




# Enabling Standards for Industry-to-Grid

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 #ConnWeek



## Introduction

- William Cox
  - Principal, Cox Software Architects LLC
  - Consulting Software Architect
  - Specializing in Smart Grid architecture and information definitions
- Toby Considine
  - Principal, TC9, Inc ([www.tcnine.com](http://www.tcnine.com))
  - Strategic Technology Consulting
  - Enterprise integration of Smart Buildings and Smart Energy



## Smart Grid Capabilities

- You need information to make intelligent choices
- Fortunately standards are well along to define and deliver that information
- All are available for public review and comment
  - Follow the links on the individual standard pages
- All have implementations in progress



## Information Exchanges

- Schedule
    - Not just data and time
  - Price and Product Definition
  - Resources for the Smart Grid (including Terms for market use)
  - Curtailment and Generation Information
- and*
- Information Exchanges to connect the participants



## Enabling Business Value

- Aggregation of your resources
- More intelligent exchanges with Aggregators
- Price streams
- Price arbitrage with day ahead prices
- Ability to bid load profiles for industrial process
- Smarter facility management decisions



## The Smart Grid and Facilities

- Today much curtailment is called “Demand Response”
- Some working on “Fast DR”
  - The definition has changed over time
- Others working on higher value products
  - Regulation
  - Spinning Reserve
- Markets (typically wholesale today) for all of these and more
- Constraints/Terms get more demanding over time



## Where the Smart Grid is Going

- More markets
- Products in wholesale markets of today will appear in retail markets tomorrow
- Microgrids add new layers
- Need flexible, extensible mechanisms to communicate critical and actionable information
- Self-configuring devices and Energy Management Systems
  - Less custom configuration—concentrate on adding value rather than reinventing



## Smart Grid Standards

- National Priority Action Plans
- NIST Roadmap & Framework for the Smart Grid
  - Schedule information—WS-Calendar
  - Price and Product and Resource—EMIX
  - Curtailment, regulation, price quotes, and market transactions—Energy Interoperation
- All are...
  - Available on the Web and free to read, use, and apply
  - Extensible by users (NIEM)
  - Designed to be used inside, outside, to & from microgrids





## WS-Calendar

- [OASIS WS-Calendar 1.0](#)
- Based on IETF iCalendar, the model for schedules
  - Intervals
  - Sequences of time-related Intervals
  - Calendar Gluons
    - For inheriting information otherwise repeated
  - Time stamps
- Expected completion June/July 2011
- [NIST Smart Grid Priority Action Plan 4](#)



## EMIX

- [OASIS Energy Market Information Exchange v1.0](#)
- Price
- Product Definition
- Resources
  - Curtailment, Generation, Storage
  - Constraints cover key market capabilities and terms
- Expected Completion June/July 2011
- [NIST Smart Grid Priority Action Plan 03](#)



## Energy Interoperation (1)

- [OASIS Energy Interoperation v1.0](#)
- Conveys vocabulary defined in EMIX and WS-Calendar
  - Price and Product Definition
  - Resource references
  - Tenders and Transactions
- Defines and conveys vocabulary for
  - Curtailment Events, Distributed Energy Resources
  - Resource response



## Energy Interoperation (2)

- Profiles on Energy Interoperation 1 include
  - OpenADR 2
  - TEMIX (Transactional EMIX)
  - Price Distribution
- Simple Directed Graph
- eCommerce robustness
- Expected Completion Summer 2011
- [NIST Smart Grid Priority Action Plan 09](#)



