„How Power Systems with High Shares of Variable Renewable Energies should be designed to address Flexibility”

Presentation to the Berlin Energy Transition Dialogue 2015

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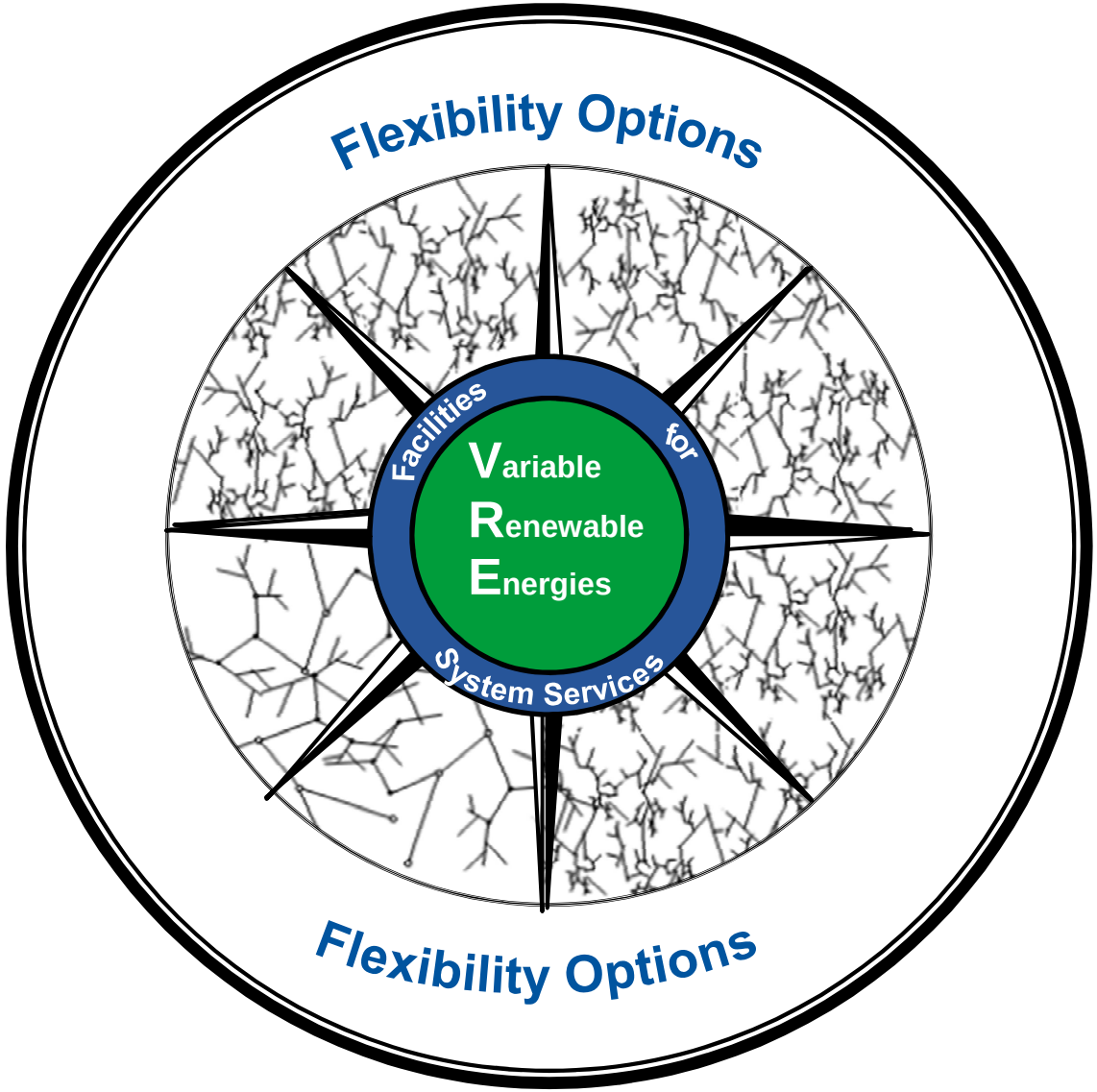
The future electricity system of Germany at a glance



