



This project has received funding from the European Union's Horizon2020 research and innovation programme under grant agreement N° 863819

FlexPlan

Final Project Workshop | 2023-02-14

Preview of the final regulatory reflections and guidelines

Andrei Morch

SINTEF Energy Research

Agenda

- Introduction of activity “Regulatory Analysis” (WP6)
- Methodology and main results from the preliminary screening study
- The main outcomes from the screening phase

Overview of “Regulatory Analysis” activity (WP6)

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Preliminary screening of planning practices and EU regulation (M1-M6)

Assessment and identification current and future (2030+) Pan-European regulatory conditions and political targets, relevant for development of an optimal environment for the real implementation of FlexPlan planning tool

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Guideline for the compliance of network planning tool with EU overall strategies and regulatory conditions

D6.1

Responsible Person	PI
Responsible Partner	ENTSO-Europe
Coordinated by WP leader	ENTSO-Europe (ENTSO-Europe AS) - ENTSO-Europe
Coordinated by the project	ENTSO-Europe (ENTSO-Europe AS) - ENTSO-Europe
Responsible	ENTSO-Europe (ENTSO-Europe AS) - ENTSO-Europe
Approved by Project	ENTSO-Europe (ENTSO-Europe AS) - ENTSO-Europe
Coordinated	ENTSO-Europe (ENTSO-Europe AS) - ENTSO-Europe



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Finalised

Lessons learned from regional cases (M36-M42)

Documenting possible national/regional regulation and practices, which could impose limitations for application of the tool.
Evaluation of replicability and scalability potential of the tool and suggestion for its improvement.

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Advanced methodology and tool taking advantage of energy and electricity flexibility in transmission and distribution grid planning

D6.2 Identified regulatory limitations and opportunities based on the regional cases

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Responsible Partner	ENTSO-Europe
Coordinated by WP leader	ENTSO-Europe (ENTSO-Europe AS) - ENTSO-Europe
Coordinated by the project	ENTSO-Europe (ENTSO-Europe AS) - ENTSO-Europe
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In progress

Pan-European level regulatory conclusions, policy recommendations and roadmap for replication (M36-M42)

Identification of the Pan-European level regulatory challenges and policy lessons learned from the comparison of the proposed planning tool and the traditional network-planning tool. Recommendation for the Policy Makers on how to address various constraints, which are directly relevant to wide application of the network planning tool and accommodation of the renewable generation in Europe.

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Advanced methodology and tool taking advantage of energy and electricity flexibility in transmission and distribution grid planning

Lessons and recommendations on pan-European level regulation, policies and strategies

D6.3

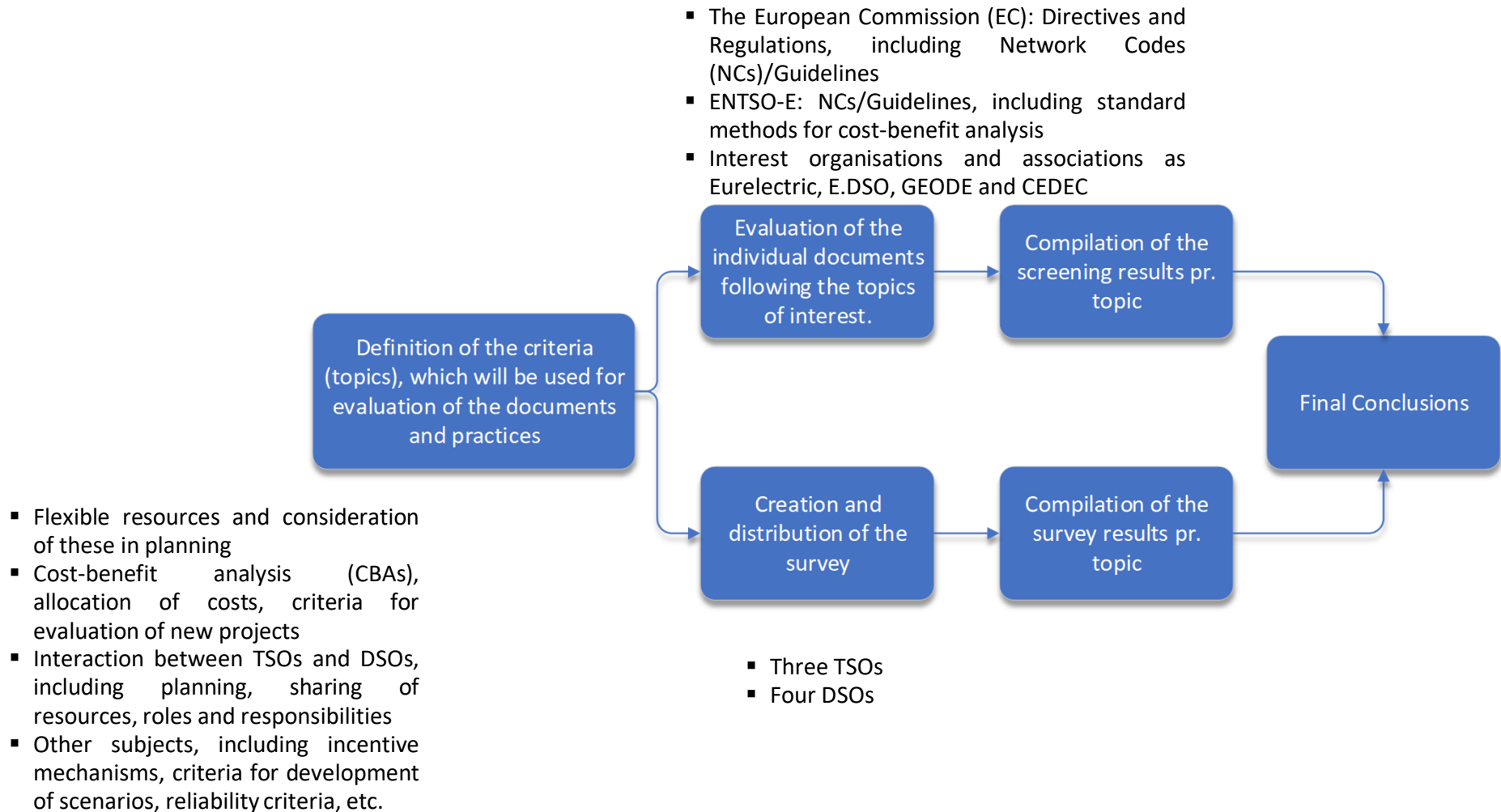
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In public consultation

Steps in the working methodology for the preliminary screening



Requirements related to consideration of flexible resources in planning

- Internal Electricity Market (IEM) Directive (2019/944):
 - Requires that distribution network development plan shall also **consider demand response, energy efficiency, energy storage facilities or other resources** that the DSO has to use as an alternative to system expansion
 - TSOs shall fully take into account the potential for the use of demand response, energy storage facilities or other resources as alternatives to system expansion when elaborating 10-year Network Development Plan (TYNDP)
- The IEM Regulation (2019/943) requires that for integration of the growing share of renewable energy, the future electricity system should make use of **all available sources of flexibility**, particularly demand side solutions and energy storage
- The ENTSO-E's 3rd Guideline for Cost Benefit Analysis (CBA) of Grid Development Projects: **flexibility of demand** is considered as a consistent part of the estimation of the socio-economic welfare
- **None** of the survey responding System Operators (SOs) consider flexible resources in their current planning practices.

Ownership and operation of energy storage*

- The most recent recast of the IEM Directive reaffirms the position stated before, not allowing System Operators (SOs) to own, develop, manage or operate energy storage facilities
- However, SOs are allowed to own, operate or manage such devices, among other conditions, if these devices are “are fully integrated network components and the regulatory authority has granted its approval”, which can pave the way for many exceptions
- The most recent version of recasts has been partially modified, taking into account input coming from some stakeholders, expanding the possible terms of derogation for SOs for operational purposes
- It seems it could be possible to own and operate batteries for some new actors formalised in the IEM Directive, as active customers and possibly Citizens Energy Communities

* the project does not aim at taking any specific position on this subject



Sharing of resources between TSO and DSO: what are the priorities?

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- The IEM Directive defines that DSOs shall cooperate with TSOs for the effective involvement of market participants connected to their grid in retail, wholesale and balancing markets. Delivery of balancing services stemming from resources located in the distribution system shall be agreed with the relevant TSO.
- Further screening and survey of the present practice indicated that at present there is no common regulatory or practice background allowing to draw clear conclusions on this topic. The necessity of defining this is clearly highlighted both at the institutional level and by the stakeholders.

Responsibilities for congestion management and balancing

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- The guideline for TSO-DSO cooperation outlines the future responsibilities for the operators:
 - TSOs - maintaining overall system security via frequency control, Load Frequency Control (LFC) block balancing and congestion management (across borders and on the TSO level) and voltage support in the transmission network in an electricity system
 - DSOs - managing voltage stability and congestion on their grids
- In the first 10-20 years it is reasonable to suppose that TSOs will remain responsible for **system balancing and congestion management** in their own networks, while DSOs could be allowed to deal with **congestion in the distribution networks**, provided that the DSO will be able to obtain sufficient resources to this.
- The EC has started the formalisation process of several **new business actors**, including Citizens Energy Communities (CECs) by indicating a scope of their roles and responsibilities in the IEM Directive.
- Eurelectric looks at CECs as an important future resource, which can be endorsed with several new duties (especially balancing responsibility) when acting either as a supplier, as an active customer, as a DSO, or as any other system user.

Outcomes from the first phase

- The EC proposes to consider the existing flexibility resources as a consistent part of network expansion planning and considering demand response and storage with the same priority as generation in dispatching and re-dispatching procedures.
- Difficult to see any common well-established practice in Europe, meaning that the process is still under development.
- Use of market-based mechanisms whenever possible is underlined in several regulatory documents with reference to many network operative aspects, e.g. for the procurement of resources for ancillary services and congestion management.
- EC shows a very pragmatic approach on several critical issues, as for example ownership and operation of energy storage.
- The application of CBAs is put forward as a unified justification criterion to activate new investments. Development of common CBA guideline for TSOs provides a clear set of principles and procedures for performing combined multi-criteria and cost-benefit analysis using network, market and interlinked modelling methodologies for developing union-wide TYNDP. On DSOs side the practice seems to be much less standardized, with preference of multi-criteria approaches.
- In a 10-20 years' timeframe it is reasonable to suppose that TSOs will remain responsible for system balancing and congestion management in their respective networks, while DSOs could be allowed to deal with congestion in their own distribution network.



