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EUROPEAN STYLE MARKETS INTEROPERABILITY TEST 2013 IEC 62325-451-4 AND IEC 62325-451-5

2013-12-16

VERSION 1.0

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REVISION HISTORY

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1	0	2014-02-04		Approved by the Market Committee on 2014-02-04.

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REFERENCE DOCUMENTS

1. The ENTSO-E Settlement Process (ESP) Implementation Guide Version 1, Release 2.

2. The ENTSO-E Problem Statement Document (EPSD) Implementation Guide Version 2, Release 0.

3. The ENTSO-E Status Request Document (ESRD) Implementation Guide Version 2, Release 0.

4. IEC 62325-451-4 draft CD: Settlement and reconciliation business process, contextual and assembly models for European market.

5. IEC 62325-451-5 draft CD: Problem statement and status request business processes, contextual and assembly models for European market.

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ACKNOWLEDGEMENT

ENTSO-E would like to begin by recognizing the work of the members of ENTSO-E Working Group EDI. The common information model (CIM) interoperability (IOP) test held in 2013 on the "European style market profile" would not have been possible without the harmonization work carried out by these experts.

ENTSO-E would like to acknowledge the persons who have contributed to make the ENTSO-E IOP test "European style market profile" a success; not all people who contributed can be named here. However, ENTSO-E would like to give special recognition to:

- Maurizio Monti (RTE), Ioannis Daoutidis and Ioannis Retsoulis (ENTSO-E), in relation to the IOP test, for directing and witnessing it, preparing the test procedure, drafting the final report and advertising it.

- ENTSO-E WG EDI members for drafting, reviewing and supporting the work on IEC 62325 "European style market profile" standards;

- Antonio Lopez (ENTSO-E) for hosting in ENTSO-E premises on the 2013-12-16/17 the IOP tests on IEC 62325-451-4 and IEC 62325-451-5.

- Chavdar Ivanov (ENTSO-E) for his support to advertise the IOP test.

- For providing XML instances of ENTSO-E Settlement, Problem Statement and Status Request documents, so that the IOP test be carried out:
  - ✓ Julien Gaudin, (RTE)
  - ✓ Gunter Schlesinger (swissgrid)
  - ✓ Benoit Marie and Mathieu Mann (Alstom)

In addition, ENTSO-E acknowledges IEC TC 57 Chairman, Thierry Lefèbvre, and IEC TC 57 WG16 members that provided assistance and supported ENTSO-E work and IOP test in various ways.

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Executive Summary

ENTSO-E conducted on 2013-12-16/17 the fourth IOP test on the CIM extension for the electricity market (IEC 62325), in its premises.

The test aimed to demonstrate that the IEC 62325-451-4 and IEC 62325-451-5 standards satisfy the information requirements for the settlement and reconciliation process, the problem statement and the status request processes in the European style market profile.

The test assessed the compliance of work carried out in IEC 62325-451-4 and IEC 62325-451-5 versus the business requirements defined by ENTSO-E's settlement, problem statement and status request processes. Its main objective was to determine whether current ENTSO-E compliant XML instances related to these three different documents can be processed using the XML Schema Definitions (XSD) defined in IEC 62325-451-4 and IEC 62325-451-5.

This "proof of concept" was a success, it can thus be stated that:

- The work carried out on the IEC 62325-301, IEC 62325-351 and IEC 62325-451-4 and IEC 62325-451-5 is in line with the business requirements;

- There is no deficiency in the standards;

- The standard versions include all the capability needed to support the already implemented exchanges for the settlement and reconciliation process, the problem statement and the status request processes in the European style market profile.

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1. INTRODUCTION

1.1 ABOUT ELECTRICITY MARKET INTEROPERABILITY (IOP) TEST

On 2013-10-17, an announcement was published on ENTSO-E web site stating that an IOP test on IEC 62325-451-4 and IEC 62325-451-5 will be carried out in December 2013 and that the registration had opened. The objectives of this IOP test were the same as for all the previous IOP tests on electricity market, i.e. to assess the compliance of the standards with the business requirements. For this IOP test, and for all interested parties, ENTSO-E has allocated a dedicated generic e-mail address for contact purposes, iop.cim_market@entsoe.eu.

On 2013-12-16/17, ENTSO-E conducted a common information model (CIM) IOP test of the IEC 62325-451-4 and IEC 62325-451-5 standards in ENTSO-E premises.

