and Settlements – Circular Schedule Rule

The ISO's proposal defines market rules for a specific class of circular schedules that can be defined based on objectively identifiable behavior. The proposal establishes automated settlement rules to remove financial incentives for creating circular schedules. The settlement rule would apply only to schedules involving a single scheduling coordinator.

A new business process has to be created within Settlements and must include the following steps:

- 1. Consume new payload from CAS, which identifies circular schedules with import & export schedules and MWs.
- 2. Build settlement rule that applies to a circular schedule, settle the Import to the ISO at the lower of LMPs at scheduling points for import and export for the MW in the market the schedule was awarded. Rules will be specified in this section of the document for market priority across market settlements and imbalance allocations.
- 3. Apply CRR claw-back rule to an SC that submits a circular schedule that contributes to congestion on a path for which that SC holds CRRs.

#### 4.3.1 Business Requirements

| ID#           | Business Feature   | Requirem<br>ent Type | Business<br>Unit(s)<br>Affected                     | Potential<br>Application<br>(s) Impacted |
|---------------|--|----------------------|---|--|
| CS-<br>BRQ017 | System shall have the capability to consume the new information, which identifies circular schedules with import & export schedules and MWs. | Core                 | Market<br>Settlement<br>Design and<br>Configuration | Settlements,<br>Integration,<br>CAS      |
|               | Business Rule:   |                      |   |  |
|               | System shall consume a new payload from CAS for each identified circular schedule, including but not limited to –                            |                      |   |  |
|               | (a) Single E-Tag ID ("Tag Info"; Example –<br>CISO_CCG000419WW01_CISO)   |                      |   |  |
|               | (b) Import Resource ID / Tie Generator ID  |                      |   |  |
|               | (c) Export Resource ID   |                      |   |  |
|               | (d) Time Interval  |                      |   |  |
|               | (e) Circular Scheduled MW  |                      |   |  |
|               | (f) Circular Flag  |                      |   |  |