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Scalability and replicability of FlexPlan methodologies and tools

Andrei Morch

SINTEF Energy Research

T6.2 Definitions of scalability and replicability

Scalability is the ability of a system to maintain its performance (i.e., relative performance) and function, and retain all its desired properties when its scale is increased without having a corresponding increase in the system's complexity

Replicability denotes the property of a system that allows it to be duplicated at another location or time

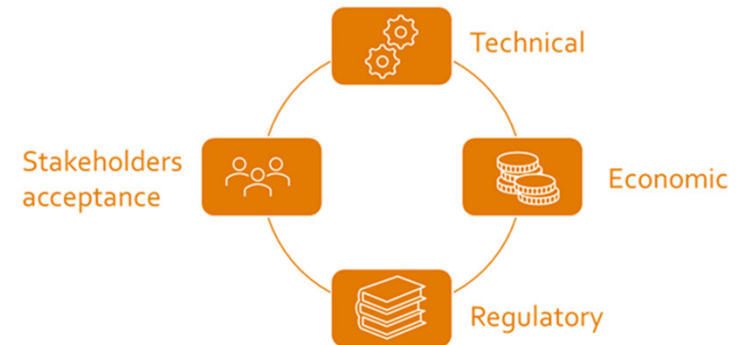
Comments:

- A system is understood as a set of interacting elements with similar boundary conditions
- The ability of a system to scale or/and replicate does not necessarily imply that the scaled-up system performs well
- Scalability is often design-dependent and that it must be tackled from the very beginning
- Scaling-up and replication might be interlinked, scalability and replicability are independent. The former is rather system dependent, whereas the latter depends on the expected change of the boundary conditions

T6.2 What makes a particular system scalable and replicable

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Although scalability and replicability of each system depends on specific factors, common and sufficiently generic factors should be sought



- **Technical factors** determine whether the solution developed in a particular project is inherently scalable and/or replicable, i.e., whether it is feasible to scale-up and/or to replicate.
- **Economic factors** reflect whether it is viable to pursue scaling up or replication.
- **Regulation and acceptance of stakeholders** such as end users, regulators, authorities, etc., reflect the extent to which the current regulatory and social environment is ready to embrace a scaled-up version of a project or whether a new environment is suitable for receiving a project.

T6.2 Examples of the factors

Area	Scalability	Replicability
Technical	Modularity Technology evolution Interface design Software integration Existing infrastructure	Standardization Interoperability Network configuration
Economic	Economy of scale Profitability	Macroeconomics Market design Business model
Regulatory	Regulation	Regulation
Stakeholder acceptance	Acceptance	Acceptance

Apart from the complexity of the solution itself, the software tools used to deploy it (e.g., simulation models, databases, etc.) need to be able to cope with the increased size.

Evaluation of replicability and scalability

We review separately two main outcomes of the project:

- The FlexPlan methodology i.e., combination of different methods and techniques assembled together in the project, allowing to make estimations of the optimal system expansion considering use of flexible resources.
- The FlexPlan tool i.e., project-specific implementation of the FlexPlan methodology in a set of software codes and data.
- NB! The main idea is to identify the main “showstoppers” and consider how they can be mitigated
- The preliminary results of the assessment



Microsoft Excel
Worksheet

The outcomes have a very strong position towards this factor	5
The outcomes have a somewhat strong position towards this factor	4
The outcomes have a neutral position towards this factor	3
The outcomes have a somewhat weak position towards this factor	2
The outcomes have a weak position towards this factor	1



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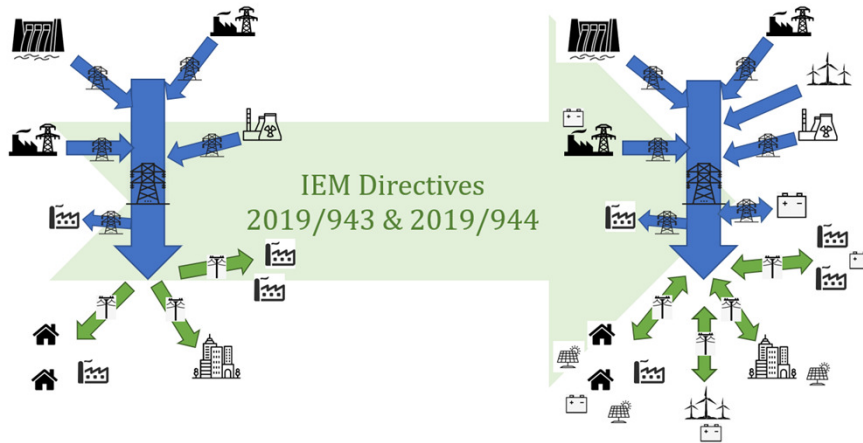
FlexPlan Final Worksop | 14th February 2023

Regulatory Guidelines

Dario Siface, Giorgia Lattanzio
RSE S.p.A.

A New Perspective

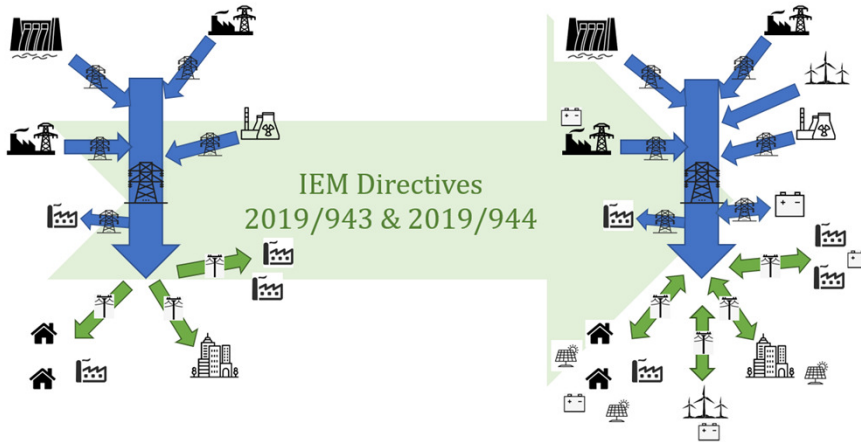
FlexPlan



FlexPlan is a research project part of the assessment of the evolution of Power Systems towards a larger involvement of distributed resources.

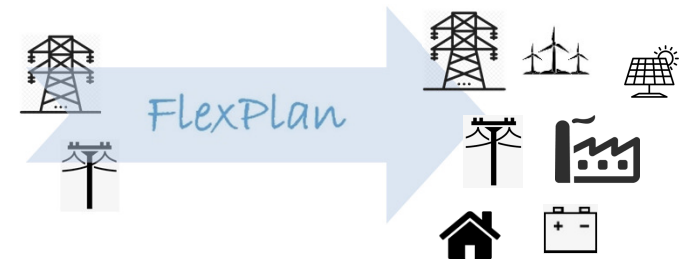
A New Perspective

FlexPlan



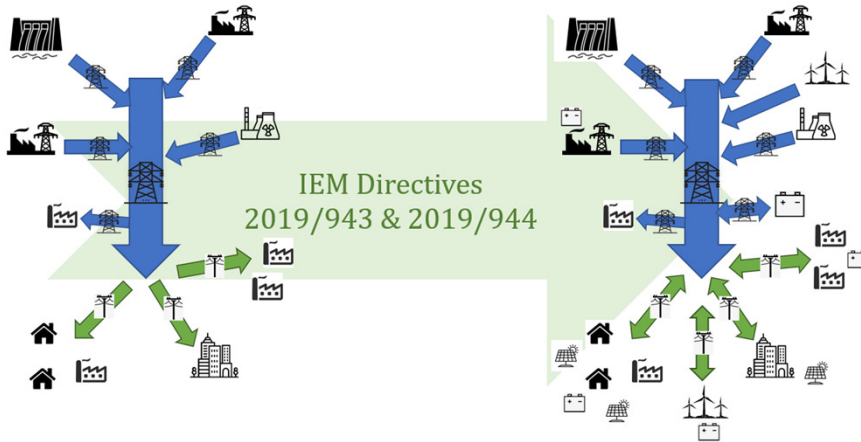
FlexPlan is a research project part of the assessment of the evolution of Power Systems towards a larger involvement of distributed resources.

It assesses the possibility to include investments on flexibility resources in synergy with investments on networks for long term planning.



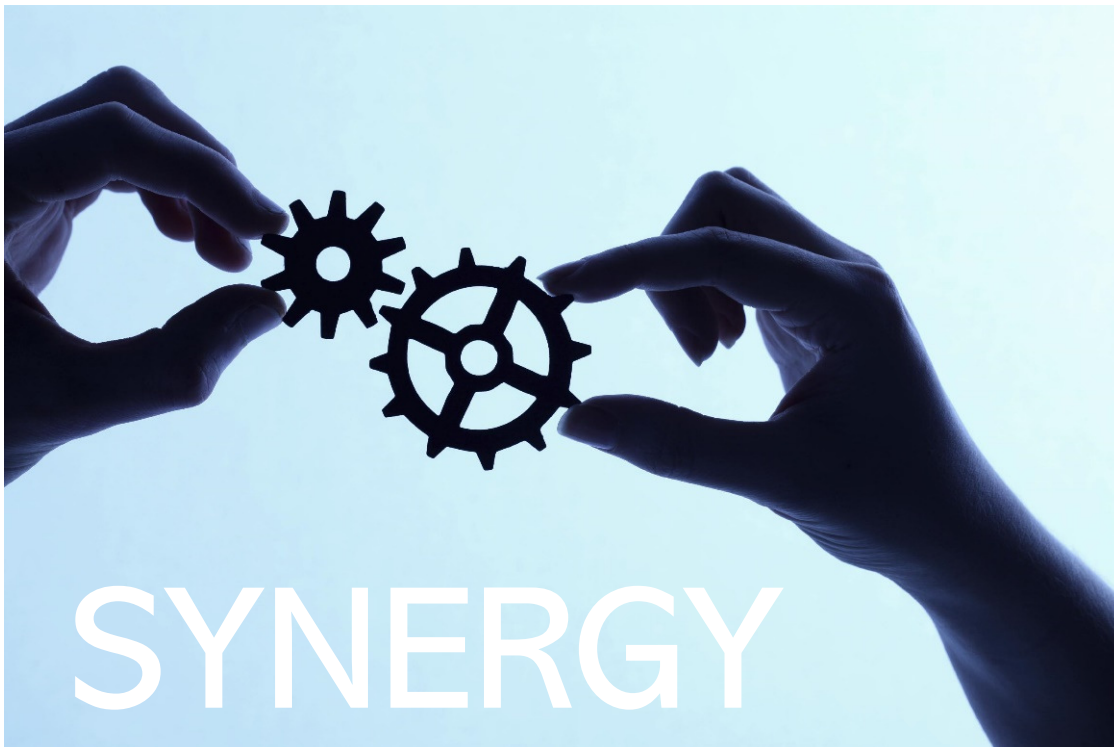
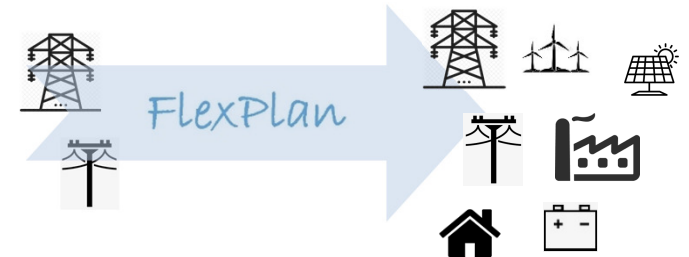
A New Perspective

