

## ENERGY COUNTRY REPORT

Energy in transition:  
an outlook for **Croatia**



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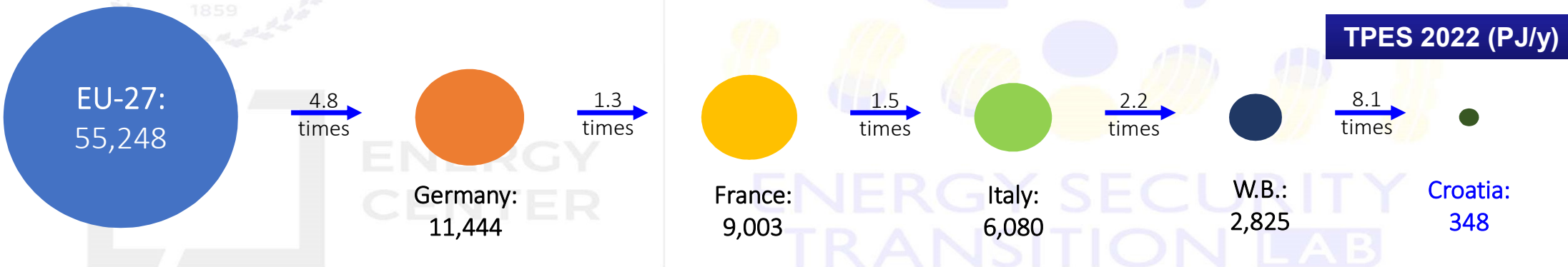
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# Outline

- Croatian energy mix w.r.t. Balkans & Europe
- Croatian energy system between sustainability and efficiency
- Energy infrastructures
- Main national energy targets and investments
- INECP investments by sector
- Evolutive scenarios
- Concluding remarks

# Croatian energy mix w.r.t. Balkans & Europe

- Croatian TPES (348 PJ/y in 2022) is 0.6% of the EU-27 one and 14% of the Western Balkan (W.B.) one
- TPES per capita is 70 GJ/person. i.e.: -27% w.r.t. EU-27; -34% w.r.t. Germany; +28% w.r.t. W.B. → reflects the different level of economic development, industrialization and urbanization of the countries



**TPES by commodity:**

- Fossil fuels: 68% (37% Oil ; 26% Natural Gas; 5% Solid fuels)
- RES: 27% (16.5% Solid biofuels; 5.6% Hydro; 2.2% Wind; 2.4% other RES)
- Electricity: 5%
- Other: 1%

*High reliance on fossil fuels despite a good share of RES*

(TPES: Total Primary Energy Supply; 1 PJ = 23.88 ktoe = 277.8 GWh)

# Croatian energy system between sustainability and efficiency



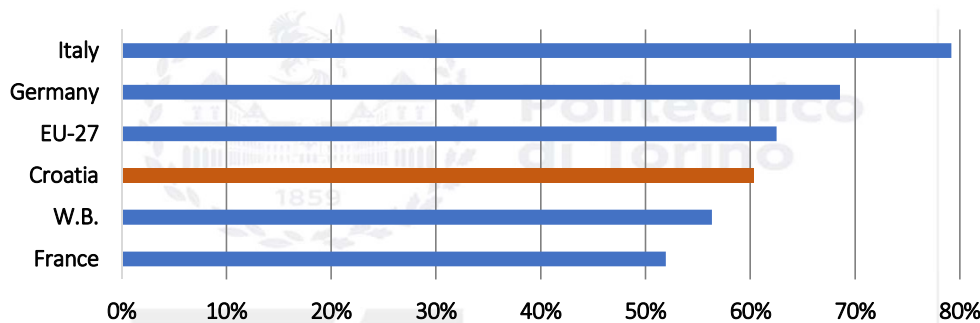
Indicator	u.o.m.	Croatia	W. Balkans	EU-27	France	Germany	Italy
TPES per capita	GJ/pers	90.2	70.3	123.9	132.5	137.5	103.0
Energy Intensity	TJ/G€	6.2	11.5	4.5	4.1	3.9	3.8
Share of fossil fuels in TPES	%	68	77	68	49	78	77
Share of RES in TPES	%	27	19	19	14	18	19
CO <sub>2</sub> emissions per capita	tCO <sub>2</sub> /pers	4.1	5	5.6	4.1	7.3	5.3
Carbon Intensity	kgCO <sub>2</sub> /€-2015	0.2	0.4	0.2	0.1	0.2	0.2

