MED & Italian Energy Report

Presentation of the 7th edition

ETTORE BOMPARD, Scientific Director of ESL@energycenter Lab, Politecnico di Torino

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Outline

- Shifting towards the Energy Transition (…still fossil fuels on the agenda)
- Transition targets in the Southern Shore and cross-Med cooperation
- Changing focus for energy security: from energy to non-energy natural resources
- CRMs for Energy Transition: key role and need for new strategies
- Med energy security in the transition: geopolitical concerns in the supply chain Manufacturers of relevant transition technologies
- Nuclear energy in the Mediterranean Basin and security of the nuclear fuel cycle
- Conclusions

Moving toward energy transition?
From the fossil-based dialogue
to the new challenges of the energy transition

Shifting towards the transition

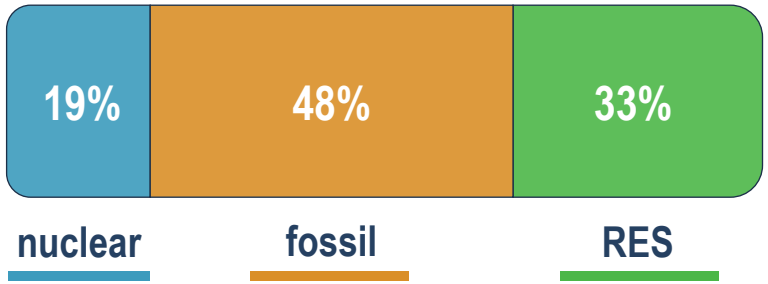
ENERGY TRANSITION

Current

Primary Energy ➔ fossil-oriented

	Italy	Tunisia	Türkyie
RES	20%	11%	19%
Fossil	76%	86%	80%
Nuclear			0%

Electricity Generation in the Med region ➔ fossil-based



Natural Resources ➔ fossil commodities + uranium

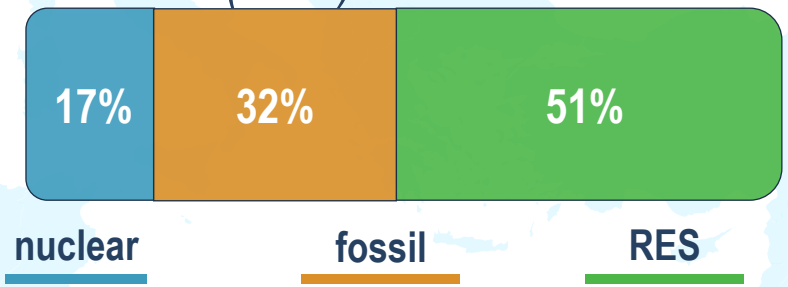
Coal **Oil** **Gas** **Uranium**

Future

Primary Energy ➔ fossil-oriented, growing RES + new nuclear

	Italy '40	Tunisia '35	Türkyie '35
RES	29%	18%	24%
Fossil	70%	82%	70%
Nuclear			6%

Electricity Generation (2040) in the Med region ⟶ (more) RES-based

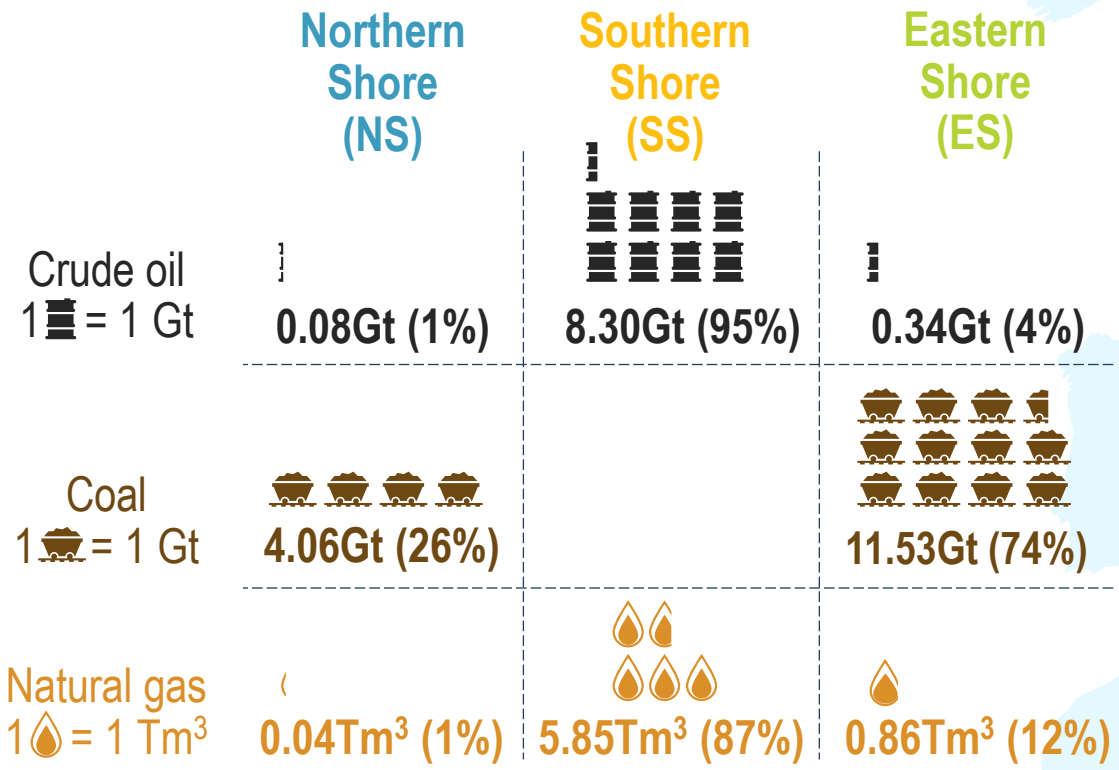


Natural Resources ➔ Critical Raw Materials

Mining / Production **Processing / Refining** **Manufacturing**

Still fossil commodities on the agenda …

Abundance of crude oil and natural gas in Southern Shore → reliance of the Mediterranean region on fossil fuels → coexistence of energy importers (e.g. Italy) and rentier states (e.g. Algeria and Libya)

