Copper Alliance

In partnership with ECOFYS

Flexibility tracker - update

October 2016

Flexibility tracker in short

Checklist of about 80 questions checking how ready is a system to embrace near 100% renewables.

Outputs:

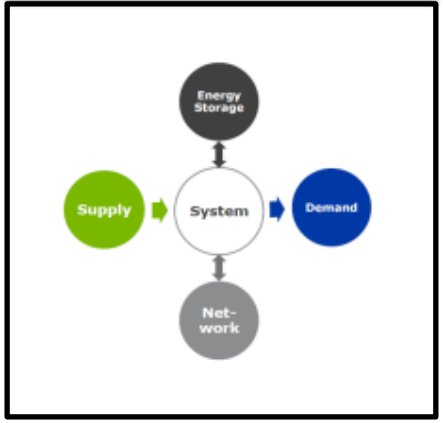
- **Summary score**
- **Benchmarks**
- **High-level action plan**

Singularity:

- it takes a **long-term & progressive perspective**
- it looks at **all opportunities** for flexibility, from 5 components (supply, demand, grids, storage, market design)
- it strikes a **balance between long-term vision and detail**

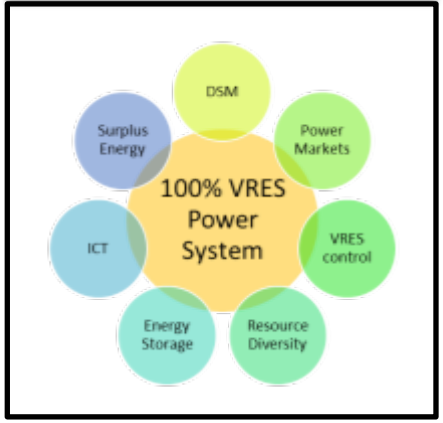
A project in 3 steps

Mapping Flexibility Options



http://j.mp/flexreport
(phase 1)

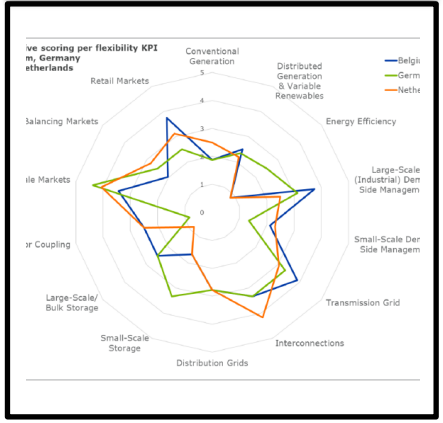
Roadmap for near 100% RE



http://j.mp/flexroadmap
(phase 2)

