Die Technologieabhängigkeit Europas im Bereich der Energie heute und morgen / Energy Technology Dependence in Europe today and tomorrow

Presentation by Dr Stephan Slingerland

Berlin, 24 October 2019

www.trinomics.eu

Trinomics

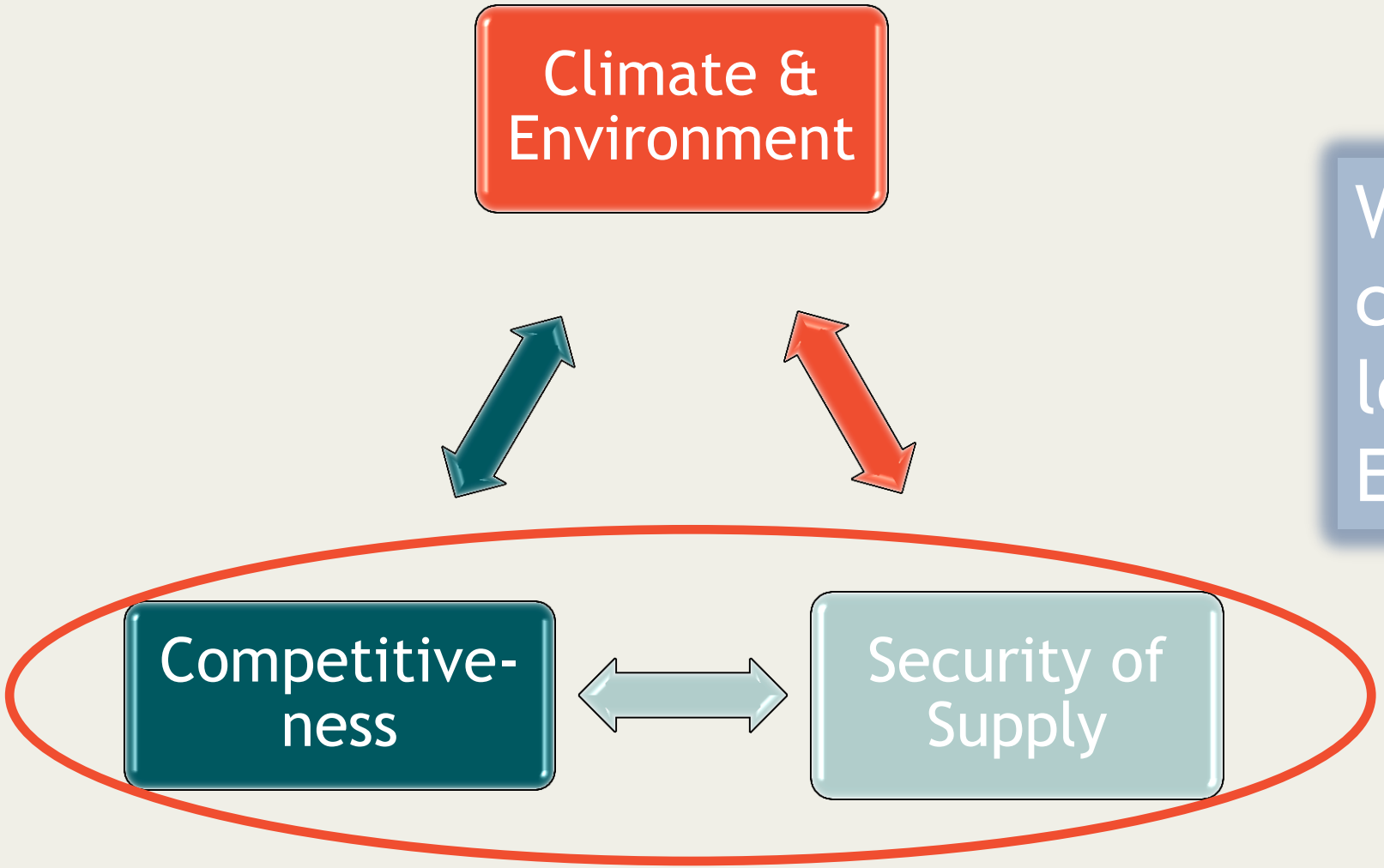
- Offices in Rotterdam and Brussels
- 35 Employees
- Specialised in work for the European Institutions