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|---|--|--|--|--|--|
| ar Scheduling Market Rule Bu<br>Planni  | siness Requirements Specification -<br>ing   | Date Created:  |  | Created:   | 3/18/2013  |
| Business Feature  |  | Req<br>ent   | uirem<br>Type  | Business<br>Unit(s)<br>Affected  | Potential<br>Application<br>(s) Impacted   |
| System shall have the capabili<br>new information (payload), wh<br>with import & export schedules               | ity to consume <u>corrections</u> to the ich identifies circular schedules and MWs.  | Core   | 9  | Market<br>Settlement<br>Design and<br>Configuration  | Settlements,<br>Integration,<br>CAS  |
| Business Rule:  |  |  |  |  |  |
| System shall consume correct payload from CAS for each ide  | stem shall consume corrections to the new circular schedule<br>/load from CAS for each identified circular schedule.   |  |  |  |  |
| Settlement Rule:  |  | Core   |  | Market   | Settlements  |
| System shall settle the import portion of any circular schedule to lower of the -                               |  |  |  | Settlement<br>Design and<br>Configuration  |  |
| <ul> <li>(a) LMP of the scheduling<br/>the schedule in the manual<br/>of the schedule was a</li> </ul>          | point for the import portion of arket in which the import portion warded.  | Tariff<br>11.33  |  | 3  |  |
| (b) LMP of the scheduling<br>the schedule in the ma<br>of the schedule was a                                    | point for the export portion of arket in which the export portion warded.  |  |  |  |  |
| System shall apply the settlem<br>the import and export were scl<br>are split between the day-ahea              | nent rule irrespective of whether<br>heduled in the same market or<br>ad market and HASP.  | Core   | 9  | Market<br>Settlement<br>Design and   | Settlements  |
|   |  |  | 11<br>DO   | Configuration  |  |
|   |  | 11.3   | 03   |  |  |
| Market Priority:  |  | Core   | 9  | Market<br>Settlement   | Settlements  |
| I he settlement rule shall be applied to the MWs of the import awarded in IFM first, then HASP, then real-time. |  | Tariff   |  | Design and<br>Configuration  |  |
|   |  | 11.3   | 33   |  |  |
|   | <b>Subject of State Priority: Ar Scheduling Market Rule Bulling Market Priority: Business Feature</b> System shall have the capabilinew information (payload), which import & export schedules <b>Business Rule:</b> System shall consume correcting payload from CAS for each ide <b>Settlement Rule:</b> System shall settle the import to lower of the -         (a) LMP of the scheduling the schedule in the main of the schedule was at the schedule in the main of the schedule was at the schedule in the main of the schedule was at the schedule in the main of the schedule was at the schedule in the main of the schedule was at the schedule in the main of the schedule was at the schedule in the main of the schedule was at the schedule in the main of the schedule was at the schedule was at the schedule in the main of the schedule was at the sche | Difference       Technology         ar Scheduling Market Rule Business Requirements Specification - Planning         Business Feature         Business Feature         System shall have the capability to consume corrections to the new information (payload), which identifies circular schedules with import & export schedules and MWs.         Business Rule:         System shall consume corrections to the new circular schedule payload from CAS for each identified circular schedule.         Settlement Rule:         System shall settle the import portion of any circular schedule.         Settlement Rule:         System shall settle the import portion of any circular schedule.         Settlement Rule:         System shall settle the import portion of any circular schedule.         System shall settle the import portion of any circular schedule.         System shall apply the scheduling point for the import portion of the schedule in the market in which the export portion of the schedule in the market in which the export portion of the schedule in the market in which the export portion of the schedule was awarded.         System shall apply the settlement rule irrespective of whether the import and export were scheduled in the same market or are split between the day-ahead market and HASP.         Market Priority:         The settlement rule shall | Difference Solution       Technology         ar Scheduling Market Rule Business Requirements Specification - Planning       Req entities         Business Feature       Req entities         System shall have the capability to consume corrections to the new information (payload), which identifies circular schedules with import & export schedules and MWs.       Construction         Business Rule:       System shall consume corrections to the new circular schedule payload from CAS for each identified circular schedule.       Construction (a)         System shall settle the import portion of any circular schedule to lower of the -       (a)       LMP of the scheduling point for the import portion of the schedule in the market in which the import portion of the schedule in the market in which the export portion of the schedule in the market in which the export portion of the schedule was awarded.       Construction of the schedule was awarded.         (b)       LMP of the scheduling point for the export portion of the schedule was awarded.       Tari 11.3         (b)       LMP of the scheduling point for the export portion of the schedule was awarded.       Tari 11.3         (b)       LMP of the schedule in the market in which the export portion of are split between the day-ahead market and HASP.       Construction of the schedule was awarded.         System shall apply the settlement rule irrespective of whether the import and export were schedule of the schedule in the same market or are split between the day-ahead market and HASP.       Tari 11.3         Tari 11.3       Tari 11. | Technology       Temp         Docum       Docum         ar Scheduling Market Rule Business Requirements Specification - Planning       Date O         Business Feature       Requirements Specification - Planning       Date O         System shall have the capability to consume corrections to the new information (payload), which identifies circular schedules with import & export schedules and MWs.       Core         Business Rule:       System shall consume corrections to the new circular schedule payload from CAS for each identified circular schedule.       Core         Settlement Rule:       System shall settle the import portion of any circular schedule to lower of the -       Core         (a) LMP of the scheduling point for the import portion of the schedule was awarded.       Core         (b) LMP of the scheduling point for the export portion of the schedule in the market in which the export portion of the schedule was awarded.       Core         System shall apply the settlement rule irrespective of whether the import and export were scheduled in the same market or are split between the day-ahead market and HASP.       Tariff 11.33         Market Priority:       Core       Tariff 11.33         Market Priority:       Core       Tariff 11.33 | Technology       Template Version:         Document Version:         Business Feature       Requirements Specification -       Business         System shall have the capability to consume corrections to the new circular schedules with import & export schedules and MWs.       Corrections to the new circular schedules         System shall consume corrections to the new circular schedule.       System shall settle the import portion of any circular schedule.         System shall settle the import portion of any circular schedule.       Corrections of the schedule.       Market         System shall settle the import portion of any circular schedule.       Corrections of the schedule in the market in which the export portion of the schedule in the market in which the export portion of the schedule in the market in which the export portion of the schedule was awarded.       Core       Market         System shall apply the settlement rule irrespective of whether the import and export were scheduled in the same market or are split between the day-ahead market and HASP.       Core       Marke |