Webinar

Flexibility tracker

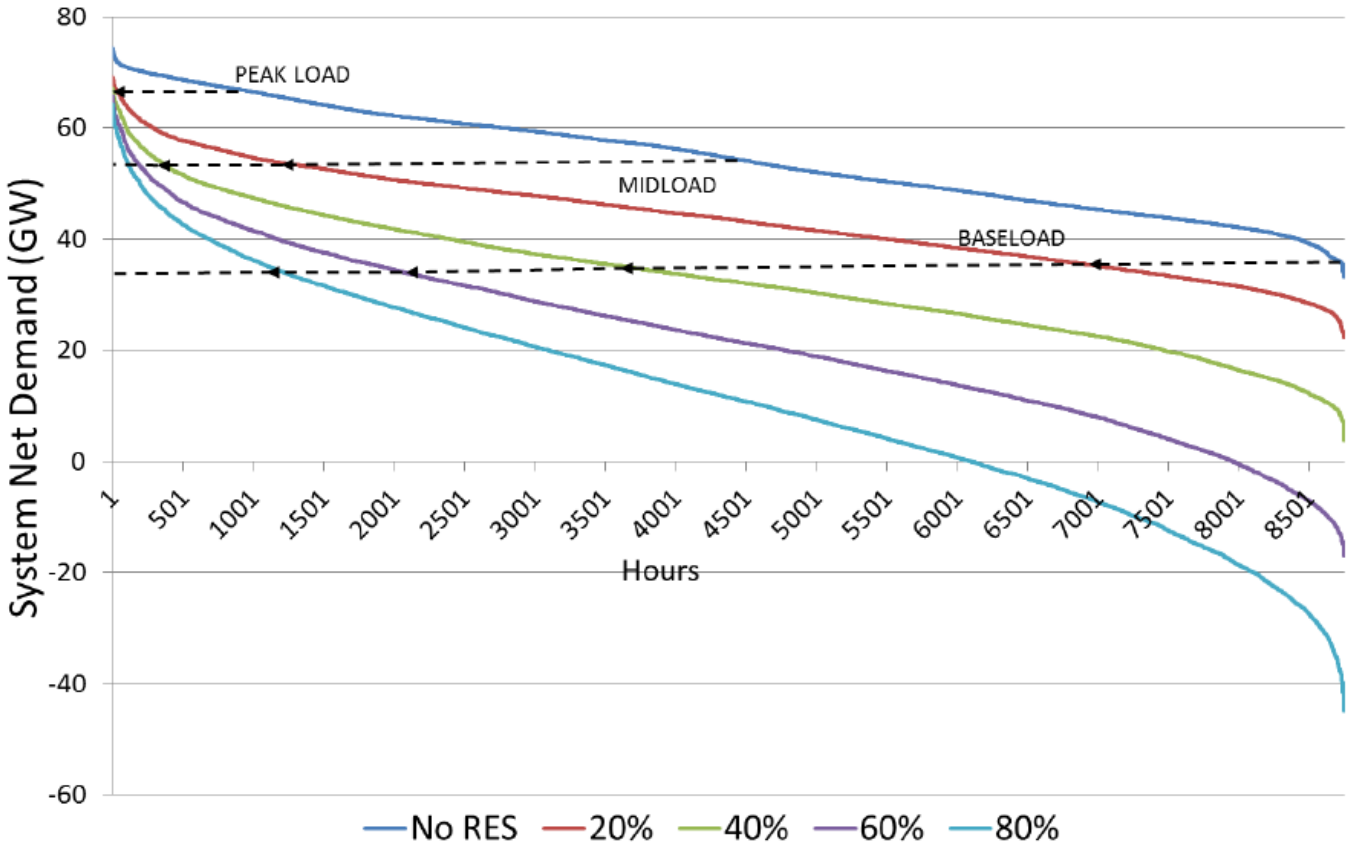


Ongoing
(phase 3)

Why flexibility is needed?

Residual load curve pushed downwards

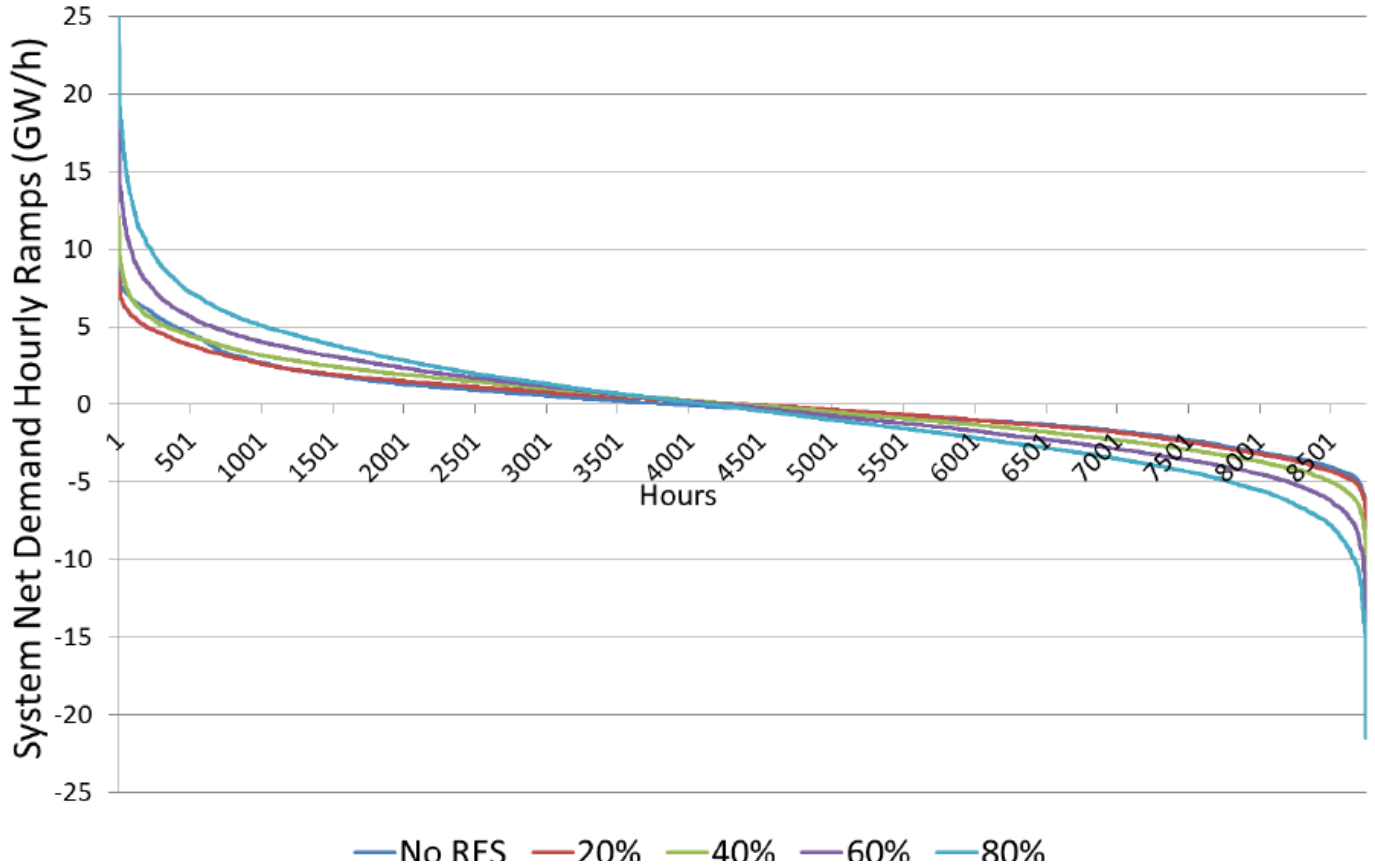
Reduced full load hours for conventional technologies



