Liquefied natural gas expansion plans in Germany: The risk of gas lock-in under energy transitions

POLET workshop on fossil fuel decline

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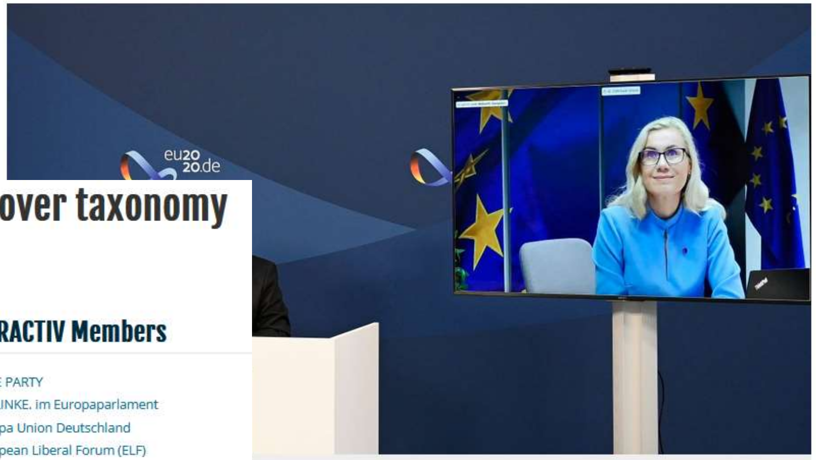

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The European Greens are currently assessing whether to follow the Austrian example and sue the European Commission over the EU taxonomy rules. [Shutterstock / Nicholas Ahonen]

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The European Greens are currently assessing whether to follow the Austrian example and sue the European Commission over the EU taxonomy rules that could label nuclear energy and gas as 'green' energy sources.

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Liquefied natural gas expansion plans in Germany: The risk of gas lock-in under energy transitions

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ABSTRACT

The German energy transition has been hailed as a role model for climate action. However, plans for the construction of three large-scale Liquefied Natural Gas (LNG) import terminals are receiving strong state support. This is inconsistent with Germany's climate targets, which require a reduction rather than expansion of natural gas consumption. In our paper, we aim to unpack the connection between the risk of natural gas lock-in and the energy transition. We analyse the co-evolution of the techno-economic, socio-technical and political realms of the German natural gas sector and influence of actors within that process. We use a combination of energy system and interview data, and introduce a new approach to triangulate material and actor analysis. We show that four natural gas lock-in mechanisms cause the support for LNG in Germany: (A) the geopolitical influence from the United States, combined with (B) security of supply concerns due to the planned coal and nuclear phase-out, (C) pressure from a wide variety of state and private sector actors, and (D) sunk investments in existing gas infrastructure. Two additional mechanisms supporting the strong position of natural gas are (E) the strength of the emerging synthetic gas niche, and (F) weak opposition against LNG and natural gas. We highlight the severely overlooked lock-in potential and related emissions, which could complicate and decelerate energy transitions as more countries reach a more advanced phase of the energy transition.

1. Introduction

Natural gas use is the most rapidly growing among all fossil fuels, and was responsible for about 35% of growth in global CO_2 emissions since 2009 [1]. While some present natural gas as a 'bridge technology' [2,3],[2] others argue that this is an ambiguous narrative to influence expectations and visions regarding natural gas [6]. In fact, using natural gas as a substitute for coal can lead to negative climate consequences due to so far underestimated life cycle emissions [7-10] and a delay of a climate neutral energy system [11]. Here, we highlight a third risk of natural gas as a bridge fuel: locking-in large-scale carbon-intensive infrastructure, which could undermine long-term climate goals.

The current rise in natural gas use is also reflected in the dawn of new infrastructure for trading Liquefied Natural Gas (LNG): Global LNG export infrastructure grew to 442 million tons per annum (MTPA) in May 2020, and LNG import infrastructure currently stands at 844 MTPA [12].[3] This compares to an LNG trade of 355 MT in 2019 [13], an increase of ~45% compared to 2015 [14].[4] The existing oversupply on the global market – especially due to new supplies from Australia, the United States and Russia – has led suppliers to search for new export possibilities, and Europe is becoming an attractive import market for LNG, as today's low LNG prices converge to the continent's pipeline

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[2] They mostly base this assumption on the fact that natural gas can emit up to 60% less CO_2 emissions compared to coal, when one accounts only for the burning process [4]. However, when accounting for life cycle emissions the outcome is less positive [5].