Current studies e.g

- Macro-economics Energy Union
- Biomethane and hydrogen potentials EU infrastructure
- City climate and air quality policies together with citizens

Energy Technology Dependence

Trinomics

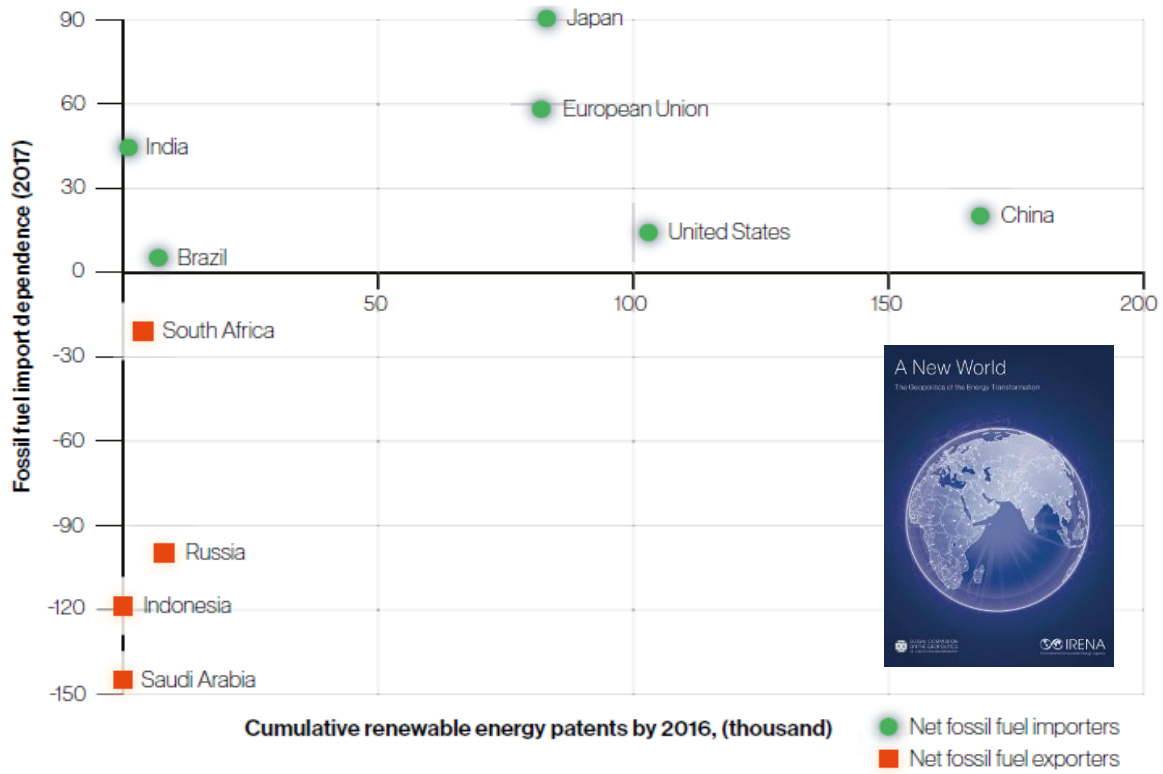


What are possible consequences of a low-carbon future for EU energy strategy?

The new geopolitics of energy

Trinomics

Figure 4. Impact of the energy transition on selected countries and groupings



Source: BP, IRENA.

