



Grid Planning beyond sub-regional and national borders

ENTSO-E's Ten-Year Network Development Plan

Dr. Mihai PAUN – Network Development ENTSO-E

RGI Technical Workshop

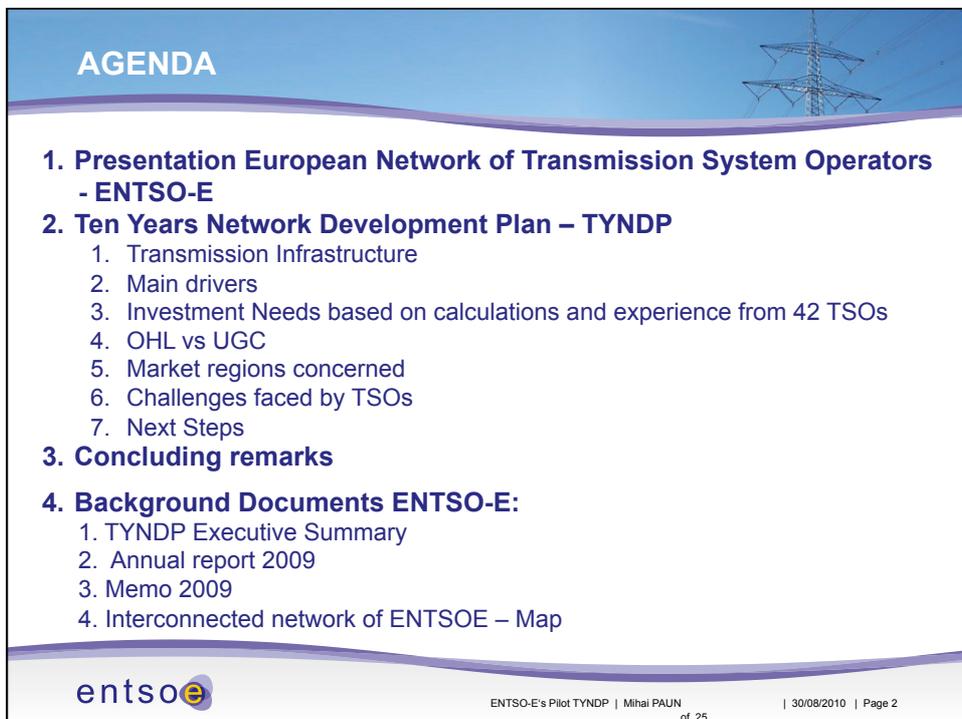
8 September 2010, Arnhem, NL

The Role of the Ten-Year Network Development Plan in
Infrastructure Policy

Mihai PAUN | 8/09/2010



Reliable Sustainable Connected



AGENDA

- 1. Presentation European Network of Transmission System Operators - ENTSO-E**
- 2. Ten Years Network Development Plan – TYNDP**
 1. Transmission Infrastructure
 2. Main drivers
 3. Investment Needs based on calculations and experience from 42 TSOs
 4. OHL vs UGC
 5. Market regions concerned
 6. Challenges faced by TSOs
 7. Next Steps
- 3. Concluding remarks**
- 4. Background Documents ENTSO-E:**
 1. TYNDP Executive Summary
 2. Annual report 2009
 3. Memo 2009
 4. Interconnected network of ENTSSOE – Map



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ENTSO-E: a trans-European network



- Fully operational since **July 2009**
- Represents **42** TSOs from **34** countries
 - **525** million citizens served
 - **828** GW generation
 - **305,000** Km of transition lines managed by the TSOs
 - **3,400** TWh/year demand
 - **400** TWh/year exchanges
- Replaces former TSO organisations: ATSOI, BALTSO, RTSO, NORDEL, UCTE, UKTSOA

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Context for the TYNDP

Energy policy goals

- **Sustainability/GHG:**
 - More renewables, further from the loads
 - More heating and mobility with electricity
- **Competitiveness/market integration:**
 - More long-distance flows
- **Security of supply**
 - More optimal resources sharing

all
require
Grid
capacity !