[3] Another 122 MTPA of export capacities and 144 MTPA of import capacities are currently under construction [12].

[4] Shipping natural gas as LNG additionally increases the greenhouse gas footprint, due to cooling and pressurising.

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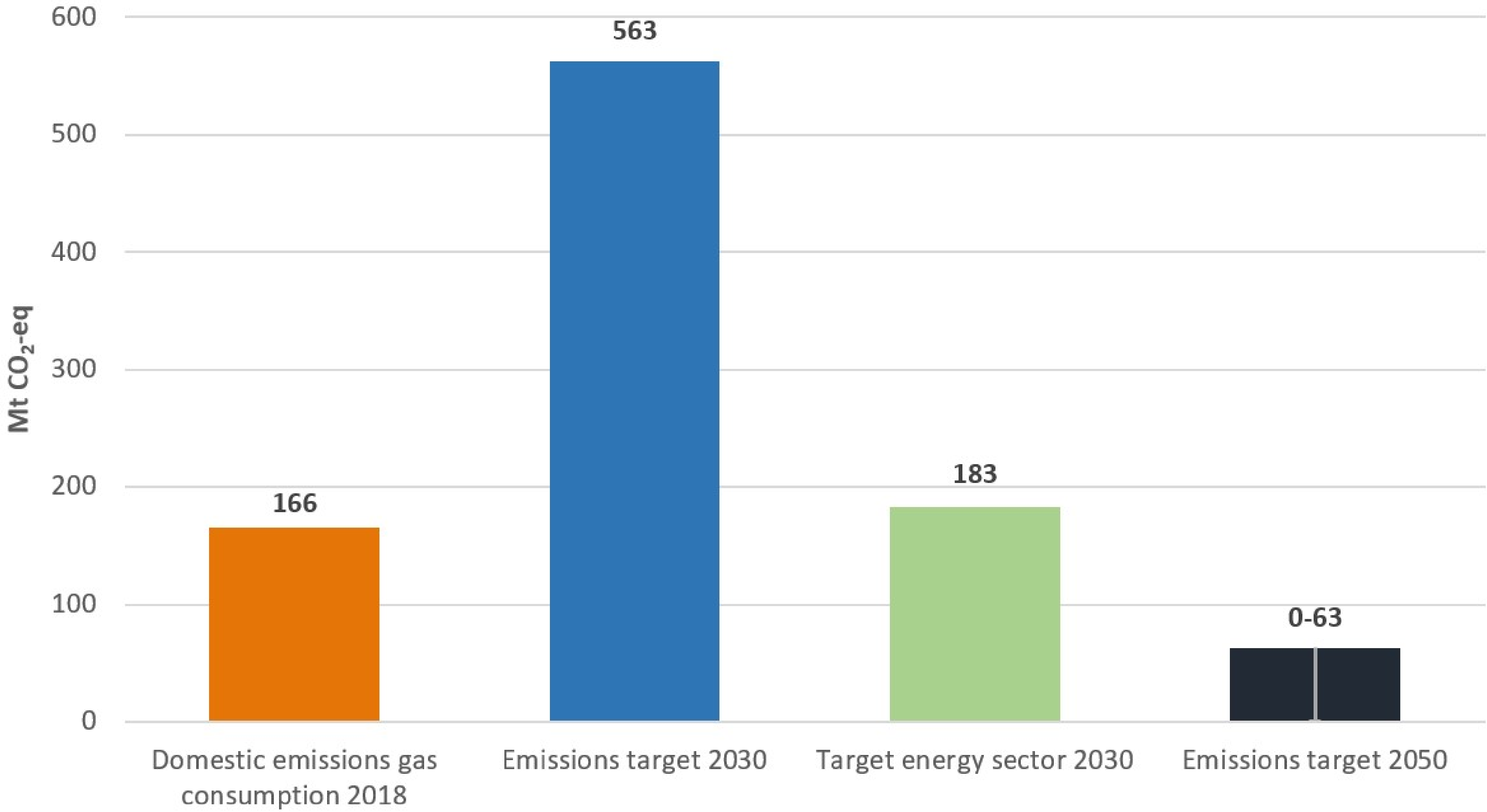
Comparison of current emissions from gas consumption and emission reduction targets for Germany

