Main Investment Clusters
in the South East Europe electricity grid

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ENTSO-E profile

**ENTSO-E**
- Established 19 December 2008
- Operational 1 July 2009
- Today 41 TSOs from 34 countries are members

### WORKING STRUCTURE
- Regional Groups
- Committees
  - System development
  - System operation
  - Markets

### MISSION
- Co-operation of the TSOs for reliable operation, optimal management and sound technical evolution of the EU electricity transmission system
- Help insure security of electricity supply
- Meet the needs of liberalized EU Internal Energy Market and facilitate market integration

➢ Regulation (EC) 714/2009, Article 8.3: “The ENTSO for electricity shall adopt: (b) a non-binding Community-wide ten-year network development plan, ... including a European generation adequacy outlook, every two years

Source: ENTSO-e
FIRST REPORT for TYNDP

- serves as basis for seeking consistency between national and regional plans
- allows ENTSO-E to identify main improvement areas and best means for planning
- the main concern is lack of social acceptance that severely delays or jeopardises the realisation of transmission projects

- Three PILLARS of EU Energy Policy

  - (SoS) Security of Supply
  - (RES) tackling climate change and integration of Renewable Energy Sources
  - (IEM) economic efficiency and realization of the Internal Energy Market

Source: ENTSO-e
FIRST REPORT for TYNDP

- EU policy priorities are important but not sole drivers for grid investment “of pan-European significance” – ENTSO-E identified SEVEN main investment clusters

- **ENTSO-E main investment clusters**

  - **Massive RES integration in the North part of Europe** – the connection of RES, mainly wind located in remote areas with low load requirements, investments are required in
    - Connection to the network,
    - Increased onshore transmission capacity
    - Efficient balancing of the system – utilizing available and future hydroelectric facilities

  - **Massive RES integration in the South part of Europe** – the connection and transmission of RES, mainly wind, hydro and solar mainly in the Iberian Peninsula (SWE and CSE), requires
    - Internal reinforcement
    - increased interconnection capacity with the rest of Europe (France)
FIRST REPORT for TYNDP

- EU policy priorities are important but not sole drivers for grid investment “of pan-European significance” – ENTSO-E identified SEVEN main investment clusters

- **ENTSO-E main investment clusters**
  
  - **Massive N-S and E-W flows** in the **South-East and Central South** regions (SEE and CSE) – dictated by the power balances and market prices of the countries including GR, MK, AL and IT as dominant importers of electricity. Includes
    - Strengthening of the regional network (assist market integration),
    - New generation (BG, HU, HR) for the N-S direction
    - Interconnection of new systems (TY, MD, UA) for the E-W direction
    - New pump-storage capacities (AT, CH)
    - Strong correlation with wind-power generation (DE, in the future FR, IT)
  
  - **Integration** of the **Baltic States** – According to the EC Energy Market Interconnection Plan (2008), aiming at full integration into the EU energy market of the three Baltic States (LT, LV, EE)
    - Strengthening of (new) interconnections with the neighbouring EU Countries (FI, SE, PL)
FIRST REPORT for TYNDP

- EU policy priorities are important but not sole drivers for grid investment “of pan-European significance” – ENTSO-E identified SEVEN main investment clusters

- **ENTSO-E main investment clusters**

  - **New Conventional Power Plants** connection, complementary to RES, all over Europe (totalling estimated 100 GW in the next decade) aiming
    - To replace old decommissioned plants, or
    - To cope with load growth and system balancing

  - **Power supply** to some EU cities and regions requiring reinforcement (in ES, FR, HU, SK, PL, CZ, etc) as this could
    - Interact with other investment needs in the area, or
    - Limit the available cross-border capacity

  - **Market integration** with new clustering of generation units, variation of sources and generated power and new centres of consumption all over Europe to ensure that wherever power is available it can be efficiently brought to consumption, requires
    - Development and adaptation of grid access rules
    - Propose most appropriate market framework

Source: ENTSO-e
FIRST REPORT for TYNDP

- TSOs evaluated the RESILIENCE of their investment projects in order to avoid stranded costs and to meet grid user’s expectations over time with appropriate solutions, according to **FOUR main criteria for resilience**:

### Main criteria for PROJECT RESILIENCE

- **New grid components** must at least maintain and possibly improve the **high standards** to which European end-users are accustomed, applying new types of generation units and transmission equipment (with specific behaviour and possible design constraints).