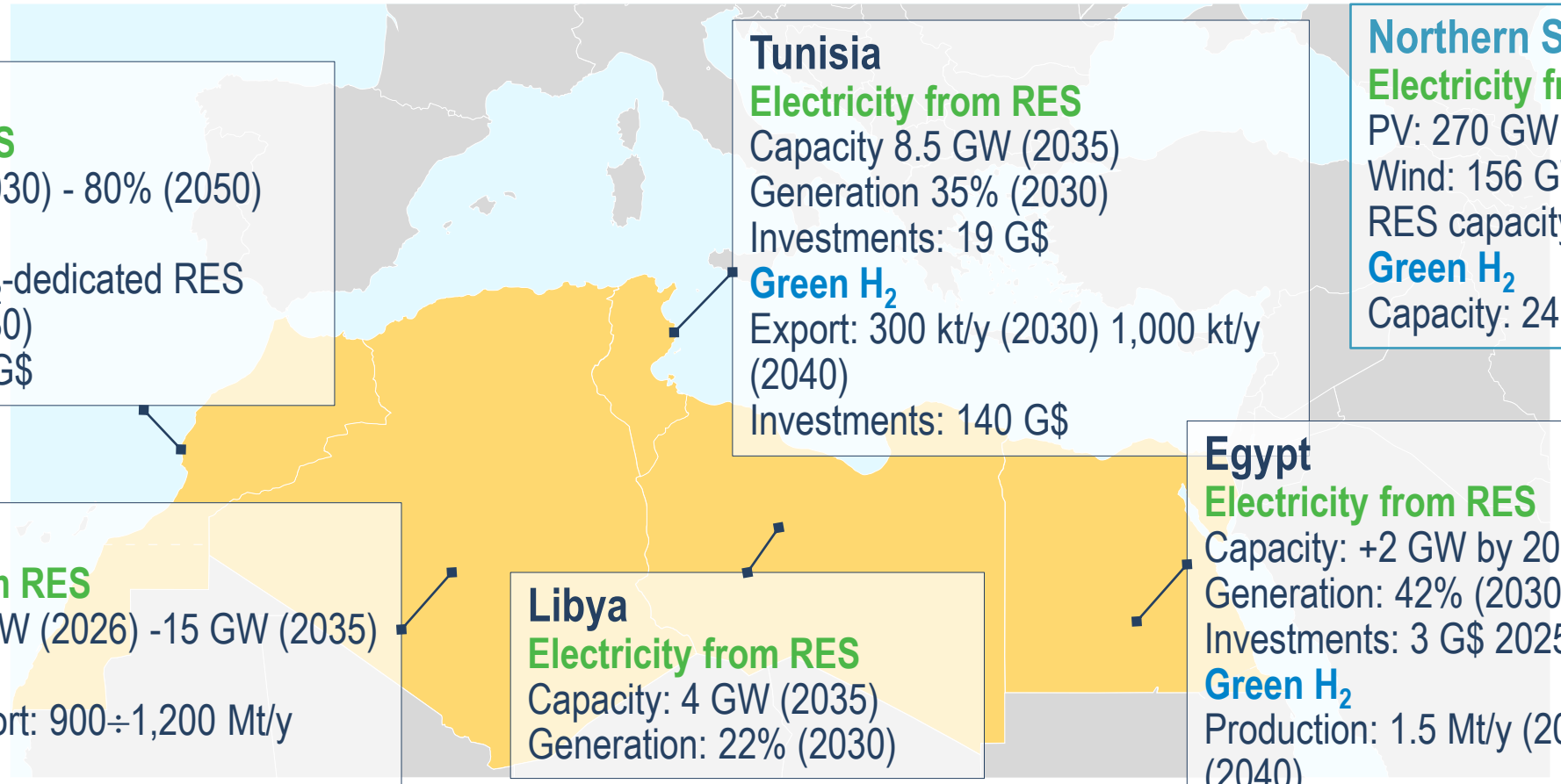


Proved Mediterranean reserves of fossil fuels (2021)

- **Share of energy import from the Southern Shore (2023)**
  - **NS:** **28%** , **17%**
    - (**26%** from **Algeria (1st)** , **11%** from **Libya (3rd)**)
  - **Türkyie:** **14%** , **2%**
    - (**42%** , **34%**, **70%** from **Russia (1st)**)
- **Economic dependency of SS on NS and ES imports (2023)**
  Share of total exports' value: Algeria **75%** (27.4G€), Egypt **29%** (1.6G€), Libya **41%** (13.1G€)
- **Fossil-oriented policy stategies for 2025-2035**
  - Algeria: **60G$** for **oil & gas exploration** and **production + refining** and **petrochemical** capacity increase
  - Libya: oil production **+13%** from Nov 23 to Nov 25 **+** expand **natural gas production** and **export** (**Greenstream** pipeline)

