

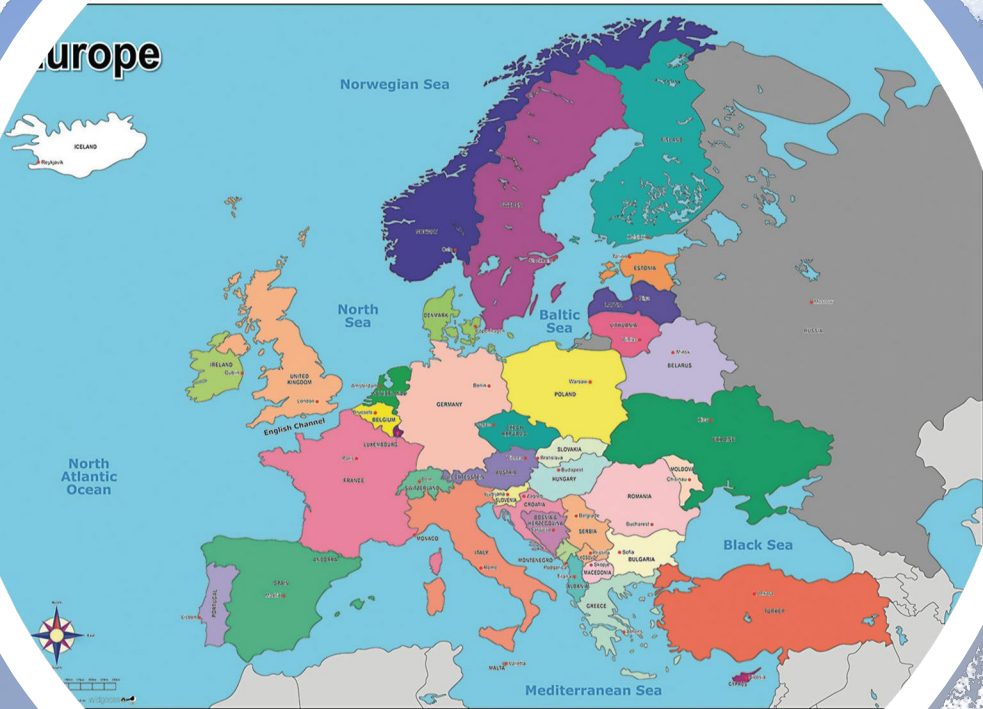
Rethinking regionalization – A new layer in European energy governance

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11/12/2019

European energy governance: are the current layers sufficient?