- **Investments** must positively address the **social welfare**, to this aim:
  - Cost-benefit analysis are undertaken by TSOs
  - Consistent and mature market frameworks are implemented
  - Harmonization concerns addressing accommodation of structural differences between countries

- **Overall consistency** of the interconnected system is considered through **new technological advances** to optimize grid development (Phase Shift Transformers, HVDC connections etc).

- **Grid planning** anticipates **long-run perspectives** – the future European power grid will probably be connected to neighbouring systems at its Southern and Eastern borders, with closed offshore networks, large amounts of climate-dependent RES etc.

Source: ENTSO-e
Main criteria for PROJECT RESILIENCE
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- Overall consistency of the interconnected system is considered through new technological advances to optimize grid development (FACTS, PST, HTLS conductors, HVDC connections etc).
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FIRST REPORT for TYNDP
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FIRST REPORT for TYNDP

TSOs evaluated the RESILIENCE of their investment projects in order to avoid stranded costs and to meet grid user's expectations over time with appropriate solutions, according to FOUR main criteria:

PROJECTS OF EUROPEAN SIGNIFICANCE (2015-2020)
ENTSO-E Planning instruments

TYNDP – Outlook 2010

Grid investment needs **up to 2015**
Greece, South Italy

Grid investment needs **after 2015**
other Balkan countries, Bulgaria, Romania

Source: ENTSO-e
ENTSO-E Planning instruments

TYNDP – 2012

REGIONAL GROUPS for TYNDP

- ENTSO-E is divided in 6 Regional Groups for grid planning and system development (NS, BS, CSW, CCE, CCS, CSE)
- The Continental SE group consists of 11 TSOs (GR, IT, BG, MK, ME, BA, HR, RS, RO, SI, HU), one corresponding member (CY), and one member in data provision and modelling (AL)

TYNDP package

- **(TYNDP)** the Ten Year Network Development Plan is focused on projects of pan-European significance detailed in each RIP
- **(RIP)** the Regional Investment Plans document the overlap between National Development Plans (TSO) and the TYNDP – focused on project planning at a regional level.
- **(SO&AF)** Scenario Outlook and Adequacy Forecast analyses future system adequacy at mid- and long-term

The objectives of the TYNDP are to ensure transparency regarding the electricity transmission network and to support decision-making process at regional and European level.

Source: ENTSO-e
TYNDP METHODOLOGY

- based on the assumption that integration of internal markets and proper enhancement of networks should lead to “least cost” generation.
- the uncertainties in evolution of future generation (location, type, capacity) are treated through scenarios
- TWO types of scenarios are applied: top-down and bottom-up scenario, as well as a “Nuclear Phase-Out” (NPO) sensitivity analysis
- finally proposed transmission projects are evaluated through calculation of energy efficiency indicator (losses), the social welfare indicator and the CO2 emission indicator

TYNDP Scenarios

- **EU 2020** – a context in which all objectives of the European policy 20-20-20 are met – (20% of RES in the final energy consumption, 20% reduction of GHG, and 20% increase in energy efficiency – i.e. reduction of overall consumption, all by 2020) – this is a top-down scenario

- “**Best Estimate**” (Scenario B) – represents the best estimate conditions of the TSOs, regardless of whether or not European objectives are globally met
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TYNDP – 2012 CSE

Legend
- RES generation
- Pumping
- Demand growth
- New conventional generation
- Generation decomissioning
- Isolated systems
- TYNDP 2012 boundaries

Source: ENTSO-e
Areas where need for grid development is triggered in order to cope with expected bulk flows – MAP OF MAIN CONCERNS

Legend
- Market integration - between price zones
- Market integration - within price zones
- Generation integration
- Security of Supply

Source: ENTSO-e
ENTSO-E Planning instruments

TYNDP – 2012 CSE

MID-TERM AND LONG-TERM INVESTMENTS IN CSE

Up to 2016

Beyond 2017

Source: ENTSO-e
ENTSO-E Planning instruments

TYNDP – 2012

ASSESSMENT OF PROJECTS IN CSE

- Clustering of investments
  - Projects contributing to the same concern (contributing to the increase of transfer capacity in the same boundary between control areas and/or to safe integration of considerable amount of RES in a specific location), While in the same time addressing the criteria for a project of European significance.

