



# ***Regional Infrastructure Development Coordination***

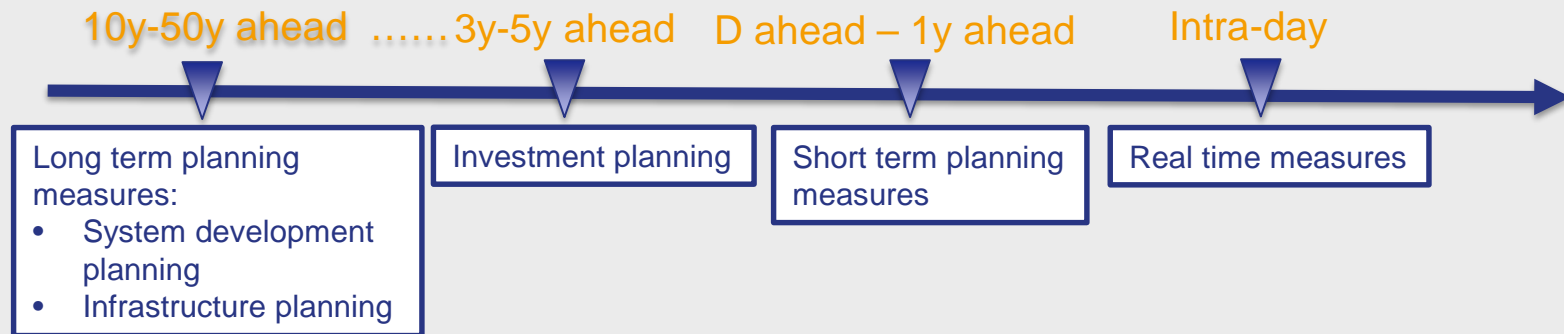
**Infrastructure planning process – from  
national to regional**

**Nenad Šidaković, ECS Electricity Infrastructure Expert**

Vienna, 30 November 2018

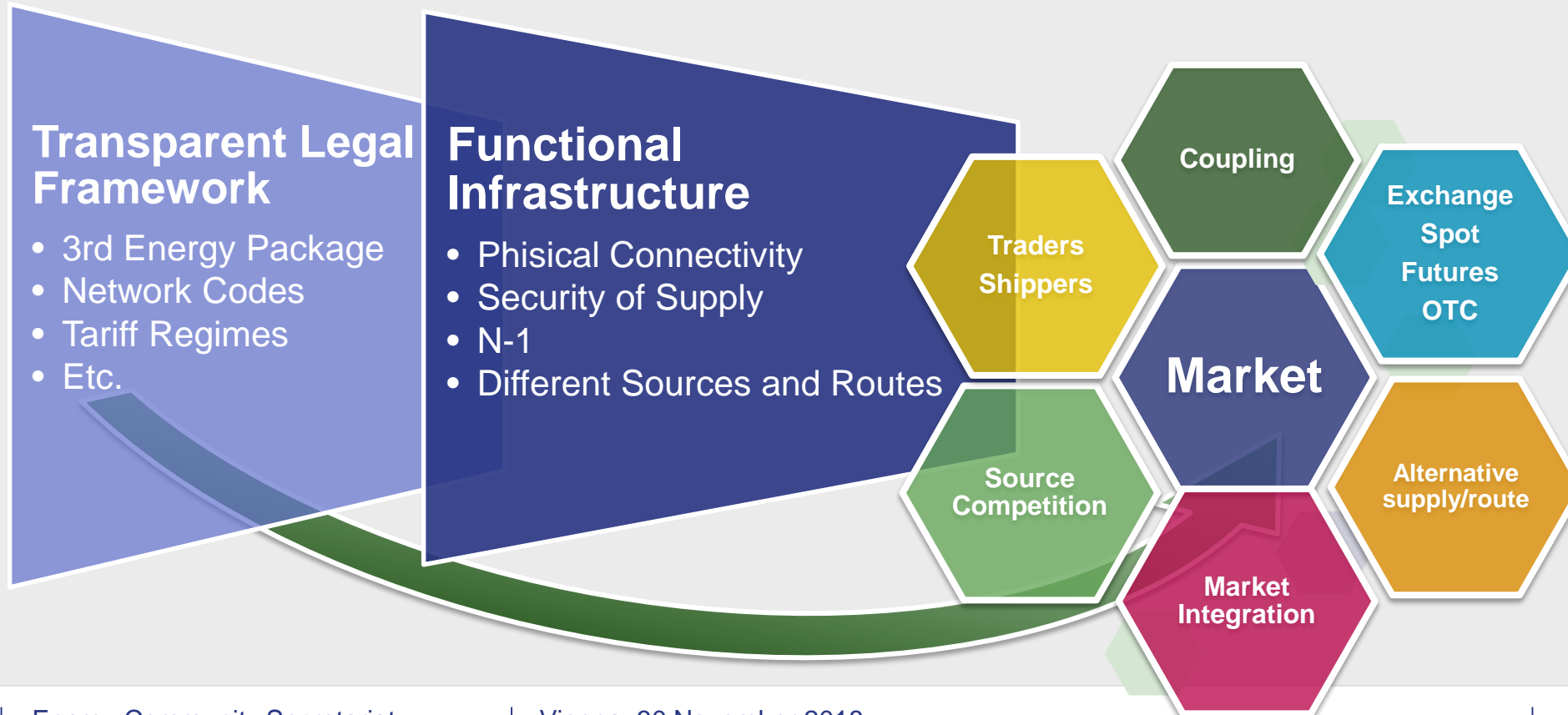
# Process timeline...

Process of ensuring secure, stable and optimal energy supply...



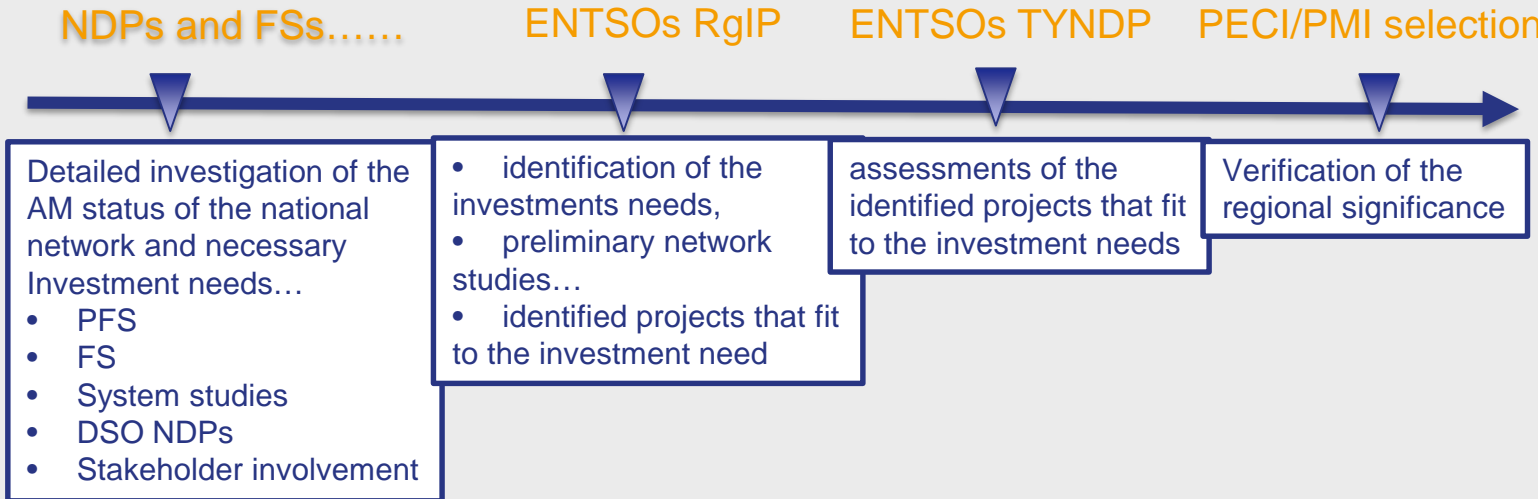
# Why is infrastructure an important area of ECS work...?

The „colourful“ world of an energy market requires...



# Process timeline...tyndp as a process

Regional system development and infrastructure planning...  
*Please note the difference between ENTSO-E and ENTSG membership and processes*