This IOP test is the fourth one carried out on CIM extension for electricity market (IEC 62325).

Currently, the IEC 62325 series of standards is composed of:

- IEC 62325-450 "Profile and context modelling rules" in IS[1] status;
- IEC 62325-301 "Common information model (CIM) extensions for market" in CDV[2] status;
- IEC 62325-351 "CIM European market model exchange profile" in IS status;
- IEC 62325-451-1 "Acknowledgement business process and contextual model for CIM European market" in IS status;
- IEC 62325-451-2 "Scheduling business process and contextual models for CIM European market" in CDV status;
- IEC 62325-451-3 "Transmission capacity allocation business process (explicit or implicit auction) and contextual models for European market" in CDV status;
- IEC 62325-451-4: Settlement and reconciliation business process, contextual and assembly models for European market in CD[3] status;
- IEC 62325-451-5: Problem statement and status request business processes, contextual and assembly models for European market in CD status.

Business processes either already defined (Reserve Resource Process, etc.) or under development by ENTSO-E, such as the ones for market transparency (European Regulation on Market Integrity and Transparency – REMIT – Regulation 1227/2011 and on submission

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[1] IS International Standard

[2] CDV: Committee Draft for vote

[3] CD: Committee Draft

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140 and publication of data in electricity market - Regulation 543/2013), will be developed based
141 on the profile defined in IEC 62325-351 standards.

1.2 ENTSO-E INVOLVEMENT

143 Interest of European TSOs in CIM started before the establishment of ENTSO-E. In
144 particular, the following activities were carried out in a former European TSOs organization,
145 i.e. UCTE (Union for Co-ordination of Transmission of Electricity):

- Work on IEC 61970-301, "Common information model", IEC 61970-452, "CIM static
  transmission network model profiles" and IEC 61970-552-4 "CIM XML model
  exchange format" for the UCTE CIM model exchange profile;
- CIM IOP tests organized by UCTE, directed by EPRI and hosted by RTE in March
  2009.

151 In 2009, ENTSO-E and all its members strongly expressed their intention to implement the
152 international standards of the International Electrotechnical Commission (IEC) Technical
153 Committee 57 on "Power systems management and associated information exchange" and
154 in particular the common information model (CIM) as well as to promote their wider
155 development and usage across industry.

156 Liaisons were officially established with:

- IEC TC 57 Working Group 13 "Energy management system application program
  interface",
- IEC TC 57 Working Group 16 "Deregulated energy market communication".

160 ENTSO-E is also a member of Electric Power Research Institute (EPRI) where it is working
161 on the development of "CIM for Dynamics", i.e. to extend CIM to dynamic modelling of the
162 power system.

163 The ENTSO-E support is founded:

- not only on a strong cooperation of ENTSO-E experts within the IEC TC 57 Working
  Groups and in particular:
    - Working Group 13 on IEC 61970;
    - Working Group 10 "Power system IED communication and associated data
      models" on IEC 61850;
    - Working Group 16 on IEC 62325.
- but also, on the organisation by the ENTSO-E Secretariat of IOP Tests to
  demonstrate the compliance of off-the-shelf products with these standards and in
  particular with the CIM European profiles

173 In July 2010, ENTSO-E led and conducted its first CIM IOP test on IEC 61970 and in
174 particular on CIM-based data exchange format.

175 Since 2010, ENTSO-E carried out every year IOP tests on IEC 61970.

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176 In 2012, for the first time, ENTSO-E led and conducted its first IOP test on IEC 62325 series
177 and since then, four IOP tests on IEC 62325 CIM market extension have already been
178 conducted.

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2. IOP TEST PROCEDURE

2.1 OBJECTIVE OF THIS IOP TEST

The IEC TC 57 series IEC 62325 covers the needs for market exchanges, and IEC 62325-301 describes the CIM (common information model extensions for market).

The parts related to "European style market profile", i.e. IEC 62325-351 and IEC 62325-451-n, contribute to the further development of the IEM (Internal European Market) by actively supporting market harmonization.

The objective of this IOP test for market exchanges is to demonstrate that:

- The IEC 62325-451-4 standard satisfies the information requirements for settlement business process in the European style market profile.

- The IEC 62325-451-5 standard satisfies the information requirements for the problem statement and status request business processes in the European style market profile.

