TECHNISCHE UNIVERSITÄT WIEN

Energy Economics Group

PROMOTING RENEWABLE ELECTRICITY: TARGETS; STRATEGIES, BY TECHNOLOGY

Matteo Carabelli, Ece Özer, Mathewos Erabo Basore

WSS 2023

June 13, Vienna

OUTLINE

1. Introduction
2. AT vs CZ
3. Current Situation and Technologies
   1. EU
   2. Austria
   3. Czech Republic
4. Targets
   1. In EU
   2. In AT & CZ
5. Strategies
   1. In EU
   2. AT
   3. CZ
6. Conclusions

1. INTRODUCTION

Why promote renewable electricity?

- Reduce greenhouse gas emissions
  - Important to reach EU decarbonization goals
    - Fit for 55 → reducing EU emissions by at least 55% by 2030
    - REPowerEU → 45% renewables in the EU mix in 2030
- Energy insecurity
  - Renewable resources contributes to the diversification of the energy mix. → helps mitigate the risks associated with energy price fluctuations and supply disruptions, reducing vulnerability to geopolitical tensions and external shocks.

What are the barriers to achieving renewable electricity?

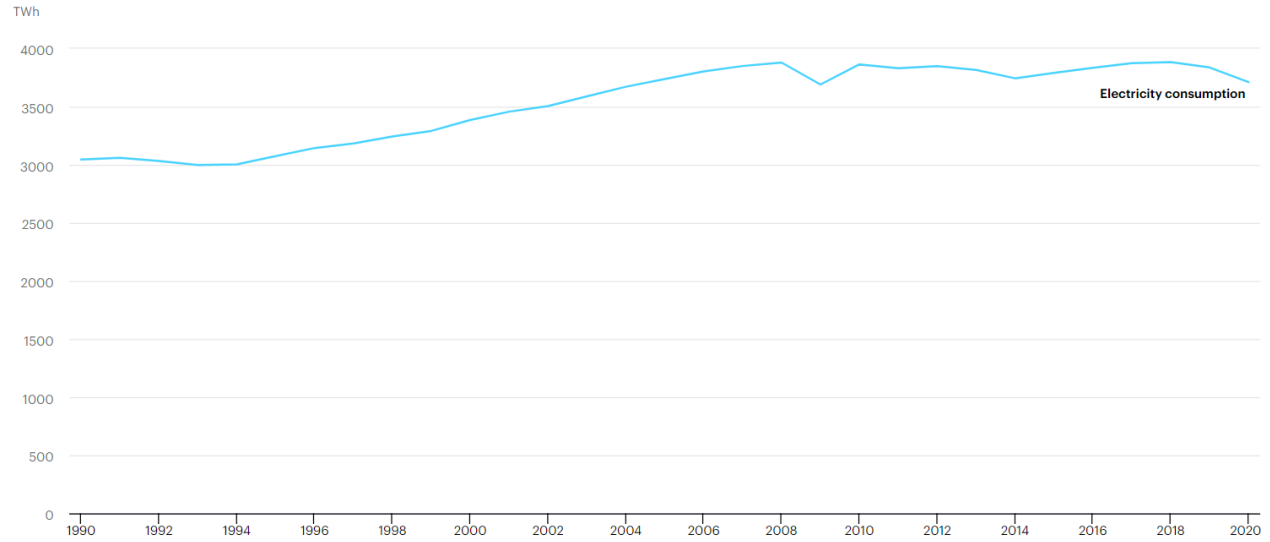
- Resource constraints
  - Certain regions may have limited potential for the specific renewable resource
- Infrastucture and grid integration
  - Upgrading and expanding infrastructure to ensure compatibility, stability, and reliable integration of renewable energy into the existing electricity system.
- Technological challenges
  - Development of efficient energy storage solutions to address the intermittent nature of renewable sources

