



2016
**Transactive
Energy
Systems**

CONFERENCE & WORKSHOP

May 17-19, 2016
Portland, Oregon



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Common Transactive Services

*A Summary of the NIST Transactive
Energy Challenge Common
Transactive Services Report*

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Overview

- NIST Transactional Energy Challenge
 - September 2015 start date
 - Multiple teams
- Common Transactional Services Team
 - 12 volunteer members and reviewers
 - Members have worked on or with all the analyzed systems
 - Contributors to the report are co-authors



○ Purpose

- Transactive systems need to work together at system boundaries
- Simplify interoperation and integration between systems
- Allow *mix and match* combining of systems
 - For example, put a PowerMatcher node in a TEMIX microgrid inside a CIM Markets system
- Simplify simulation design
- Generalize simulation results via interoperability



Common Transactional Services— Requirements

- The Common Transactional Services should be
 - **Standard**, providing service requests and responses that are clearly defined and standardized
 - **Extensible and adaptable** with standard models for price (in any currency) and product definition
 - **Open** Free to read and use
 - **Supportable** in open source implementations
 - As **simple** and **minimal** as possible
 - **Implement Transactional Energy** and
 - Support *highly automated coordinated self-optimization*
 - Bridge to and from each system



Common Transactional Services— Definition

Common Transactional Service

Description

Other Names Used

<i>Common Transactional Service</i>	<i>Description</i>	<i>Other Names Used</i>
Quote	Provide or request a price quotation on a product	Price quote, quote
Tender	Make a tender to buy or sell a product. Tenders may be binding or non-binding.	Offer, bid
Transaction	Accept a Tender, agreeing to and creating a Transaction binding on the parties.	Acceptance, contract, clearing
Delivery	Meter the actual delivery quantity	Verify, certify, meter, read meter



◉ Semantic and System Interoperation

- Syntactic level interoperability is easier if the semantics align
- We show how the semantics of transactive energy services align
- System interoperation is more than services:
 - Product definitions
 - Market design
 - Other characteristics
- Product definition issues are discussed here and in other papers at this conference



○ Transactional Systems

- Systems examined in this team effort were
 - CIM Markets (62325 family)
 - Pacific Northwest Smart Grid Demo Project (PNW)
 - PowerMatcher
 - TeMIX
 - OASIS Energy Interoperation/IEC 62939-3 in progress
- See the [full report](#) for a brief discussion of
 - MIT Transactional Control System
 - Transactional OpenADR



Products in Transactional Systems

Products	CIM	PNW	Power Matcher	TeMIX	CTS
Power	Yes	Yes	Yes		Yes
Energy	Yes			Yes	Yes
Forward	Yes	Near term		Yes	Yes
Transport	Yes			Yes	Yes
Ancillary	Yes			Yes	Yes



Adapting to the CTS

- For example PowerMatcher and CTS
 - PowerMatcher balances power across sets of devices
 - Exchanges supply & demand curves
 - Can represent with CIM *offer curves* in CTS
 - Can instead represent with concurrent tenders
 - Timing and settlement cycles
 - PowerMatcher is *until something changes*
 - CTS and most systems are cyclic with fixed nested intervals
 - Product definition is Power
- See the [full report](#) and paper for other examples



Conclusions

- We've shown how to apply a small set of standardized Common Transactive Services to
 - Guide interoperability
 - Focus product definition
- The CTS
 - Are easily automatable
 - Keep standards of performance are with the transacting parties (GWAC TE Principles)
 - Also support the TEA definitions of Transactive Energy
- Recommendation:
 - Implementers, architects, and integrators of Transactive Energy Systems take advantage of the CTS to accelerate their work





Questions

