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Implications for Public Policy

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Energy Systems Integration: Implications for Public Policy

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Energy Systems Integration (ESI) is an emerging paradigm and at the centre of the EU energy debate. ESI poses significant public policy implications, because, by identifying and exploiting the synergies within and between the sectors, ESI aims to increase flexibility in the energy system, maximize integration of renewable energy and distributed generation, and reduce environmental impact.

We investigate the economic aspects of ESI-enabling technologies and discuss how EU national regulators incentivize their adoption. We conclude that **current regulatory frameworks in the EU do not sufficiently stimulate ESI investments.** In addition, we also identify policy solutions to overcome economic and policy barriers to ESI.

Because **ESI is a combination of different types of integration**, there is **no specific optimal solution** that can be recommended. Thus, **ESI needs to be a bespoke approach** that considers the peculiarities of idiosyncratic energy systems and provides **a context-specific framework of potential solutions**.

The **focus of policy makers has been directed towards decarbonization** of energy and transportation sector, which has been rendered plausible due to recent **technological developments in clean energy resources.** This creates a push towards further adoption of Renewable Energy Sources (RES) and a simultaneous streamlining of Distributed Generation (DG) generation.

Because **ESI takes a holistic view of energy systems** and utilizing the synergies between them, **it can reduce the required investments to address the shift towards renewable energy systems.** Thus, its goal is to reduce total system costs while contributing to achieve a clean, affordable, and secure energy system.

As mentioned earlier, **technological advancements have given way to new opportunities in energy systems**, and as such, also can play a role in ESI. Information and Communication Technology, Storage Systems and Conversion Technologies can provide benefits to various parts of energy systems, either through cost savings or by facilitating flexibility options. However, because the development of the technologies is costly, regulation may need to play an active role in creating a more certain investment environment and incentivizing the adoption of these technologies in line with ESI.

Regulatory focus has been on improving efficiency of the utilities as well as improving service quality rather than stimulating innovation. Thus, as the conventional regulatory approaches fail to provide incentives for innovation and investment in energy networks**, innovative regulatory frameworks should be developed.** One such way is illustrated by output-based mechanisms, that in contrast to the input-based focus on cost-minimization, focus on the outcome of innovation, quality of services as well as desired sustainability targets.

The lack of investment in ESI can be explained by different economic and policy barriers to its adoption. While some will disappear naturally with technological advancements, direct policy measures are required to address most barriers. Both the barriers as well as potential policy solutions are discussed at length in the underlying working paper.

These barriers are (1) the cost of adopting ESI-enabling technologies, (2) intrinsic risk of innovative projects, both in term of economic viability and consumer acceptance, (3) institutional constraints in incentivizing adoption of innovative technologies in face of existing, technology neutral regulatory framework, (4) potential conflict of incentives in the coordination between grid users, (5) access to data, (6) consumer acceptance, (7) role of the regulator in identifying a clear boundary between regulation and the market, (8) behaviour of prosumers behind-the-meter and (9), the regulators capabilities and resources to intervene on whole energy system cohesively.

In overcoming the barriers to achieve effective ESI implementation, several policy solutions are proposed. These policy solutions are (a) incentives to innovation, (b) driving consumer actions, (c) fostering the emergence of new players, (d) TSO/DSO adoption, (e) ICT & Data access, (f) incentivise coordination, (g) decoupling of firm revenues from energy

consumption, (h) cross-sector development plans and (i), coordination at the EU level.

An illustration of which barriers these policy solutions alleviate, can be found in Table 1.

Proposed Policies \ Barriers	Cost of techs	Innovation risk	Tech-neutrality	Coordination	Data access	Consumer acceptance	Boundary regulation/ market	Behind-the-meter behaviour	Regulator's capabilities
Innovation incentives	x	x	X						
Drive consumer actions	x	x				x			
Foster emergence of new players	x	x					x		
TSO/DSO adoption	x						x		
ICT & data access		x		x	x				
Incentivise coordination				x	x		x		
Decoupled revenues				x				x	
Cross-sector development plans	x			x		x			x
Coordination at the EU level	x	x	x	x	x	x	x		x

Table 1: Policy Solutions to Barriers for ESI implementation

References

Cambini, C., Congiu, R., Jamasb, T., Llorca, M., & Soroush, G. (2020). Energy Systems Integration: Implications for Public Policy. CSEI Working Paper 2020-02, CBS Department of Economics (forthcoming in *Energy Policy*).