2. AT VS CZ

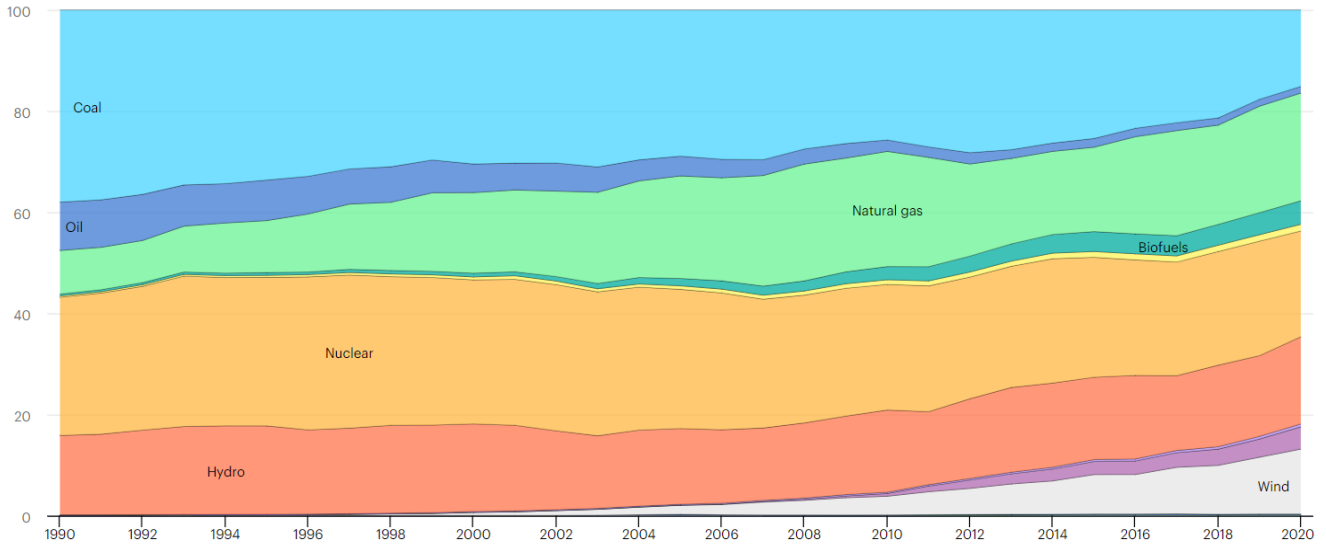
In 2020	Austria	Czech Republic
Population	8,956,000	10,506,000
Area (km^2)	83,879	78,870
Inhabitants/km^2	106.8	133.2
GDP	480,386 M US$	281,778 M US$
Electricity consumption (TWh)	71.6	67.3
Electricity production (TWh)	72.5	81.3
CO2 emissions per capita (t CO2/population)	6.4	8.1

3. CURRENT SITUATION AND TECHNOLOGIES - EU

- EU27 electricity sector transformed with a focus on renewable generation and decarbonization,
- EU renewable share in energy mix 2021: 21.8%[1]
- Share of electricity generation by source 2022:[2]
  - Hydro and Nuclear: 32.04%
  - Wind and Solar: 22.28%
  - Gas: 20%
  - Coal: 16%
  - Other resources: 9.8%



Total electricity consumption, Europe, 1990-2021 (source: IEA)



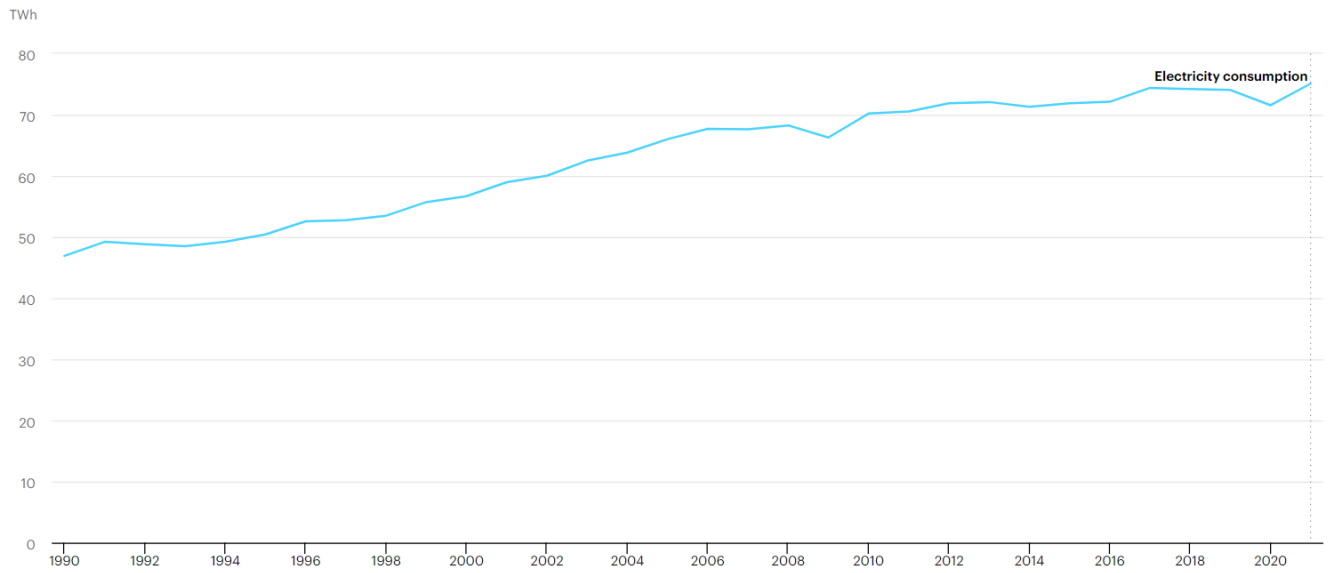
Electricity generation by source, Europe, 1990-2021 (source: IEA)