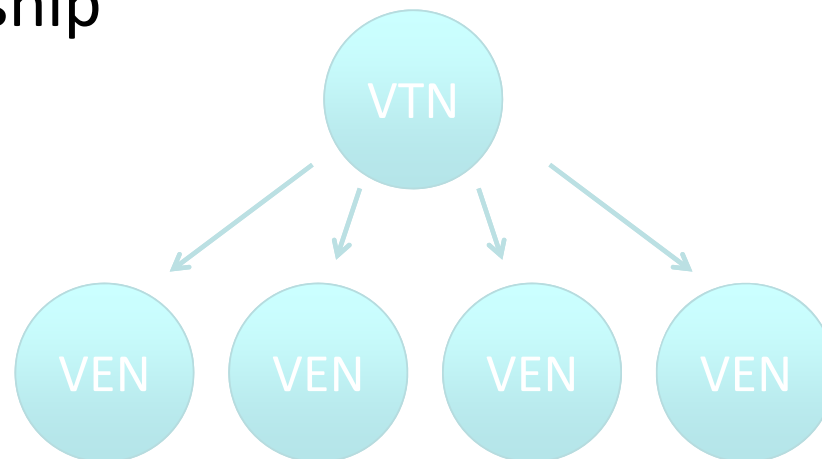
## Example: Resource Market Terms

- In EMIX Public Review Draft 02 called *constraints*
- Based on existing market models of terms and conditions
- Market terms are what your facility commits to when buying or selling
- Use Market terms for resources in your facilities to determine what you can sell or need to buy
- Some terms (See EMIX PR02 for the list)
  - Minimum Duration, Maximum Duration
  - Minimum Notice, Maximum Notice



## Virtual Top and End Nodes

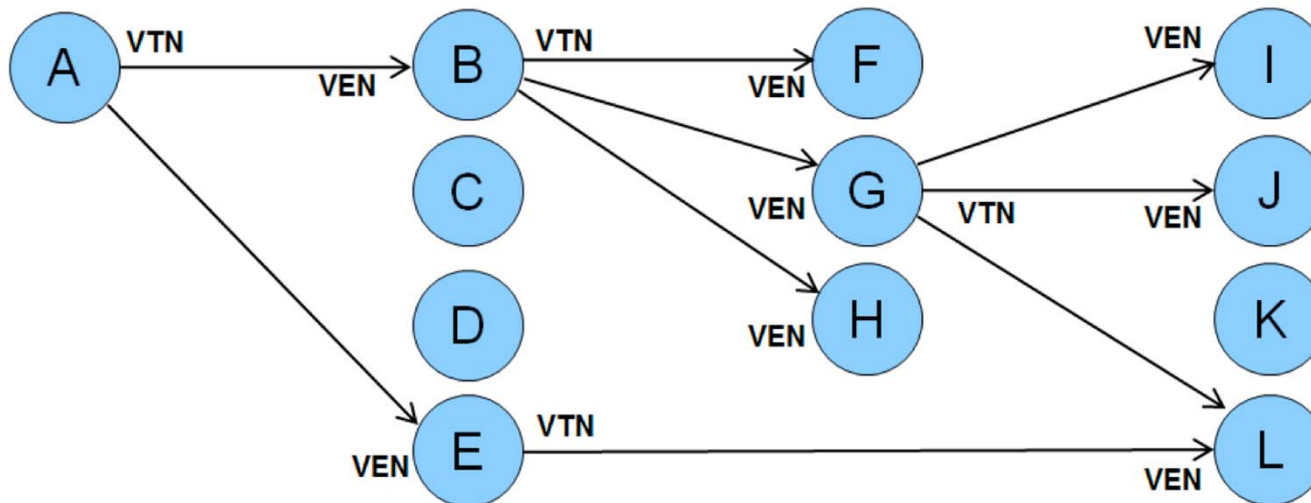
- A simple recursive pattern of Virtual Top Nodes and Virtual End Nodes
- A Virtual Top Node has one or more VENs in a given relationship
- A Virtual End Node has exactly one VTN in a given relationship





