

EMIX 1.0 and the OASIS Smart Grid Suite of Standards Version 1.0

Committee Note 01

06 June 2012

Specification URIs

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Abstract:

We describe how EMIX relates to other OASIS Standards, including WS-Calendar, Energy Interoperation, Emergency Management, SOA Reference Model, and Security standards.

Status:

This document was last revised or approved by the OASIS Energy Market Information Exchange (eMIX) TC on the above date. The level of approval is also listed above. Check the "Latest version" location noted above for possible later revisions of this document. Technical Committee members should send comments on this document to the Technical Committee's email list. Others should send comments to the Technical Committee by using the "Send A Comment" button on the Technical Committee's web page at http://www.oasis-open.org/committees/emix/.

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1 Introduction

- 2 We describe how EMIX [EMIX] relates to the OASIS suite of Smart Grid Standards, WS-Calendar
- 3 [WS-Calendar], Energy Interoperation [EnergyInteroperation], as well as other OASIS Standards
- 4 including Emergency Management [REF NEEDED], SOA Reference Model [SOA-RM], and
- 5 Security standards.

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- 6 EMIX is an information model for energy and market information, which is in turn used by
- 7 Energy Interoperation services for communicating price and product information.
- 8 Understanding the relationship of the three standards helps in understanding the OASIS Smart
- 9 Grid suite of standards.
- 10 To more effectively understand and use EMIX, one must start with a broad understanding of
- 11 OASIS WS-Calendar [WS-Calendar] schedules to which price and product information is
- attached. We then describe how OASIS Energy Interoperation [EnergyInteroperation] and its
- 13 OpenADR 2 profile uses both EMIX and WS-Calendar.
- 14 Composing relatively simple standards has significant advantages over building large unitary
- standards. The OASIS suite of Smart Grid Standards is designed for composition and re-use, and
- in fact composes with each other and with other specifications and technologies as we describe
- in Section 2.

18 1.1 References

19 1.1.1 OASIS Committee Specifications and Drafts

- 20 **[EMIX]**
- 21 OASIS Energy Market Information Exchange [EMIX] Version 1.0. Latest version.
- 22 http://docs.oasis-open.org/emix/emix/v1.0/emix-v1.0.pdf.
- 23 [EnergyInteroperation]
- 24 OASIS Energy Interoperation Version 1.0. Latest version.
- 25 http://docs.oasis-open.org/energyinterop/ei/v1.0/energyinterop-v1.0.pdf.
- 26 **[SOA-RM]**
- 27 OASIS Reference Model for Service Oriented Architecture Version 1.0, 12 October 2006. OASIS
- 28 Standard. http://docs.oasis-open.org/soa-rm/v1.0/soa-rm.html
- 29 [WS-Calendar]
- 30 OASIS WS-Calendar Version 1.0, 30 July 2011. OASIS Committee Specification. http://docs.oasis-
- 31 open.org/ws-calendar/ws-calendar-spec/v1.0/cs01/ws-calendar-spec-v1.0-cs01.pdf

32 1.1.2 Other References

- 33 [Collaborative]
- 34 Collaborative Energy Status Page, Various Dates, http://collaborate.nist.gov/twiki-
- 35 sggrid/bin/view/SmartGrid/CollaborativeEnergyStatus
- 36 [Emergency]
- 37 OASIS Emergency Management Technical Committee, http://www.oasis-
- 38 open.org/committees/emergency/
- 39 **[EMIX Issues]**
- 40 EMIX Issues Page, http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/EMIXissuesPage
- 41 **[PAP09**]
- 42 Slides for Priority Action Plan 09, July 2011. http://collaborate.nist.gov/twiki-
- 43 sggrid/pub/SmartGrid/PAP09DRDER/PAP09 OpenSG 20110719.pptx

2 EMIX and the OASIS Smart Grid Standards

45 2.1 Overview

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- 46 We focus on the suite of OASIS Smart Grid standards. The three standards respond to three of
- 47 the National Institute of Science and Technology [NIST] Priority Action Plans [PAPs], and have
- 48 been implemented so as to address interoperation requirements across and within domains of
- 49 the Smart Grid.¹
- 50 The OASIS Smart Grid suite consists of three standards. The first two are pure information
- 51 models, expressed as an XML vocabulary for describing information in their scope; the third is
- 52 an information model, architecture, and set of Web services definitions for communicating
- 53 among participants in the Smart Grid.
- OASIS Energy Market Information Exchange **[EMIX]** corresponding to NIST/SGIP Priority
 Action Plan 03²
 - OASIS WS-Calendar [WS-Calendar] corresponding to NIST/SGIP Priority Action Plan 04³
 - OASIS Energy Interoperation [EnergyInteroperation] corresponding to NIST/SGIP Priority Action Plan 09⁴
- The relationships of these three standards and a family of seed standards for energy usage information⁵ can be seen in **Figure 1**.

