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What governance of cross-border energy infrastructure in the EU to achieve climate neutrality?
Revision of the TEN-E regulation

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NOTE

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KEY MESSAGES

The revision of the TEN-E regulation is an opportunity to align decisions on energy infrastructure in the European Union (EU) with the climate neutrality objective. Otherwise, there is a risk that substantial public funds are spent on energy infrastructure projects that could become stranded assets and delay decarbonisation.

The governance of EU energy infrastructure choices framed by the TEN-E regulation is currently based on the expertise of gas and electricity transmission system operators. This expertise should be supplemented by a stronger consultation process with energy system stakeholders, as well as with a scientific body, to ensure full consideration of all options for decarbonisation in the development of framework scenarios and in infrastructure financing decisions, including energy efficiency and of sector integration potential.

The governance of TEN-E could be improved by including the contribution of the European Scientific Advisory Board on Climate Change (ESAB)_– established by the Climate Law – to the definition of cost-benefit analysis criteria and the types of long-term scenarios developed by the gas and electricity transmission system operators ("ENTSOs"). ESAB's participation would increase the transparency of infrastructure planning and the consideration of non-grid solutions to decarbonisation.

The introduction of hydrogen infrastructure into the scope of the TEN-E regulation as proposed by the European Commission should be complemented with sustainability criteria ensuring that this category is not used to finance fossil methane infrastructure in the medium term.

1. INTEGRATING CLIMATE NEUTRALITY INTO DECISIONS ON EU ENERGY INFRASTRUCTURE

The Trans-European Networks - Energy (TEN-E) regulation was adopted in 2013 to ensure the proper functioning of the internal energy market and the security of supply, partly by promoting the interconnection of energy networks in the European Union.

Today, the context of cross-border energy infrastructure construction has changed. It appears that the security of supply no longer justifies expanding cross-border gas transmission infrastructure[1,2], particularly as imports and consumption of natural gas are decreasing and must continue to do so in order to achieve climate neutrality by 2050[3,4]. Moreover, the path to climate neutrality will bring far-reaching changes to gas and electricity infrastructure, especially a significant reduction in demand, the incorporation of technologies such as low-carbon hydrogen, and demand management measures[5]. Investments in unnecessary cross-border energy infrastructure projects could constitute stranded assets and generate lock-in effects in fossil fuel consumption[6]. In addition, it is essential that selected projects are the ones that best help reach emission reduction objectives and at the least cost.

The TEN-E regulation is central to decision-making on the construction and financing of EU energy interconnections. It defines two important processes for energy infrastructure planning at the European level:

- The methodology for conducting cost-benefit analysis (CBA) that identifies, among others, **projects of common interest (PCIs)**. These are cross-border infrastructure projects that are prioritised in terms of deployment and funding. A list of PCIs is published every two years.
- The **Ten-Year Network Development Plans (TYNDPs)**: these ten-year plans are published every two years by the gas and electricity transmission system operators, organised respectively through ENTSOG and ENTSO-E, and are the basis for assessing infrastructure projects' eligibility for EU funding.

In this context, the priority for the revision of the TEN-E regulation is to align it with the objectives of the Green Deal. Given the long lifetime of infrastructure assets (around 50 years), it is crucial that the revision is ambitious in aligning with climate objectives., The European Commission submitted a proposal in December 2020, and discussions are underway at the European Parliament and the Council of the European Union aiming for a final position by summer 2021, with the goal of adopting the revision by the end of the year.

France has a key role to play through the Council of the European Union, which it will preside in the first half of 2022. The revision of the TEN-E regulation is a first test of the EU's commitment to implementing the Green Deal.

One of the key challenges for the revision of TEN-E with regard to its alignment with the goal of EU climate neutrality is the modification of the framework for energy infrastructure planning in Europe. This framework consists of two key phases: the definition of EU energy scenarios forming the basis of analyses of the advisability of infrastructure investment, and the criteria for decisions on whether or not to support projects of common interest. In both cases, adjustments appear necessary to ensure that these processes fully integrate the climate neutrality objective, by considering alternatives to the construction of network infrastructure, in particular energy efficiency improvements[7].

