



Global Exchanges and Markets Committee Environment and Electrical Units of Measure

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Document History

Revision	Date	Author	Revision Comments
0.1	June 17, 2011	Ryan Pierce, CME Group	Initial revision.
0.2	July 19, 2011	Ryan Pierce, CME Group	<p>Revised based on comments at July 13, 2011 GExMC meeting:</p> <p>Changed abbreviations for environmental offsets and credits, and kW-d. Made electrical capacity units Variable Quantity.</p> <p>Provided clarification that time units for electrical capacity are business or legal constructs. Also changed this to refer to generation capacity, not grid transmission.</p> <p>Added kW and MW capacity units for minute, hour, and year.</p> <p>Added kWh to go with MWh.</p> <p>Added glossary definitions.</p>
0.3	July 22, 2011	Ryan Pierce, CME Group	<p>Revised based on comments at July 21, 2011 GExMC meeting:</p> <p>Added commentary to Section 3.</p> <p>Added examples to Appendix D.</p> <p>Added new EventType enums Delivery Start Time and Delivery End Time.</p>
As Built	2011-09-05	Jim N	As Built
	2011-12-27	Lisa T.	Editted to include enum value descriptions changes for EventType to be sentence case.
	2011-02-20	Lisa T.	Final clean up edit to replace "tbd" in narrative text.

1 Introduction

FIX uses the concept of UnitOfMeasure to indicate the underlying quantity of a commodity on which a derivatives contract is based. The field UnitOfMeasure (996) is used to indicate this within the Instrument component, and UnitOfMeasureQty (1147) indicates the quantity being referenced.

This Gap Analysis adds new Unit of Measure enumerations to support environmental trading and electrical capacity trading.

2 Business Workflow

2.1 Environmental Trading

Under Cap and Trade frameworks, central authorities such as government bodies limit emissions of pollutants and provide Allowances to firms that pollute. Allowances are essentially permits to emit specified quantities of pollutants, such as carbon dioxide-equivalent greenhouse gas emissions. Firms with emissions exceeding their Allowances can purchase additional Allowances. And firms who are emitting less than their Allowances can sell their excess Allowances. Examples of Allowances include European Union Allowances, Regional Greenhouse Gas Initiative (RGGI) Allowances, and those issued by the state of California.

Polluters can also comply through the purchase of Offsets. These are generally associated with specific projects that reduce or offset pollution, such as planting trees or recapturing methane from landfills or livestock. Examples include Certified Emission Reductions (CERs) and Climate Reserve Tonnes (CRTs).

Additionally, Credits can be used to meet specific targets. For example, a government body may require that 20% of all electrical power generated come from renewable sources. If a utility company is generating only 10% of its power from renewable sources, then it would need to purchase Credits to make up the difference. Operators of wind farms would produce these Credits, and could sell them. Utilities generating more than 20% of their power from renewable sources could likewise sell Credits. Unlike Offsets, Credits generally are not traceable to specific sources. Energy efficiency and water management are also examples of Environmental Credit markets.

Currently, the FIX Protocol defines a Unit of Measure for “Allowances” (Alw). No action here is needed.

FIX also defines two types of Offsets: “Certified Emissions Reduction” (CER) and “Climate Reserve Tonnes” (CRT). However, other forms of Offsets exist. Rather than continue to create new Unit of Measure enumerations for each new type of Offset, this Gap Analysis proposes the creation of “Environmental Offset” (EnvOfst) that can be used for all types of Offsets.

FIX has no defined unit for Credits. This Gap Analysis proposes the creation of “Environmental Credit” (EnvCrD).

2.2 Electricity Capacity

FIX defines a single unit for electrical energy: “Megawatt hours” (MWh). This corresponds to the amount of electricity produced by a generator and sold to the consumer. Currently, “Kilowatt hours” does not exist as a unit for electrical energy. This Gap Analysis will add:

- “Kilowatt hour” - kWh

Additionally, for each consumer of power, generating capacity must exist to provide that power. Generators have the capacity to generate a certain number of MW of power, and they sell that capacity to users. In other words, by purchasing capacity, a user knows that a generator is available to supply the customer with power should the customer need to use it. By requiring consumers to purchase capacity in addition to electricity, the consumers contribute to the infrastructure required to generate the power they use.

While the units used for energy and capacity appear similar, they are different concepts. For example, someone who purchases 1 MWh of electricity from a generator, but has it delivered over a 10 minute period, is using 6 MW of generation capacity. A person purchasing the same 1 MWh of electricity who has it delivered over a 4 hour period will, by comparison, only utilize 0.25 MW of the generator’s capacity.