1: Eurostat – Renewable Energy Statistics

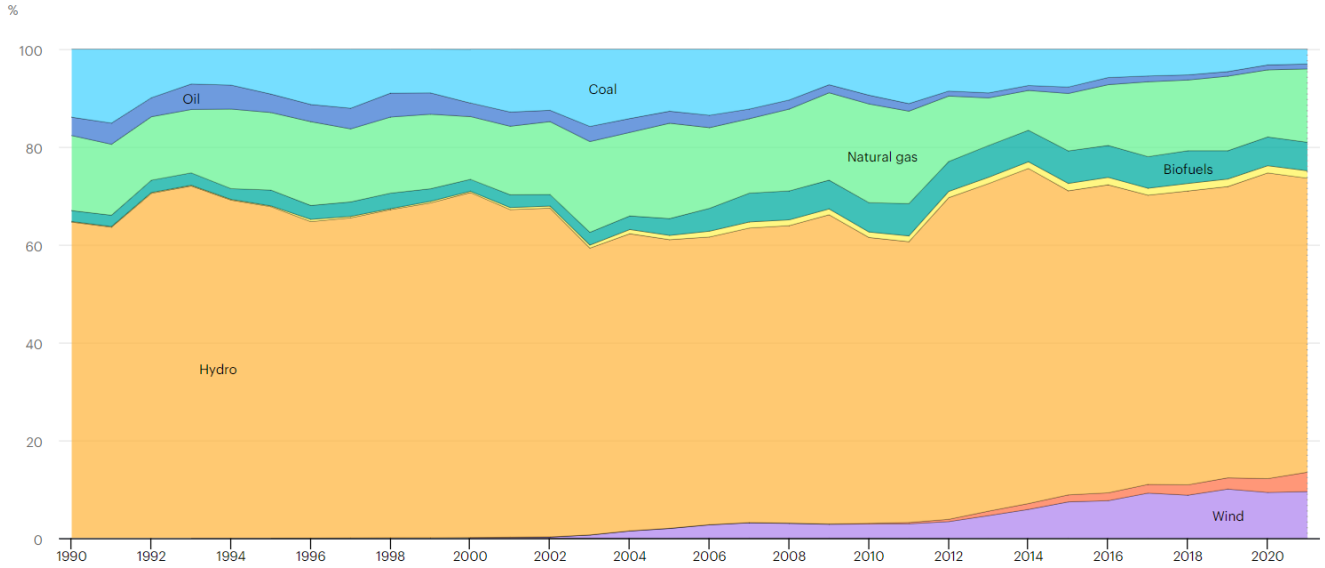
2: Energy Monitor – *Europe: Renewables in 2022 in five charts – and what to expect in 2023*

3. CURRENT SITUATION AND TECHNOLOGIES - AU

- Austria's electricity consumption in 2021: 75.1 TWh,[1]
- Share of renewables *in last 12 months*:[3]
  - 36% in total final consumption,
  - **76% in total electricity generation:**
    - Hydro: 67 %,
    - Wind: 10%,
    - Solar: 4%
    - Biomass: 2.2%.