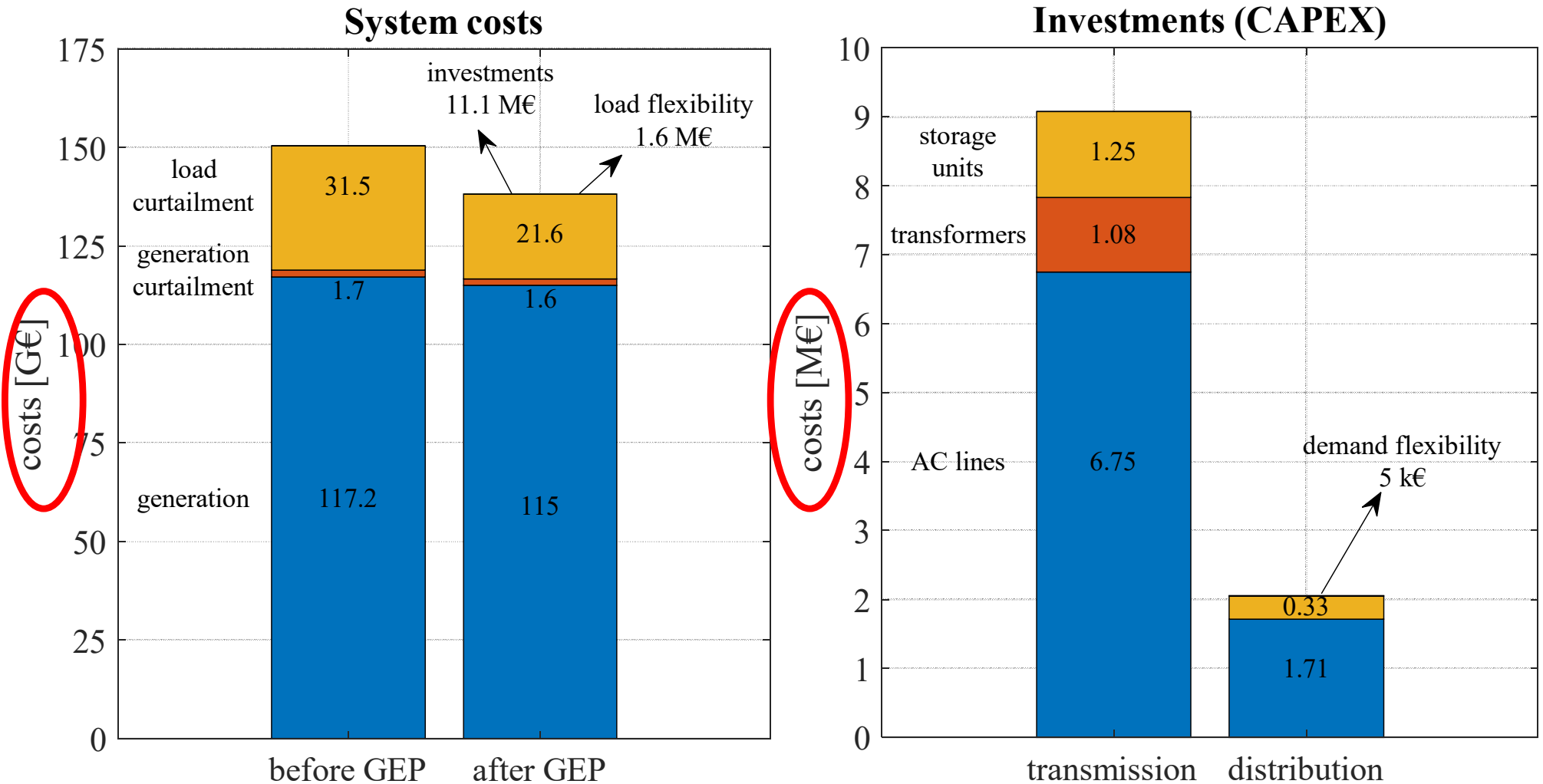
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It assesses the possibility to include investments on flexibility resources in **SYNERGY** with investments on networks for long term planning.

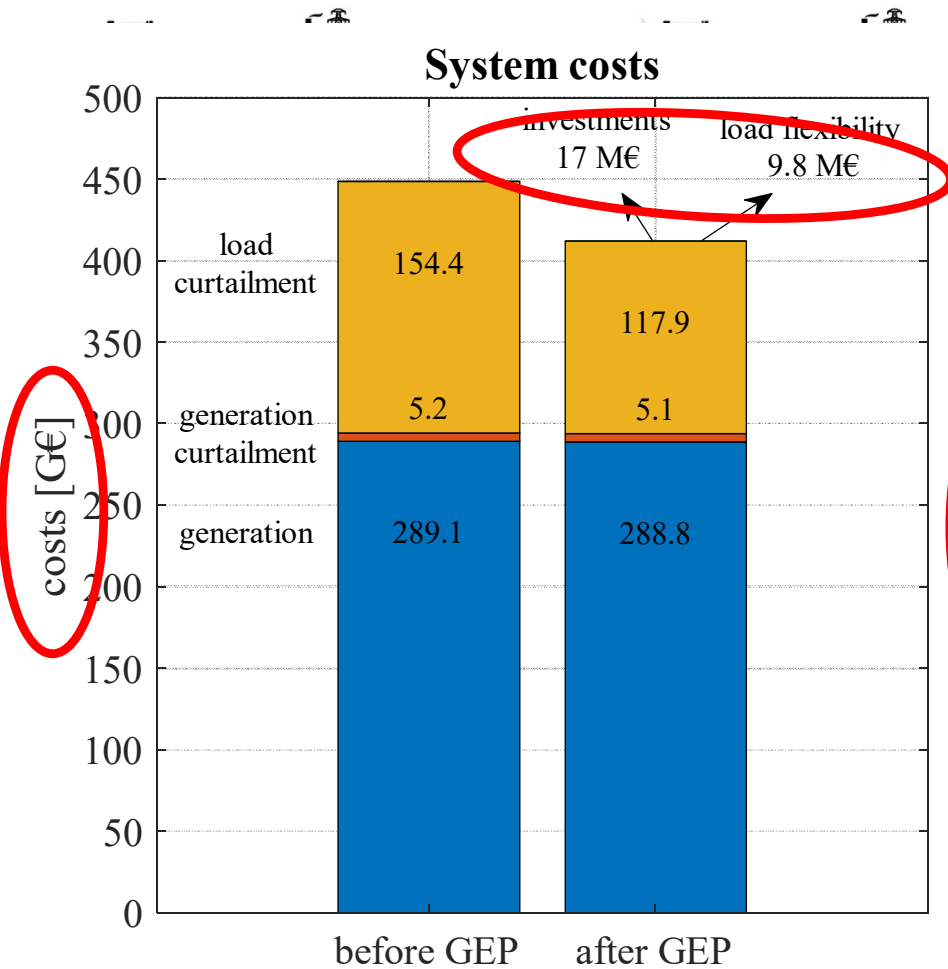




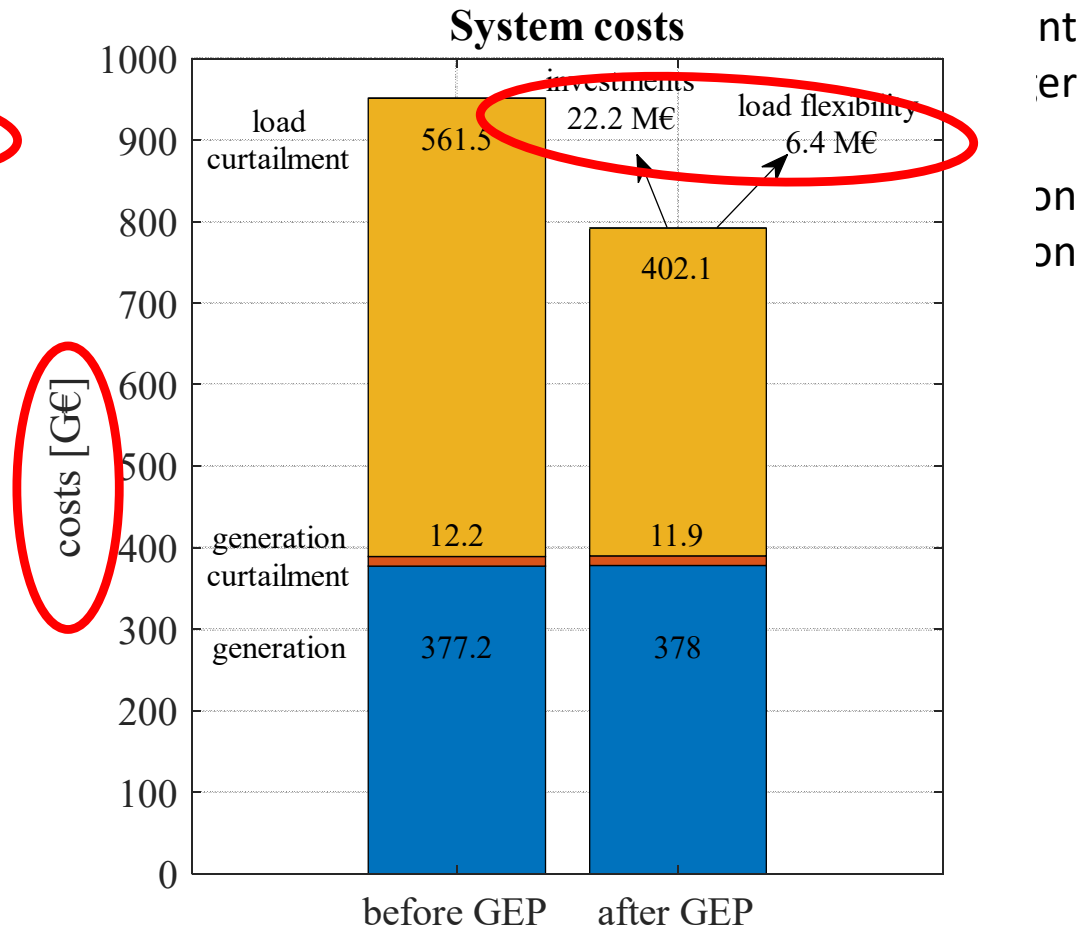
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A New Perspective