As these processes are already operational within the European markets, this IOP test provides a unique opportunity:

- to identify any deficiencies in the standard,

- to assess that the standard versions of IEC 62325-451-4 and IEC 62325-451-5 include all the capability needed to support the already implemented exchanges.

This IOP test will also enable to validate the development carried out and to finalise the comments for the IEC 62325-451-4 and IEC 62325-451-5 documents in CD status in order to improve the standards and also their acceptance for all the market participants in Europe.

In short, this IOP test on "European style market profile" is a "proof of concept" of the development carried out within the CIM.

2.2 IOP TEST PROCEDURE

To evaluate the conformity of the standard the following IOP test procedure was defined[4]:

- Step 1: From a set of XML ENTSO-E document instances, do the following checks using the relevant schema, core-components and codelist:
    - o Well-formedness of the XML instance,
    - o Validity of the XML instance.

- Step 2: Review any errors found, perform diagnosis and correct them.

- Step 3: Validate the corrected set of XML instances following step 2.

---

[4] XML ENTSO-E document instances is one of the following types: settlement, status request and problem statement.

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210   • Step 4: Transform the set of XML ENTSO-E document instances with the corrections
211   applied in step 2 into a set of XML CIM IEC 62325 instances.

212   • Step 5: On the XML CIM IEC 62325 instances generated at step 4, do the following
213   checks using the relevant IEC schema and codelist:

214   o Well-formedness of the XML instance;

215   o Validity of the XML instance.

216   • Step 6: Review any errors found, perform diagnosis and correct them.

217   • Step 7: Validate the corrected set of XML instances following step 6.

218   2.3 IOP TEST TOOLS

219   The tools used to carry out the IOP test are:

220   • Altova XMLSpy Standard Edition 2013 release 2, http://www.altova.com/xmlspy.html,
221   for the XSLT transformations (step 4), i.e. to convert an ENTSO-E XML instance into
222   the corresponding EIC 62325 XML instance;

