

**UNIVERSITY OF TWENTE.**



## STATE AID FOR ENERGY TRANSITION

A qualitative study of the impact of the EU's hydrogen IPCEI on  
the sustainability transition in Europe

**Master Thesis**

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## **Abstract**

Green hydrogen is regarded as an important part of the energy transition in Europe. However, the current production capacities are far from the desired targets, and Europe lacks an infrastructure for hydrogen connecting production facilities with customers. Amongst other policies to accelerate the integration of green hydrogen into the energy market, the European Union has launched the program "Important Projects of common European interest (IPCEI) on hydrogen" in 2021. As a policy instrument, IPCEI allows Member States to use State aid in strategic value chains to support research, development and innovation in desired fields. The objective of IPCEI is to support highly ambitious R&D&I projects, in which the financial risks involved are not covered by the market. The conditions for IPCEI funding are significant spillovers in the European Union. The question arises in how far IPCEI projects can keep up with the expectations. Therefore, this thesis investigates which features of IPCEI on hydrogen support innovation and sustainability transition in Europe. To answer the research question, a qualitative content analysis was conducted with public documents and interview transcripts. The documents analyzed are stakeholder responses to a European consultation regarding the reviewed IPCEI guidelines in 2021. Additionally, five expert interviews were conducted for this thesis. A coding scheme was developed using the framework of socio-technical systems (STS), strategic niche management (SNM), and the multi-level perspective (MLP). The analysis of stakeholder responses and expert interviews shows that the IPCEI framework includes innovation-fostering aspects but the performance of hydrogen IPCEI could be improved by better coordination. The most important elements supporting hydrogen innovations are the openness for diverse actors, specifically SMEs, and the provision of public funding. Furthermore, IPCEI assists the upscaling by establishing a structure for knowledge and best practice sharing. The findings also imply that administrative burdens and uncertainties in the process could be reduced by providing common guidelines for applications and evaluations, and by specifying how project results are shared.

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## List of Abbreviations

<b>CPIs</b>	citizen participation initiatives
<b>ERPS</b>	European Parliamentary Research Service
<b>EU</b>	European Union
<b>FCEVs</b>	fuel cell electric vehicles
<b>FID</b>	first industrial deployment
<b>IPCEI</b>	important projects of common European interest
<b>IP</b>	intellectual property
<b>IPR</b>	intellectual property rights
<b>KPI</b>	key performance indicator
<b>MLP</b>	multi-level perspective
<b>PV</b>	Photovoltaics
<b>OEMs</b>	original equipment manufacturers
<b>SME</b>	small and medium-sized enterprises
<b>SNM</b>	strategic niche management
<b>STS</b>	socio-technical systems
<b>STEM</b>	the fields of science, technology, engineering and math

# 1 Introduction

## 1.1 IPCEI on hydrogen

Innovation and scientific production play an important role in the European Union, as the share of public investment in R&D is high in global comparison (DIACONU, 2019, p. 21). Among other tools to stimulate innovation, the EU has introduced the concept of important projects of common European interest (IPCEI). The IPCEI policy instrument allows Member States to support ambitious R&D projects under certain conditions that are expected to tackle societal problems (EVROUX, 2022, p. 1).

IPCEI is applied in strategic value chains in which the European Union identifies the need for innovation. One of these fields is renewable energy, and especially green hydrogen. The Russian invasion of Ukraine in 2022 was a disruptive event that has shown weaknesses in the European energy policy. The European dependence on Russian natural gas creates uncertainty for the future, as well as other global developments like climate change and the Covid-19 pandemic (EVROUX, 2022, p. 8).

Apart from supply security, the EU tries to stimulate innovation in alternative fuels. The threat of climate change and Europe's related objective to become climate-neutral by 2050 have directed more attention to renewable or carbon-neutral energies. Because green hydrogen is a potential energy carrier for the future, the EU has set the goal to produce 10 million tons of renewable hydrogen by 2030. In view of this ambitious target, there is a need for faster development of hydrogen technologies in Europe, as the current hydrogen production via water electrolysis/ power-to-hydrogen is 30,000 tons (HYDROGEN EUROPE, 2023). This comparison makes it clear that innovations are needed to accelerate green hydrogen production. Besides, the development of an infrastructure for hydrogen production, transportation, storage and implementation is needed. The European market for (green) hydrogen is in its infancy.