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ENTSO-E published its Final Pilot Ten-Year Network Development Plan

- Six weeks of public consultation - 1 March - 11 April
- Stakeholder Workshop on 19 March
- The publication of the TYNDP marks the end of a significant effort by ENTSO-E, with support from the European Commission, ERGEG, and many key stakeholders, to fulfill one major task according to European legislation, but also the beginning of even more intense work leading to the second release of the plan in two years.
- ENTSO-E elaboration of the TYNDP - open and transparent; *over 100 stakeholder representatives* attended ENTSO-E's workshop and *21 written responses* were received by ENTSO-E



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Transmission Infrastructure in the centre

EU Strategic Goals

- Sustainability
- Competitiveness
- Security of Supply

“ENTSO-E shall adopt a non-binding Community-wide ten-year network development plan”

- Transparency
- Decision making process
- Networks/scenarios/Generation outlook/resilience



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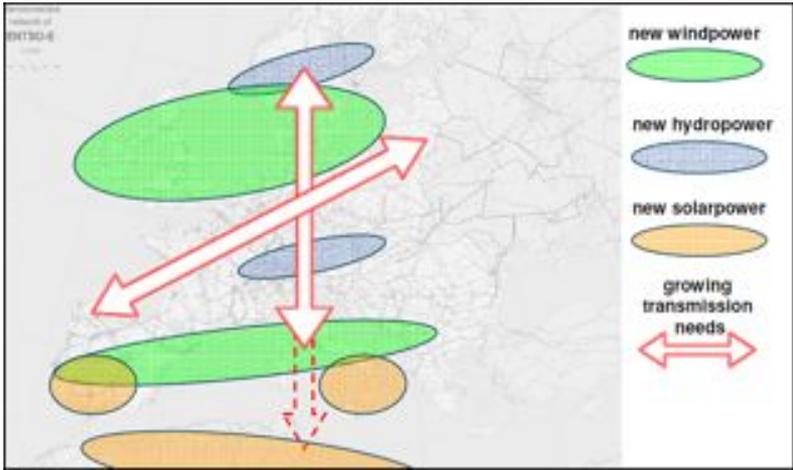
Main drivers

- **Massive integration of renewable energy sources**
 - in Northern Europe
 - in Southern Europe→ Connection, Power transmission, Balancing
- **Important East-West and North-South energy flows in South-East and Central-South regions**
- **Baltic States integration**
- **Connection of new conventional power plants**
- **Power supply of some large European cities and regions**