# Infrastructure planning and realisation – NATIONAL APPROACH

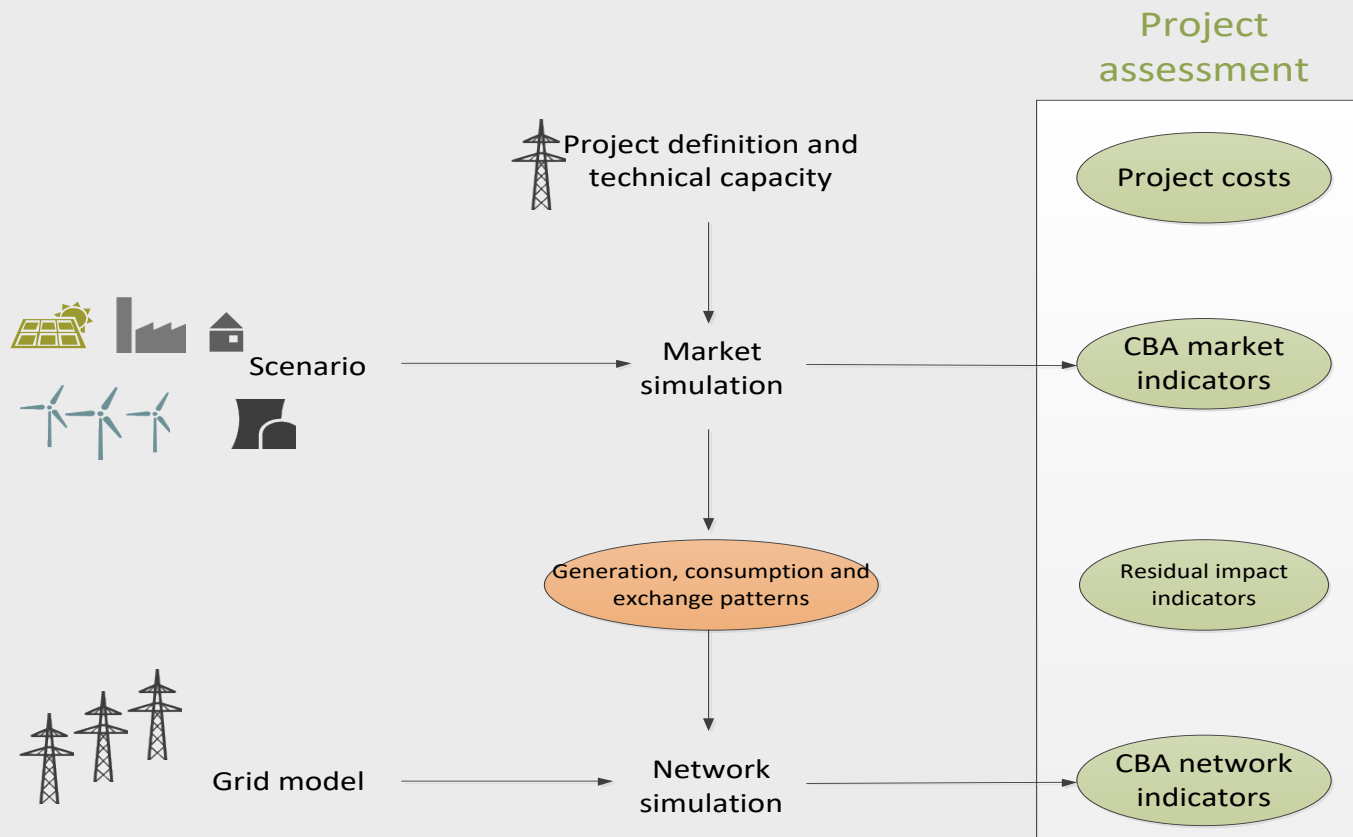


# Infrastructure planning – regional/ pan-European ENTSO approach

- TYNDP – Ten Year Network Development Plan,
- 6 RgIPs – Regional Investment Plans,
- Adequacy Reports...



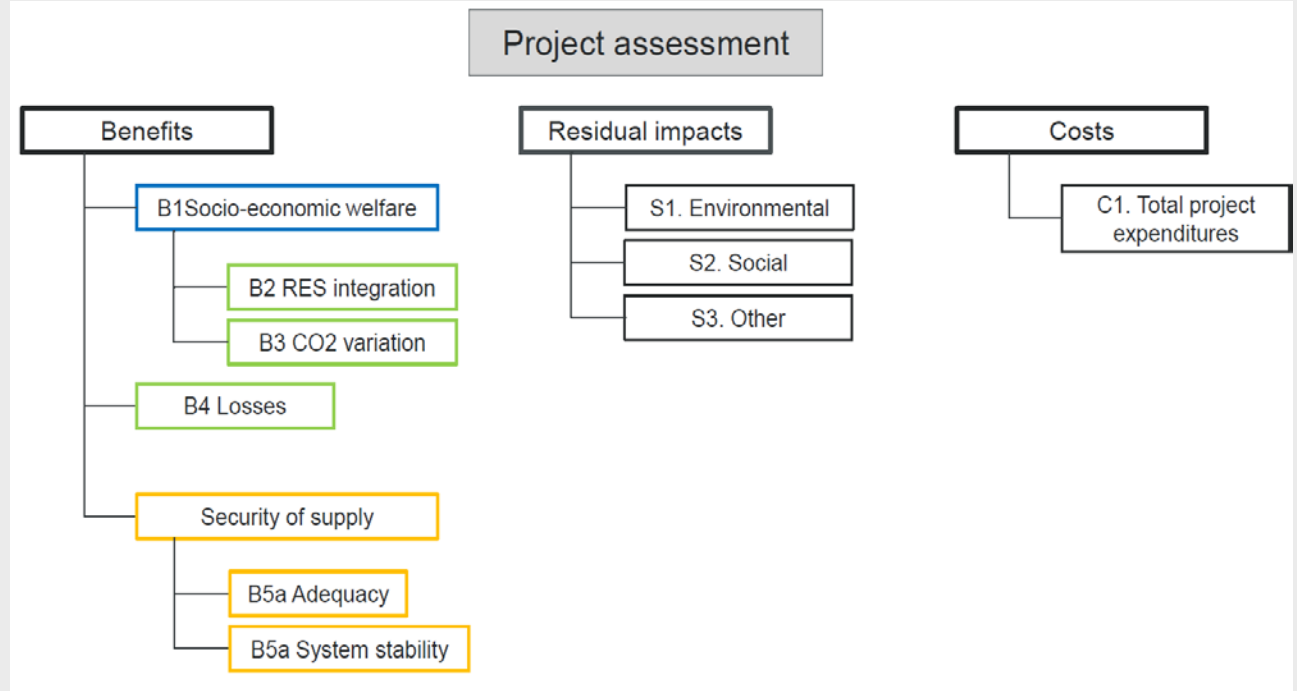
# ENTSO-E project assessment process



# ENTSO- E TYNDP2018 – Assessment of individual projects



2nd ENTSO-E CBA methodology with multi-criteria assessment







The Regulation, as adapted for the Energy Community, lays down rules for the timely development and interoperability of energy networks in the Energy Community, in order to:

- ***Verify priority (714/2009, 715/2009),***
- ***Facilitate, and***
- ***Financially assist...***

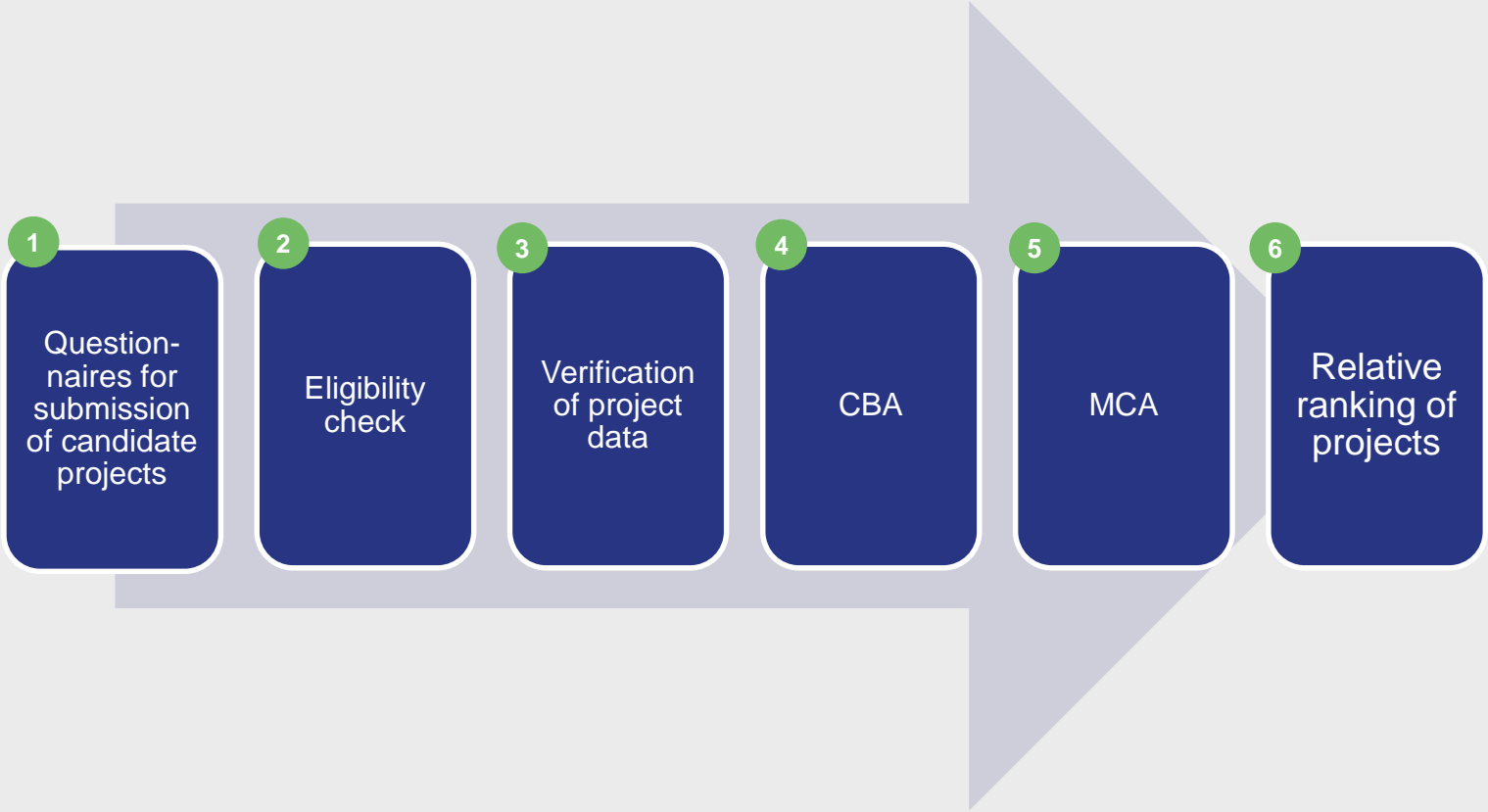
***...PRIORITY infrastructure projects in Energy Community: PECI/PMI – Projects of Energy Community Interest / Projects of Mutual Interest***



The selection of priority infrastructure projects is done in line with the EU Regulation 347/2013, as adapted for the Energy Community.

1. *1<sup>st</sup> PECI/PMI selection process was organized in 2016.*
2. *2<sup>nd</sup> PECI/PMI selection process was organized in 2018.*
3. **Categories:** energy infrastructure concerning electricity, gas and oil, as well as 1 thematic area covering smart grids.
4. **Two Project Groups formed with the following objectives:**
  - to list all projects eligible to be candidates for PECI / PMI status;
  - to assess all eligible projects, based on the proposed and accepted methodology, fulfilling the necessary criteria defined in the Regulation;
  - to adopt a preliminary PECI/PMI list, as well as to perform monitoring tasks accordingly.

