



Wind energy in smart energy system

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The **framework conditions** determine

- **which technologies to deploy** and
- which **business cases** these have in the energy system.

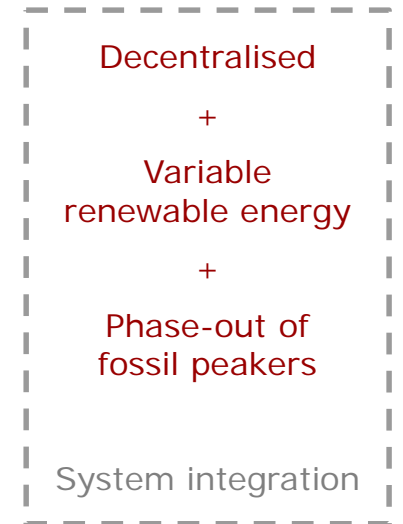
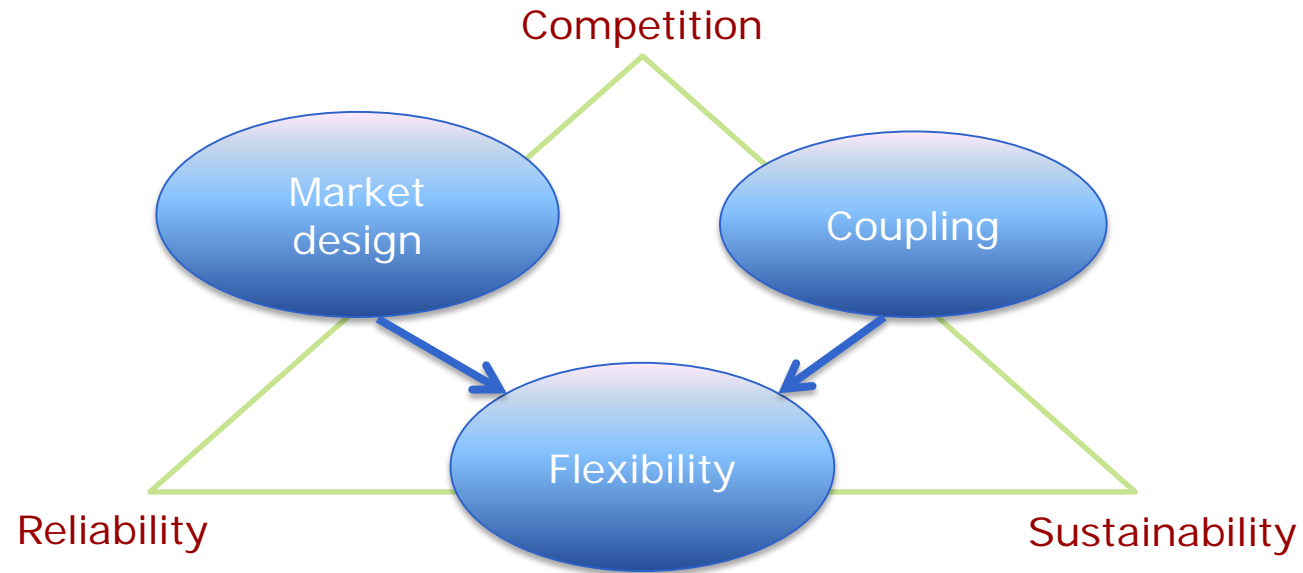
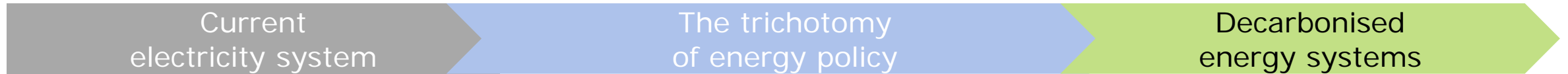
Research Objective

Develop innovative framework conditions that facilitate the green transition while

1. removing barriers,
2. creating incentives, and
- 3. improving business cases** for new technologies and system solutions.

