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

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2013-12-16

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VERSION 1.0

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

## REFERENCE DOCUMENTS

56

57

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

58

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

59

60

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

61

62

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

63

64

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

65

## ACKNOWLEDGEMENT

66

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

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

- 74 • Maurizio Monti (RTE), Ioannis Daoutidis and Ioannis Retsoulis (ENTSO-E), in relation  
75 to the IOP test, for directing and witnessing it, preparing the test procedure, drafting  
76 the final report and advertising it.
- 77 • ENTSO-E WG EDI members for drafting, reviewing and supporting the work on IEC  
78 62325 “European style market profile” standards;
- 79 • Antonio Lopez (ENTSO-E) for hosting in ENTSO-E premises on the 2013-12-16/17  
80 the IOP tests on IEC 62325-451-4 and IEC 62325-451-5.
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88 WG16 members that provided assistance and supported ENTSO-E work and IOP test in  
89 various ways.

## Executive Summary

90

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

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

96 The test assessed the compliance of work carried out in IEC 62325-451-4 and IEC 62325-  
97 451-5 versus the business requirements defined by ENTSO-E's settlement, problem  
98 statement and status request processes. Its main objective was to determine whether current  
99 ENTSO-E compliant XML instances related to these three different documents can be  
100 processed using the XML Schema Definitions (XSD) defined in IEC 62325-451-4 and IEC  
101 62325-451-5.

102 This “proof of concept” was a success, it can thus be stated that:

- 103 • The work carried out on the IEC 62325-301, IEC 62325-351 and IEC 62325-451-4  
104 and IEC 62325-451-5 is in line with the business requirements;
- 105 • There is no deficiency in the standards;
- 106 • The standard versions include all the capability needed to support the already  
107 implemented exchanges for the settlement and reconciliation process, the problem  
108 statement and the status request processes in the European style market profile.

## 109 1. INTRODUCTION

### 110 1.1 ABOUT ELECTRICITY MARKET INTEROPERABILITY (IOP) TEST

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

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

120 This IOP test is the fourth one carried out on CIM extension for electricity market (IEC  
121 62325).

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

- 123 • IEC 62325-450 “Profile and context modelling rules” in IS<sup>1</sup> status;
- 124 • IEC 62325-301 “Common information model (CIM) extensions for market” in CDV<sup>2</sup>  
125 status;
- 126 • IEC 62325-351 “CIM European market model exchange profile” in IS status;
- 127 • IEC 62325-451-1 “Acknowledgement business process and contextual model for CIM  
128 European market” in IS status;
- 129 • IEC 62325-451-2 “Scheduling business process and contextual models for CIM  
130 European market” in CDV status;
- 131 • IEC 62325-451-3 “Transmission capacity allocation business process (explicit or  
132 implicit auction) and contextual models for European market” in CDV status;
- 133 • IEC 62325-451-4: Settlement and reconciliation business process, contextual and  
134 assembly models for European market in CD<sup>3</sup> status;
- 135 • IEC 62325-451-5: Problem statement and status request business processes,  
136 contextual and assembly models for European market in CD status.

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

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<sup>1</sup> IS International Standard

<sup>2</sup> CDV: Committee Draft for vote

<sup>3</sup> CD: Committee Draft

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.

## 142 **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):

- 146 • Work on IEC 61970-301, “Common information model”, IEC 61970-452, “CIM static  
147 transmission network model profiles” and IEC 61970-552-4 “CIM XML model  
148 exchange format” for the UCTE CIM model exchange profile;
- 149 • CIM IOP tests organized by UCTE, directed by EPRI and hosted by RTE in March  
150 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:

- 157 • IEC TC 57 Working Group 13 “Energy management system application program  
158 interface”,
- 159 • 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:

- 164 • not only on a strong cooperation of ENTSO-E experts within the IEC TC 57 Working  
165 Groups and in particular:
  - 166 ○ Working Group 13 on IEC 61970;
  - 167 ○ Working Group 10 “Power system IED communication and associated data  
168 models” on IEC 61850;
  - 169 ○ Working Group 16 on IEC 62325.
- 170 • but also, on the organisation by the ENTSO-E Secretariat of IOP Tests to  
171 demonstrate the compliance of off-the-shelf products with these standards and in  
172 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.



