



ENERGY REGULATORS REGIONAL ASSOCIATION

BENCHMARK ANALYSIS: Ancillary services and Balancing markets

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**BENCHMARK ANALYSIS:
Ancillary services and Balancing markets
in ERRA Member Countries**

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The Analysis was prepared based on information collected from ERRA Licensing and Competition Committee Members in the period of November 2015 – February 2016.

The following ERRA Members submitted their answers:

- Public Services Regulatory Commission of **Armenia**
- State Electricity Regulatory Commission of **Bosnia and Herzegovina**
- **Georgian** National Energy and Water Supply Regulatory Commission
- **Hungarian** Energy and Public Utility Regulatory Authority
- Public Utilities Commission of **Latvia**
- National Commission for Energy Control and Prices of **Lithuania**
- Energy Regulatory Commission of **Macedonia**
- National Energy Regulatory Agency, **Moldova**
- Energy Regulatory Authority, **Poland**
- Energy Agency, **Serbia**
- Energy Market Regulatory Authority of **Turkey**
- National Energy and Utilities Regulatory Commission of **Ukraine**

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Ancillary services and Balancing markets in ERRA Member Countries

Benchmarking Analysis

Introduction:

This Benchmarking Analysis aims to provide information on the different market models, procurement methods and cost elements of ancillary service - and balancing markets in operation in different ERRA member countries, thus it could provide good orientation for all ERRA members.

The Hungarian Energy and Public Utility Regulatory Authority (HEA) prepared a questionnaire for this purpose and it was sent to all ERRA Members.

By the end of 2015, 12 member states responded (including HEA).

First of all we like to thank to all members who filled the questionnaire. Most of the questions were answered by the responding members. Question 11 was maybe a bit equivocal because some of the members gave the newly built generation capacity in 2014, however, HEA asked the total built in generational capacity in the member state's system.

Annex 1 contains the detailed answers of the responding Member states.

Quick summary of the key findings of the answers:

- **Armenia:**

There is one license holder in the Republic of Armenia in charge of transmission of electricity (capacity) in the whole territory of the country and one license holder in charge of operating the electricity system of the Republic of Armenia.

- **Bosnia and Herzegovina:**

Primary reserves, black start and U-Q control are compulsorily free service.

There is an international cooperation regarding to tertiary reserves with Slovenia and Croatia.

Only power plants provide ancillary services and TSO purchases only domestic reserves.

New Market rules are coming in to force from the 1st of January 2016. Ancillary Services rules will be totally changed. Market based procurement of ancillary services is planned.

- **Georgia:**

According to the Grid Code, some of power plants (according to TSO preferences) should be capable to provide such service (Black start, U-Q control). However no price for such service is determined and no agreement has been conclude yet.

Only power plants provide ancillary services and TSO purchases only domestic reserves.

- **Hungary:**

There is an international cooperation (eGCC - Grid Control Cooperation with Slovakia and Czech Republic) in the field of secondary imbalance netting.

According to the Hungarian Energy Law generators have to offer their balancing reserves to the TSO.

In Hungary there are no compulsorily free services.

Power plants, virtual power plants, traders, consumers (few) provide ancillary services and TSO purchases only domestic reserves.

- **Latvia:**

Latvia is participating in primary regulation only with own net exchange regulation. The frequency is regulated centrally by Russian TSO.

There is an international cooperation (cooperation only with Baltic TSOs) in the field of secondary imbalance netting.

The agreement with reserve provider is concluded for two year period.

Power plants provide ancillary services and TSO purchases reserves from domestic and neighboring providers.

- **Lithuania:**

There is an international cooperation (3 TSOs cooperating) in the field of secondary balancing netting.

Power plants provide ancillary services and TSO purchases reserves from domestic, but if needed, there are agreements with the neighboring TSOs.

- **Macedonia:**

Power plants (JSC ELEM – generation company) provide ancillary services and TSO purchases only domestic reserves.

- **Moldova:**

There are no balancing reserves in the Republic of Moldova because of the marginal percent of generation ($\approx 20\%$).

Currently, all the issues related to the Balancing Electricity Markets are under preparation and approval on the legislative level.

Regarding the international cooperation, and in particular the procurement of the parallel work of the Ukrainian and Moldovan electricity systems, the state-owned company „Moldelectrica” works closely with the Ukrainian TSO – state-owned company „Ukrenergo”.

Power plants provide ancillary services and TSO purchases electricity in order to cover losses, by using domestic reserves.

- **Poland:**

The capacity providers i.e. generators with centrally dispatched generation units (CDGU) are obliged to offer their balancing reserves to the TSO.

Polish TSO purchase only domestic reserves.

- **Serbia:**

There is no international cooperation for secondary imbalance netting.

Primary control reserve is free service.

Power plants provide ancillary services and there is Tertiary Control reserve contract with Montenegro.

There are contracts for Emergency Exchange with almost all neighboring TSO (as tertiary reserve).

- **Ukraine:**

The black start service exists, also there are primary control reserves, but not as a service.

- **Turkey:**

Primary and secondary frequency control reserves are applied.

Ancillary services regulation TSO (TEİAŞ) is required to sign black start agreements with generators having that capacity. Every power plant with installed capacity above 30 MW is required to supply reactive power regulation free of charge on a certain limited power factor range.

For primary frequency control reserves, generators with installed capacity above 50 MW have an obligation to provide a reserve equal to 1% of their installed capacity through their own facilities or through another certified generators by transferring their obligation to that generator. For secondary frequency control reserves, every generator with installed capacity above 100 MW has an obligation to offer their unused capacity as a potential to TSO. TSO selects among available capacity based on their opportunity cost.

Generators above 30 MW have an obligation to provide free reactive power support within a limited power factor operating range.

Generators provide ancillary services

There is only domestic reserves purchased by TSO.

ANNEX 1: Member states answers:

Armenia

1. How many **control areas** (CA) are there in your country?

(How many TSOs are operating in your country?)

There is one license holder in the Republic of Armenia in charge of transmission of electricity (capacity) in the whole territory of the country and one license holder in charge of operating the electricity system of the Republic of Armenia.

2. What types of **balancing reserve categories** are applied in your country? (e.g.: **primary**, **secondary** and **tertiary** reserves)

Primary, secondary and tertiary reserves are applied.