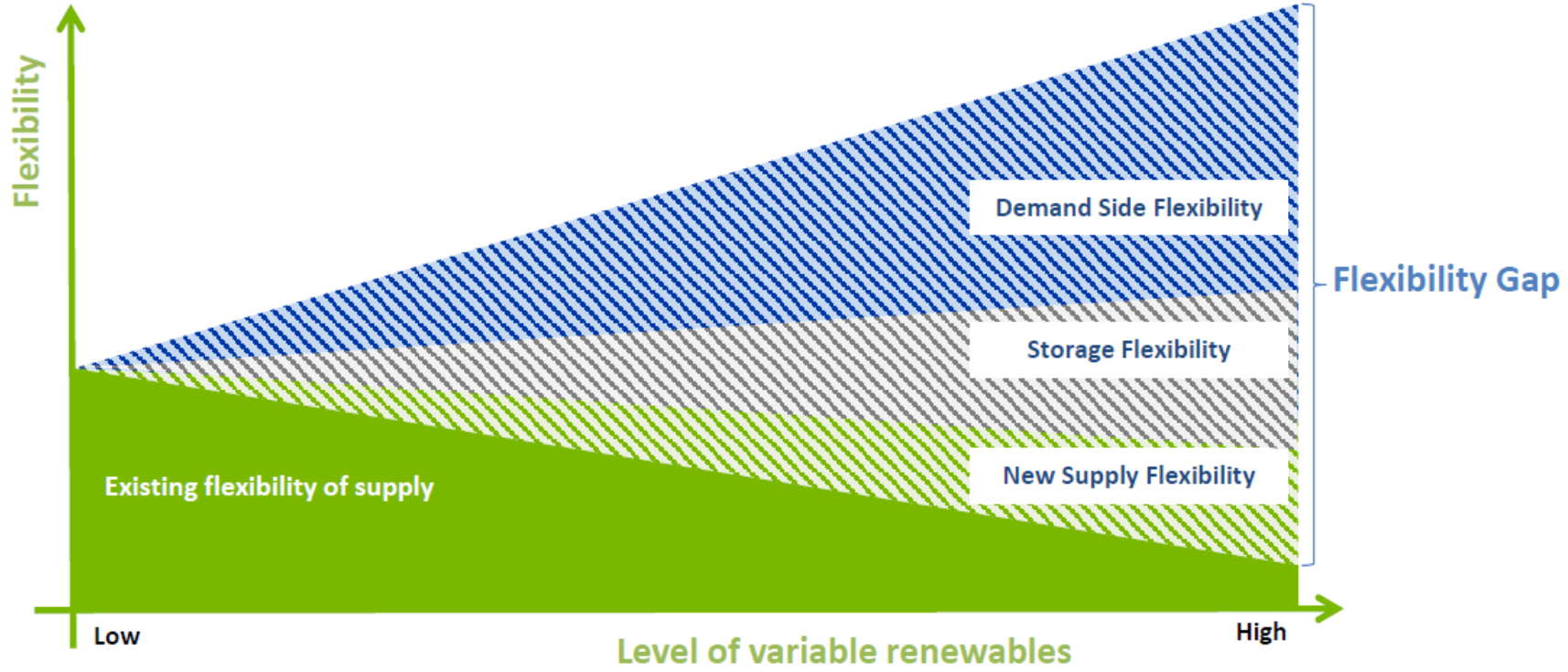
Why flexibility is needed?