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.

## 179 2. IOP TEST PROCEDURE

### 180 2.1 OBJECTIVE OF THIS IOP TEST

181 The IEC TC 57 series IEC 62325 covers the needs for market exchanges, and IEC 62325-  
182 301 describes the CIM (common information model extensions for market).

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

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

- 187 • The IEC 62325-451-4 standard satisfies the information requirements for settlement  
188 business process in the European style market profile.
- 189 • The IEC 62325-451-5 standard satisfies the information requirements for the problem  
190 statement and status request business processes in the European style market  
191 profile.

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

- 194 • to identify any deficiencies in the standard,
- 195 • to assess that the standard versions of IEC 62325-451-4 and IEC 62325-451-5  
196 include all the capability needed to support the already implemented exchanges.

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

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

### 202 2.2 IOP TEST PROCEDURE

203 To evaluate the conformity of the standard the following IOP test procedure was defined<sup>4</sup>:

- 204 • Step 1: From a set of XML ENTSO-E document instances, do the following checks  
205 using the relevant schema, core-components and codelist:
  - 206 ○ Well-formedness of the XML instance,
  - 207 ○ Validity of the XML instance.
- 208 • Step 2: Review any errors found, perform diagnosis and correct them.
- 209 • Step 3: Validate the corrected set of XML instances following step 2.

---

<sup>4</sup> XML ENTSO-E document instances is one of the following types: settlement, status request and problem statement.

- 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 ○ Well-formedness of the XML instance;
- 215 ○ 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 IEC 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).

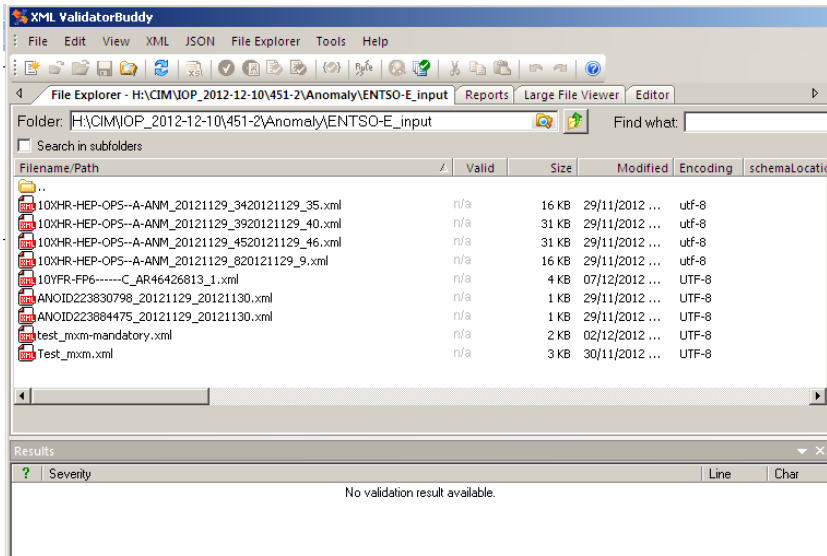
225 As XMLSpy tool stops at each encountered error, it was thus more efficient to use a tool