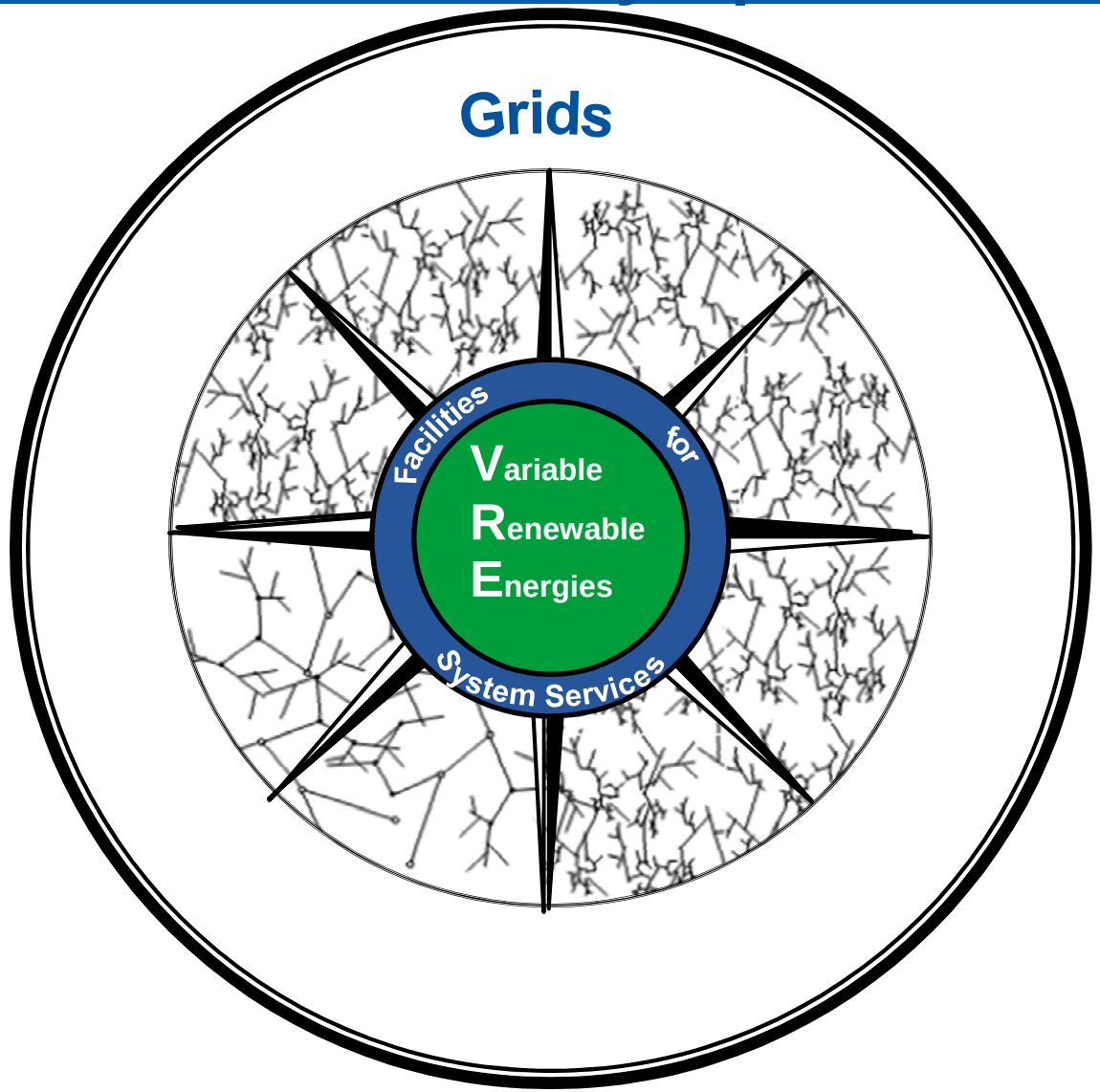
4 technical system components:

- **VRES**
- **FfSS**
- **Grids**
- **FO**

Why flexibility options?