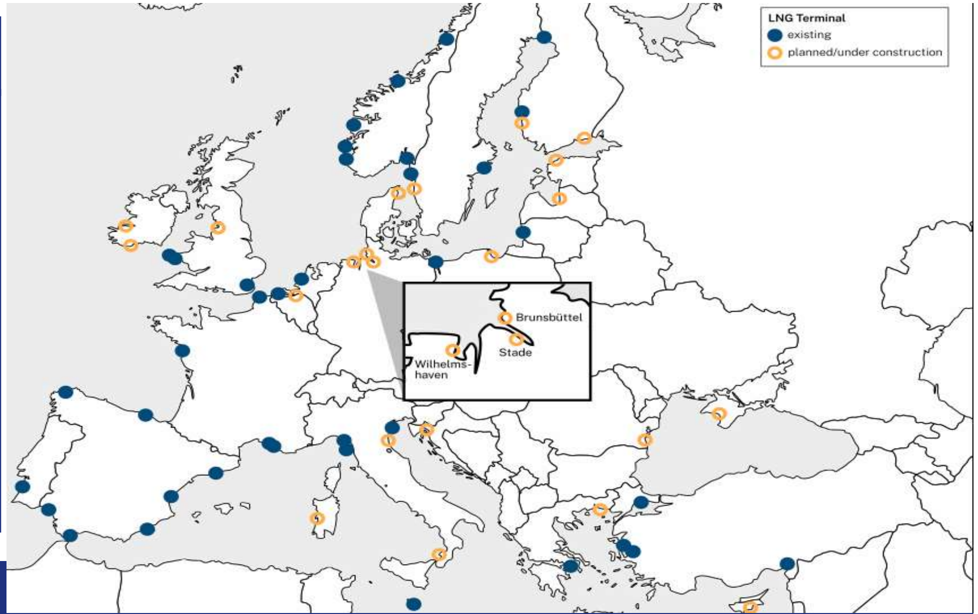


(Brauers, Braunger, and Jewell 2021)

Investigation of the German natural gas lock-in through Liquefied Natural Gas terminal investment plans

Background

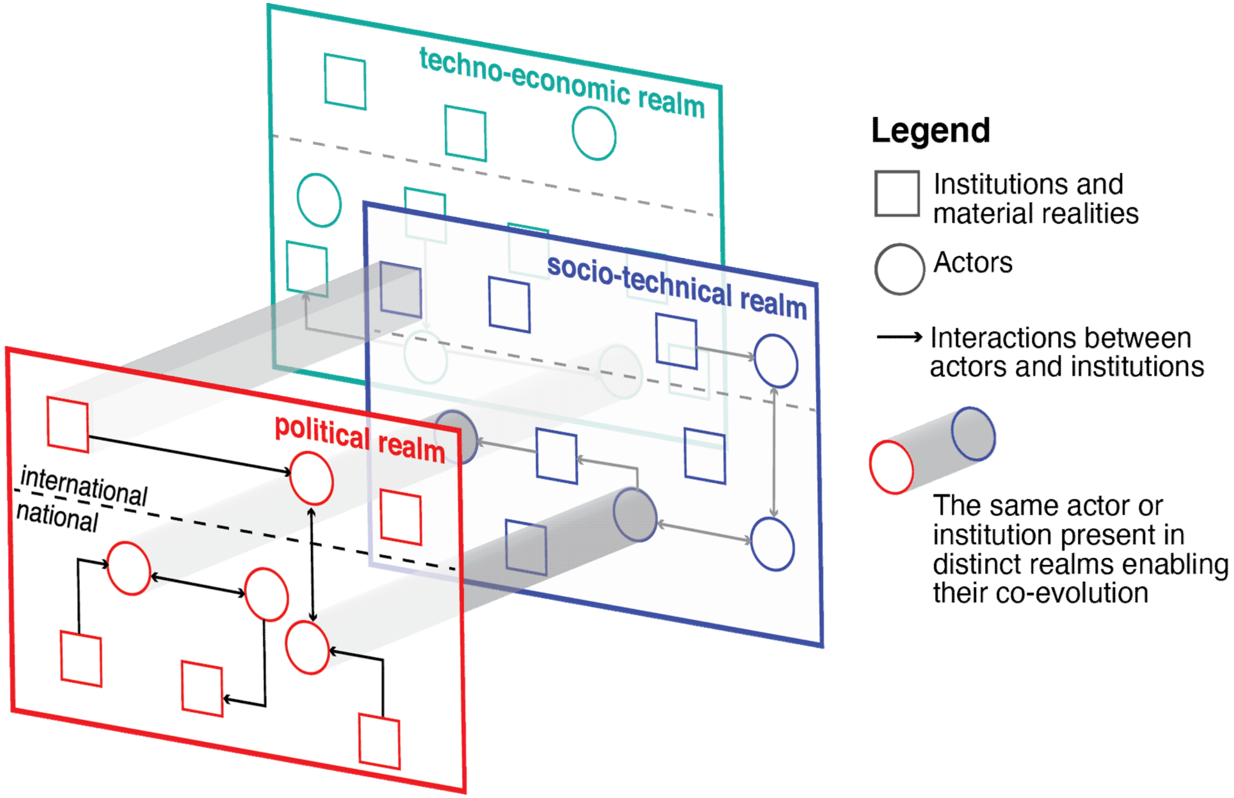
- Germany biggest gas market of the EU; ~50% of gas via pipelines from Russia.
- Existing EU LNG import capacity sufficient to cover ~43% of EU gas demand.
- No German LNG terminal proposal has permit for construction & no final investment decision.
- Strong political support for LNG terminals.



