

# **Survey on Energy Community TSOs compliance with NC Interoperability and data exchange**

- Assessment Paper -

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## *EXECUTIVE SUMMARY*

This assessment paper provides an overview of compliance with Regulation (EC) 2015/703 on interoperability and data exchange on interconnection points (IPs) between two TSOs in the Energy Community Contracting Parties, but also, probably more important on IPs between one TSO from EU country and another from Energy Community Contracting Parties. Data about compliance with NC interoperability and data exchange between two TSOs from EU is collected to check if this network code is fully implemented.

Network code on interoperability and data exchange sets rules for interconnection agreements, units, gas quality and odourisation and data exchange.

Differences in technical, operational and communication areas could create barriers or at least make obstacles for natural gas market integration. So, full implementation of NC interoperability and data exchange on interconnection points (IPs) between TSOs in Energy Community but also between TSO in Energy community and adjacent TSOs will increase gas flow and facilitate efficient gas trade in the region on behalf of final customers of natural gas.

# INTRODUCTION

## The Energy Community

The **Energy Community**<sup>1</sup> comprises Albania, Bosnia and Herzegovina, the Former Yugoslav Republic of Macedonia, Kosovo\*<sup>2</sup>, Moldova, Montenegro, Serbia and Ukraine. Armenia, Georgia, Turkey and Norway are Observer Countries.

The **Energy Community Regulatory Board** (ECRB) operates based on Article 58 of the Energy Community Treaty. As an institution of the Energy Community the ECRB advises the Energy Community Ministerial Council and Permanent High Level Group on details of statutory, technical and regulatory rules and should make recommendations in the case of cross-border disputes between regulators.

## Scope

In the most Energy Community gas markets not exists or they are still on a low level of development and the gas systems of the Energy Community lay behind European developments as regards network intensity and interconnections. Implementation of NC Interoperability and data exchange is important for already connected systems but also in the light of future network constructions. Pipeline projects in countries without gas infrastructure also should be in line with NC Interoperability and data exchange.

Interoperability of connected gas transmission networks is a key requirement for undisturbed cross border flows. Regulation (EC) 2015/703 on interoperability and data exchange<sup>3</sup> sets interoperability standards for EU gas networks. Coherent application in the Energy Community is essential for ensuring interoperability.

The ECRB Gas Working Group (GWG) Work Program 2016 foresees the GWG Task Force I Interoperability to make a survey on Contracting parties compliance with Regulation (EC) 2015/703 on interoperability and data exchange.

The assessment will focus on identification of differences comparing with interoperability rules on IPs among EU TSOs. Next step is proposal how and when to implement this NC on IPs between Energy Community TSOs and Energy Community and EU TSOs.

The present report assesses the convergence rules on interoperability and data exchange applied in the Energy Community Contracting Parties and Neighboring Participants with the related concepts applied on European level.

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<sup>1</sup> [www.energy-community.org](http://www.energy-community.org).

<sup>2</sup> Throughout this document the symbol \* refers to the following statement: This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo declaration of independence.

<sup>3</sup> Not applicable in the Energy Community yet.



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The report covers Bosnia and Herzegovina, Moldova, Serbia and Ukraine as Energy Community Contracting Parties, and Austria, Italy, Poland and Romania as an EU countries neighboring the Energy Community. Data for Poland are from IP with Ukraine.

## Methodology

Data and analyses provided in present report are exclusively based on information provided by the regulatory authorities of the analyzed markets.

Albania, Kosovo\* and Montenegro had not IPs because of absence of gas infrastructure.

Other EU Neighboring Countries did not provide information.

# FINDINGS

The present paper compare actual practice on IPs in natural gas transmission system in the Energy Community Contracting Parties and some EU Neighboring Countries with rules for Interconnection agreements (IA), Units, Gas quality and Data exchange defined in Regulation (EC) 2015/703 on interoperability and data exchange.

## 1. Interconnection agreements (IA)

Regulation (EC) 2015/703 define rules for content of IA. Two adjacent transmission system operators should define terms and conditions for natural gas flow control, measurement principles for gas quantities and quality, rules for matching process, rules for the allocation of gas quantities, communication procedures in case of exceptional events, settlement of disputes arising from interconnection agreements and amendment process for interconnection agreement.