# PECI/PMI - Project assessment process



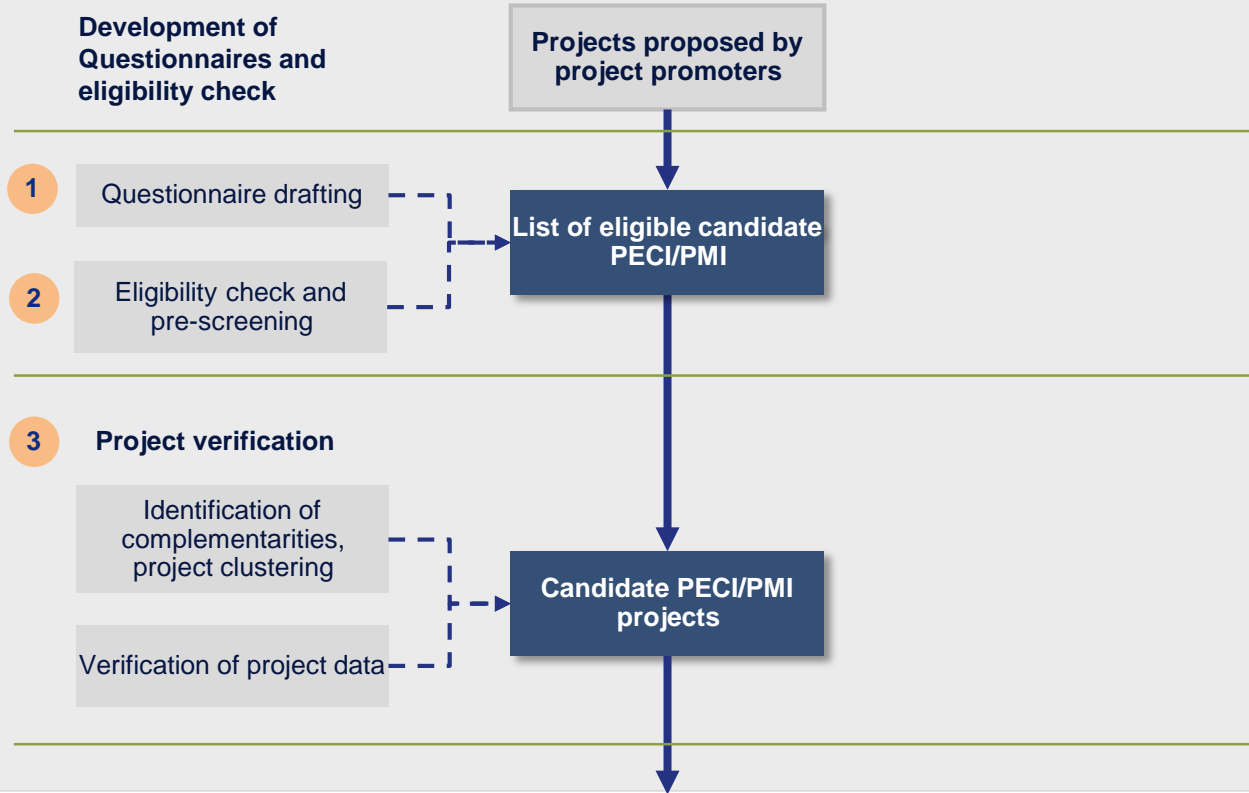
# Project categories – PECI/PMI



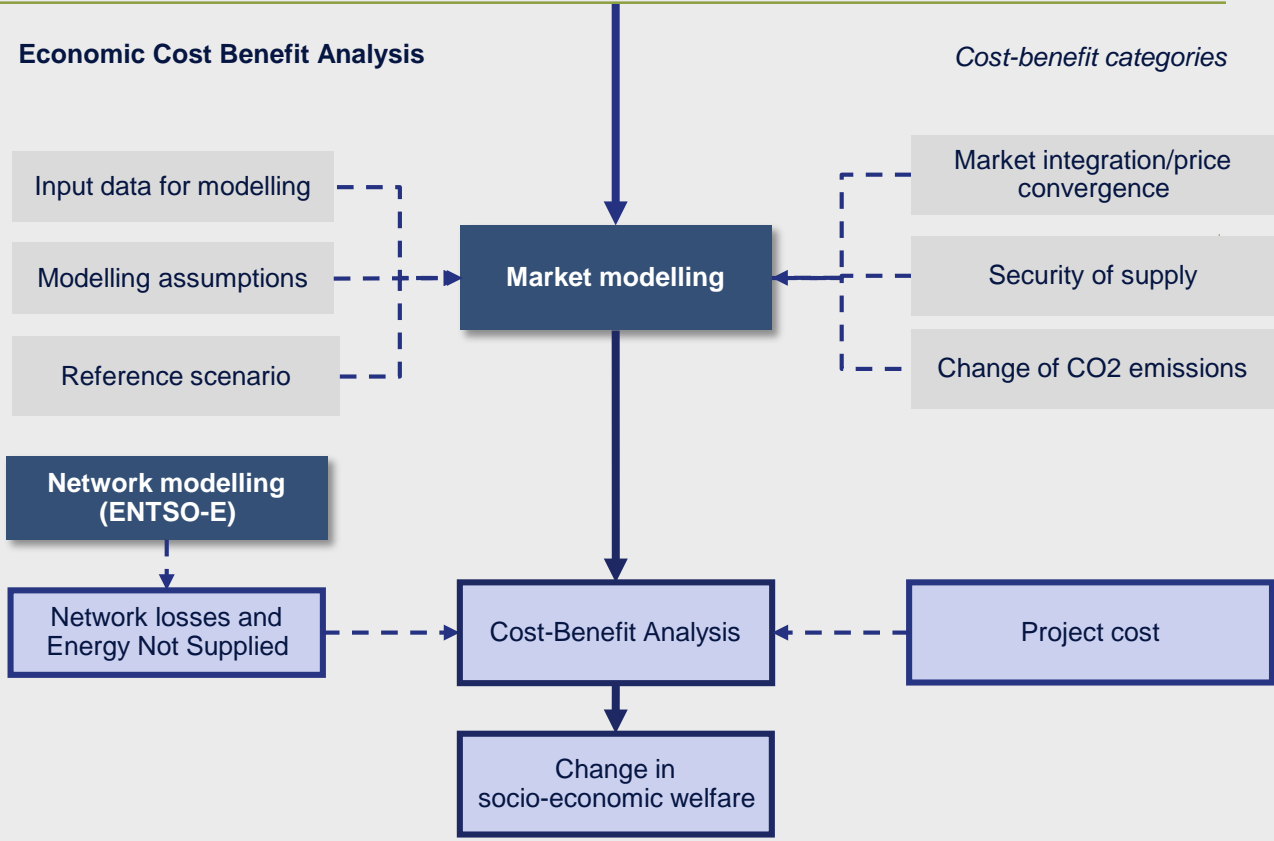
<b>General Criteria</b>	<b>Potential Benefits outweigh costs</b>	Involves at least 2 CPs or a CP and a MS
		Located in one CP and has a Cross-border impact
	<b>Fits in the defined project categories</b>	
<b>Specific Criteria</b>	<b>Electricity</b>	Market Integration
		SoS
		Sustainability
	<b>Gas</b>	Same + Competition
	<b>Smart Grid</b>	
	<b>Oil</b>	SoS
Mitigation of Environmental Risk		
<b>PECI</b>	If involves a CP and a MS has to be PCI first in EU	
<b>PMI</b>	If involves a CP and a MS and is not PCI in the EU	