Residual load ramps increase with higher VRES shares

Increased need for flexibility



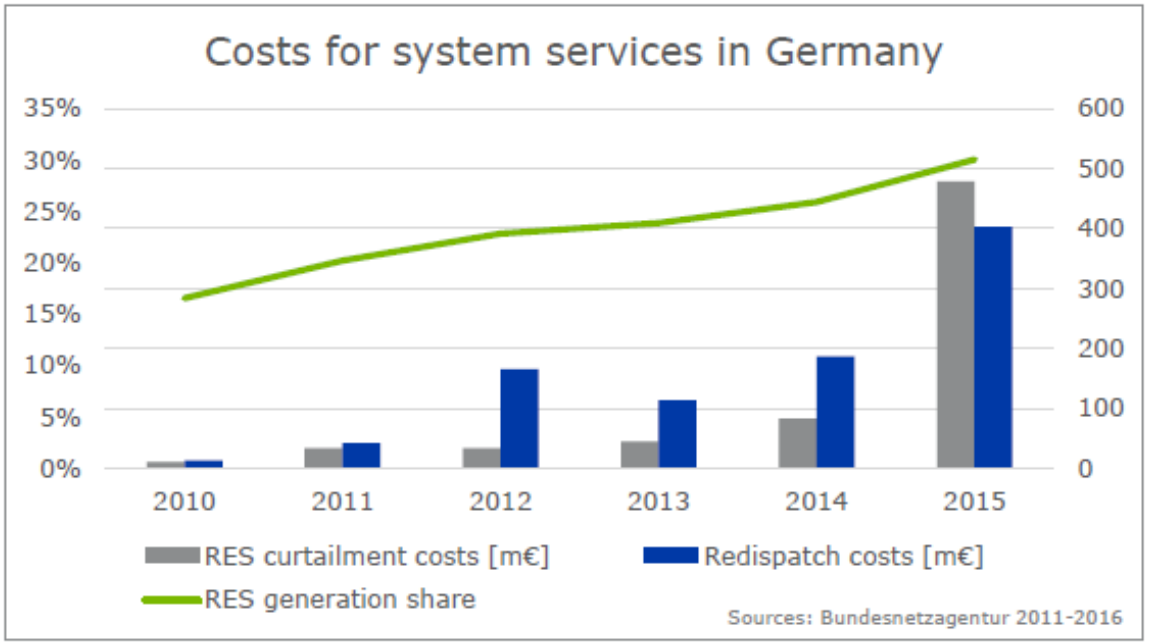
Why flexibility is needed?



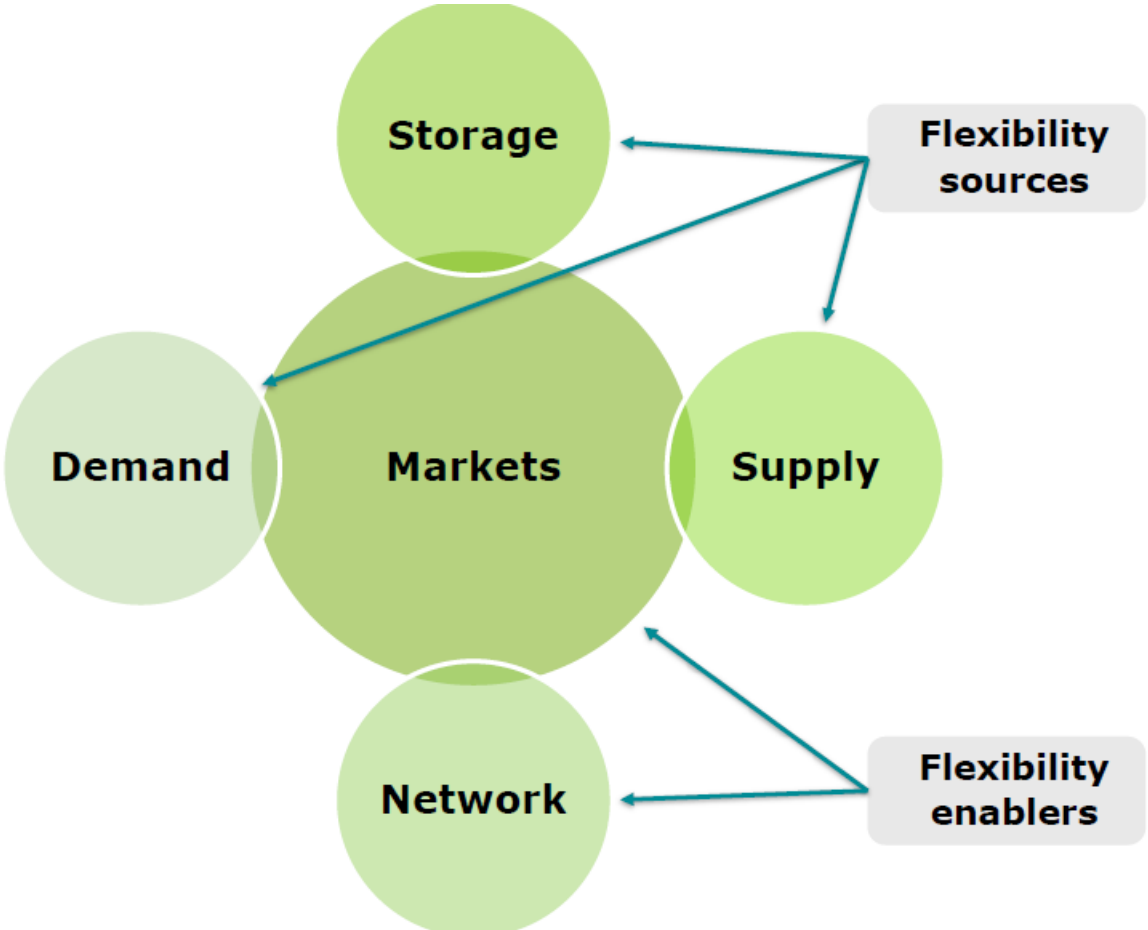
Existing flexibility measures and signs of inflexibility

Historic measures mainly on the supply side

Signs of inflexibility: frequency excursions, RES curtailment, high redispatch, negative prices..