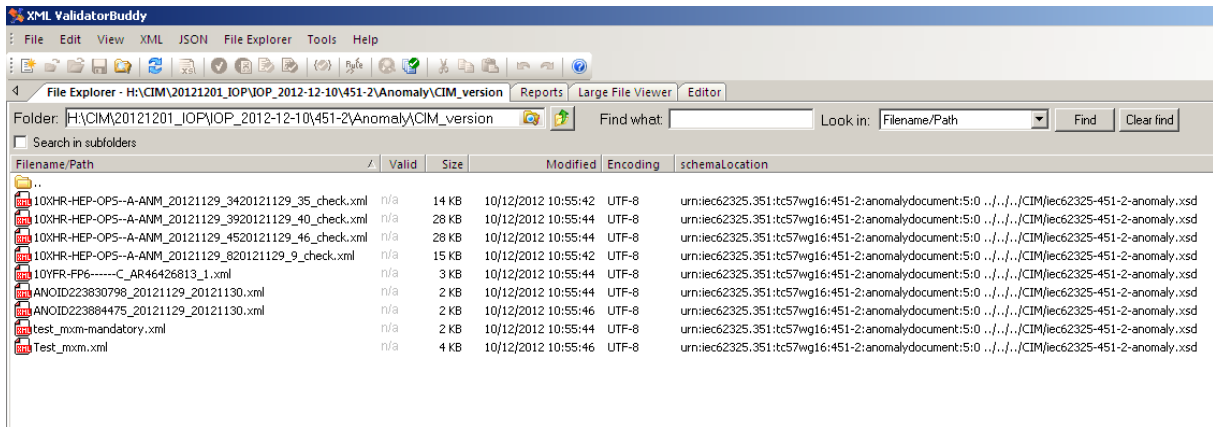
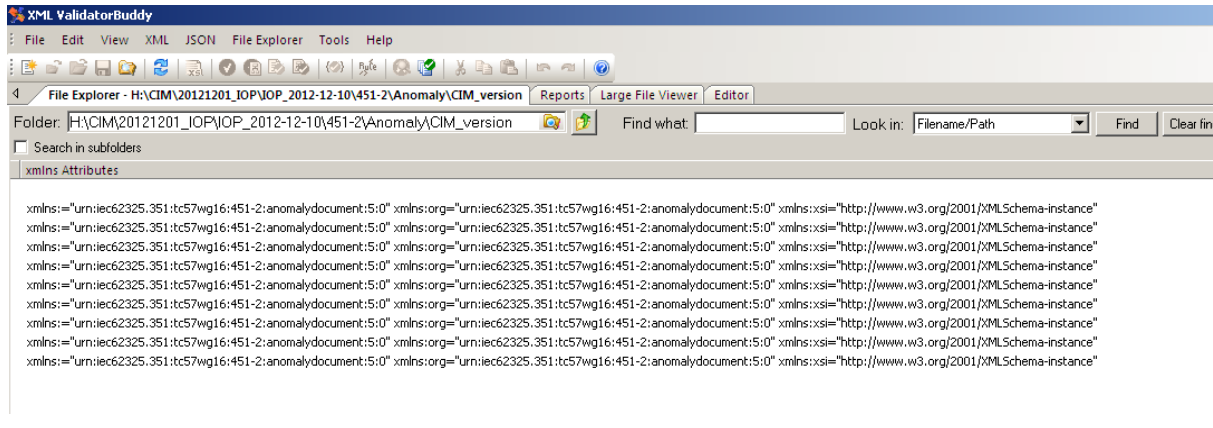
226 enabling the identification of all errors in a single run. This feature is provided by XML

