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How to reach Paris. A comprehensive long-term energy- economy scenario for Austria

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*in co-operation with Environment Agency Austria, Austrian Energy Agency, TU Graz, Energy Economics Group, ethink
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25-28 September 2019

Limassol - Cyprus



How to Reach Paris. A Transition Scenario for Austria

Objective of the project

develop, model & analyze

new energy scenarios for Austria until 2050

- **WEM Scenario** - with existing (climate mitigation) measures until May 2016, counterfactual
- **Transition Scenario** achieving at least 80-95% reductions in energy-related GHG emissions (2050/1990), thus achieving the **Paris Agreement's long-term goal** to keep the increase in global average temperature to well below 2°C above pre-industrial levels; and to limit the increase to 1.5°C, to substantially reduce the risks and impacts of climate change

How to Reach Paris. Why develop model-based energy scenarios?

Energy scenarios provide a framework for a **consistent analysis** of future perspectives on **energy consumption**, including various **combinations of technology options** and **policy measures** to decarbonise the economy and society, and to **quantify** and assess their **impact on the economic performance**, energy consumption and greenhouse gas emissions.

The scenarios are modelled by **coupling** several **technology-oriented sectoral bottom-up models** of the project partners with the top down model **WIFO.DYNK** (dynamic New Keynesian model)

Methodological Approach: WIFO.DYNK

Macroeconomic Input-Output Model of Austrian economy

- Hybrid (Input-Output, CGE)
- Detailed depiction of Austrian economy (62 industry sectors and 47 goods categories of demand)
- e.g. depiction of household demand for durable, energy-consuming goods
- Depiction of investment decisions in stocks and infrastructure

Features: consistent links to

- Austrian **energy balance** → integrated physical and monetary flow data
- **Technological bottom-up models** of energy-intensive sectors:
 - Energy supply and transformation technologies/utilities model
 - Transport sector model (car stocks, modal split, transport technologies)
 - Housing sector model (detailed depiction of age and heating/cooling efficiency structure)

→ Economic drivers of energy demand (GDP, vehicle stocks, housing stock or energy efficiency of capital stocks) are generated endogenously.

Transition Scenario

- 5 Key Challenges/Insights

1. Required framework conditions:
Carbon pricing to steer low-carbon investments and collective action (on a global scale)
2. Reducing energy consumption:
Increasing energy efficiency, fostering behavioural and lifestyle changes
3. Rebuilding the energy system:
Electrification and renewable energy deployment
4. Developing a comprehensive transformation narrative
5. Avoiding dangerous climate change is a prerequisite to let the economy grow

1) Framework Conditions are Essential to Enable Transition Carbon Pricing, Rational Decision-Making and Collective Action

The Transition scenario assumes

- **global climate action and commitment** to achieving the objectives of the Paris Climate Agreement to limit temperature rise well below + 2°C
 - **external costs of fossil fuel use to be internalized**
 - **carbon pricing for rational decision-making**
 - **binding regulatory measures**
 - **national support schemes** are directed towards decarbonization
 - **participation** of diverse stakeholders at different governance levels
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- competitiveness distortion and carbon leakage are not an issue
 - rational decision-making is fostered
 - w.r.t. investors regarding carbon neutral innovations
 - w.r.t. households regarding low-carbon products and services
 - climate policy is highly accepted within society (positive narrative)
 - transition is more than a technological fix, it represents a new mindset

1a) Carbon Pricing Assumption in Transition Scenario

Steep and substantial **rise in CO₂ prices** according to the **carbon content** of the specific energy carrier

Prices for fossil fuels exceed those of the WEM scenario from 2025 onwards

8 €/t CO₂ in 2015

15 €/t CO₂ in 2020

40 €/t CO₂ in 2030 [2015/2030: +11.2% p.a.]

200 €/t CO₂ in 2050 [2030/2050: + 8% p.a.]

