



# Demand Response

- As the Tool of Flexibility -

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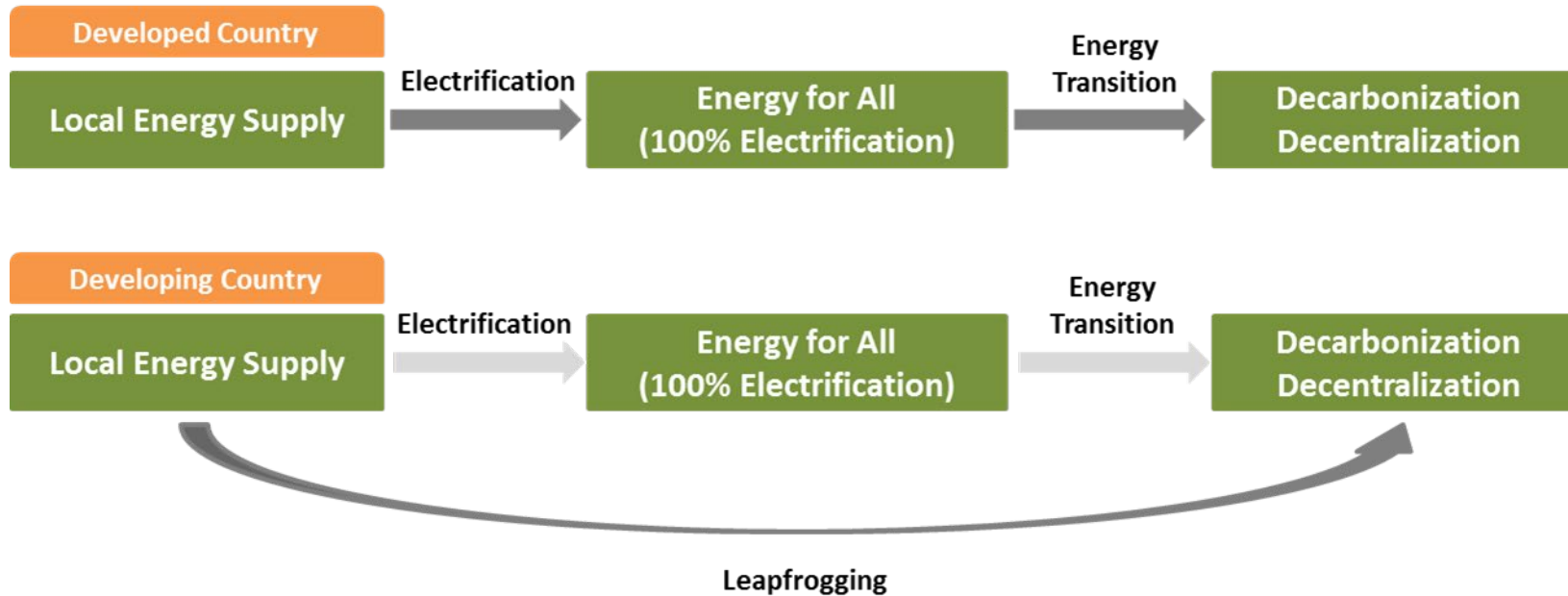


# Background



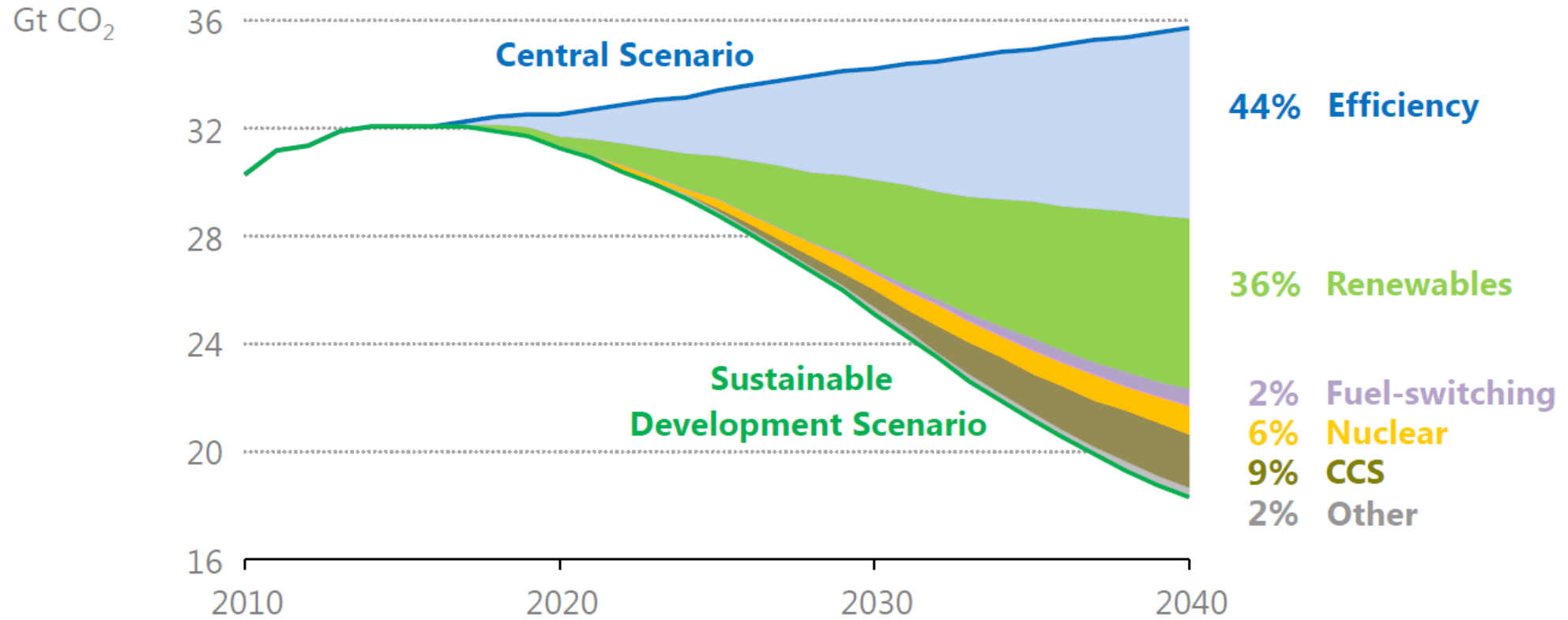
# Energy Transition

- Energy transition is generally defined as a long-term structural change in energy systems.



