
OpenADR Transactive Services

William Cox, PhD

The Energy Mashup Lab Inc

Cox Software Architects LLC

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Who Is The Energy Mashup Lab?

- Open Source Foundation in startup mode
- Transactive Energy
 - IoT Transactive Resource Framework—AllSeen Alliance
 - Common Transactive Services
- Transactive Energy Agents
- <http://theenergymashuplab.org>
- Join us!
 - Newsletter
 - Memberships
 - Projects

Who Am I?

- Consulting Software Architect
- Structuring systems and service definitions
- Standards
 - Co-Chair with David Holmberg of OASIS Energy Interoperation
 - Co-Chair of OASIS Energy Market Information Exchange
 - Architect for OpenADR to OpenADR2/EI evolution
 - Lead on WS-Calendar Platform-Independent Model
 - Lead on IEC OpenADR2b-CIM Demand Response Interoperation
- Selected Frameworks and projects
 - Publishing on transactive energy from before we called it that
 - NIST Smart Grid Framework architecture section, co-wrote business section

■ <http://CoxSoftwareArchitects.com>

Main Points

- Transactive Energy Principles
- Transactive Energy Benefits
- Common Transactive Services
- Transactive Microgrids built with OpenADR
- What changes are needed?
- What advantages are gained?
- Strategic questions answered

Transactive Energy Principles

Highly automated coordinated self-optimization	Transactive energy systems should provide for non-discriminatory participation by qualified participants
Transacting parties are accountable for standards of performance	Transactive energy systems should be observable and auditable at interfaces
Maintain system reliability and control while enabling optimal integration of renewable and distributed energy resources	Transactive energy systems should be scalable, adaptable and extensible across a number of devices, participants and geographic extent

Transactive Energy Benefits

- *Not* transactive control
 - We use a more specific definition than the GridWise Architecture Council's Transactive Energy Framework
- Only Transactive Energy addresses surplus and shortage
 - All mechanisms address shortage
- Each actor's goals are different—one size does not fit all
- Highly Automated coordinated self-optimization
 - Each actor buys or sells energy consistent with their business/personal goals and needs

Common Transactive Services

- Enables interoperation across all examine TE Systems
 - TeMIX
 - Pacific Northwest SG Demo Project
 - PowerMatcher
 - IEC 62325
- Simplest complete set of transactive services
- Transactive profile included in OASIS Standard
- Being advanced in IEC (62939-3 in process)

Common Transactive Services (2)

Common Transactive Service

Description

Other Names Used

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

What Changes are Needed?

- Add two services
 - EiTender (offer/bid)
 - EiTransaction (acceptance/contract)
 - Much simpler than EiEvent
 - See [OASIS Energy Interoperation](#) (IEC 62939-3 in process)
 - See the [Common Transactive Services](#) for details

- The OpenADR Alliance has already defined security profiles, interaction profiles, and test & certification
 - Apply the security profile set
 - Fit the Energy Interoperation standard to the OpenADR2 RESTful services
 - Determine when certification is needed

What Advantages are Gained?

- Build on OpenADR2's installed base
- First mover advantage—one of first to a broad market
- 100% compatible with OpenADR2b
- Adds Transactive Energy to Demand Response strength
- Adds Demand Response strength to Transactive Energy
- Gives Alliance members the opportunity to experiment and innovate with Transactive Energy in advance of the competition

Answers to the Strategic Questions

My advice to the OpenADR Alliance

- How could OpenADR enable Transactive Energy Systems?
 - Build from DR strength
 - Improve Transactive Energy with back off DR
 - To soft management rather than less acceptable hard control
 - Conforms to the Common Transactive Services
 - See NIST TEC Common Transactive Services Report and TES 2016 paper

- Are Transactive Energy initiatives and demonstrations leveraging OpenADR?
 - Transactive Microgrid design (TEC) extends transactive capability in a microgrid implemented with OpenADR2
 - Design and requirements completed
 - See NIST TEC Microgrid Group and TES 2016 paper
 - EPRI California Energy Commission project extends OpenADR
 - At least one other CEC project is using standards-based Transactive Energy
 - Most are “roll your own” inventions, technology explorations

Answers to the Strategic Questions (2)

My advice to the OpenADR Alliance

- What is OpenADR's competition when it comes to Transactive Energy Standards?
 - Standards: only IEC 62325 series
 - Others are proposed to be used but not standardized
 - Only OpenADR is an IEC document and can have transactive capability

- How should the OpenADR Alliance address Transactive Energy?
 - ~~■ Do nothing different?~~
 - TE relevant branding and positioning? **YES**
 - Technical improvements to support TE? **YES**
 - Make transactive services available anticipating growth in Transactive Energy
 - Help fuel that rapid growth by having a standard TE systems that maps to all other transactive systems



Thanks!

Questions and comments
welcome—I'm looking
forward to the continued
conversation

References

- The Energy Mashup Lab – open source foundation for Transactive Energy and Energy Agents (including IoT)
<http://TheEnergyMashupLab.org>
- Transactive Energy Challenge Papers and Presentations
<https://github.com/EnergyMashupLab/TransactiveEnergyChallenge>
- [OASIS Energy Interoperation](#) (IEC 62939-3 in process)
- [Common Transactive Services](#) paper and report for details on the services
- William Cox papers
http://coxsoftwarearchitects.com/Pages/C_New.html
- [GridWise Architecture Council Transactive Energy Principles](#)