223   • XML ValidatorBuddy Desktop version 4.4, http://xml-tools.com, for well-formedness
224   and validity of the XML instance versus the relevant schema (step 1, 3, 5 and 7).
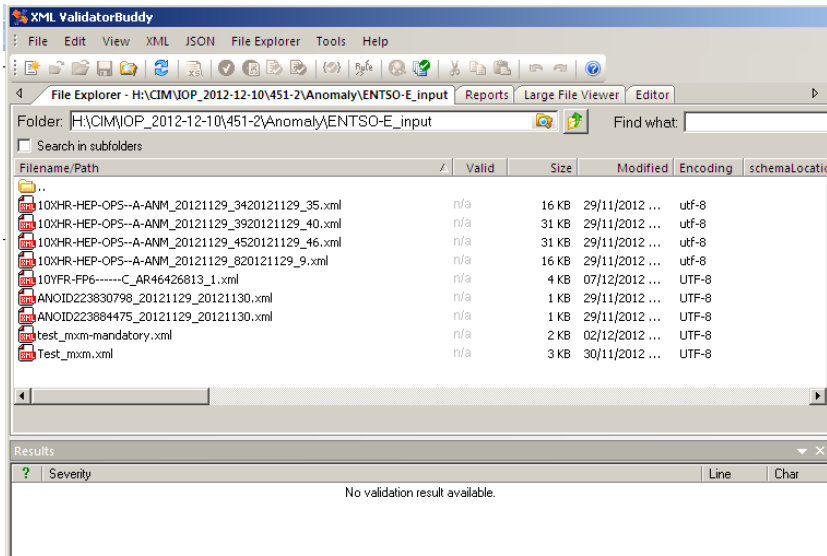
225   As XMLSpy tool stops at each encountered error, it was thus more efficient to use a tool
226   enabling the identification of all errors in a single run. This feature is provided by XML