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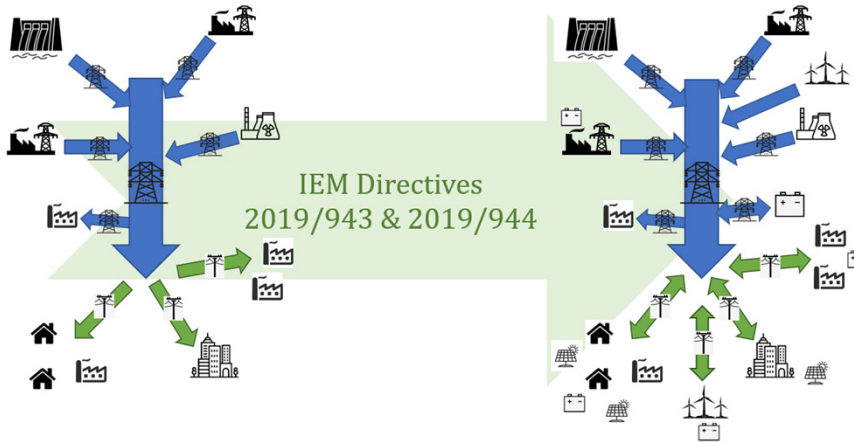
2040



2050

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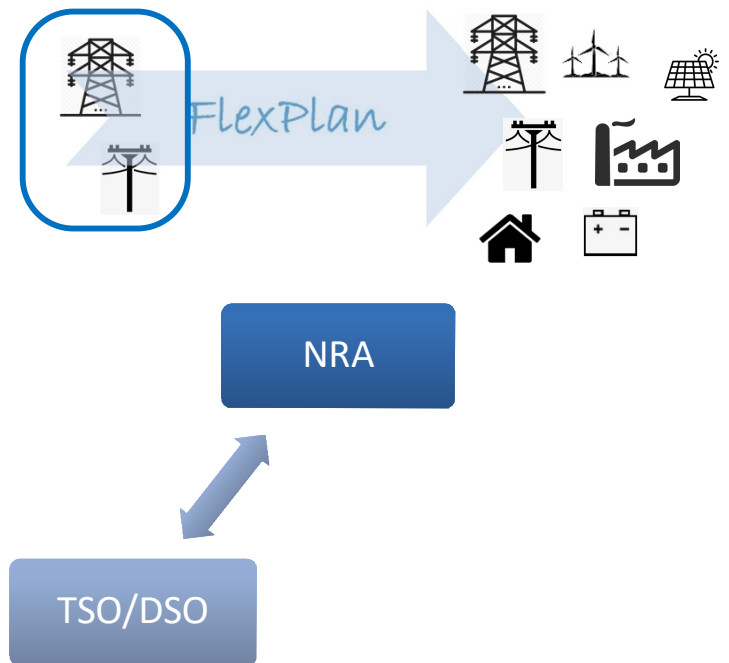
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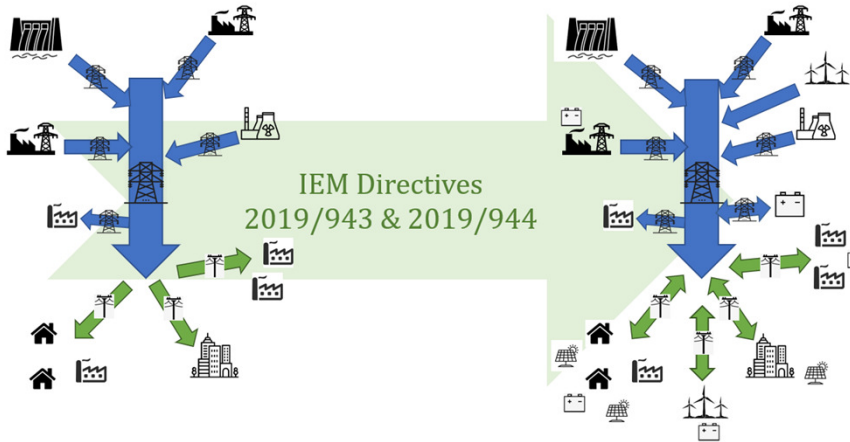
It assesses the possibility to include investments on flexibility resources in synergy with investments on networks for long term planning.

If in the present situations investment – under the control of NRAs – are only in charge to SOs,



A New Perspective

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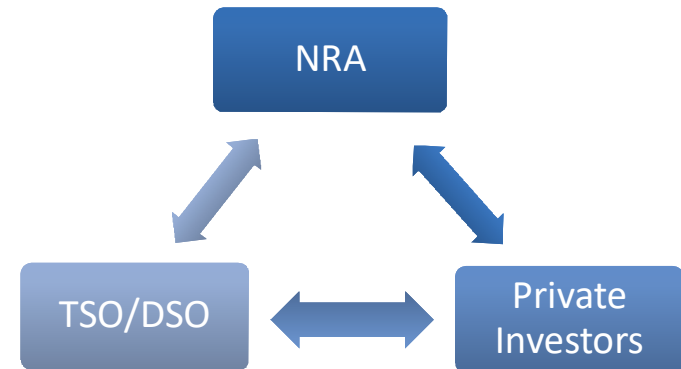
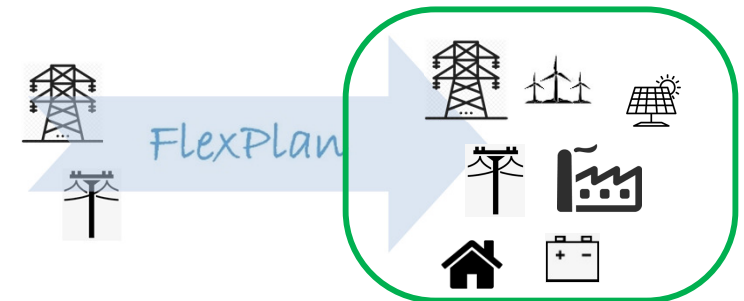


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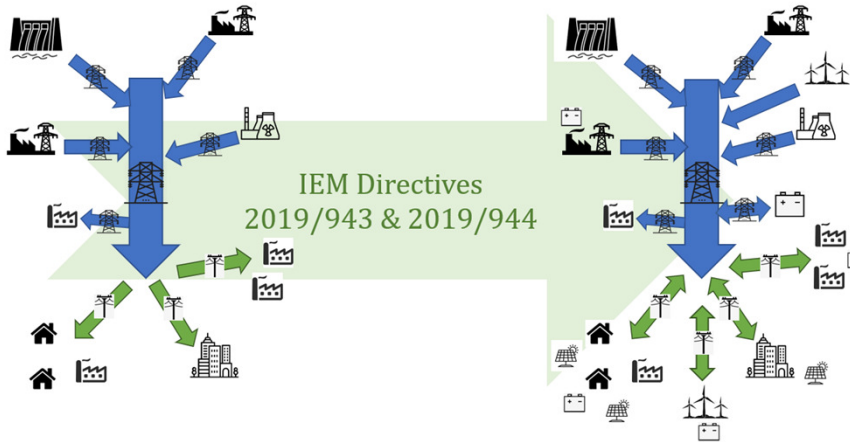
If in the present situations investment – under the control of NRAs – are only in charge to SOs, the desired future configurations will include also private investors – i.e. flexibility owners.

These new figures will have to interact both with SOs – to meet the real needs of the Power System – and with NRAs – to assess the goodness of the investments.