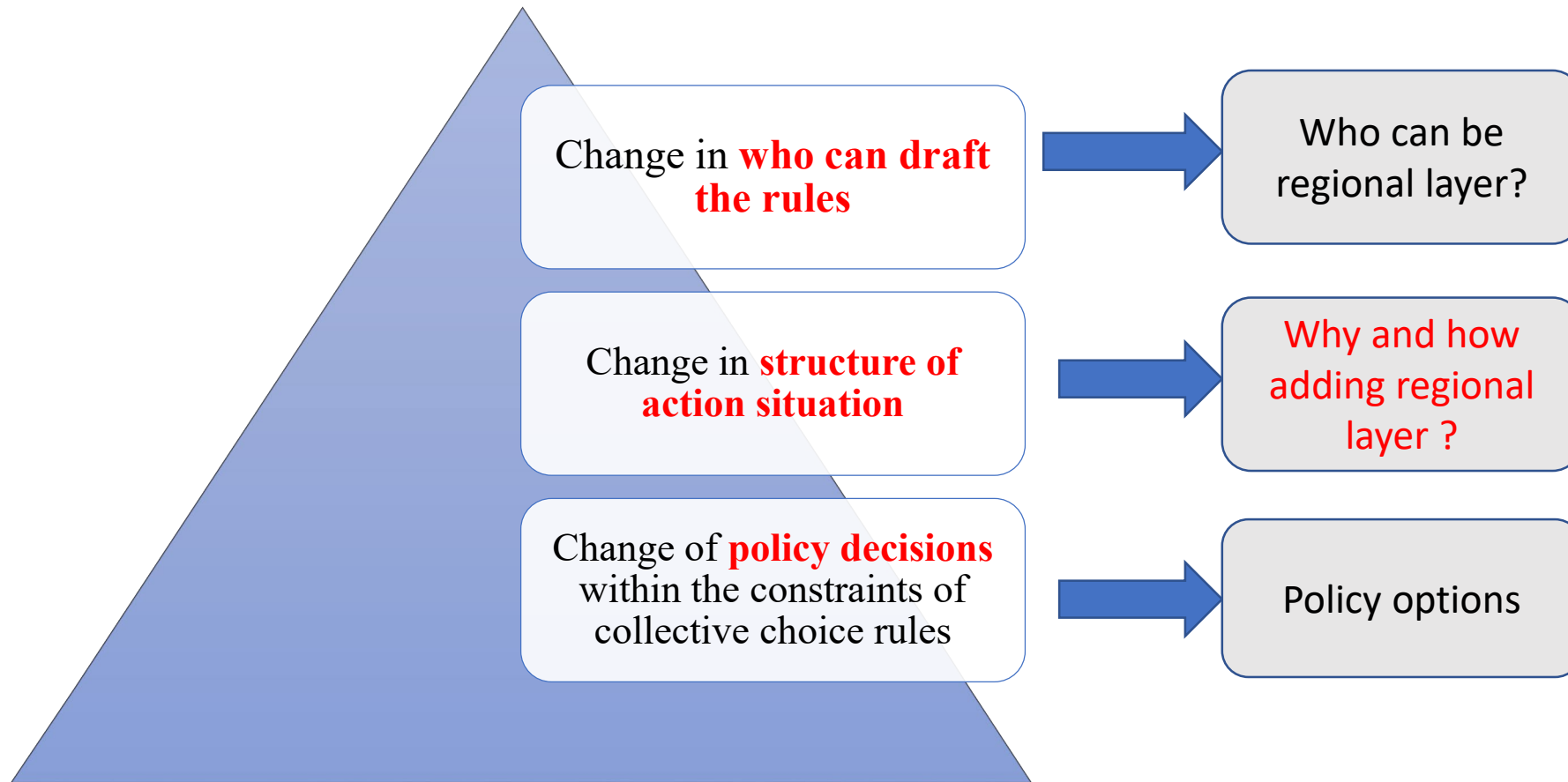
National level

- National TSO (Unbundling 3rd Package)
- National Regulatory Agencies (NRA from 2nd Package)

European level

- EU Institutions
- ENTSO-E
- ACER
- Dilemma
 - EU ETS → cross-border, national emission exchange coming soon
 - Market coupling → cross-border, national power exchange and TSO
 - Transmission investment → national regulation
 - Renewable investment → national regulation

Governance layers in IAD framework



Institutional Analysis and Development layers by Olstrom

Regional cooperation factors

- **What factors foster cross-border energy cooperation?**
 - **Scenario & technology uncertainties**
 - **Externality**

- **What makes EU Member States take divergent paths in energy transition?**
 - **Energy security**

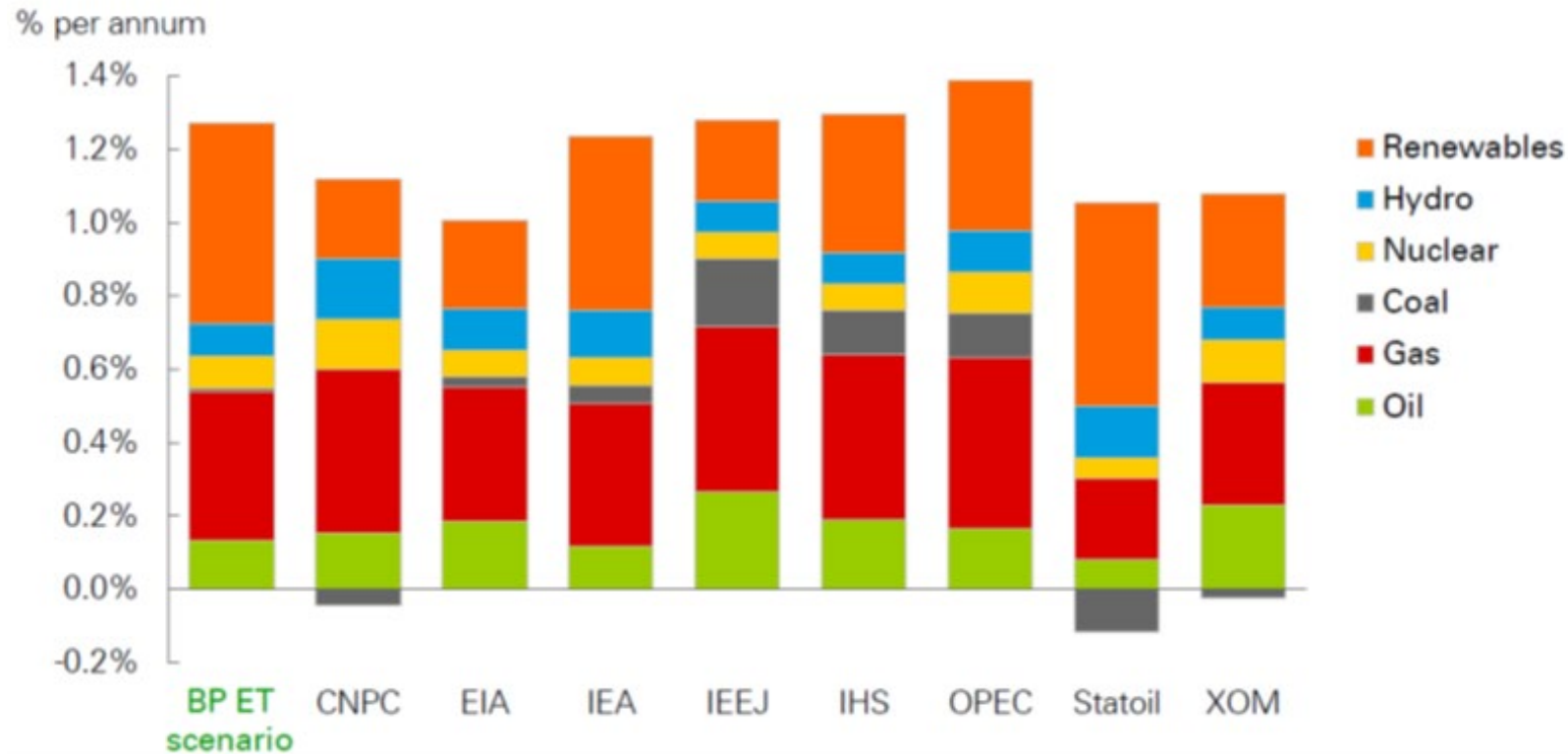
Major international energy agencies and companies