3. Are there so-called **black start** (BS) and Voltage and Reactive power reserves (**U-Q-control**) in your country?

No answer.

4. Please give us the **total gross energy consumption and ratio import-export energy** in 2014 [%]

Total gross consumption in 2014 was 5352 GWh.

The import and export of electricity in 2014 was 205,8 kWh and 1313,6 kWh (the ratio is approximately 0,157).

5. Please give us the **composition of consumption and production** in 2014 (Share of domestic energy (electricity) production)

Local production of electricity by the end of 2014 amounted in 7750 GWh, and consumption in 5352 GWh, out of which the consumption of the population was: 1933,5 GWh, budgetary organizations: 231,1 GWh, industry: 1243,7 GWh, transportation: 115,5 GWh, irrigation: 172,4 GWh, water supply and sanitation: 74,6 GWh, the remaining customers: 1581,2 GWh.

6. Please give us the **ratio of renewables within final energy sources consumption** in 2014 [%]

Electricity production in 2014 amounted in 7750 GWh, out of which 1996,7 GWh was generated from renewable resources, meaning 25,8 percent (electricity production of JSC "International Energy Corporation" amounted in 474,7 GWh, while the production of JSC "ConturGlobal Hydro Cascad" in 833,1 GWh,)

Electricity generation in only small HPPs (with installed capacity below 30MW) resulted in 688,9 million kWh, meaning 8,9% of all generation. Electricity distribution in the domestic market was in the amount of 6325,0 million kWh, out of which 673,5 million kWh was provided by renewable energy resources. In this context the ratio is 10,6%.

7. Please give us the **yearly gross electricity consumption** (in GWh) of your country in 2014!

5352 GWh

8. Please give us the **highest winter and summer peak load values** in the last 10 years in your CA!

No answer.

9. Please give us the **biggest generation outage** (in MW) in the last 10 years in your country!

No answer.

10. Please give us the **utmost generation block** (in MW) operating in your CA!

The largest generating unit is the CJSC "Armenian Nuclear Power Plant," its installed capacity is 407,5 MW.

11. Please give us your **CA's total generation capacity built-in (2014)**!

In 2014, only 14 small hydropower plants were built with a total capacity of 21 MW.

12. Please give us the **needed quantities** of the applied reserve categories (in MW, primary, secondary, tertiary, upward and downward directions separately)!

No answer.

13. Are there any international cooperation with your neighboring country in the field of **secondary balancing netting**? ('Grid Control Cooperation', GCC)

No.

14. **For how long period** (time-scale) does your TSO purchase the necessary reserves? (Please separately, according to the applied categories.)

No answer.

15. **Are the capacity providers** (generators and traders) **obliged to offer** their balancing reserves to the TSO?

No answer.

16. Are there any **compulsorily free services** (e.g. BS or primary control reserve), or all of them have their cost?

No answer.

17. Is the **total cost of yearly AS a pass-through item** in your price regulation system, or there are supplementary incentive solutions, too?

No answer.

18. Is the **price-setting of balancing energy** is a symmetric calculation from the point of view of the 2 directions, or an asymmetric one?

(are the average prices in absolute values equal or the upward directions values are higher)

No answer.

19. Is there a **gap** between the price of balancing energy paid by the TSO to the generators (traders) and the price paid by balance circles to the TSO for balancing energy?

No answer.

20. Which market players do provide ancillary services in your country (e.g: power plants, traders, consumers)?

No answer.

21. Does your TSO purchase **only domestic reserves** or there are any cross-border providers in your system?

TSO does not purchase.

Bosnia and Herzegovina

1. How many **control areas** (CA) are there in your country?

(How many TSOs are operating in your country?)

One TSO (ISO + TRANSCO - two legal entities).

2. What types of **balancing reserve categories** are applied in your country? (e.g.: **primary**, **secondary** and **tertiary** reserves)

Primary (producers responsibility free of charge), secondary and tertiary.

3. Are there so-called **black start** (BS) and Voltage and Reactive power reserves (**U-Q-control**) in your country?

Black start – Yes, U-Q Control - Yes - obligatory for generators without remuneration.

4. Please give us the **total gross energy consumption and ratio import-export energy** in 2014 [%]

Gross consumption -11.379 GWh, import/export ratio = 0,52 or 52%

5. Please give us the **composition of consumption and production** in 2014 (Share of domestic energy (electricity) production)

Domestic energy production - 14.472 GWh covers all domestic consumption.

6. Please give us the **ratio of renewables within final energy sources consumption** in 2014 [%]

HPP (Hydro Power Plant) - 39,7% TPP (Thermal Power Plan) 60,3%

7. Please give us the **yearly gross electricity consumption** (in GWh) of your country in 2014!

11.379 GWh

8. Please give us the **highest winter and summer peak load values** in the last 10 years in your CA!

Year	Winter [MW]	Summer [MW]
2014	2207	1647
2013	2074	760
2012	2143	1718
2011	2150	1730
2010	2173	1669
2009	2033	1588
2008	2117	1623
2007	2078	1550
2006	2019	1495

9. Please give us the **biggest generation outage** (in MW) in the last 10 years in your country!

275 MW

10. Please give us the **utmost generation block** (in MW) operating in your CA!

300MW

11. Please give us your **CA's total generation capacity built-in (2014)**!

RES up to 10MW

12. Please give us the **needed quantities** of the applied reserve categories (in MW, primary, secondary, tertiary, upward and downward directions separately)!

Secondary average 53 MW; tertiary (upward) 250MW

13. Are there any international cooperation with your neighboring country in the field of **secondary balancing netting**? ('Grid Control Cooperation', GCC)

No, only in tertiary reserve (Slovenia, Croatia and BiH).

14. **For how long period** (time-scale) does your TSO purchase the necessary reserves? (Please separately, according to the applied categories.)

Secondary and tertiary are contracted yearly with monthly resolution.

15. **Are the capacity providers** (generators and traders) **obliged to offer** their balancing reserves to the TSO?

Yes, only generators.

16. Are there any **compulsorily free services** (e.g. BS or primary control reserve), or all of them have their cost?

Primary reserve, BS, U-Q control.