227 ValidatorBuddy.

228 The IOP test procedure as defined in §2.2 was carried out as follows:

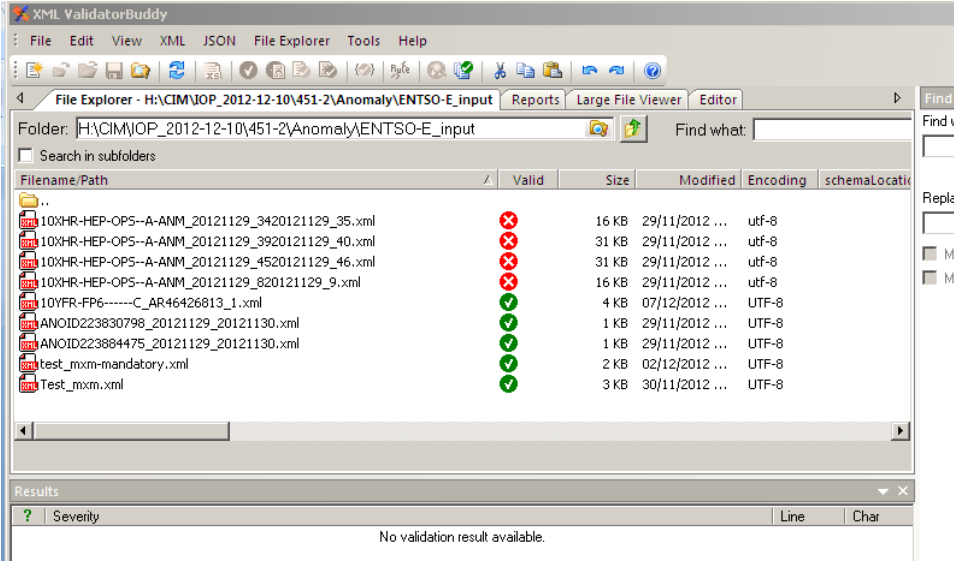
229

Step	Detailed procedure
1	<p>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:</p>  <p style="text-align: center;"><b>FIGURE 1: OPEN FOLDER OF ENTSO-E XML INSTANCES</b></p>

Step	Detailed procedure
1	<p data-bbox="231 353 1268 387">2. Open a folder of XML instances with namespace with XML ValidatorBuddy:</p>  <p data-bbox="526 840 1157 873"><b>FIGURE 2: DETAILED VIEW OF XML INSTANCES 1/2</b></p>  <p data-bbox="526 1321 1157 1355"><b>FIGURE 3: DETAILED VIEW OF XML INSTANCES 2/2</b></p>

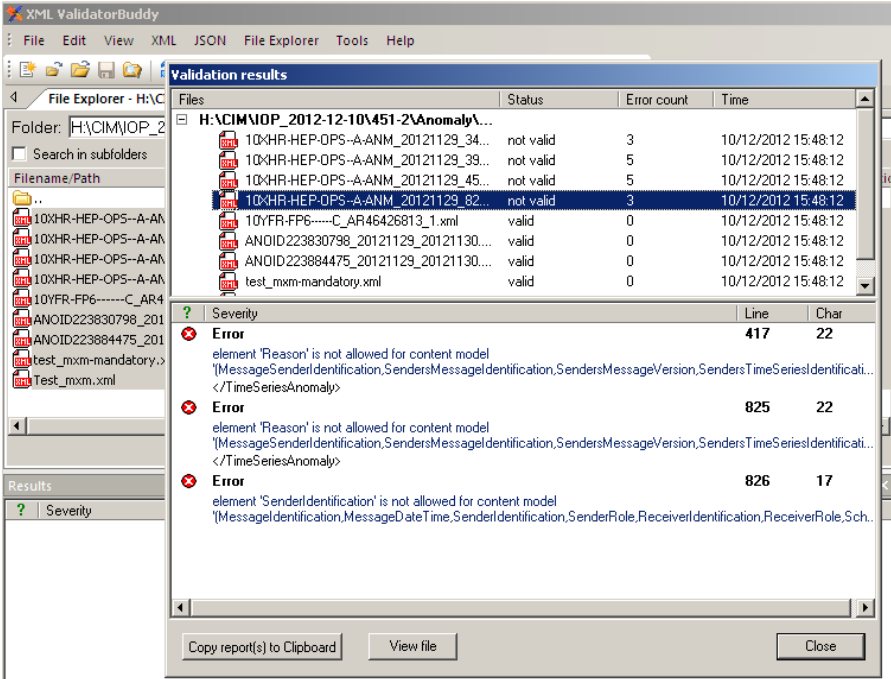
**Step** **Detailed procedure**

1 3. Then validate using XML ValidatorBuddy.