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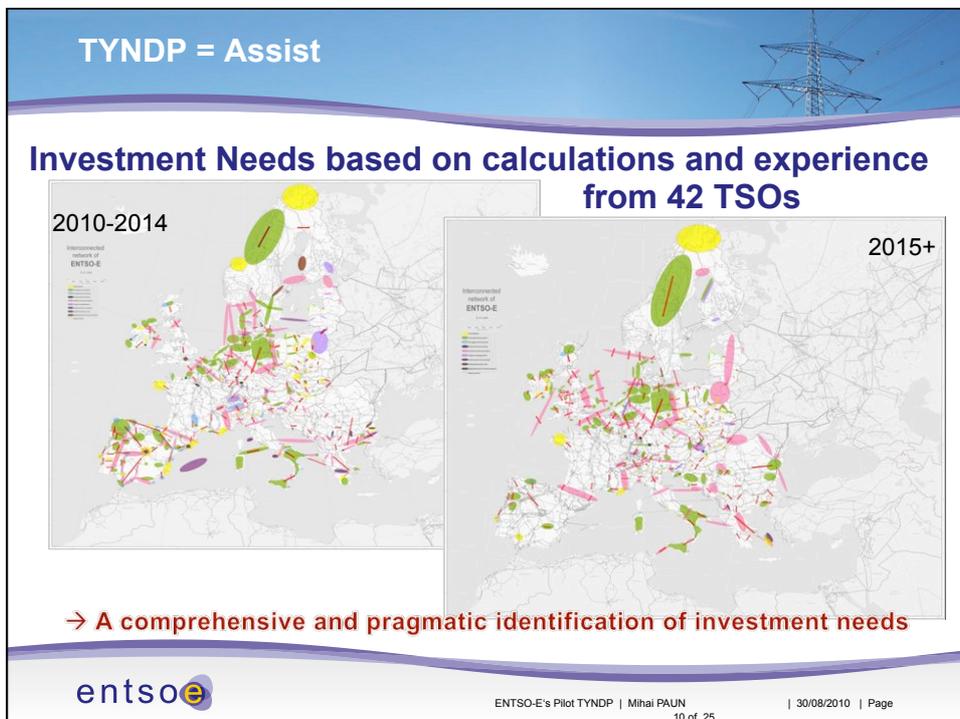
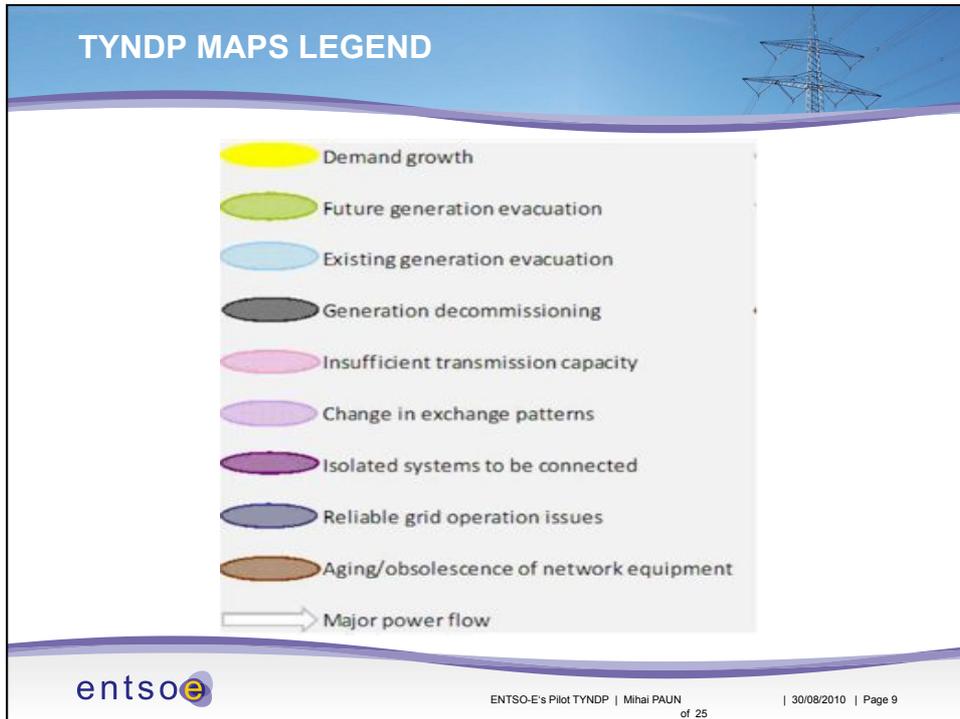
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Main Drivers



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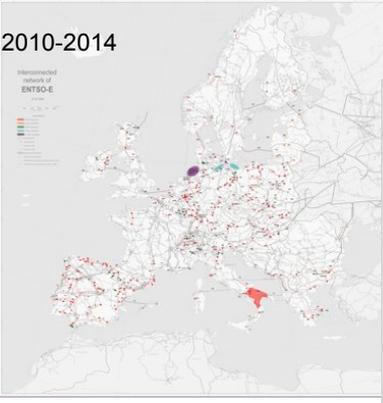
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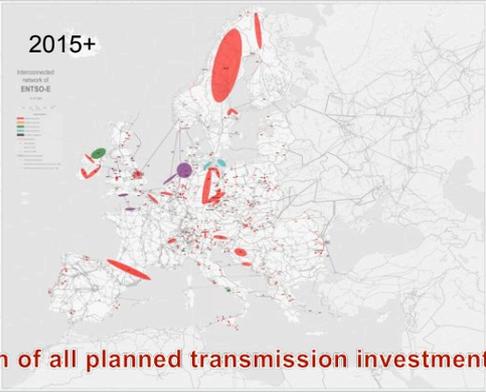
TYNDP = Coordinate