1st phase – Mapping flexibility options



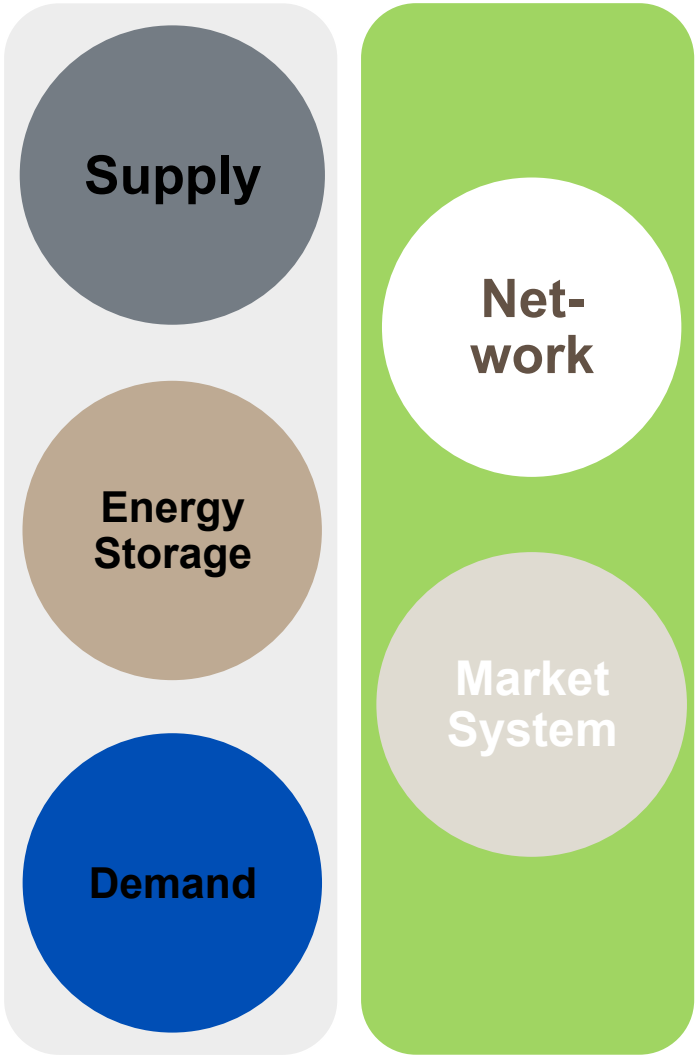
Overview of flexibility options

1. Flex Coal, 2. Gas
3. Oil, 4. Biogas,
5. CHP, 6. Nuclear
7. VRES

8. Pump storage,
9. (AA-)CAES
10. Flywheels
11. Batteries
12 Hydrogen (Power to Gas)

13. Demand Response
- Energy intensive industries
- Services
- Smart applications

14. Electric vehicles
15. Heat pumps
16. Resistance heating



17. Network expansion (Installation of lines)
- Add transmission capacity (HVAC /HVDC)
- Increase meshing, alleviate congestions

18. Power flow control (“smart“ devices)
- Flow control devices PST, FACTS, HVDC

19. Market Rules
20. Market integration:
- Expansion of markets
- Expansion of control zones

http://j.mp/flexreport
(phase 1)