Source: EST elaboration on Eurostat and IEA

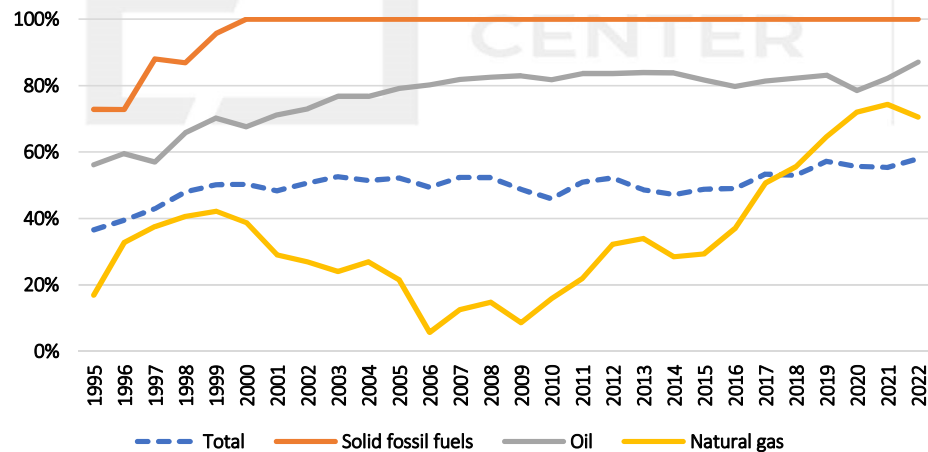
- Despite a lower TPES per capita, Croatia (like the other Balkan countries) shows a **high energy intensity** w.r.t. EU-27 and main EU Member States → **Opportunity** for **improvement** in the **energy efficiency** of the economic and productive system
- Croatian **energy mix** is **improving** its environmental **sustainability** with a **RES penetration higher** w.r.t. the other Balkan Countries but also w.r.t. main EU Member States
- However, in the RES penetration a **relevant role** is played by **solid biomass** in **residential** space heating → possible issues in terms of **air pollution** (e.g., in 2022 the per capita emissions of **PM10** in Croatia were **2.1 times** the **EU-27** ones and the p.c. emissions of **PM2.5** were 2.4 times)

# Energy dependency

Overall energy dependency (2022)



Croatian energy dependency by commodity



- Energy dependency comparable to EU-27 one (60% vs 63%)
- Dependency by commodity in 2022:
  - Solid fossil fuels: 100%
  - Oil: 87%
  - Natural gas: 70%
    - Increasing trend due to the simultaneous decrease in domestic production
    - 84% of Natural gas import is in form of LNG
- Main supply Countries in 2022:
  - Solid fossil fuels: Russia (50% of the total import)
  - Oil: Azerbaijan (30% of the total import)
  - Natural gas: US (70% of the total import)

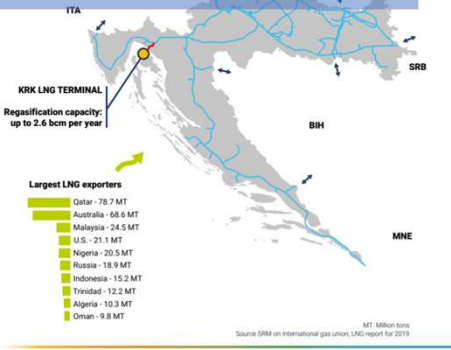
# Energy infrastructures



- ### Electricity infrastructure
- 7,774 km of transmission network
  - 141,937 km of distribution network
  - 4 interconnections with Slovenia, Hungary, Serbia, B&H