Sources: Energy Institute, Eurostat, Turkish EMRA, CEPII, OPEC

Targets for the transition in the Southern Shore



Morocco
Electricity from RES
Generation: 52% (2030) - 80% (2050)
Green H_2
Capacity: 5.2 GW H_2-dedicated RES
Export: 220 kt/y (2030)
Investments: 25-40 G$

Tunisia
Electricity from RES
Capacity 8.5 GW (2035)
Generation 35% (2030)
Investments: 19 G$
Green H_2
Export: 300 kt/y (2030) 1,000 kt/y (2040)
Investments: 140 G$

Northern Shore 2030
Electricity from RES
PV: 270 GW
Wind: 156 GW
RES capacity: 76% (avg)
Green H_2
Capacity: 24 GW electrolyzers

Algeria
Electricity from RES
Capacity: 3.2 GW (2026) -15 GW (2035)
Green H_2
Production/export: 900÷1,200 Mt/y (2040)

Libya
Electricity from RES
Capacity: 4 GW (2035)
Generation: 22% (2030)

Egypt
Electricity from RES
Capacity: +2 GW by 2025
Generation: 42% (2030) 60% (2040)
Investments: 3 G$ 2025/ 26
Green H_2
Production: 1.5 Mt/y (2030) 5.8 Mt/y (2040)

Despite commitments, deployment of energy transition in **Southern Shore** is hindered by geopolitical **instabilities**, lack of foreign **investments** and strong economic **dependency on fossil** fuels

Sources: EMBER, National Energy and Hydrogen Strategies (see ENEMED Report)

Cross-Mediterranean cooperation for the energy transition

Power

Project Name	From	To	Power [MW]	Total cost [M€]
SACOI3	Italy	France	400	1,829
ELMED	Tunisia	Italy	600	850
Medlink	Italy	Algeria	unknown	5,000
Great Sea Interconnector	Greece	Cyprus	1,000	2,365
	Cyprus	Israel		
GRITA2	Greece	Italy	1,000	1,900
GREGY	Greece	Egypt	3,000	3,569
Villanonva-Lastva	Italy	Montenegro	1,200	500

Hydrogen

Project Name	From	To	H_2 flow [Mt/y]	Total cost [M€]
SouthWest corridor	Portugal	Spain	0.75	10,586
	Spain	France	2.0	
	France	Germany	2.0	
France-Germany H2 valleys	France	Germany	0.1	312
Franco-Belgian H2 corridor	France	Belgium	1.0	426
Hy4link	France	Luxembourg	0.2	n/a
Alpine Hydrogen Corridor	Italy	Germany	unknown	n/a
SoutH2 corridor	Tunisia	Italy	4.4	3,624
	Italy	Austria	1.8	
	Austria	Germany	1.3	
H2DRIA	Greece	Bulgaria	0.9	1,860
H2 Poseidon	Greece	Italy	1.5	n/a

Initiatives are ongoing to reinforce the cooperation in the Mediterranean and to build a "green" energy dialogue

- **Cross-border infrastructure PCIs/PMIs (*Dec 2025*)**

  Investment for interconnectors with at least 1 terminal in Med countries → **Power**: 16.0 G€, **Hydrogen**: 16.8 G€

- **EU Pact for the Mediterranean (*Dec 2025*)**
  - Strengthen **cooperation** with Southern Mediterranean partners
  - 3 pillars: ① **People** as a driving force for change and innovation; ② Stronger and more sustainable **economies**; ③ **Security** and preparedness
  - Several **investments** areas (*Sustainable economic growth, Opportunities for young people, Green energy technologies, Water management and climate adaptation, Trade and job creation, Education, skills and cross-border mobility, Digital innovation, Security*)
  - **Funded** under NDICI Global Europe until end of 2027; then it will benefit from a budget of **42 G€** in the Multiannual Financial Framework (MFF). Also open to private sector investments

PCI: Project of Common Interest; PMI: Project of Mutual Interest; NDICI: Neighbourhood, Development and International Cooperation Instrument; Source: European Commission

A changing focus for energy security: from energy to non-energy natural resources

Energy Security … and Natural Resources (availability)

Natural **resources**: energy and non-energy. **Energy security**: ① current system → supply of energy resources; ② energy transition → supply of non-energy resources

Energy resources

- **Renewables** (solar, wind, hydro, geothermal) → **Green & clean**
- **Nuclear** fuel (uranium) → **Clean but not green**
- **Fossil** fuels (coal, oil, natural gas) → **Neither clean nor green**
  - Today, **energy security** is linked to the supply of:

1. fossil fuels

2. nuclear fuels

- **High** import **dependency** (especially in NS):

$$\frac{\textit{Net Imports}}{\textit{Total Primary Supply}} \longrightarrow$$ EU: **70%**; Med: **43%**

- High fossil reserves in SS → long-standing **fossil-based** energy **dialogue** in the Mediterranean region

Non-energy resources

- **Critical Raw Materials** (CRMs) are employed to manufacture relevant **technologies for energy transition**

  → Energy security will **gradually shift** from fossil fuels to supply of:

1. minerals

2. semi-finished products

3. green tech

- Key role of the **availabilty** of **CRMs** but also of the their **processing** and **manufacturing** capacity → **three-sided security concept:**