2. Revising the governance of trans-European energy infrastructure to better integrate all solutions for climate neutrality

The design of the Ten-Year Network Development Plan (TYNDP) and the PCI selection criteria is currently based on the expertise of gas and electricity transmission system operators (TSOs), through ENTSO-E and ENTSOG (the "ENTSOs"). Although they have a public service role and naturally have in-depth knowledge of their networks as well as the capacity to develop evolution scenarios, such a set-up nevertheless raises two key problems, which the Commission's proposal for the revision of TEN-E identifies but does not solve.

Neutrality towards infrastructure sizing. Ensuring the security of energy supply does not depend exclusively on network infrastructure solutions. Some changes, such as measures concerning energy efficiency, storage, electrification, sector integration, and the incorporation of hydrogen, are crucial to achieving climate neutrality, but can affect the value of assets for TSOs, which have a commercial interest in expanding the network. This aspect is highlighted at the European level by the energy regulators[8] and by several energy industry representatives[9,10,11]. The

1 Artelys. (2020). *An updated analysis on gas supply security in the EU energy transition*.

2 Artelys. (2020). *What energy infrastructure to support 1.5°C scenarios ?* Retrieved from https://www.artelys.com/wp-content/uploads/2020/12/Artelys-2050EnergyInfrastructureNeeds.pdf

3 European Commission. (2018). *A Clean Planet for all - In-depth analysis*. (COM (2018) 773). Retrieved from https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

4 ENTSOG, & ENTSO-E. (2020). *TYNDP 2020 Scenario Report*. Retrieved from https://tyndp.entsoe.eu/scenarios

5 Bouacida, I., & Berghmans, N. (2021). Carbon neutrality in Europe: future challenges for the gas infrastructure. *IDDRI Study*, *1*.

6 Global Energy Monitor. (2021). *Europe Gas Tracker*. https://globalenergymonitor.org/report/europe-gas-tracker-report-2021/

7 European Parliament. (2018). Directive 2018/2002/EU amending Directive 2012/27/EU on energy efficiency. *Official Journal of the European Union*. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2002&from=EN

8 ACER, & CEER. (2019). *The Bridge Beyond 2025. Conclusions Paper*. Retrieved from https://www.ceer.eu/documents/104400/-/-/f1846269-a27b-b3db-5edc-697b9156d3c4

9 European Alliance to Save Energy. (2020). *EU-ASE Response for TEN-E Consultation Roadmap*.

10 European Association for Storage of Energy. (2020). *Open Letter on the Revision of the TEN-E Regulation*.

11 EGEC Geothermal. (2020). *EGEC views on the TEN-E inception questionnaire consultation*.

associated risk is over-funding infrastructure projects that are not essential to the security of supply and to decarbonization or may even be counter-productive since they would create an incentive to consume more fossil gas in order to ensure returns on investments. The TYNDP scenarios illustrate this risk, since estimations for methane demand by the ENTSOs are significantly higher than those of the 1.5°C scenarios produced by the Commission[12] and compatible with the European climate neutrality objective (Figure 1), which may lead to over-investment in methane infrastructure projects that are unsustainable in the long term. Moreover, the two scenarios for climate neutrality by 2050 proposed by the ENTSOs in the latest TYNDP are very similar, with the only parameter that differs being the degree of centralisation of the system, whereas the volumes of gas consumption vary little. Developing more diverse scenarios, for example in terms of energy demand and changes in economic activity, would ensure a more robust assessment of infrastructure projects, as indicated by the EU Agency for the Cooperation of Energy Regulators (ACER) in its opinion on the latest TYNDP[13]. Even if they have the same objective, scenarios aimed at climate neutrality may propose different pathways; this is reflected in several baseline scenarios, which consider different assumptions in terms of behavioural change, economic growth and international trade[14,15,16].