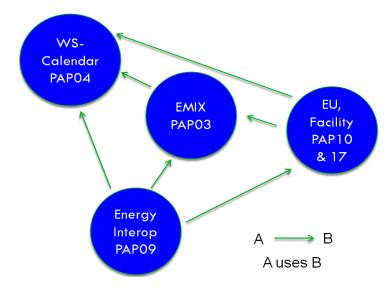
¹ See the NIST Smart Grid Framework and Roadmap at http://nist.gov/smartgrid/upload/FinalSGDoc2010019-corr010411-2.pdf and the Smart Grid Interoperability Panel Priority Action Plans at http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/PriorityActionPlans

² http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/PAP03PriceProduct

³ http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/PAP04Schedules

http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/PAP09DRDER

 $^{^{5}}$ Addressed in NIST/SGIP Priority Action $\underline{\mathsf{Plan}\ 10}$ and $\underline{\mathsf{Plan}\ 17}$



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Figure 1 Dependency graph for EMIX, Energy Interoperation, and WS-Calendar

As shown, EMIX uses WS-Calendar and is in turn used by Energy Interoperation. Energy Interoperation and EMIX use the minimal subset of the NAESB Energy Usage information. The arrows indicate that Energy Interoperation uses both EMIX and WS-Calendar, while EMIX uses only WS-Calendar.

The following sections describe how the specifications are used and use other specifications.

2.2 EMIX and WS-Calendar

The WS-Calendar and Energy Market Information Exchange (EMIX) specifications are both information models, expressed as *XML vocabularies*. WS-Calendar uses and extends the IETF iCalendar standards, which are the common information model and vocabulary for calendaring and scheduling. The **[WS-Calendar]** specification was joint work between the North American Energy Standards Board [NAESB]⁶ and the Calendaring and Scheduling Consortium.⁷

- WS-Calendar uses Sequences of time Intervals to communicate schedules. Information elements that are unique to an Interval are communicated in the Interval, while information elements common to the entire Sequence are factored out and communicated once with the Sequence.
- For example, the start time of the Sequence, and a common duration of each Interval might be communicated once with the Sequence (in a WS-Calendar artifact called a *Gluon*), while price information might vary across the Intervals and be contained within each Interval.
 - In WS-Calendar, a Gluon relates to a Sequence by relating to a specific Designated Interval within that Sequence. All other Intervals have defined temporal relationships, directly or indirectly, to the Designated Interval. If a Gluon contains a start date and time, that start date and time is inherited only by a single Designated Interval; the start dates and times for all other

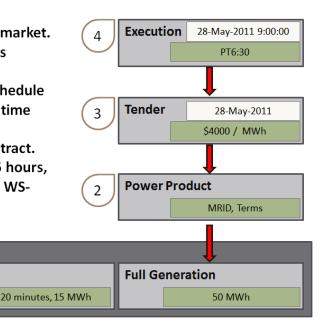
⁶ http://naesb.org/

http://calconnect.org/

- Intervals in the Sequence can be computed from that single date and time. This allows scheduling of an entire set of time-related intervals, a Sequence, with one operation rather than
- changing each interval's start, end, and/or duration.
- 87 EMIX uses the common terminology of markets. EMIX expresses schedules for energy use,
- 88 delivery, curtailment, and demand with the WS-Calendar vocabulary for schedules, and provides
- 89 the EMIX vocabulary for expressing information on price and product definition. These
- 90 definitions are used by implementers and by other standards.
- 91 EMIX extends WS-Calendar Intervals and Gluons, attaching price, quantity, product definitions,
- 92 and more. In the EMIX information model, Interval Duration and the Product Description, Price,
- and Quantity for each Interval in a Sequence can each be inherited from a Gluon.⁸ This follows
- and extends the rules of inheritance defined in WS-Calendar.
- Figure 2 below provides a model demonstrating a sequence of three Intervals, and the
 successive application of Gluons to bring them to market.
 - 1. Party defines sequence offering Power to market.
 - 2. Gluon references Interval, private Intervals described in Terms
 - 3. Tender uses gluon to reference existing Schedule and Terms, using Availability to indicate a time window, and stating the asking price.
 - External reference to Tender executes contract.
 Start date and time (9:00) and Duration (6 hours, 30 minutes) are set in Sequence (1) as per WS-Calendar inheritance rules

