

## Use Case 21: Energy Scheduling, Billing, and Settlement

### Summary:

This Use Case presents the activities involved in the creation of an energy trading transaction. It shows the integration of the deregulated energy market with regulated transmission operations through the Transaction Information System (TIS). TIS produced tags, which link up the commercial transaction (Purchase/Sale) with the operational energy interchange transaction (Received/Delivered), also provide the link to the Billing and Settlement process.

This Use Case is focused on the management and tagging of information involved in energy transactions and Billing and Settlement. The supporting functions, such as interface capacity calculation, etc. are not directly addressed.

### Actor(s):

Name	Role description
Energy Seller	The energy seller in the energy marketplace.
Energy Buyer	The energy buyer in the energy marketplace.
Energy Broker	Matches buyers and sellers, and secures transmission (and other ancillary services) needed to complete the energy transaction.
Control Area Operator	Operates the EMS. Approves and implements OASIS requested transactions. Verifies Intra-control area power system security for the requested transactions before granting approval (and implementing) the transactions.
Security Coordinator	Reviews requested transactions for Inter-control area security. Approves or disapproves the requested transaction based on Inter-control area schedules.
Transmission Provider	Provides the transmission capacity required by the power needed to fulfill the transaction's energy exchange. Posts transmission capacities and reservations on the OASIS node.

**Probable Participating Systems:**

<b>System</b>	<b>Services or information provided</b>
TIS	Brief description or list of services or information provided by this system in the context of this use case.
OASIS	OASIS is the interface from transmission operations to the market.
EMS	The EMS schedules the actual power interchange between control areas needed to realize the actual energy transfer required by the energy transaction.  The EMS keeps tracks of scheduled interchange, and actual interchange, which is later used in the Settlement process to resolve the actual billing.
IDC / TMS	The IDC system "clears" all transaction for power system reliability. In the future, the TMS will integrate the IDC, TIS, and OASIS systems.
Billing System	The Billing System settles the payment for energy contracted and actually delivered. The billing information is produced and provided to the energy broker, buyer, seller.
Accounting System	The Accounting System(s) track the invoices, payments, etc. to balance the finances of the commercial energy transaction.

**Pre-conditions:**

As the infrastructure described herein is in various forms of realization, the assumption is that all pre-conditions are in place.

**Assumptions / Design Considerations:**

State any known assumptions, limitations, constraints, or variations that may affect this use case. Consider:

- This Use Case assumes a single segment transaction, and describes the "normal" case of establishing the transaction.
- Other cases will describe multi-segment transactions, curtailment of a transaction, etc.

**Normal Sequence: Single Segment Energy Transaction  
No Curtailment, Revision, or Termination.**

Use Case Step	Description
<p><u>Step 1</u></p> <p>Energy Purchase and Sale Agreement</p>	<p>A Seller of Energy, and a Buyer of Energy agree upon the sale of an amount of energy (Mwh or Kwh), for a certain time period, for an agreed to price, under agreed to (i.e. contract) conditions. Typically, an Energy Broker facilitates this market transaction and handles the interfaces to the operational side of the transaction.</p>
<p><u>Step 2</u></p> <p>Transmission Path Secured for transport of energy</p>	<p>A transmission path required to transport the agreed upon energy is secured. The Energy Broker secures this path by reserving transmission capacity from OASIS nodes. The transaction requires reservation of transmission capacity from an OASIS node. A complete path must be established, from Point of Delivery (POD) of energy, to Point of Receipt (POR) for approval of the energy sale.</p>
<p><u>Step 3</u></p> <p>Tag information entered by Energy Broker and Energy Market System.</p>	<p>The Energy Broker (typically using an Energy Market System) captures information needed to create a Transaction tag. This Transaction Information System (TIS) tag is an electronic entity which contains the information needed for transaction identification, tracking, and processing.</p>
<p><u>Step 4</u></p> <p>TIS tag is created by the OASIS node.</p>	<p>The OASIS node takes the tag information provided by the Energy Broker and creates a complete TIS tag. (Tag enters the REQUEST state)</p> <p>Note: These tags are described in detail in the NERC document "Interchange Scheduling/Tagging with Interchange Transaction Support -see reference 1.</p> <p>This tag will link the energy market (commercial) transaction to the power system (operations) Interchange Transaction.</p>
<p><u>Step 5</u></p> <p>Tag is sent to all parties.</p>	<p>The TIS tag is propagated from the OASIS node to the central TIS tag cache (one tag cache per Interconnection), to the Control Area EMS, and to the Energy Broker system.</p>