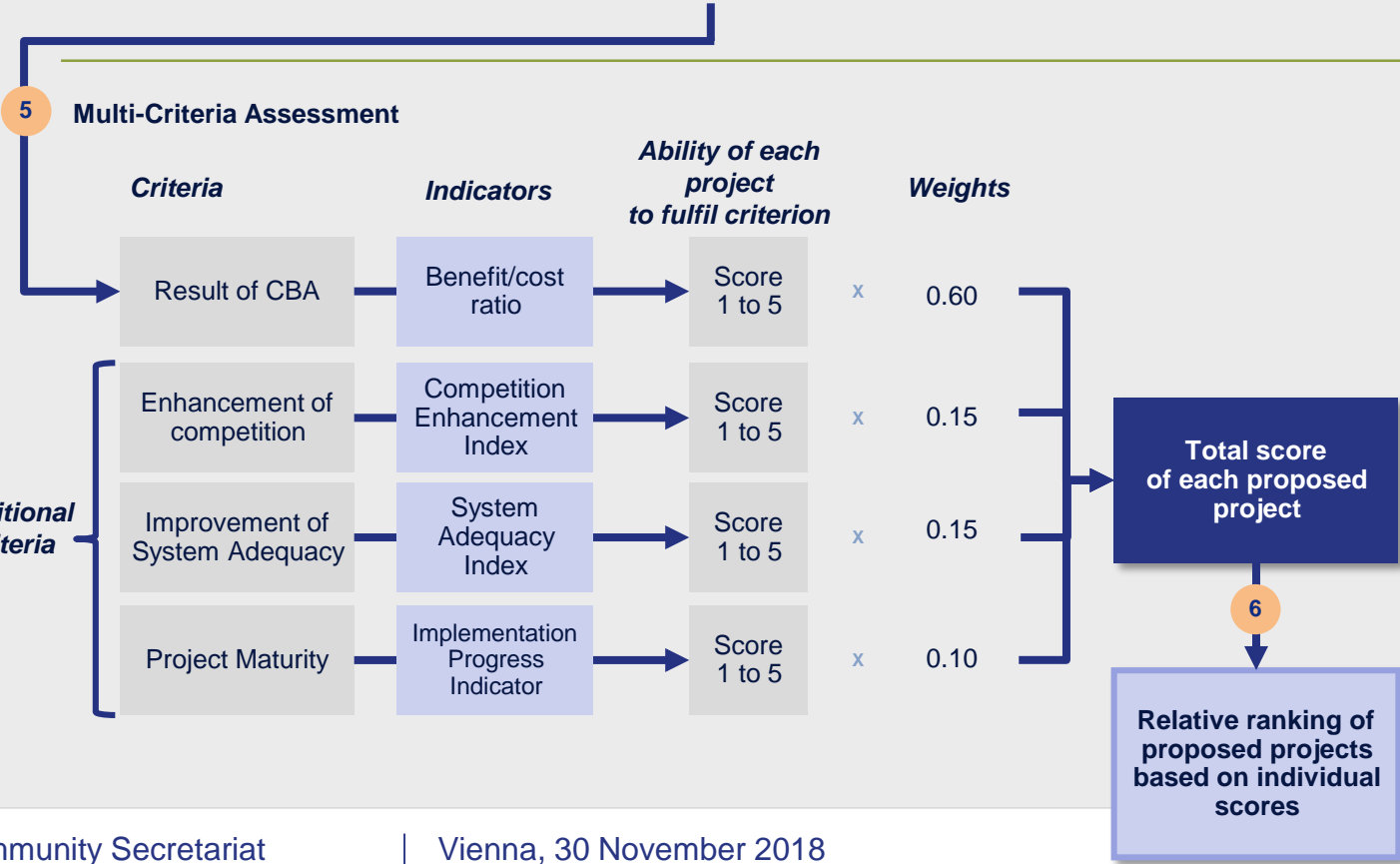
# PECI/PMI Project Assessment



## 4 Economic Cost Benefit Analysis

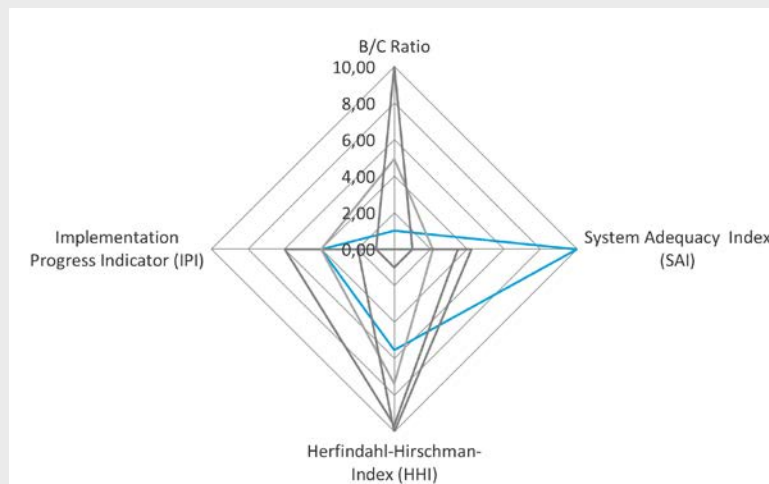


# PECI/PMI Project Assessment



# El\_xx: Project results

	System Adequacy Index (SAI)	Herfindahl-Hirschman-Index (HHI)	Benefit / Cost Ratio (B/C)	Implementation progress Indicator (IPI)	Total Score	Ranking
Score	10	5,54	1	4	3,33	3
Impact (change of indicator)	3,64	887,53	1,16	4		



*SAI and HHI values shown here represent the impact of a project (i.e. the difference without and with the individual project) in the countries on each end of the interconnector*



# CBA Sensitivity Results

NPV, m€	PINT	TOOT	Low CO <sub>2</sub>	High demand	Low demand	Low gas	High gas	Deep iteration
	39.8	52.2	91.0	41.2	32.7	-121.8	197.1	-13.4
	-118.2	-121.4	-119.6	-129.6	-123.5	-122.7	-119.6	-122.6
	814.5	497.4	637.7	643.3	1 011.9	508.4	1 318.0	734.6
	-45.5	-45.6	-44.7	-48.1	-45.6	-44.5	-50.6	-45.6
	1 416.8	930.1	1 144.8	946.5	2 111.8	1 055.7	2 071.9	1 309.7

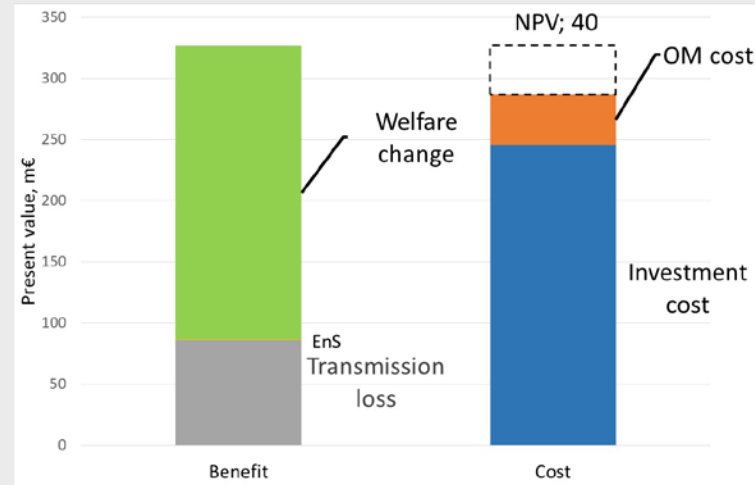
Benefit/cost ratio	PINT	TOOT	Low CO <sub>2</sub>	High demand	Low demand	Low gas	High gas	Deep iteration
	1.2	1.2	1.4	1.2	1.1	0.5	1.8	0.9
	-0.3	-0.4	-0.3	-0.5	-0.4	-0.4	-0.3	-0.4
	4.5	3.1	3.7	3.8	5.3	3.2	6.7	4.2
	-1.3	-1.3	-1.3	-1.5	-1.3	-1.3	-1.6	-1.3
	8.8	6.1	7.3	6.2	12.6	6.8	12.4	8.2

- TOOT: Take out one at a time
- Low CO<sub>2</sub>: using half of the reference CO<sub>2</sub> price
- High/low demand: yearly growth rates are 0.5% higher/lower compared to REF in all modelled countries
- Low gas/high gas: assuming +/-30% natural gas price change in all modelled countries
- Deep Iteration: natural gas prices and quantities were iterated between the gas and electricity market models in several runs

# El\_xx: Project results

m€	Welfare change			
	Consumer	Producer	Rent	Total
AL	-24.7	41.9	-0.8	16.4
BA	-36.5	49.7	1.5	14.7
BG	-64.6	95.4	-2.1	28.8
GR	-50.7	51.3	-21.1	-20.5
HR	-31.2	46.7	-0.8	14.8
HU	-77.6	53.7	-2.8	-26.6
IT	666.2	-385.6	-106.6	173.9
KO	-17.5	19.4	0.2	2.1
ME	-13.6	17.8	51.4	55.6
MD	0.0	0.0	0.0	0.0
MK	-22.0	12.2	-0.4	-10.3
PL	-38.6	44.9	-2.6	3.7
RO	-134.5	134.0	2.3	1.9
RS	-101.2	73.6	1.8	-25.8
SK	-50.5	67.0	2.0	18.4
UA_E	0.0	0.0	0.0	0.0
UA_W	-8.0	1.1	0.1	-6.8
<b>Region</b>	<b>-4.9</b>	<b>323.2</b>	<b>-78.0</b>	<b>240.4</b>
EnC	-357.9	349.7	56.0	47.8
Hosted	-151.2	141.0	54.7	44.5

Origin	Destination	Year of commissioning	NTC: O->D (MW)	NTC: D->O (MW)
ME	RS	2025	500	500
ME	IT	2024	500	500
RS	BA	2024	450	200



- Positive NPV: +40m€
- PI index:1.16

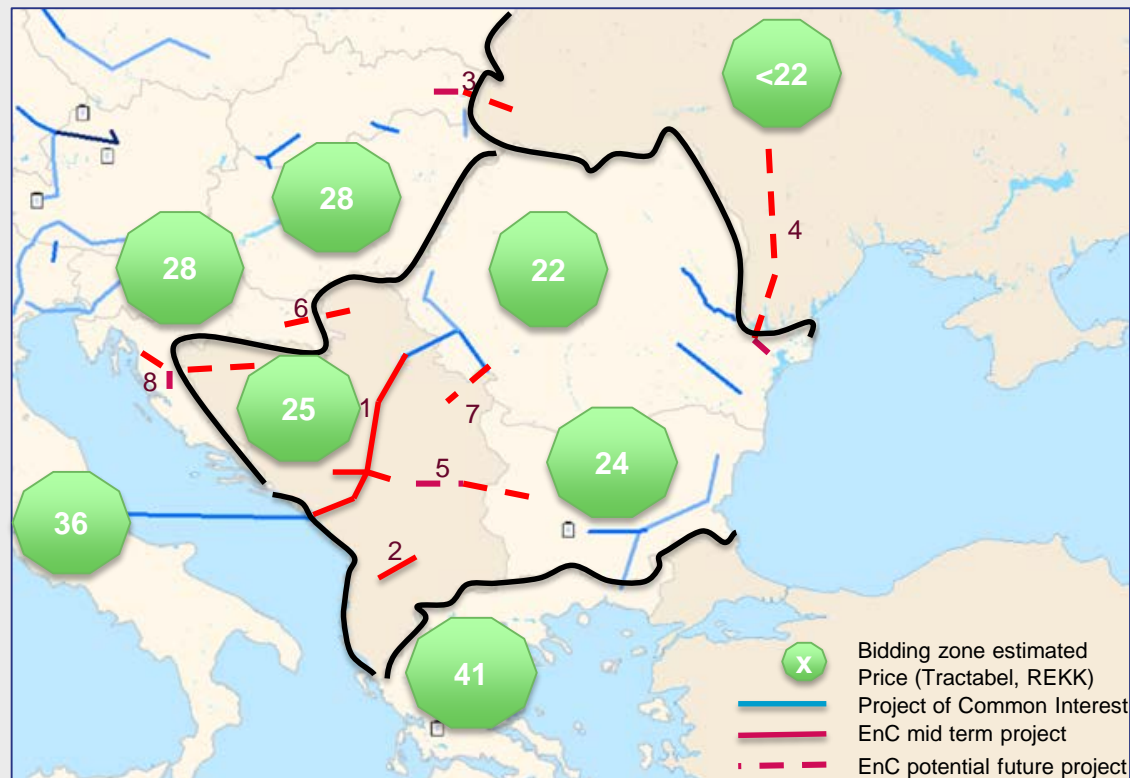
# PECI/PMI - Electricity Projects in EnC up to 2030