227   ValidatorBuddy.
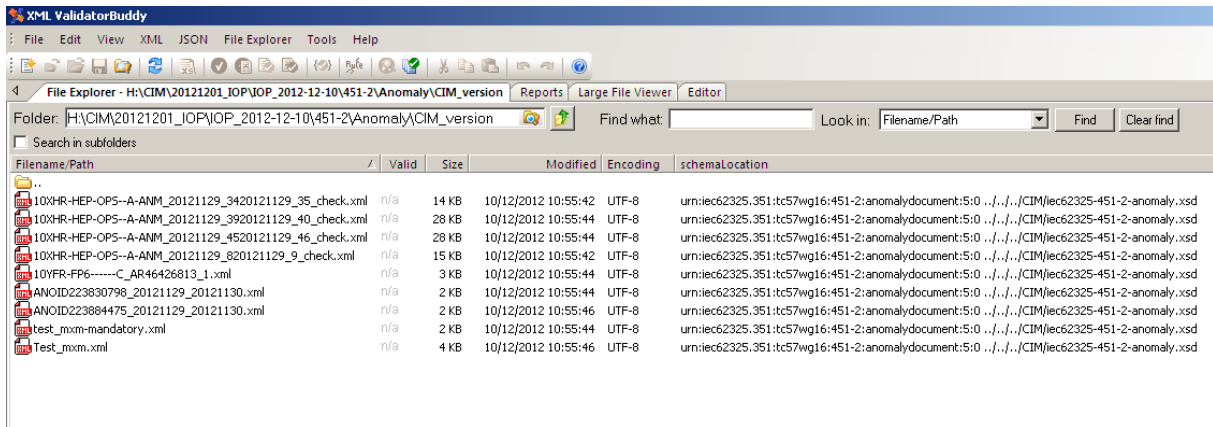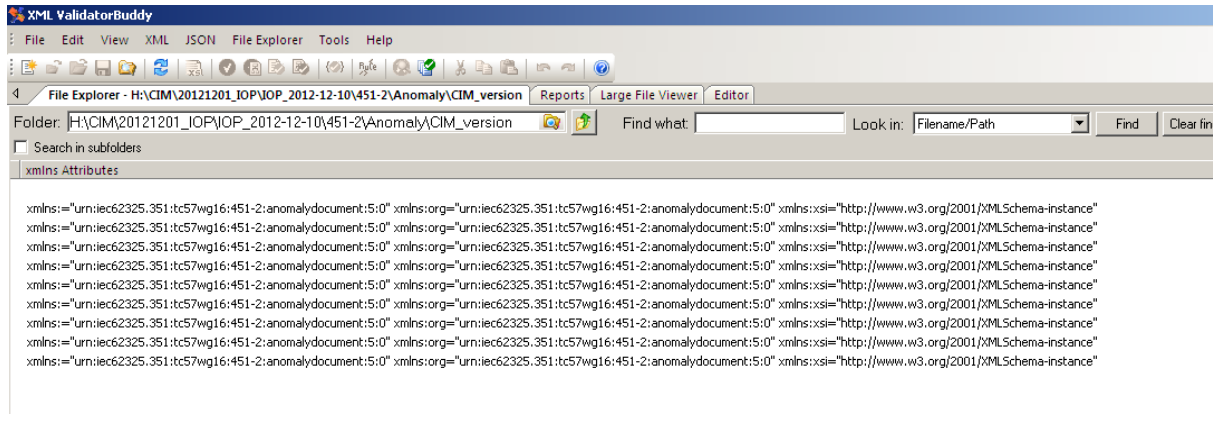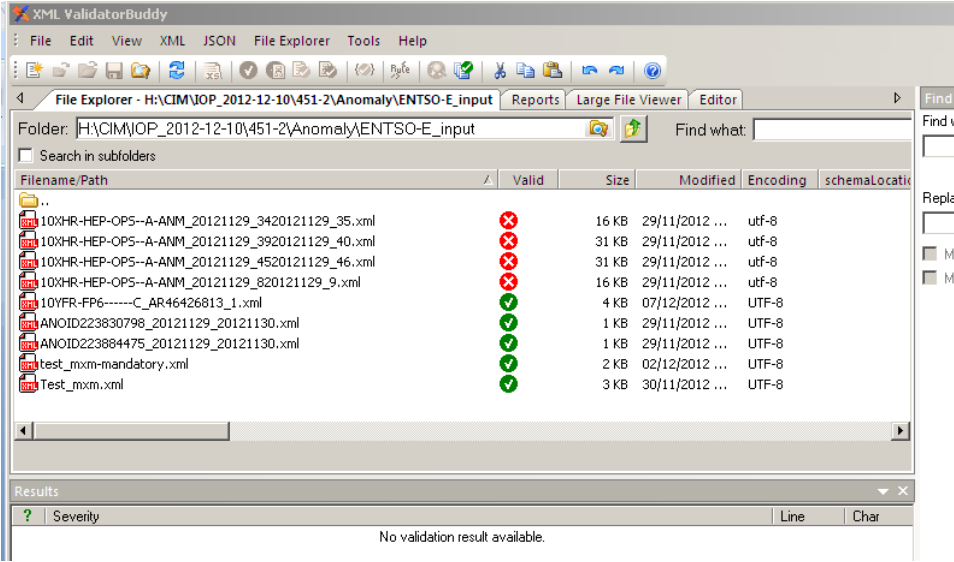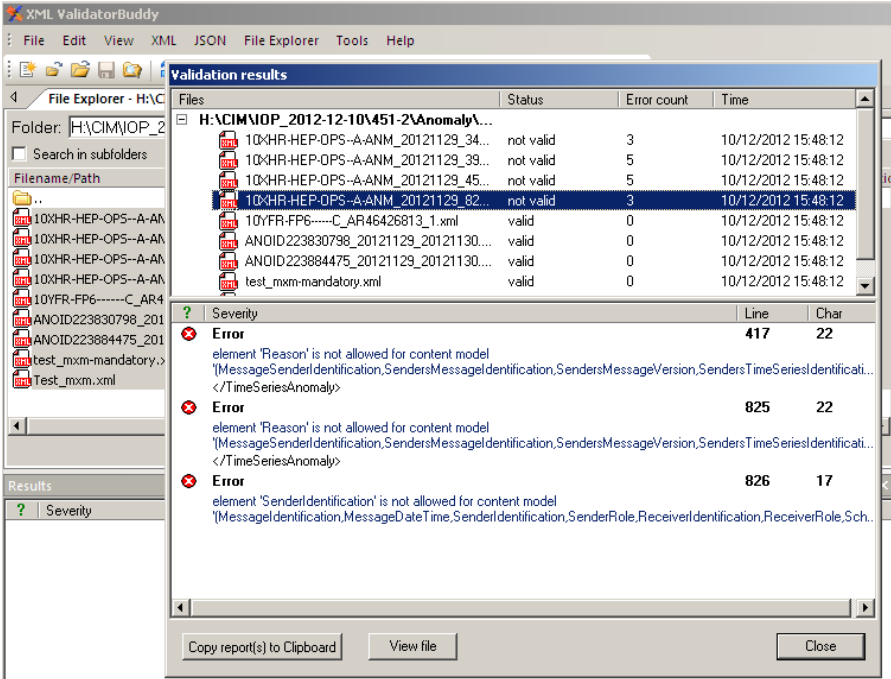
228   The IOP test procedure as defined in §2.2 was carried out as follows:
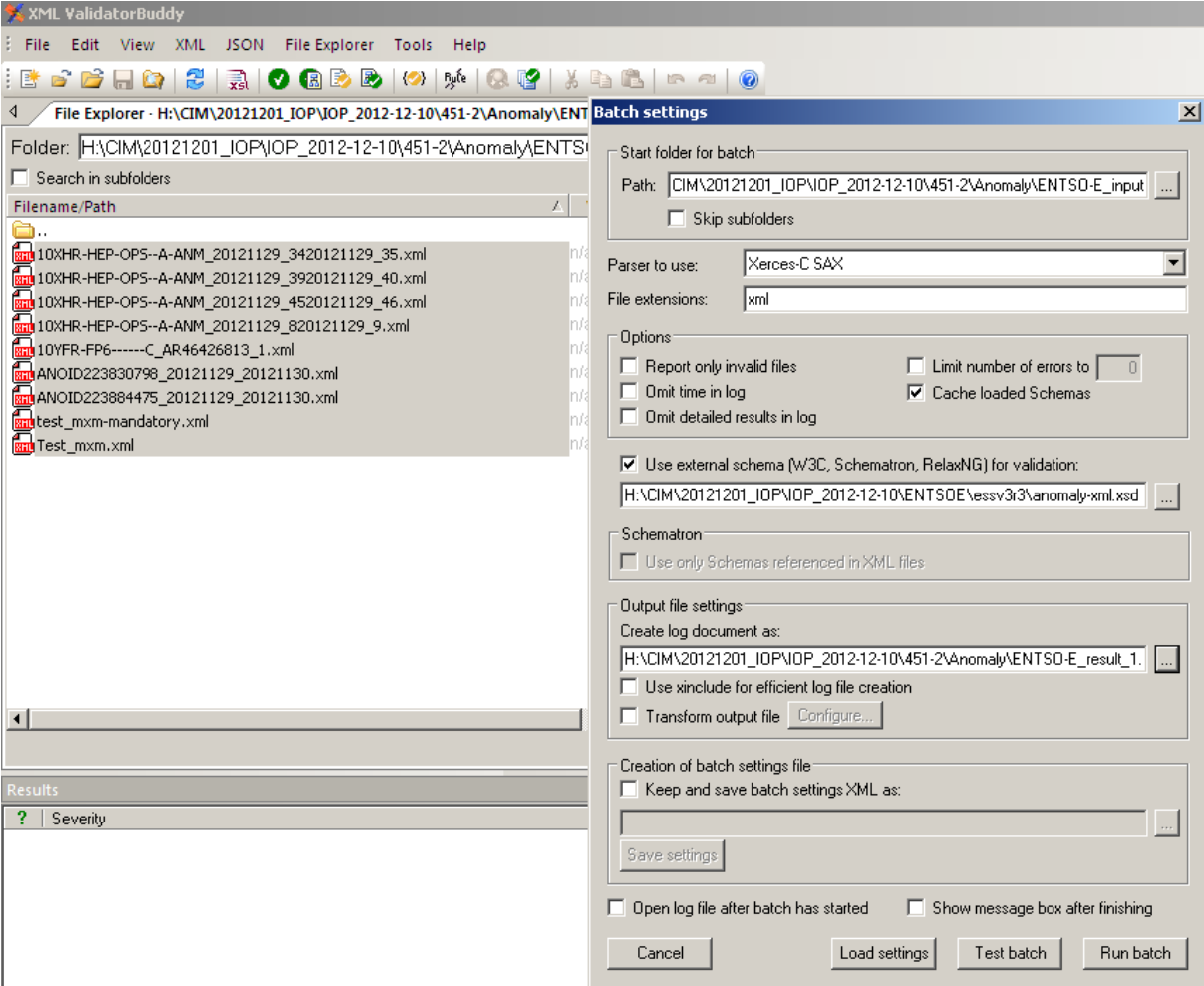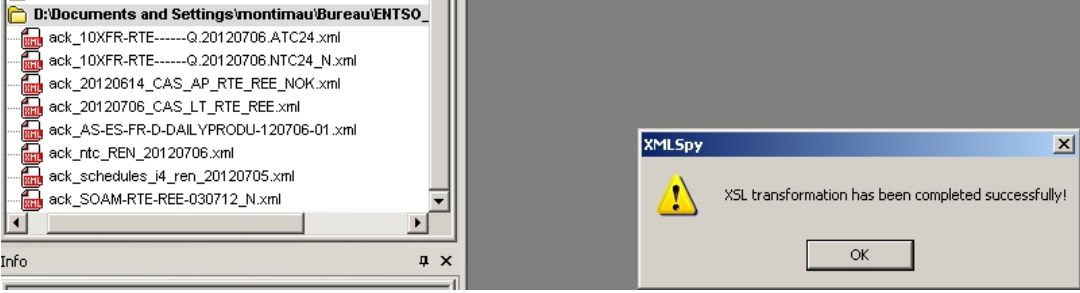
229