A shifting balance of (energy) power

Project method

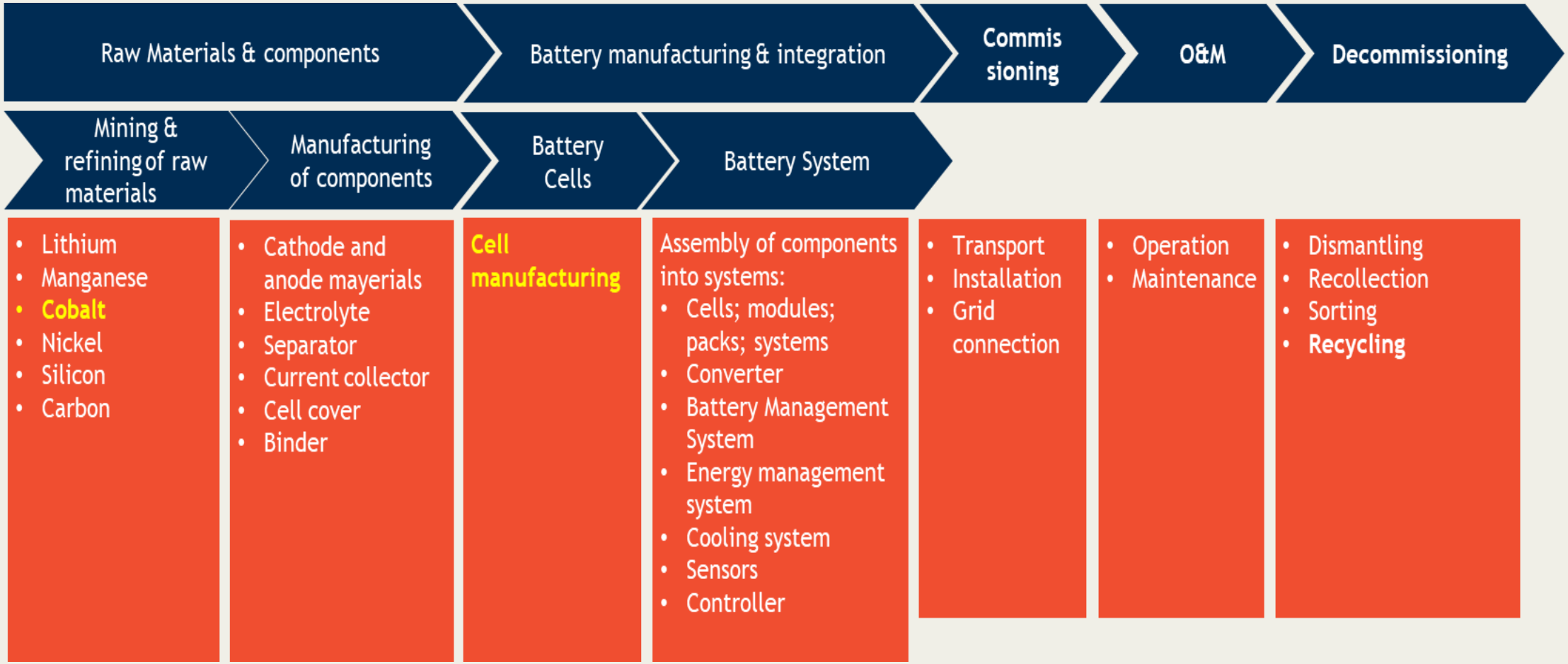
Trinomics

Broad brush	Criteria	Detailed assessment	Criteria	Recommendations
•Bioenergy •CO_2 capture •CO_2 use •CO_2 storage •Energy storage •Flexible conventional •Geothermal •Hydropower •Hydrogen & Fuel cells •Ocean energy •Solar energy •Wind energy •Heat pumps		•Wind energy •Solar PV •Li-Ion battery storage	•EU external dependence •Market concentration •Political risk •Ease of market entry •Availability of substitutes •Competitiveness trends	•Integrated policy strategy