<p><u>Step 6</u></p> <p>Interchange Transaction reviewed for Control Area Approval.</p>	<p>The Control Area operator, using information from the Control Area EMS, either approves or disapproves the requested energy transaction. This approval is an <i>intra</i>-Control Area approval.</p> <p>If disapproved, the TIS tag records denial of schedule request, and the energy transaction is not implemented (schedule moves to DENY state).</p> <p>If approved, the Control Area forwards the request to the Regional Security Coordinator for <i>inter</i>-Control Area approval.</p>
<p><u>Step 7</u></p> <p>Regional Security Coordinator reviews requested transaction.</p>	<p>The Regional Security Coordinator reviews the Control Area approved transaction to verify that regional power system security will be maintained, and that the transaction will not conflict with other regional security transactions.</p> <p>The Regional Security Coordinator is interfaced to the NERC Inter-Regional Security Network (ISN) which coordinates real-time power system information among the NERC regions.</p> <p>If disapproved, the TIS tag records denial of schedule request (by the Regional Security Coordinator), and the energy transaction is not implemented (schedule moves to DENY state).</p> <p>If approved, the TIS tag is updated to show that Energy Transaction has been approved (tag moves to APPROVED state) and the requestor is informed of approval.</p>
<p><u>Step 8</u></p> <p>Energy Broker (Requestor) decides to accept approval or withdraw.</p>	<p>Requestor accepts approval, (tag moves to IMPLEMENT state) or withdraws request (tag moves to WITHDRAW state).</p> <p>Upon entering the IMPLEMENT state, a new schedule is transmitted from the OASIS node to the Energy Broker, the Control Area EMS, the Security Coordinator, and to the TIS central cache.</p> <p>If the schedule moves to the WITHDRAW state, the OASIS nodes transfers this information to the Energy Broker. The schedule is not implemented by the Control Area.</p>

<p><u>Step 9</u></p> <p>Control Area implements Interchange Transaction</p>	<p>Provided the schedule moves to IMPLEMENT, the Control Area Operator implements the schedule using the EMS. The Interchange Transaction schedule includes the TIS tag, which links this operational transfer of energy back to the commercial energy transaction, and to the transmission and ancillary services provided to support this energy transaction.</p> <p>The energy transfer is realized by controlling the power generated within the Control Area, and power is interchanged from the Control Area to other adjoining Control Areas. The Interchange Schedule records the Point of Delivery of Energy, the Point of Receipt of Energy, the Level of Energy, the Start/Stop Times, the Energy Type, and various other details about the Energy Transaction.</p> <p>The Energy Accounting function(s) of the EMS monitor the scheduled energy interchange and the actual energy interchange.</p>
<p><u>Step 10</u></p> <p>Scheduled Interchange is adjusted with Actual.</p>	<p>The scheduled interchange is adjusted based on the actual energy interchange, as computed by the Control Area EMS. A settlement process uses this adjusted energy transfer to create the final energy transfer. The settlement process implements the commercial adjustments that the energy schedule is subject to under the commercial agreements of the energy marketplace.</p>
<p><u>Step 11</u></p> <p>Billing</p>	<p>The actual energy transfer, as adjusted by the settlement process, is processed by the billing system. This information is entered into the Billing and Accounting Applications of the various entities involved in the transaction, to finalize the commercial transaction.</p>

**Exceptions / Alternate Sequences:**

Describe any alternative actions that may be required that deviate from the normal course of activities. Should the alternate sequence require detailed descriptions, consider creating a new Use Case.

**Post-conditions:**

Describe conditions that must exist at the conclusion of the use case.

**References:**

1. Interchange Scheduling/Tagging with Interchange Transaction Support - Discussion, Layout and Implementation Issues, Draft Version 3, January 27, 1998, NERC

**Issues:**

<b>ID</b>	<b>Description</b>	<b>Status</b>
1.		

**Revision History:**

<b>No</b>	<b>Date</b>	<b>Author</b>	<b>Description</b>
0.	24-AUG-1998	M. Wald	Billing and Settlement Use Case EPRI CCAPI Working Group

**Use Case Diagram:**