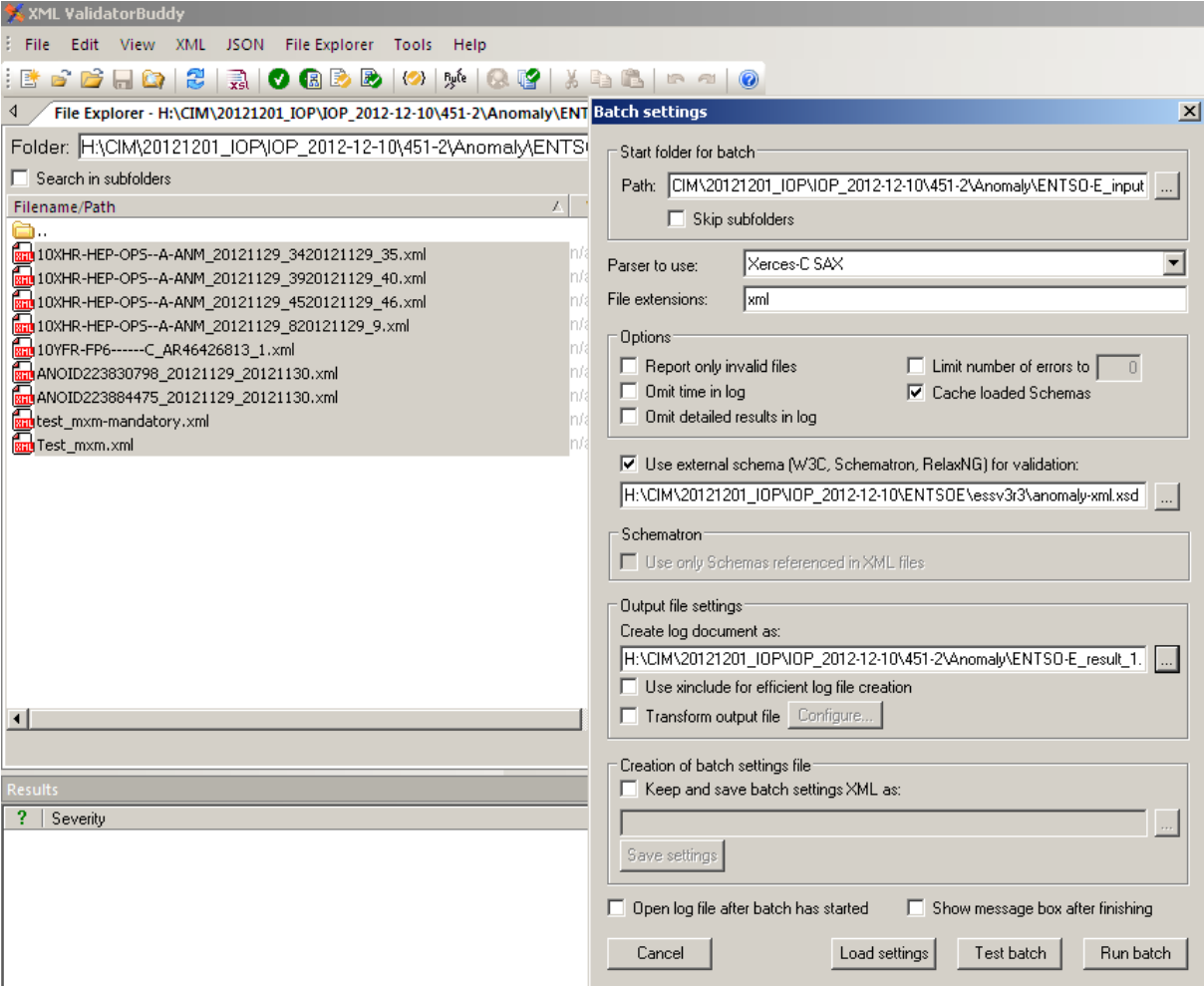
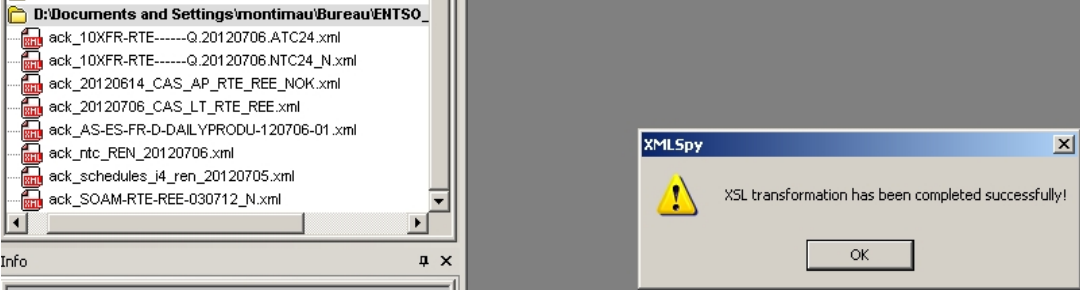