A New Perspective

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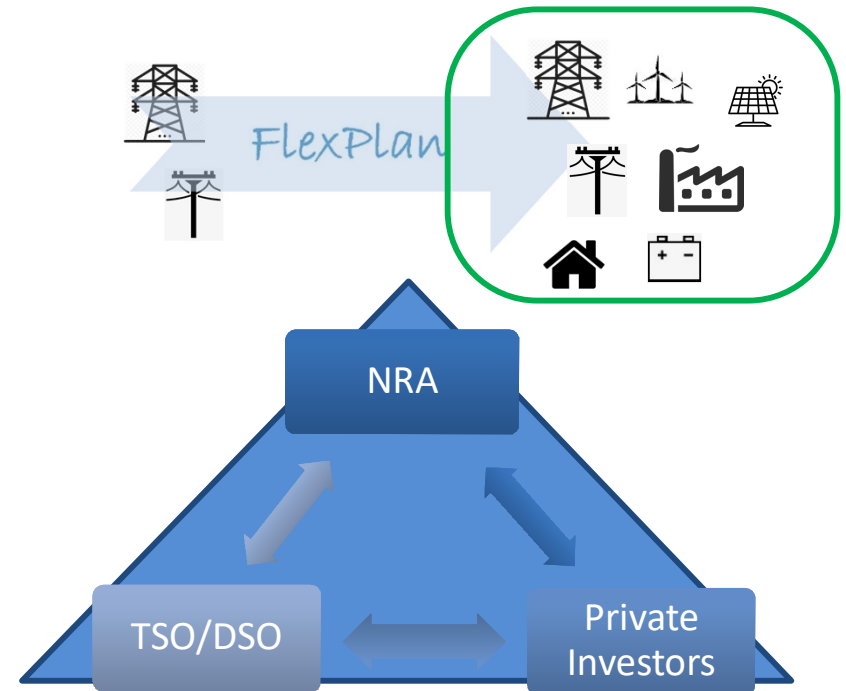
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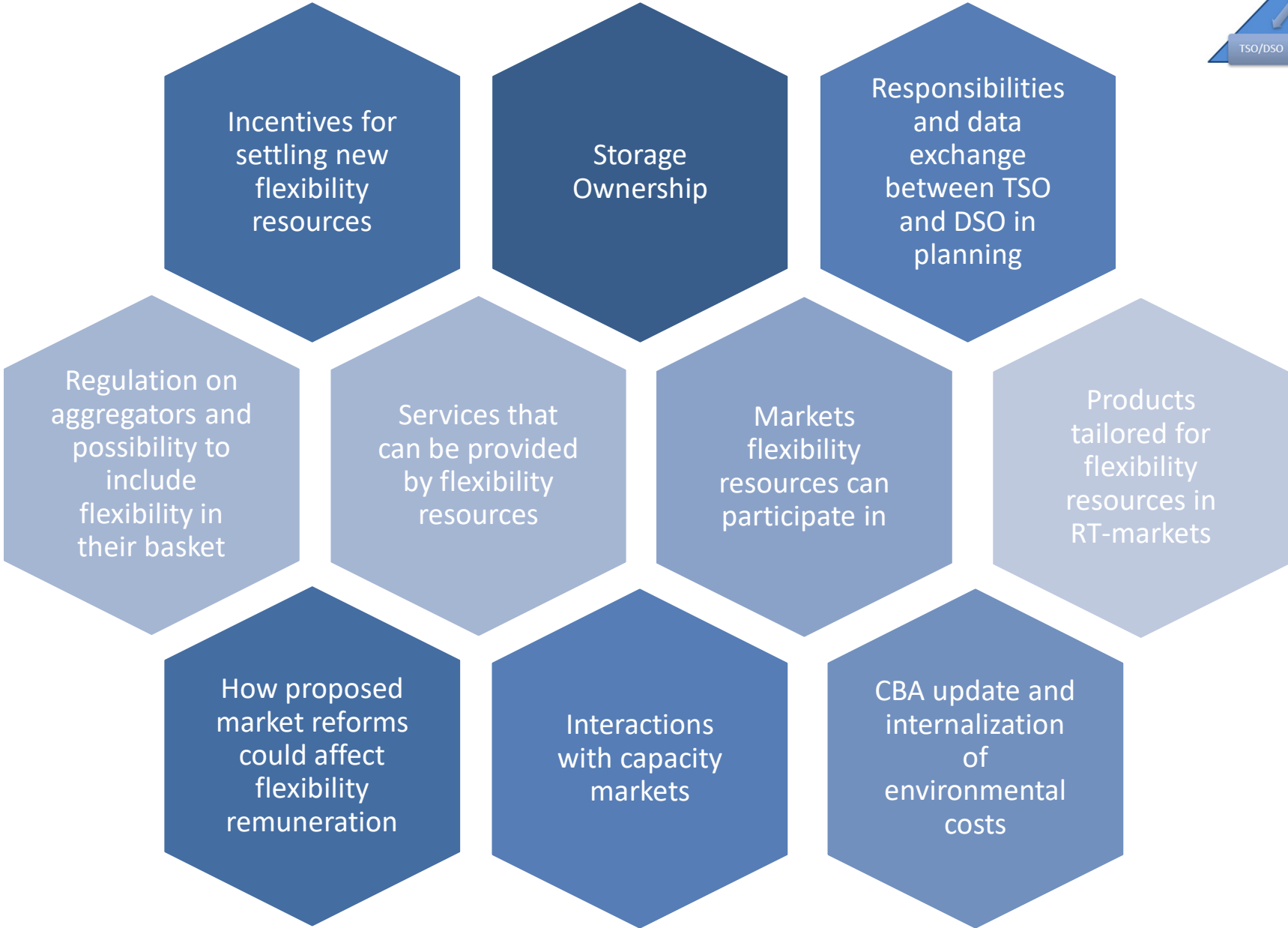
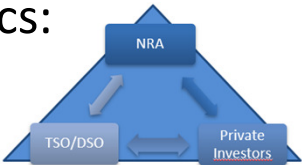
A new – more complex – “triangular” interconnection will have to be considered.



Preliminary thoughts for regulatory guidelines

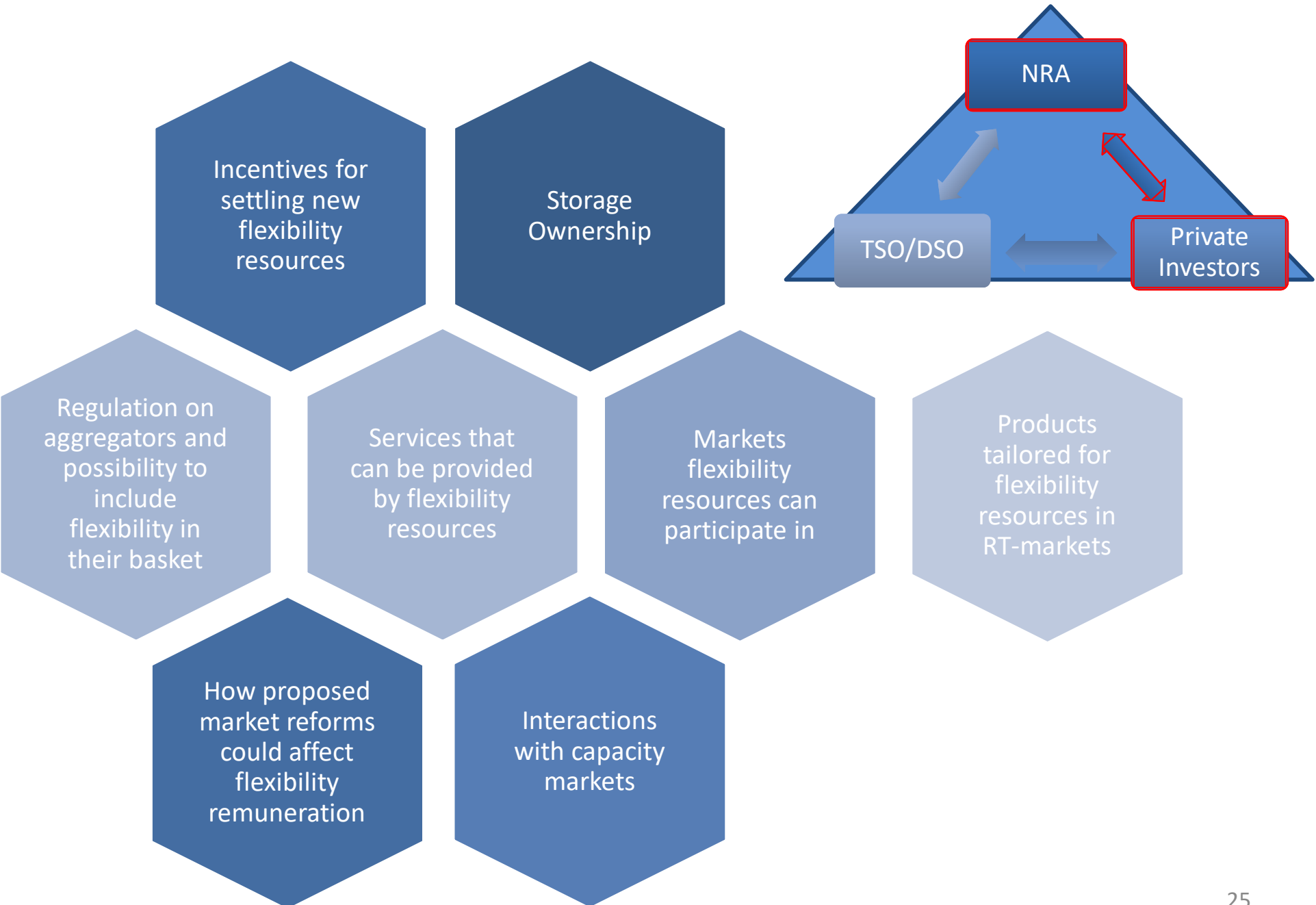
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FlexPlan proposes to analyse the regulatory guidelines considering 10 main topics:



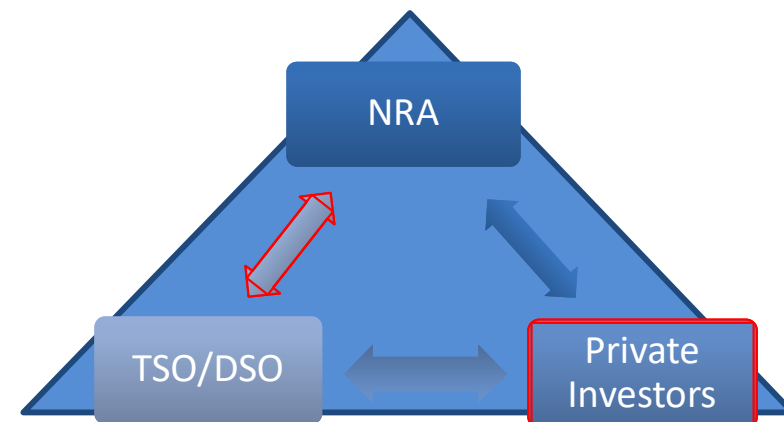
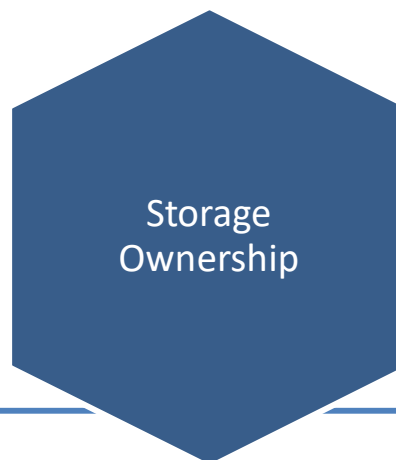
Preliminary thoughts for regulatory guidelines

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Preliminary thoughts for regulatory guidelines

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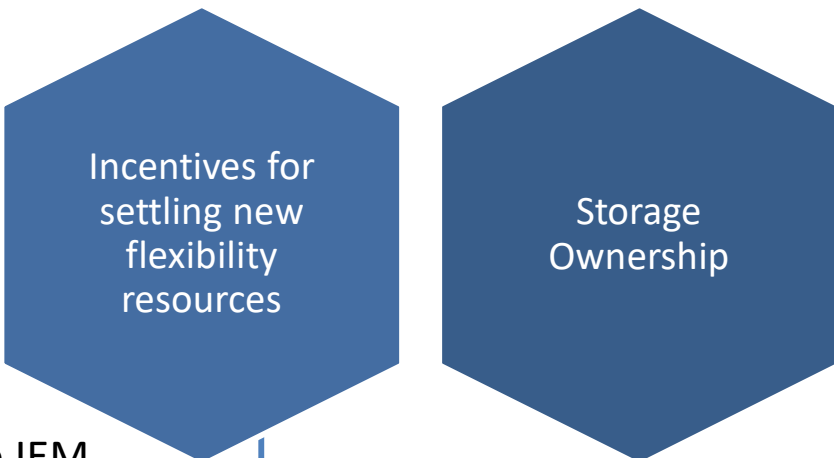
SOs are not allowed to own storage facilities according to IEM Directives.