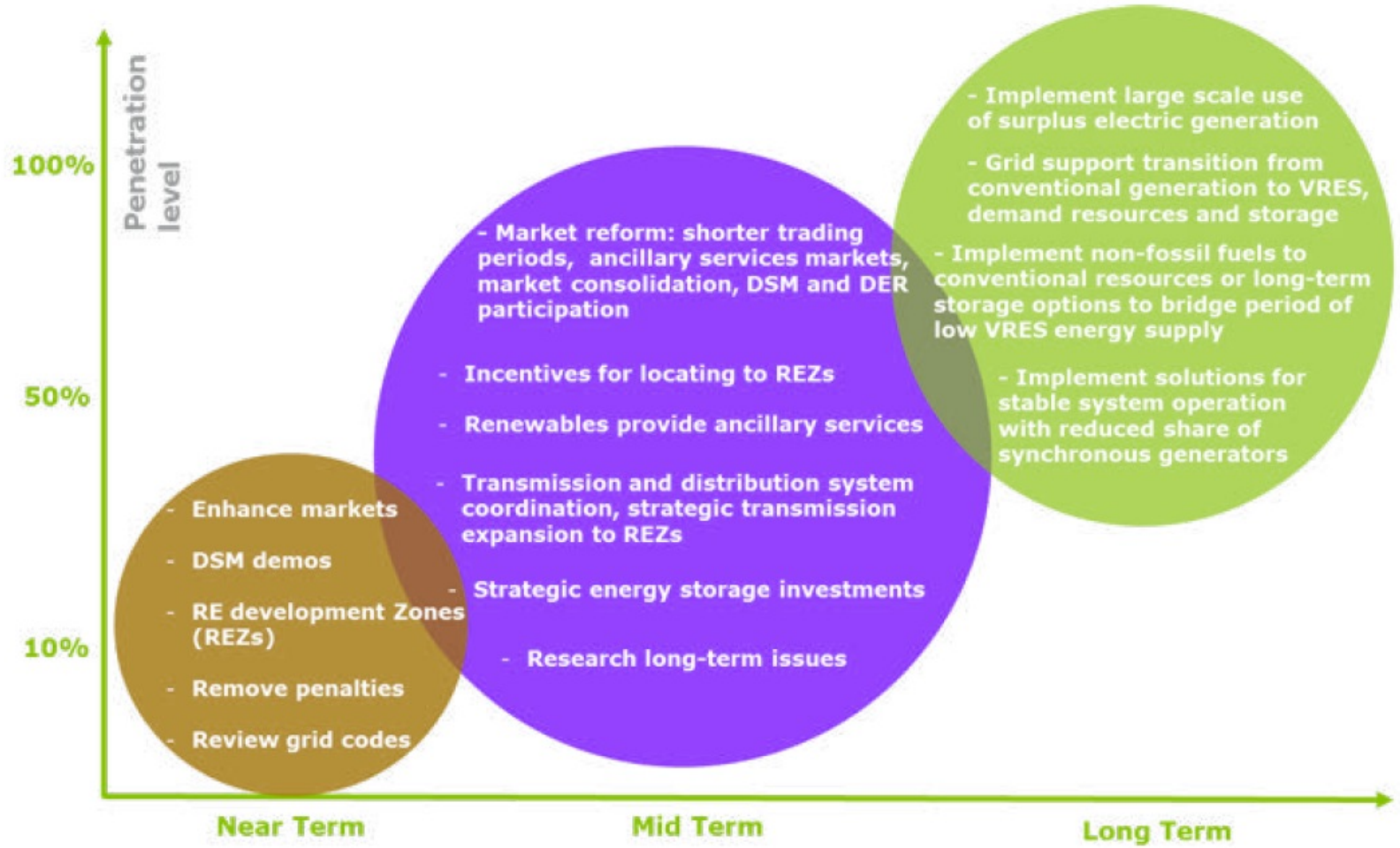
2nd phase: roadmap for flexibility

1. Exploit flexibility and energy storage inherent in **demand** (prosumers)
2. Enable liquid, expanded and close-to-real-time **power markets**
3. **Control VRES** generators to provide grid support services
4. Set price incentives or mechanisms that **reflect diversity-related benefits** in the development of variable resources.
5. Deploy **bulk energy storage** to cover longer periods (weeks to months) of low renewable energy supply.
6. Develop **smart grids** for the coordination of flexible resources across voltage levels
7. Establish new electric energy uses to capitalize on the **surplus energy events**