## Mid term projects (TYNDP) PECIs

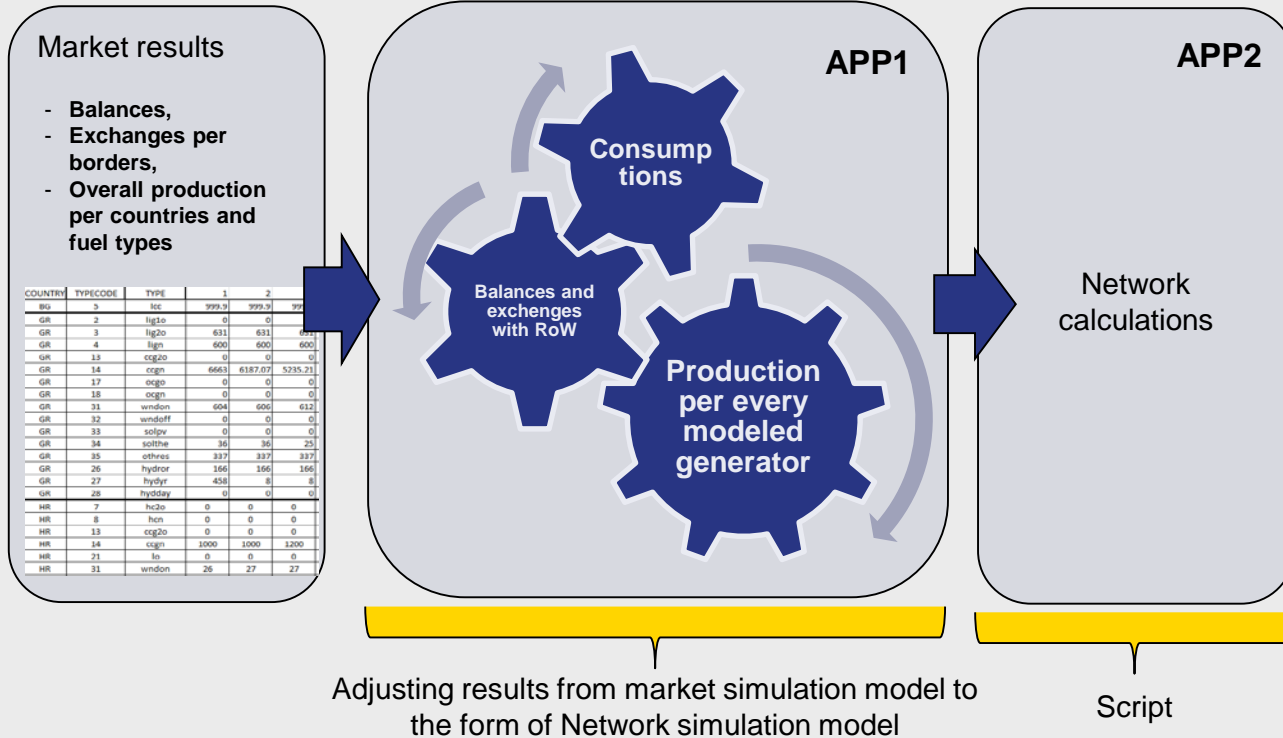
1. Transbalkan corridor – phase 1
  - 400 kV OHL Resita (RO) – Pancevo (RS)
  - 400 kV OHL Kragujevac (RS) – Kraljevo (RS)
  - 400 kV OHL Obrenovac (RS) – B.Basta (RS)
  - 400 kV OHL B.Basta (RS) – Pljevlja (ME) – Visegrad (BA)
  - 400 kV OHL Pljevlja (ME) – Lastva (ME)
2. 400 kV OHL Bitola (MK) – Elbasan (AL)

## Mid to Long term projects:

3. 400 kV OHL Mukacheve (UA) – V.Kapusany (SK)
4. 400 kV OHL with B2B Substation, Isacea (RO) – Vulcanesti (MD) – Chisinau (MD)
5. Transbalkan corridor – phase 2
  - 400 kV OHL B. Basta (RS) - Kraljevo (RS)
  - 400 kV OHL Kraljevo (RS) – Nis (RS)
  - New interconnection between Serbia and Bulgaria
6. New interconnection between Serbia – Croatia
7. New interconnection between Serbia – Romania
8. 400 kV OHL B. Luka (BA) – Lika (HR)



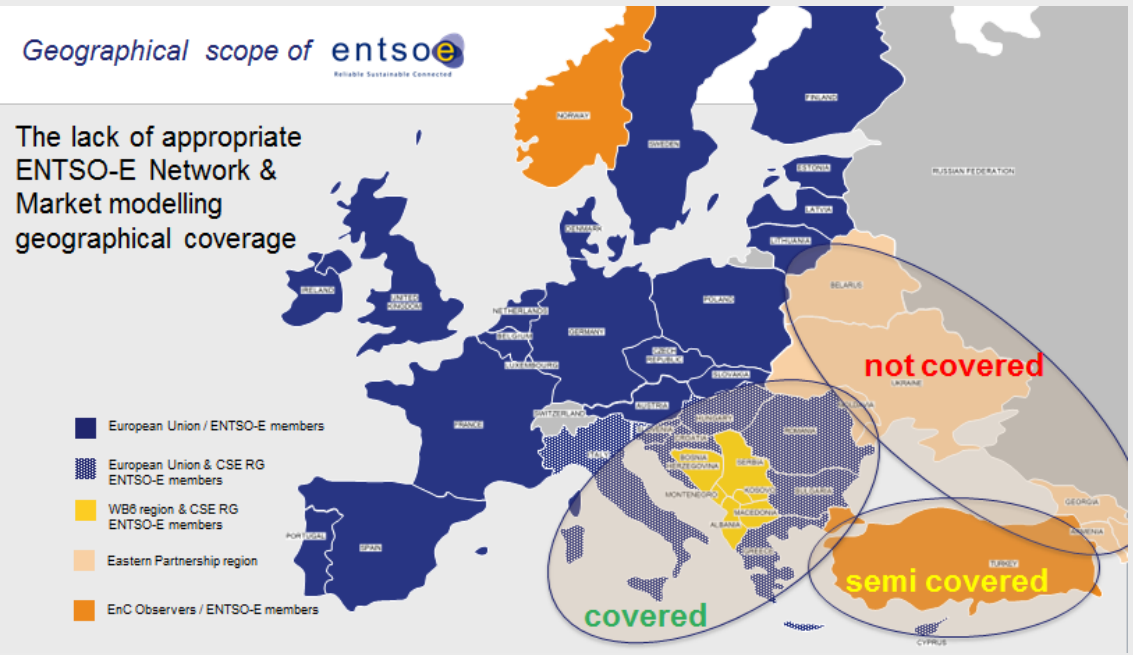
# Market talking to Network and Gas talking to Electricity – the future is now



# Line up activities of PECI/PMI and ENTSO/E TYNDP processes



Until ENTSOE TYNDP2018, network and market modelling geographical scope, as well as scenarios and visions did not cover UA and MD (as well as other EU4Energy Members) which generated problems during project identification (not covered by TYNDP) and project assessment phase in EnC region.



# PCI vs PEI/PMI vs PEPI - summary

## *PCIs, PEIs and PMIs assessments*

*EU MS 2017: used mostly ENTSO – E TYNDP assessment results, and agreed with the Commission the final PCI list*

*EnC 2016/2018: customised the prioritisation assessment*

- *used a similar methodology as EC/ENTSO-E*
- *enhanced with full CBA calculation, NPV distribution calculation, Multi-criteria assessment, ranking of projects by score/merit*
- *performed a sensitivity analysis instead of different scenarios*

*EnC 2018 additional features : Electricity and Gas Market models „talk“ to each other*

*PEPIs (Projects of Eastern Partnership Interest) – new category in the Eastern Partnership*

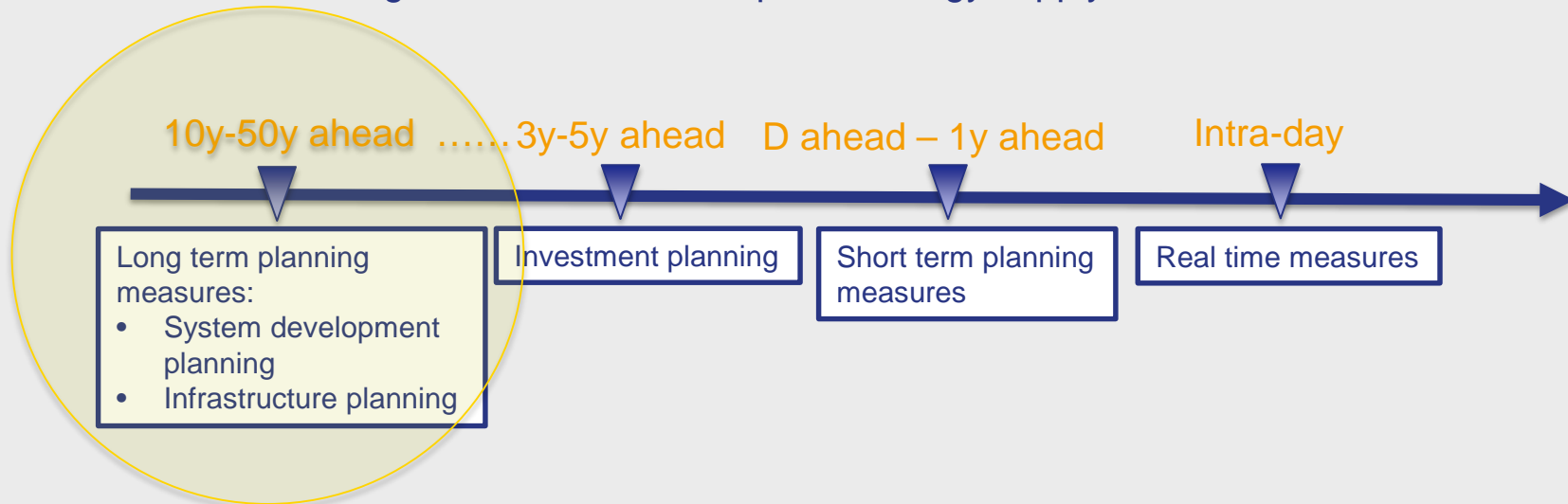


The background is a dark blue image of the Earth from space, showing the outlines of continents. Overlaid on the Earth is a complex network of glowing blue lines that connect various points across the globe, resembling a global communication or energy network. The lines are bright and have a slight glow, creating a sense of dynamic connectivity.

# Lessons Learned from TYNDP Appraisal Process: GNERC Case Study

# Process timeline...

Process of ensuring secure, stable and optimal energy supply...