## Example: Beyond Utility-Customer

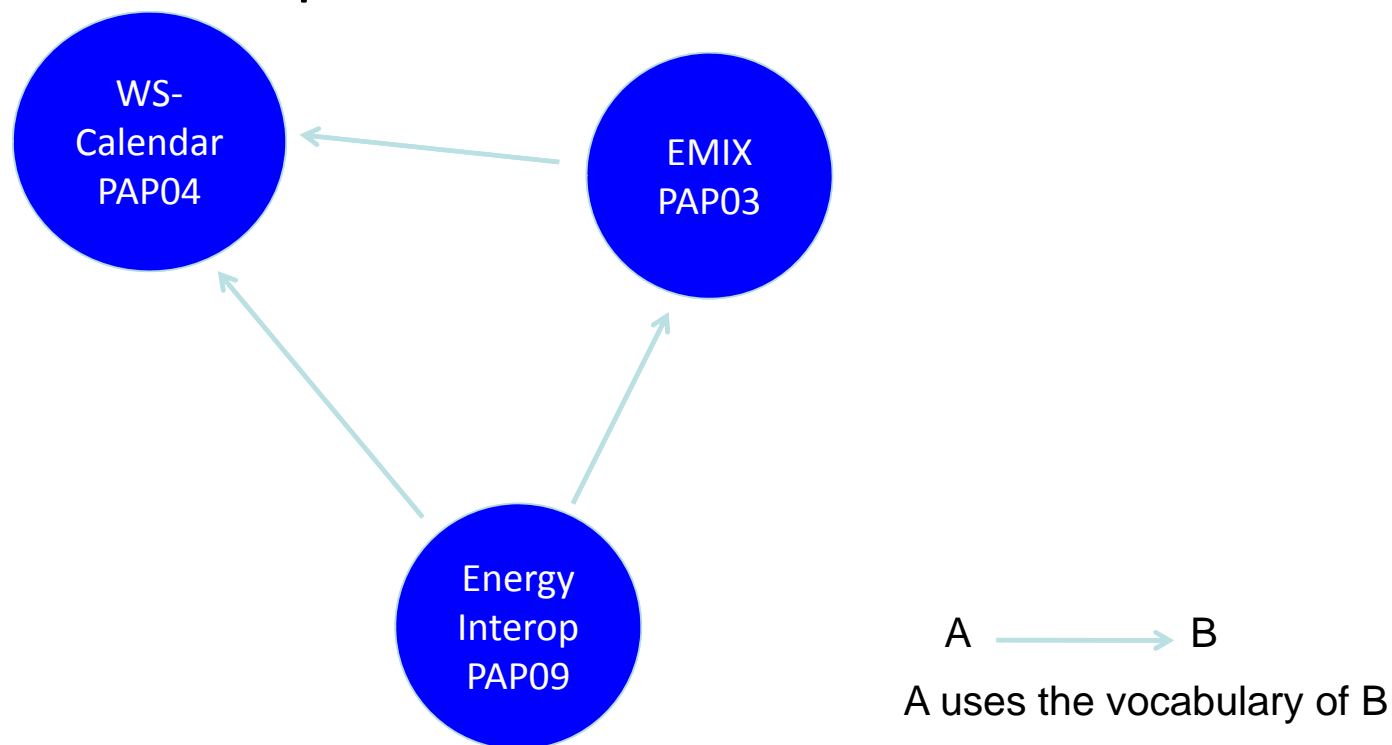
- A is an ISO issuing a DR signal
- B, C, D, E are first level aggregators
- F, G, H are second level aggregators and B's customers
- I, J, L are stores and are G's customers
- L is also E's customer





## Relationship of Vocabularies

- The standards define vocabularies (information models) and (Energy Interoperation only) interaction patterns







## Facility Smart Grid Information Model

- ASHRAE (the BACnet people) are standardizing a seed Facility Smart Grid Information Model
  - FSGIM—ASHRAE SPC201P
- Cox is on the Energy Manager Model team
  - Using WS-Calendar Intervals, EMIX Resources, EMIX price streams, and Energy Interoperation signals
- Expected completion 2011
- First Public review mid-year
- [NIST Smart Grid Priority Action Plan 17](#)



## Conclusions

- The Smart Grid is evolving rapidly to market terms and conditions
- Simple interoperation based on standards is more durable and cost effective
- Information models will complete standardization in months
- Opportunities to manage your (or your clients' facilities better)



Thanks!

- Questions?
  
  
  
  
  
  
  
  
  
  
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