The European Union aims at achieving technological leadership in respect to renewable hydrogen. Therefore, it needs to foster technological innovation in various parts of the hydrogen value chain, and has created four IPCEI waves on hydrogen. These are a good case test to investigate in how far governments can promote innovation.

In this thesis, the research question **“In how far does the IPCEI on hydrogen framework provide the necessary conditions for the sustainability transition in Europe?”** is answered. As the IPCEI policy instrument refers to State aid, it implies the interference of governments in markets to achieve a public goal. Because

the center of a policy should always be the public good, the impacts of the policy should be carefully considered. Moreover, large-scale green hydrogen development and infrastructure setup in Europe is novel, so the effectiveness of the IPCEI framework has not been evaluated yet. Hydrogen IPCEI projects are notified since 2021 and have just started recently, so a limitation of this thesis is that the outcomes lie in the future. However, because IPCEI is a powerful policy instrument, an evaluation of the known elements provides an early assessment and contributes to the literature of industrial policy and innovation studies.

It also touches on the issue of innovation stimulation and R&D promotion activities by governments. A successful transition means the breakthrough of innovations into mainstream market which requires the alignment of several actors and elements like governments, competing industries, but also culture and society. Innovation stimulation and innovation improvement are the starting point of a transition. Under certain circumstances, the improved innovation may reach mass market level and alter the existing system, and a transition becomes visible. To assess how the IPCEI framework affects the sustainability transition, its effect on innovation stimulation must be investigated besides additional effects on actors and their connections with each other. There is disagreement on the question whether and how States should practice industrial policy to stimulate innovation, or how much they should intervene in markets (BELITZ & GORNIG, 2021). The liberal, anti-interventionist perspective doubts a State's capability to detect meaningful future technologies, arguing governments should only provide a legal and infrastructural framework for the market. An opposing view is the interventionist perspective which demands an active involvement in the selection and support of promising technologies (BELITZ & GORNIG, 2021, p. 2). An even further-reaching approach is the mission-oriented industrial policy in which policy focuses on societal goals, such as decarbonization. The European Union's industrial policy is a mix of interventionist and more mission-oriented policy strategies, and with the IPCEI framework, the EU has an industrial policy instrument to stimulate innovation in desired fields.

### **1.2 Theoretical background**

To assess how IPCEI on hydrogen can stimulate innovation and assist the sustainable transformation in the field of hydrogen infrastructure in Europe, the theoretical framework of socio-technical systems (STS) and strategic niche management (SNM) are applied. The STS framework, in combination with the multi-level perspective

(MLP), specifies which actors and activities must align to support a radical niche innovation and make it enter the mainstream market. Therefore, the theory assists identifying relevant factors of IPCEI in the hydrogen transition. In order to gain information on the policy from different perspectives, the method of qualitative expert interviews is chosen. Experts from the hydrogen industry and consulting agencies are interviewed, and the interviews are coded via qualitative content analysis. Furthermore, a survey executed by the European Commission on the IPCEI regulation is analyzed and triangulated against the interview responses.

### 1.3 Structure of the thesis

This thesis answers the research question **"In how far does the IPCEI on hydrogen framework provide the necessary conditions for the sustainability transition in Europe?"**

The theoretic foundation of research is presented in chapter 3 by providing insights from the literature on socio-technical systems (STS), strategic niche management (SNM), and the multi-level perspective (MLP). Based on this theoretical background, three sub-questions were formulated to answer the research question, and expectations drawn from the theory on the IPCEI case are formulated.

The first sub-question focuses on the features of the IPCEI framework which promote better niche management. Therefore, the theory on strategic niche management (SNM) as in Geels (2007) is implemented. SNM describes the array of behaviors and strategies theorized to promote and protect radical innovations from market selection, creating a protected niche. (HATZL et al., 2016, p. 59). With the help of SNM theory, it is investigated which elements of IPCEI protect the R&D projects from the market and financial risks. The results are presented in subchapter 5.2 and discussed in subchapter 6.1.

Sub-question 2 asks which features of IPCEI promote upscaling. Upscaling can be defined as the growth of the innovation or technology in question within the niche and out of the niche into the mainstream market (BOSSINK et al., 2023, p. 2). Here, especially the STS literature provides explanations for the upscaling of niche innovations. The upscaling features of IPCEI can be found in subchapter 5.3. Furthermore, a discussion of the findings is provided in subchapter 6.2.