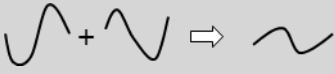

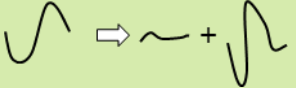
The Clean Energy Transition

Goals and RE-thinking of frameworks



Enabling wind integration by coupling



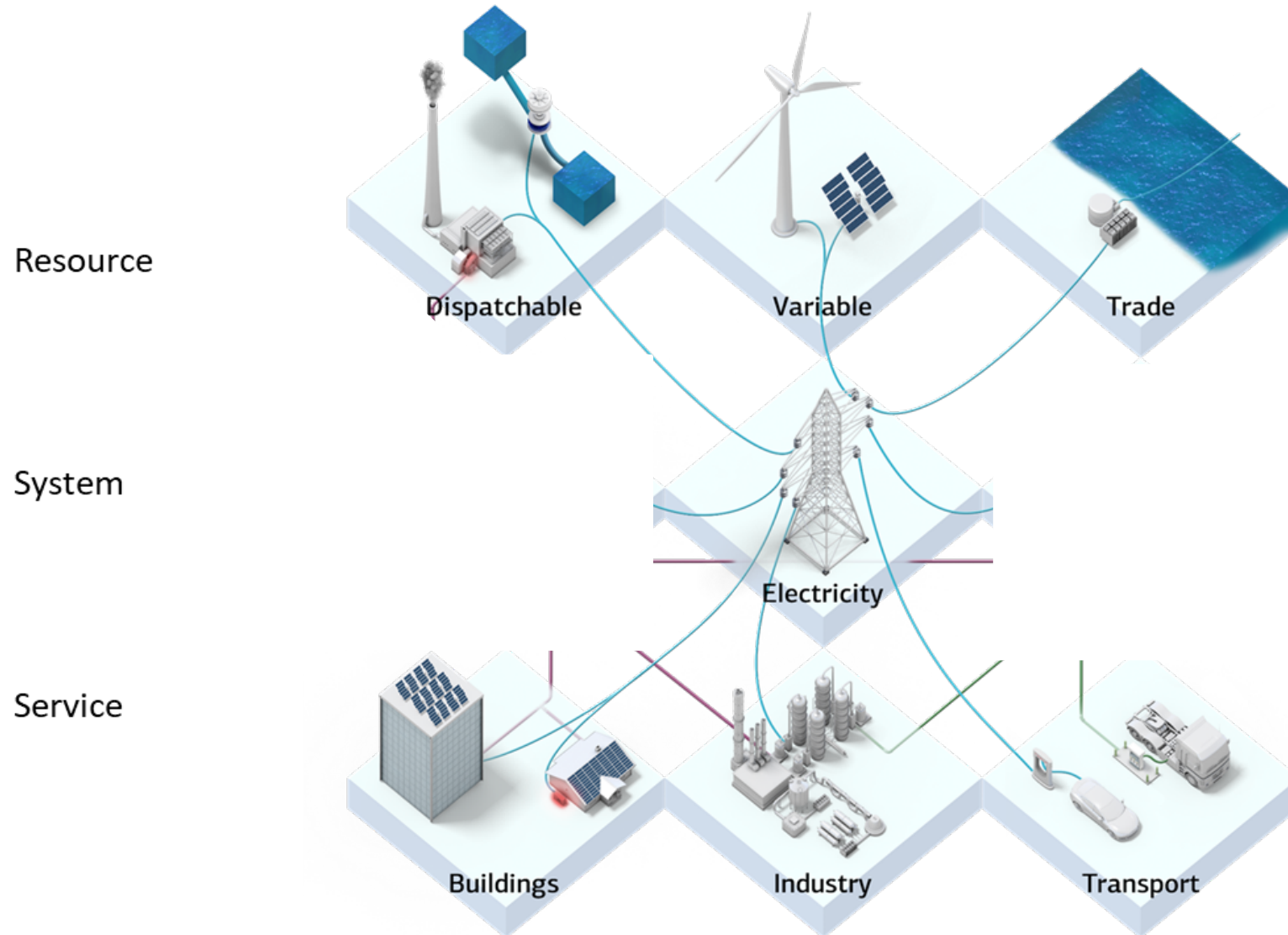
Scenario	Coupling/ connectivity	Incentives for flexibility	Price variations	Driver	Impact
Business-as-usual	-	-		-	-
Interconnection	Geographical connections	Price differences between regions		Different technology mix	Increased imports and exports
System integration	Sector coupling	Price differences between energy sources and technologies		Increased business opportunities	Increased national demand
Targeted markets	Market coupling	Price volatility in the electricity market		More actors	Differentiated pricing