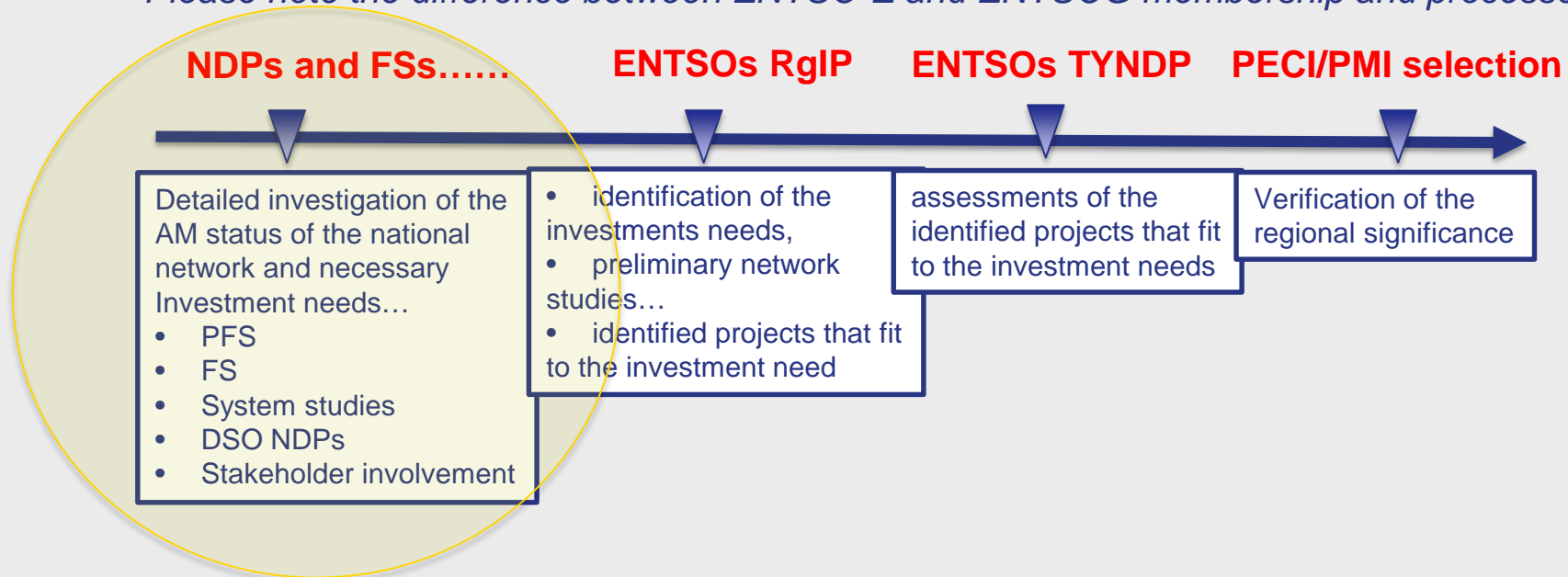




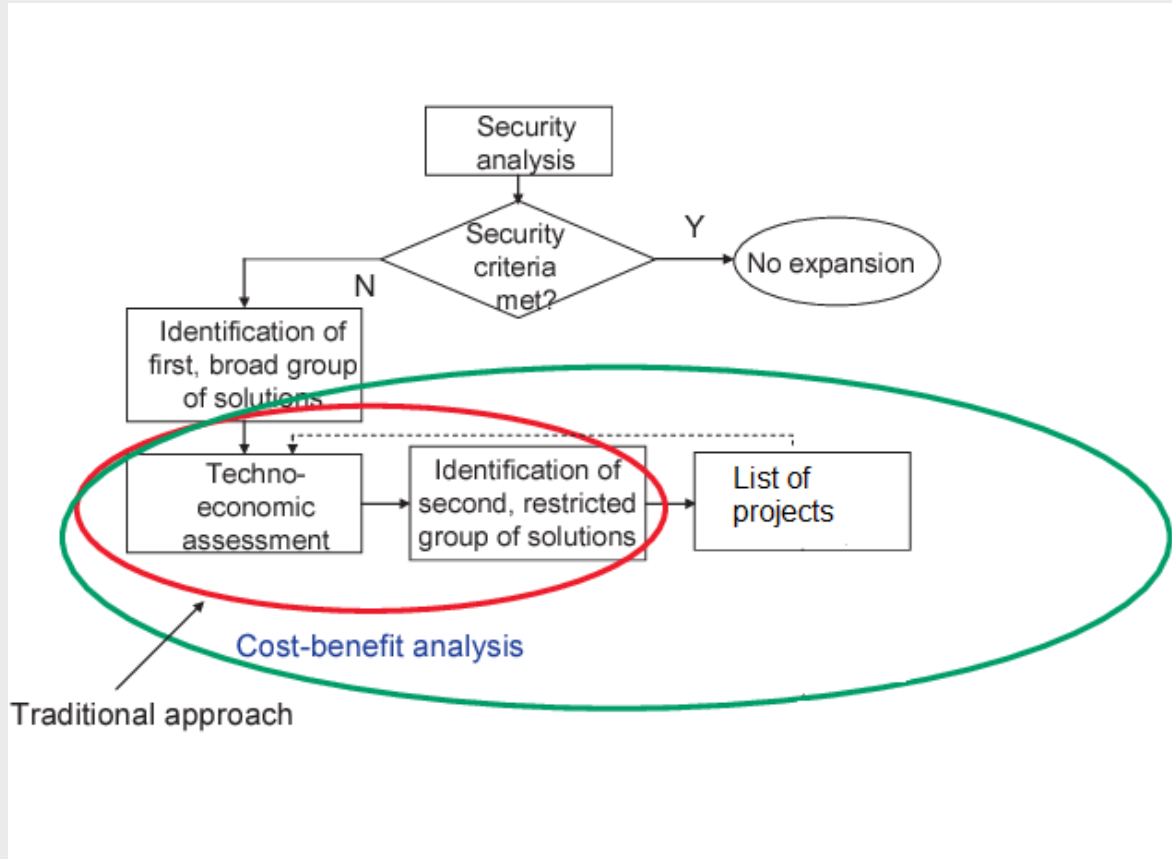
# Process timeline...

Regional system development and infrastructure planning...

*Please note the difference between ENTSO-E and ENTSG membership and processes*



# Traditional system development process



1. **Ministry:** Energy Law needs to be amended in order to reflect the obligations derived from the Article 22 of the Directive 2009/73(72)/EC (gas and electricity TSOs to submit TYNDP with the other necessary documentation (TYNDP package – as defined under point 8.) to GNERC for approval, in line with the Article 22 of the Directive 2009/73(72)/EC).

## **Article 22, Directive 2009/73(72)/EC:**

**22.1** *“Every year, transmission system operators shall submit to the regulatory authority a ten-year network development plan based on existing and forecast supply and demand after having consulted all the relevant stakeholders. That network development plan shall contain efficient measures in order to guarantee the adequacy of the system and the security of supply.”*

**22.2** *“The ten-year network development plan shall in particular: (a) indicate to market participants the main transmission infrastructure that needs to be built or upgraded over the next ten years; (b) **contain all the investments already decided and identify new investments which have to be executed in the next three years;** and (c) provide for a time frame for all investment projects.”*

**22.3** *“When elaborating the ten-year network development plan, the transmission system operator shall make reasonable assumptions about the evolution of the generation, supply, consumption and exchanges with other countries, taking into account investment plans for regional and Community-wide networks.”*

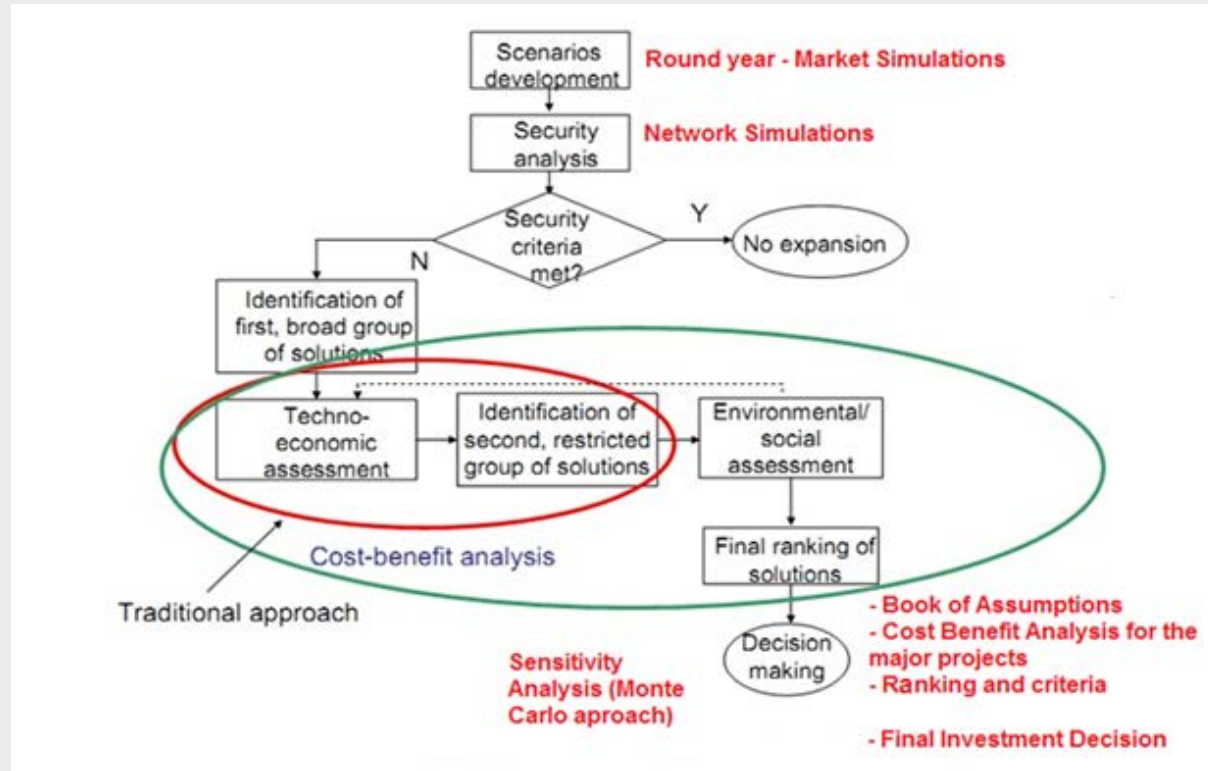
**22.6** *“The regulatory authority shall monitor and evaluate the implementation of the ten-year network development plan.”*