17. Is the **total cost of yearly AS a pass-through item** in your price regulation system, or there are supplementary incentive solutions, too?

AS pass through item in our price regulation system.

18. Is the **price-setting of balancing energy** is a symmetric calculation from the point of view of the 2 directions, or an asymmetric one?

(are the average prices in absolute values equal or the upward directions values are higher)

Not applicable in 2014.

19. Is there a **gap** between the price of balancing energy paid by the TSO to the generators (traders) and the price paid by balance circles to the TSO for balancing energy?

Not applicable in 2014.

20. Which market players do provide ancillary services in your country (e.g: power plants, traders, consumers)?

Power plants

21. Does your TSO purchase **only domestic reserves** or there are any cross-border providers in your system?

Only domestic reserves.

Georgia

1. How many **control areas** (CA) are there in your country?

(How many TSOs are operating in your country?)

One TSO.

2. What types of **balancing reserve categories** are applied in your country? (e.g.: **primary**, **secondary** and **tertiary** reserves)

Stand-by reserves.

3. Are there so-called **black start** (BS) and Voltage and Reactive power reserves (**U-Q-control**) in your country?

According to the Grid Code, some of power plants (according to TSO preferences) should be capable to provide such service. However no price for such service is determined and no agreement has been conclude yet.

4. Please give us the **total gross energy consumption and ratio import-export energy** in 2014 [%]

Total gross consumption 11005.6 GWh; export 5.5%; import 7.7%

5. Please give us the **composition of consumption and production** in 2014 (Share of domestic energy (electricity) production)

Generation: 10369 GWh

6. Please give us the **ratio of renewables within final energy sources consumption** in 2014 [%]

2,27%

7. Please give us the **yearly gross electricity consumption** (in GWh) of your country in 2014!

10369 GWh

8. Please give us the **highest winter and summer peak load values** in the last 10 years in your CA!

Winter 18 (data is missing)

9. Please give us the **biggest generation outage** (in MW) in the last 10 years in your country!

Winter -1853 MW; Summer - N/A

10. Please give us the **utmost generation block** (in MW) operating in your CA!

300 MW

11. Please give us your **CA's total generation capacity built-in (2014)**!

3497 MW

12. Please give us the **needed quantities** of the applied reserve categories (in MW, primary, secondary, tertiary, upward and downward directions separately)!

Information N/A.

13. Are there any international cooperation with your neighboring country in the field of **secondary balancing netting**? ('Grid Control Cooperation', GCC)

No.

14. **For how long period** (time-scale) does your TSO purchase the necessary reserves? (Please separately, according to the applied categories.)

Only stand-by reserve capacity is purchased by market participants (consumers and exporters) on monthly basis.

15. **Are the capacity providers** (generators and traders) **obliged to offer** their balancing reserves to the TSO?

No such obligation, No BRPs.

16. Are there any **compulsorily free services** (e.g. BS or primary control reserve), or all of them have their cost?

According to the Grid Code, all power plant should participate in primary frequency control. No cost for such service is determined.

17. Is the **total cost of yearly AS a pass-through item** in your price regulation system, or there are supplementary incentive solutions, too?

Pass through.

18. Is the **price-setting of balancing energy** is a symmetric calculation from the point of view of the 2 directions, or an asymmetric one?

(are the average prices in absolute values equal or the upward directions values are higher)

No 2 direction calculation is applied, No balancing market established yet

19. Is there a **gap** between the price of balancing energy paid by the TSO to the generators (traders) and the price paid by balance circles to the TSO for balancing energy?

No.

20. Which market players do provide ancillary services in your country (e.g: power plants, traders, consumers)?

Power plants.

21. Does your TSO purchase **only domestic reserves** or there are any cross-border providers in your system?

Only Domestic.

Hungary

1. How many **control areas** (CA) are there in your country?

(How many TSOs are operating in your country?)

One control area, one TSO (MAVIR Ltd.)

2. What types of **balancing reserve categories** are applied in your country? (e.g.: **primary**, **secondary** and **tertiary** reserves)

Primary, secondary, tertiary.

3. Are there so-called **black start** (BS) and Voltage and Reactive power reserves (**U-Q-control**) in your country?

Yes, both of them.

4. Please give us the **total gross energy consumption and ratio import-export energy** in 2014 [%]

Total gross energy consumption: 42589 GWh; import: 13388 GWh, domestic: 29201 GWh

5. Please give us the **composition of consumption and production** in 2014 (Share of domestic energy (electricity) production)

Composition of consumption: 36,7 % nuclear; 31,4% import; 14,2% coal/lignite; 10,8% hydrocarbon; 6,8% renewable

Composition of production: 53,6 % nuclear; 20,7% coal/lignite; 15,8% hydrocarbon; 9,9% renewable

6. Please give us the **ratio of renewables within final energy sources consumption** in 2014 [%]

6,8 %

7. Please give us the **yearly gross electricity consumption** (in GWh) of your country in 2014!

42589 GWh

8. Please give us the **highest winter and summer peak load values** in the last 10 years in your CA!

Highest winter peak: 6602 MW (2007); Highest summer peak: 6457 MW (08.07.2015)

9. Please give us the **biggest generation outage** (in MW) in the last 10 years in your country!

1394 MW (16.12.2013)

10. Please give us the **utmost generation block** (in MW) operating in your CA!

500 MW

11. Please give us your **CA's total generation capacity built-in (2014)**!

8936 MW

12. Please give us the **needed quantities** of the applied reserve categories (in MW, primary, secondary, tertiary, upward and downward directions separately)!

primary +-28 MW; secondary: upward 240-270 MW, downward 120-155 MW;

tertiary: upward 500MW

13. Are there any international cooperation with your neighboring country in the field of **secondary balancing netting**? ('Grid Control Cooperation', GCC)

Yes, Grid Control Cooperation with Slovakia and Czech Republic.

14. **For how long period** (time-scale) does your TSO purchase the necessary reserves? (Please separately, according to the applied categories.)

TSO purchase the necessary reserves (primary, secondary, tertiary) for quarter year.

15. **Are the capacity providers** (generators and traders) **obliged to offer** their balancing reserves to the TSO?

Yes, according to the Hungarian Energy Law generators have to offer their balancing reserves to the TSO.