Step	Detailed procedure
1	1. For a received set of XML ENTSO-E document instances, open with XML ValidatorBuddy the corresponding folder, assign the relevant ENTSO-E XSD schema: FIGURE 1: OPEN FOLDER OF ENTSO-E XML INSTANCES

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Step	Detailed procedure
1	2. Open a folder of XML instances with namespace with XML ValidatorBuddy:

FIGURE 2: DETAILED VIEW OF XML INSTANCES 1/2

FIGURE 3: DETAILED VIEW OF XML INSTANCES 2/2

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Step	Detailed procedure
1	3. Then validate using XML ValidatorBuddy. **FIGURE 4: VALIDATION USING XML VALIDATORBUDDY**
1	4. Display the errors identified by XML ValidatorBuddy **FIGURE 5: ERROR MESSAGE ON XML INSTANCES**

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Step	Detailed procedure
1	5. Generate a batch run with XML ValidatorBuddy **FIGURE 6: GENERATE A BATCH RUN**
2	Correct any errors detected in the set of XML instances.
3	Validate the corrected ENTSO-E XML instances with XML ValidatorBuddy, if needed.
4	Transform the set of corrected XML ENTSO-E document instances into a set of XML CIM IEC 62325 document instances using XML Spy. **FIGURE 7: GENERATE IEC XML INSTANCES**

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Step	Detailed procedure
5	Validate the CIM XML instances with the relevant IEC XSD using XML ValidatorBuddy.
6	Correct any errors detected in the set of XML instances.
7	Validate the corrected CIM XML instances with XML ValidatorBuddy, if needed.