All known and contemplated Projects of European Significance

2010-2014



2015+



→ The most up-to-date collection of all planned transmission investments

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TYNDP = Coordinate

Projects of European Significance

Project Technology	Total Length (km)	Length of the new connections (km)	Length of the upgraded Connections (km)
AC	32,500	25,700	6,900
of which > 300 kV	29,600	23,000	6,400
DC (mainly subsea)	9,600	9,600	0
Total	42,100	35,300	6,900
of which in mid-term	18,700		

~ 25% of the total – DC links (mainly sub-sea or underground cables)

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OHL vs UGC

- OHL are more vulnerable than UGC to adverse weather conditions;
- UGC have proved, over the years, to be a useful and reliable supplement to the OHL;
- High voltage UGC - major design improvements but the cost ratio between the two solutions increases with the voltage level and may reach figures between 10 and 25 for very high voltages, namely 400 kV, which is the most suitable level for interconnections.

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OHL vs UGC

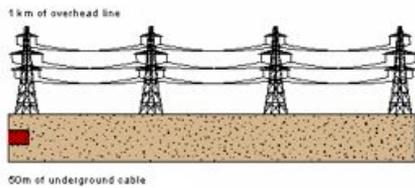
- Undergrounding of transmission lines is increasingly seen by some organisations as a potential means of overcoming environmental/planning constraints on the construction of new electricity transmission lines, especially interconnector capacity.

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OHL vs UGC

- However, this solution is currently very costly, technically much more demanding, and brings its own environmental drawbacks, so that the undergrounding option is likely to be applicable only where a careful economic feasibility study has been made.
- This solution could only be applicable as a means to surmount specific hold-ups in the construction of vital links.



5 km of overhead line

50 km of underground cable

VHV


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TYNDP = Evaluate (1)

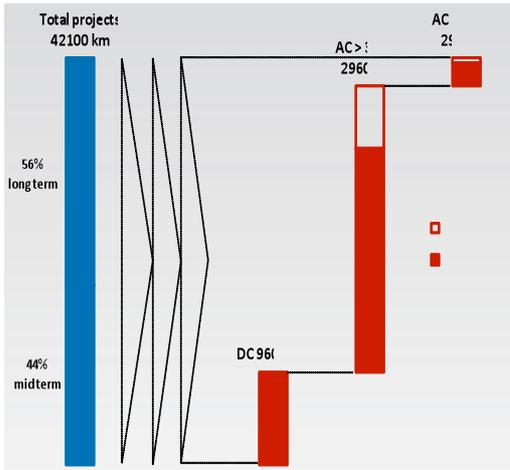
The TYNDP projects represent ~14% of existing lines