16. Are there any **compulsorily free services** (e.g. BS or primary control reserve), or all of them have their cost?

In Hungary there are no compulsorily free services.

17. Is the **total cost of yearly AS a pass-through item** in your price regulation system, or there are supplementary incentive solutions, too?

In Hungary the costs of yearly AS are mainly pass-through items (secondary and tertiary reserves). Primary, BS and U-Q are handled in a more sophisticated manner.

18. Is the **price-setting of balancing energy** is a symmetric calculation from the point of view of the 2 directions, or an asymmetric one?

(are the average prices in absolute values equal or the upward directions values are higher)

In Hungary this system is asymmetric

19. Is there a **gap** between the price of balancing energy paid by the TSO to the generators (traders) and the price paid by balance circles to the TSO for balancing energy?

Yes. The difference is spent on reduction of the TSO's tariff of AS.

20. Which market players do provide ancillary services in your country (e.g: power plants, traders, consumers)?

Power plants, virtual power plants, traders, consumers (few).

21. Does your TSO purchase **only domestic reserves** or there are any cross-border providers in your system?

TSO purchase only domestic reserves.

Latvia

1. How many **control areas** (CA) are there in your country?

(How many TSOs are operating in your country?)

One TSO.

2. What types of **balancing reserve categories** are applied in your country? (e.g.: **primary**, **secondary** and **tertiary** reserves)

Secondary and tertiary. Latvia is participating in primary regulation only with own net exchange (saldo) regulation. The frequency centralisily is regulated by Russian TSO.

3. Are there so-called **black start** (BS) and Voltage and Reactive power reserves (**U-Q-control**) in your country?

Yes.

4. Please give us the **total gross energy consumption and ratio import-export energy** in 2014 [%]

Electricity consumption - 7.219 TWh, Import - 74%, Export - 42%

5. Please give us the **composition of consumption and production** in 2014 (Share of domestic energy (electricity) production)

Consumption: Industry-27.7%, Building-1.3%, Electrotransport - 1.9%, Non-industry users - 31.1%, Trading and public catering sector - 10.5%, Agriculture and firestry sector - 2.1%, Household sector - 25.8%

Production: the domestic installed capacity is sufficient for consumption covering, but it has the seasonal character (CHP and HPP).

6. Please give us the **ratio of renewables within final energy sources consumption** in 2014 [%]

62%; Renewable energy share from total installed capacity amount in Latvia. 38.6% of RES in final consumption

7. Please give us the **yearly gross electricity consumption** (in GWh) of your country in 2014!

7219 GWh

8. Please give us the **highest winter and summer peak load values** in the last 10 years in your CA!

Winter - 1421 MW in 2006, Summer - 415 MW in 2007

9. Please give us the **biggest generation outage** (in MW) in the last 10 years in your country!

450 MW

10. Please give us the **utmost generation block** (in MW) operating in your CA!

450 MW

11. Please give us your **CA's total generation capacity built-in (2014)**!

25 MW; Total increase of installed capacity in 2014 comparing with 2013.

12. Please give us the **needed quantities** of the applied reserve categories (in MW, primary, secondary, tertiary, upward and downward directions separately)!

Primary: upward/downward - 0. Secondary: upward - 100, downward - 0. Tertiary: upward - 100, downward - 0.

13. Are there any international cooperation with your neighboring country in the field of **secondary balancing netting**? ('Grid Control Cooperation', GCC)

2; Cooperation only with Baltic TSOs (2)

14. **For how long period** (time-scale) does your TSO purchase the necessary reserves? (Please separately, according to the applied categories.)

The agreement with reserve provider is concluded for two year period. After day forecast reserves are harmonized for each hour.

15. **Are the capacity providers** (generators and traders) **obliged to offer** their balancing reserves to the TSO?

No.

16. Are there any **compulsorily free services** (e.g. BS or primary control reserve), or all of them have their cost?

No.

17. Is the **total cost of yearly AS a pass-through item** in your price regulation system, or there are supplementary incentive solutions, too?

No.

18. Is the **price-setting of balancing energy** is a symmetric calculation from the point of view of the 2 directions, or an asymmetric one?

(are the average prices in absolute values equal or the upward directions values are higher)

Symmetric: 3% upward and 3% downwards.

19. Is there a **gap** between the price of balancing energy paid by the TSO to the generators (traders) and the price paid by balance circles to the TSO for balancing energy?

Yes. Depends on internal regulation and agreement between trader and TSO.

20. Which market players do provide ancillary services in your country (e.g: power plants, traders, consumers)?

Power plants.

21. Does your TSO purchase **only domestic reserves** or there are any cross-border providers in your system?

Both: domestic and from neighboring countries.

Lithuania

1. How many **control areas** (CA) are there in your country?

(How many TSOs are operating in your country?)

One TSO.

2. What types of **balancing reserve categories** are applied in your country? (e.g.: **primary, secondary** and **tertiary** reserves)

Primary, secondary (emergency and deviations), tertiary, reactive power and voltage control, black-start.

3. Are there so-called **black start** (BS) and Voltage and Reactive power reserves (**U-Q-control**) in your country?

Yes.

4. Please give us the **total gross energy consumption and ratio import-export energy** in 2014 [%]

65,3% (Import - 7.78 TWh; export - 0.16 TWh, gross energy consumption - 11,7 TWh)

5. Please give us the **composition of consumption and production** in 2014 (Share of domestic energy (electricity) production)

34,7% (4 054 GWh)

6. Please give us the **ratio of renewables within final energy sources consumption** in 2014 [%]

14,6 %

7. Please give us the **yearly gross electricity consumption** (in GWh) of your country in 2014!

11 676 GWh

8. Please give us the **highest winter and summer peak load values** in the last 10 years in your CA!

2,5 MW was in 2007 winter (HEA: data is too low, maybe GW?)

no data for summer peak

9. Please give us the **biggest generation outage** (in MW) in the last 10 years in your country!

300 MW in 2009-2014 period.

10. Please give us the **utmost generation block** (in MW) operating in your CA!

300 MW of biggest generator Lietuvos elektrinė with total installed capacity 1 655 MW.

11. Please give us your **CA's total generation capacity built-in (2014)**!

28,75 MW

12. Please give us the **needed quantities** of the applied reserve categories (in MW, primary, secondary, tertiary, upward and downward directions separately)!