Broad brush assessment - Summary table	Critical dependence (Criterion 1)	Importance for EU security of supply (Criterion 2)		Importance for EU leadership in renewables (Criterion 3)					Priority of managing dependence
	Extent of critical dependence**	Current installed capacity - EU	Net capacity additions until 2030 - EU	Current installed capacity - World	Net capacity additions until 2030 - World	EU share of EPA patent applications	EU share of global patent applications	EU share of global publications	Expert assessment based on scores on criteria 1, 2 and 3
Technology family or variant*	High/medium/low	MW	MW	MW	MW	%	%	%	
Solar - Photovoltaic	Medium	100,414	49,436	290,791	658,426	35%	8%	25%	Firm
Solar - Concentrated solar power	Medium	2,308	2,569	4,873	29,376	59%	16%	38%	Secondary
Solar - Heating & cooling	Low	34,357	84,541	416,675	297,049		16%	31%	
Wind - All variants	High	154,283	116,974	466,505	652,622	69%	17%	48%	Firm
Hydro - All variants	Low	159,562	39,792	1,242,961	679,088	64%	16%	24%	
Biomass - Thermochemical conversion	Low	409,953	127,000	3,388,266	223,606	56%	8%	40%	
Biomass - Biochemical conversion	Low	42,047		288,582		42%			
Geothermal - High enthalpy	Low	814	945	12,628	18,651	50%	16%	35%	
Geothermal - Low enthalpy	Medium	64							Secondary
Ocean - All variants	Low	248	2,513	537	5,299	57%	16%	33%	
Hydrogen & fuel cells - Renewable hydrogen	Low	Negligible	Negligible / Uncertain	Negligible	Negligible / Uncertain	36%	Not available	21%	
Hydrogen & fuel cells - Proton-exchange membrane fuel cells	Low						Not available		
Hydrogen & fuel cells - Solid oxide fuel cells	Medium						Not available		
Storage - Batteries	High	350	2,650	1,400	12,600	28%	Not available	20%	Firm
CO2 Capture - All variants	High	Negligible	1,083	Negligible	Uncertain	38%	Not available	33%	Secondary
CO2 Storage - All variants	Medium	N/A	N/A	N/A	N/A		Not available	33%	
CO2 Reuse - Carbonate mineralisation	Low	N/A	N/A	N/A	N/A	N/A	N/A	26%	
CO2 Reuse - CCU fuels	Medium	N/A	N/A	N/A	N/A	N/A	N/A		
Flexible conventional - Gas engines	Low	212,280	79,512	1,562,558	699,818	Not available	Not available	32%	
Flexible conventional - Gas turbines	Medium					Not available	Not available		Secondary
Heat pumps	Low	30,000	26,000	84,000	76,000	Not available	17%	29%	

Detailed assessment – value chain

Trinomics



Detailed assessment results: Wind energy

Trinomics

Examined in detail: neodymium, dysprosium, fibreglass, HVDC insulation, 'Integrated Gate Biopolar Transistors' (IGBTs)

Dependency	EU external dependence	Market concentration (CR4)	Political risk	Ease of market entry	Availability of substitutes	Competitiveness trends
Neodymium	>99%	99%	Low	Low	No/limited	Not applicable
Dysprosium	>99%	99%	Low	Low	Yes - in progress	Not applicable
HVDC insulation materials	Low	91%	Low	Medium	Yes - in progress	Stable
Fibreglass	>35%	87%	Low	Medium	Yes - available	Declining
IGBTs	Low	70%	Low	High	No/limited	Stable

- **Neodymium** and **dysprosium** are the main critical dependencies in the wind energy sector
- For **fibreglass**, current dependencies give some reason for concern, but there is no urgent need for action
- **HVDC insulation materials** and **IGBTs** are not considered critical dependencies

Detailed assessment results: Solar PV

Trinomics

Examined in detail: PV cells, modules, inverters

Dependency	EU external dependence	Market concentration (CR4)		Political risk	Ease of market entry	Availability of substitutes	Competitiveness trend
		Country	Firm				
PV Cells	+/- 80%	91%	<40%	Low	Low	High	Stable
PV Modules	45-70%	87%	34%	Low	Medium	High	Stable
PV Inverters	0%	78%	50-60%	Low	Medium	High	Stable

- **PV cells** and **modules** are both critical dependencies
- There is no dependency for **PV inverters**