- **In order to ensure security of supply**
- **Security of supply can be characterized as a *public good* because usually its demand does not correspond to the willingness to pay for it – at least not to the willingness of the industry facing global competition**
- **As a consequence ensuring security of supply cannot rely solely on markets but needs a mix of market and regulatory measures**

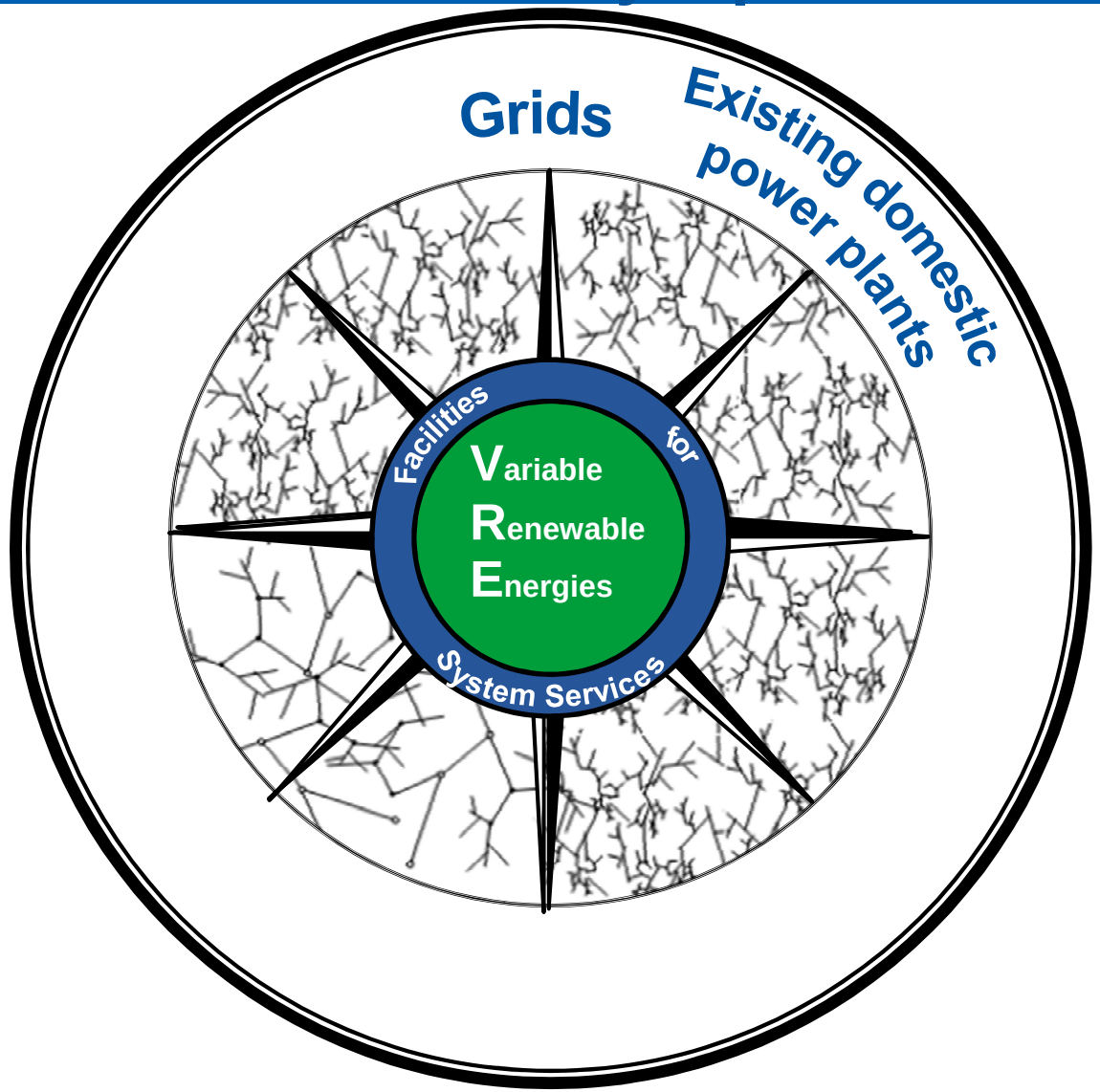
Flexibility Option #1



Grids

- are in fact not really a flexibility option
- but help to minimize the need for flexibility options
- should be “smarter” in the future
- should be financed through a “smart” incentive regulation