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| Circul         | ar Scheduling Market Rule Bu<br>Plann   | siness Requirements Specification -<br>ing   |            | Date C        | Created:   | 3/18/2013                                |
| ID#            | Business Feature  |  | Req<br>ent | uirem<br>Type | Business<br>Unit(s)<br>Affected                          | Potential<br>Application<br>(s) Impacted |
| CS-            | Settlement Rule Implementa  | tion Procedure   | Core       | Э             | Market   | Settlements                              |
| BRQ022         | System shall follow the steps t<br>rule:  | below for applying the settlement  |            |               | Settlement<br>Design and<br>Configuration                |  |
|                | 1. Consume circular sch   | eduling payload from CAS.  |            |               | 5  |  |
|                | 2. Determine the break of<br>Circular Schedule MW   | lown of the import schedule of /, by market.   |            |               |  |  |
|                | <ol> <li>Determine the break of<br/>Circular Schedule MW</li> </ol>   | lown of the export schedule of /, by market.   |            |               |  |  |
|                | <ol> <li>Perform prorata comp<br/>import was scheduled<br/>export was scheduled<br/>CS-BRQ-021:</li> </ol>                | arison of LMP at the point where<br>to the LMP of the point where<br>, using the market priority as in |            |               |  |  |
|                | The settlement rule sh<br>import awarded in IFM   | nall be applied to the MWs of the<br>I first, then HASP, then real-time.                               |            |               |  |  |
|                | Appendix A presents several p<br>occur and provides some exal<br>following the rules described in                         | possible scenarios that could<br>mples to illustrate how to settle<br>n this section.                  |            |               |  |  |
|                | Examples covered in Appendi   | x A are:   |            |               |  |  |
|                | <ul> <li>All circular schedule (i<br/>IFM and HASP; Impor<br/>market.</li> </ul>  | import/export) scheduled in the<br>t and export are the same, by                                       |            |               |  |  |
|                | <ul> <li>All circular schedule (i<br/>IFM and HASP; Impor<br/>market.</li> </ul>  | import/export) scheduled in the<br>t and export are different, by                                      |            |               |  |  |
|                | - All circular schedule -<br>export scheduled in H  | import scheduled in the IFM and ASP.   |            |               |  |  |
|                | - An Import schedule se   | erving both load and export.   |            |               |  |  |
| CS-            | Consume CRR claw-back se  | ettlement amount from CRRS   | Core       | е             | Market   | Settlements,                             |
| BRQ023         | System shall have the capabili information, on CRR claw-bac circular schedules for each of for the time period <i>t</i> . | ity to consume the new<br>k settlement amount due to<br>the entities holding CRR portfolio             |            |               | Settlement<br>Design and<br>Configuration,<br>PSTO, PSTD | CRRS,<br>Integration                     |