Transmission

Electricity/gas/heat
Transport/storage

Markets for RES
Reliability/capacity markets
Local community markets

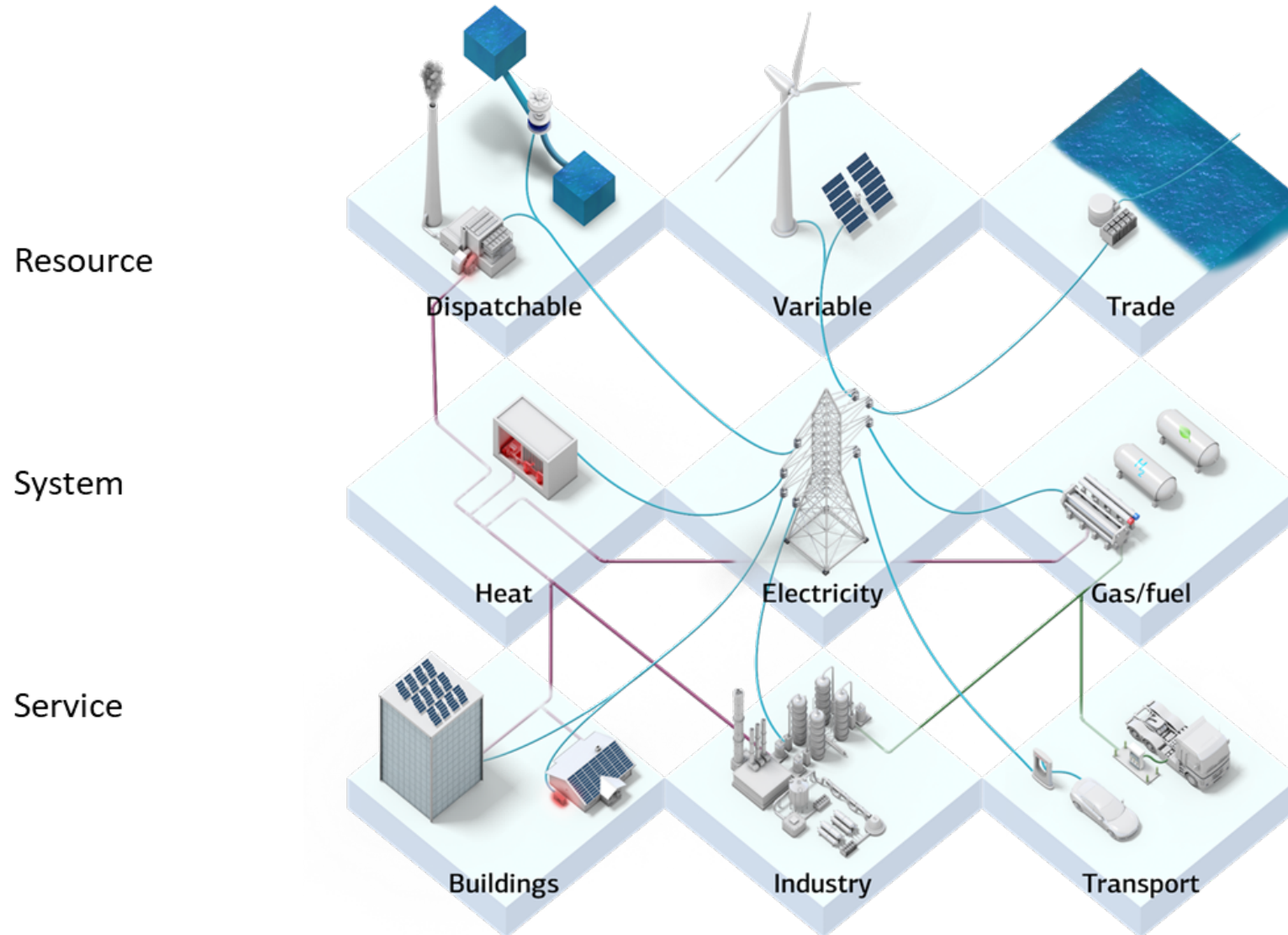
Flexibility in the electricity infrastructure