Total electricity consumption, Austria, 1990-2021 (source: IEA)

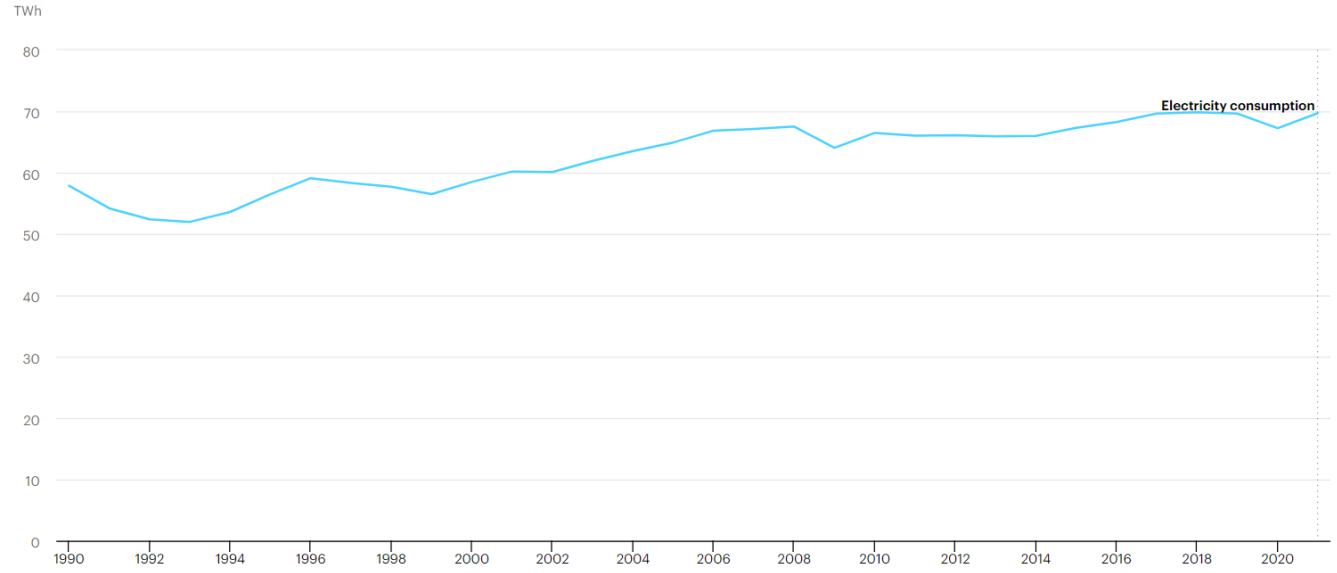


Total electricity generation by source, Austria, 1990-2021 (source: IEA)

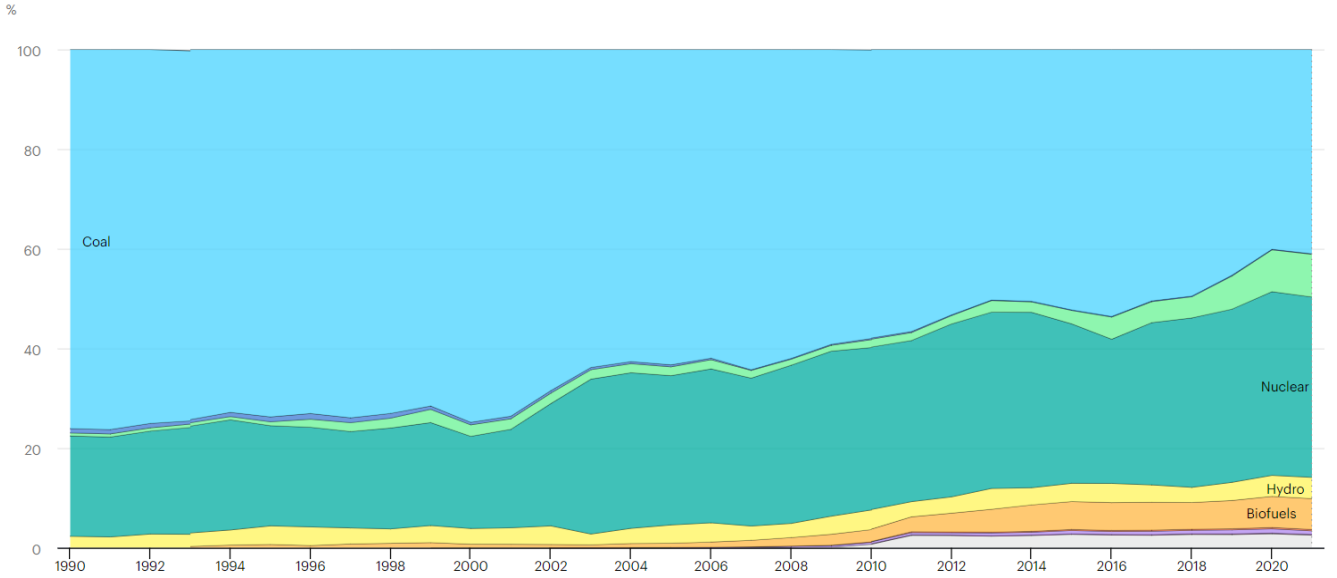
1: Eurostat – Renewable Energy Statistics
3: electricitymaps – https://app.electricitymaps.com/zone/AT