	Irena	IEA	Shell
	REmap case	2 degrees	Sky
Total primary energy supply [EJ/yr]	550	586	828
Total final consumption [EJ/yr]	386	398	548
Renewable energy share in total primary energy supply %	63	46	43
Fossil fuel CO2 emission in 2050			
Baseline [Gt/yr]	37	37	
Emission in 2050 [Gt/yr]	9.7	9	18
Contribution of abatement options			
Renewable energy [%]	41	37	
Energy efficiency (including electrification) [%]	53	35	
Others [%]	6	29	
Energy intensity improvement	2.8	2.9	2
Electric mobility in transport	31	n/a	21
Total biomass demand	128	147	55

Source: IRENA 2018

Scenario uncertainties

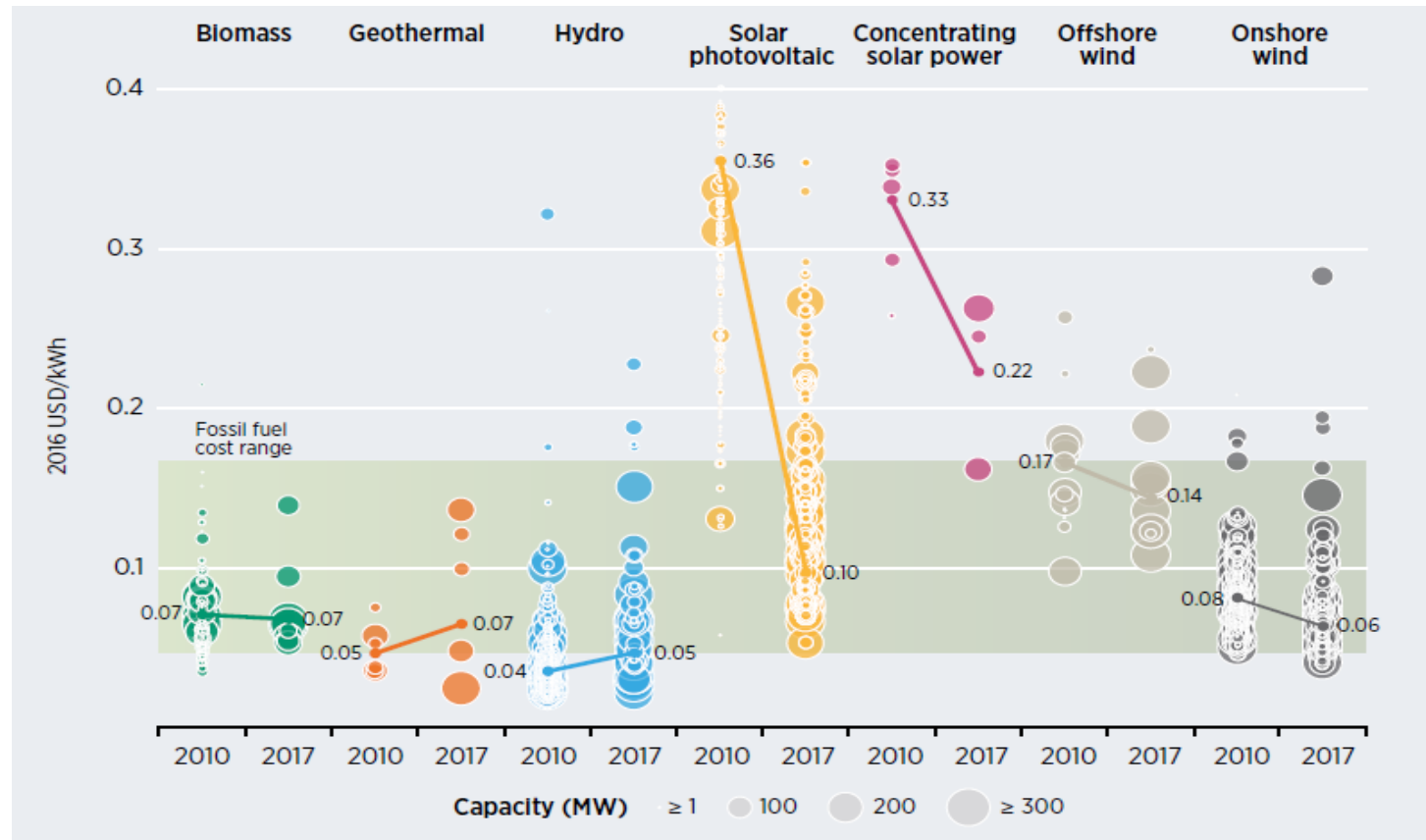
- Major international energy agencies and energy companies



Source: BP website

Technology: Experiment or Exploration

Current RES or next generation?