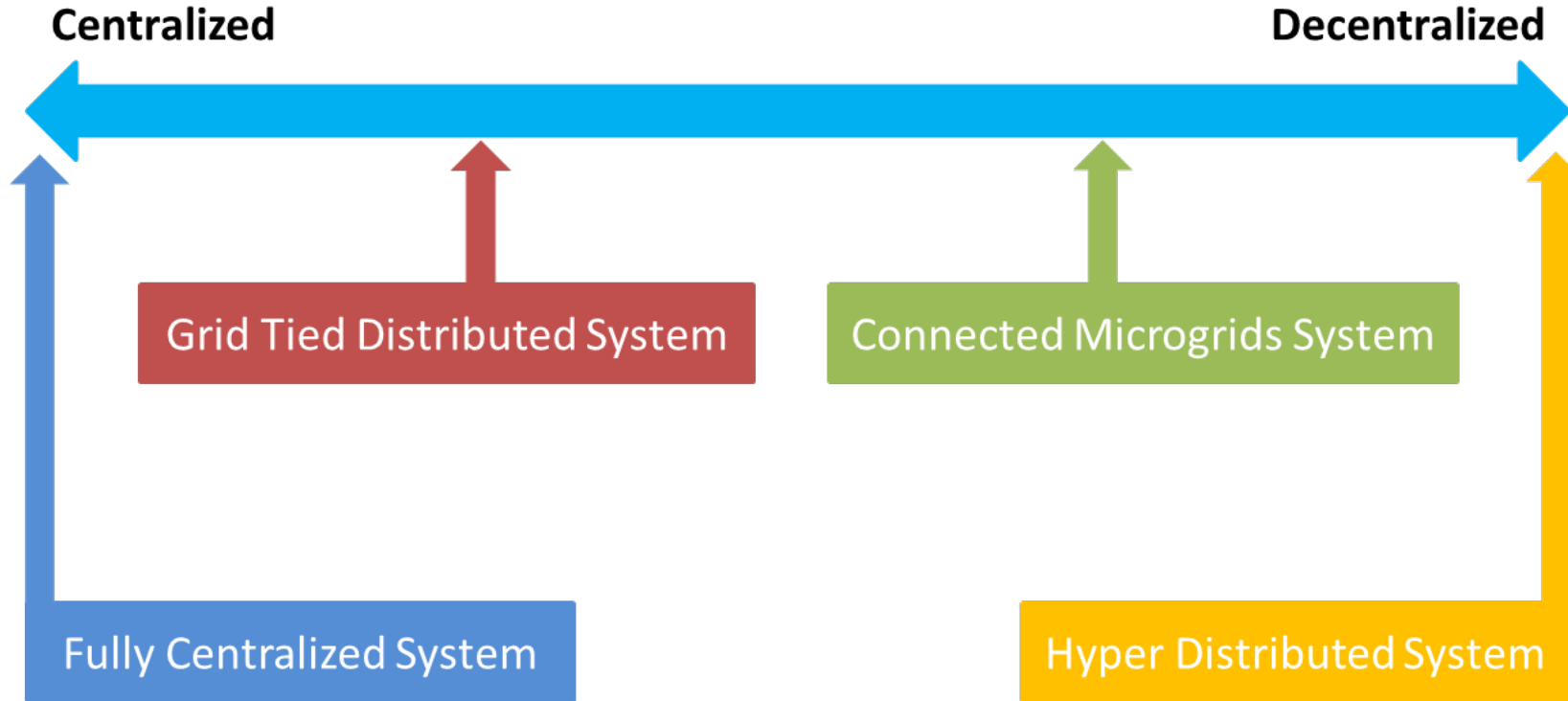


# Decarbonization



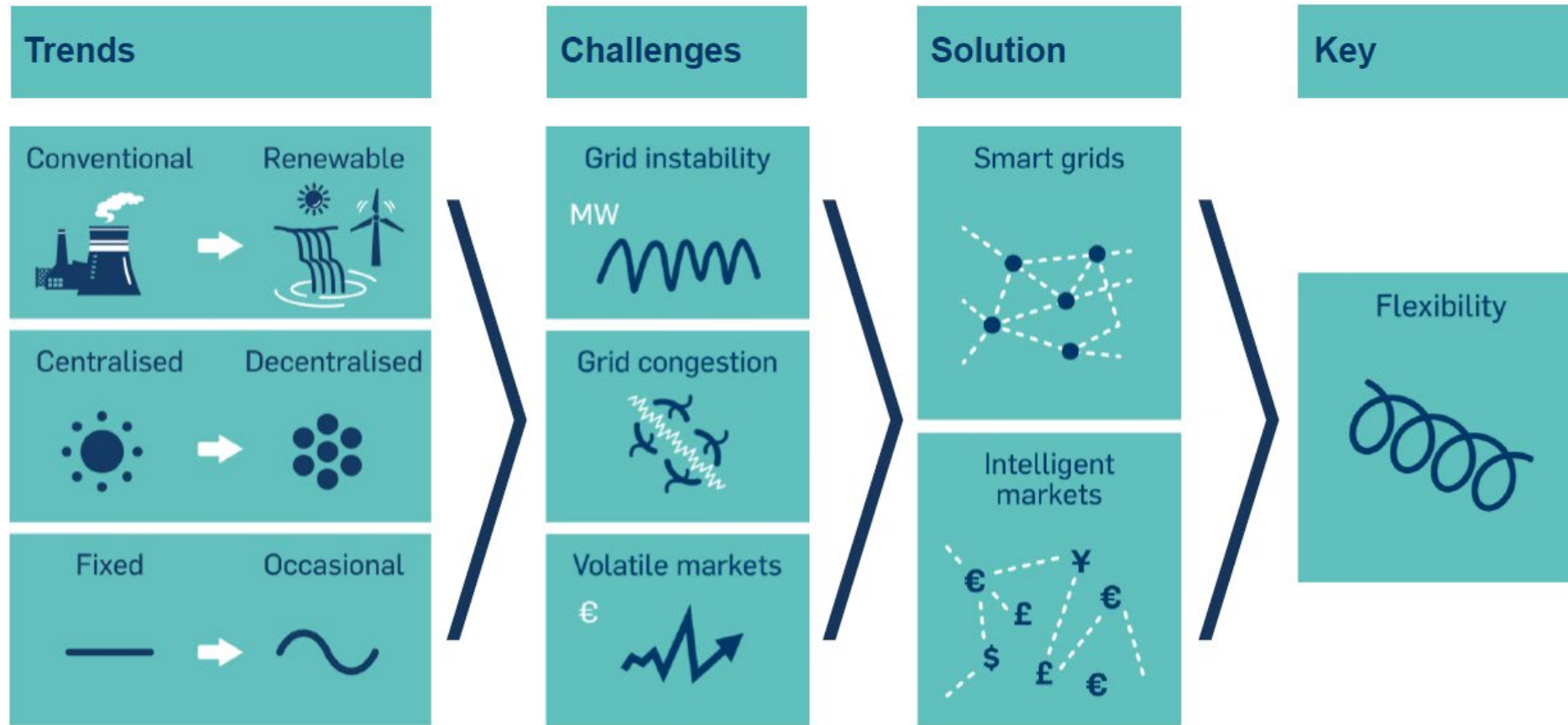


# Decentralization





# Flexibility is Key in Future Energy Systems



From: [http://www.gaccsouth.com/fileadmin/ahk\\_atlanta/Bilder/Consulting/Federal\\_Projects/Energiedialog/8\\_DEUCHERT\\_-\\_Ancillary\\_services\\_etc..pdf](http://www.gaccsouth.com/fileadmin/ahk_atlanta/Bilder/Consulting/Federal_Projects/Energiedialog/8_DEUCHERT_-_Ancillary_services_etc..pdf)