To avoid conflict of interests and market distortion, private investors should be found.

Also “must-run” operation could be considered.

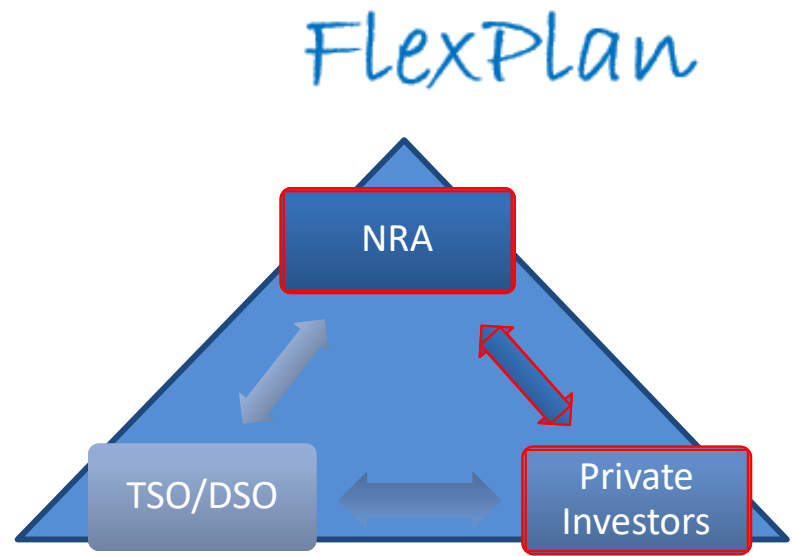
SOs ownership should be allowed only if strictly necessary (e.g. to prevent exercise of market power).

Preliminary thoughts for regulatory guidelines



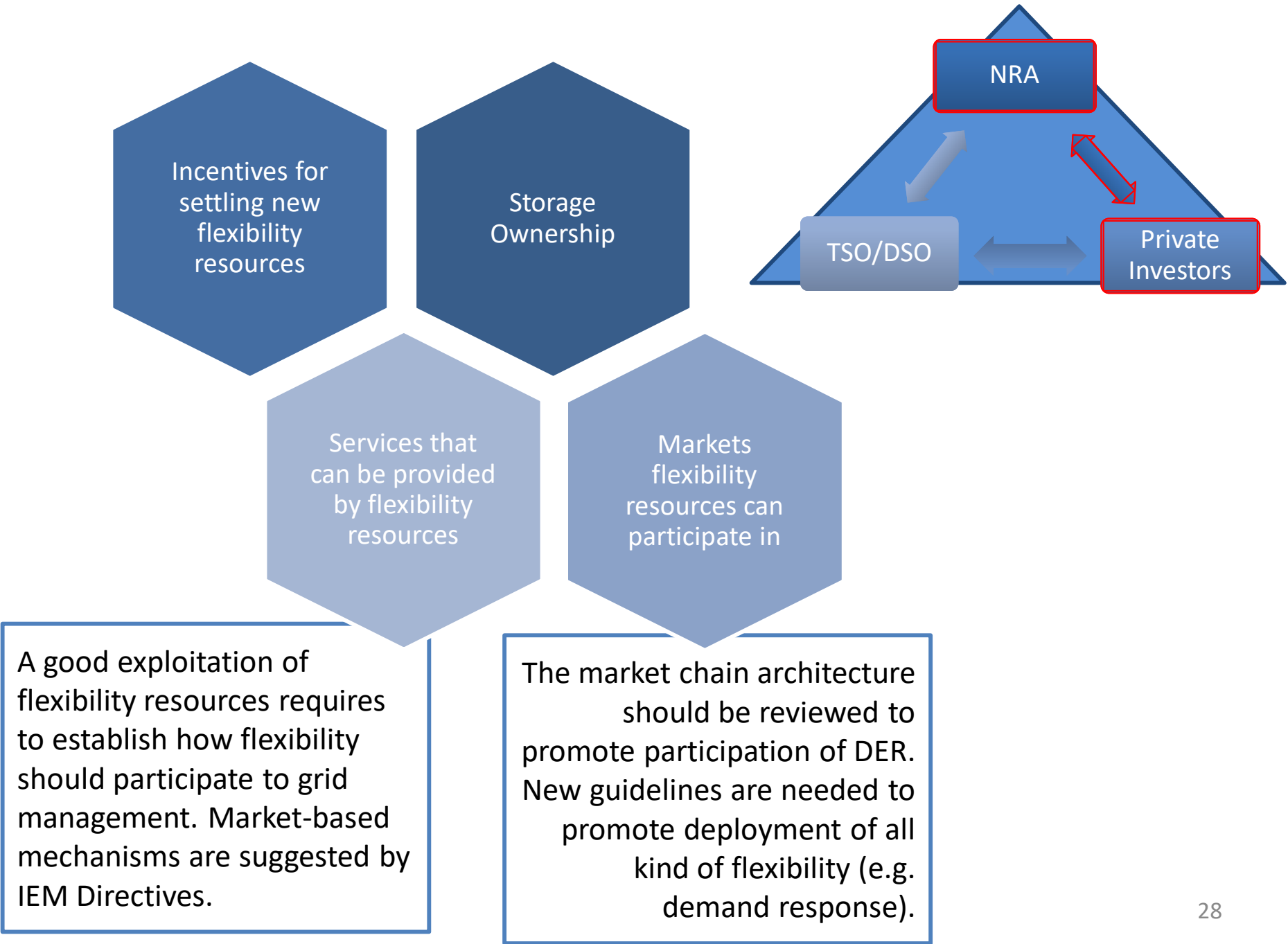
According to IEM Directives, flexibility should be valorised as a support to T&D grid planning.

Local economic signals would foster an optimal deployment of the new resources, while ensuring a proper remuneration of the new flexibility assets.



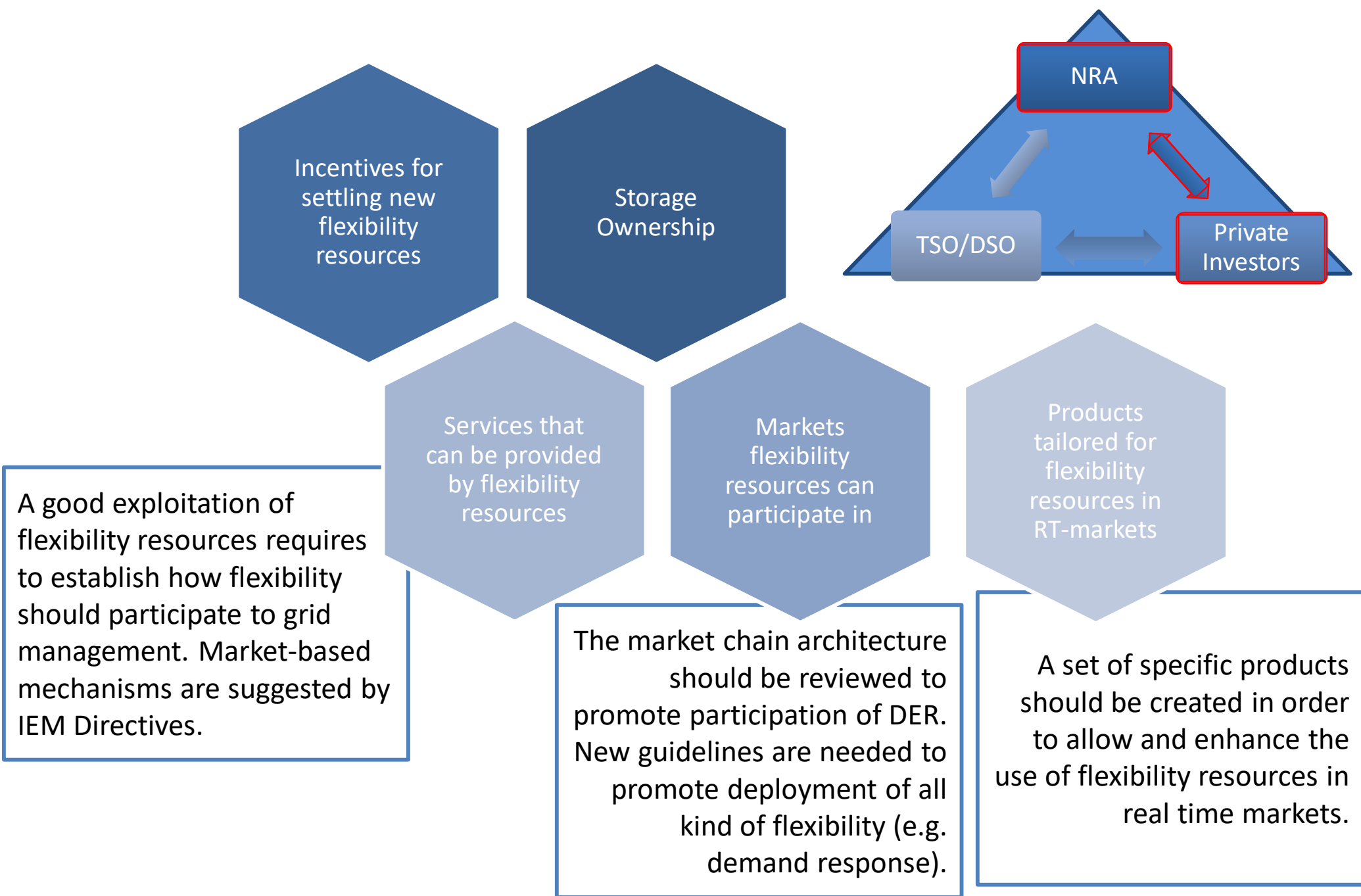
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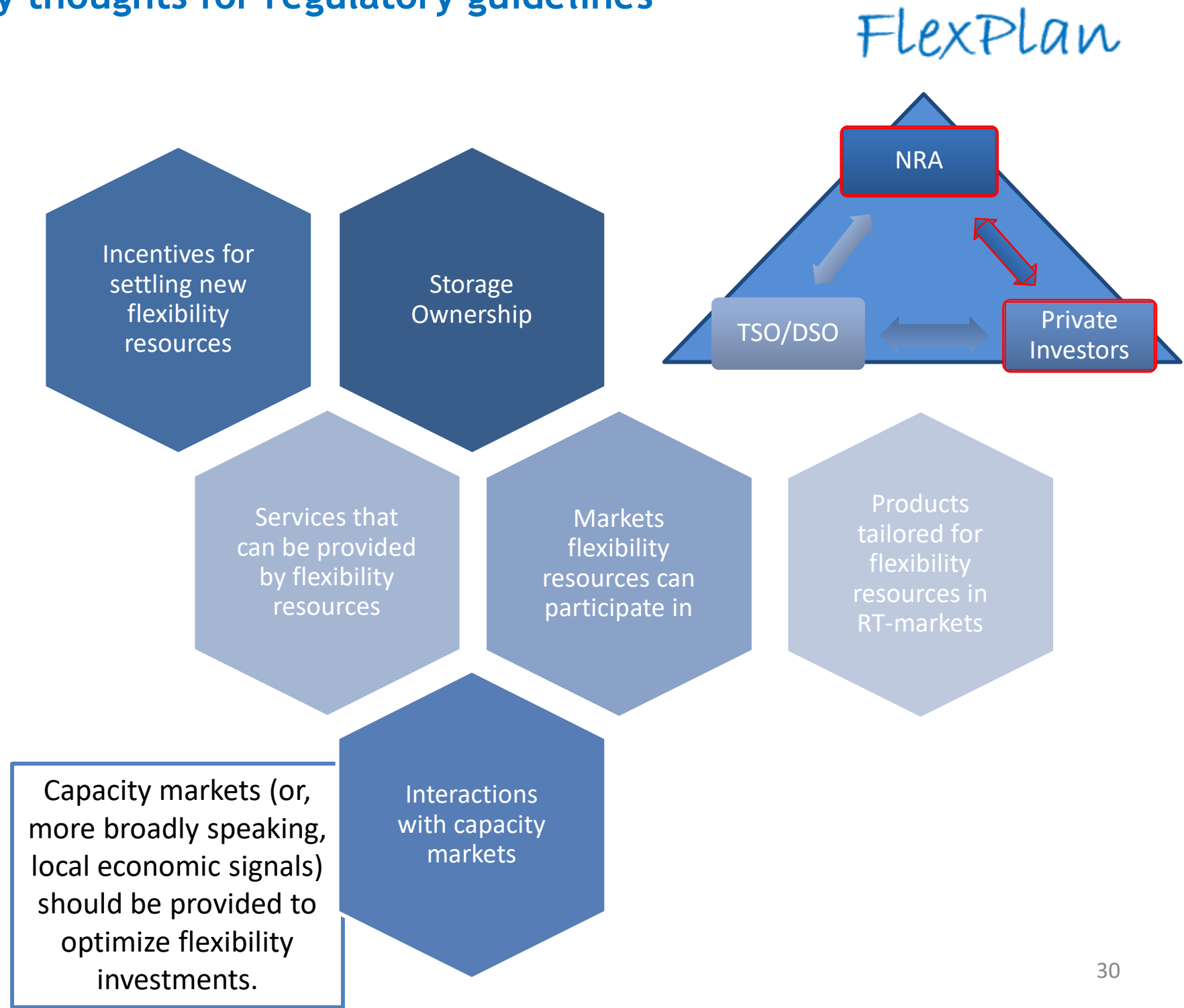