Thirdly, it is asked which features of IPCEI are counterproductive for innovation in Europe, and which elements of the framework may prevent an efficient energy transition. This includes weaknesses of the IPCEI framework in respect to cost

efficiency, time efficiency or changing trends. The corresponding weaknesses are described in subchapter 5.4 and put into context in subchapter 6.3.

The methodology of the research is described in chapter 4. After the results section in chapter 5 and the discussion in chapter 6, a short conclusion summarizes the findings and provides an outlook for further research.



## 2 Case background

### 2.1 Legal Background of IPCEI

As pan-European projects, IPCEI involve several Member States. If a project gets an IPCEI status, it receives exceptional State aid. The legal base for State aid is laid down in article 107(3)(b) TFEU. While article 107(1) TFEU states that State aid favoring a certain company or good is incompatible with the European internal market, article 107(3) lists exceptions for that case. In number 3(b), the treaty declares State funding for important projects of common European interest as compatible with the internal market competition rules (THE MEMBER STATES, 2008, article 107(3)(b) TFEU). State aid control is crucial because State aid has the potential to distort competition as Member States may grant domestic enterprises a significant advantage over foreign companies (DAM et al., n.d.).

The necessity and proportionality of the State aid measure must exceed the distortion of competition. Since 2006, the European Commission launched several guideline documents for analyzing the compatibility of State aid for IPCEI with the internal market rules (SZCZEPAŃSKI, 2020, p. 2). The current compatibility rules were published in 2021 and list criteria for projects falling under article 107(3)(b) TFEU. IPCEI State aid refers either to a single project or an integrated project involving several single projects. The “common European interest”, as mentioned in article 107 TFEU, is defined as the European Union’s strategies or common objectives. The European Green Deal, Next Generation EU, and the new European Research Area for research and innovation are mentioned as examples among others (EUROPEAN COMMISSION, 2021, section 3.2.1, point 14). IPCEI projects must be designed to tackle market failures or systemic failures. Furthermore, at least four Member States must be involved in the project (EUROPEAN COMMISSION, 2021, section 3.2.1, point 16). The project’s benefits shall serve the whole Union in form of positive spillover effects. Moreover, besides the State aid, projects must have considerable co-funding by the beneficiary. In their specific criteria, the Commission states that IPCEI in R&D&I must be fundamentally innovative or comprise a significant value added to the sector. The importance of the project is defined either as relevant scope or size, or as considerable financial or technological risk (EUROPEAN COMMISSION, 2021, section 3.3). The European Commission exerts a balancing test, weighing the project’s benefits against the State aid’s market intervention. Generally, State aid is considered necessary when no other, less distortive policy instruments exist for achieving the

desired result (EUROPEAN COMMISSION, 2021, section 4.2). In addition, regular reporting about the project's status is required.

## 2.2 Political Background: European Hydrogen Policy

At the European level, the European hydrogen strategy, published in 2020, lays down general goals and incentives for improving research in the field of hydrogen, international cooperation, supporting investments and creating a hydrogen infrastructure.

In 2022, the European Union (EU) published a list of 20 key actions to be delivered and implemented. Amongst the key actions are the Smart Mobility Strategy which proposes measures to implement hydrogen in the transport sector, and the amended Renewable Energy Directive (EU) 2018/2001 concretizing what defines renewable hydrogen (EUROPEAN COMMISSION, n.d.-c). In this thesis, the terms "green hydrogen" and "renewable hydrogen" are used interchangeably, referring to hydrogen produced via electrolysis of water where the electricity derives from renewable energy sources. Additionally, the EU identifies hydrogen stemming from biomass conversion or biogas reforming also as renewable (EUROPEAN PARLIAMENT AND COUNCIL, 2018).

By 2030, the Commission intends to produce 10 million tons of renewable hydrogen in the EU. This target is formulated in the so-called "hydrogen accelerator" referring to REPowerEU Plan. REPowerEU is a plan published in May 2022 and follows two main goals. The first goal is to tackle climate change. The second goal is to end the dependence on Russian gas and oil as soon as possible. REPowerEU includes incentives for facilitating energy laws in favor of renewables, updating strategies and investment. For the hydrogen sector, it provides an additional funding of 200 million euros for hydrogen research projects (EUROPEAN COMMISSION, 2022).