1. raw materials

2. refining/processing capacity

3. manufacturing capacity

Mean EU import dependency on CRMs
→ Extraction **70%** Processing **81%**

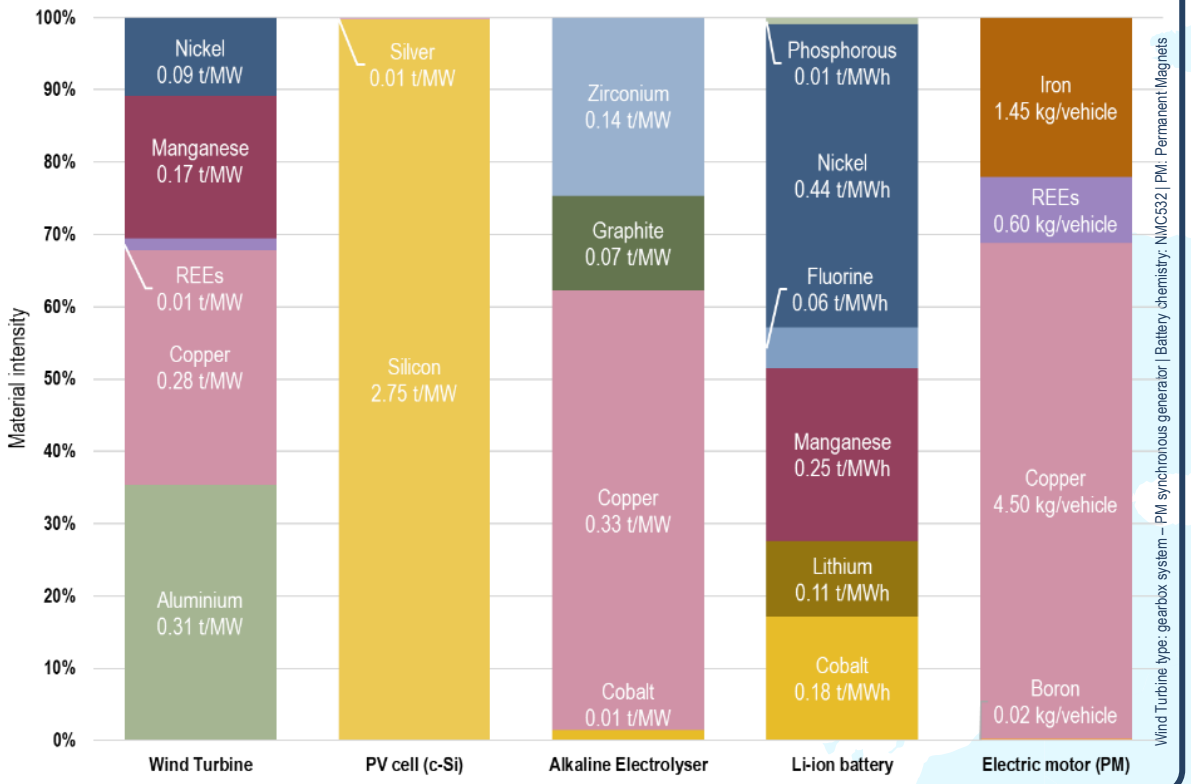
CRMs for energy transition: key role and need for new strategies

Most **technologies** for the transition (generation from RES, storage, transmission and consumption) employ **CRMs**

⟶ Expected **increase** in the **demand** for **electricity** → **increase** in the **demand** for **CRMs**

⟶ New **security issues** due to lack of resources in the Mediterranean Basin → need for new **policy strategies**

Material intensity by technology



Legislative intiatives in EU

- **2023**: updated list of **34 CRMs** by the EC (**16 Strategic Raw Materials**, **SRMs** → strategically-relevant end-use sectors + sharp increase in demand)

  Trade balance of CRMs Med countries ↔ extra-Med countries in 2023: **-28G$** (gross expenditure: **-68G$**)

- **2024**: **EU Critical Raw Materials Act (CRMA)**
  Non-binding targets for 2030 to **improve the security** of supply of CRMs, at different stages of the **supply chain**

Extraction 10% | Processing 40% | Recycling 25%

+ Max 65% of total consumption from a **single supplier**

Source: JRC, CEPII, European Commission

Security issues in the transition for the Mediterranean

CRMs in the Mediterranean Basin

Türkyie	NR	PC	RC
Baryte	5th (9%)		
Boron	1st (87%)	1st (48%)	
Feldspar	2nd (31%)	1st (40%)	1st (37%)

Algeria	NR	PC	RC
Helium	2nd (15%)		3rd (9%)

France	NR	PC	RC
Hafnium			1st (50%)

Morocco	NR	PC	RC
Baryte		3rd (13%)	
Phosphates	1st (68%)	2nd (14%)	2nd (11%)

Main suppliers of CRMs

Australia	NR	PC	RC
Lithium	2nd (23%)	1st (43%)	

DRC	NR	PC	RC
Cobalt	1st (56%)	1st (69%)	
Copper	5th (8%)	2nd (11%)	3rd (6%)

South Africa	NR	PC	RC
PGMs	1st (77%)	1st (57%)	
Manganese	1st (33%)	2nd (35%)	11th (1%)

Brazil	NR	PC	RC
Niobium	1st (90%)	1st (93%)	1st (88%)

+ China

CRMs in the world (rank: wrt world. NR: Natural Reserves, PC: Production Capacity, RC: Refining Capacity); PGMs: Platinum Group Metals

The transition implies the **security** of **CRMs** supply → new **dependencies** for EU and Med countries due to the **absence** of both **resources** and refining & **manufacturing** capacity