Driven by SoS
26000 km

Driven by RES
20000 km

Driven by IEM
28500 km



Total project: 42100 km

56% long term

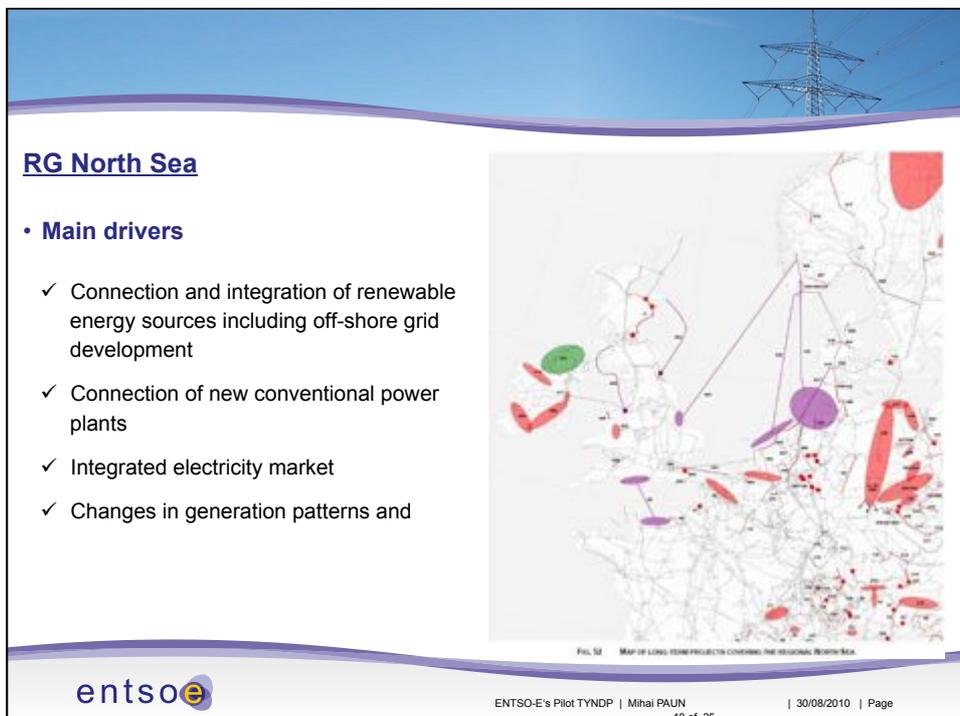
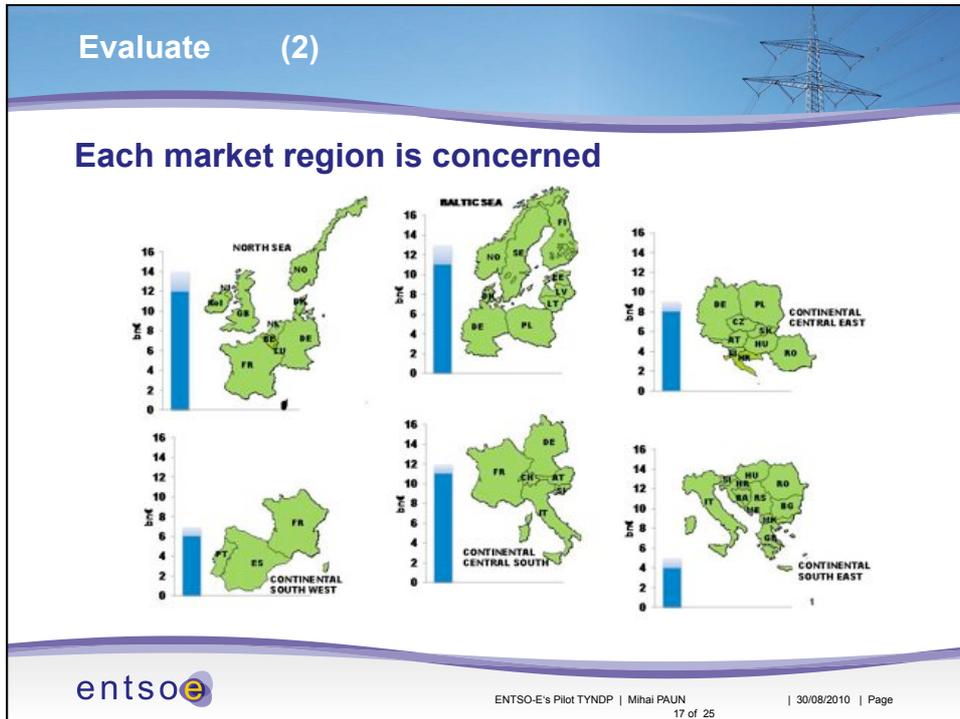
44% midterm

AC > 296

DC 96

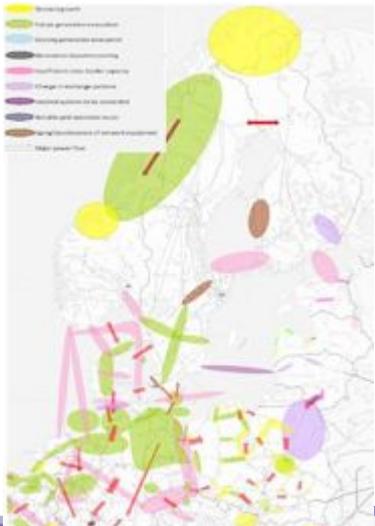
€ 23 to 28 billion for the first five years !