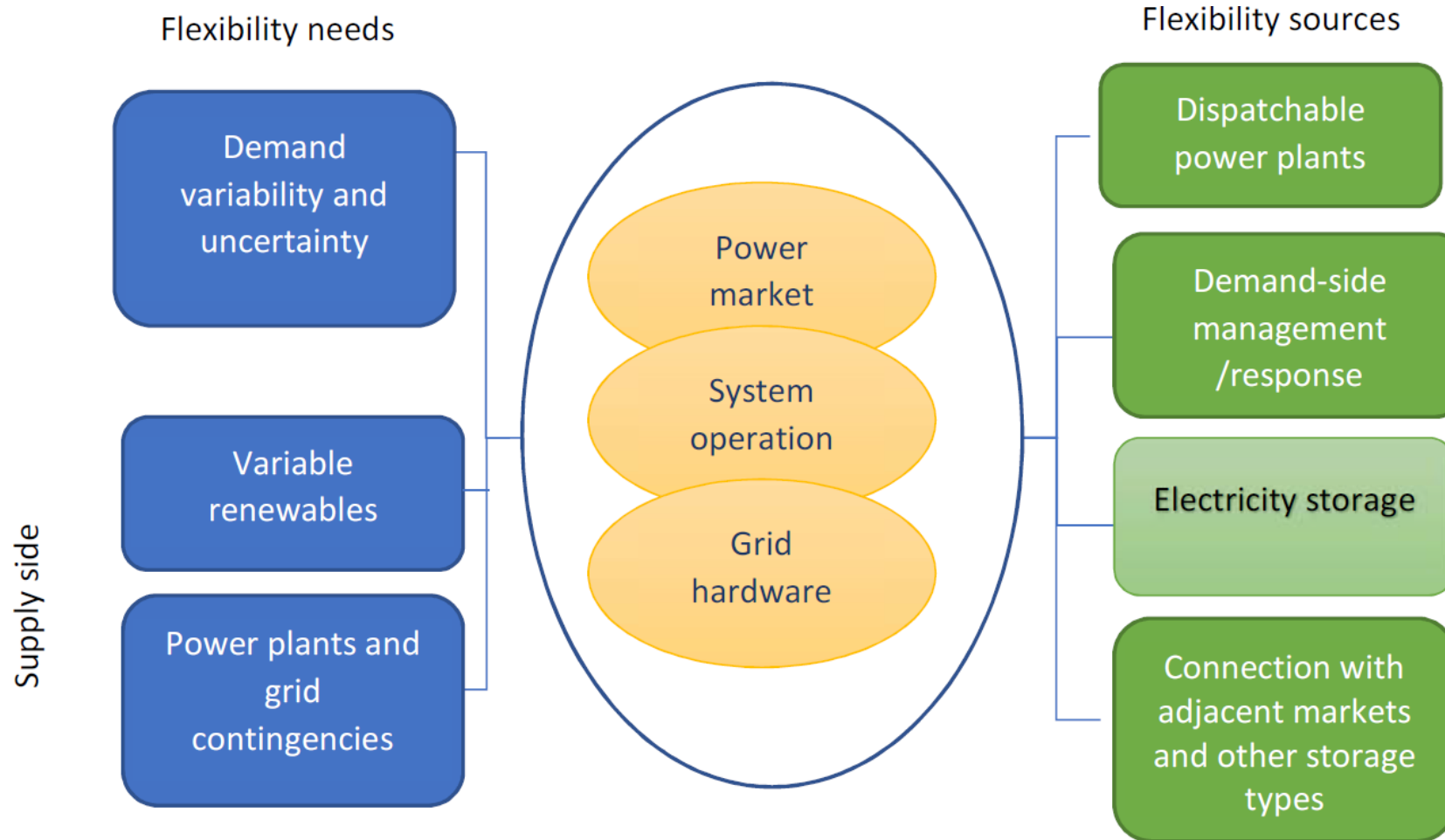


# Unlocking System Flexibility





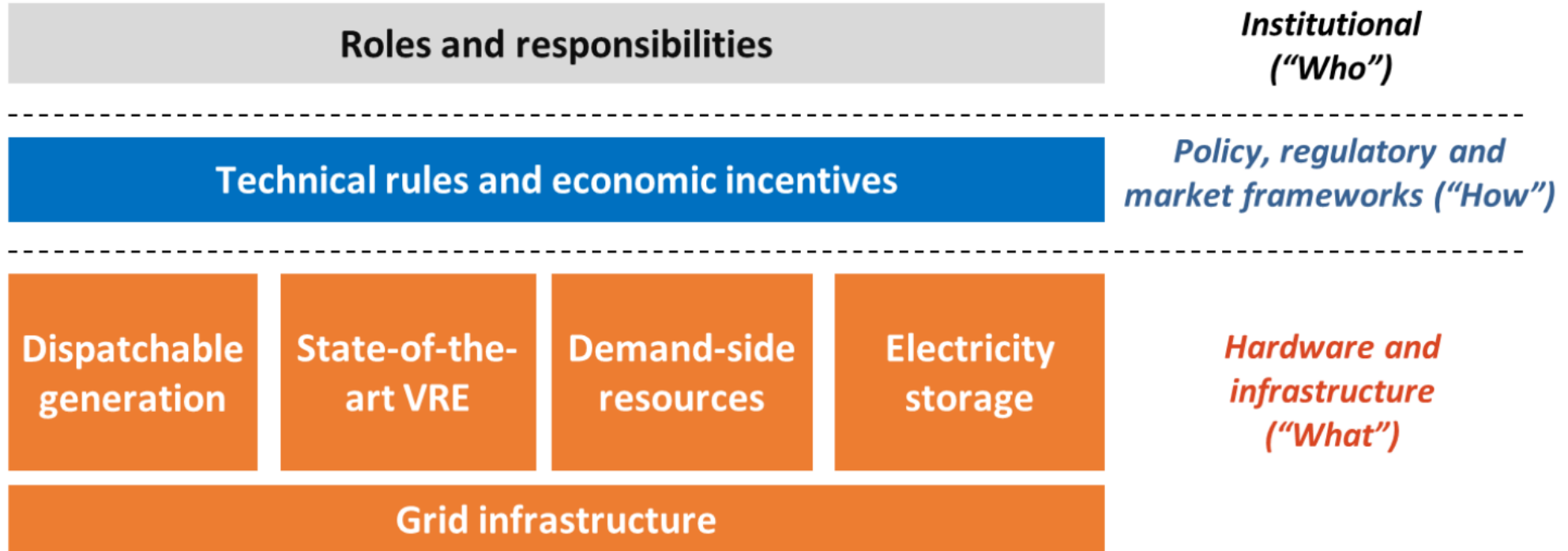
# Flexibility Needs/Sources



From: REEM Innovation and Technology Roadmap: Energy Storage Application, REEM, 2017