Source: IRENA

- Deployment as Self fulfilling process
- Nordhaus learning coefficient bias
- Germany: combining supporting on research and deployment yields higher benefit

Cross-border effect of technology uncertainties

- Theory

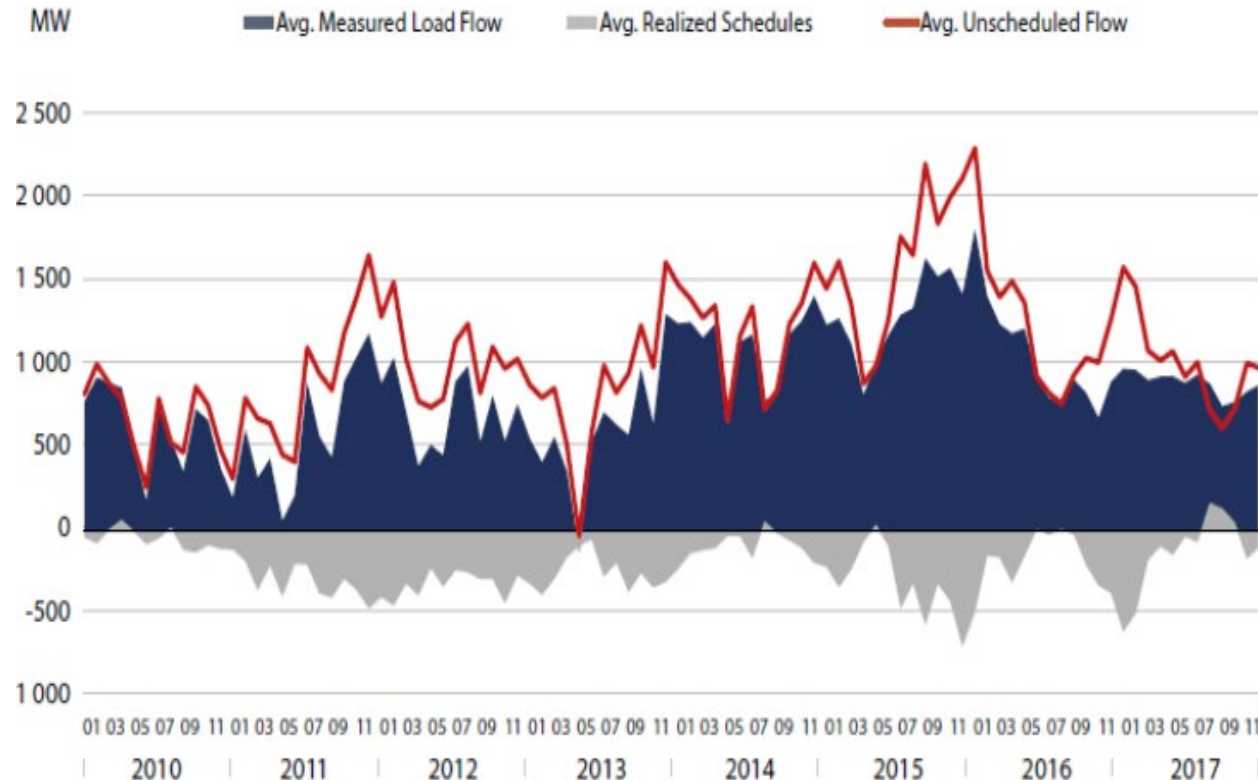
- Uncertainties to bet on certain technology for a single country
- Information gap

- Uncertainties in real world

- Political cost to have all agreeing on the same set of technologies and supporting schemes are extremely high
- National development plan VS EU top down scenarios → significant variations of the volume of wind and solar in the TYNDP 2016



Externality: no country by itself



- ❑ Separation of market and technical operation by PX and TSO coordination

- ❑ Zonal pricing mostly conformed to national border boundaries

Loop flow in German Polish border (Purchala, 2018)

German-Polish interconnection



**NO STREAMLINING PLANNING
AND INVESTMENT FOR
TRANSMISSION NETWORK**



**COST AND BENEFITS
ASYMMETRY**



**ENERGY SECURITY RISK
PERCEPTION**



**TRANSMISSION INVESTMENT
COORDINATION VS MARKET
ORGANIZATION**

Energy Security

- IEA and IRENA definition combined
- Affordability
- Change of flow in fossil fuel trade
- Commercial race to be renewable technology leader

- Energy security in EU
- Energy as joint competence between EU and MS
- No European definition for energy security → energy mix national issue
- National energy history, reflection and practice on energy strategy differ

Change of Flow in Fossil Fuel Trade: Germany



Gas as transitional fuel under ETS mechanism?