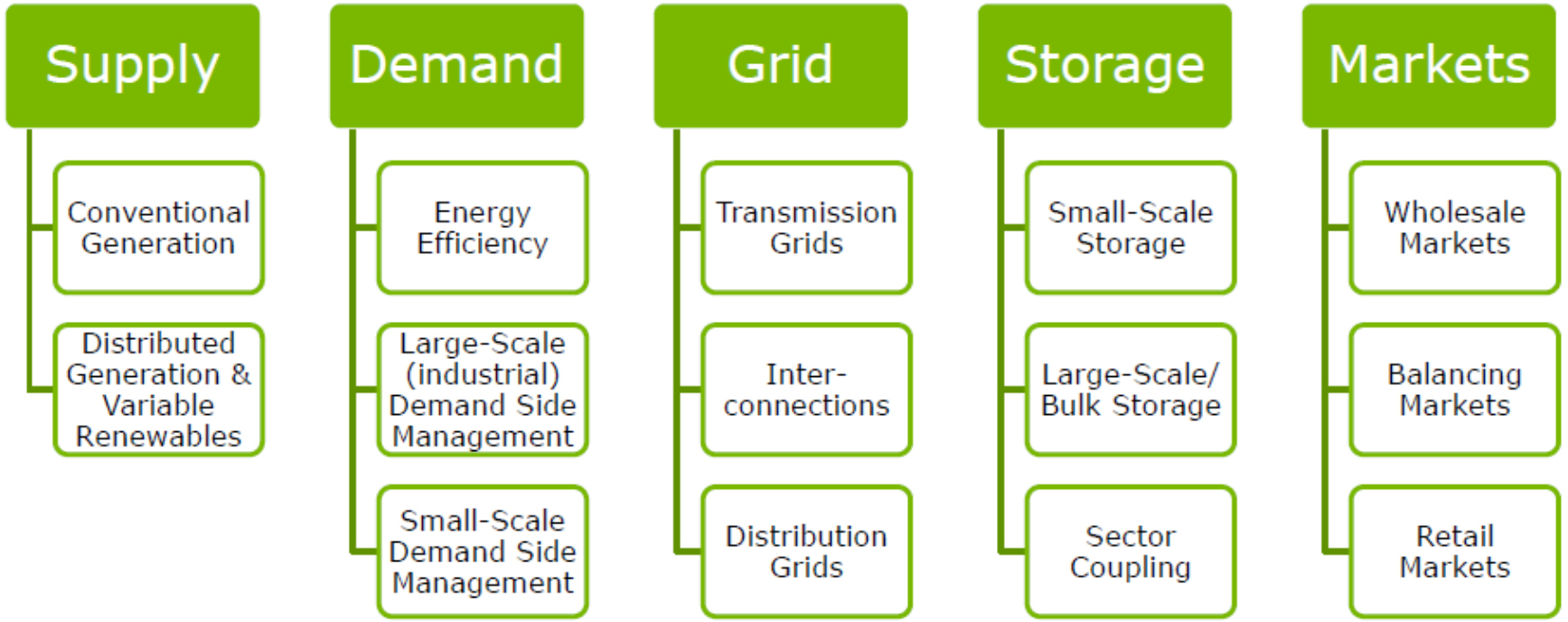
http://j.mp/flexroadmap
(phase 2)

Webinar

2nd phase: roadmap for flexibility



3rd phase - Flexibility tracker: categorisation of actions



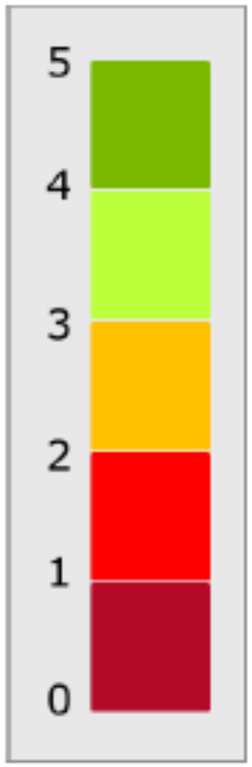
5 categories, 14 KPIs (based on factual and qualitative questions)
The structure allows:

- ranking each system per KPI (flexibility 'identity')
- obtaining comparison reports per KPI

Flex tracker example: demand side KPIs

Subcategory	Question	Range and Scoring
Energy Efficiency	Are measures initiated by policy makers on track to meet the national short-/mid-term energy efficiency targets (2020)?	Yes/Trend/No (Scoring: Yes: 1, Trend: 0.5, No: 0)
	Is the long-term potential of energy efficiency measures for the system being assessed?	Yes/Trend/No (Scoring: Yes: 1, Trend: 0.5, No: 0)
Large-Scale (Industrial) Demand	Are there significant industrial DSM programmes?	Yes/Trend/No (Scoring: Yes: 1, Trend: 0.5, No: 0)
	Is industrial DSM participating in wholesale markets?	Yes/Trend/No (Scoring: Yes: 1, Trend: 0.5, No: 0)
	Is industrial DSM participating in balancing markets?	Yes/Trend/No (Scoring: Yes: 1, Trend: 0.5, No: 0)
	What is the theoretical potential of industrial DSM? [Industrial DSM potential / peak load]	Industrial DSM potential/ peak load (Scoring: ≥5%: 1, <5% & ≥2.5%: 0.5, <2.5%: 0)