2. **GNERC:** To prepare the **Procedure that will describe the process of submission, assessment, approval and monitoring of the realisation of the TYNDP and 3 year Investment plan** (description of the process with the list of activities/obligations and deadlines).
3. **TSOs:** To be drafted by TSOs - **Project Assessment Methodology with the Book of Assumptions, or so called CBA methodology**, which will be used for the assessment of the major infrastructure projects, including economic and financial NPV, b/c ratio, internal rate of return, payback period. For the rest of the projects multi-criteria assessment with the ranking and prioritisation is necessary. To be approved by GNERC.
4. **TSOs: Final Investment Decision** necessary for the projects. **For the cross border projects legally binding bilateral agreement between neighboring systems** is necessary. To be sent to the GNERC as part of the overall **TYNDP package** as defined under bullet 8.
5. **GNERC:** To adopt risk assessment and mitigation measures methodology, defined in Regulation 347/2013, adapted and adopted by EnC, as “Methodology and the criteria used to evaluate investments in electricity and gas infrastructure projects and the higher risks incurred by them”. Before adoption to be sent to, and approved by ECRB.
6. **TSOs: To introduce Market simulations into TYNDP preparation in order to mitigate uncertainties through better modelling and different scenarios** (round year calculations). (avoiding underutilisation of the constructed network elements – risk mitigation)
7. **TSOs: to introduce calculation of NPV, b/c ratio, internal rate of return, payback period** (financial for the company, economical for the national level)

**8. TYNDP package** that should be prepared and sent by TSO to the NRA, consists of the following (also illustrated on the Figure):

- TYNDP together with 3-year Investment plan (Investment candidates must be covered/assessed through TYNDP).
- Project Assessment Methodology with the Book of Assumptions.
- FID - Final Investment Decision for each of the Investment item candidates.
- For the cross border projects legally binding bilateral agreement between neighboring systems is necessary (in order to mitigate the risk).
- Maturity/Priority/Limited resources – existence of the Feasibility Study with the appropriate CBA (NPV, b/c, IRR, payback period) for the major projects and Multi Criteria Ranking for all other projects.
- Financing plan proposal.

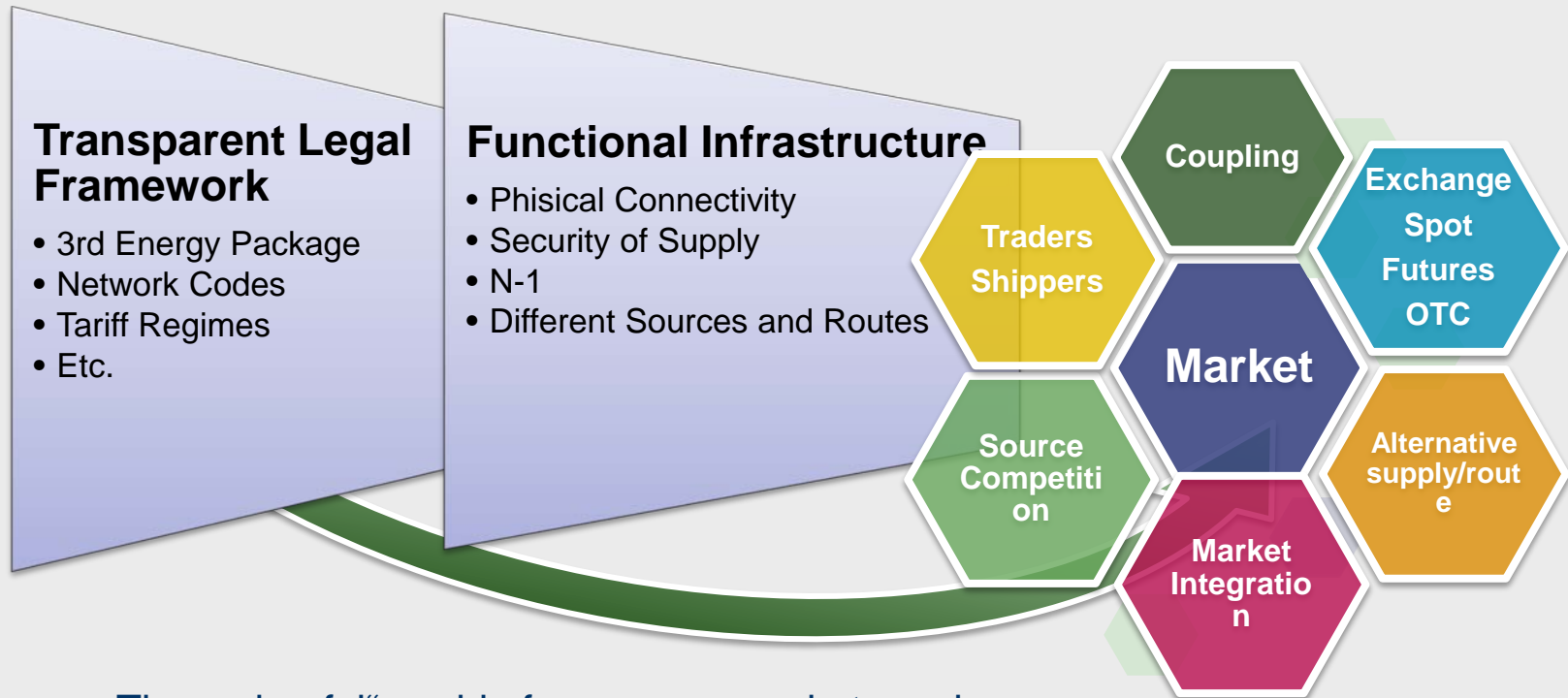
# NTYNDP development process





# Ancillary slides

## Why is infrastructure important for the overall power system and market operation



The „colourful“ world of an energy market requires...



***In line with the Regulation, the Regulators shall examine the possibility of applying regulatory incentives to answer certain risks, specific to cross-border projects. Some examples include:***

- WACC premium in justified cases
- Early cost recognition
- Shorter depreciation period
- Longer regulatory period
- Etc...
- [EC Study on Incentives](#)

***If decided earlier, the incentives can be included in CBCA decision and the Business Plan when identifying the Financial Gap***



# References

## ***The basis for the current presentation:***



- EXPLANATORY NOTES On the Implementation of EU Regulation 347/2013 - MC decision 2015/09
- ACER Recommendations and CBCA Decisions are available here:

[http://www.acer.europa.eu/en/Gas/Infrastructure\\_development/CBCA-decisions/Pages/default.aspx](http://www.acer.europa.eu/en/Gas/Infrastructure_development/CBCA-decisions/Pages/default.aspx)

- ACER Presentations are available here:

<http://www.acer.europa.eu/Events/Workshop-on-2nd-ACER-CBCA-Recommendation/default.aspx>

- ENTSO's CBA Methodologies:

<https://www.entsoe.eu/major-projects/ten-year-network-development-plan/CBA-Methodology/Pages/default.aspx>

<http://www.entsog.eu/publications/cba-methodology#CBA-METHODOLOGIES>

- Regulation 347/2013 and adapted MC Decision:

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:115:0039:0075:en:PDF>

[https://www.energy-community.org/portal/page/portal/ENC\\_HOME/DOCS/3888285/24F6E4206F75620BE053C92FA8C088EE.PDF](https://www.energy-community.org/portal/page/portal/ENC_HOME/DOCS/3888285/24F6E4206F75620BE053C92FA8C088EE.PDF)

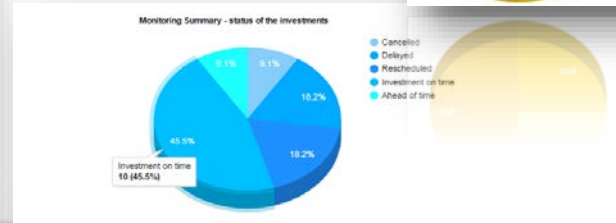
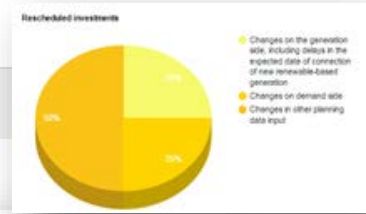
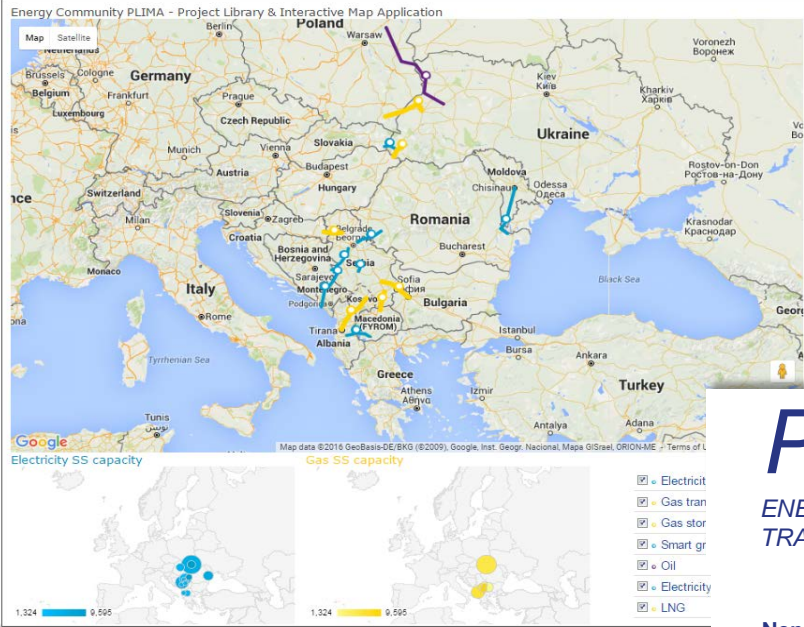
***Current presentation is a simple introduction – for in-depth studies ACER documents are very useful***