First questions about IPs in our research was about maximum number of network users on IP in the last 5 years to see complexity of work for TSO in this IP. We can see huge differences among countries. First group is with really small number of network users; B&H with 2, Moldova with 1 on first IP and 3 on second IP and Serbia with 2 on IP to B&H and 4 on IP from Hungary. Poland have 1 network user on IP from Ukraine and 7 on IP to Ukraine. Ukraine have 16 IPs and gave number of network user for three IP with IA. There are 15 network users on IP from Poland, 20 network user on IP from Slovakia and 23 network user on IP from Hungary. In Romania on IP with Hungary maximum 19 is maximum number of network users. Austria have more than 50 network users on IPs and Italy have more than xx network users.

General set of questions about IA in our research was: does an IA exist on IP, does TSO invite network users to comment text of the IA before concluding or amending an IA and is an IA prepared based on ENTSOG template. Answers on these questions you can see in Table 1.

Table 1. General information about IA

Country	Does an IA exist on IP?	Does TSO invite network users to comment an IA?	Is the IA prepared based on ENTSOG template?
Bosnia and Herzegovina	NO	NA	NA
Moldova	YES/YES	YES/NO	Partially/NO

<b>Serbia</b>	YES/NO	NO/NA	NO/NA
<b>Ukraine</b>	YES(3)/NO(13)	NO/NA	Partially (2 from 3)/NA
<b>Austria</b>	YES	NO	NO
<b>Italy</b>	YES	XX	XX
<b>Poland</b>	YES	NO	NO
<b>Romania</b>	YES/NO	YES	YES

As you can see, IA not exist on IP between Serbia and Bosnia and Hercegovina and on a lot of IPs in Ukraine, but also on some IPs in Romania. Reason for this is, probably, limited number or only one network user on both side of IP and/or long term supply contract.

TSOs not invited network users to comment proposed text of the IA before concluded or amending an IA for all IPs with IA and only few IA was prepared based on ENTSOG template in all cases except IN Romania on IP with Hungary.

All IAs contain rules of flow control and these rules was designated by TSO responsible for steering the gas flow across the IP.

All IAs contain details on measurement standards on IPs for gas quantity and quality. Regulation (EC) 2015/703 define very detail list of measurements principles on which the adjacent transmission system operators shall agree. This list contains 16 measurements principles and on the most IPs IA include all measurements principles from Regulation (EC) 2015/703. On one IP in Poland and Romania and on both IPs in Moldavia IA not include one measurement principle and in one IP in Ukraine 7 measurment principles are not part of IA.

Matching process is very important on IP when exist different network users on two side of IP. The adjacent transmission system operators has the rules dealing the matching process. The lesser rule is define rules unless otherwise agreed by the adjacent transmission system operators in their IP.

Also, the transmission system operators perform, if is not agreed on other way, the matching process in the following sequential steps:

- calculating and sending processed quantities of gas by the initiating TSO within 45 minutes of the start of the nomination or re-nomination cycle;
- calculating and sending of confirmed quantities of gas by the matching TSO within 90 minutes of the start of the nomination or re-nomination cycle;
- sending confirmed quantities of gas to network users and scheduling the gas flow across the IP by the adjacent TSOs within two hours of the start of the nomination or re-nomination cycle.

Small difference in steps in the matching process exist on IPs in Serbia and one on IP in Moldova and Ukraine.

Regulation (EC) 2015/703 define the minimum harmonised information contained within the data exchange for the matching process: IP identification; network user identification; identification of the party delivering to or receiving gas from the network user; start and end time of the gas flow for which the matching is made; gas day; processed and confirmed quantities and direction of gas flow. In all countries IA specify information for data exchange for matching process. Ukraine inform that on one IP network users not provide adjacent TSOs with all harmonized information defined by NC Interoperability and data exchange based on contract signed in the previous period. Network user inform adjacent TSOs only about processed and confirmed quantities for gas day on that IP. In Table 2. You can see answers per country about matching process.