Generation capacity cannot be sold instantaneously. It is sold for the period of a minute, hour, day, month, or year. Note that these time periods are business or legal constructs that do not always correspond to the same quantity of time due to a leap second, an hour inserted or removed due to Daylight Saving Time, the variable number of days in a month, and leap year. This Gap Analysis proposes the addition of 10 new units for electrical capacity:

- “Kilowatt-Minute (electrical capacity)” – kW-min
- “Megawatt-Minute (electrical capacity)” – MW-min
- “Kilowatt-Hour (electrical capacity)” – kW-h
- “Megawatt-Hour (electrical capacity)” – MW-h
- “Kilowatt-Day (electrical capacity)” – kW-d
- “Megawatt-Day (electrical capacity)” – MW-d
- “Kilowatt-Month (electrical capacity)” – kW-M
- “Megawatt-Month (electrical capacity)” – MW-M
- “Kilowatt-Year (electrical capacity)” – kW-a
- “Megawatt-Year (electrical capacity)” – MW-a

Each of these units permits the buyer to consume up to a given amount of electricity over the grid for a given time period. It does not include the price for purchasing the electricity itself, which would be handled through separate transactions.

To enable specifying delivery start and end times for electricity capacity, two new enumerations for EventType(865) are needed:

- Delivery Start Time(21)
- Delivery End Time(22)

3 Issues and Discussion Points

3.1 Identifying Delivery Time

Contracts for electricity capacity require specification of the time during which the electricity capacity is delivered. Usually, this time is critical to pricing and trading. E.g. one cannot buy a 1 MW-Month contract and later choose which month to redeem it. Rather, one buys a 1 MW-Month contract for August 2011, which is not fungible with a 1 MW-Month contract for September, 2011. This is comparable to other derivatives; August 2011 live cattle are not fungible with October 2011 live cattle, and one must specify a delivery month when trading the contract.

Contracts for a year, month, or day can be identified easily using MaturityMonthYear(200). In the case of a year, the month should be the first delivery month, e.g. for the 2012 calendar year, MaturityMonthYear(200) = 201201

Contracts for an hour or minute require use of EventGrp to determine the delivery time. Two new enumerations [in EventType\(865\) field](#), Delivery Start Time(21) and Delivery End Time(22), are created for this purpose. However, one can also use Delivery Start Time in combination with EventTimePeriod(~~FBD~~1826) and EventTimeUnit(~~FBD~~1827), two new fields introduced in the approved Gap Analysis Responding to the US Tri-Party Repo Task Force Proposal.

4 Proposed Message Flow

This Gap Analysis contains no changes to existing FIX message flows.

Appendix A - Data Dictionary

Tag	Field Name	Action	Data type	Description	FIXML Abbreviation	Add to / Deprecate from Message type or Component block
865	EventType	Update	int	Code to represent the type of event Valid Values: ... 7 = Last eligible trade date 8 = Swap start date 9 = Swap end date 10 = Swap roll date 11 = Swap next start date 12 = Swap next roll date 13 = First delivery date 14 = Last delivery date 15 = Initial inventory due date 16 = Final inventory due date 17 = First intent date 18 = Last intent date 19 = Position removal date 21 = Delivery Start Time 22 = Delivery End Time	EventTyp	
996	UnitOfMeasure	Update	String	The unit of measure of the underlying commodity upon which the contract is based. Two groups of units of measure enumerations are supported. Fixed Magnitude UOMs are primarily used in energy derivatives and specify a magnitude (such as, MM, Kilo, M, etc.) and the dimension (such as, watt hours, BTU's) to produce standard fixed measures (such as MWh - Megawatt-hours, MMBtu - One million BTUs). The second group, Variable Quantity UOMs,	UOM	

			<p>specifies the dimension as a single unit without a magnitude (or more accurately a magnitude of one) and uses the UnitOfMeasureQty(1147) field to define the quantity of units per contract. Variable Quantity UOMs are used for both commodities (such as lbs of lean cattle, bushels of corn, ounces of gold) and financial futures.</p> <p>Examples: For lean cattle futures contracts, a UnitOfMeasure of 'lbs' with a UnitOfMeasureQty(1147) of 40,000, means each lean cattle futures contract represents 40,000 lbs of lean cattle.</p> <p>For Eurodollars futures contracts, a UnitOfMeasure of Ccy with a UnitOfMeasureCurrency of USD and a UnitOfMeasureQty(1147) of 1,000,000, means a Eurodollar futures contract represents 1,000,000 USD.</p> <p>For gold futures contracts, a UnitOfMeasure is oz_tr (Troy ounce) with a UnitOfMeasureQty(1147) of 1,000, means each gold futures contract represents 1,000 troy ounces of gold.</p> <p>Valid Values: Fixed Magnitude UOM Bcf - Billion cubic feet MMbbl - Million Barrels(deprecated in FIX.5.0SP1) MMBtu - One Million BTU kWh – Kilowatt hours MWh - Megawatt hours CBM - Cubic Meters</p>		
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				<p>Variable Quantity UOM Bbl - Barrels Bu - Bushels lbs - pounds Gal - Gallons oz_tr - Troy Ounces t - Metric Tons (aka Tonne) tn - Tons (US) USD - US Dollars [DEPRECATE] Alw - Allowances CER - Certified Emissions Reduction PRINC - Principal with relation to debt instrument CRT - Climate Reserve Tonnes Ccy – Amount of currency BDFT – Board feet IPNT – Index point day – Days cwt – Hundredweight (US) g – Grams dt – Dry metric tons EnvOfst – Environmental Offset EnvCrd – Environmental Credit kW-min – Kilowatt-Minute (electrical capacity) MW-min – Megawatt-Minute (electrical capacity) kW-h – Kilowatt-Hour (electrical capacity) MW-h – Megawatt-Hour (electrical capacity) kW-d – Kilowatt-Day (electrical capacity) MW-d – Megawatt-Day (electrical capacity) kW-M – Kilowatt-Month (electrical capacity) MW-M – Megawatt-Month (electrical capacity) kW-a – Kilowatt-Year (electrical capacity) MW-a – Megawatt-Year (electrical capacity)</p>		
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Appendix B - Glossary Entries

