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The Energy Playbook –An affordable strategy to net zero

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The European energy transition is at a critical crossroads. Since the onset of the energy crisis in 2022, persistently high energy costs have placed significant strain on industries and households, raising concerns over the affordability of the transition. Simultaneously, the ambitious goal of achieving net zero emissions by 2050 requires unprecedented levels of investment. Over the next decade, an estimated EUR 6.6 trillion must be funnelled into the energy system to meet the objectives outlined in the EU Green Deal and REPowerEU plan (cf. European Commission, 2022). This implies that annual investments must more than double by 2030. The question of how to balance cost-efficiency, energy security, and sustainability has become increasingly pressing.

Beyond climate protection, Europe's reliance on fossil fuel imports, which account for 60% of its energy consumption and 30% of its system costs, presents an opportunity for transformation. A well-structured energy transition can mitigate these dependencies, enhance economic resilience, and drive domestic value creation. However, the current trajectory risks inefficiencies, as capital is allocated to expensive solutions with uncertain long-term viability.

The feasibility of reaching net zero has been demonstrated in numerous studies, particularly in the highly regarded IEA scenarios (cf. IEA 2024). However, the IEA's focus is global, rather than on Europe and Germany. Other European studies—such as the EU Impact Assessment (cf. European Commission, 2023), the Ten-Year Network Development Plan (cf. ENTSOG and ENTSO-E, 2024), the UBA (2019) study, and analyses from companies such as Shell (2023), Elia (2021) or EDF (2024)—primarily assess the technical feasibility of net zero, rather than its economic viability. This is precisely the gap that our study wants to fill. The Energy Playbook study develops an affordable, yet realistic scenario to net zero and compares it to the current EU targets to identify potential for optimisation.

The Energy Playbook scenario prioritises decarbonisation options based on abatement costs to achieve maximum emissions reductions per euro spent, while following a technology-neutral approach, allowing market mechanisms to determine the most effective solutions without favouring specific technologies. Based on a comprehensive and detailed modelling of the European energy system, we calculate the required energy-related investment and annual system costs in Europe. In addition, we quantify the alternative investment path and system costs of an EU Reference sensitivity, based on the current targets of the EU REPowerEU and Green Deal plan and the EU Impact Assessment. We find that, Europe can realise significant cost savings and economic benefits, including lower electricity prices, a flatter investment curve, and cumulative savings of approximately EUR 1.5 trillion in energy system costs by 2050 by following the Energy Playbook scenario instead of sticking to the REPowerEU and Green Deal pathway.

Based on the identified cost saving potentials, we conclude that a successful energy transition requires clear prioritisation of efforts. The current approach mandates simultaneous decarbonisation of power, heat, transport, and industry, which risks losing focus on key enablers. To ensure affordability and feasibility, the study identifies cost saving potential along three steps:

1. Prioritise electrification first: Electrification remains the most cost-effective pathway for 80% of the transition.
 - However, electricity is currently overburdened with taxes and levies, making it less competitive. Reducing these costs will accelerate electrification and lower overall system expenditures.
 - A timely grid expansion is critical to support the increasing share of renewable energy and the electrification of demand. Current non-competitive regulatory returns in the EU do not attract sufficient private capital,

hindering the rapid scaling of Europe's electricity infrastructure.

- Integrating digital solutions can optimise energy consumption patterns, reducing the need for costly backup capacity and enabling system-wide efficiency gains.

2. Scale an affordable energy system: Europe needs to align the ramp-up of supply and demand. If these elements decouple, the energy system risks inefficiency, leading to over-subsidisation and stranded assets.

- Hydrogen will play a critical role in the long term, but it remains costly. A phased approach that aligns supply with demand will optimise resource allocation and defer unnecessary infrastructure investments, saving up to EUR 200 billion by 2030.

- Rescaling the system can cut the required renewable capacity expansion by 30% by 2030, cutting annual subsidies by EUR 20 billion.

- Strengthening cross-border grid interconnections can eliminate the need for 100 GW of additional backup capacity, reducing system costs and improving resilience.

3. Don't trip on the last mile: The final phase of decarbonisation –eliminating the last 10% of emissions –will be the most complex and costly in terms of abatement. To prepare for this challenge, Europe should:

- Invest in innovation: The affordability of the last mile will depend on breakthroughs in clean baseload power, cost-effective hydrogen production, and advanced carbon removal technologies.

- CCS and carbon offsets are key to net zero, often offering a cheaper alternative to hydrogen-based solutions. Their success depends on the timely development of regulatory frameworks and infrastructure.

Backed by in-depth analysis and modelling, the Energy Playbook identifies major cost-saving potential on the road to net zero. With concrete policy recommendations, it offers actionable insights for discussions and clear direction for policymakers.

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