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3. IOP TEST RESULTS

3.1 OVERVIEW OF THE IOP TEST

The IEC 62325-451-3 IOP test was carried out on the XML instances provided by:

- ✓ Swissgrid, Swiss TSO;
- ✓ RTE, French TSO;
- ✓ Alstom, SCADA/EMS/MMS software provider.

The results of this IOP test on IEC 62325-451-4 and IEC 62325-451-5 are summarized in the following table:

Documents (ESP, ESPD, ESR)	ENTSO-E XML instances					IEC XML instances			
	Well-formedness	Validity	Correction (if any)	Validity	Transformation	Well-formedness	Validity	Correction (if any)	Validity
swissgrid	🙂	🙂	-	-	🙂	🙂	🙂	-	-
RTE	🙂	☹	🙂	🙂	🙂	🙂	🙂	-	-
Alstom	🙂	☹	🙂	🙂	🙂	🙂	☹	🙂	🙂
Legend	🙂: Test is successfull				☹: Test is not successfull				

The detail results and the errors issued by XML ValidatorBuddy are to be found in §4.1

It can be stated that:

- the work carried on the IEC 62325-451-4 and IEC 62325-451-5 are in line with the business requirements;
- there is no deficiency in the standard;
- The standard versions include all the capability needed to support the already implemented exchanges for the settlement, problem statement and status request business processes.

3.2 DETAILED REVIEW OF ERRORS FOUND

The following table provides the list of all errors found during the IOP test and the development of the XSLT to transform the XML instances:

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Description of error	Correction applied	Recommendation
Settlement – Three submitted documents were not based on the ENTSO-E schema for the settlement process, i.e. RgceSettlementDocument and Measurement ValueDocument	None	Out of scope.
Problem statement document – Use of milliseconds in the DateTime attribute	Replace 2013-01-01T00:00.000Z with 2013-01-01T00:00Z	The XML instance shall respect the XSD syntax.
Status Request document – Use of milliseconds in the DateTime attribute	Replace 2013-01-01T00:00.000Z with 2013-01-01T00:00Z	The XML instance shall respect the XSD syntax.

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4. ANNEX – XML VALIDATORBUDDY OUTPUTS

4.1 ERRORS DETECTED IN ENTSO-E XML INSTANCES

The well-formedness and validity checks were carried out; the results are provided in the following table:

4.1.1 SETTLEMENT

Three XML instances were not processed, as they were not corresponding to the Settlement report document.

4.1.2 PROBLEM STATEMENT

No error was found on the instances.

4.1.3 STATUS REQUEST

XML instance name	valid	line	Error Description	Error	Action/Correction
ESR3010361265.xml	FALSE	2	The XML instance is based on version 1 Release 1 of status request schema and not version 2 Release 0.		Convert XML instance from version 1 to version 2.
ESR3029823526.xml	FALSE	2	The XML instance is based on version 1 Release 1 of status request schema and not version 2 Release 0.		Convert XML instance from version 1 to version 2.

4.2 VALIDATION OF CORRECTED ENTSO-E XML INSTANCES

Once the corrections have been applied, the status of the ENTSO-E XML instances is as follows:

Document	XML instance name	Date and Time of Test	Valid
Settlement	EAR-MAND-2.xml	12/16/13 09:26:04	TRUE
Settlement	EARMeterData.xml	12/16/13 09:26:04	TRUE
Settlement	SOAM_10YIT-GRTN-----B_10YFR-RTE------C_002.xml	12/16/13 09:26:04	TRUE
Settlement	SOVA_10YFR-RTE------C_10YBE----------2_001.xml	12/16/13 09:26:04	TRUE
Problem Statement	EPSD312454821.xml	12/16/13 10:20:14	TRUE
Status Request	20110704_TPS_11X-PARTY-BG--A5_10XCH-SWISSGRIDC_SRQ_2011-07-04-50Z.xml	12/16/13 10:59:02	TRUE
Status Request	ESR3010361265.xml	12/16/13 10:59:02	TRUE
Status Request	ESR3029823526.xml	12/16/13 10:59:02	TRUE
Status Request	REQ_12XBKW-HANDEL--X_10XFR-RTE------Q_1518.xml	12/16/13 10:59:02	TRUE