- ### Gas infrastructure
- 2,544 km transmission network
  - 20,144 km distribution network
  - 2 interconnection points (Slovenia and Hungary)
  - 1 regasification terminal in Krk (84% of Natural gas import is LNG)



- ### Oil infrastructure
- 631,5 km of pipelines in the North (Adria pipeline)
  - Interconnections with Slovenia, Hungary, B&H and Serbia



Renovation of the energy infrastructure is one of the country's main goals:

- **Electricity infrastructure** planned funds: 6.3% of the 2030 INECP funds and 8.6% of the INECP funds for 2050
- **Gas infrastructure** planned funds: 4.6% of the 2030 INECP funds



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(INECP: Integrated National Energy and Climate Plan)

# Main national energy targets and investments



## Targets by 2030:

- Reduction of GHG emissions by 2030 w.r.t. 2005:
  - EU-27 target: ETS sector -62% ; non-ETS -16.7%
  - Croatian INECP (WAM scenario): ETS sector -50.2% ; non-ETS -17.1%
- RES share (INECP - WAM scenario): 42.5% in gross final consumption; 73.6% in electricity consumption; 47% in buildings consumption (for heating and cooling); 21.6% in transport

## Investments by 2030 & 2050:

- Estimated total additional investment of 115 G€: 36.5 G€ in the period 2024-2030 (average of 5.2 G€/y) and 78.5 G€ in the period 2031-2050 (3.9 G€/y)
- The estimation of needed investments is not uniquely and homogeneously computed in all EU Member States → a precise comparison is not possible

However for example, w.r.t. some of the main EU countries in the INECP the following values are reported:

- Germany: 690 G€ (additional investments in 2023-2030)
- France: 406 G€ (additional investments in 2024-2030)
- Italy: 174.4 G€ (additional investments in 2024-2030)

(INECP: Integrated National Energy and Climate Plan)

# INECP investments by sector

INECP investments sectors	2024-2030		2024-2050	
	Value (M€)	Share (%)	Value (M€)	Share (%)
Construction sector	21.873	59.9%	69.906	60.8%
Electricity production and infrastructure	6.049	16.6%	28.098	24.4%
Hydrocarbon research	3.225	8.8%	5.125	4.5%
Transport sector	1.261	3.5%	4.928	4.3%
Other renewable technologies	960	2.6%	2.140	1.9%
Natural gas infrastructure	1.679	4.6%	1.733	1.5%
Heating industry	1.008	2.8%	1.518	1.3%
Hydrogen production	191	0.5%	923	0.8%
Extraction and geological storage of CO <sub>2</sub>	14	0.0%	294	0.3%
Reduction of fugitive emissions	179	0.5%	179	0.2%
Biomethane production	69	0.2%	143	0.1%
<b>Total</b>	<b>36.508</b>	<b>100%</b>	<b>114.987</b>	<b>100%</b>

- In 2024-2050, **85.2%** of the investments is concentrated in only **2 sectors** (construction and electricity). In particular:
  - Energy **renovation of buildings**: **24%** of the total investments
  - Construction of **nZEB**: **37%** of the total investments
  - **Electricity production**: **16%** of the total investments (mainly for new generation capacity from RES)
  - Electricity **transmission and distribution**: **8%** of the total investments (mainly for reinforcement and upgrade of the network)
- **32%** of the total investments in 2024-2050 is concentrated in the **first 7 years** (2024-2030)
- The **average annual** investment of the period 2024-2030 is **5.2 G€/y** while the one of the period 2031-2050 is **3.9 G€/y**