Research Questions and Approach

- Why do those LNG terminals receive political support - despite commitments to climate protection?
- How do the material conditions around natural gas consumption and LNG infrastructure relate to and interact with actors' perceptions of these conditions?
- How do these interactions shape systemic changes and create lock-ins within the German energy transition?
- Application of meta-theoretical energy transition framework *(Cherp et al. 2018)* & combination of actor *(Brugha and Varvasovsky 2000)* & material analysis. Qualitative content analysis *(Gläser and Laudel 2010)* of 14 semi-structured interviews, background talks, workshop & documents. (Brauers, Braunger, and Jewell 2021)

Actors influence the realms while the realms define the space for actors' perceptions and related strategic actions



Framework & approach

- Policies, artefacts and actors all connect and influence the three realms.
- Focus here on how key actors walk across realms, play different roles in different realms and thus facilitate their co-evolution.
- Actors at the same time influence and are influenced by the realms.
- Material analysis describes actors' context.
- Actor analysis how their agency depends on their perceptions of a situation.
- Here: New approach to combine both material realities and actors' interests and strategies to identify the space for agency in shaping energy transitions.

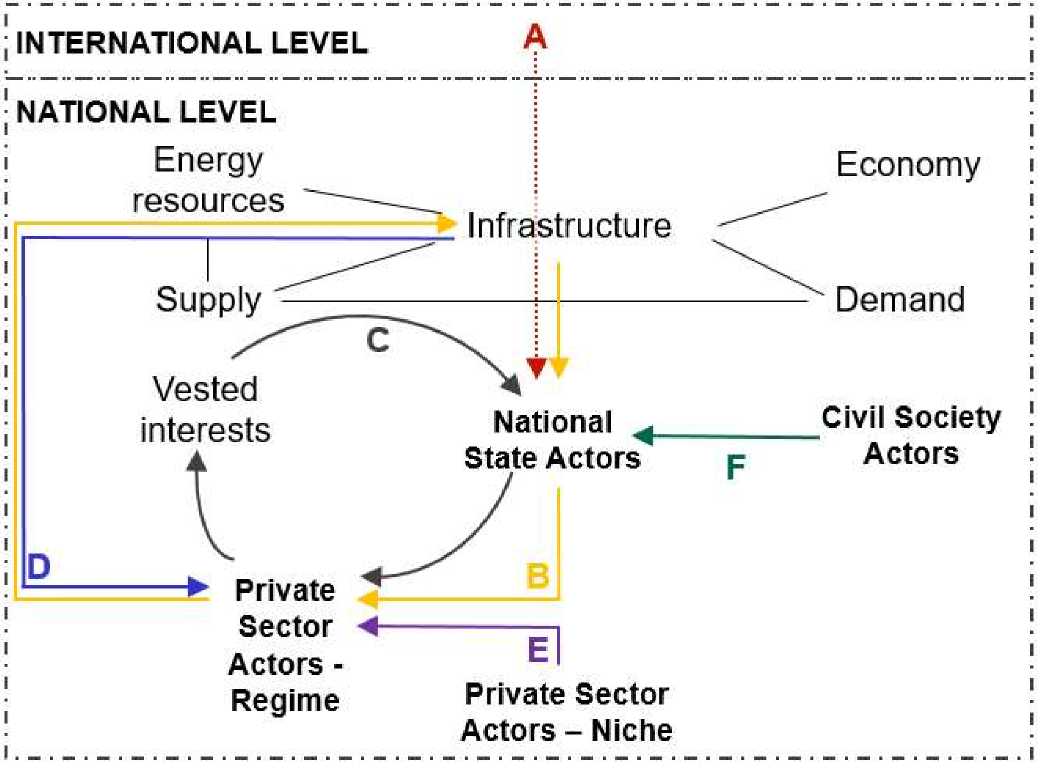
(Brauers, Braunger, and Jewell 2021)