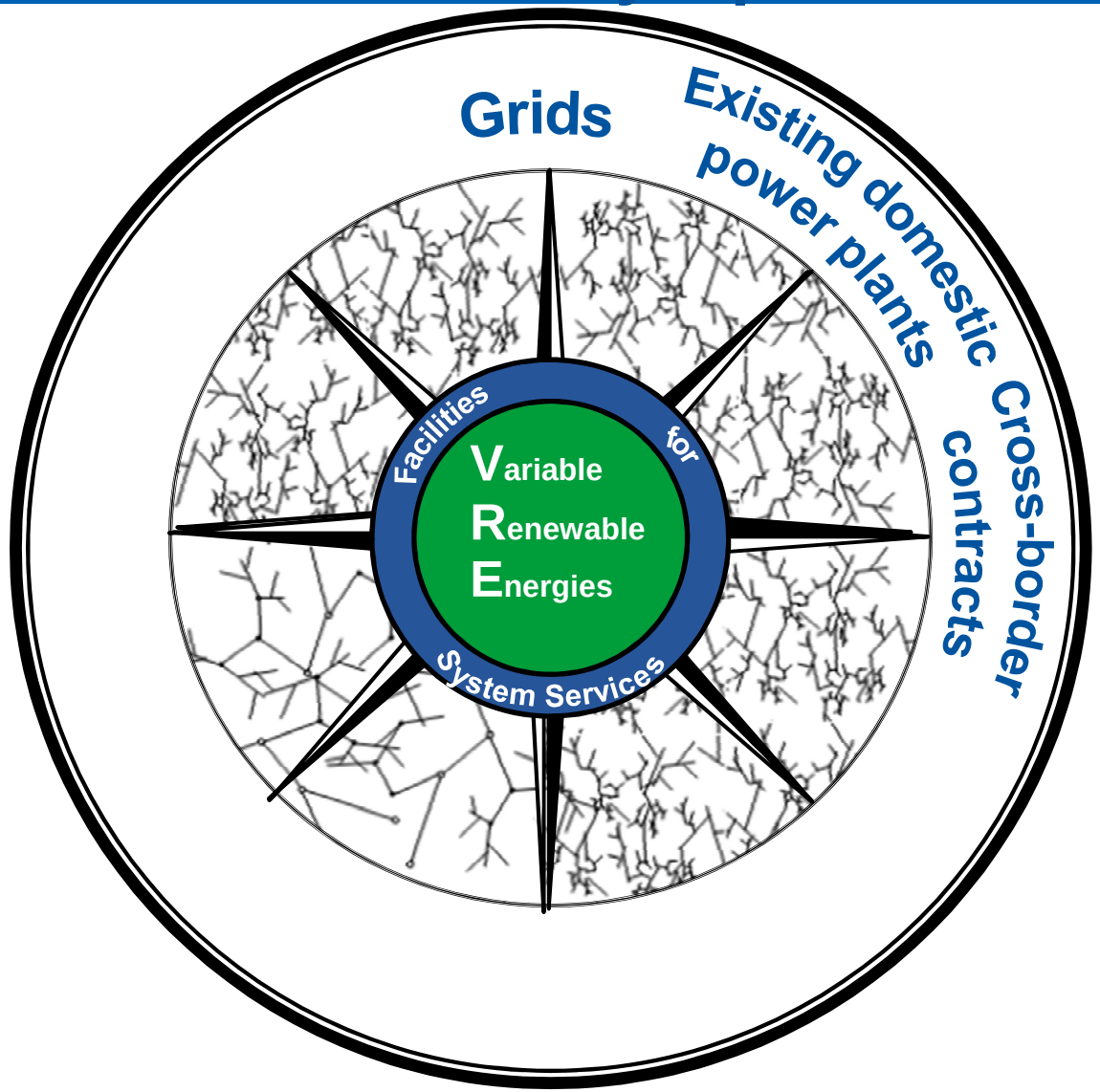
Flexibility Option #2



Existing domestic power plants

- have a lot of technical opportunities to become more flexible
- have a strong incentive to get more flexible through low/negative prices at the power exchange