Consideration of the potential for energy system integration. The storylines that underlie the TYNDP scenarios are developed jointly by ENTSOG and ENTSO-E, but their technical and economic optimisation is done separately by carrier[17]. However, integrated optimisation between energy carriers makes it possible to model equipment at the intersection of energy sectors, such as hybrid heat pumps, electrolysers and district heating[18]. Thus, the way sector integration reduces energy infrastructure needs can be fully taken into account. A number of studies show the importance of multi-vector optimisation in quantifying infrastructure needs, at the level of scenarios and the assessment of specific projects[19,20,21,22], but also in ensuring the security of supply[23]. The need for integrated modelling between gas and electricity carriers is already set out in the TEN-E regulation of 2013[24], but has not been translated into reality. Although infrastructure modelling and planning has traditionally been conducted separately for each carrier, the importance of joint scenario building and planning exercises is identified and is taking form in several member states[25,26,27]. These national-level efforts show that it is also possible to implement this type of modelling at the European level. In addition to the risk of overestimating infrastructure needs, failing to correctly model sector integration could hinder its implementation, and therefore decarbonisation.

The Commission's proposal for the revision of TEN-E identifies the need for assessing infrastructure needs while taking into account the goal of climate neutrality, the principle of energy efficiency and the potential of sector integration, and partially addresses it; however, its provisions do not seem sufficient to ensure appropriate governance.

The role of ACER. In article 12, the Commission proposes closer supervision of the TYNDP design process by ACER, in particular that ACER shall publish guidelines for scenario development that are consistent with climate and energy objectives and the energy efficiency first (EE1st) principle. As in the previous regulation, ACER and the Commission give their opinions on the methodologies used by the ENTSOs for TYNDP scenarios and CBA (articles 11 and 12). In addition, the revision empowers ACER to approve the CBA methodology (article 11). However, this power is very limited, since ACER can only demand "incremental" changes, in other words not affecting the definition of costs and benefits and the parameters that measure them (article 11). ACER's opinions are no more binding than in the initial version of TEN-E, even though ACER has stressed that its opinions are not

12 European Commission. (2018). *A Clean Planet for all - In-depth analysis. COM (2018) 773*. https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

13 ACER. (2020). *Opinion on ENTSO-E and ENTSOG draft TYNDP 2020 Scenario Report*. *6*, 1–13. https://acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER Opinion 06-2020 on ENTSO-E and ENTSOG draft TYNDP 2020 Scenario Report.pdf

14 Riahi, K., van Vuuren, D. P., Kriegler, E., Edmonds, J., O'Neill, B. C., Fujimori, S., Bauer, N., Calvin, K., Dellink, R., Fricko, O., Lutz, W., Popp, A., Cuaresma, J. C., KC, S., Leimbach, M., Jiang, L., Kram, T., Rao, S., Emmerling, J., … Tavoni, M. (2017). The Shared Socioeconomic Pathways and their energy, land use, and greenhouse gas emissions implications: An overview. *Global Environmental Change*, *42*, 153–168. https://doi.org/10.1016/j.gloenvcha.2016.05.009

15 European Commission. (2018). *A Clean Planet for all - In-depth analysis. COM (2018) 773*. https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

16 Mathy, S., Criqui, P., & Hourcade, J.-C. (2015). Pathways to deep decarbonization in France. *IDDRI - SDSN*.

17 ENTSOG, & ENTSO-E. (2020). *TYNDP 2020 Scenario Methodology Report*.

18 Cambini, C., Congiu, R., Jamasb, T., Llorca, M., & Soroush, G. (2020). Energy Systems Integration: Implications for public policy. *Energy Policy*, *143*, 111609. https://doi.org/10.1016/j.enpol.2020.111609

19 Artelys. (2020). *What energy infrastructure to support 1.5°C scenarios ?* Retrieved from https://www.artelys.com/wp-content/uploads/2020/12/Artelys-2050EnergyInfrastructureNeeds.pdf

20 ACER, CEER. Position on Revision of the Trans-European Energy Networks Regulation (TEN-E) and Infrastructure Governance. 2020.

21 Trinomics, Artelys. *Measuring the Contribution of Gas Infrastructure Projects to Sustainability as Defined in the TEN-E Regulation*.; 2020.