**FIGURE 4: VALIDATION USING XML VALIDATORBUDDY**

1 4. Display the errors identified by XML ValidatorBuddy



**FIGURE 5: ERROR MESSAGE ON XML INSTANCES**

Step	Detailed procedure
1	<p>5. Generate a batch run with XML ValidatorBuddy</p>  <p style="text-align: center;"><b>FIGURE 6: GENERATE A BATCH RUN</b></p>
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	<p>Transform the set of corrected XML ENTSO-E document instances into a set of XML CIM IEC 62325 document instances using XML Spy.</p>  <p style="text-align: center;"><b>FIGURE 7: GENERATE IEC XML INSTANCES</b></p>

<b>Step</b>	<b>Detailed procedure</b>
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.

### 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 successful				😞: Test is not successful				

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:



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.

## 249 4. ANNEX – XML VALIDATORBUDDY OUTPUTS

### 250 4.1 ERRORS DETECTED IN ENTSO-E XML INSTANCES

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

#### 253 4.1.1 SETTLEMENT

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

#### 256 4.1.2 PROBLEM STATEMENT

257 No error was found on the instances.

#### 258 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.

259

### 260 4.2 VALIDATION OF CORRECTED ENTSO-E XML INSTANCES

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

263

264

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

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. <b>000Z</b> </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. <b>000Z</b> "/>	<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

## 273 5. ANNEX-LIST OF FOLDERS AND XML INSTANCES

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.

### 277 5.1 CONTENT OF THE ZIP FILE

278 The zip file structure is the following one:

279	<b>20131216_IOP</b>	
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	<b>20131216_IOP\451-4</b>	
288	EAR	Folder of XML instances
289	<b>20131216_IOP\451-5</b>	
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	<b>20131216_IOP\451-4\EAR</b>	
297	CIM_version	The XML instances after the XSLT transformation from ENTSO-E to CIM
298		
299	ENTSO-E_input	The ENTSO-E XML instances including the corrections to validate them (input of XSLT transformation).
300		
301		
302	ENTSO-E_not_valid	The erroneous ENTSO-E XML instances.
303	ENTSO-E_input	Folder of ENTSO-E XML instances

## 304 **6. ANNEX – XSLT USED TO CARRY OUT THE CONVERSION**

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

307 [https://www.entsoe.eu/major-projects/common-information-model-cim/cim-for-energy-  
309 markets/standards-iop-tests/](https://www.entsoe.eu/major-projects/common-information-model-cim/cim-for-energy-<br/>308 markets/standards-iop-tests/)