German Energiewende



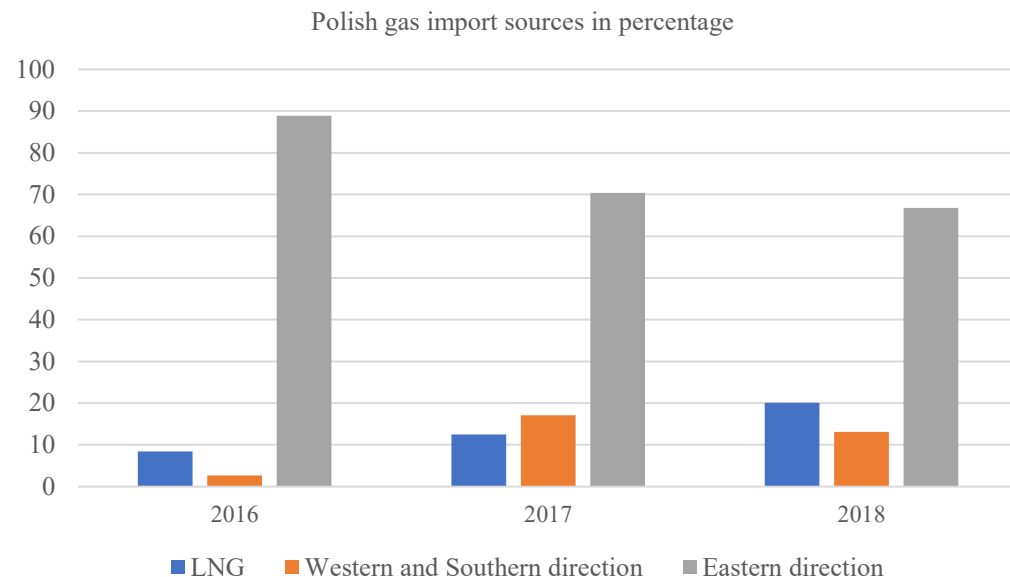
Market based principle for German energy policy



Energy security: achieved by competitive market, responsibility of private utilities

Change of Flow in Fossil Fuel Trade: Poland

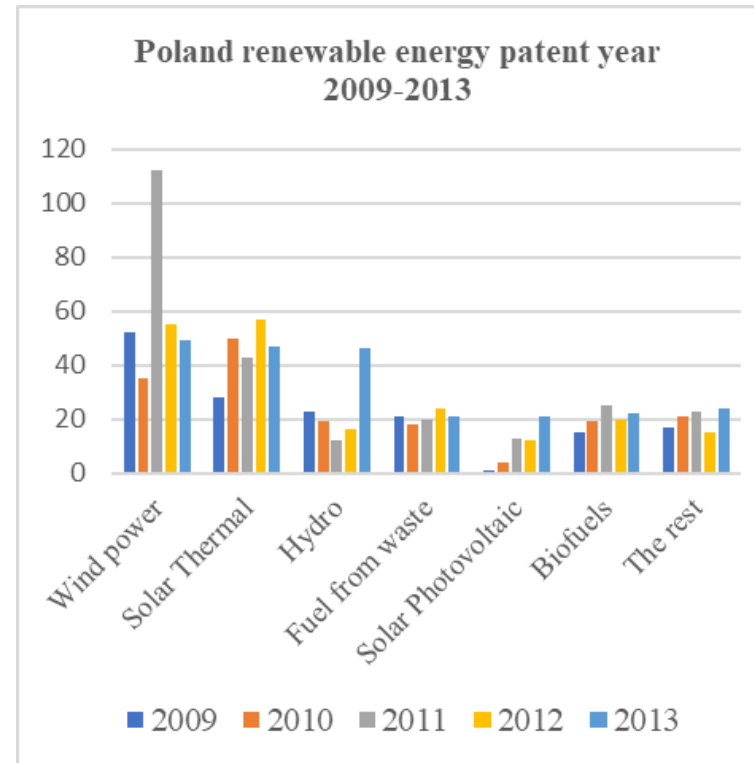
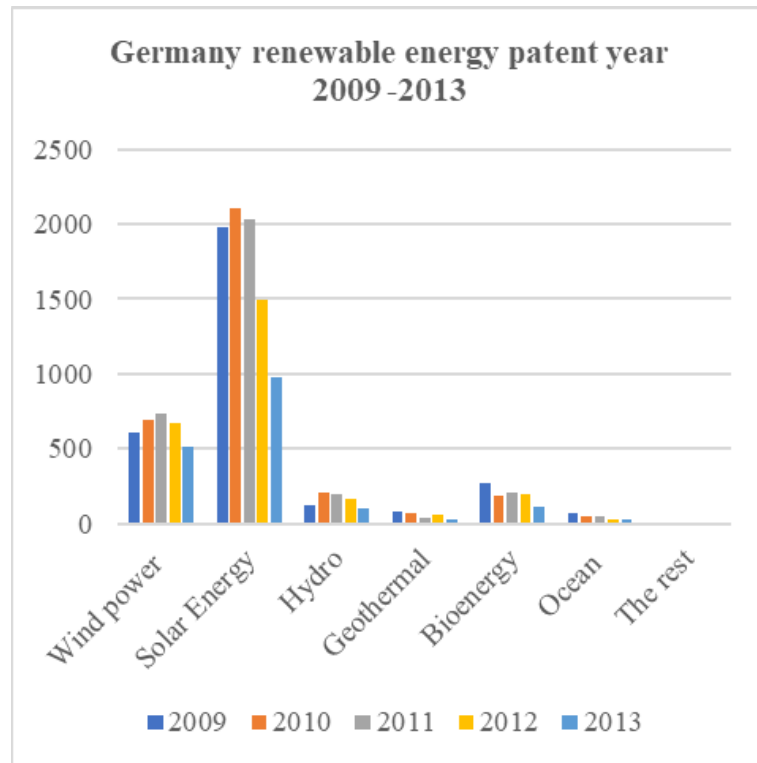
- Energy as pillar in National Responsible Development Plan
- Energy policy objective in the NRDP: security, availability and price
- Energy security → Energy independence from domestic coal production