- Advantages of clustering
  - More didactic, clear for stakeholders
  - Needed in order to identify the European significance of a transmission investment planned by TSOs of the Region
  - Achieve a better coordination of investments materialization among TSOs
  - Mutual insight focus by involved TSOs

- Each project is evaluated against 9 criteria

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<th>Grid transfer capability increase</th>
<th>Social and economic welfare</th>
<th>RES integration</th>
<th>Improved security of supply</th>
<th>Losses variation</th>
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<th>Technical resilience</th>
<th>Flexibility</th>
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Main PROJECT CLUSTERS

- **Project 28** is associated with submarine HVDC interconnection IT-ME - to serve for RES integration, SoS in the region and a new path from production centres in BA MN and RS, later in HR, to IT.

- **Project 51** is related to Corridor 8, connecting the BG coast on the Black Sea with the AL coast on the Ionian Sea – increase of power transfer capacity between TY and BG, GR, MK, AL.

- **Project 95** comprises construction of 2 x 400 kV SS and 3 lines in BG to accommodate RES penetration.

- **Project 52** comprises extension of 400 kV network in Peloponnese (GR) aimed to increase SoS and considerable amount of RES to be integrated.

- **Project 27** is aimed to increase transfer capacity SI – IT, SI – HU, SI – HR and HR – BA, improving SoS and diversifying SoS increasing resilience and flexibility of the network.

- **Project 49** is related to Corridor 10 and aims to increase transfer capacity and SoS in MK, AL and GR from the direction of RO, BG and RS.
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TYNDP – 2012

CLUSTERING OF INVESTMENTS IN CSE

- **Main PROJECT CLUSTERS**

  - **Project 50** aims to increase power transfer from RO and BG as main exporters in the area towards RS and HU, also enforcement for the N-S corridor from UA and RES integration in RS, RO

  - **Project 53** comprises investment in RO to accommodate integration of RES and conventional generation but also as transfer capacity from UA

  - **Project 108** is also purely RO cluster, to allow integration of new pump-storage HPP of 1000 MW aimed to assist the safe operation of RO system and integration of RES in the area
NEW INVESTMENT PROJECTS

- **9 Project clusters** are identified in CSE
- **68 investments** of pan-European significance are proposed
- **5700 km** of new lines are foreseen
- Close to **€10.8 billion** of investments are required

Investment costs

Source: ENTSO-e
ESTIMATED GTC INCREASE

Source: ENTSO-e

ENERGY INFRASTRUCTURE DEVELOPMENT PLAN FOR SEE - Regional Experts meeting – Sofia, 28 March 2012

ENTSO-E Planning instruments

TYNDP – 2012

Source: ENTSO-e
ENTSO-E Planning instruments

TYNDP – 2012

PROJECT INDICATORS

Socio-economic welfare

Security of Supply

CO2 mitigation

RES integration

Source: ENTSO-e
The interest in the Energy Community is shifting to the EAST (following the EU – Eastern Partnership initiative)

The Contracting Parties are located on some of the main energy corridors between EU and Asia
**ECS – Main Investment Clusters in the SEE electricity grid**

**ENERGY COMMUNITY Planning instruments**

**Energy Community – structure**

- **9 Contracting Parties**
  - Albania
  - Bosnia and Herzegovina
  - Croatia
  - The former Yugoslav Republic of Macedonia
  - Moldova
  - Montenegro
  - Serbia
  - Ukraine
  - UNMIK (Kosovo pursuant to UNSCR 1244)

- **4 Observers**
  - Armenia
  - Georgia
  - Norway
  - Turkey

- **15 Participants**
  - Austria
  - Bulgaria
  - Cyprus
  - Czech Republic
  - France
  - Germany
  - Helene Republic
  - Hungary
  - Italy
  - The Netherlands
  - Poland
  - Romania
  - Slovakia
  - Slovenia
  - United Kingdom

- Moldova (2010) and Ukraine (2011) acceded to the Treaty which tripled the energy market (from 26 to 73 million inhabitants)