Source: WMD, USGS. BGS

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Very **limited reserves** of CRMs in Med countries (boron, feldspar and phosphate rock, with a less strategic relevance for the transition)

Supply chain (reserves + production + refining) of the most strategically relevant CRMs dominated by few countries, mainly **China** (~**monopolistic control** on production and trade)

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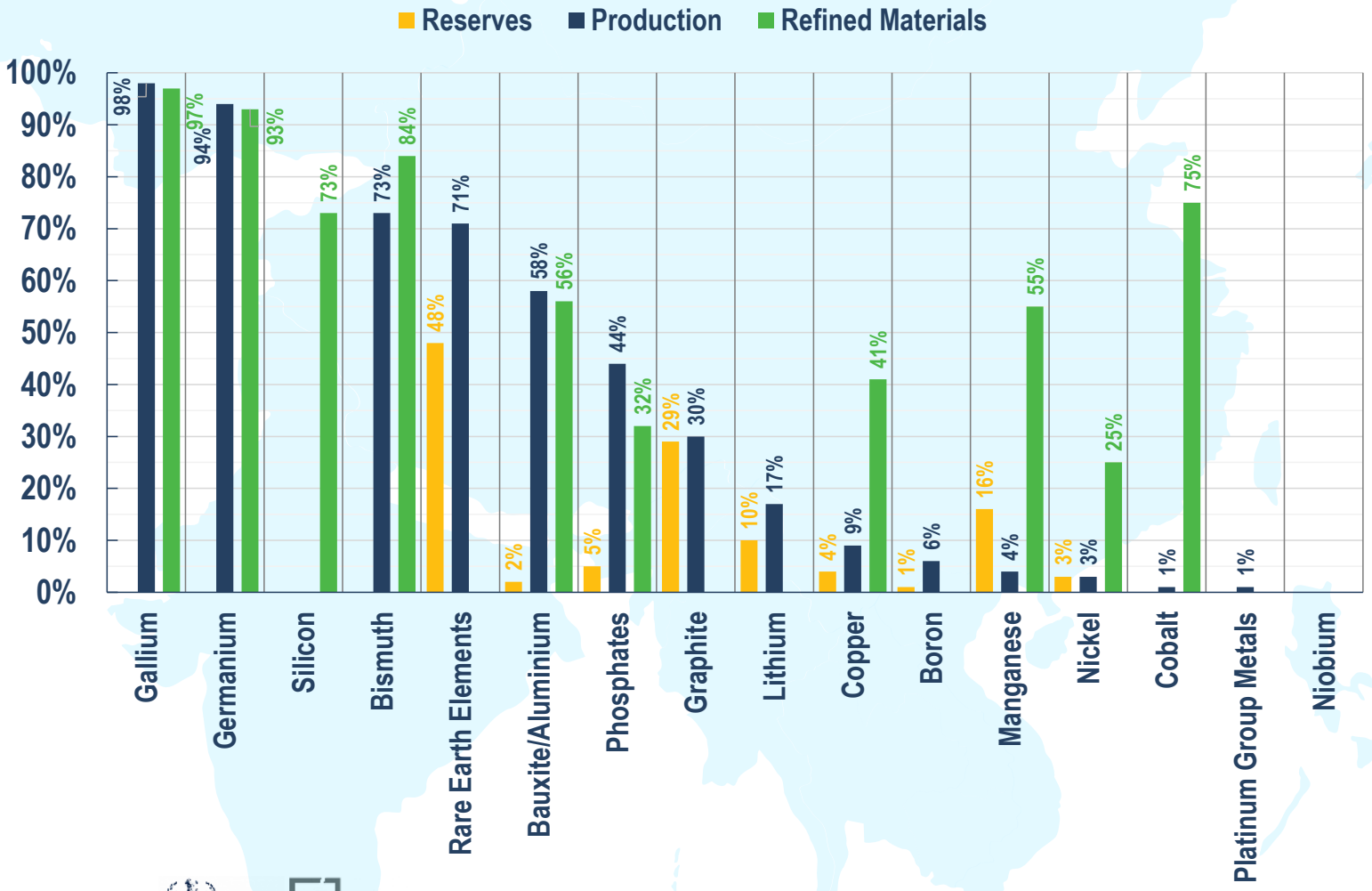
Source: WMD, USGS. BGS

The leading role of China in the supply chain of CRMs

Global shares of natural reserves, raw material production and refined materials production in China

