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

Committee Note 01

06 June 2012

Abstract:

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

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http://docs.oasis-open.org/emix/emix-oasis/v1.0/cn01/emix-oasis-v1.0-cn01.html.

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1   Introduction

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

EMIX is an information model for energy and market information, which is in turn used by Energy Interoperation services for communicating price and product information. Understanding the relationship of the three standards helps in understanding the OASIS Smart Grid suite of standards.

To more effectively understand and use EMIX, one must start with a broad understanding of OASIS WS-Calendar **[WS-Calendar]** schedules to which price and product information is attached. We then describe how OASIS Energy Interoperation **[EnergyInteroperation]** and its OpenADR 2 profile uses both EMIX and WS-Calendar.

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.

1.1 References

1.1.1 OASIS Committee Specifications and Drafts

[EMIX]
OASIS Energy Market Information Exchange [EMIX] Version 1.0. Latest version.
http://docs.oasis-open.org/emix/emix/v1.0/emix-v1.0.pdf.

[EnergyInteroperation]
OASIS Energy Interoperation Version 1.0. Latest version.
http://docs.oasis-open.org/energyinterop/ei/v1.0/energyinterop-v1.0.pdf.

[SOA-RM]
OASIS Reference Model for Service Oriented Architecture Version 1.0, 12 October 2006. OASIS Standard. http://docs.oasis-open.org/soa-rm/v1.0/soa-rm.html

[WS-Calendar]
OASIS WS-Calendar Version 1.0, 30 July 2011. OASIS Committee Specification. http://docs.oasis-open.org/ws-calendar/ws-calendar-spec/v1.0/cs01/ws-calendar-spec-v1.0-cs01.pdf

1.1.2 Other References

[Collaborative]

Collaborative Energy Status Page, Various Dates, http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/CollaborativeEnergyStatus

[Emergency]

OASIS Emergency Management Technical Committee, http://www.oasis-open.org/committees/emergency/

[EMIX Issues]

EMIX Issues Page, http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/EMIXissuesPage

[PAP09}

Slides for Priority Action Plan 09, July 2011. http://collaborate.nist.gov/twiki-sggrid/pub/SmartGrid/PAP09DRDER/PAP09_OpenSG_20110719.pptx

2 EMIX and the OASIS Smart Grid Standards

2.1 Overview

We focus on the suite of OASIS Smart Grid standards. The three standards respond to three of the National Institute of Science and Technology [NIST] Priority Action Plans [PAPs], and have been implemented so as to address interoperation requirements across and within domains of the Smart Grid.[1]

The OASIS Smart Grid suite consists of three standards. The first two are pure information models, expressed as an XML vocabulary for describing information in their scope; the third is an information model, architecture, and set of Web services definitions for communicating among participants in the Smart Grid.

- OASIS Energy Market Information Exchange **[EMIX]** corresponding to NIST/SGIP Priority Action Plan 03[2]

- OASIS WS-Calendar **[WS-Calendar]** corresponding to NIST/SGIP Priority Action Plan 04[3]

- OASIS Energy Interoperation **[EnergyInteroperation]** corresponding to NIST/SGIP Priority Action Plan 09[4]

The relationships of these three standards and a family of seed standards for energy usage information[5] can be seen in **Figure 1**.

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[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

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

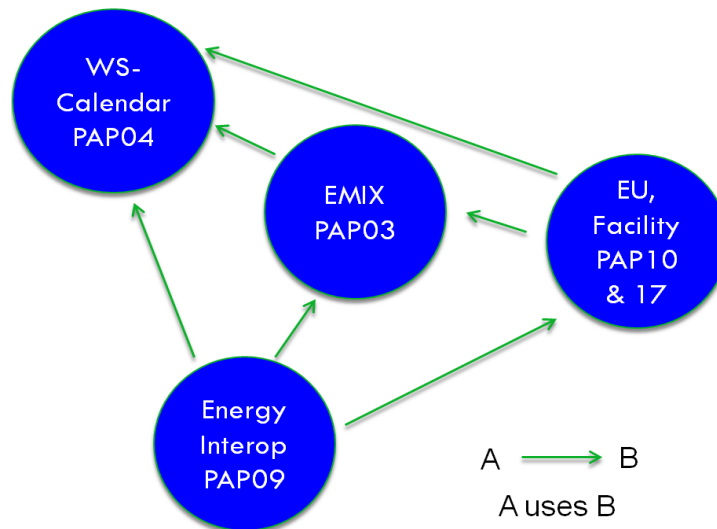[5] Addressed in NIST/SGIP Priority Action Plan 10 and Plan 17

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

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

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

2.2 EMIX and WS-Calendar

68

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

74 WS-Calendar uses Sequences of time Intervals to communicate schedules. Information elements
75 that are unique to an Interval are communicated in the Interval, while information elements
76 common to the entire Sequence are factored out and communicated once with the Sequence.

77 For example, the start time of the Sequence, and a common duration of each Interval might be
78 communicated once with the Sequence (in a WS-Calendar artifact called a *Gluon*), while price
79 information might vary across the Intervals and be contained within each Interval.

80 In WS-Calendar, a Gluon relates to a Sequence by relating to a specific Designated Interval
81 within that Sequence. All other Intervals have defined temporal relationships, directly or
82 indirectly, to the Designated Interval. If a Gluon contains a start date and time, that start date
83 and time is inherited only by a single Designated Interval; the start dates and times for all other

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[6] http://naesb.org/
[7] http://calconnect.org/

84 Intervals in the Sequence can be computed from that single date and time. This allows
85 scheduling of an entire set of time-related intervals, a Sequence, with one operation rather than
86 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,
93 and Quantity for each Interval in a Sequence can each be inherited from a Gluon.[8] This follows
94 and extends the rules of inheritance defined in WS-Calendar.