Preliminary thoughts for regulatory guidelines

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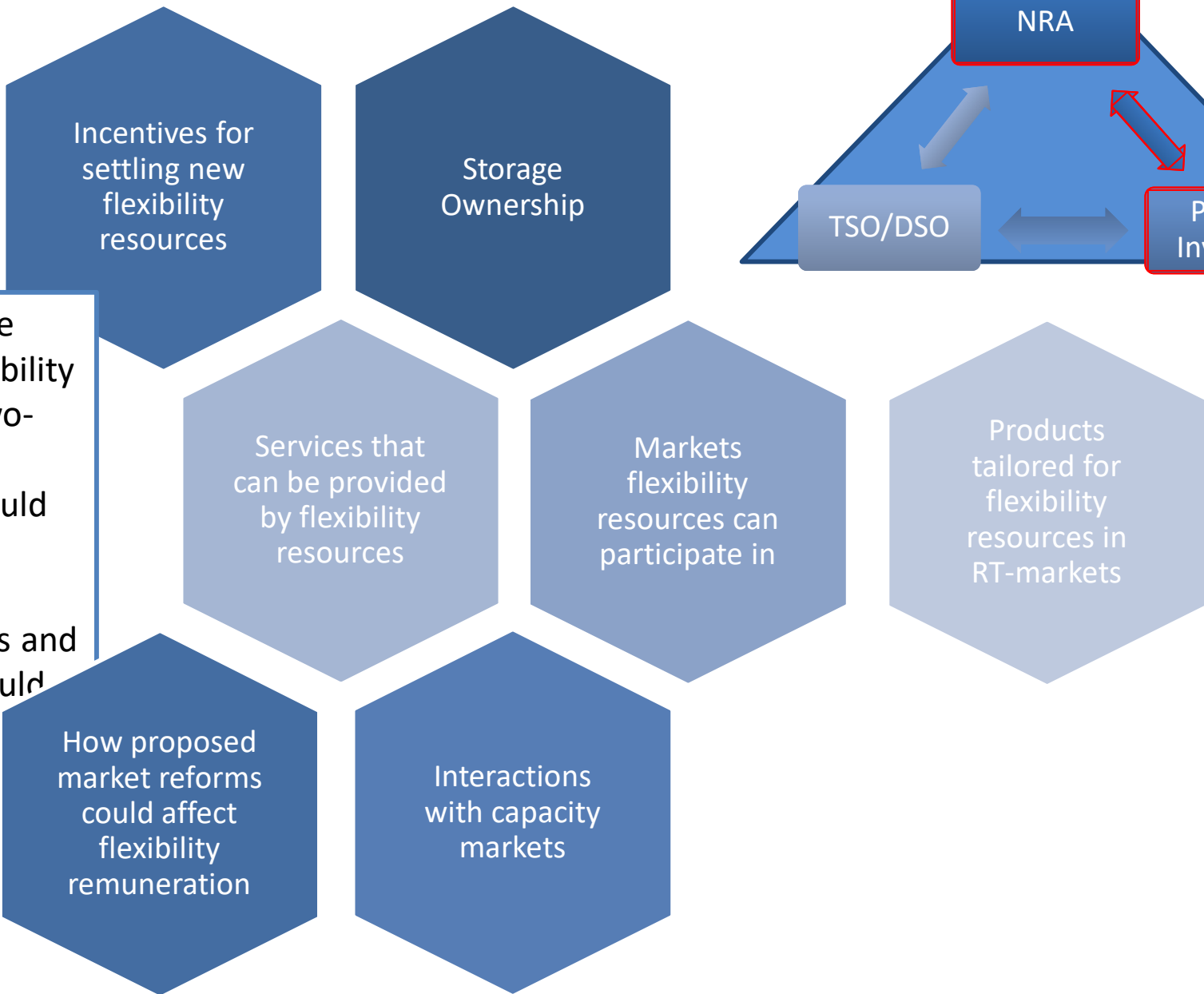
Preliminary thoughts for regulatory guidelines



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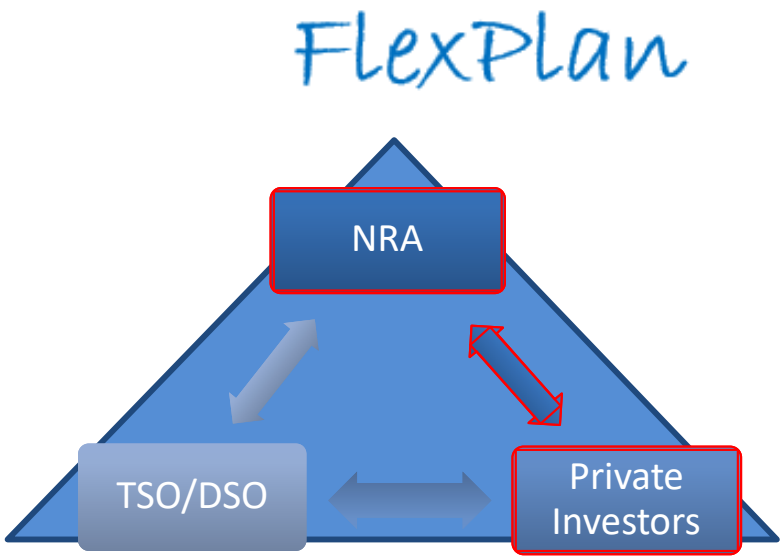
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Market reforms are investigated (possibility of price-caps or two-stage markets). These reforms should consider the deployment of flexibility resources and how their role should be remunerated.



Preliminary thoughts for regulatory guidelines

Aggregators represent a great potential for flexibility deployment. New rules must be defined to increase the attractiveness of flexibility service provision by these participants.



NRA

GUIDELINES

- ⇒ National Regulatory Authorities should translate the suitability of **deploying new storage or flexibility in strategic network locations** into **opportune incentivization tools** for potential investors.

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locational element (e.g. by setting up locational capacity markets) able to drive potential investors to **foster investments in critical nodes** (identified by SOs).

Possible drawback: regions with high potential for the exercise of market power.