Supply flexibility

Demand responds

System integration



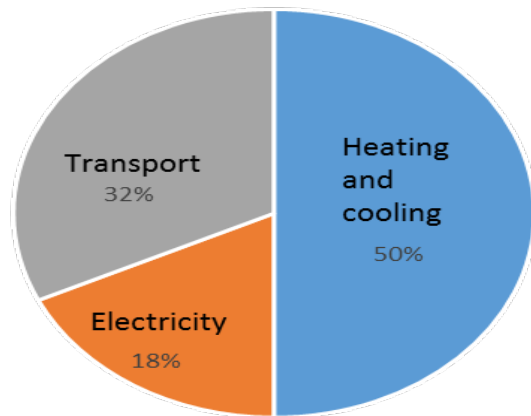
Supply flexibility

Sector coupling/
Electrification

Demand responds

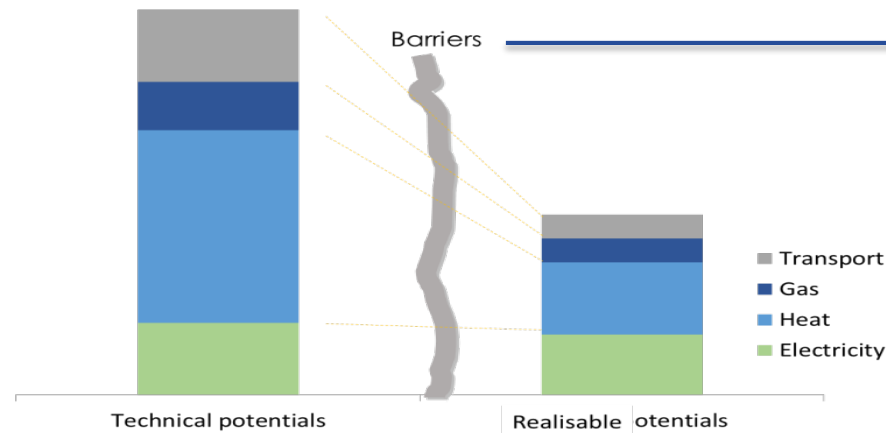
Sector coupling

Smart electrification as source of flexibility



Distribution of EU energy consumption
(Source: EU Heating and Cooling strategy)

From technical to realisable potentials



Framework conditions

- Market design
- Direct regulation
- Fiscal policies
- Support schemes
- Grid regulation



Nordic Barriers

- EU framework (Clean Energy for All Europeans)
- Nordic region greener than EU
- Traditional energy policy framework still dominate

Main barriers

B1 Insufficient market signals for some stakeholders;

B2 Uneven frameworks for different renewable energy resources.