3. CURRENT SITUATION AND TECHNOLOGIES - CZ

- Czech Republic's electricity consumption in 2021: 69.7 TWh,[1]
- Share of renewables in total final consumption in 2021: 17.67%,[1]
- Dependency on coal and nuclear power in electricity generation (in 2022):[3]
  - Nuclear: 37.5%,
  - Coal: 34.2%.
- Share of renewables in electricity generation *in the last 12 months*:[3]
  - Solar: 5.5%,
  - Hydro: 3.4%,
  - Biomass: 3%,
  - Wind: 0.8%.



Total electricity consumption, Czech Republic, 1990-2021 (source: IEA)



Total electricity generation by source, Czech Republic, 1990-2021 (source: IEA)

1: Eurostat – Renewable Energy Statistics

3: electricitymaps – https://app.electricitymaps.com/zone/CZ

4. TARGETS – EU[4]

2018

Renewable Energy Directive revision; 32% RE share for 2030

2021

- Update of RED; 40% RE share for 2030

2022

- REPowerEU plan to accelerate the RE transition

2023

- Provisional agreement to increase RE target to 42,5% for 2030

4: European Commission – Renewable Energy Targets

4. TARGETS - AT & CZ[5]

- **Austria:**

Renewable share by sector (% of gross final consumption)	Status 2018	Targets	
		2020	2030
Gross final consumption	33.4%	34%	46-50%
Transport	9.8%	10%	14%
Electricity	73.1%	No target	100%*

- **Czech Republic:**

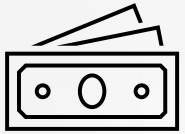
Renewable share by sector (% of gross final consumption)			Targets
	2019	2020	2030
Gross final consumption	16.2%	13%	22%
Transport	7.8%	10.8%	14%
Electricity	14.1%	13.5%	17%
Heating and cooling	22.7%	15.5%	1 percentage point annually to 2030

5: International Energy Agency

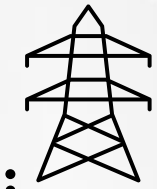
5. STRATEGIES – EU

- **Renewable Energy Directive framework:** binding targets, Guarantees of Origin and promotion of supporting schemes
- **Cooperation mechanisms among EU countries:** statistical transfers, joint projects and joint support schemes
- **REPowerEU plan:** energy conservation, clean energy production, diversification of EU's energy supply
  - Accelerating the rollout of PV energy, with a dedicated EU Solar Energy Strategy, aiming to deploy over 320 GW of new solar photovoltaic by 2025, and almost 600 GW by 2030.
  - Speeding up renewables' permit granting processes.
  - Repower renewable energy power plants.
- **ETS (Emission Trading Systems):** Since its introduction in 2005, the **EU's emissions have decreased by 41%.**
- National supporting schemes

5. STRATEGIES – SUPPORTING SCHEMES[6]



- **Investment supports:**
  - Subsidies
  - Grants
  - Loans
  - Tax incentives
  - R&D fundings



- **Generation supports:**
  - Feed-in Tariffs
  - Feed-in Premium
  - Tendering and auctions schemes
  - Net-metering

- **Quantity targets:**
  - Quota obligations
  - (Green Energy Certificates)