22 Koirala, B., Hers, S., Morales-España, G., Özdemir, Ö., Sijm, J., & Weeda, M. (2021). Integrated electricity, hydrogen and methane system modelling framework: Application to the Dutch Infrastructure Outlook 2050. *Applied Energy*, *289*, 116713. https://doi.org/10.1016/j.apenergy.2021.116713

23 Pambour, K., Cakir Erdener, B., Bolado-Lavin, R., & Dijkema, G. (2017). Development of a Simulation Framework for Analyzing Security of Supply in Integrated Gas and Electric Power Systems. *Applied Sciences*, *7*(1), 47. https://doi.org/10.3390/app7010047

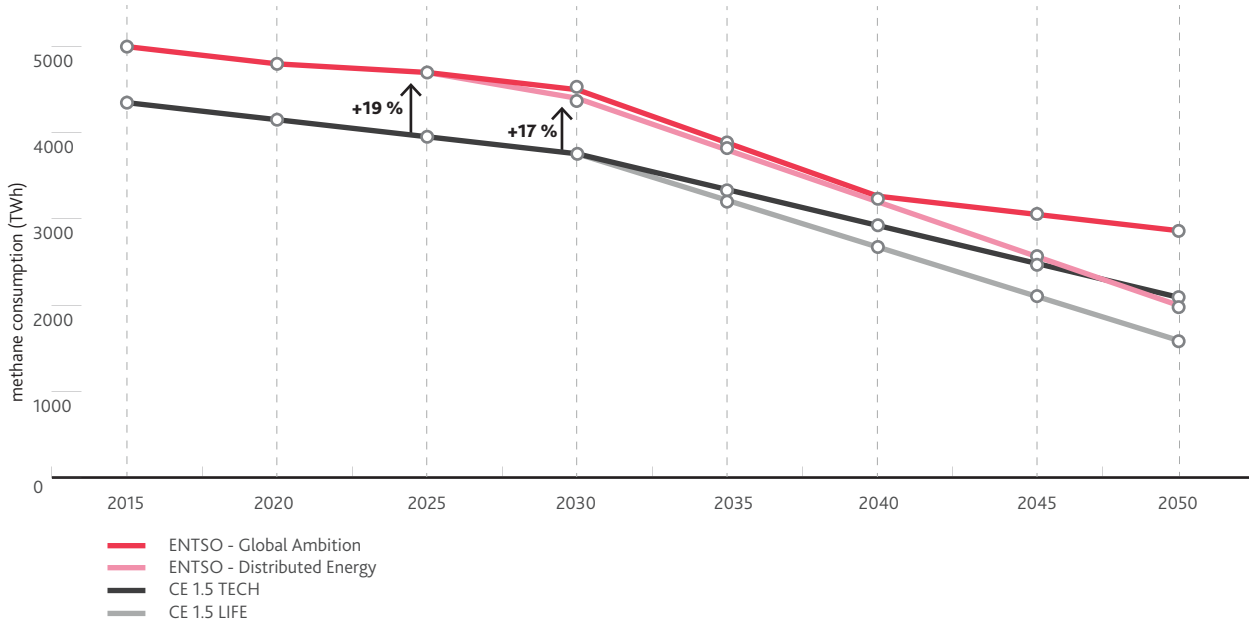
24 European Parliament. (2013). Regulation on guidelines for trans-European energy infrastructure 347.2014. *Official Journal of the European Union*.

25 ACER. (2020). *Opinion on the consistency of gas NDPs with EU TYNDP*. *9*.

26 https://www.dena.de/newsroom/meldungen/dena-empfiehlt-einfuehrung-eines-systementwicklungsplans/

27 Gasunie, & TenneT. (2019). *Infrastructure Outlook 2050 : a joint study by Gasunie and TenneT on integrated energy infrastructure in the Netherlands and Germany*. Retrieved from https://www.gasunie.nl/en/expertise/system-integration/infrastructure-outlook-2050

FIGURE 1. Methane consumption in EU28 networks according to scenarios achieving net climate neutrality by 2050 produced by the ENTSOs (TYNDP 2020 by ENTSO-E and ENTSOG) and the European Commission.



sufficiently taken into account[28], for example its suggestion to consider more diverse trajectories for gas demand by 2050 in the 2020 TYNDP[29]. The fact that ACER's opinions are insufficiently taken into account is partly due to the timing of methodology design. The consultation of stakeholders takes place exclusively ahead of the publication of the ENTSOs' methodologies, while the opinions of ACER and the Commission must be published within three months. The ENTSOs have three more months to update their methodologies. The Commission's proposal does not alter these deadlines, yet this schedule leaves no time to propose and implement major changes to methodologies based on the work of the ENTSOs. Moreover, the schedule would need to be adjusted in order to ensure ACER submits its opinions earlier in the definition of CBA criteria and TYNDP scenarios.