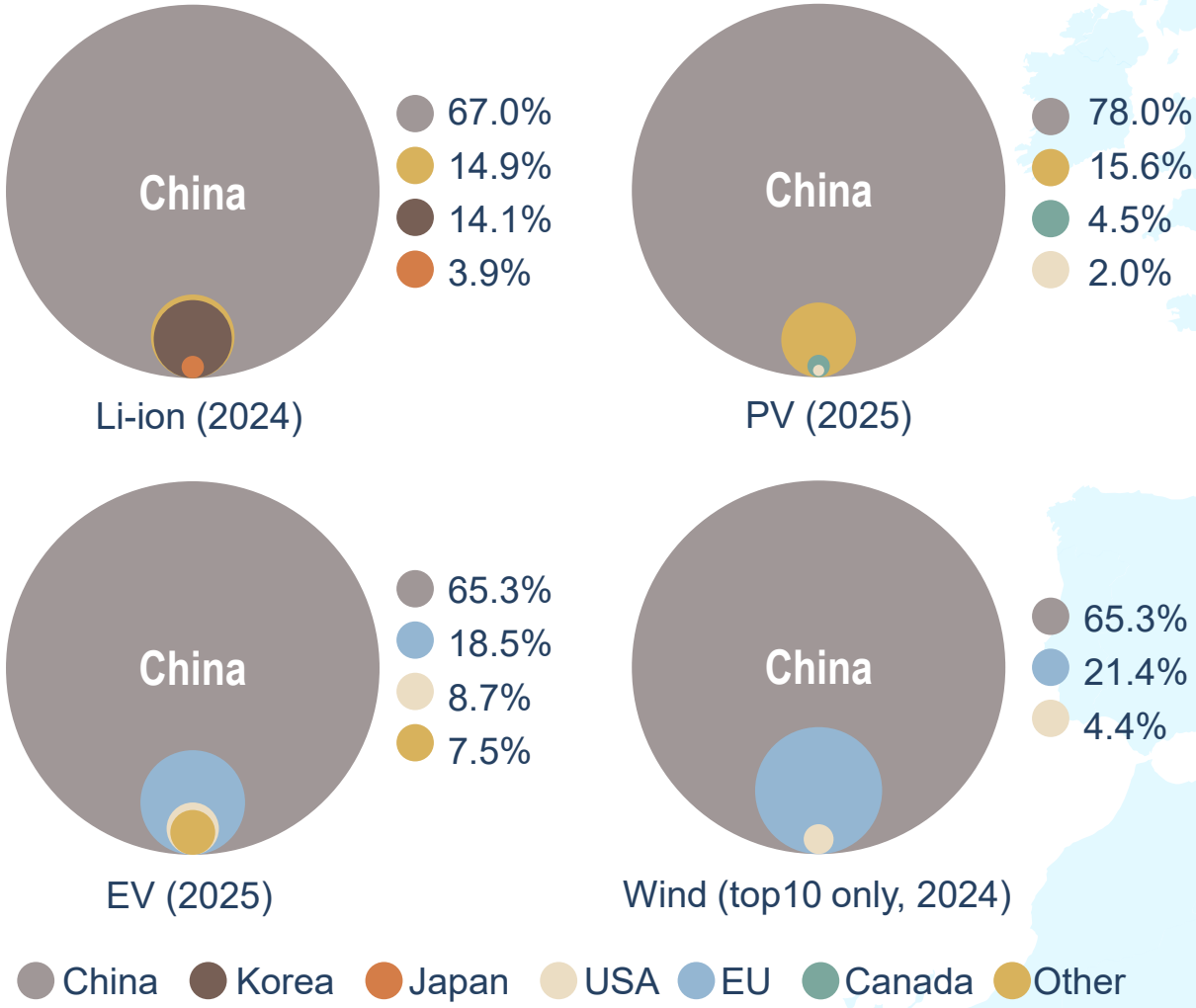


China

- China ranks **1st** in terms of **proved reserves** of most CRMs (Antimony, Baryte, Feldspar, **Graphite**, **REE**, Strontium, Tantalum, Tungsten)
- First producer of **12 out of 25** CRMs
- **Monopolistic** shares of production: gallium (98%), germanium (94%) ➔ control over finished products
- **Rare Earth Elements** (REEs, 71%) ➔ control over the supply chain of permanent magnets
- **REEs**: single supplier for the EU (100% dependency)
- Refining and processing ➔ control of downstream supply chain stages: **cobalt** (negligible raw ores production but **75% of refined** products)

Source: WMD, USGS. BGS

Manufacturers of relevant transition technologies



- **Europe** is enhancing battery and EV manufacturing capacity, but mainly relying on **foreign investment**
- **China** mostly served the **domestic market. Exports** are expected to increase in the next **5-10 years**

- **World Market value (2023):**
  - Batteries + EVs ≈ 465 G$ (67% of global green-tech market)
- **Manufacturing capacity in Europe (2025):**
  - **EVs**: ×2 demand ➔ net exporter (trade balance: **+14G€**)
  - **Battery**: ×0.7 demand ➔ net importer (trade balance: **-17G€**)
- **Capacity owners – Battery:**
  - 2025: Korea (74%), **Europe (17%)**, others
  - Future[1]: **Europe (35%)**, Korea (28%), China (25%), others

  Foreign investors: LG (5 G$), Samsung (1.5 G€), SK (1.6 G€) CATL (7.3 G€; 100 GWh/y plant in Hungary)
- **Capacity owners – EVs:**
  - 2025: **Europe (78%)**, USA (16%), others

  Foreign investors: **BYD** (4 G€, 150,000 EVs/y in Hungary)

Source: IEA (2024), Bruegel, Enerdata, BNEF, SNE (2025); [1]Facilities under construction become operational