Policy recommendations (Market-based policy framework):

R1 **Create a level playing field** for all RES technologies across sectors through consistent fiscal policies;

R2 Implement electricity **grid tariffs** which allow market signals for flexibility to reach the end-users;

R3 **Dynamic taxation** of electricity (e.g. restructuring levies and taxes);

R4 Encourage **VRE operators to act flexibly** using short-term market-based incentives;

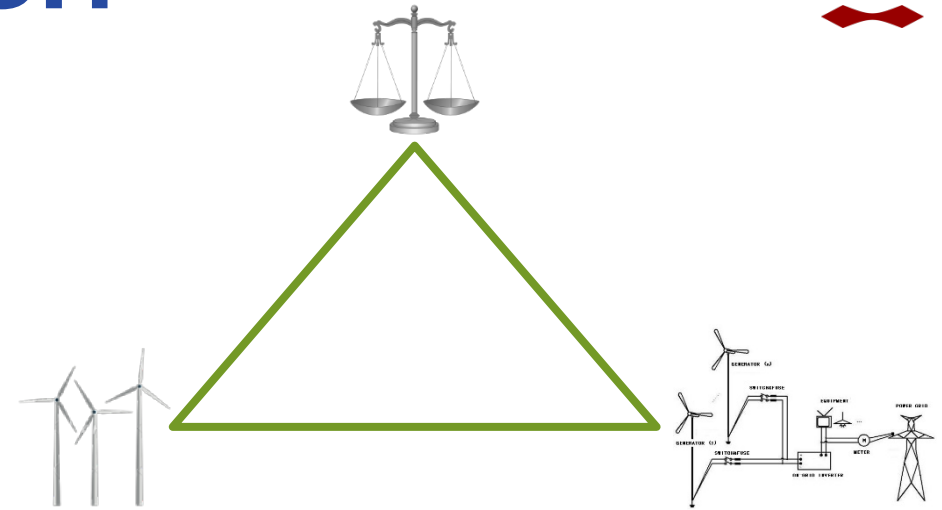
R5 Abolish RES support during negative price periods;

R6 Enhance electrification by removing the limitations on using electricity for heating;

R7 Tackle investment risks in flexible individual heating through new financing and private ownership models.