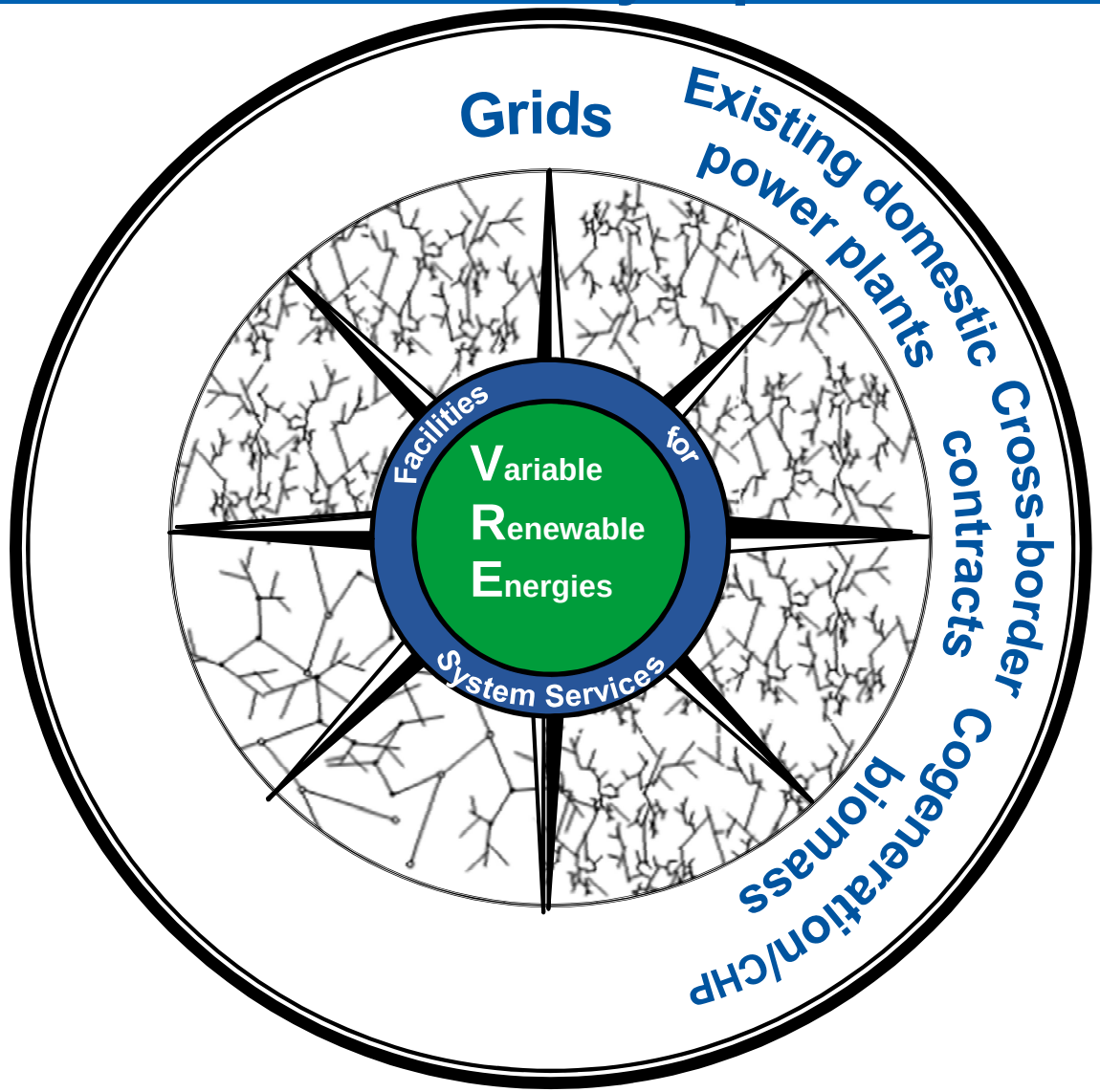
Flexibility Option #3



Cross-border contracts

- could help to minimize the need for national flexibility options
- need sufficient interconnectors
- rely solely on cross-border *trust* between neighboring countries