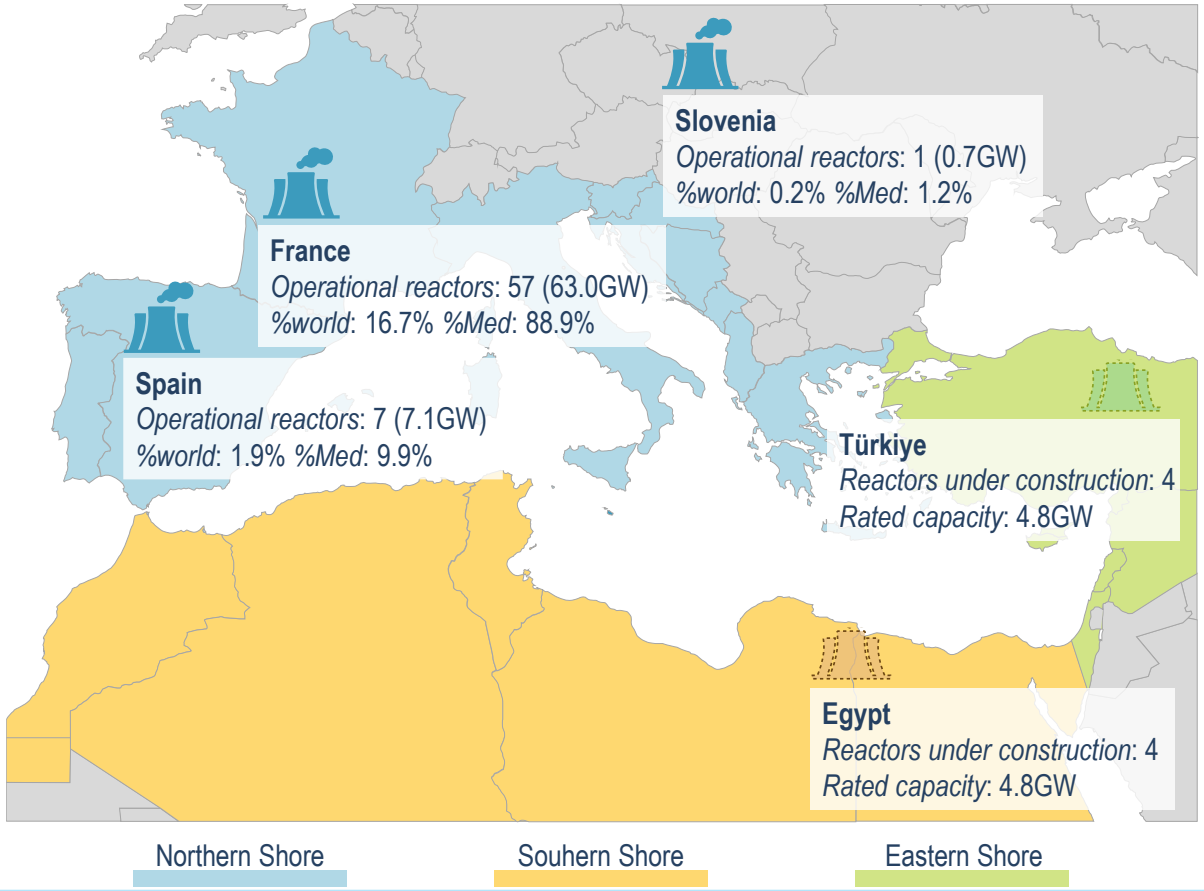
The potential role of nuclear energy

The role of nuclear energy in the Mediterranean Basin

☑ Nuclear generates 40k times more energy than natural gas (per unit mass of combustible fuel) and uses 10% of the surface required by PV to generate the same energy

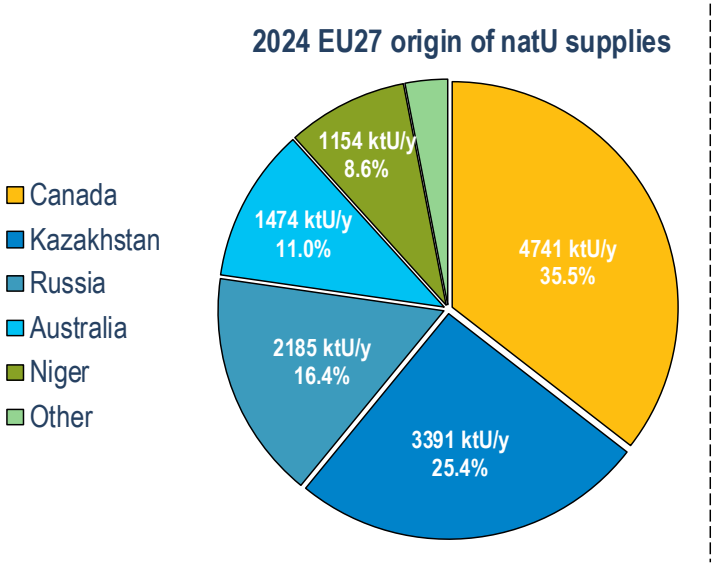
☒ Its higher upfront costs and long licensing times (≈ 10 y) prevent it from being chosen as a preferable source