Infrastructure gaps identification. The proposal also introduces a third process into the TEN-E regulation: the publication by the ENTSOs of a report listing infrastructure gaps in the European Union, which helps to better determine whether an infrastructure project corresponds to an actual need for the energy system (article 13). This provision increases the transparency of PCI selection and reaffirms the importance of the EE1st principle, sector integration and non-infrastructure solutions. But in practice, infrastructure gaps are primarily identified by the ENTSOs, with no need for approval either by ACER or the Commission, although they do issue opinions. Furthermore, no criteria are formulated to ascertain whether priority is given to energy efficiency and non-infrastructure solutions. This does not resolve the lack of neutrality in infrastructure sizing and does not guarantee consideration of the potential for sector integration.

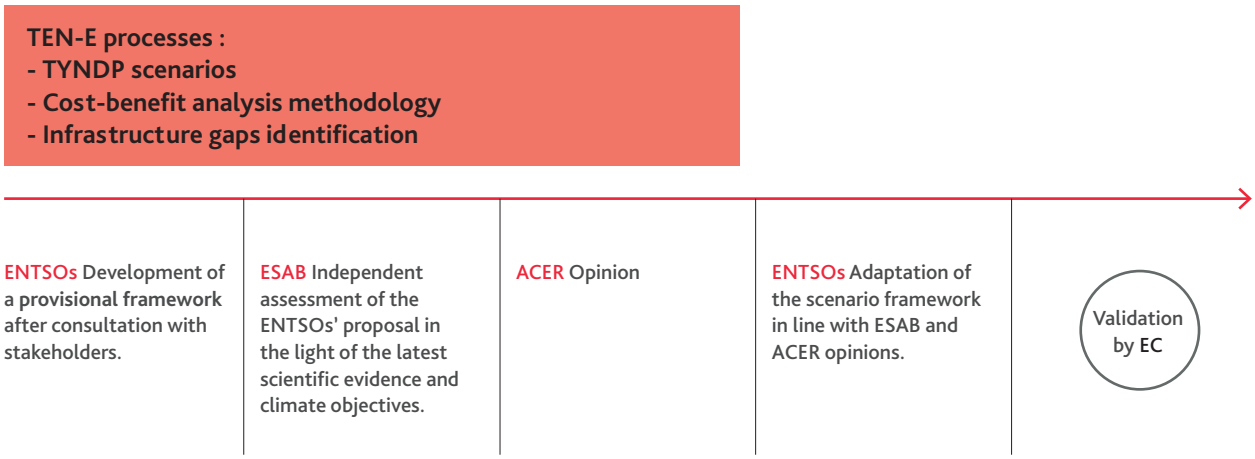
Independent scientific assessment. An independent scientific assessment could improve the legitimacy and neutrality of TYNDP scenario design, CBA criteria and infrastructure gaps. This function could be carried out by the European Scientific Advisory Board on Climate Change (ESAB), which would then guarantee the consistency of cross-border infrastructure planning with climate objectives. It would assess the framing of the long-term scenarios developed by the ENTSOs in order to ensure that the full range of possible paths to climate neutrality and of assumptions for demand and technology deployment are examined. It would also be mandated to issue an opinion on TSO proposals regarding the methodology for cost benefit analysis, considering recent scientific knowledge, and, where appropriate, to propose alternative assumptions. This is particularly relevant for technologies that contribute to decarbonisation, and which are not at the heart of ENTSOs' expertise (demand-side management, hydrogen). This scientific expertise would complement ACER's regulatory expertise. The final validation of CBA criteria and long-term scenarios would still be the remit of the European Commission, a body with political legitimacy. The contribution of this body to infrastructure planning has already been formulated by several stakeholders. ENTSOG proposes a Joint Advisory Panel for Scenarios[30], which would inform decisions by showing stakeholders' viewpoints. This proposal reflects a desire

28 ACER, & CEER. (2019). *The Bridge Beyond 2025. Conclusions Paper*. Retrieved from https://www.ceer.eu/documents/104400/-/-/f1846269-a27b-b3db-5edc-697b9156d3c4