# Relevant Dimensions for Unlocking System Flexibility



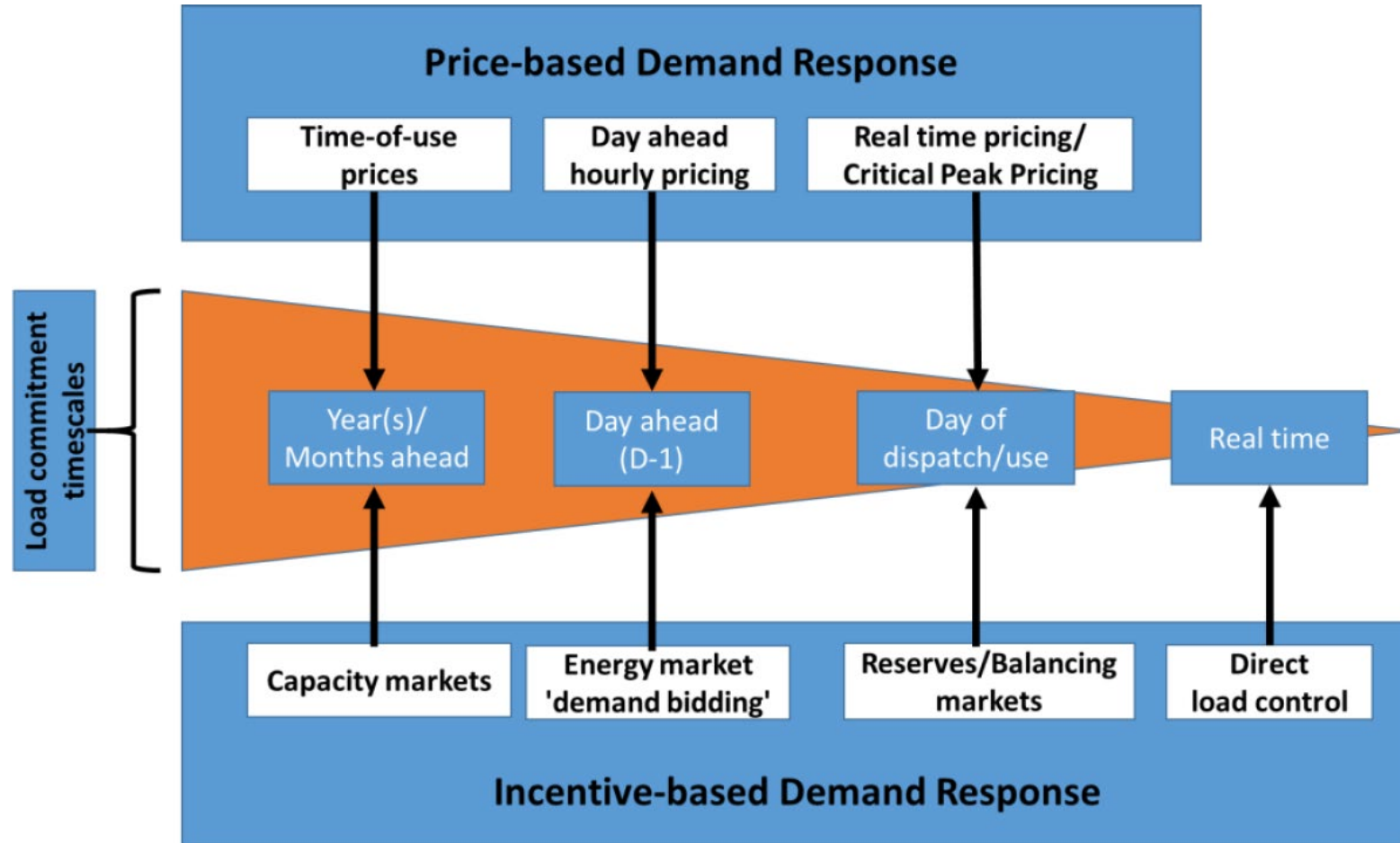
From: *Tracking Clean Energy Progress*, IEA, 2018



# Demand Response



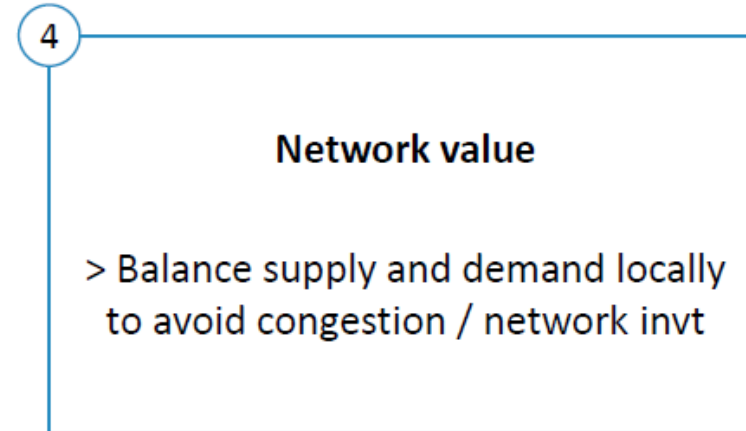
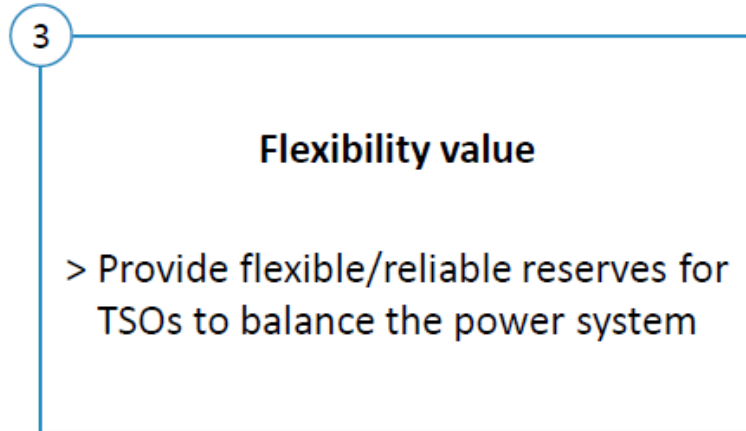
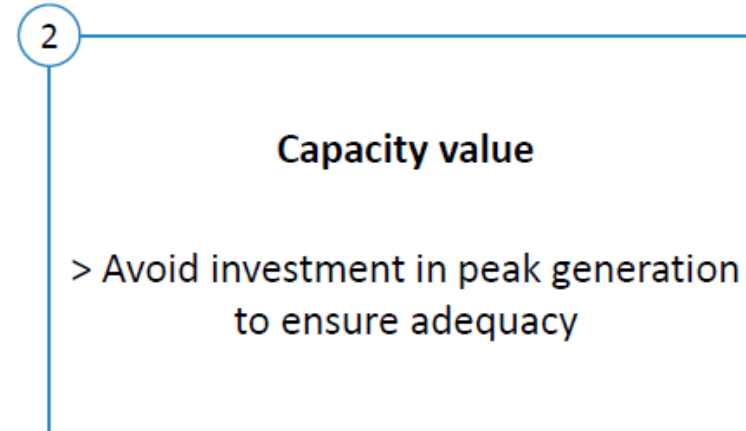
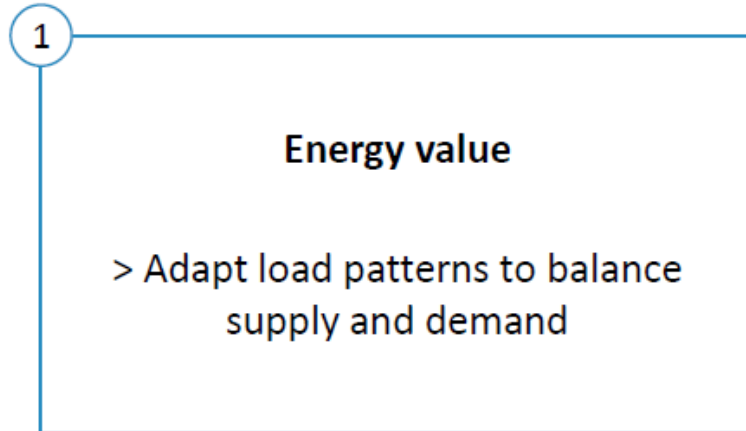
# Types of Demand Response



From: [https://ec.europa.eu/energy/sites/ener/files/documents/demand\\_response\\_ia\\_study\\_final\\_report\\_12-08-2016.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/demand_response_ia_study_final_report_12-08-2016.pdf)