Table 2. Matching process

Country	Rules for the matching process	Is the matching process during nomination cycle in line with NC?	Does an IA specify information for data exchange for matching process?
Bosnia and Herzegovina	XX	XX	XX
Moldova	Lesser rule	NO/YES	YES
Serbia	Some other rules	NO	YES
Ukraine	Lesser rule	NO/YES/YES	YES
Austria	Lesser rule	YES	YES
Italy	XX	XX	XX
Poland	Lesser rule	YES	YES
Romania	Lesser rule	YES	YES

Rule for the allocation of gas quantities for TSOs in Austria, Italy, one IP in Moldova, Poland, Romania and Ukraine is an operational balancing account (OBA). On IP between Poland and Ukraine OBA is used, but it is settled to zero on end of each month. On other IP in Moldova allocation is based on measurement. On Serbian IPs with B&H and with Hungary, the biggest network user allocation is based on measurement and for all other allocation is equal to nomination.



Communication language between TSOs in case of exceptional events is English on the most IPs. Russian is language on IP between Poland and Ukraine, Russian and Romanian in Moldavia and Serbian on IP between Serbia and B&H.

Dispute settlement mechanism is defined in the most IA. On the IPs between Poland and Ukraine IA define that disputes shall be settled by negotiations and not specifies the applicable law, the court of jurisdiction or the terms and conditions of the appointment of experts of an institutional forum. IA not exist on IP between Serbia and B&H.

## 2. Units

Regulation (EC) 2015/703 define the reference conditions for volume 0°C and 1.01325 bar, and default combustion reference temperature 25°C. Also, define set of units for any data exchange and data publication. Units are bar for pressure, °C for temperature, m<sup>3</sup> for volume, kWh/ m<sup>3</sup> for gross calorific value (GCV), kWh for energy and kWh/ m<sup>3</sup> for Wobbe index.

Referent pressure on IPs in all countries is equal to value defined in NC, but referent condition for temperature 0°C is only in IPs in EU countries and partially in Ukraine. In B&H and Serbia referent condition for temperature is 15°C and Moldavia and partially Ukraine use 20°C in line with import contracts. Combustion reference temperature for calorific value, energy and Wobbe index are 25°C in all countries except B&H and Serbia where use 15°C. Gross calorific value is used in all countries except B&H, Serbia and Moldavia. Also unit for energy is kWh in all countries except B&H and Serbia where use MJ, and Moldova where use MJ and kWh. Referent conditions and units per countries are given in the table below.

Table 3. Natural gas referent conditions and units for energy

Country	Temperature and pressure for volume	Combustion temperature and type of calorific value,	Unit for energy
Bosnia and Herzegovina	15°C and 1.01325 bar	15°C and Lower	MJ
Moldova	20°C and 1.01325 bar	25°C and Lower	MJ and kcal
Serbia	15°C and 1.01325 bar	15°C and Lower	MJ
Ukraine	0° and 20°C and 1.01325 bar	0°C and Gross	kWh
Austria	0°C and 1.01325 bar	25°C and Gross	kWh
Italy	0°C and 1.01325 bar	25°C and Gross	kWh

<b>Poland</b>	0°C and 1.01325 bar	25°C and Gross	kWh
<b>Romania</b>	0°C and 1.01325 bar	25°C and Gross	kWh

### 3. Gas quality

Regulation (EC) 2015/703 define transmission system operators obligation to publish on their website for each IP, with a frequency of at least once per hour during the gas day, the Wobbe-index and gross calorific value for gas entering their transmission networks at all IPs. B&H, Ukraine and on one IP in Moldova, TSOs not published Wobbe-index and gross calorific value for gas at all. Italy published this data on monthly level, for one IP in Moldova on the weekly level, Austria, Romania and Serbia on daily level and only Poland published Wobbe-index and gross calorific value for gas on hourly level.

All countries informed that gas quality differences never caused a restriction in cross/border trade.

Also, all countries confirmed that differences in odourisation practise never caused a restriction in cross/border trade.

Although it is not part of NC, we make investigation which parameters of gas quality are prescribed in applicable natural gas quality standards.