29 ACER. (2020). *Opinion on ENTSO-E and ENTSOG draft TYNDP 2020 Scenario Report*. 6, 1–13. Retrieved from https://acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER Opinion 06-2020 on ENTSO-E and ENTSOG draft TYNDP 2020 Scenario Report.pdf

30 ENTSOG. (2020). ENTSOG position on TEN-E revision. https://www.entsog.eu/sites/default/files/2020-11/SD0021_201110_Note_TEN-E_Position_Final.pdf

FIGURE 2. Proposal on strengthening the TEN-E process to align infrastructure planning with climate objectives.



TYNDP: Ten-Year Network Development Plan. ENTSOs: European Network of Transmission System Operators for gas and electricity EC: European Commission ESAB: European Scientific Advisory Board on Climate Change

to improve the transparency and commitment of stakeholders in the TYNDP and PCI exercises. A panel of this kind would make it possible to formalise the consultation process, but it would only have a consultative role and the members would be chosen by the ENTSOs, which does not ensure the neutrality of decisions on network development. Several environmental NGOs and the think tank E3G propose the creation of an independent expert body that would be responsible for determining the selection criteria for PCI projects[31] and for supervising the TYNDP process[32]. The role ESAB could play in these processes is illustrated in Figure 2.

Planning of cross-border hydrogen transport infrastructure. The Commission's proposal introduces the hydrogen infrastructure category and mandates ENTSOG to assess projects in this category. In view of the potential deployment of hydrogen in the energy system by 2030 and 2050 and of some interconnections to decarbonise industrial activities[33], this carrier being included in gas and electricity infrastructure planning exercises is a positive development. However, considering that a significant portion of hydrogen infrastructure would result from the conversion of methane pipelines, it is crucial that the hydrogen category does not fund new pipelines which would transport methane in the short and medium term, while production of and demand for pure hydrogen are not sufficiently developed, even if the long-term objective would be their conversion to hydrogen. Existing interconnection capacities for methane are sufficient to ensure security of supply and extending them could contribute to delay the phase out of fossil gas in some uses. Furthermore, there is still significant uncertainty regarding the regulation of hydrogen infrastructure at the national level, in particular the conditions under which gas TSOs would be authorised to transport hydrogen as well as the provisions to prevent a monopoly and the cross-subsidisation of methane and hydrogen infrastructure, which would pass on to all of today's methane consumers the cost of developing hydrogen infrastructure that they would not use.

In the face of these uncertainties regarding the infrastructure needs for hydrogen development, a more cautious and progressive approach is needed, adopting a progressive and dynamic regulatory framework, as advocated by E3G, ACER and CEER[34,35]. In addition, it is important that the hydrogen category is subject to sustainability criteria for the gas it transports to indeed avoid extending methane interconnections even in the short and medium term.It would also be preferable not to entrust the methane TSOs with assessing hydrogen infrastructure needs, given that they could have a commercial interest in prioritising methane or the repurposing of their networks and large-scale cross-border infrastructure.

31 CEE Bankwatch Network, CAN Europe, Food & Water Action Europe, Ecologistas en Acción, Friends of the Earth Europe, Greenpeace, E3G. (2021). *A fossil-free TEN-E regulation. NGO briefing on the revision of the Trans-European energy infrastructure regulation*. Retrieved from https://caneurope.org/fossil-free-ten-e-regulation-ngo-briefing/

32 Giannelli, E., & Fischer, L. (2020). Energy Infrastructure for a European Green Deal Benchmarks for the New Trans-European Networks for Energy Regulation (TEN-E). *E3G Briefing Paper*, (March), 1–17.

33 Agora Energiewende, & AFRY Management Consulting. (2021). *No-regret hydrogen. Charting early steps for H2 infrastructure in Europe*. https://www.agora-energiewende.de/en/publications/no-regret-hydrogen/

34 ACER, & CEER. (2020). *Position on Revision of the Trans-European Energy Networks Regulation (TEN-E) and Infrastructure Governance*.

35 ACER, & CEER. (2021). When and How to Regulate Hydrogen Networks ? *"European Green Deal" Regulatory White Paper Series*, *1*.

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