The systemic focus, key concepts for the next phase of the energy transition and role of lock-in in each realm

Realm	Systemic focus *(based on Cherp et al. 2018)*	Key concepts for the next phase of the energy transition *(see Markard 2018)*	The role of lock-in *(developed from Seto et al. 2016 and Buschmann and Oels 2019)*
Political realm	Policy systems – political actions and energy policies	State balancing supply and demand and competing interests	Institutional lock-in, particularly vested interests, and discursive lock-in, particularly from incumbents
Techno-economic realm	Energy flows and markets	Managing stable energy provision and transition a larger portion of the energy system to low-carbon	Infrastructural and technological lock-in, particularly stranded assets
Socio-technical realm	Energy technologies and artefacts, businesses and practices embedded in socio-technical systems	Understanding regime resilience particularly amidst increased pressure from new(ish) entrants	Behavioural lock-in, or the continuation of suboptimal technology use, regime resistance in the form of combined instrumental, discursive, material and institutional forms of power

(Brauers, Braunger, and Jewell 2021)

Explanatory mechanisms for developments of the three realms and political support for LNG terminal proposals in Germany



Adopted from Cherp et al. 2017.

Each mechanism is designated by a specific colour and letter.

Main empirical findings

Lock-in mechanisms:

A – Institutional lock-in: Pressure on German state actors to support LNG through international diplomacy (especially the US and Russia).

B – Institutional lock-in: State actors support incumbents to ensure a secure supply-demand balance.

C – Regime resistance: Regimes enable beneficial regulation through promoting the alignment of their vested interests with political interests.

D – Infrastructural lock-in: Sunk investments reduce willingness for change.

Other mechanisms supporting terminals:

E – Niche innovations strengthen the gas regime.

F – Weak opposition of actors outside the regime poses no counterweight.

(Brauers, Braunger, and Jewell 2021)

Other main finding and contributions

Summarised findings on natural gas lock-in

- Institutional lock-in results from pressure of international state actors and domestic incumbents; political decisions shifted to the expansion of natural gas use, and therefore the support of LNG.
- Infrastructure lock-in related to potentially stranded assets of long-lived natural gas infrastructure; fear of lost profits or destruction of values already prevents stronger regulation on natural gas, and would increase with additional infrastructure investments.
- Behavioural lock-in is more important on the consumer side and the heating sector, behaviour change with regasified LNG fed into the grid not necessary.
- Discursive lock-in of natural gas being ‘climate friendly’ and a ‘bridge fuel’ still dominant, preventing debate about barriers natural gas poses to advanced energy transitions.

General main findings

- Despite relatively high climate ambition Germany is providing strong state support to LNG.
- Risk of this leading to an increasing natural gas lock-in, even as natural gas consumption today is already inconsistent with future climate targets.
- Findings particularly relevant to other EU countries with a similar energy situation and coastline, such as Spain, Portugal, or the United Kingdom.
- To avoid an increasing natural gas lock-in & negative economic and ecological impacts, natural gas infrastructure investments needs to be aligned with climate policy targets, and not only seen in a security of supply context.

(Brauers, Braunger, and Jewell 2021)

Thank you very much for your attention.

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