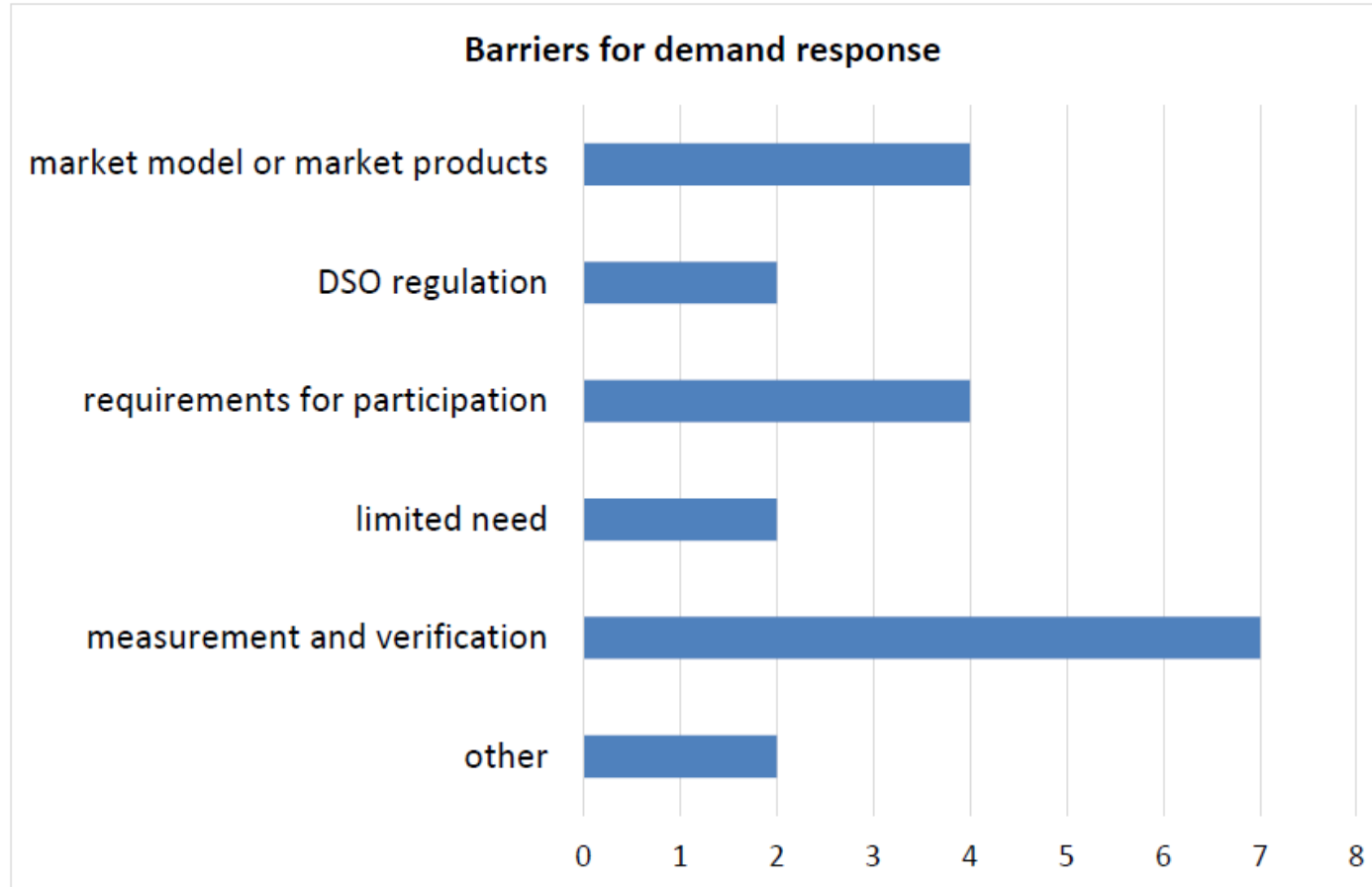
# Value of Demand Response



From: [http://www.europarl.europa.eu/cmsdata/119723/2\\_Verhaeghe\\_%20ITRE\\_300517.pdf](http://www.europarl.europa.eu/cmsdata/119723/2_Verhaeghe_%20ITRE_300517.pdf)



# Barriers for Demand Response



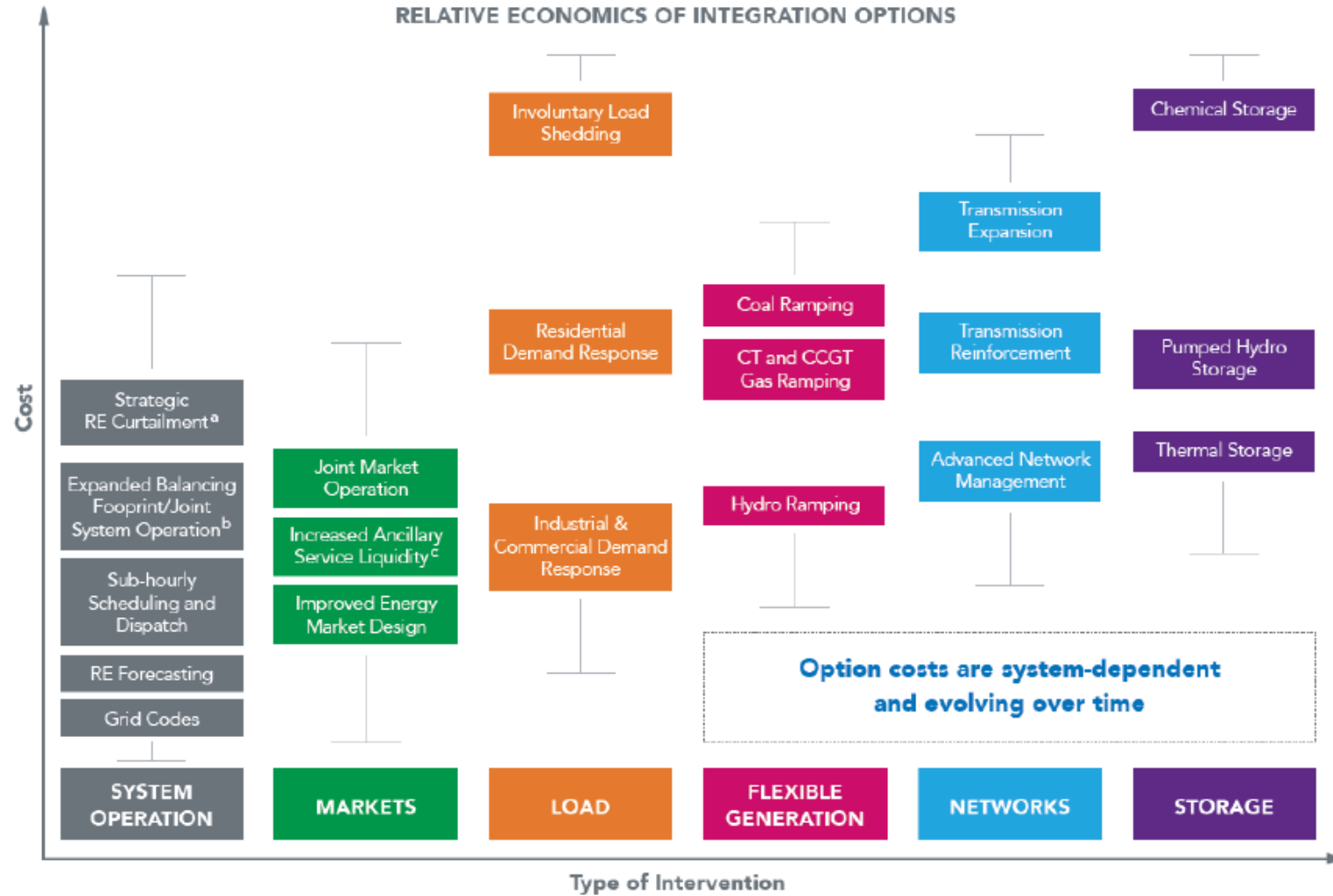
From: <https://economie.fgov.be/sites/default/files/Files/Event/170912%20iSGAN/Session-2-Flexibility-around-the-world-Pieter-Vingerhoets.pdf>