Term	Definition	Field where used
Allowance	A permit or unit issued to installations through an environmental market policy to emit or pollute a specified environmental liability. Examples include EU Allowances under the EU Emission Trading Scheme and Regional Greenhouse Gas Initiative (RGGI) Allowances.	UnitOfMeasure
Environmental Offset	Mechanism whereby individuals or firms pay for reductions elsewhere in order to offset their own environmental liability. Note that Certified Emissions Reduction (CER) and Climate Reserve Tonnes (CRT) are both considered types of environmental offsets.	UnitOfMeasure
Environmental Credit	A unit earned for taking an environmental action that can be traded. Examples include power generated from renewable sources, energy efficiency, and water management.	UnitOfMeasure

Appendix C – Abbreviations

Term	Proposed Abbreviation	Proposed Messages, Components, Fields where used

Appendix D - Usage Examples

Annual Electricity Capacity Contract

This is a contract for 10 MW-Years for the 2012 calendar year.

MaturityMonthYear(200)	201201
UnitOfMeasure(996)	MW-a
UnitOfMeasureQty(1147)	10

Monthly Electricity Capacity Contract

This is a contract for 10 MW-Months for the month of August, 2011.

MaturityMonthYear(200)	201108
UnitOfMeasure(996)	MW-M
UnitOfMeasureQty(1147)	10

Daily Electricity Capacity Contract

This is a contract for 10 MW-Days for December 9, 2011.

MaturityMonthYear(200)	20111209
UnitOfMeasure(996)	MW-d
UnitOfMeasureQty(1147)	10

Hourly Electricity Capacity Contract

This is a contract for 10 MW-Hours for December 9, 2011 at 7 PM CST, which is UTC-6. Note that EventDate is of type LocalMarketDate, but EventTime is of type UTCTimestamp, meaning that its date is December 10. (7 PM Chicago time + 6 hours = 1 AM next day UTC.)

MaturityMonthYear(200)	20111209
UnitOfMeasure(996)	MW-h
UnitOfMeasureQty(1147)	10
NoEvents(864)	2
➔ EventType(865)	TBD (Delivery Start Time)
➔ EventDate(865)	20111209
➔ EventTime(1145)	20111210-01:00:00
➔ EventType(865)	TBD (Delivery End Time)
➔ EventDate(865)	20111209
➔ EventTime(1145)	20111210-02:00:00

Alternately, a start time and an event time unit and period could be used:

MaturityMonthYear(200)	20111209
UnitOfMeasure(996)	MW-h
UnitOfMeasureQty(1147)	10
NoEvents(864)	1
➔ EventType(865)	TBD (Delivery Start Time)
➔ EventDate(865)	20111209
➔ EventTime(1145)	20111210-01:00:00
➔ EventTimeUnit(TBD)	H (Hour)
➔ EventTimePeriod(TBD)	1

Minute Electricity Capacity Contract

This is a contract for 150 MW-Minutes for the 15 minute period on December 9, 2011 between 7:30 and 7:45 PM CST. Note that the capacity provided is 10 MW, but for a 15 minute period, therefore 1 contract is for 150 MW-Minutes.

MaturityMonthYear(200)	20111209
UnitOfMeasure(996)	MW-min
UnitOfMeasureQty(1147)	150
NoEvents(864)	2
➔ EventType(865)	TBD (Delivery Start Time)
➔ EventDate(865)	20111209
➔ EventTime(1145)	20111210-01:30:00
➔ EventType(865)	TBD (Delivery End Time)
➔ EventDate(865)	20111209
➔ EventTime(1145)	20111210-01:45:00

Alternately, a start time and an event time unit and period could be used:

MaturityMonthYear(200)	20111209
UnitOfMeasure(996)	MW-min
UnitOfMeasureQty(1147)	150
NoEvents(864)	1
➔ EventType(865)	TBD (Delivery Start Time)
➔ EventDate(865)	20111209
➔ EventTime(1145)	20111210-01:30:00
➔ EventTimeUnit(TBD)	Min (Minute)
➔ EventTimePeriod(TBD)	15