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| ID#  | Business Feature   |  | Requirem<br>ent Type  |   | Business<br>Unit(s)<br>Affected                                    | Potential<br>Application<br>(s) Impacted |
| CS-<br>BRQ024                              | Apply CRR claw-back settler<br>System shall apply CRR 'claw.<br>CRRs on the paths that the cir<br>congestion. CRRs on both the<br>to claw-back for the SC's sche<br>schedule segment at import or  | ment amount from CRRS<br>-back' rule for the SCs that hold<br>cular schedule contributes to<br>import and export paths subject<br>dule that is identified as circular<br>export point.   | hold<br>to<br>ubject<br>cular 11.2.4.   |   | Market<br>Settlement<br>Design and<br>Configuration,<br>PSTO, PSTD | Settlements,<br>CRRS                     |
| CS-<br>BRQ025                              | BCR Ineligibility for Resource<br>The System shall ensure that a<br>identified as a circular schedul<br>Recovery (BCR) eligible resour<br>that occurs during the time per<br>schedule.<br>This is applied to resources, w<br>system units, system resource<br>demand resources, participatin | es in Circular Schedules<br>a resource that has a schedule<br>e shall not be a Bid Cost<br>rce for any settlement interval<br>riod covered by the circular<br>which include generating units,<br>es, participating loads, and proxy<br>ng in circular schedules. | Cord<br>Tari<br>Appe<br>Mast<br>Defir<br>Supp<br>Bid C<br>Reco<br>(BCF<br>Eligith<br>Reso | e<br>ff<br>endix A,<br>ter<br>nitions<br>olement,<br>Cost<br>overy<br>R)<br>ble<br>purces | Market<br>Settlement<br>Design and<br>Configuration                | Settlements                              |

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# 5. Appendix A: Circular Scheduling Market Rule Examples

This appendix provides numerical examples of four settlement scenarios that may arise in implementation of circular scheduling market rule.

5.1 Example 1: All circular schedule; Import/export scheduled in the IFM and HASP; Import and export are the same, by market.

| Example 1 | Market   | DAM | HASP | RT (OA) | Circular<br>Tag | DDEV/Meter |
|-----------|----------|-----|------|---------|-----------------|------------|
| Import    |          |     |      |         |                 |            |
|           | Schedule | 70  | 30   | 0       | 100             | 100        |
|           | Price    | 6   | 3    | 10      |                 |            |
| Export    |          |     |      |         |                 |            |
|           | Schedule | 70  | 30   | 0       | 100             | 100        |
|           | Price    | 5   | 2    | 15      |                 |            |
|           |          |     |      |         |                 |            |
| Load      | Schedule | 0   |      |         |                 |            |
|           | Price    | 7   |      |         |                 |            |

| Settlement |  | MW | Price | Settlement |
|------------|--|----|-------|------------|
| Immout     | Circular IFM Import from                 | 70 | F     | 250        |
| Import     |  | 70 | 5     | 350        |
|            | Circular IFM Import from                 |    |       |            |
|            | HASP Export                              | 0  | 2     | 0          |
|            | Circular HASP Import                     |    |       |            |
|            | from IFM Export                          | 0  | 3     | 0          |
|            | Circular HASP Import<br>from HASP Export | 30 | 2     | 60         |
|            | HASP Import Remainder                    |    |       |            |
|            | Settlement                               | 0  | 3     | 0          |
|            | OA STLMT                                 | 0  | 10    | 0          |
| Total      |  |    |       | 410        |

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5.2 Example 2: All circular schedule; Import/export scheduled in the IFM and HASP; Import and export are different, by market.

| Example 2 | Market   | DAM | HASP | RT (OA) | Circular<br>Tag | DDEV/Meter |
|-----------|----------|-----|------|---------|-----------------|------------|
| Import    |          |     |      |         |                 |            |
|           | Schedule | 70  | 30   | 0       | 100             | 100        |
|           | Price    | 6   | 3    | 10      |                 |            |
| Export    |          |     |      |         |                 |            |
|           | Schedule | 60  | 40   | 0       | 100             | 100        |
|           | Price    | 5   | 8    | 15      |                 |            |
|           |          |     |      |         |                 |            |
| Load      | Schedule | 0   |      |         |                 |            |
|           | Price    | 7   |      |         |                 |            |

| Settlement |                          | MW | Price | Settlement |
|------------|--------------------------|----|-------|------------|
|            | Circular IFM Import from |    |       |            |
| Import     | IFM Export               | 60 | 5     | 300        |
|            | Circular IFM Import from |    |       |            |
|            | HASP Export              | 10 | 6     | 60         |
|            | Circular HASP Import     |    |       |            |
|            | from IFM Export          | 0  | 3     | 0          |
|            | Circular HASP Import     |    |       |            |
|            | from HASP Export         | 30 | 3     | 90         |
|            | HASP Import Remainder    |    |       |            |
|            | Settlement               | 0  | 3     | 0          |
|            | OA STLMT                 | 0  | 10    | 0          |
| Total      |                          |    |       | 450        |