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RG Baltic Sea

- **Development of a coordinated extension plan of interconnections between the Baltic States & Poland and Baltic States & Nordic area**
- **Long term drivers :**
 - ✓ RES integration
 - ✓ Continental interconnections and North-South reinforcements in Nordic countries



Legend for the map:

- Yellow circle: Proposed projects
- Green circle: Projects under construction
- Blue circle: Existing interconnections
- Black circle: Projects under study
- Pink circle: Projects under study (border regions)
- Purple circle: Projects under study (border regions)
- Brown circle: Projects under study (border regions)
- Red line: Major power lines

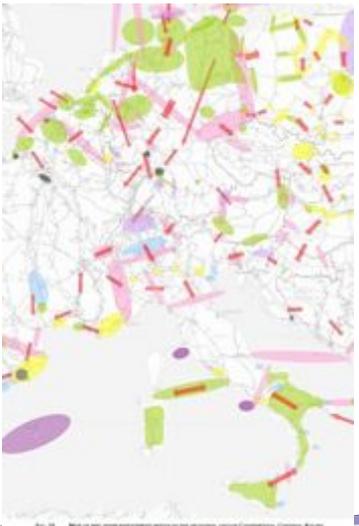
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Pilot TYNDP delivers (an overview of regional initiatives)

RG Continental Central South

- **Need for increased net and cross-border capacity through the Alps Region:**
 - ✓ Development of RES at the Northern and Southern borders of the CCS region
 - ✓ Enhanced storage facilities in the Alps
- **In the longer term, development of a Trans-Mediterranean HVDC “**



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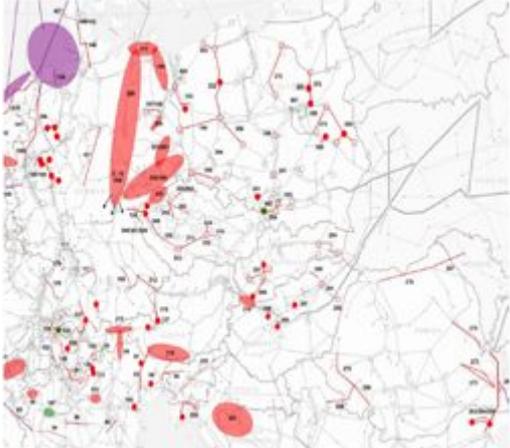
September 10, 2010

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RG Continental Central East

- **Joint interconnection studies to increase security of supply and RES integration**
- **Main drivers**
 - Connection of new generation : RES in the North, conventional generation in Northern and Eastern part,
 - Pumped storage in the South
 - Security of supply in Eastern part
 - Ageing and obsolescence



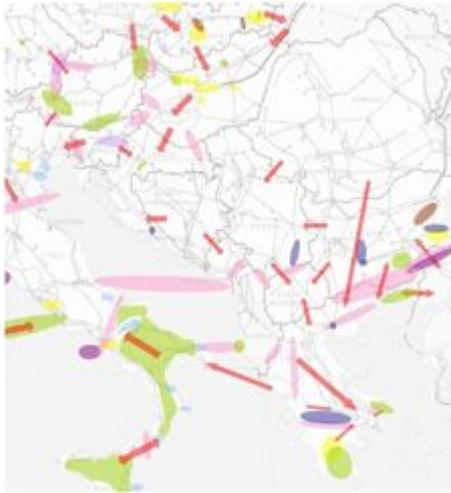
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RG Continental South East

Main drivers for network development :

- ✓ Market integration in the region
- ✓ Accommodation of future RES production
- ✓ Possible extension of the synchronous zone to the East
- ✓ Expansion of the 400kV Network of North Greece and Grid Reinforcements in Bulgaria linked to interconnection with Turkey