# Evolutionary scenarios – decarbonisation

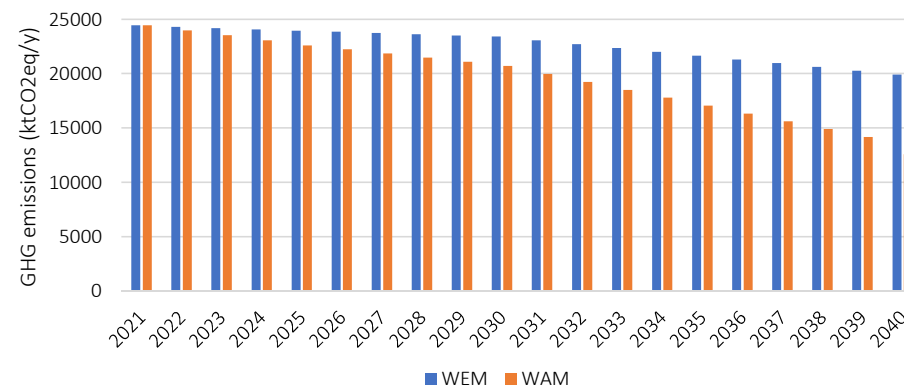
- Croatian INECP analysed 2 scenarios:
  - With Existing Measures (WEM): expected technology and structural changes in energy consumption and production based on current trends without any additional energy and climate measures
  - With Additional Measures (WAM): implementation of ad hoc additional policies to support the energy transition
- The WAM scenario is therefore the most ambitious one in terms of decarbonisation effects



## GHG EMISSIONS

- Significant decrease in GHG emissions in WAM scenario: -14% in 2030 w.r.t. 2022; -47% in 2040 w.r.t. 2022
- In 2030 WAM scenario allows a reduction of GHG emission w.r.t. 1990 by 34.1%. while WEM scenario leads only to a reduction by 25.6% → High contribution of additional measures
- WAM scenario allows to reach the EU target for non-ETS emissions by 2030 which are projected to be 14.3 GtCO<sub>2</sub>eq/y i.e. 17.1% lower than 2005 value (target: -16.7%)

GHG emissions projections in WEM and WAM scenario



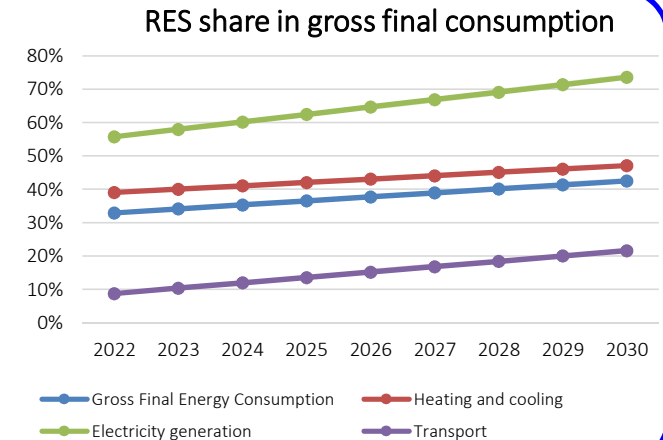
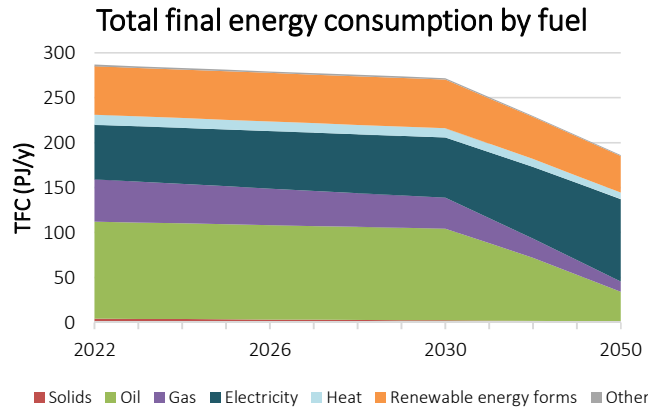
Source: INECP