Possible solutions

- combine market-based mechanisms for the procurement of flexibility with long-term contracts with a pre-established strike price, to disincentivize aggressive strategies
- establish a cap on bid prices
- SO bids the asset on behalf of the owner – “must-run” configuration (only extreme situations)

GUIDELINES

- ⇒ National Regulatory Authorities should translate the suitability of **deploying new storage or flexibility in strategic network locations** into **opportune incentivization tools** for potential investors.
- ⇒ Real time market should be reformed by **defining products that allow “flexibility” providers to compete with traditional resources on a “level playing field” basis**. Operative constraints of storage and demand side management should be fully considered.
- ⇒ A clarification on the nature of the services provided by these subjects could also **help the process of market reform** that is going on now, since it cannot be neglected that storage and DSM will be major players in the future provision of ancillary services to the System

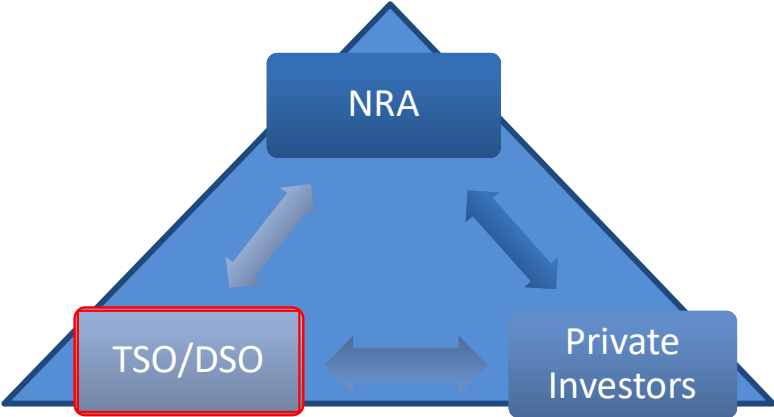
NRA

GUIDELINES

- ⇒ **Active use of Demand Response** – indicated by 2019/944 Directive – still shows a **lack of a comprehensive regulatory framework**. There are significative expectations from the forthcoming Network Code for Demand Response, since the ACER's Framework Guideline for the Code creates, among the other things, a logical connection between network development planning as described in Art.32 and demand response, as an alternative to system expansion.

GUIDELINES

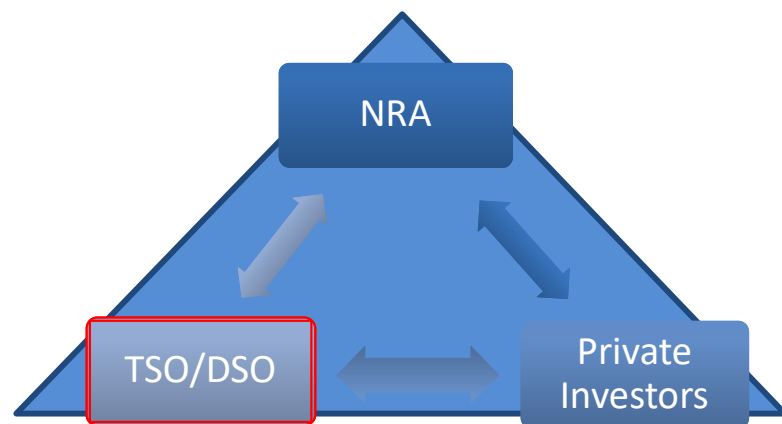
- ⇒ **Active use of Demand Response** – indicated by 2019/944 Directive – still shows a **lack of a comprehensive regulatory framework**. There are significant expectations from the forthcoming Network Code for Demand Response, since the ACER's Framework Guideline for the Code creates, among the other things, a logical connection between network development planning as described in Art.32 and demand response, as an alternative to system expansion.
- ⇒ The role and responsibilities of **aggregators** should be accurately designed within the redefinition of real-time market architectures. By the FlexPlan "vision", they **should act by compensating positions with opposite risk exposures among the aggregated resources**, thus favouring real-time markets operation. However, there should be **solid business opportunities** for this figure, without which no real subject, even in presence of a specific regulation, will ever volunteer to take such responsibility.



Responsibilities and data exchange between TSO and DSO in planning

Cooperation between TSO and DSO must be strengthened.

Planning procedures should be modified to favor the deployment of flexibility resources, also keeping in mind TSO-DSO cooperation for acquiring resources from distribution.



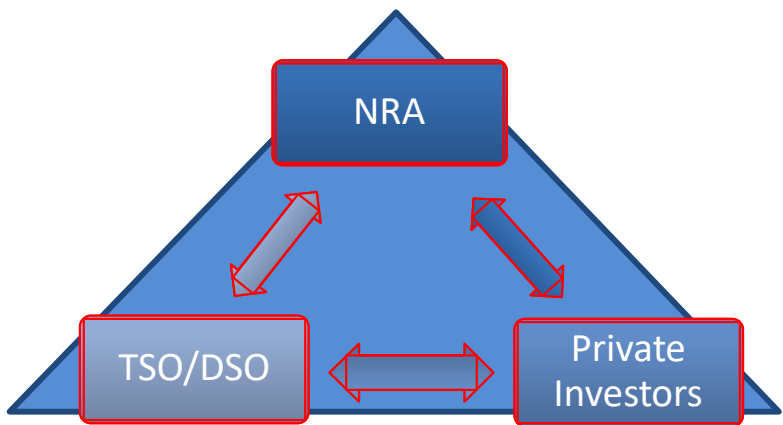
GUIDELINES

- ⇒ **A fully integrated T&D planning, it is not reasonable** due to the numerical complexity of the optimization problem and the legal implications of a complete data sharing, even between SOs
- ⇒ **Coordinated approach** by means of an **exchange of data at the border** between different systems, **allowing DSOs**, in case advantageous for the system, **to oversize their network to get fit to provide services to transmission.**

T&D decomposition approach proposed by FlexPlan can be a good starting

Preliminary thoughts for regulatory guidelines

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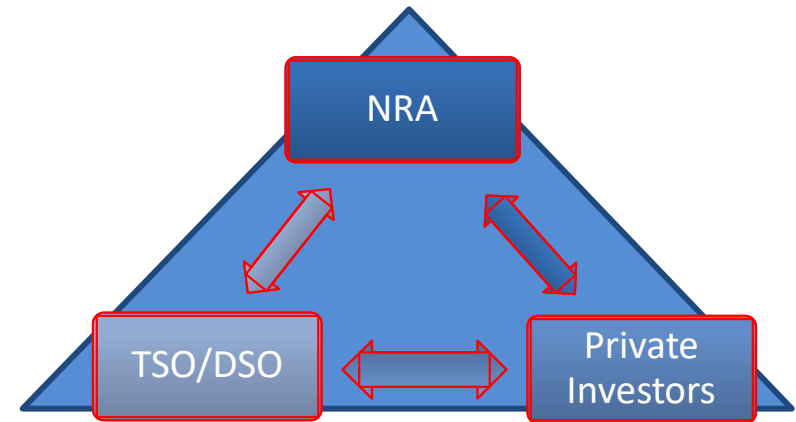


Cost-benefit analysis must take into account positive effects of flexibility resources (monetized and not-monetized effects). Importance must be given to GHG and other pollutant reduction.



Preliminary thoughts for regulatory guidelines

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GUIDELINES

- ⇒ Cost-benefit analysis must take into account positive effects of flexibility resources. Key importance must be attributed to GHG and other pollutant reduction. **Environmental aspects should be put in monetary terms so that they can be co-evaluated with more traditional ones (social welfare, etc).**

CBA update and
internalization
of
environmental
costs

Thank you...

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RESERVE SLIDES

Technical Factors: Scalability

Scalability		
Factor	Methodology	The tool
Modularity	How easy it is to add new components or whether there are limits on adding components?	Does the tool have a modular architecture?
Technology evolution	Can we expect significant improvement of computational power/time?	Can we expect significant improvement of computational power/time?
	Can we expect significant improvement of the applied mathematical methods and techniques?	Can any residing technology become obsolete?
	Does the methodology depend upon other technologies e.g. telecommunications?	Does the tool depend upon other technologies e.g. telecommunications?
Interface design	NA	Does the interface design e.g. interaction between different components (internal and external) limit upscaling of the tool?
Software integration	NA	To what extent the performance of software tools is affected when the solution size increases?
Existing infrastructure	NA	Is there any existing infrastructure, which may limit the maximum scale for deployment of the tool?

Technical Factors: Replicability

Replicability		
Factor	Methodology	The tool
Standardisation	Are there any country-specific standards, which may create obstacles in deployment of the methodology in another country?	Are there any country-specific standards, which may create obstacles e.g. imbalance settlement periods, grid models etc.?
Interoperability	Are there any limitations on interoperability with methods used in other countries? (CBA rules)	To what extent are solutions and their components/functions interoperable or even plug-and-play?
Network configuration	Are there any elements which are given and cannot be changed e.g. climate, temperatures, terrain conditions, generation mix) which are limiting for replication of the methodology?	Are there any elements which are given and cannot be changed e.g. climate, temperatures, terrain conditions, generation mix) which are limiting for replication of the tool?

Economic factors: Scalability

Scalability		
Factor	Methodology	The tool
Economy of scale	Internal factors:	Internal factors: What is the cost function for using the tool e.g. linear or exponential?
	External factors	External factors: What is the cost function for external costs e.g. linear or exponential? (collection of data, updating of grid models)
Profitability	To what extent benefits grow when increasing the solution size? (e.g. increasing size of the system vs. optimal solutions)	To what extent the benefits grow when increasing the solution size?

Economic factors: Replicability

Replicability		
Factor	Methodology	The tool
Macroeconomics	To what extent can national taxes, CO2 charges, interest rates, support schemes limit replication of the methodology?	? To what extent can national taxes, CO2 charges, interest rates, support schemes influence replication of the tool?
Market design	How dependent is replication of the tool upon national variations of market design (definition of products, services and bids) including roles and responsibilities?	? How dependent is replication of the tool upon national variations of market design (definition of products, services and bids) including roles and responsibilities?

Regulatory factors: Scalability and Replicability

Scalability			Replicability		
Factor	Methodology	The tool	Factor	Methodology	The tool
Regulatory	To what extent regulatory factors may influence the size of the deployment? (e.g. limitations on access to data)	? To what extent regulatory factors may influence the size of the deployment? (e.g. limitations on access to data)	Regulatory	To what extent regulatory factors may influence replication in another country? (e.g. limitations on access to data, roles and responsibilities)	To what extent regulatory factors may influence replication in another country? (e.g. limitations on access to data, roles and responsibilities)
	Is it necessary to change the existing roles and responsibilities?	Is it necessary to change the existing roles and responsibilities?			

Stakeholder acceptance: Scalability and Replicability

Scalability		
Factor	Methodology	The tool
Acceptance	To what extent the methodology support increased number of users?	Which stakeholders like regulators, policy makers and end users are ready to embrace an enlarged project?

Replicability		
Factor	Methodology	The tool
Acceptance	To what extent the user acceptance problems can be expected?	To what extent the user acceptance problems can be expected?
	To what extent the methodology has to be modified to be accepted in a different country?	To what extent the methodology has to be modified to be accepted in a different country?