95 **Figure 2** below provides a model demonstrating a sequence of three Intervals, and the
96 successive application of Gluons to bring them to market.

97
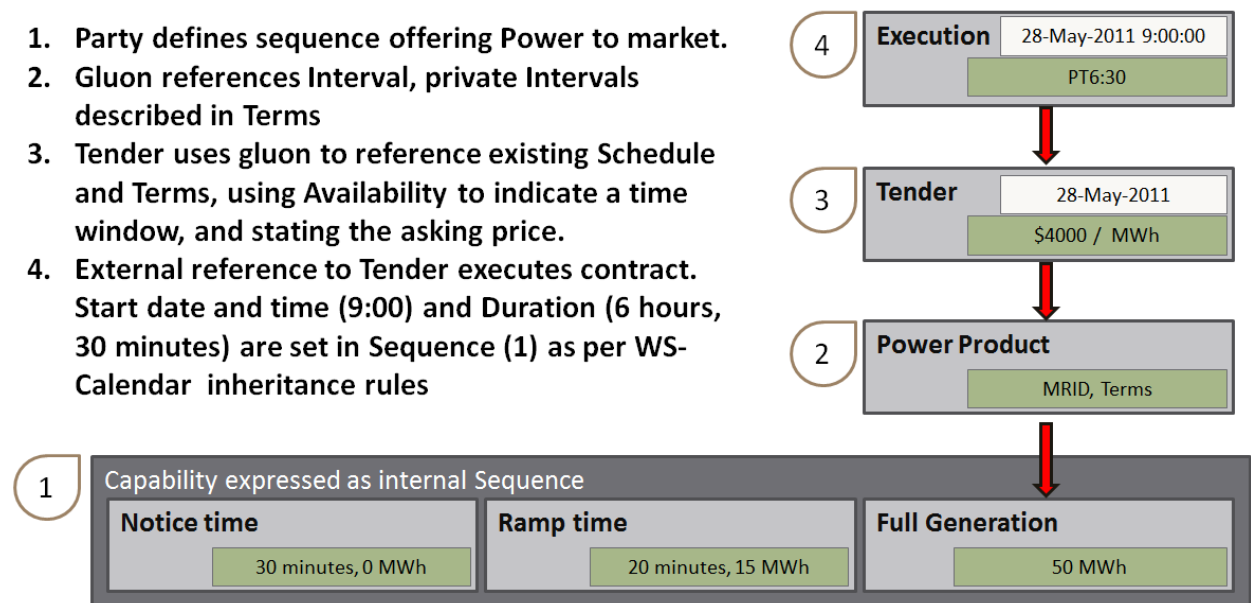
98 **Figure 2 EMIX Schedule and Building a Product (from [EMIX] Section 6.4)**

2.3 EMIX and Energy Interoperation

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

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

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

105 Energy Interoperation defines interactions for conveying price quotes (such as clearing prices in
106 a market) and tenders (such as offers to buy or sell) by conveying EMIX schedules with energy
107 product information.

108 In addition several information items in Energy Interoperation build on EMIX definitions. These
109 include

110 • The EMIX Market Context—a reference to the program, contract, tariff, or market
111   related to the interaction

112 • The EMIX Resource Description—a description of capabilities for curtailment and
113   generation and for ancillary services

114 • The EMIX Product Description—a description of details of time, place(s), and more

115 • Market (or program or tariff or…) Standard Terms—a description of notice, frequency,
116   units, and other requirements

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3 EMIX and Other Specifications

3.1 Composition for Consistency

The OASIS Smart Grid Suite of Standards are defined to be composed as part of palette of standards used in an application environment, and also to have other standards composed with them.

For example, price and product information may be commercially sensitive. Following the compositional approach for electronic commerce and eBusiness standards, a deployment using EMIX will define and compose the necessary security standards to achieve the deployment business and security goals.

Likewise, the messages containing EMIX price and product information may travel on a variety of transports and with a variety of reliability, privacy, assured delivery, and non-repudiation standards and technologies that depend on the business and security goals of the deployment.

By defining information models that can be exchanged with any security and reliability, uses of EMIX in any environment can share code, information model, XML schema, and the understanding of energy products achieved through broad public discussion and review.

3.2 Other OASIS Standards

In this section we list several OASIS Standards used by or coordinated with by EMIX.

OASIS Emergency Management Standards—EMIX uses the same profile of the Open Geospatial Consortium's GML. This allows, for example, an area affected by a power outage to be communicated in the same way to emergency management service.

OASIS Energy Interoperation—Useful capabilities are enabled by the GML geospatial definitions that are possible in EMIX. Prices may be described for an area of coverage of a particular feeder or substation, and with OASIS Energy Interoperation a curtailment event could be called on that area, or Distributed Energy Resources may be called on.

OASIS Security Standards—The industry-standard OASIS security standards[9] can be composed with EMIX, WS-Calendar, and Energy Interoperation, tailoring security to the requirements for an interaction or a piece of information.

OASIS Message Reliability Standards—The industry-standard OASIS message reliability standards[10] can be used to send and receive EMIX price and product information in Energy Interoperation messages or whatever messaging standards one selects.

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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

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148 # 4 Conclusion

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

Appendix A. Acknowledgments

The following individuals have participated in the creation of this specification and are gratefully acknowledged:

Participants:

Edward Cazalet, Individual
Toby Considine, University of North Carolina
William Cox, Individual
David Holmberg, National Institute of Standards and Technology

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

162