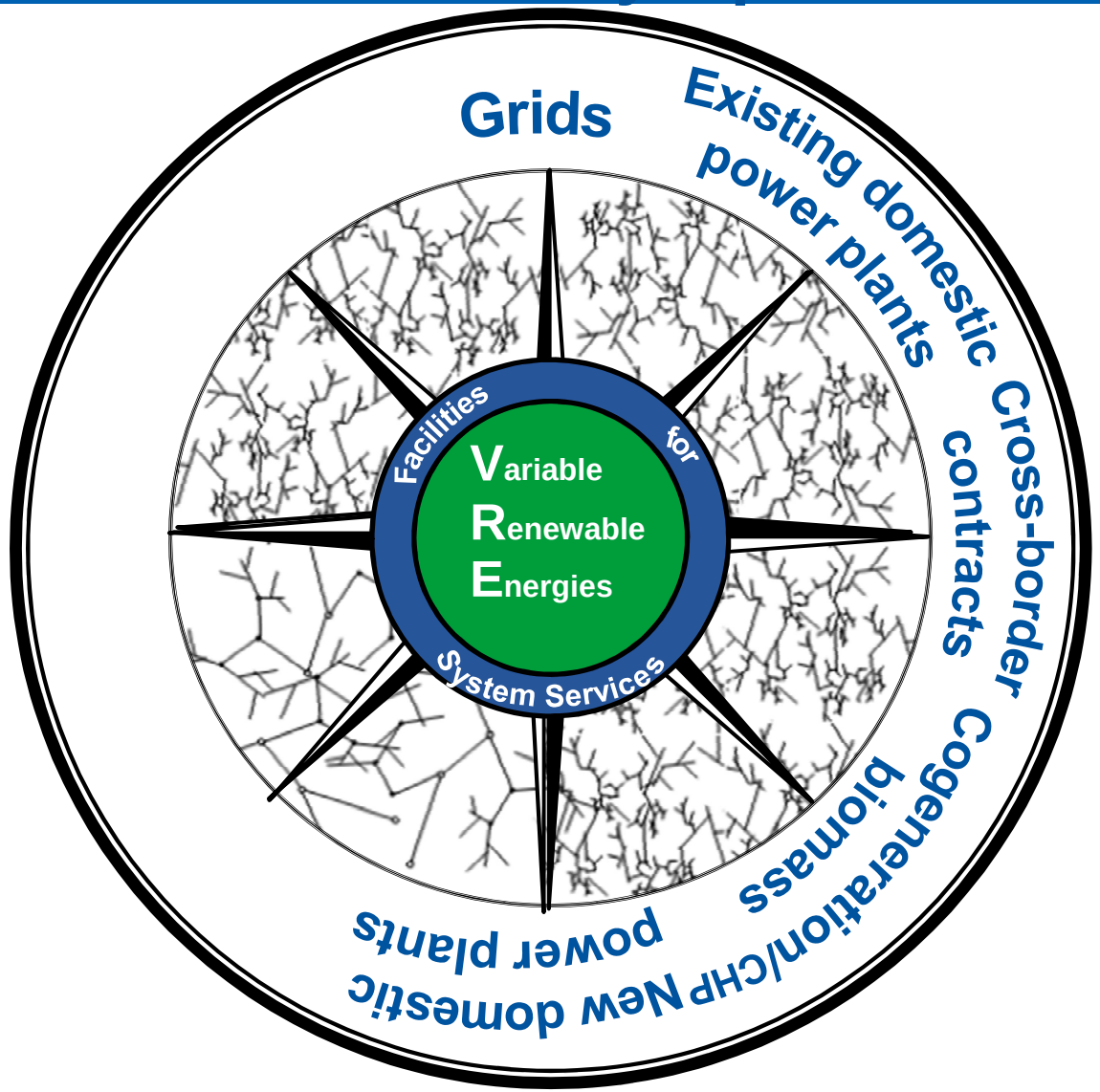
Flexibility Option #4



Cogeneration/CHP plants incl. biomass

- **have enough technical flexibilities to complement wind and solar**
- **but need a remuneration scheme that gives incentives to their market-oriented operation**