# Recommendation



# No Silver Bullet

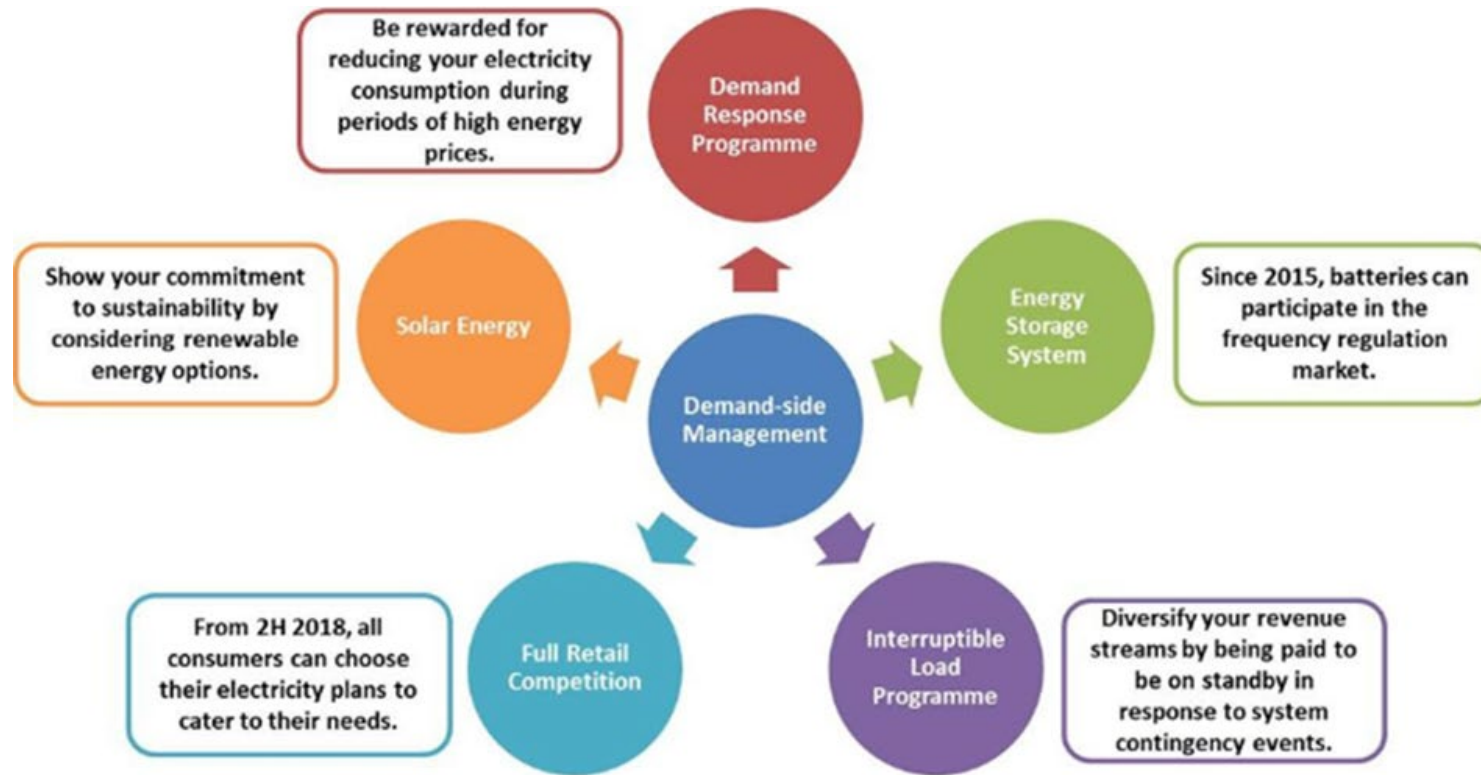


Source: NREL (2014)





# Consumer Participations





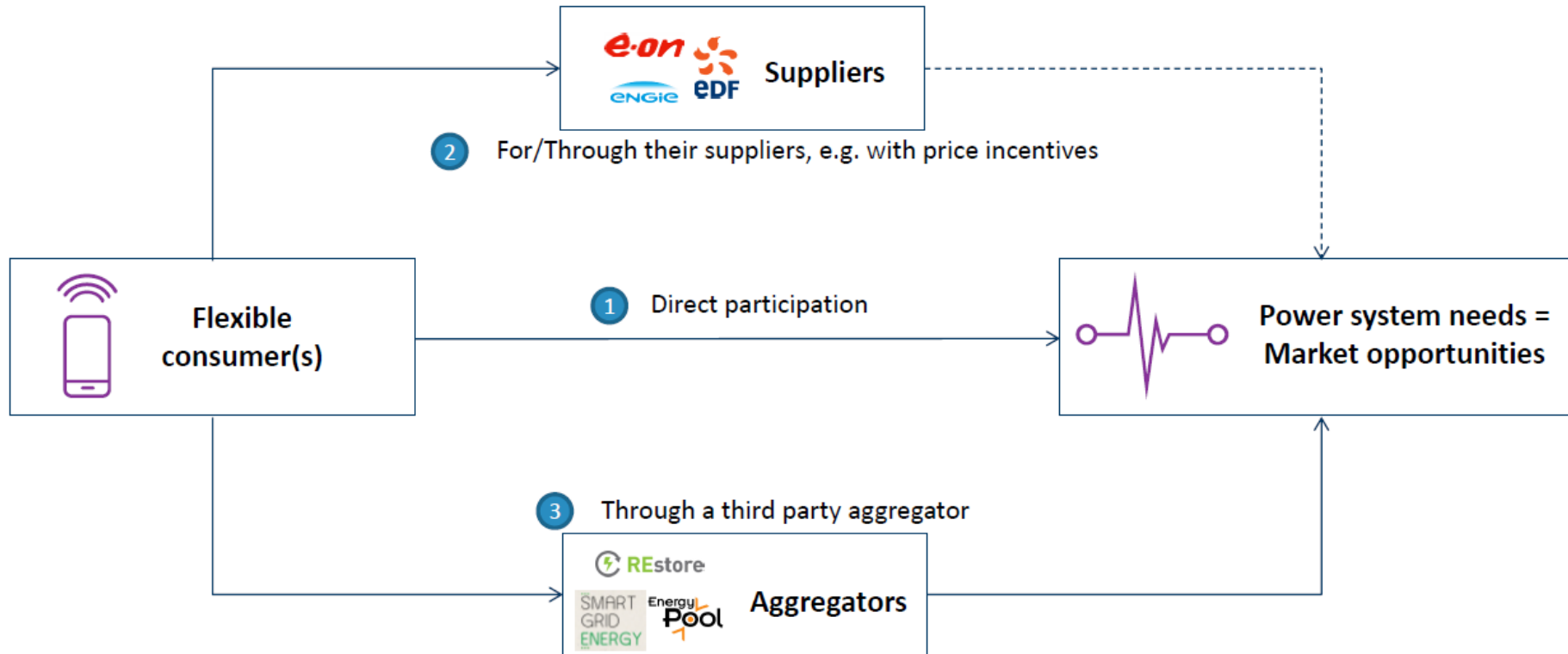
# Structured Action Plan



From: [https://www.ei.se/Documents/Publikationer/rapporter\\_och\\_pm/Rapporter%202017/Ei\\_R2017\\_10.pdf](https://www.ei.se/Documents/Publikationer/rapporter_och_pm/Rapporter%202017/Ei_R2017_10.pdf)