Secondary (emergency) - 200 MW, secondary (deviations) - 25 MW, tertiary - 270 MW, reactive power and voltage control - 1260h, black start - 0,21 mill EUR

13. Are there any international cooperation with your neighboring country in the field of **secondary balancing netting**? ('Grid Control Cooperation', GCC)

Yes, 3 cooperating TSOs.

14. **For how long period** (time-scale) does your TSO purchase the necessary reserves? (Please separately, according to the applied categories.)

All year round.

15. **Are the capacity providers** (generators and traders) **obliged to offer** their balancing reserves to the TSO?

Yes.

16. Are there any **compulsorily free services** (e.g. BS or primary control reserve), or all of them have their cost?

All of them have their cost.

17. Is the **total cost of yearly AS a pass-through item** in your price regulation system, or there are supplementary incentive solutions, too?

Pass-through with ex-ante and ex-post regulation.

18. Is the **price-setting of balancing energy** is a symmetric calculation from the point of view of the 2 directions, or an asymmetric one?

(are the average prices in absolute values equal or the upward directions values are higher)

Asymmetric.

19. Is there a **gap** between the price of balancing energy paid by the TSO to the generators (traders) and the price paid by balance circles to the TSO for balancing energy?

2,5 mill EUR, which was used for transmission price cap reduction.

20. Which market players do provide ancillary services in your country (e.g: power plants, traders, consumers)?

Power plants.

21. Does your TSO purchase **only domestic reserves** or there are any cross-border providers in your system?

Only domestic, but if needed, there are agreements with the neighboring TSOs.

Macedonia

1. How many **control areas** (CA) are there in your country?

(How many TSOs are operating in your country?)

One TSO.

2. What types of **balancing reserve categories** are applied in your country? (e.g.: **primary, secondary** and **tertiary** reserves)

We have three types of reserves primary, secondary and tertiary.

3. Are there so-called **black start** (BS) and Voltage and Reactive power reserves (**U-Q-control**) in your country?

We have "black start" (definition: Ability of Generator unit to switch on without external voltage). We have power U-Q control.

4. Please give us the **total gross energy consumption and ratio import-export energy** in 2014 [%]

Import 38 %,5, export 1 %.

5. Please give us the **composition of consumption and production** in 2014 (Share of domestic energy (electricity) production)

Consumption 6.960 GWh, Generation 4.982 GWh

6. Please give us the **ratio of renewables within final energy sources consumption** in 2014 [%]

24,18 %

7. Please give us the **yearly gross electricity consumption** (in GWh) of your country in 2014!

Total consumption in 2014 year: 6.960 GWh

8. Please give us the **highest winter and summer peak load values** in the last 10 years in your CA!

Maximum peak load in winter: on 31 December 2011 year - 1.642MW.

Maximum peak load in summer load: on 27 July 2011 - 621MW

9. Please give us the **biggest generation outage** (in MW) in the last 10 years in your country!

No answer.

10. Please give us the **utmost generation block** (in MW) operating in your CA!

TPP Bitola 3x225=675 MW

11. Please give us your **CA's total generation capacity built-in (2014)**!

WPP (Wind Power Plant) Bogdanci: 36MW

12. Please give us the **needed quantities** of the applied reserve categories (in MW, primary, secondary, tertiary, upward and downward directions separately)!

Primary reserve 8MW, Secondary reserve there is calculation about 40MW and tertiary 100MW

13. Are there any international cooperation with your neighboring country in the field of **secondary balancing netting**? ('Grid Control Cooperation', GCC)

No.

14. **For how long period** (time-scale) does your TSO purchase the necessary reserves? (Please separately, according to the applied categories.)

On a yearly level

15. **Are the capacity providers** (generators and traders) **obliged to offer** their balancing reserves to the TSO?

Domestic generation.

16. Are there any **compulsorily free services** (e.g. BS or primary control reserve), or all of them have their cost?

In 2014 year TSO purchased primary, secondary and tertiary reserve from JSC ELEM (Generation Company) and the price is regulated by ERC

17. Is the **total cost of yearly AS a pass-through item** in your price regulation system, or there are supplementary incentive solutions, too?

Cost for AS passed by price for transmission and ERC approved this cost.

18. Is the **price-setting of balancing energy** is a symmetric calculation from the point of view of the 2 directions, or an asymmetric one?

(are the average prices in absolute values equal or the upward directions values are higher)

Balance Responsible Party pays for balancing energy. The price for balancing is formula coefficient of referent price of distortion and the price from HUPX. ERC every three months makes calculation and decision for coefficient of referent price of distortion.

19. Is there a **gap** between the price of balancing energy paid by the TSO to the generators (traders) and the price paid by balance circles to the TSO for balancing energy?

Yes, income of balancing services ERS is not include in price.

20. Which market players do provide ancillary services in your country (e.g: power plants, traders, consumers)?

JSC ELEM (generation company).

21. Does your TSO purchase **only domestic reserves** or there are any cross-border providers in your system?

Only domestic reserves.

Moldova

1. How many **control areas** (CA) are there in your country?

(How many TSOs are operating in your country?)

Provided by the the Act of ANRE on the approval of Electricity Market Rules N 75 of 12.12.2002, the Moldovan electric power system consists of the left and right banks of the river Dniester electricity regions and has interconnections with the electricity systems of other countries with installed measuring and / or telecommunication facilities, within which the system operator ensures the stabile, reliable, safe and efficient functioning of the transmission network, directly controls the load of generating capacity, and supports the agreed schedule for the exchange of electricity and capacity with the regions falling out of the authority of the Dispatching Office.

On the right bank of the river Dniester in the Republic of Moldova, the only company with dispatching function, is a state-owned enterprise "Moldelectrica."

2. What types of **balancing reserve categories** are applied in your country? (e.g.: **primary**, **secondary** and **tertiary** reserves)

There are no balancing reserves in the Republic of Moldova because of the marginal percent of generation ($\approx 20\%$)

3. Are there so-called **black start** (BS) and Voltage and Reactive power reserves (**U-Q-control**) in your country?

Not existing, as the proportion of the generation of electricity is not significant in comparison with the import of electricity ($\approx 80\%$). The import arrives from the left bank of the river Dniester of the Republic of Moldova – Transnistria.