(in € of 2015), IEA WEO 2016

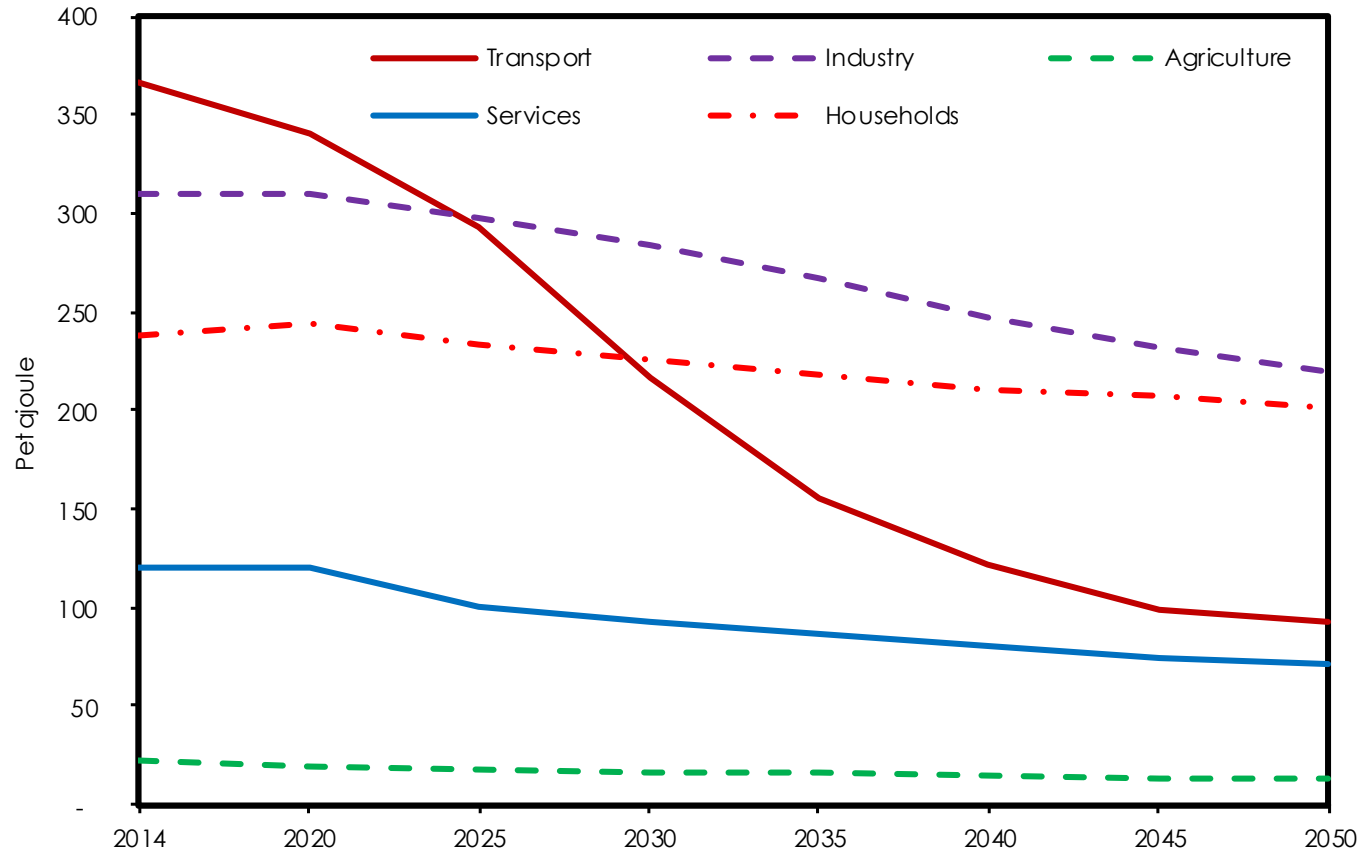
CO₂ price increase leads to effective energy price increases:

Oil price 2050: +250%, +440% including CO₂ price

Natural gas price 2050: +151%, +320% including CO₂ price

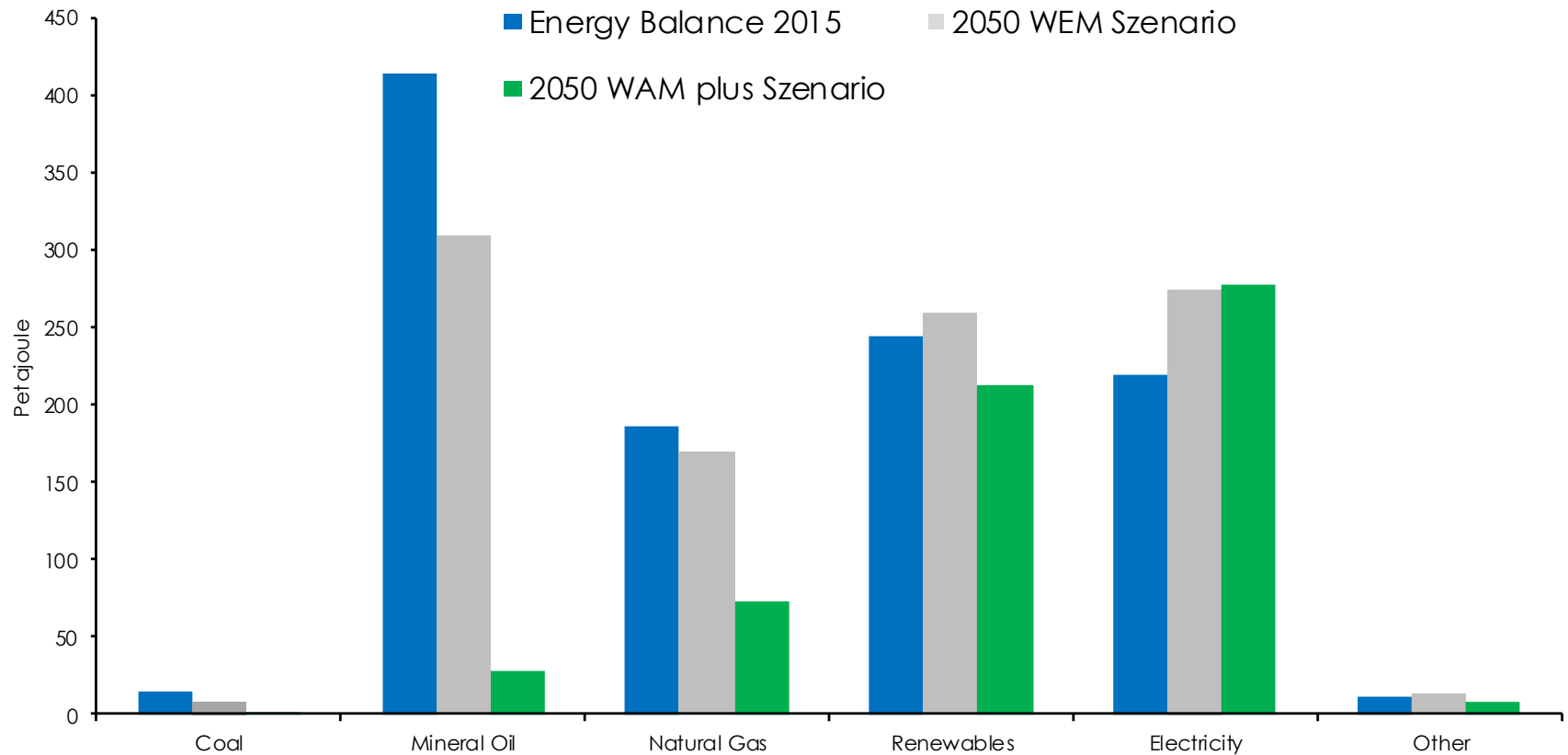
→ Price incentives lead to structural change with regard to **targeted low-carbon infrastructure investments** (substantially higher energy efficiency and less dependence on fossil fuels by shifting the energy mix towards renewable energies.)