Clear trend and preference of **reducing** the gas flow from **Eastern direction**

Commercial race to renewable technology

Renewable patent number as proxy to measure the relative position in the technology race

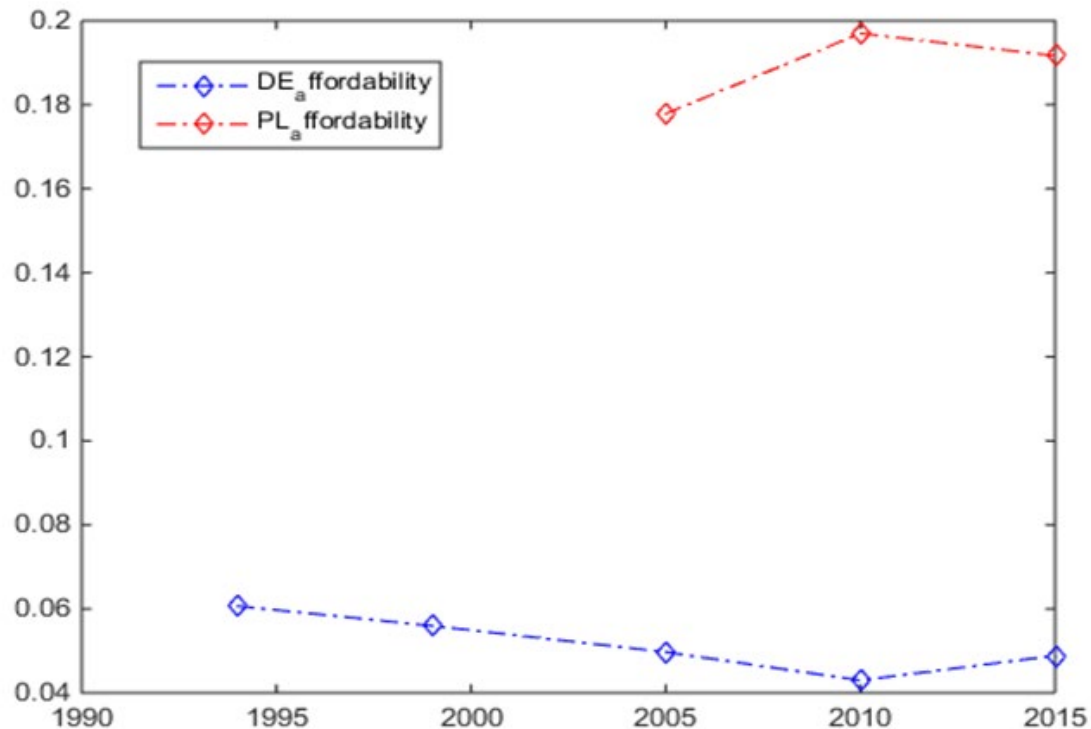


- ❑ Firms' inclination to continue innovation on clean technology correlates positively with their stock of clean patents
- ❑ Positive loop for innovation: initial political barrier conquered, countries at the forefront countries accelerate easily
- ❑ Countries that are near the knowledge frontier will likely to continue benefiting from further knowledge advancement

