

# 1 DRI Project RTU Configuration via DNP3 XML

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## 2 *ISO New England Smart Grid Demand Resource Integration (DRI) Project*

3 Tuesday, April 14, 2009

### 4 **Purpose**

5 The purpose of this document is to describe the use of DNP3 XML to configure a Demand Designated  
6 Entity (DDE) RTU as part of ISO New England's Smart Grid Demand Resource Integration Project. A DDE  
7 Demand Resource (DR) RTU may require updates on a monthly basis depending on changes as a result  
8 of changes detected in the ISO New England Customer Asset Management System (CAMS). Business  
9 related changes in CAMS that can trigger a monthly DR RTU update include but are not limited to:

- 10 1. New DR Assets being added to a DR Resource
- 11 2. DR Assets being retired from a DR Resource
- 12 3. DR Asset to DR Resource Mapping Changes
- 13 4. New DR Resource(s) and associated DR Asset(s)
- 14 5. DR Resources being retired
- 15 6. A new RTU coming online
- 16 7. An RTU being retired

17 The ISO New England IT Department will distribute a DNP3 XML file at least 'X' business days before the  
18 start of a new month to each affected DDE for each RTU they have registered in CAMS.

19 The DNP3 XML schema used is based upon v2-03 of the DNP XML Package dated June 20, 2007. The  
20 DNP XML package including XSLT and XSD can be found at <http://www.dnp.org> in the Document Library  
21 section. ISO-NE will only populate the *DocumentHeader* and *Database* portion of the schema. For the  
22 Database section, ISO-NE will only populate *BinaryInput*, *BinaryOutput*, *AnalogInput* and  
23 *AnalogOutput* sections of the *Database* sub-schema. Please see Figure One.

24 Referenced Documents

25 *ISO New England Demand Resource RTU Specification*

```
<?xml version="1.0" encoding="UTF-8" ?>
<!-- <?xml-stylesheet type="text/xsl" href="DNP3DeviceProfileVersion2-03.xslt" media="screen"? -->
- <DNP3DeviceProfileDocument xmlns="http://www.dnp3.org/DNP3DeviceProfileVersion2-03" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.dnp3.org/DNP3DeviceProfileVersion2-03 DNP3DeviceProfileVersion2-03.xsd">
  <!-- Document Header -->
  - <documentHeader>
    <documentName>ISO-NE DR Program DDE #1 RTU</documentName>
    <documentDescription>This is the DR RTU layout for a Test DDE for June 2010. It consists of one DR Resource "ABC" with three associated DR
Assets</documentDescription>
    - <revisionHistory version="1">
      <date>06/01/2010</date>
      <author>ISO-NE</author>
      <reason>June 2010 RTU Point Database</reason>
    </revisionHistory>
  </documentHeader>
  - <referenceDevice>
    - <optional>
      <configuration />
      <iec61850DeviceMapping />
      <!-- Database -->
      - <database>
        + <binaryInputGroup>
        <doubleBitInputGroup />
        + <binaryOutputGroup>
        <counterGroup />
        + <analogInputGroup>
        + <analogOutputGroup>
        <sequentialFileTransfer />
        <octetStringGroup />
        <virtualTerminalGroup />
        <datasetPrototype />
        <datasetDescriptor />
      </database>
      <implementationTable />
    </optional>
  </referenceDevice>
  <auxiliaryInfo />
</DNP3DeviceProfileDocument>
```

26

27 **Figure 1**

## 28 **Rationale**

29 ISO-NE is expecting to manage thousands of DR Assets and hundreds of DR Resources. This  
30 management will start within CAMS and be automatically synchronized with our EMS and DR  
31 Communications infrastructure on a monthly basis. The relationship between DDE, RTU, Resource and  
32 Asset is defined within CAMS while the relationship between Resource, Asset and DNP Object types for  
33 any RTU is defined within the *ISO-NE Demand Resource RTU Specification*.

34 Each month a new DR Model will be automatically produced as part of a periodic internal business  
35 process. One by-product of this model generation will be a set of DNP XML documents – one for each  
36 DDE RTU defined in CAMS.

## 37 **Vendor Requirements**

38 Rather than configuring an RTU database manually on a monthly basis, ISO-NE is looking to RTU vendors  
39 to support configuration their respective RTU database through DNP XML – specifically through the  
40 *Database* section of the XML document is required.

41 It is understood that some RTU’s may support more than one association with the ISO-NE DNP Master  
42 and that there is an implied one-to-one relationship between a DNP XML file and an RTU association.

43 Please note that a monthly RTU database update via XML is not meant to take the place of a more  
44 rigorous RTU configuration that typically takes place during initial RTU testing and checkout.