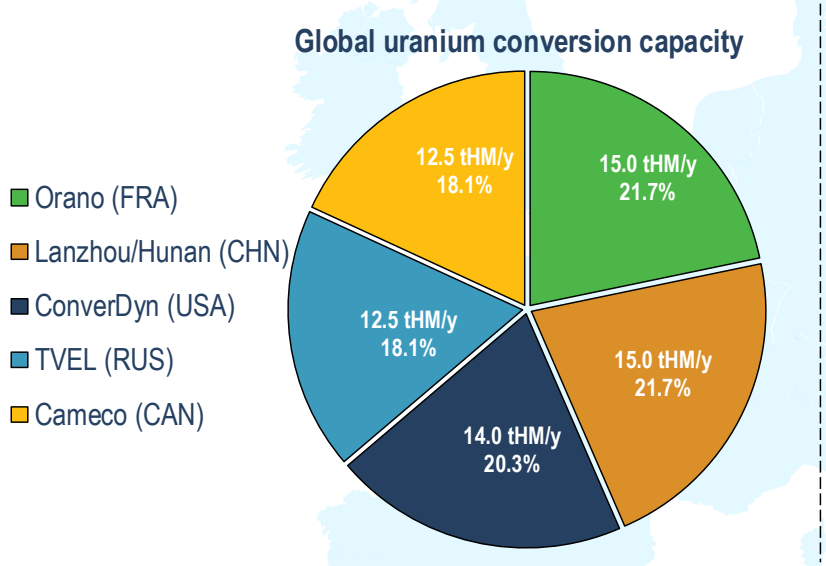
- **Mediterranean fleet:** 65 reactors (100% Norhtern Shore)
  - **France**: relevant player worldwide (17% global capacity)
    Capacity expansion ➔ 10 GW + 13 GW prospectively
    ⊗ recurrent delays ➔ costs from 52 G€ to 80 G€
  - **Türkyie**: 4 reactors (Russian) under construction ➔ 17 G€
    ➔ 4.8 GW by 2028 / ≈10% electricity demand in 2030
    Capacity expansion ➔ 2 plants by 2035 ➔ 7.2 GW in total
  - **Egypt**: 4 reactors (Russian) under construction ➔ 26 G€ (more than 80% from Russian loan)
    ➔ 4.8 GW by 2030 / ≈13% electricity demand in 2030
- **Mediterranean 2030 demand for nuclear fuel:** 10 MtU of nuclear fuel (13%-15% w.r.t. world)

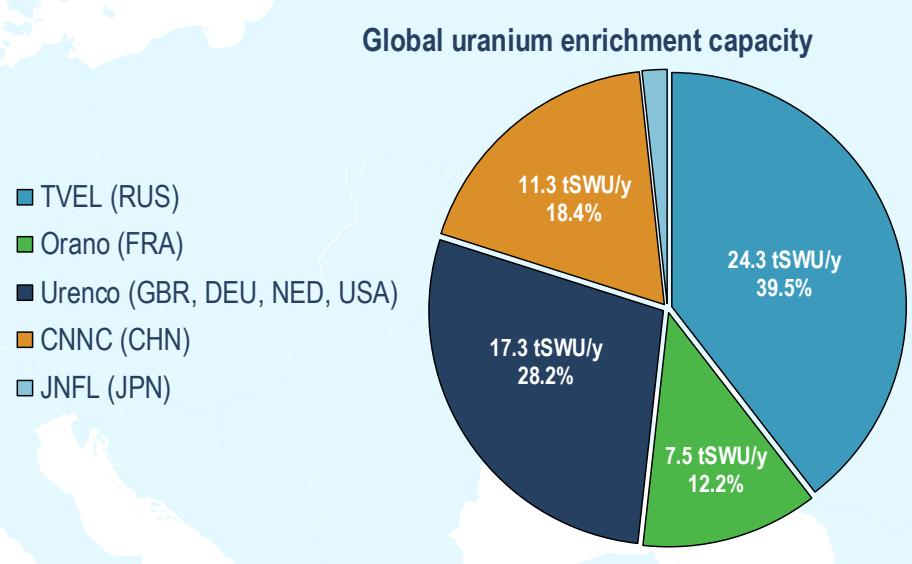


Sources: IAEA-PRIS, NEA-OECD

Energy Security implications of the nuclear fuel cycle







HM: Heavy Metal SWU: Separative Working Unit

- **10 mining companies** (from **7 countries** only) own global uranium production. **EU27** supply: **77.4%** of natural uranium from **Canada**, **Kazakhstan** and **Russia** only. **TVEL** (**Russia**): 18.1% of uranium conversion and 39.5% of uranium enrichment
  - ➔ Severe dependency on **Russia** for the provision of services along the Nuclear Fuel Cycle
  - ➔ Economic value of the French imports of enriched nuclear fuel from Russia: **370 M€** over **450 M€** (**81%**)
- **Mediterranean**: tighter dependency after **2030** because **Türkyie** and **Egypt** will operate **Russian** reactors

Sources: Euratom Supply Agency, IAEA-PRIS, WNA

Conclusions

Conclusions

- At least in the **short term** (next 5-10 years) energy **security** will remain strictly linked to the supply of **fossil** fuel commodities
- From this perspective, the **current** trans-Mediterranean energy integration and **fossil-based dialogue** can play an **important role** (in 2023, 29% of natural gas and 17% of oil imported by the Northern Shore came from the Southern one, and theoretically – in case of need – there is room to increase these shares)
- In the **mid/long term** (2035÷2050), however, potential **security issues** related to the **transition** emerge: the Mediterranean region has a high **potential** for **RES**, **but** to exploit it ① supply chain of **CRMs** and ② **manufacturing** chain of the necessary technologies (PV panels, wind turbines, batteries, ...) are **needed**

- Security concerns for the Med region due to: ① **new "green dependencies"** due to the **absence** of both **resources** and **refining** & **manufacturing** capacity of **CRMs**; ② **geopolitical issues** related to the leading role of **China** in CRMs availability and production; ③ **reliance** on **extra-Med investments for** increasing the **manufacturing** capacity

- Need for: ① defining a **regional shared strategy** for the **CRMs** supply, enhancing as possible the exploitation of local resources and increasing the refining and processing capacity (→ lowering the current strategic role of China) and the recycling; ② **promoting regional investments** (mainly from EU) in industrial manufacturing – also through public-private partnerships – creating new value chains and positive local occupational impacts; ③ **synergistically exploiting** the actual **strength elements** of the single areas (natural resources, room for large investments in new production facilities at affordable costs in the SS; capital, technological know how, structured market in the NS)

Thank you for your attention