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5.3 Example 3: All circular schedule; Import scheduled in the IFM and export scheduled in HASP.

| Example 3 | Market   | DAM | HASP | RT (OA) | Circular<br>Tag | DDEV/Meter |
|-----------|----------|-----|------|---------|-----------------|------------|
| Import    |          |     |      |         |                 |            |
|           | Schedule | 100 | 0    | 0       | 100             | 100        |
|           | Price    | 6   | 3    | 11      |                 |            |
| Export    |          |     |      |         |                 |            |
|           | Schedule | 0   | 100  | 0       | 100             | 100        |
|           | Price    | 5   | 4    | 15      |                 |            |
|           |          |     |      |         |                 |            |
| Load      | Schedule | 0   |      |         |                 |            |
|           | Price    | 7   |      |         |                 |            |

| Settlement |                       | MW  | Price | Settlement |
|------------|-----------------------|-----|-------|------------|
|            | Circular IFM Import   |     |       |            |
| Import     | from IFM Export       | 0   | 5     | 0          |
|            | Circular IFM Import   |     |       |            |
|            | from HASP Export      | 100 | 4     | 400        |
|            | Circular HASP Import  |     |       |            |
|            | from IFM Export       | 0   | 3     | 0          |
|            | Circular HASP Import  |     |       |            |
|            | from HASP Export      | 0   | 3     | 0          |
|            | HASP Import Remainder |     |       |            |
|            | Settlement            | 0   | 3     | 0          |
|            | OA STLMT              | 0   | 11    | 0          |
| Total      |                       |     |       | 400        |

| California ISO                               | Technology    | Template Version: | 2.8 |
|--|---------------|-------------------|-----|
| Shaping a Renewed Future                     |               | Document Version: | 1.0 |
| Circular Scheduling Market Rule Bu<br>Planni | Date Created: | 3/18/2013         |     |

5.4 Example 4: An Import schedule serving both load and export.

| Example 4 | Market   | DAM | HASP | RT (OA) | Circular<br>Tag | DDEV/Meter |
|-----------|----------|-----|------|---------|-----------------|------------|
| Import    |          |     |      |         |                 |            |
|           | Schedule | 40  | 70   | 0       | 100             | 110        |
|           | Price    | 6   | 3    | 10      |                 |            |
| Export    |          |     |      |         |                 |            |
|           | Schedule | 70  | 30   |         | 100             | 110        |
|           | Price    | 5   | 4    | 15      |                 |            |
|           |          |     |      |         |                 |            |
| Load      | Schedule | 0   |      | 10      |                 |            |
|           | Price    | 7   |      | 25      |                 |            |

| Settlement |  | MW | Price | Settlement |
|------------|--|----|-------|------------|
|            | Circular IFM Import                      |    |       |            |
| Import     | from IFM Export                          | 40 | 5     | 200        |
|            | Circular IFM Import                      |    |       |            |
|            | from HASP Export                         | 0  | 4     | 0          |
|            | Circular HASP Import                     |    |       |            |
|            | from IFM Export                          | 30 | 3     | 90         |
|            | Circular HASP Import<br>from HASP Export | 30 | 3     | 90         |
|            | HASP Import Remainder                    |    |       |            |
|            | Settlement                               | 10 | 3     | 30         |
|            | OA STLMT                                 | 0  | 10    | 0          |
| Total      |  |    |       | 380        |