2) Reducing Energy Consumption: Final Energy Demand by Sectors (Transition Scenario)



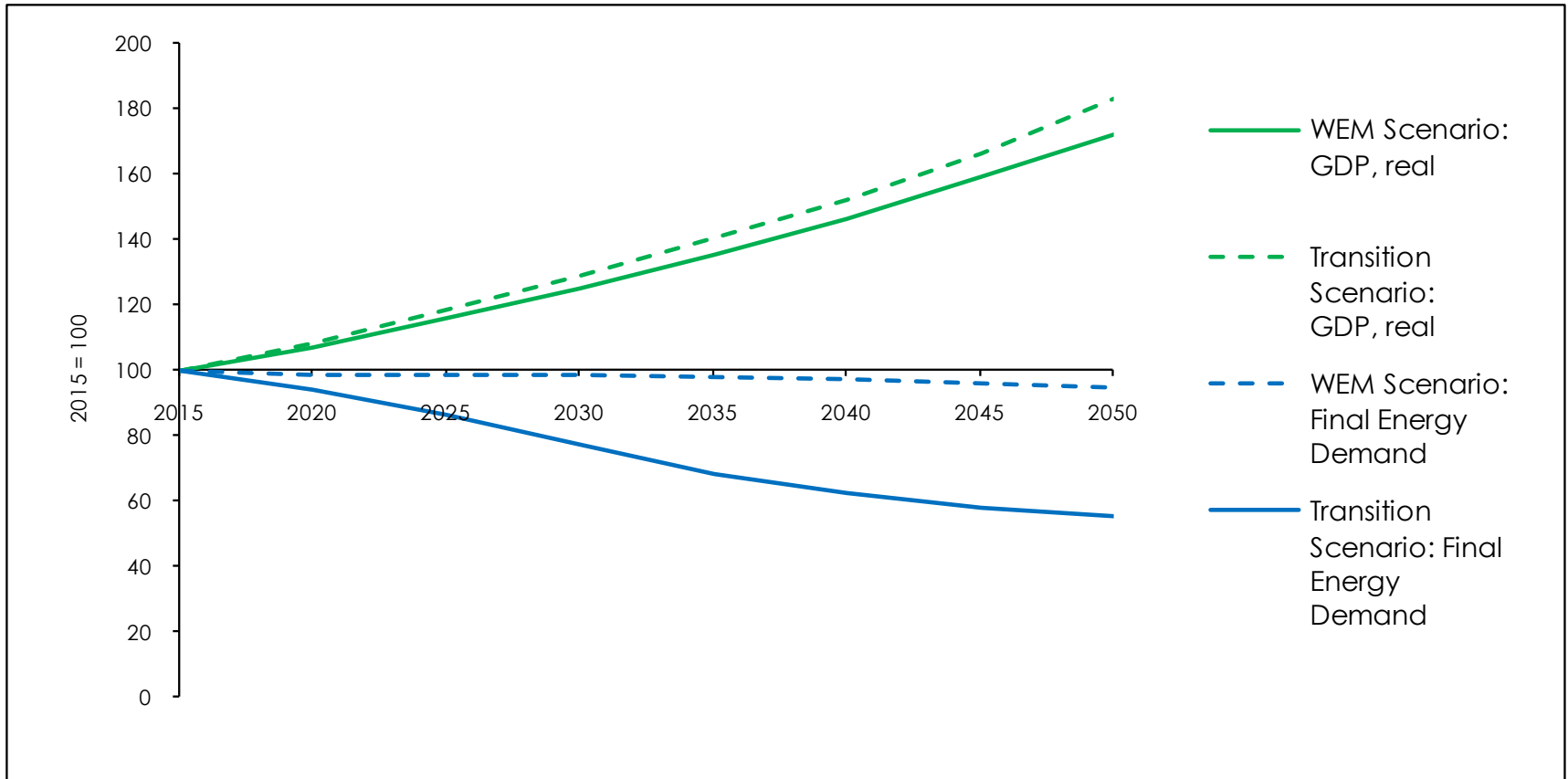
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3) Electrification and Renewable Energy Deployment, Energy Demand by Fuels



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5) Avoiding Dangerous Climate Change and thus Growing the Economy



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Concluding Remarks

Transition is possible if the right policy measures are set and collective action is pursued

Transition is not only possible but it potentially enhances economic growth due to massive investments in new infrastructure

Growing the economy is possible only if dangerous climate change is to be avoided

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Thank you!

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Link to Project Report:

https://www.wifo.ac.at/publikationen/publikationssuche?detail-view=yes&publikation_id=61089