Detailed assessment results: Battery energy storage

Trinomics

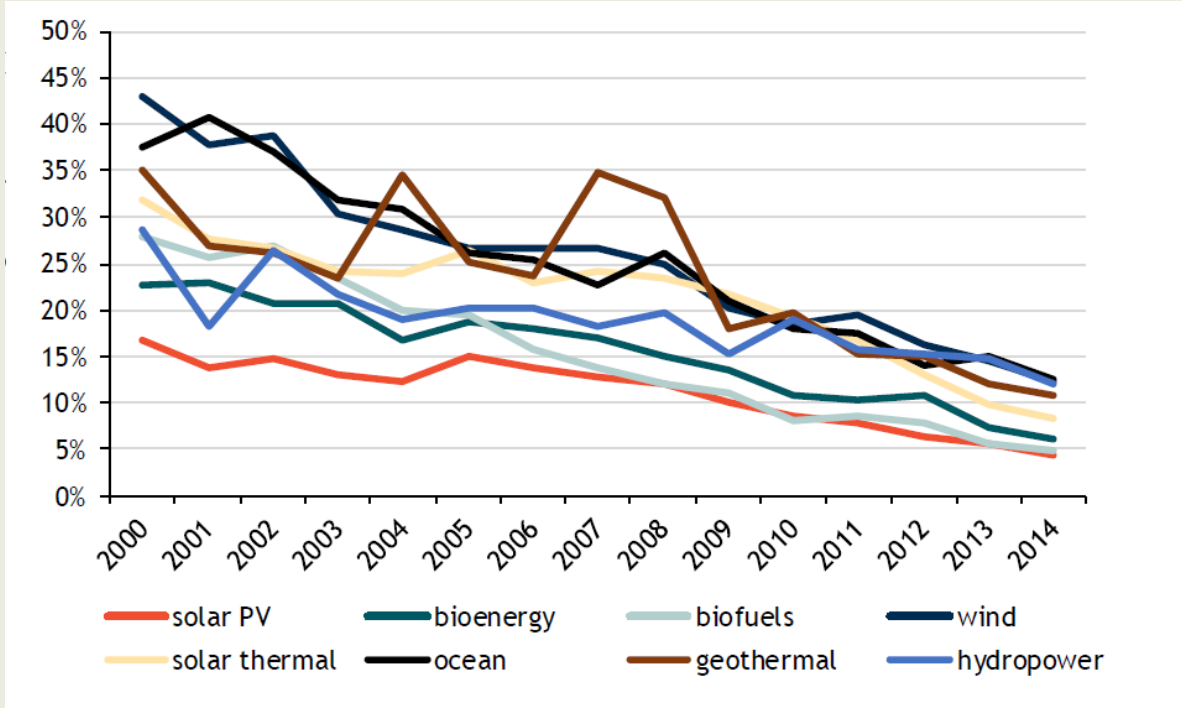
Examined in detail: raw cobalt, refined cobalt, battery cells, battery recycling

Dependency	Import share	Market concentration (CR4 Country)	Political risk	Ease of market entry	Availability of substitutes	Competitiveness trend
Raw Cobalt	>99%	72%	High	Low	Low	Not applicable
Refined Cobalt	32%	71%	Low	Low	Low	Not available
Battery Cells	High	95%	Low	Low	Medium	Stable

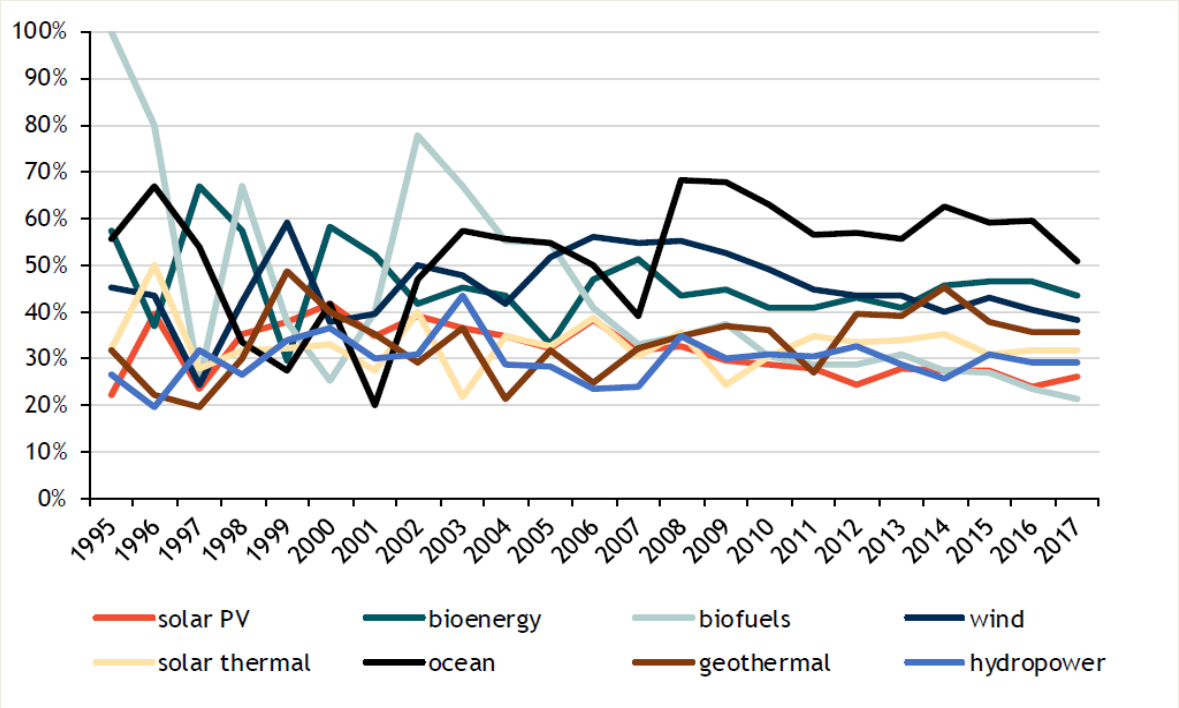
- **Raw cobalt** is a critical dependency for the EU battery energy storage sector
- **Refined cobalt** is no critical dependency but maintaining the EU industry is of strategic importance
- **Battery cells** are a critical dependency but with a relatively low risk
- **Battery recycling** is a potential future dependency. But with sufficient support, this could become a strategic part of the value chain for the EU