45 In particular, ISO-NE will require the following DNP Object Types to be configured via XML for monthly  
46 RTU database updates:

- 47 1. Analog Inputs
- 48 2. Analog Outputs
- 49 3. Binary Inputs
- 50 4. Binary Outputs

51 For each DNP object type, the Vendor RTU shall support the following configuration via XML:

- 52 5. Setting of default static variation
- 53 6. Setting of default event variation
- 54 7. Setting of default command event variation (output objects only)

55 The following list depicts RTU point database configuration requirements for each DNP object type.

### 56 Binary Input

57 Please note that meta-data associated with each DR Resource and Asset specified in the *Name*,  
58 *Description*, *nameState1* and *nameState2* tags is for use by the vendor and/or DDE in configuring the  
59 RTU and associated backend system.

```
60 <index>0</index>
61 <name>DR Asset ID</name> <!-- meta data -- >
62 <description>Description</description> <!-- meta data -- >
63 <defaultChangeEventClass>one</defaultChangeEventClass>
64 <includedInClass0Response>true</includedInClass0Response>
65 <nameState0>off</nameState0> <!-- meta data -- >
66 <nameState1>on</nameState1> <!-- meta data -- >
67
```

### 68 Analog Input

69 Please note that meta-data associated specified in the *Name*, *Description* and *Units* tags is for use by the  
70 vendor and/or DDE in configuring the RTU and associated backend system.

```
71 <index>0</index>
72 <name>DR Asset ID</name> <!-- meta data -- >
73 <description>Description</description> <!-- meta data -- >
74 <defaultChangeEventClass>one</defaultChangeEventClass>
75 <scaleOffset>0.0</scaleOffset>
76 <scaleFactor>0.01</scaleFactor>
77 <resolution>1</resolution> <!--Not required -- >
78 <units>Volts</units> <!-- meta data -- >
79
```

### 80 Binary Output

81 Please note that meta-data associated specified in the *Name*, *Description*, *NameState0* and *NameState1*  
82 tags is for use by the vendor and/or DDE in configuring the RTU and associated backend system.

```
83 <index>0</index>
84 <name>DR Asset ID</name> <!-- meta data -- >
85 <description>Description</description> <!-- meta data -- >
86 <defaultChangeEventClass>none</defaultChangeEventClass>
87 <defaultCommandEventClass>none</defaultCommandEventClass>
```

```
88 <supportSelectOperate>false</supportSelectOperate> <!--Not required -- >
89 <supportDirectOperate>true</supportDirectOperate>
90 <supportDirectOperateNoAck>true</supportDirectOperateNoAck>
91 <supportPulseOn>true</supportPulseOn>
92 <supportPulseOff>true</supportPulseOff>
93 <supportLatchOn>true</supportLatchOn>
94 <supportLatchOff>true</supportLatchOff>
95 <supportTrip>false</supportTrip>
96 <supportClose>false</supportClose>
97 <countGreaterThanOne>false</countGreaterThanOne> <!--Not required -- >
98 <cancelCurrentOperation>false</cancelCurrentOperation> <!--Not required -- >
99 <nameState0>no action</nameState0> <-- meta data -- >
100 <nameState1>trip</nameState1> <-- meta data -- >
```

101

## 102 Analog Output

103 Please note that meta-data associated specified in the *Name*, *Description* and *Units* tags is for use by the  
104 vendor and/or DDE in configuring the RTU and associated backend system.

```
105 <index>0</index>
106 <name>DR Asset ID</name> <-- meta data -- >
107 <description>Description</description> <-- meta data -- >
108 <defaultChangeEventClass>one</defaultChangeEventClass>
109 <defaultCommandEventClass>two</defaultCommandEventClass>
110 <supportSelectOperate>false</supportSelectOperate>
111 <supportDirectOperate>true</supportDirectOperate>
112 <supportDirectOperateNoAck>true</supportDirectOperateNoAck>
113 <resolution>1</resolution> <!--Not required -- >
114 <units>Volts</units> <-- meta data -- >
```

115

## 116 Transfer and Processing of XML Configuration Documents

117 The transfer of the DDE DR RTU XML monthly configuration documents by ISO-NE will be through secure  
118 email and not through DNP file transfer functionality.

119 Vendors will choose to use appropriate means to process the XML file to configure their RTU. It is not  
120 expected that the RTU itself be able to parse the XML but rather the file will be processed offline and  
121 will be used to configure a separate RTU for testing.

122

### 123 Vendors are encouraged to utilize XML RTU configuration through existing RTU Configuration Tools!

124 Some possible ways this can be accomplished:

- 125 1. XSLT to transform XML to other forms such as CSV to use with existing RTU configuration tools
- 126 2. Direct parsing of XML to use with existing RTU configuration tools
- 127 3. Other

128

129 **ISO New England RTU Test Set**

130 In order to facilitate interoperability testing of the DNP XML schema configuration, ISO New England is  
131 requesting DDE's to download the Triangle MicroWorks (TMW) RTU Test Harness (TH) ([www.tmw-  
usa.com](http://www.tmw-<br/>132 usa.com)) which has a 21 day free trial and is approximately \$1500 to purchase.

133 ISO New England will provide sample DNP XML files that represent a typical small number of DR  
134 Resources and Assets in a layout consistent with the *DR RTU Specification document*. More importantly,  
135 a corresponding XSLT stylesheet will be provided that takes a sample XML file and converts it to  
136 commands (TK/TCL) that can be used to automatically configure the TMW TH database with the needed  
137 DNP Objects corresponding to the DR Resources and Assets.

138 This RTU Test Set will serve to familiar the DDE with what will happen on a monthly basis to their RTU  
139 and also provide a working example for DDE's and Vendors to reference to prepare a final solution  
140 suitable to the DDE and their chosen RTU and backend infrastructure.

141 The ISO-NE RTU Test Set (XML/XSLT files for configuring RTUs, and pertinent instructions ) will be  
142 available 04/30/09 for download. Unstructured testing with the ISO-NE RTU Test Set and ISO-NE DNP  
143 Master will take place from 08/15/09 to 11/30/09 along with unstructured testing as time permits.