Energy Poverty

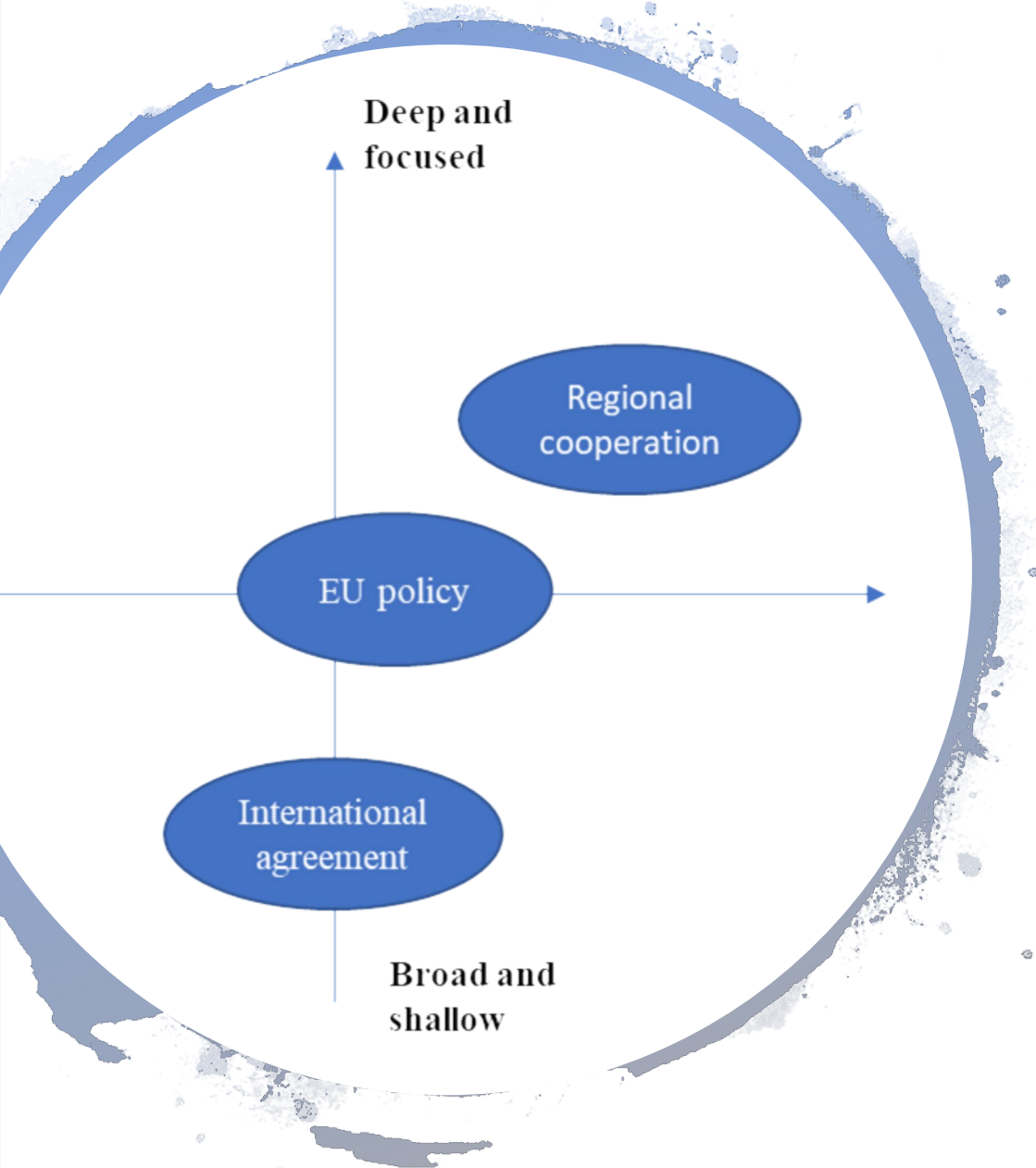
- Energy affordability

-Energy consumption as share of total household expenditure



- Poland: Renewable generally perceived too expensive for Polish society

- Germany: Energy poverty not a major issue, less than 5% of household not able to pay energy bill