Smart Energy Innovation

Technology - Regulation - System



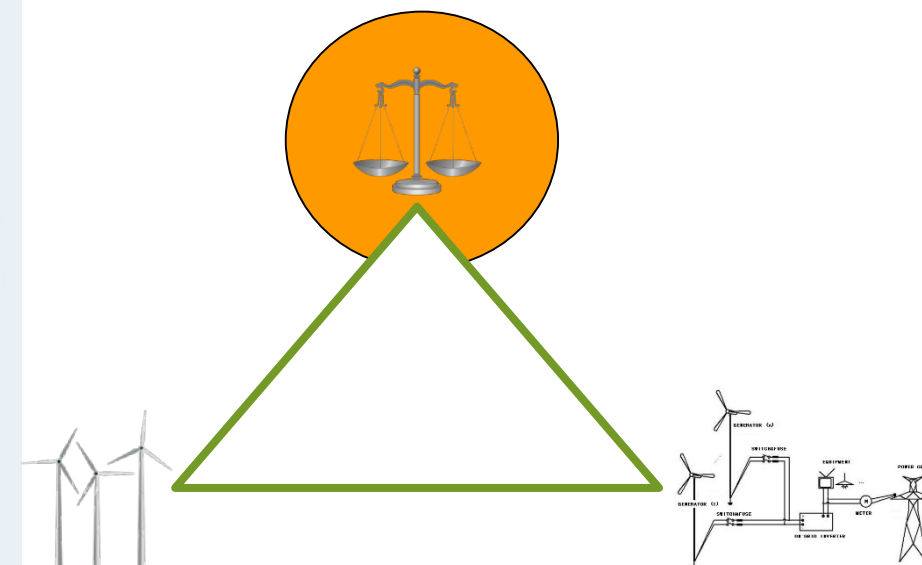
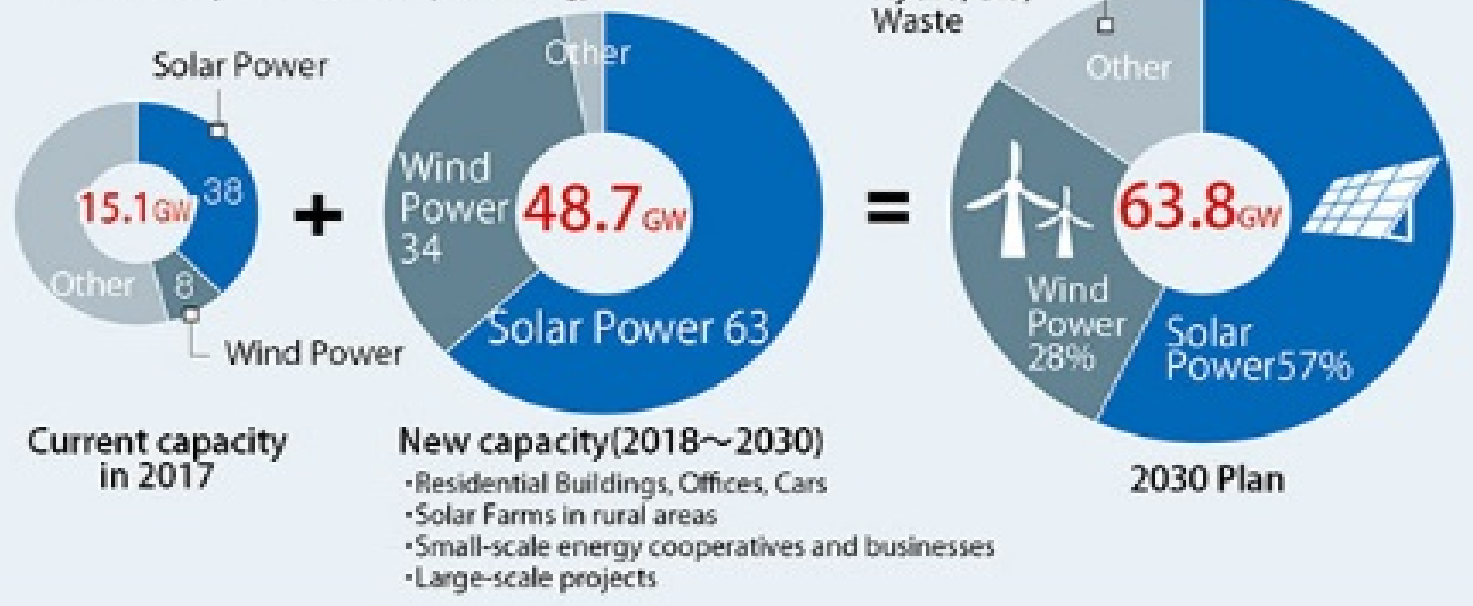
Case & Call To Action

parties	Technology	Economics	System
Industry & governmental	<ul style="list-style-type: none"> Vestas, developers technology companies 	<ul style="list-style-type: none"> Energy Agencies in Denmark and Korea - both regional and national. 	<ul style="list-style-type: none"> Smart grid test beds. System operators, e.g. Energinet (dk)
University	<ul style="list-style-type: none"> DTU Wind Corresponding Korean University Institute 	<ul style="list-style-type: none"> DTU Management Engineering Corresponding Korean energy economics institute 	<ul style="list-style-type: none"> DTU Elektro Corresponding Korean electrical engineering institute

Enabling new renewables in Korea

'Renewable Energy 3020' Goals for Provision of Facilities

Source: Ministry of Trade, Industry, and Energy



Questions to participants:

1. Which framework conditions are needed in order to improve the business case for solar and wind technologies?
2. How can Danish and Korean solutions create synergies? Building on each other's strong sides/experiences.