# Evolutionary scenarios - energy mix



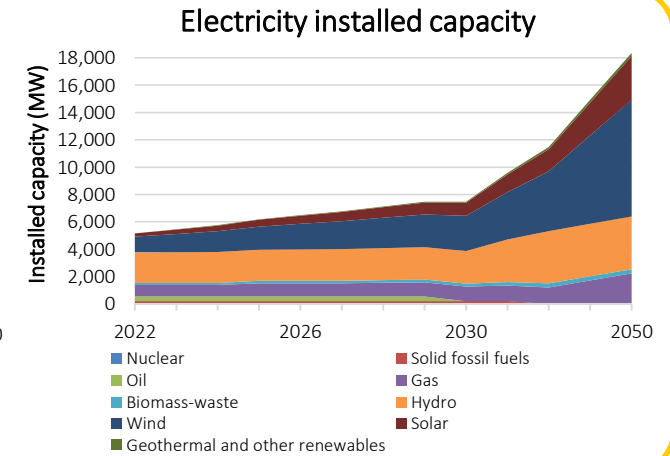
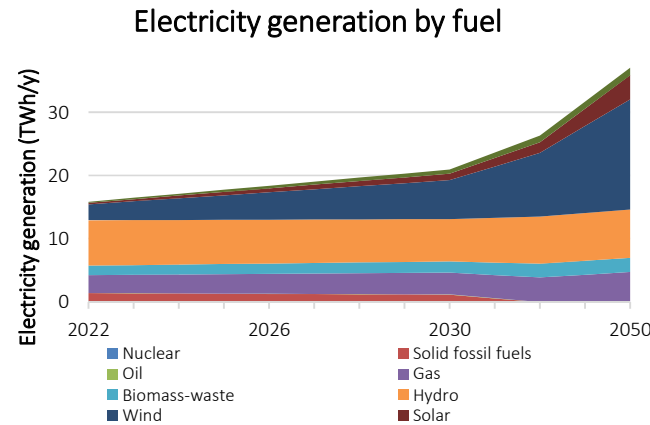
## ENERGY MIX AND ROLE OF RES

- Increase in the efficiency of the energy system with a reduction of the overall TFC, especially in the period 2030-2050
- Increase in the electrification of TFC: 21% in 2022; 25% in 2030; 49% in 2050
- Strong reduction in gas and solid fuels share by 2050
- Increase in the share of RES in all sectors



## ELECTRICITY GENERATION

- High increase of RES in electricity generation: 73% in 2022; 77.8% in 2030; 87% in 2050
- Increasing reduction in the use of fossil fuels: 0% of oil and solid fuels; 12% of natural gas in 2050
- Major role of wind: installed capacity 46% of the total in 2050. 3 times than 2030 one
- Limited contribution of generation from solar energy (17% in 2050)



# Concluding remarks



- Croatia currently has a **good level** of penetration of **RES** in its energy mix compared to the EU average and aims to further increase it for achieving EU targets
- INECP goes in this direction, with planned policy measures able to enable a **significant decarbonization** of the system
- The planned measures result in an **improvement** in the overall **energy efficiency** of the system, with a **reduction** in energy **demand**
- However, the **plan** is still **under review** and recommendations from the EU Commission (published in December 2023) seem to encourage Croatia to be **even more ambitious** from the point of view of emissions reduction and RES penetration
- Croatia's decarbonization strategies have also a **positive impact** from the **energy security** perspective, by reducing import dependency (**31.9%** by **2050** according to the WAM scenario vs. **60%** in **2022**)
- A **major role** is expected to be played by **wind power**, while **solar PV** in the presented plan shows a **limited contribution** → there may be margin to increase RES penetration by pushing on the exploitation of solar energy potential through further investment
- Decarbonization policies can act as a **driver** for Croatia's **economic development** (with the creation of new job positions) particularly in the **construction** sector, where the majority of the investment is expected to be concentrated

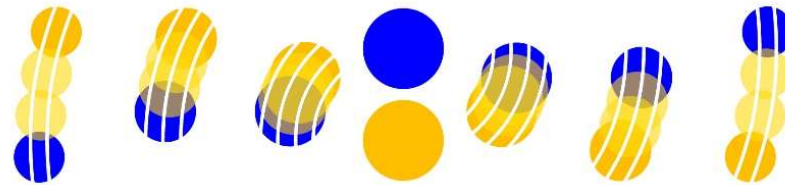


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