- In October 2011 Armenia acquired the status of observer and Poland became a participant

**Participation in the energy community (February 2012)**
Three main OBJECTIVES

- sustainability
- security of supply
- competitiveness

The same objectives in a more DEMANDING ENVIRONMENT

- no common legal platform
- no regional legal enforcement
- deteriorated energy infrastructure
- limited own investment potentials
- fragmented political environment
- economic and social disadvantages
- perception of political instability

A common ADVANTAGE:

- policy for accession to the EU
Processes which influence the investment policy in the region

- Regional **Energy Strategy TF**
- Wholesale Market Opening initiative (**WMO**)
- Establishment of a Coordinated Auction Office (**CAO**)
- Gas-to-Power initiative (**Gas Ring concept**)

**ENERGY COMMUNITY Planning instruments**

**Energy Community – investment factors**
Considerations towards market integration

- **Small and fragmented markets** (multiple borders, multiple rules, fragmented demand)
- **Concentrated and bundled generation** (lack of transparency and cost-reflectivity)
- **Exclusive approach to energy supply** (exclusive rights or priorities of access, reserved capacities)
- **Fragmented legislation** (adverse and incompatible for market integration)
- **Need for Diversification of trading platforms** (OTC, time-ahead, real-time, balancing, capacity trading)
- **Compatible regulation** (dispute settlement, reciprocity, mutual recognition of rules)
- **Safety and mutual assistance** (in case of disruption and sudden crisis)
- **Large infrastructure investment** (electricity transportation, power generation, RES)
Development of organized regional market

- MEASURES UNDER THE TREATY REQUIRED FOR DEVELOPMENT OF A REGIONAL MARKET
  Based on the legal commitments under the Treaty

- AGREEMENT ON A REGIONAL MARKET STRUCTURE and ACTION PLAN
- AGREEMENT ON THE ESTABLISHMENT OF A REGIONAL MARKET OPERATOR
- ESTABLISHMENT OF IMPLEMENTATION PROJECT
  Based on the draft proposals from the WB – Wholesale Market Opening Study of 2010, related conclusions of ECRB and PHLG and corresponding support from national Transmission operators and regulatory authorities

- DEVELOPMENT OF MARKET FRAMEWORK, MARKET RULES AND DETAILED DESIGN
- IMPLEMENTATION OF THE PROJECT ACTIVITIES INCLUDING FUNDING
- DRY RUN OF THE REGIONAL MARKET (PHASE-OUT)
  Based on the provisions and timeframe of the established Implementation Project

- FOLLOW-UP AND OPERATION OF THE ELECTRICITY MARKET
Development of a platform for REGIONALLY COORDINATED cross-border transmission capacity allocation and congestion management

- **CURRENT STATUS of capacity allocation rules**
  (bilateral coordination, market principles, transparent pricing, pay-as-bid)

- Coordinated Auction Office (SEE CAO) initiative
  (Treaty obligations, R 1228/2003, CSE CAO – Frysing, DRY RUN project)

- Political commitments
  (MoU, seat in Montenegro, extended timelines, controversial approach)

- **CURRENT STATUS of the CAO project**
  (Participation, Project Company, financing, legal documentation)

- Alternative models
  (Flow-based model, Implicit auctions, Market coupling, ENTSO-e, coexistence)

- Possible problems
  (Accuracy of NTC calculation, reserved capacity, monitoring, regulation)
ENERGY COMMUNITY Planning instruments

Energy Community – Gas Ring Concept

- Russian or Caspian gas via Hungary

- Caspian gas via Romania (Nabucco)

- Caspian gas via Romania (White Stream & PEGP & AGRI)

- Russian gas via Bulgaria (Blue Stream or South Stream/’Nord’) or LNG Revithoussa

- Caspian or Russian gas via Greece (TGI or TAP or South Stream/’Sud’) or LNG Revithoussa

- Mix of gas via Croatia

- Offshore?

- LNG?
ENERGY COMMUNITY Planning instruments

Energy Community – Gas Ring Concept

Presented by the EC at the 1st Joint ECRB – PHLG meeting on 30th June 2010 in Vienna
THANK YOU FOR THE ATTENTION