Regionalization criteria: adaptive efficiency, deep and focused

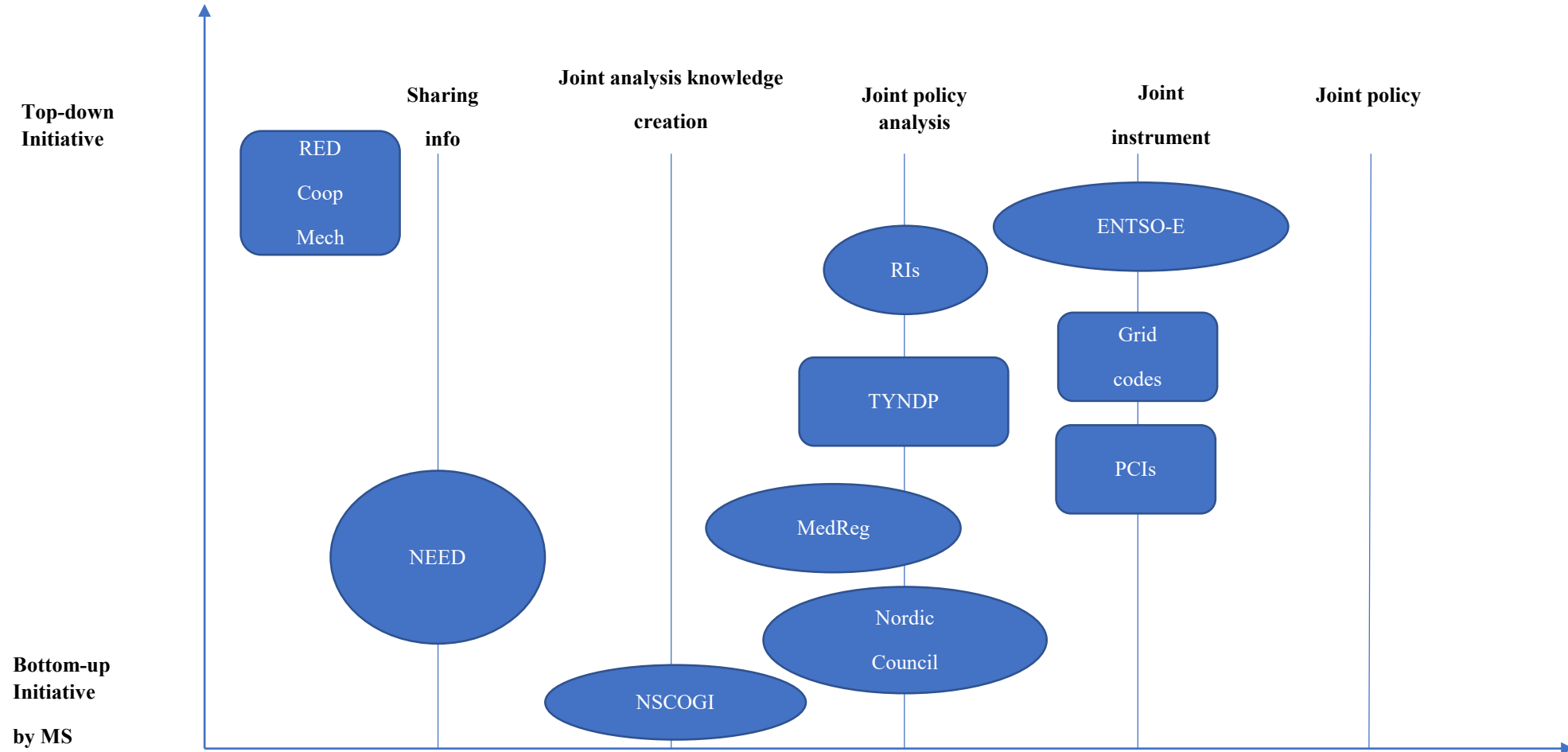
- Uncertainties → Adaptive efficiency
- Externality → Deep and focused
- Energy security → Deep and focused

Governance options

- Deep and focused cooperation requires joint commitment tool
- Joint asset base in regional cooperation for cross-border renewable and transmission projects

Back up slides

Status quo of cross-border cooperation



Benefits of regional cooperation in RE investment

Challenges	Benefits of regional cooperation
High capital cost for renewable projects	<ul style="list-style-type: none">• Capex could be lowered if neighbouring countries jointly develop their projects at sites with best available resource or cheapest to develop• Larger projects at regional level can lead to Capex reduction and capacity factor improvement
Lack of market scale	<ul style="list-style-type: none">• Regional cooperation could benefit from higher competition and economies of scale• Larger market scale could fasten penetration of new technologies
Lack of capital for RE projects	<ul style="list-style-type: none">• Regional cooperation could pool efforts in public-private partnership and improve availability of capitals for RE investments• Regional cooperation allows cheaper capital in one Member State in another that has less capital or higher financing cost
Developers facing difficulties to secure bankable renewable projects	<ul style="list-style-type: none">• The set up of regional projects could introduce harmonized administrative, grid related or common support regulations
Integration issues	<ul style="list-style-type: none">• Regional cooperation allows better solutions to integrate large scale renewables into the grid include working towards

Challenges and solution overview

- Technology and scenario uncertainties
 - Externality loop flow uncertainties
-
- ➔ Status quo: Indicative planning methodology poses challenges on investment accountability and creates stranded asset risk
 - ➔ Solution: Joint commitment tool or collaborative governance based on ISO or user initiated transmission

Planning and ownership: Joint commitment tool

- Joint regulated asset base as solution for uncertainty sharing and ex-post cost allocation
- Key challenges: agreeing distribution rule
- Under zonal pricing, the renewable integration cost consist: subsidies, grid related cost and balancing cost
- Advantage: strong commitment signal from public sector, reputation in the network industry, regulator experience
- Disadvantage: long lead time for agreement over cost and benefit

Planning and ownership: joint planning

- German offshore wind case study
- Proposed regional planning steps

Resource Assessment

- Assess the resource availability of currently mature renewable energy technologies

Target Division

- Set regional target
- Divide target capacity into price zones

Plan & Auctions

- Plan the renewable and transmission network investment
- Host auctions

Planning and ownership: ISO model

Collaborative governance with users involved in the cross-border network investment decision making

Case study: User initiated transmission investment in Argentina

Case study: Long term power purchasing agreement and its potential to match cross-border network investment

Two types: physical or financial PPA

Governance implication: creation of ISO and role division between ISO and network investor under different pricing schemes

Financing

Principle – agent theory: lack of top down incentive for national authority or TSO to invest in cross-border network

- A PCI list of everything equals a list of nothing
- Financing source: green bonds for cross-border infrastructure in the joint RAB
- Rate adder to stimulate investment in the planning and construction phase

Market operation

- Market rules → asset utilization → investment rate
- Smaller bidding zones (flow gate rights)
- Nodal pricing (financial transmission rights)
- Risk hedging tool: Financial transmission rights under the two pricing schemes
- Implication of risk hedging tool on institutional set ups
- Cross border market development that allows long term renewable PPA