Table 4. Natural gas quality parameters

Country	C1	C2	C3	C4+	N2	Izo butan	n- butan	Izo pentan	n- pentan	CO2
<b>B&amp;H</b>	Min 92%	Max 4%	Max 2%	Max 2%	Max 2%	NO	NO	NO	NO	NO
<b>Moldova1</b>	Min 40%	Max 15%	Max 6%	NO	Max 15%	Max 4%	Max 4%	Max 2%	Max 2%	Max 2%
<b>Moldova2</b>	Min 90%	Max 7%	Max 3%	Max 3%	Max 5%	NO	NO	NO	NO	Max 2%
<b>Serbia</b>	Min 90%	Max 4%	Max 2%	Max 2%	Max 3%	NO	NO	NO	NO	Max 2%
<b>Ukraine</b>	Min 90%	Max 7%	Max 3%	Max 3%	Max 5%	NO	NO	NO	NO	Max 2%
<b>Austria</b>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx

<b>Italy</b>	*	*	*	*	*					Max 2%
<b>Poland</b>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
<b>Romania</b>	Min 70%	Max 10%	Max 3,5%	Max 1,5%	Max 10%			Max 0,5%	Max 0,5%	Max 8%

\* In Italy the values for C1, C2,C3, C4+ are intrinsically limited by the acceptability Range of the Wobbe index.

Table 5. GCV, Wobbe index and sulfur, oxygen and water dew parameters range

<b>Country</b>	<b>GCV (KWh/m<sup>3</sup>)</b>	<b>Wobbe (KWh/m<sup>3</sup>)</b>	<b>Total sulfur (mg/m<sup>3</sup>)</b>	<b>Mercaptane sulfur (mg/m<sup>3</sup>)</b>	<b>H2S (mg/m<sup>3</sup>)</b>	<b>Oxygen (%mol)</b>	<b>Water dew point (°C)</b>
<b>B&amp;H</b>	10,076 – 11,374	13,650 – 16,412	Max. 20	Max. 6	Max. 5	NO	-5/40 bar
<b>Moldova</b>	Min. 10,343	12,074 – 15,937	NO	Max. 36	Max.20	1	NO
<b>Serbia</b>	10,562 – 11, 212	13,650 – 14,950	Max. 20	Max. 5,6	Max. 5	NO	-5/40 bar
<b>Ukraine</b>	10,102 – 10,659	11,402 - 15,085	NO	Max. 20	Max. 6	0,02	-2,5/70 bar
<b>Austria</b>	10,700 – 12,800	13,330 – 15,700	Max. 10	Max. 6	Max. 5	0,5	-8/40 bar
<b>Italy</b>	10,234 – 13,260	13,853 - 15,293	Max. 150	Max. 15,5	Max. 5	0,6	-5/70 bar
<b>Poland</b>	Min 10,556	12,500 – 15,806	Max. 20	Max.16	Max. 7	0,2	-5/55 bar
<b>Romania</b>	xx	xx	Max. 100	Max.8	Max.6,8	0,02	

Data in Table 5. defines minimum and maximum values for natural gas characteristic using reference conditions: 0°C and 1.01325 bar for volume, gross Wobbe index and gross calorific value at 25°C for combustion in line with Regulation (EC) 2015/703, Chapter III UNITS . Data at another referent conditions for combustion/ metering are transferred to (25°C/0°C) in accordance with Regulation (EC) 2015/703 ANNEX Conversion factors between reference conditions. Relations 1 kWh = 3,6 MJ and 1 kcal = 4,1868 MJ are also used.

#### **4. Data exchange**

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Regulation (EC) 2015/703 define different types of data exchange: document based data exchange, integrated data exchange and interactive data exchange.

Austria confirm usage of document based data exchange and integrated data exchange. In both types of data exchange data format is Edig@s/HML.

On Poland Ukraine border due to lack of data exchange solutions on Ukrainian side, matching is done with excel sheets exchanged as email attachments.

On IP on Romanian Hungarian border integrated data exchange and interactive data exchanged is used.

##### **Italy**

On IP with one network user in Moldavia other type of data exchange is used, Modbus TCP-IP. On second IP also other type of data exchange is used, the encrypted manufacturer.

On IPs between Hungary and Serbia and Serbia and B&H TSOs exchange information is by sending emails.

Different security measures can be taken to protect data exchange.

On Austrian IPs and on IP between Romania and Hungary data exchange security measures are: protection of the confidentiality by encryption, integrity and authenticity by signature of the sender and security measure to prevent unauthorised access to IT infrastructure.