4. Please give us the **total gross energy consumption and ratio import-export energy** in 2014 [%]

Consumption (gross) of the Moldovan energy system in 2014 was 5834 GWh in the following way:

– right bank of the river Dniester – 4290 GWh

– left bank of the river Dniester – 1543 GWh

Import from the unified electricity system of Ukraine was in the amount of 700 GWh.

Export of electricity in 2014 was not applicable.

5. Please give us the **composition of consumption and production** in 2014 (Share of domestic energy (electricity) production)

In 2014 the share of local generation of energy was 18%.

6. Please give us the **ratio of renewables within final energy sources consumption** in 2014 [%]

1,5 %

7. Please give us the **yearly gross electricity consumption** (in GWh) of your country in 2014!

4130 GWh

8. Please give us the **highest winter and summer peak load values** in the last 10 years in your CA!

Highest winter peak load was 1157 MW (in 2007) in the whole Moldovan electricity system; and 946 MW (in 2011) in the right side part of the Dniester.

There are no statistics available about the summer peak loads.

9. Please give us the **biggest generation outage** (in MW) in the last 10 years in your country!

In October 2014 JSC „Moldgres” turned off 4 blocks with a total capacity of 650 MW.

10. Please give us the **utmost generation block** (in MW) operating in your CA!

JSC „Moldgres”; block capacity 240 MW.

11. Please give us your **CA's total generation capacity built-in (2014)**!

There was no built-in generation capacity introduced in 2014.

12. Please give us the **needed quantities** of the applied reserve categories (in MW, primary, secondary, tertiary, upward and downward directions separately)!

Primary: +/-4 MW;

Secondary: +67 MW /Hz;

Tertiary: upward 240 MW, downward 100 MW.

13. Are there any international cooperation with your neighboring country in the field of **secondary balancing netting**? ('Grid Control Cooperation', GCC)

Currently, all the issues related to the Balancing Electricity Markets are under preparation and approval on the legislative level.

Regarding the international cooperation, and in particular the procurement of the parallel work of the Ukrainian and Moldovan electricity systems, the state-owned company „Moldelectrica“ works closely with the Ukrainian TSO – state-owned company „Ukrenergo“

14. **For how long period** (time-scale) does your TSO purchase the necessary reserves? (Please separately, according to the applied categories.)

TSO is not involved in purchasing reserves.

15. **Are the capacity providers** (generators and traders) **obliged to offer** their balancing reserves to the TSO?

Not obliged.

16. Are there any **compulsorily free services** (e.g. BS or primary control reserve), or all of them have their cost?

Costs are related to the transmission of electricity only.

17. Is the **total cost of yearly AS a pass-through item** in your price regulation system, or there are supplementary incentive solutions, too?

It is not a pass-through item.

18. Is the **price-setting of balancing energy** is a symmetric calculation from the point of view of the 2 directions, or an asymmetric one?

(are the average prices in absolute values equal or the upward directions values are higher)

Currently, all the issues related to the Balancing Electricity Markets (including tariff setting mechanisms) are under preparation and approval on the legislative level.

19. Is there a **gap** between the price of balancing energy paid by the TSO to the generators (traders) and the price paid by balance circles to the TSO for balancing energy?

Currently, all the issues related to the Balancing Electricity Markets (including tariff setting mechanisms) are under preparation and approval on the legislative level.

20. Which market players do provide ancillary services in your country (e.g: power plants, traders, consumers)?

Power plants

21. Does your TSO purchase **only domestic reserves** or there are any cross-border providers in your system?

Currently the TSO purchases electricity in order to cover losses, by using domestic reserves.

Poland

1. How many **control areas** (CA) are there in your country?

(How many TSOs are operating in your country?)

One TSO

2. What types of **balancing reserve categories** are applied in your country? (e.g.: **primary**, **secondary** and **tertiary** reserves)

In Poland: primary, secondary and tertiary reserves.

3. Are there so-called **black start** (BS) and Voltage and Reactive power reserves (**U-Q-control**) in your country?

Yes, there are so-called black start (BS) and Voltage and Reactive power reserves (U-Q-control) in Poland.

4. Please give us the **total gross energy consumption and ratio import-export energy** in 2014 [%]

total gross energy consumption in 2014 - 158734 GWh

import energy in 2014 - 13508,9 GWh

export energy in 2014 - 11342,1 GWh

ratio import-export energy in 2014 – 119%

domestic energy production – 156567 GWh

5. Please give us the **composition of consumption and production** in 2014 (Share of domestic energy (electricity) production)

domestic energy production – 156567 GWh

composition of production

hard coal	51%
lignite	35%
industrial power plants	6%
renewables (wind and another RES)	5%
gas	2%
water power plants	1%

6. Please give us the **ratio of renewables within final energy sources consumption** in 2014 [%]

12,4%

7. Please give us the **yearly gross electricity consumption** (in GWh) of your country in 2014!

158734 GWh

8. Please give us the **highest winter and summer peak load values** in the last 10 years in your CA!

the highest winter peak load values 25 845 MW (2012.02.07)

the highest summer peak load values 22 487 MW (2015.09.01)

9. Please give us the **biggest generation outage** (in MW) in the last 10 years in your country!

1 126 MW (gross power)

(Explanation: Due to the single failure on the TSO's grid there was no load in the Polish Energy System from one power plant in the given moment.)

10. Please give us the **utmost generation block** (in MW) operating in your CA!

858 MW (block No. 14 - Belchatow Power Plant)

11. Please give us your **CA's total generation capacity built-in (2014)**!

38 121 MW (installed capacity)

12. Please give us the **needed quantities** of the applied reserve categories (in MW, primary, secondary, tertiary, upward and downward directions separately)!

In Poland: primary: upward/downward \pm 170 MW ; secondary: upward/downward \pm 500 MW; tertiary: upward 9% of hourly system demand minus reserves available as primary and secondary (in day-ahead planning processes), downward: not applicable

13. Are there any international cooperation with your neighboring country in the field of **secondary balancing netting**? ('Grid Control Cooperation', GCC)

Currently there are no international cooperation with Polish neighboring country in this field.