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265 ## 4.3 CHECK TRANSFORMED IEC XML INSTANCES

266 The XSLT transform was applied and the resulting files were checked versus the IEC
267 schema.

268 The detailed information is provided in the following table:

269 ### 4.3.1 PROBLEM STATEMENT

XML instance name	valid	line	Error Description	Error	Action/Correction
EPSD312454821.xml	FALSE	16	Use of milliseconds in the attribute Expected_MarketDocument.type	\<expected_MarketDocument.createdDateTime>2014-02-13T13:00:00.**000Z**\</expected_MarketDocument.createdDateTime>	\<expected_MarketDocument.createdDateTime>2014-02-13T13:00:00Z\</expected_MarketDocument.createdDateTime>

270 ### 4.3.2 STATUS REQUEST

XML instance name	valid	line	Error Description	Error	Action/Correction
ESR3029823526.xml	FALSE	9	Use of milliseconds in the attribute CreationDateTime	\<CreationDateTime v="2012-01-03T13:00:00.**000Z**"/>	\<CreationDateTime v="2012-01-03T13:00:00Z"/>

271 ### 4.3.3 FINAL STATUS OF XML INSTANCES AFTER CORRECTIONS

272

Document	XML instance name	Date and Time of Test	Valid
Settlement	EAR-MAND-2.xml	12/16/13 11:26:04	TRUE
Settlement	EARMeterData.xml	12/16/13 11:26:04	TRUE
Settlement	SOAM_10YIT-GRTN-----B_10YFR-RTE------C_002.xml	12/16/13 11:26:04	TRUE
Settlement	SOVA_10YFR-RTE------C_10YBE----------2_001.xml	12/16/13 11:26:04	TRUE
Problem Statement	EPSD312454821.xml	12/16/13 12:20:14	TRUE
Status Request	20110704_TPS_11X-PARTY-BG--A5_10XCH-SWISSGRIDC_SRQ_2011-07-04-50Z.xml	12/16/13 13:59:02	TRUE
Status Request	ESR3010361265.xml	12/16/13 13:59:02	TRUE
Status Request	ESR3029823526.xml	12/16/13 13:59:02	TRUE
Status Request	REQ_12XBKW-HANDEL--X_10XFR-RTE------Q_1518.xml	12/16/13 13:59:02	TRUE

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5. ANNEX-LIST OF FOLDERS AND XML INSTANCES

273

274 All the files used to carry out the IOP test (except the XMLSpy tool and XML ValidatorBuddy)
275 are available on the ENTSO-E web site, EDI Library page, section "CIM Market IOP".

276 A zip file containing the information described hereafter is included.

5.1 CONTENT OF THE ZIP FILE

277

278 The zip file structure is the following one:

```
279 20131216_IOP
280     451-4                                 Folder for IEC 62325-451-4 test
281     451-5                                 Folder for IEC 62325-451-5 test
282     CIM                                   Folder with the IEC 62325 XSD
283     ENTSOE                                Folder with the ENTSO-E XSD
284     ENTSO-E XML instances                 Folder of the ENTSO-E XML instances
285     XSLT                                  Folder of the XSLT files
286
287 20131216_IOP\451-4
288     EAR                                   Folder of XML instances
289 20131216_IOP\451-5
290     Problem Statement                     Folder of XML instances
291     Status Request                        Folder of XML instances
292
293     ...                                   ...
294
295 Example of the structure of one folder
296 20131216_IOP\451-4\EAR
297     CIM_version                           The XML instances after the XSLT
298                                           transformation from ENTSO-E to CIM
299     ENTSO-E_input                         The ENTSO-E XML instances including
300                                           the corrections to validate them
301                                           (input of XSLT transformation).
302     ENTSO-E_not_valid                     The erroneous ENTSO-E XML instances.
303     ENTSO-E_input                         Folder of ENTSO-E XML instances
```

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6. ANNEX – XSLT USED TO CARRY OUT THE CONVERSION

The stylesheets used to convert an ENTSO-E XML instance into an IEC 62325 XML instance can be found on the following page:

https://www.entsoe.eu/major-projects/common-information-model-cim/cim-for-energy-markets/standards-iop-tests/