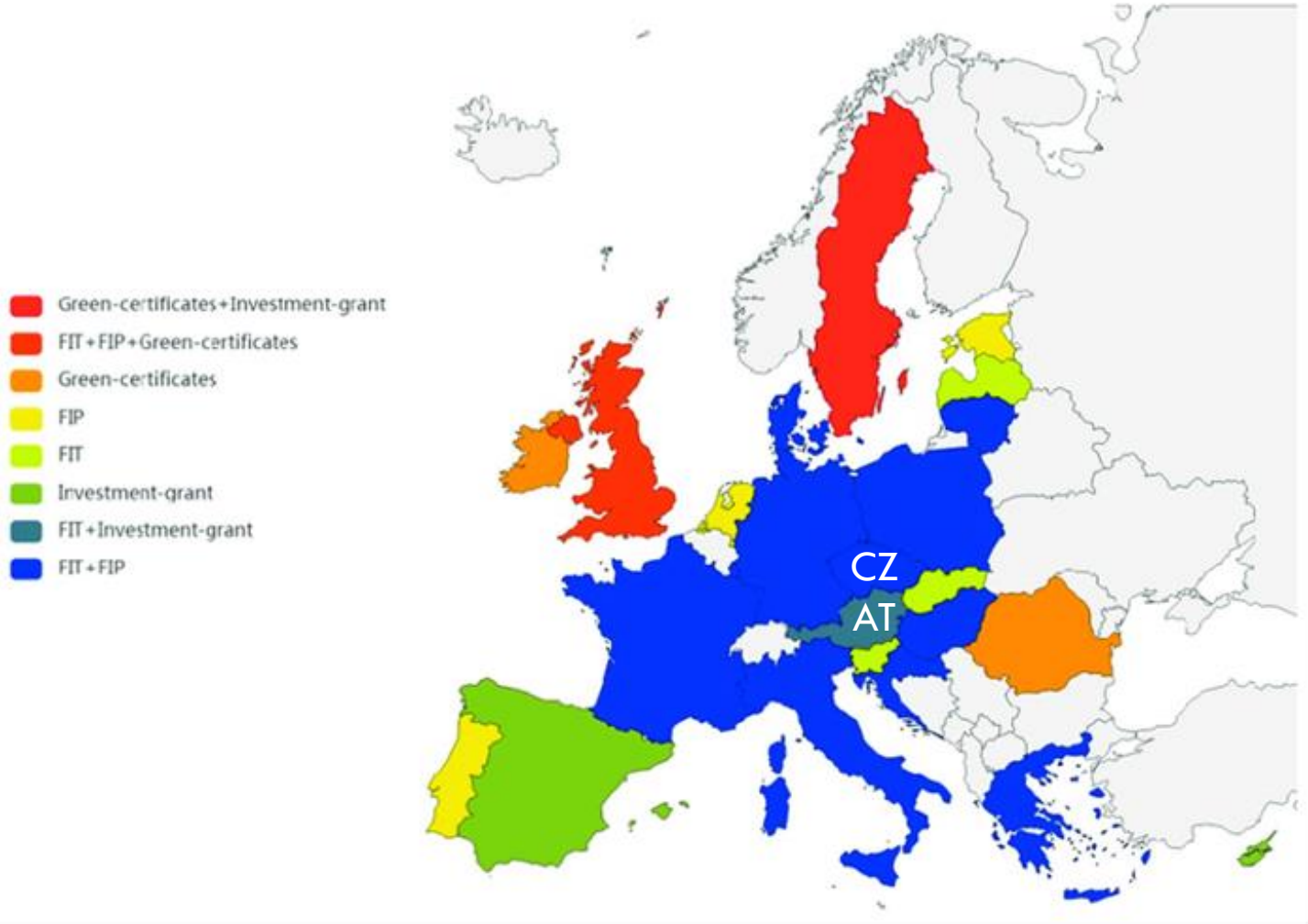
- **Carbon policies (indirect support schemes):**
  - Carbon pricing
  - Emission Trading System

6: Cicek, A., Guzel, S., Erdinc, O., 2021, *Comprehensive survey on support policies and optimal market participation of renewable energy.*

5. STRATEGIES – EU SUPPORTING SCHEMES[7]

Austria:
- FIT
- Investment subsidies

Czech Republic:
- FIT
- Green Bonus (FIP)



7: Pineiro-Villaverde, G., García-Álvarez, M., 2022, *Impact of Clean Energy Policies on Electricity Sector Carbon Emissions in the EU-28.*

5. STRATEGIES – AT

July 2021: Austria National's recovery and Resilience Plan and Federal Act on the Expansion of Energy from Renewable Sources

- Competitive allocation of aid through auctions
- Feed-in Premium: premium price and awardees determined by auctions
- Investment grants: applications are ranked and grants are awarded until dedicated support funds are exhausted

5. STRATEGIES – CZ

September 2021: amendment to Act No. 165/2012 on incentivized energy sources

- Green Bonus (fixed FIP) for capacity < 1 MW
- Subsidies awarded through auctions for capacity > 1 MW
- Review of fundings of power plants to reduce incentives in overfunded sectors
- Abandoning the feed-in-tariff

6. CONCLUSION

✓Promoting renewable electricity generation is crucial for transitioning to a sustainable and low-carbon energy future.

✓Continued efforts in

- policy and strategies development,
- technological advancements,
- international cooperation

will further drive the adoption of renewable electricity and contribute to a cleaner and more sustainable energy landscape.

THANK YOU FOR YOUR ATTENTION!