14. **For how long period** (time-scale) does your TSO purchase the necessary reserves? (Please separately, according to the applied categories.)

In Poland: the day before delivery (after day-ahead gate closure time and after completion of the Integrated Scheduling Process in Central Dispatched System)

15. **Are the capacity providers** (generators and traders) **obliged to offer** their balancing reserves to the TSO?

The capacity providers i.e. generators with centrally dispatched generation units (CDGU) are obliged to offer their balancing reserves to the TSO.

16. Are there any **compulsorily free services** (e.g. BS or primary control reserve), or all of them have their cost?

All of them have their cost.

17. Is the **total cost of yearly AS a pass-through item** in your price regulation system, or there are supplementary incentive solutions, too?

The total cost of yearly AS is a pass-through item in Polish tariff regulation system.

18. Is the **price-setting of balancing energy** is a symmetric calculation from the point of view of the 2 directions, or an asymmetric one?

(are the average prices in absolute values equal or the upward directions values are higher)

In Poland the system is symmetric - the prices are equal in both directions.

19. Is there a **gap** between the price of balancing energy paid by the TSO to the generators (traders) and the price paid by balance circles to the TSO for balancing energy?

There no gap between these prices for balancing energy, but the prices paid for the solving the system constraints can be different.

20. Which market players do provide ancillary services in your country (e.g: power plants, traders, consumers)?

In Poland: power plants with centrally dispatched generation units (CDGU) and traders/consumers with DSR equipment (intervention reduction of power)

21. Does your TSO purchase **only domestic reserves** or there are any cross-border providers in your system?

Polish TSO purchase only domestic reserves.

Serbia

1. How many **control areas** (CA) are there in your country?

(How many TSOs are operating in your country?)

One control area and one TSO.

2. What types of **balancing reserve categories** are applied in your country? (e.g.: **primary**, **secondary** and **tertiary** reserves)

Primary, secondary and tertiary reserves are applied in Serbia

3. Are there so-called **black start** (BS) and Voltage and Reactive power reserves (**U-Q-control**) in your country?

Yes.

4. Please give us the **total gross energy consumption and ratio import-export energy** in 2014 [%]

28.065 GWh, import: 3.180 GWh and export: 1.021 GWh

5. Please give us the **composition of consumption and production** in 2014 (Share of domestic energy (electricity) production)

Domestic electricity production: 32.151 GWh

6. Please give us the **ratio of renewables within final energy sources consumption** in 2014 [%]

Production from renewables: 203.617 MWh

7. Please give us the **yearly gross electricity consumption** (in GWh) of your country in 2014!

33.228 GWh

8. Please give us the **highest winter and summer peak load values** in the last 10 years in your CA!

winter peak load 7656 MW (31.Dec.2010. in 18.00)

summer peak load 5846 MW (29.Sep.2008. in 21.00)

9. Please give us the **biggest generation outage** (in MW) in the last 10 years in your country!

It was generation outage at the same time of 2 generators of TENT-B and 2 generators of TENT-A in 2007. (in total 1.720 MW-2x580MW+2x280MW)

10. Please give us the **utmost generation block** (in MW) operating in your CA!

Mini hydroelectric power plants 2,36MW (HEA: this data is maybe refers the smallest generation block)

11. Please give us your **CA's total generation capacity built-in (2014)**!

0

12. Please give us the **needed quantities** of the applied reserve categories (in MW, primary, secondary, tertiary, upward and downward directions separately)!

in Serbia: primary +-45 MW; secondary: upward 80 MW, downward 80 MW; tertiary: upward 450 MW, downward 150 MW)

13. Are there any international cooperation with your neighboring country in the field of **secondary balancing netting**? ('Grid Control Cooperation', GCC)

No, there is no international cooperation for secondary balancing netting

14. **For how long period** (time-scale) does your TSO purchase the necessary reserves? (Please separately, according to the applied categories.)

Yearly contract.

15. **Are the capacity providers** (generators and traders) **obliged to offer** their balancing reserves to the TSO?

Yes.

16. Are there any **compulsorily free services** (e.g. BS or primary control reserve), or all of them have their cost?

Primary control reserve is free service.

17. Is the **total cost of yearly AS a pass-through item** in your price regulation system, or there are supplementary incentive solutions, too?

There are no supplementary incentive solutions.

18. Is the **price-setting of balancing energy** is a symmetric calculation from the point of view of the 2 directions, or an asymmetric one?

(are the average prices in absolute values equal or the upward directions values are higher)

The average prices in absolute values are equal.

19. Is there a **gap** between the price of balancing energy paid by the TSO to the generators (traders) and the price paid by balance circles to the TSO for balancing energy?

Yes, the difference is not regarded as profit, but this difference is taken away from TSO through correction factor in the next year regulation period

20. Which market players do provide ancillary services in your country (e.g: power plants, traders, consumers)?

Power plants.

21. Does your TSO purchase **only domestic reserves** or there are any cross-border providers in your system?

There is Tertiary Control reserve contract with Montenegro;

There are contracts for Emergency Exchange with almost all neighbouring TSO (as tertiary reserve).

Ukraine

1. How many **control areas** (CA) are there in your country?

(How many TSOs are operating in your country?)

One TSO.

2. What types of **balancing reserve categories** are applied in your country? (e.g.: **primary, secondary** and **tertiary** reserves)

Secondary and tertiary reserves.

3. Are there so-called **black start** (BS) and Voltage and Reactive power reserves (**U-Q-control**) in your country?

Yes, there are.

4. Please give us the **total gross energy consumption and ratio import-export energy** in 2014 [%]

Gross energy consumption	import	export
167,481 million kW * Year	0	4,7%

5. Please give us the **composition of consumption and production** in 2014 (Share of domestic energy (electricity) production)

Consumption [kWh]

Metallurgy											
	33 933										
	20%										
TPP	TPP	NPP	HPP	PSH	TPP (public)	PP and small HPP	WPP	SPP	Biomass	Total	
	68 470	6 539	88 389	8 249	843	4 773	3 017	1 129	432	104	181 945
	38%	4%	49%	5%	0%	3%	2%	1%	0%	0%	100%

6. Please give us the **ratio of renewables within final energy sources consumption** in 2014 [%]

0,9 %

7. Please give us the **yearly gross electricity consumption** (in GWh) of your country in 2014!

167480,8 GWh

8. Please give us the **highest winter and summer peak load values** in the last 10 years in your CA!

winter summer

30727 MW 20303 MW

9. Please give us the **biggest generation outage** (in MW) in the last 10 years in your country!

1000 MW

10. Please give us the **utmost generation block** (in MW) operating in your CA!

1000 MW

11. Please give us your **CA's total generation capacity built-in (2014)**!

641,4 MW (partially due to the reconstruction)

12. Please give us the **needed quantities** of the applied reserve categories (in MW, primary, secondary, tertiary, upward and downward directions separately)!