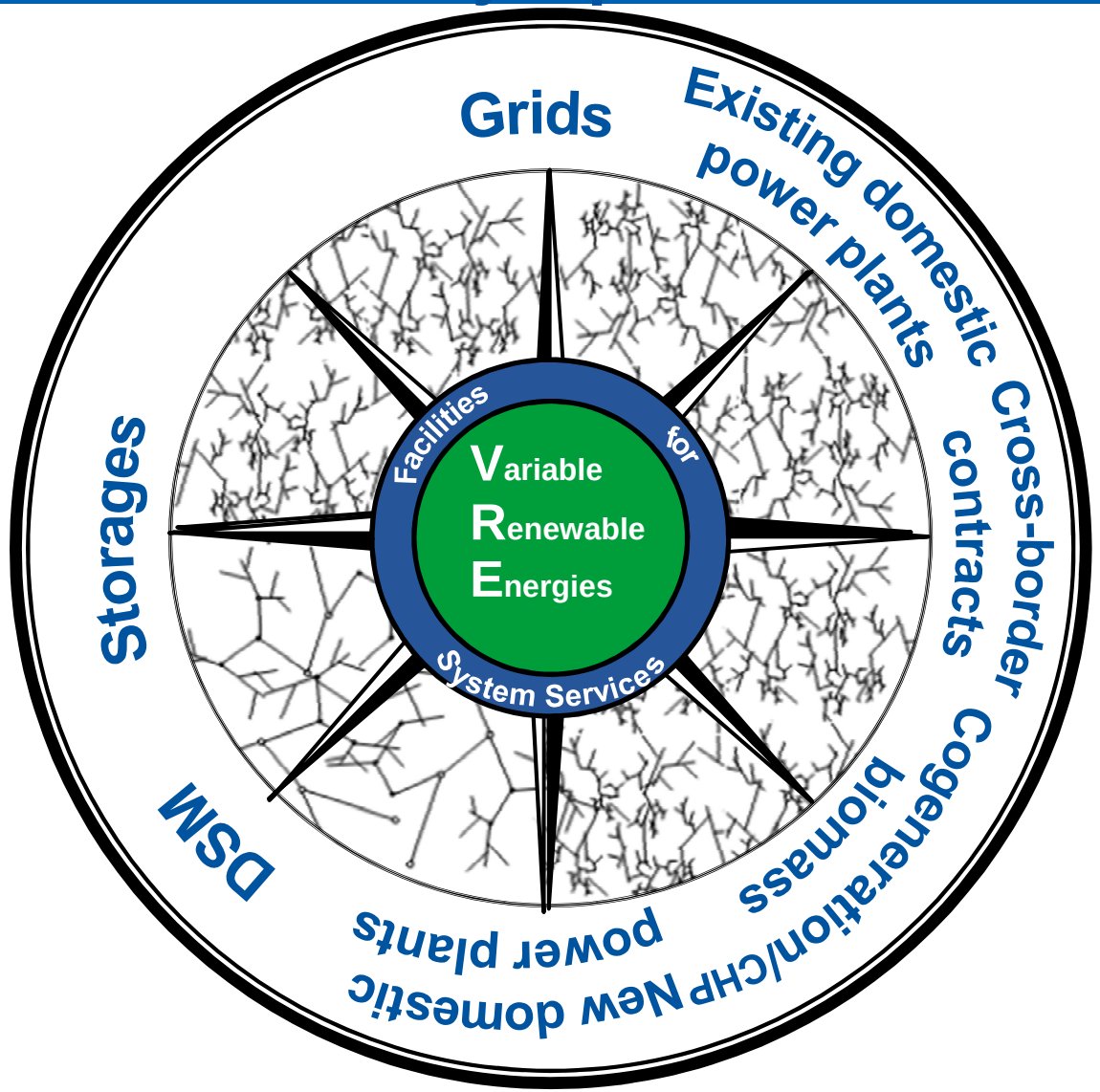
Flexibility Option #5



New domestic power plants

- gas combined-cycle plants or gas turbines are the most flexible fossil plants to complement the VRES
- evidence grows that they cannot be financed through the existing markets
- eventually the markets must be complemented by additional **capacity payments**