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TYNDP = Inform (1)

About the challenges faced by TSOs

- Social Acceptance : **Permitting issues !!**
- Legal & Regulatory Frameworks
- Channelling of reliable information about future generation

New EU Policy

Focus on the **rapid realization** of transmission investments

Identify and promote **strategic** EU projects

Intervene when **market** and **regulatory** schemes are inadequate to attract investors

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Inform (2)

Strategic scenarios ≠ Planning scenarios

- Security of Supply
- Stranded costs
- Increased uncertainty

TYNDP to become

The **factual** and **methodological basis** for new policy instruments (e.g. Infrastructure Package)

The **reference** for stakeholders' projects

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First TYNDP = a Pilot + process has started !

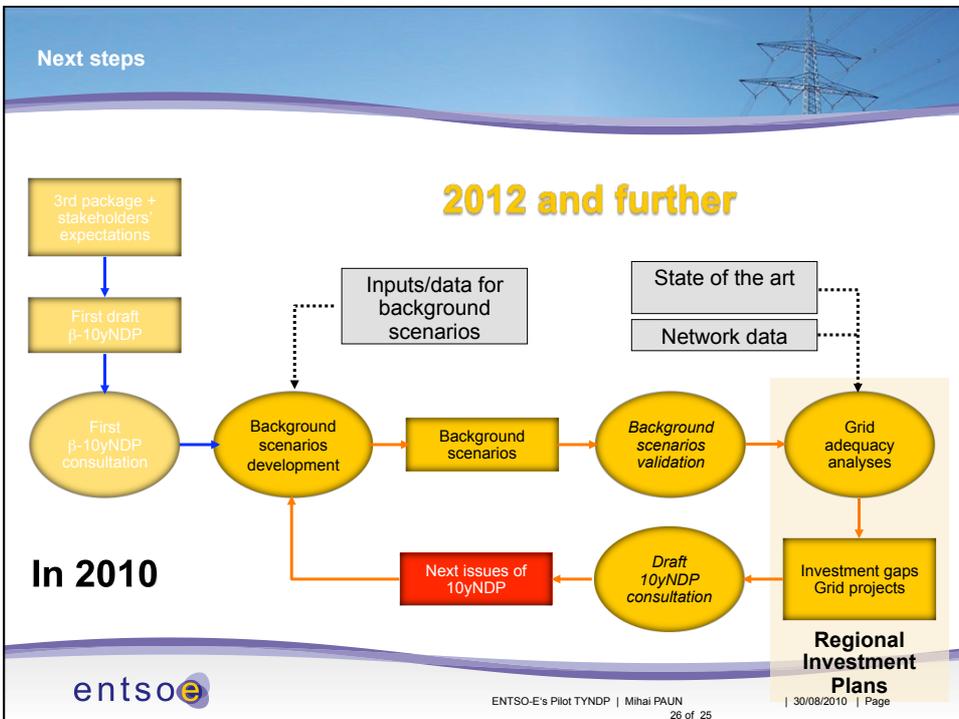
Energy Infrastructure Package:

TYNDP : assisting the assessment of the Policy

- Compare TYNDP planning scenarios with publicly available scenarios related to the EU2020 targets.
 - “What if” planning scenarios should converge to 2020 scenarios.
 - More RES? Less Fossil? Where?
- Propose measures to accelerate permitting procedures in Europe.
- Visualize main enhancements in transmission capacities.
 - Also, focus on forward-looking indicators for market integration.

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Some concluding remarks

ENTSO-E

- **Welcomes the new policy initiative in the form of the Energy Infrastructure Package**
 - but also expects concrete measures to cover current policy gaps
- **Invests major resources in TYNDP**
 - with the aim to assist, coordinate, evaluate and inform policy makers
- **Is a reliable and proactive partner in fulfilling EU energy policy goals**



THANK YOU!

Contact:

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- **For More INFO visit: <http://www.entsoe.eu/>**
- **ETSO POSITION ON USE OF UNDERGROUND CABLES TO DEVELOP EUROPEAN 400 KV NETWORKS**





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