Restricted list of email addresses is used in the information exchange on IP between Poland and Ukraine. It means that only emails sent by authorised persons are accepted and processed.

##### **Italy**

Integrity and authenticity by signature of the sender is used as a security measure on IP with one network user in Moldavia. On oher IP protection of the confidentiality by encryption, integrity and authenticity by signature of the sender and security measure to prevent unauthorised access to IT infrastructure is used.

On IPs between Hungary and Serbia and Serbia and B&H there are not sofisticed measures for data protection. If there any strange information at email exchange, two TSOs check it by phone call.

## SUMMARY OF RESULTS

Through questionnaire we found out that the Interconnection Agreement not exist on some IP between the Energy Community Contracting Parties TSOs, but also on IPs with non EU TSO and EU TSO. The Interconnection Agreement exist on all IPs between the Energy Community Contracting Parties TSO and EU TSO. All IA contain rules for flow control and details on measurements standards on IP for gas quantity and quality. Matching process is define in IA, but some differences exist in rules for the matching process, steps and timeframe. Rules for the allocation of gas quantities is OBA on the most of IPs, but not at all. Also, on some IPS communication language is not English and on one IP IA not define details about dispute settlement mechanism.

On all IPs on the side of the Energy Community Contracting Parties different reference conditions, different set of units and different calorific values is used compering with Regulation (EC) 2015/703. The network code defines that referent condition for volume shall be 0°C. In the Energy Community Contracting Parties, on the other hand, referent conditions for volume are 15°C and 20°C. For calorific values, energy and Wobbe index the referent temperature in the network code shall be 25°C, but Energy Community Contracting Parties used 15°C and 0°C. In the network code gross calorific value shall be used, but Energy Community Contracting Parties use lower calorific value. In the Network Code on Interoperability and Data Exchange Rules units are: kWh for energy and kWh/m<sup>3</sup> for calorific value and Wobbe-index. In the Energy Community Contracting Parties the units are: MJ and kCal for energy and MJ/m<sup>3</sup> and kCal /m<sup>3</sup> for calorific value and Wobbe- index. Only exception are new IPs between EU TSOs and Ukraine TSO.

All countries informed that gas quality differences or differences in odourisation practise never caused a restriction in cross/border trade. The most Energy Community Contracting Parties TSOs not published Wobbe-index and gross calorific value for gas entering in their transmission networks at all IPs and no one publish these data on the hourly level.

TSOs in the Energy Community Contracting Parties on all IPs exchange data information via email insted using one of three solution defined in NC: document based data exchange, integrated data exchange and interactive data exchange. Some TSOs from the Energy Community on some IPs implemented security measures defined in Regulation (EC) 2015/703.

## CONCLUSIONS

Regulation (EC) 2015/703 of 30 April 2015 establishing a network code on interoperability and data exchange rules. This NC is apply in EU from 1 May 2016. Regulation (EC) 2015/703 is not obligatory for implementation in The Energy Community Contracting Parties.

The Energy Community Contracting Parties should implement this network code on interconnection points with goal to create precondition to attract new shippers, increase gas flow from different gas sources and facilitate gas trade in the region on benefit of final customers of natural gas. But, for final customers of natural gas in the Energy Community Contracting Parties is probably more important to implement the network code provisions on IPs between EU countries and the Energy Community Contracting Parties.

After comparison between Regulation (EC) 2015/703 and praxis on the IPs in the Energy Community Contracting Parties it can be concluded:

Interconnection Agreement not exist on some IPs between two TSO from the Energy Community.

On all IPs on the side of the Energy Community Contracting Parties TSOs use different reference conditions, different set of units and different calorific values compering with Regulation (EC) 2015/703.

Also, on all IPs with the Energy Community Contracting Parties TSOs exchange data information via email instead using sophisticated solution define in NC.

Realistic deadline for the Energy Community TSOs to implement all solutions from Network Code on Interoperability and Data Exchange should not be less than two years after the Energy Community NC adoption. In the same time frame implementation of the network code should be assured on IPs between the Energy Community Contracting Parties and EU countries TSO.

Provision from this NC should be a default rules also for all new IPs in the Energy Community Contracting Parties.