Flexibility Options #6 and #7



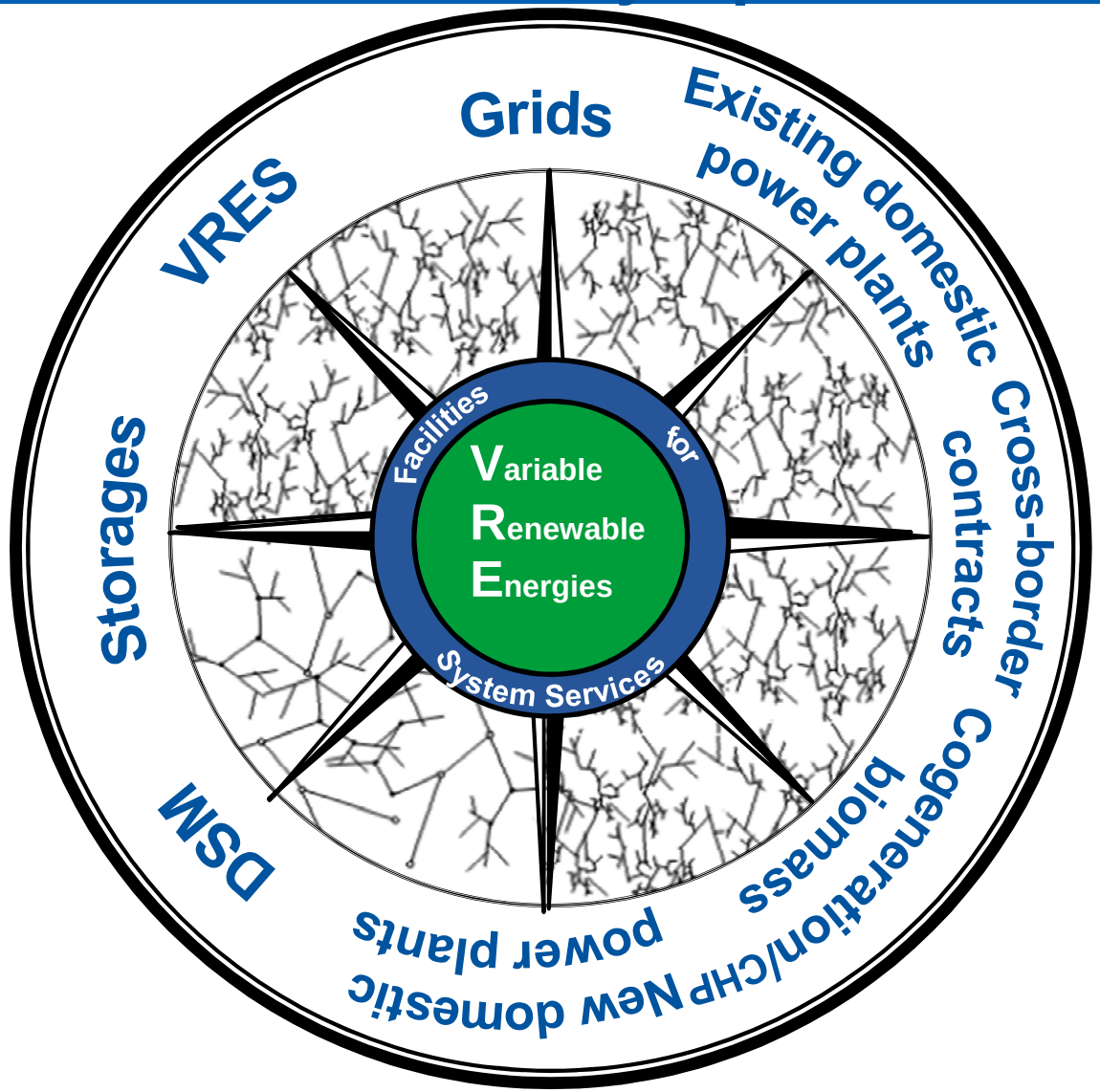
Demand-Side Management and Storages

- need large spreads in the markets for their business cases
- compete against other flexibilities
- Nevertheless this competition should take place on a level playing field which could mean that the conditions of market access have to be improved and/or market roles have to be changed

Demand-Side Management

- might be a business case only for large industrial and commercial customers as long as the share of variable renewable energies does not exceed a certain threshold
- has a better chance to participate in the markets if the access requirements allow for shorter participation periods, pooling solutions etc.
- might be fully exploited by an additional decentralized capacity market where all loads with all sizes could be supplied every 15 minutes; however this market would require significant additional efforts from the suppliers and might be too complex for the majority of them

Flexibility Option #8



Variable Renewable Energies

- are in fact not really a flexibility option
- can help to mini-mize the need for flexibility options
- but: curtailment should be the *ultima ratio* and be avoided whenever possible
- Thus **market premiums** are better than capacity payments
- Suppliers should have the incentive to extend their market roles to the heating market

Resume

- The future electricity system will most likely be dominated by variable renewable energies; they will define the rationality of the system
- In order to ensure security of supply as a public good one needs a mix of market and regulatory measures to complement them with flexibility options
- A well dimensioned grid including interconnectors is key to minimize the need for additional flexibility options
- Flexibilities on the demand-side should be unlocked by a better market access starting with large industrial and commercial customers; extended market roles of suppliers could help

Thank you very much for your attention!

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