Capability expressed as internal Sequence

30 minutes, 0 MWh



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Figure 2 EMIX Schedule and Building a Product (from [EMIX] Section 6.4)

Ramp time

2.3 EMIX and Energy Interoperation

Notice time

OASIS Energy Interoperation [EnergyInteroperation] uses the WS-Calendar and Energy Market Information Exchange (EMIX) information models to implement demand-response, distributed energy resource interactions, and transactive energy interactions.

For Events, information may consist of curtailment or generation or regulation levels, quantities, or prices. The price expression is simplified from EMIX.

⁸ Only the Designated Interval inherits the Start Date and Time.

105 106 107	Energy Interoperation defines interactions for conveying price quotes (such as clearing prices in a market) and tenders (such as offers to buy or sell) by conveying EMIX schedules with energy product information.		
108 109	In addition several information items in Energy Interoperation build on EMIX definitions. These include		
110 111	•	The EMIX Market Context—a reference to the program, contract, tariff, or market related to the interaction	
112 113	•	The EMIX Resource Description—a description of capabilities for curtailment and generation and for ancillary services	
114	•	The EMIX Product Description—a description of details of time, place(s), and more	
115 116	•	Market (or program or tariff or) Standard Terms—a description of notice, frequency, units, and other requirements	
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3 EMIX and Other Specifications 118 3.1 Composition for Consistency 119 120 The OASIS Smart Grid Suite of Standards are defined to be composed as part of palette of 121 standards used in an application environment, and also to have other standards composed with 122 them. 123 For example, price and product information may be commercially sensitive. Following the 124 compositional approach for electronic commerce and eBusiness standards, a deployment using 125 EMIX will define and compose the necessary security standards to achieve the deployment 126 business and security goals. 127 Likewise, the messages containing EMIX price and product information may travel on a variety 128 of transports and with a variety of reliability, privacy, assured delivery, and non-repudiation 129 standards and technologies that depend on the business and security goals of the deployment. 130 By defining information models that can be exchanged with any security and reliability, uses of 131 EMIX in any environment can share code, information model, XML schema, and the 132 understanding of energy products achieved through broad public discussion and review. 3.2 Other OASIS Standards 133 134 In this section we list several OASIS Standards used by or coordinated with by EMIX. 135 OASIS Emergency Management Standards—EMIX uses the same profile of the Open Geospatial 136 Consortium's GML. This allows, for example, an area affected by a power outage to be 137 communicated in the same way to emergency management service. 138 OASIS Energy Interoperation—Useful capabilities are enabled by the GML geospatial definitions 139 that are possible in EMIX. Prices may be described for an area of coverage of a particular feeder

an interaction or a piece of information.
 OASIS Message Reliability Standards—The industry-standard OASIS message reliability

area, or Distributed Energy Resources may be called on.

standards¹⁰ can be used to send and receive EMIX price and product information in Energy

147 Interoperation messages or whatever messaging standards one selects.

or substation, and with OASIS Energy Interoperation a curtailment event could be called on that

OASIS Security Standards—The industry-standard OASIS security standards⁹ can be composed

with EMIX, WS-Calendar, and Energy Interoperation, tailoring security to the requirements for

emix-oasis-v1.0-cn01 Non-Standards Track

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⁹ For example, Web Services Security, XACML, SAML, WS-SecureConversation, and more at http://www.oasis-open.org/standards

¹⁰ For example, WS-Reliability, Web Services Reliable Messaging, and more at http://www.oasis-open.org/standards

4 Conclusion EMIX is part of a suite of Smart Grid Standards under development by OASIS. By standardizing the description of energy schedules and product attributes, EMIX provides a means for exchanging information among different domains of the Smart Grid and among participants with different business and information models.

Appendix A. Acknowledgments 153 The following individuals have participated in the creation of this specification and are gratefully 154 155 acknowledged: 156 Participants: 157 Edward Cazalet, Individual Toby Considine, University of North Carolina 158 William Cox, Individual 159 David Holmberg, National Institute of Standards and Technology 160

161 Appendix B. Revision History

Revision	Date	Editor	Changes Made
01	[Rev Date]	David Holmberg	Based on contributed notes by TC members
02	13 October 2011	William Cox	Rewrite based on review and comments