Primary +/- 162 MW

Secondary: 1000 MW -500 MW

Tertiary: 1000 MW -500 MW

13. Are there any international cooperation with your neighboring country in the field of **secondary balancing netting**? ('Grid Control Cooperation', GCC)

The market model does not involve it.

14. **For how long period** (time-scale) does your TSO purchase the necessary reserves? (Please separately, according to the applied categories.)

The market model does not involve the purchase of reserves.

15. **Are the capacity providers** (generators and traders) **obliged to offer** their balancing reserves to the TSO?

The market model does not involve it.

16. Are there any **compulsorily free services** (e.g. BS or primary control reserve), or all of them have their cost?

The black start service exists, also there are primary control reserves, but not as a service.

17. Is the **total cost of yearly AS a pass-through item** in your price regulation system, or there are supplementary incentive solutions, too?

The market model does not involve AS.

18. Is the **price-setting of balancing energy** is a symmetric calculation from the point of view of the 2 directions, or an asymmetric one?

(are the average prices in absolute values equal or the upward directions values are higher)

No answer.

19. Is there a **gap** between the price of balancing energy paid by the TSO to the generators (traders) and the price paid by balance circles to the TSO for balancing energy?

No answer.

20. Which market players do provide ancillary services in your country (e.g: power plants, traders, consumers)?

The market model does not involve AS.

21. Does your TSO purchase **only domestic reserves** or there are any cross-border providers in your system?

The market model does not involve it.

Turkey

1. How many **control areas** (CA) are there in your country?

(How many TSOs are operating in your country?)

One (1 TSO - TEAİŞ - Turkish Electricity Transmission Company).

2. What types of **balancing reserve categories** are applied in your country? (e.g.: **primary**, **secondary** and **tertiary** reserves)

Primary and secondary frequency control reserves are applied. As well as balancing reserves (on-line reserves) are available through balancing power market.

3. Are there so-called **black start** (BS) and Voltage and Reactive power reserves (**U-Q-control**) in your country?

In our ancillary services regulation TSO (TEİAŞ) is required to sign black start agreements with generators having that capacity. Every power plant with installed capacity above 30 MW is required to supply reactive power regulation free of charge on a certain limited power factor range.

4. Please give us the **total gross energy consumption and ratio import-export energy** in 2014 [%]

Total gross energy consumption is 257,2 TWh in 2014. (Import: 7,953 TWh Export: 2,696 TWh, Ratio of import-export out of gross consumption 2%)

5. Please give us the **composition of consumption and production** in 2014 (Share of domestic energy (electricity) production)

Composition of consumption: Household: 22,3% Commercial and Public Services: 26,2% Industry: 47,2% Agricultural Irrigation: 1,9% Lightening: 1,9% The Others: 0,6%; composition of production: Natural Gas: 47,85%, Coal: 29,89%, Hydraulic: 20,45%, Others: 1,81%

6. Please give us the **ratio of renewables within final energy sources consumption** in 2014 [%]

20,45%

7. Please give us the **yearly gross electricity consumption** (in GWh) of your country in 2014!

Total gross energy consumption is 257,2 TWh in 2014.

8. Please give us the **highest winter and summer peak load values** in the last 10 years in your CA!

In summer: 43,289 MW; in winter: 40,562 MW

9. Please give us the **biggest generation outage** (in MW) in the last 10 years in your country!

31 March 2015

10. Please give us the **utmost generation block** (in MW) operating in your CA!

1000 MW

11. Please give us your **CA's total generation capacity built-in (2014)**!

69519,8 MW

12. Please give us the **needed quantities** of the applied reserve categories (in MW, primary, secondary, tertiary, upward and downward directions separately)!

Primary frequency reserves +- 350 MW. Secondary frequency reserves +- 1000 MW

13. Are there any international cooperation with your neighboring country in the field of **secondary balancing netting**? ('Grid Control Cooperation', GCC)

No.

14. **For how long period** (time-scale) does your TSO purchase the necessary reserves? (Please separately, according to the applied categories.)

Hourly.

15. **Are the capacity providers** (generators and traders) **obliged to offer** their balancing reserves to the TSO?

For primary frequency control reserves, generators with installed capacity above 50 MW have an obligation to provide a reserve equal to 1% of their installed capacity through their own facilities or through another certified generators by transferring their obligation to that generator. For secondary frequency control reserves, every generator with installed capacity above 100 MW has an obligation to offer their unused capacity as a potential to TSO. TSO selects among available capacity based on their opportunity cost.

16. Are there any **compulsorily free services** (e.g. BS or primary control reserve), or all of them have their cost?

Generators above 30 MW have an obligation to provide free reactive power support within a limited power factor operating range.

17. Is the **total cost of yearly AS a pass-through item** in your price regulation system, or there are supplementary incentive solutions, too?

The total cost of ancillary services is pass-through to the transmission tariff.

18. Is the **price-setting of balancing energy** is a symmetric calculation from the point of view of the 2 directions, or an asymmetric one?

(are the average prices in absolute values equal or the upward directions values are higher)

The price of balancing energy is different for positive and negative imbalances.

19. Is there a **gap** between the price of balancing energy paid by the TSO to the generators (traders) and the price paid by balance circles to the TSO for balancing energy?

There is no gap (difference) for the price of balancing energy paid by TSO or received by TSO.

20. Which market players do provide ancillary services in your country (e.g: power plants, traders, consumers)?

Generators provide ancillary services.

21. Does your TSO purchase **only domestic reserves** or there are any cross-border providers in your system?

There is only domestic reserves purchased by TSO.