# Project categories – PECI/PMI

<b>General Criteria</b>	<b>Potential Benefits outweigh costs</b>	Involves at least 2 CPs or a CP and a MS Located in one CP and has a Cross-border impact
	<b>Fits in the defined project categories</b>	
	<b>Specific Criteria</b>	
<b>Specific Criteria</b>	<b>Electricity</b>	Market Integration SoS Sustainability
	<b>Gas</b>	Same + Competition
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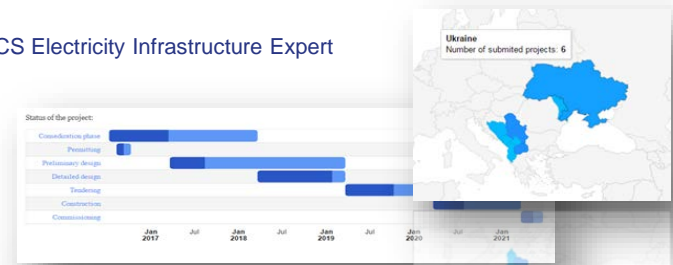
Skopje, 29th May 2018



# PLIMA

ENERGY COMMUNITY SECRETARIAT INFRASTRUCTURE  
TRANSPARENCY PLATFORM AND PROJECT MONITORING TOOL

Nenad Šijaković, ECS Electricity Infrastructure Expert





**According to the Article 18 of adopted Regulation 347/2013 (MC Decision [D/2015/09/MC-EnC](#)):**

The Energy Community Secretariat shall establish, by six months after the date of adoption of the first Energy Community list (14<sup>th</sup> April 2017), an **infrastructure transparency platform** easily accessible to the general public, including via the internet. This platform shall contain the following information:

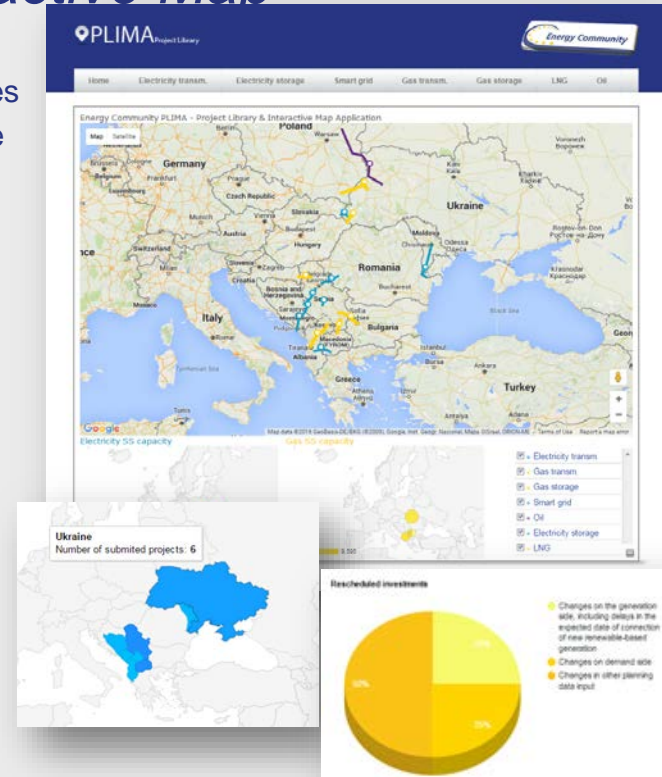
- general, updated information, including geographic information, for each project of Energy Community interest;
- the implementation plan as set out in Article 5(1) for each project of Energy Community interest;
- the main results of the cost-benefit analysis on the basis of the methodology drawn up pursuant Article 11 for the projects of Energy Community interest concerned, except for any commercially sensitive information;
- the Energy Community list;
- the funds allocated and disbursed by the Union for each project of Energy Community interest.

# PLIMA – Project Library and Interactive Map Application

PLIMA – Project Library and Interactive Map Application provides up to date information on the geographic location for each of the projects listed as PECE/PMI, as well as other relevant project data, using user friendly and interactive approach, and represents:

- Infrastructure Transparency Platform, and
- Project Monitoring Tool

PLIMA is a web based application developed using PHP/MySQL, and is currently being migrated to the Magnolia-Content Management System), with number of embedded Google map APIs and different Google charts, **which ensures high level of cost-effectives and its performance.**

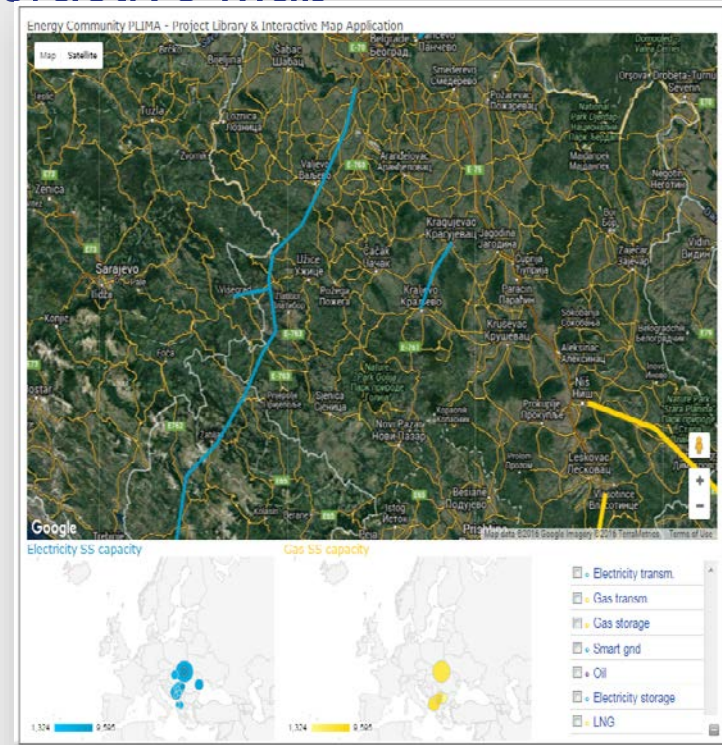




# PLIMA – Project Library and Interactive Map Application

PLIMA possess the following functionalities (1):

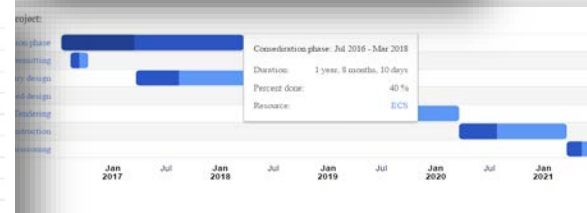
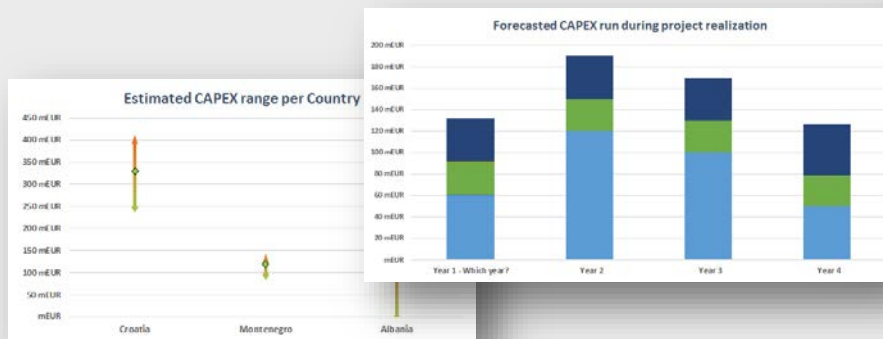
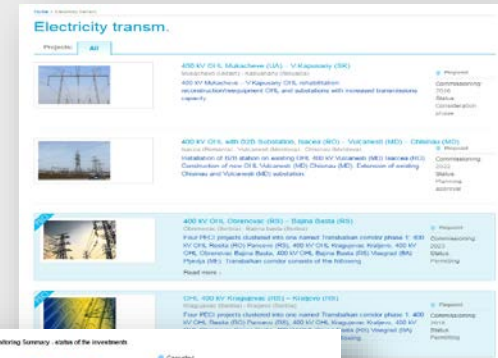
1. PECI/PMI projects presentation using Interactive map approach (using Google map APIs),
2. Project library, dynamically connected to the GIS based map, provides up to date information on the geographic location for each of the projects listed as PECI/PMI as well as other relevant project data, using user friendly and interactive user interface. Projects covered by PLIMA are divided into the following categories:
  - a) Electricity transmission,
  - b) Electricity storage,
  - c) Smart grid,
  - d) Gas transmission,
  - e) Gas storage,
  - f) LNG, and
  - g) Oil.



# PLIMA – Project Library and Interactive Map

## Application

- Possibility to list every project category with pinpoint function connected with Interactive map interface.
- Project detailed page, with all necessary project data, images, charts as well as predefined, Data Base backed up, interactive Gantt Diagram with predefined project phases, which is used for the project monitoring purposes (each phase is described by start date, end date, duration, percent done...).
- Overall projects Monitoring Tool with appropriate charts and other relevant statistical data.

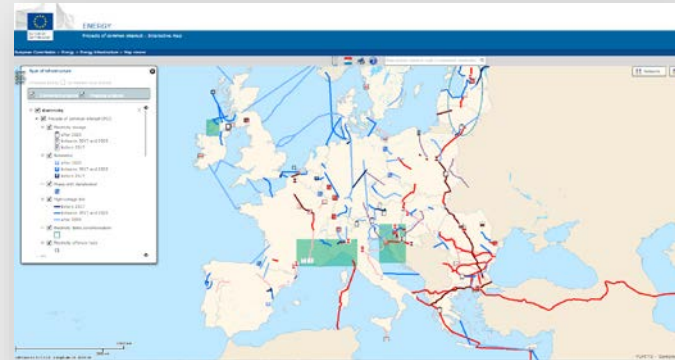




## Other existing solutions

### EC solution

[http://ec.europa.eu/energy/infrastructure/transparency\\_platform/map-viewer/main.html](http://ec.europa.eu/energy/infrastructure/transparency_platform/map-viewer/main.html)



### ENTSO/E solution

<http://tyndp.entsoe.eu/map/>