Flex tracker scoring: rating against the 100% RES goal

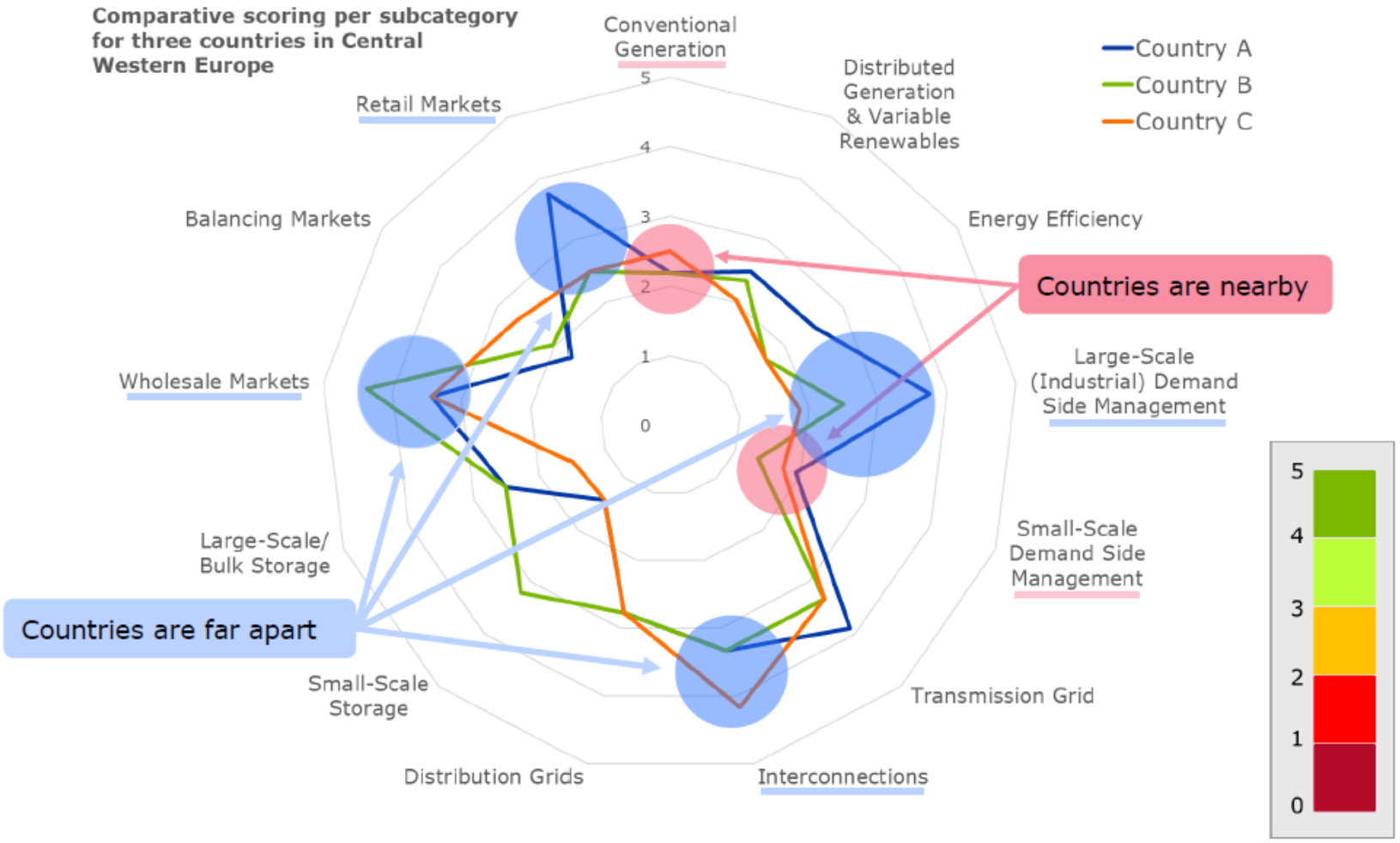


Weighting factors are applied allowing some questions to have more significance: achieved goals (e.g. VRES penetrations) rate higher than plans.

Final score presented in a range 0-5 on a red-green colour code:

- 0-1: dark red (insufficient-very low readiness)
- 1-2: red (insufficient-low readiness)
- 2-3: orange (medium readiness)
- 3-4: light green (medium-high readiness)
- 4-5: green (high readiness)

Flex tracker - Snapshot



Flex tracker functionalities

Flexibility identity	Of each country
Overview across countries	Comparison and combined plots
Country reports	VRES targets, key info on system & flex options
Category reports	Which countries are better on a specific actions and why?
Best practices	Enable exchange of policies
Periodic updates	Tracking developments

High level action plan

Flex tracker - Some preliminary learnings

- **Structural challenges**. There are areas where all assessed countries score equally low and need to improve, e.g.:
  - Increase flexibility of conventional generation
  - Deployment of small-scale demand side flexibility

- **Individual challenges**. There are also areas where certain countries rank significantly higher than others. Besides possible explanations by structural differences, these are areas for the identification of best practices, e.g.:
  - Deployment of industrial demand side management
  - Interconnections
  - Wholesale markets
  - Retail markets

- Countries being analysed: Belgium, Germany, Netherlands, Poland, Spain. Others upcoming (Italy, UK, DK, France, 1-2 countries outside EU)

Possible roles for a joint IEADSM & ISGAN task on tracking flexibility

Validation

Cross-checking the tracker approach against IEADSM and ISGAN findings

Benchmarking

Developing a portal website on flexibility benchmarks and best practices

Application

Converting the tracker findings into policy recommendations

Further development

Integration of other energy sectors (heat, transport)

A tracker for regions (e.g. Europe

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