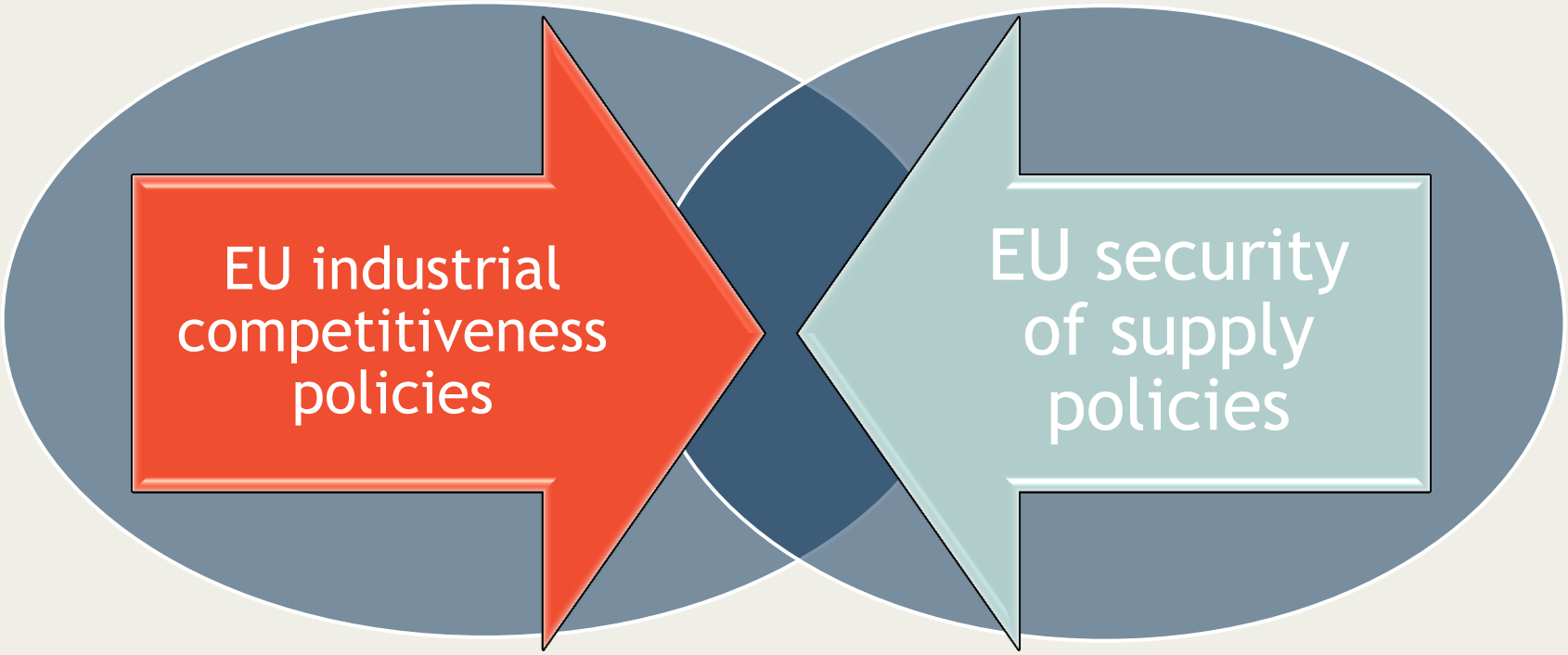
EU Patents and Publications

EU's share of global patents (%)