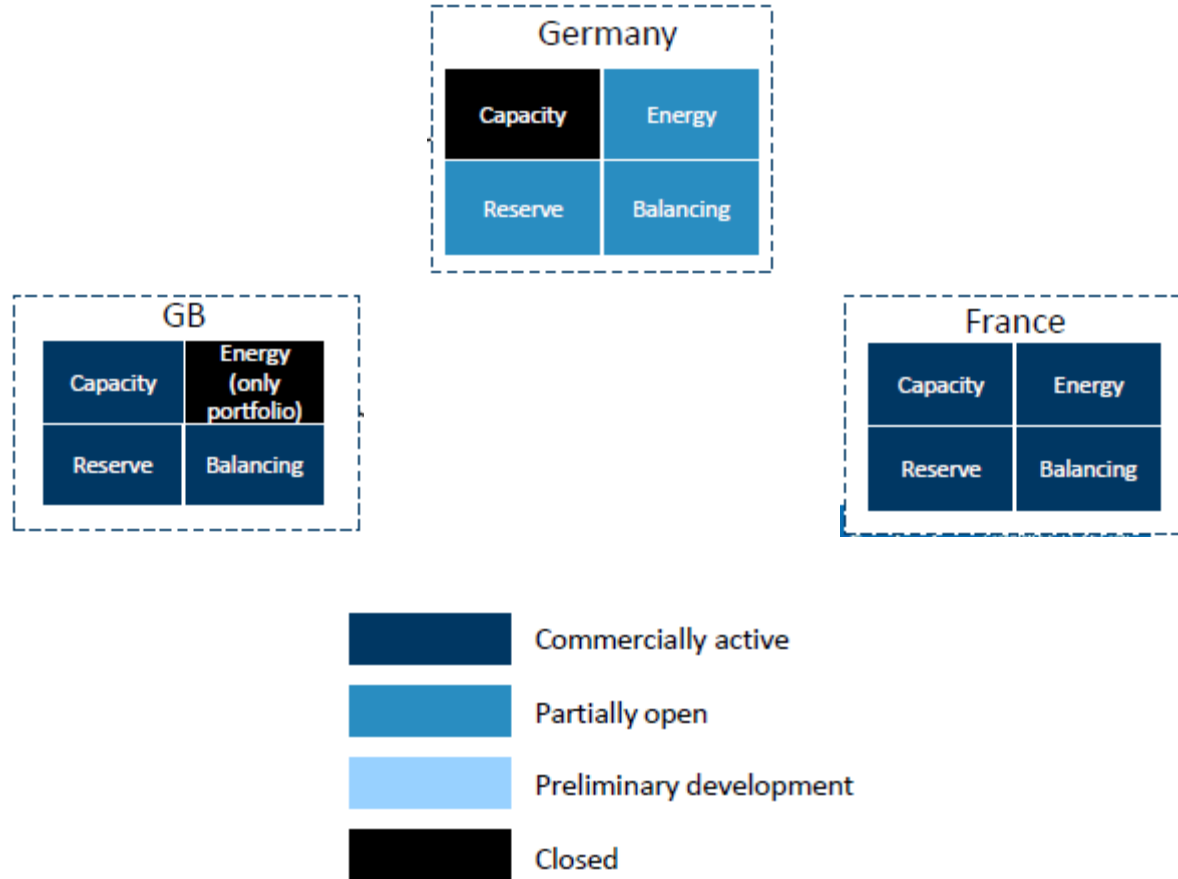
# Market Design (1)



From: [http://www.europarl.europa.eu/cmsdata/119723/2\\_Verhaeghe\\_%20ITRE\\_300517.pdf](http://www.europarl.europa.eu/cmsdata/119723/2_Verhaeghe_%20ITRE_300517.pdf)



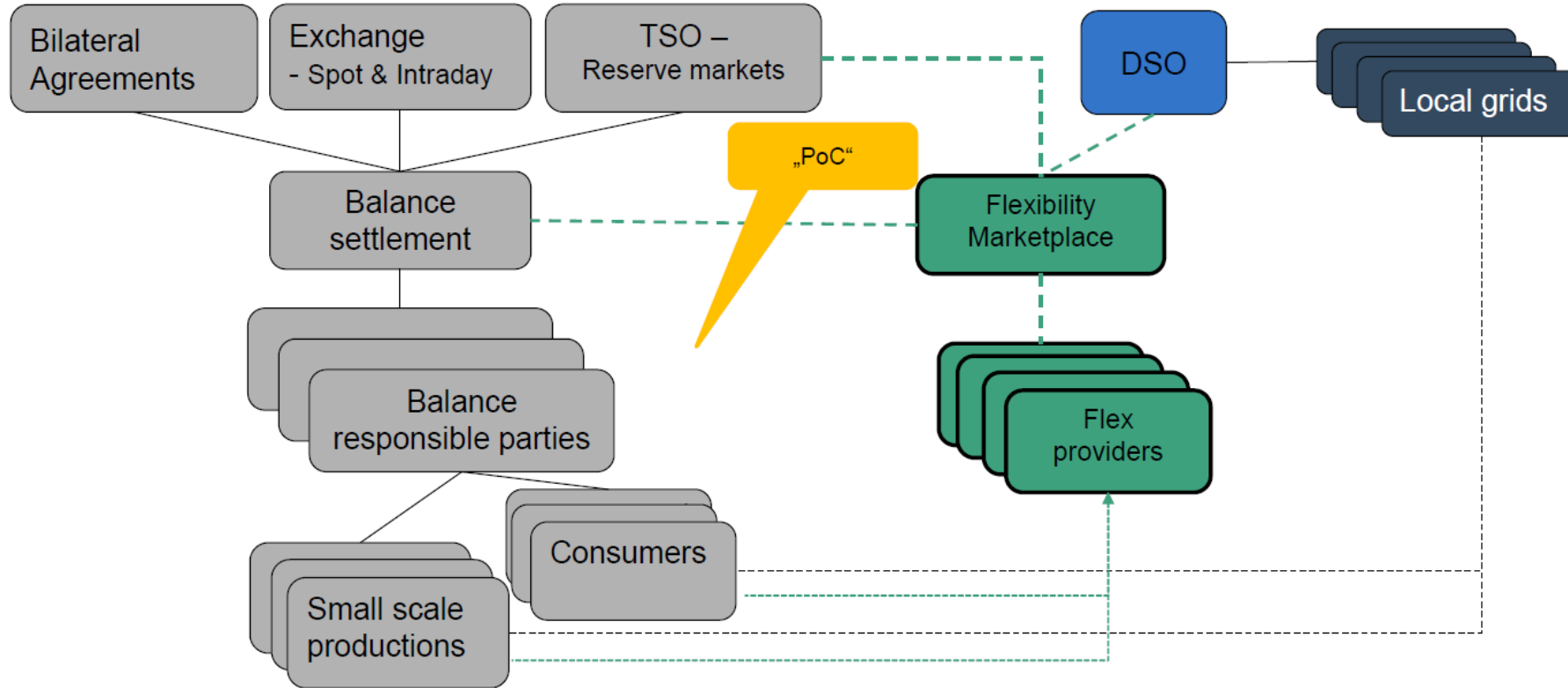
# Market Design (2)