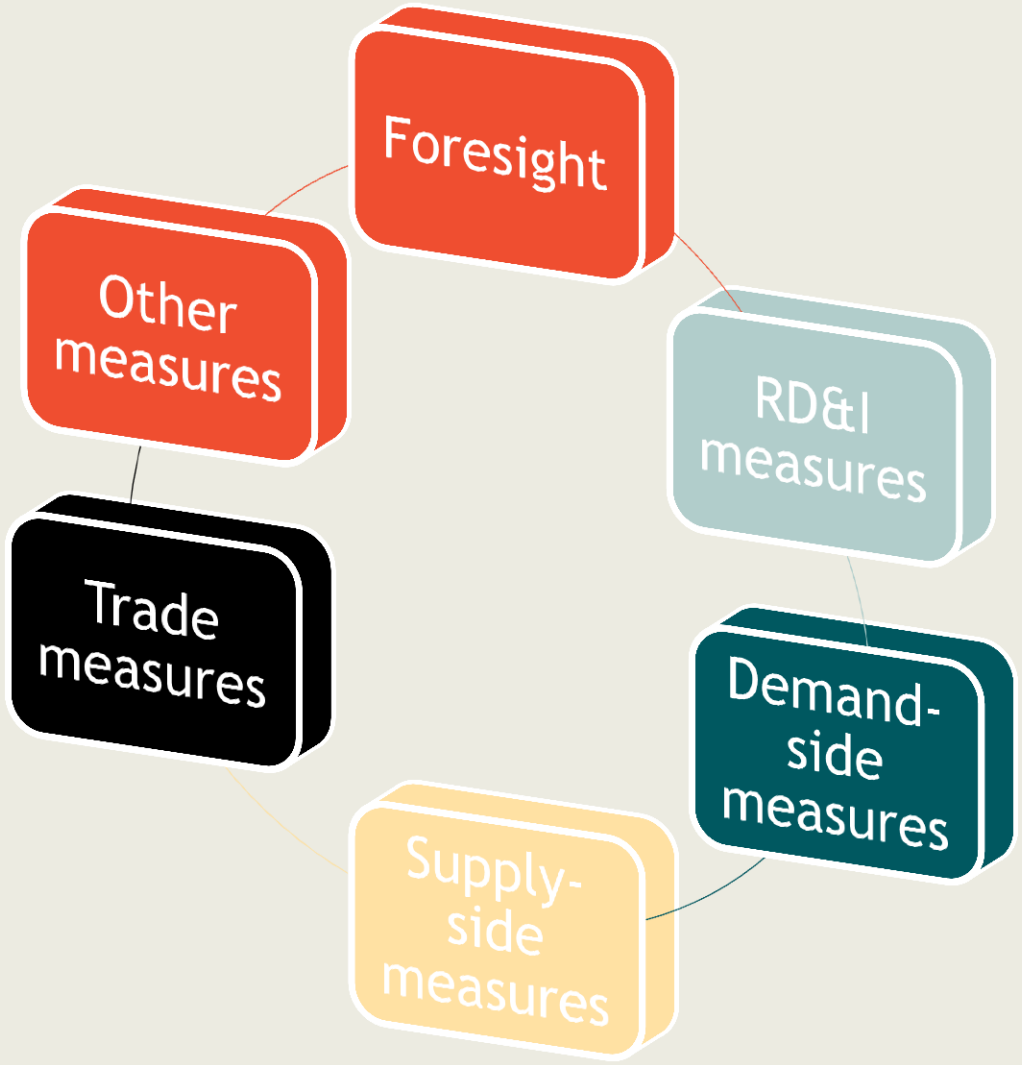
EU's share of global publications (%)





EU energy policy fundamentals will have to adapt

An integrated strategy to address EU energy technology dependence



- Embed regular technology foresight in regulation
- Targeted RD&I in HorizonEurope and SET Plans
- Support consumer demand by ‘EU Branding’
- Cross-sectoral clustering for developing EU niches
- Open markets and diversification of suppliers
- Transparent resource flows & responsible mining

Trinomics

Merci bien de votre attention
Herzlichen Dank für Ihre Aufmerksamkeit

www.trinomics.eu