From: [http://www.europarl.europa.eu/cmsdata/119723/2\\_Verhaeghe\\_%20ITRE\\_300517.pdf](http://www.europarl.europa.eu/cmsdata/119723/2_Verhaeghe_%20ITRE_300517.pdf)



# Market Design (3)



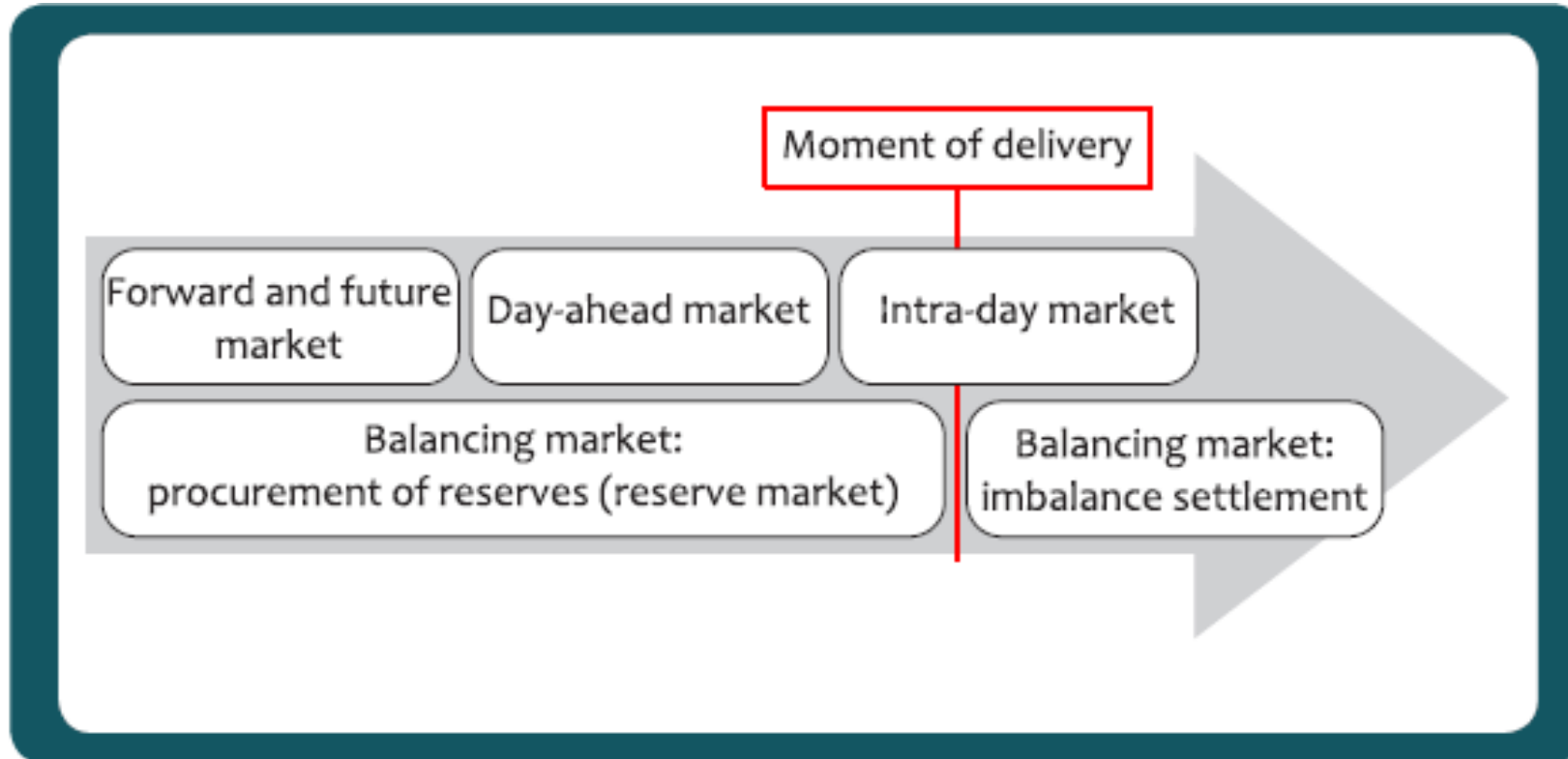
From: [http://www.europarl.europa.eu/cmsdata/119723/2\\_Verhaeghe\\_%20ITRE\\_300517.pdf](http://www.europarl.europa.eu/cmsdata/119723/2_Verhaeghe_%20ITRE_300517.pdf)



Thank you!



# Ordering of Different Electricity Market

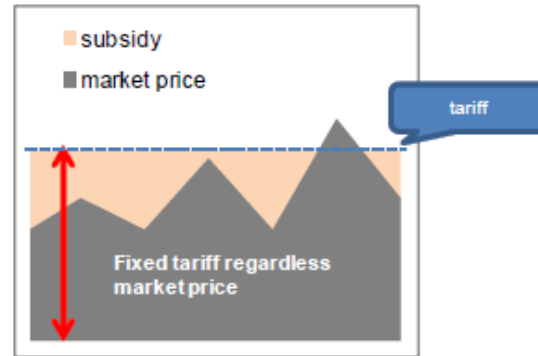


From: [https://set.kuleuven.be/ei/images/EI\\_factsheet8\\_eng.pdf/](https://set.kuleuven.be/ei/images/EI_factsheet8_eng.pdf/)



# Supports for Renewable Energy

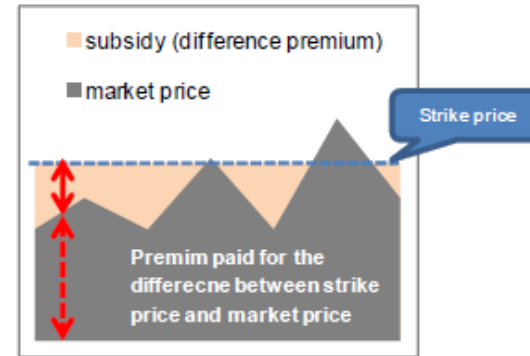
(1) FIT



Purchase obligation

Example: Japan(2012-)

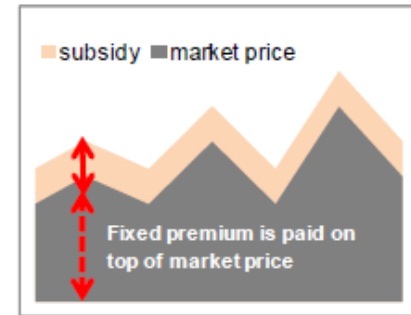
(2) FIP (difference)-CfD



Obligation) Direct marketing

Example: Germany(2014-)-U.K. (2013-)

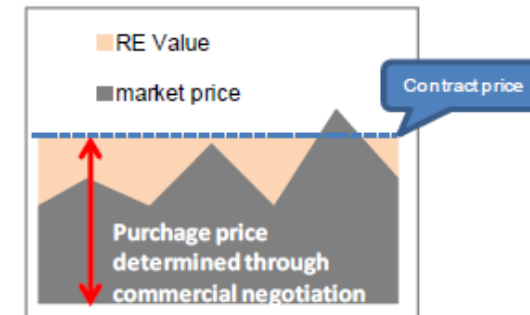
(3) FIP (fixed)



Optional) Direct marketing

Example: Spain(1998-2012)

(4) RPS



Procurement of obliged amount

Example: Japan(2003-2012)

From: <https://eneken.iecej.or.jp/data/6330.pdf>