Another act to translate the European hydrogen strategy into more concrete policies is the "Fit-for-55 package" that was published in July 2021. As part of Fit-for-55, the "Hydrogen and decarbonized gas market package" (COM/2021/803 final, COM/2021/804 final) has reviewed and updated existing legislation on gas (EUROPEAN COMMISSION, n.d.-a).

Additionally, other EU programs like NextGenerationEU or public-private partnerships support the development of renewable hydrogen technologies, infrastructure and storage possibilities. So, the EU's motivation to accelerate hydrogen is communicated since 2020.

### 2.3 Former IPCEI projects

IPCEI can be initiated in several sectors, e.g. energy, cross-border transport, or research and development. In the past, the Commission has granted only a few IPCEI projects that either referred to infrastructure or to strategic value chains. The first two IPCEI, former called projects of common interest (PCIs), were the Oresund link between Denmark and Sweden, and the Fehmarn belt connecting Germany and Denmark via road and rail track (SZCZEPAŃSKI, 2020, p. 4). In respect to strategic value chains, the Commission initiated an IPCEI on microelectronics in 2018. The second IPCEI concerns batteries and a battery value chain, with an implementation phase from 2019 to 2031 (SZCZEPAŃSKI, 2020, p. 7).

### 2.4 IPCEI on hydrogen

Hydrogen IPCEI have been discussed since 2019. In 2020, the IPCEI on hydrogen was launched with 22 participating Member States and Norway. In preparation, every Member State had issued a call of interest and checked on domestic projects, national laws, political strategies and financial capacities. In the following, a matchmaking was carried out. The matchmaking was conducted via an online conference, organized by the German energy agency dena because Germany took over the coordinating role (GERMAN ENERGY AGENCY - DENA, 2021). The goal was to identify synergies, bottlenecks and positions in the value chain to form an IPCEI, and to associate projects to IPCEI notification groups (RIJKSDIENST VOOR ONDERNEMEND NEDERLAND, 2021b).

The IPCEI process is steered by the Task Force which includes representatives from all participating Member States and the coordinating country. The Task Force develops proposals regarding the structure of IPCEI and contents, which are agreed on in consensus during meetings. Although the IPCEI time frame, project process and contents are decided by the Task Force, the European Commission assists them in form of several directorate-generals (RIJKSDIENST VOOR ONDERNEMEND NEDERLAND, 2021b).

For IPCEI on Hydrogen, four so-called waves have been agreed on. The first wave, IPCEI *Hy2Tech*, focuses on the development of efficient, large-scale and commercial usable technologies concerning hydrogen. 41 projects were selected for IPCEI Hy2Tech and approved by the Commission in 2022. Member States provide 5.4 billion Euros of State Aid for the first IPCEI. The expectation is that additional 8.8 billion Euros

from private investors add on to the projects (EUROPEAN COMMISSION, n.d.-b).

Also in 2022, the second IPCEI wave *Hy2Use* was approved. Thereby, 35 projects receive about 5.2 billion Euros of public investment. Additionally, 7 billion Euros of private funding is estimated. IPCEI *Hy2Use* aims at complementing the first IPCEI by focusing especially on hydrogen infrastructure, electrolysis and the integration into industrial applications.

Two more IPCEI waves on hydrogen are currently in the match-making or notification process and expected to be approved in 2023/2024. In wave three called *Hy2Infra* the import and regional storage solutions are at the center of attention for this wave. The fourth wave focuses on hydrogen applications in the transportation sector and is called *Hy2Move*.

### 2.5 Application Process

The application and selection process follows several steps and includes institutions at different levels.

In the first step, Member States announce the opportunity towards domestic industries. Then, companies communicate their interest. Information events can comprehend the initial phase. Enterprises are asked to provide insights in their intended project, such as a portfolio and a funding gap analysis. The provided insights are then shared with other Member States, and synergies are sought. When a national agency sees potential in a project, it invites the enterprise to European match-making events where companies get in contact with each other. Yet, this phase is all about initial networking and non-binding.

When a national government recognizes sufficient support from the industry and potential in the projects, it officially calls for applications. Another condition for this start is that there is national funding available. The Member State then evaluates and pre-selects projects according to the European IPCEI compatibility criteria and additional conditions. The preselection is forwarded to the European Commission for the pre-notification phase. The Commission draws further information and develops the final IPCEI project in a so-called chapeau document. It takes the Commission between six and twelve months to pre-notify the projects. Hereafter, the notification procedure takes place in which the chapeau document is finalized. The Commission informs Member States over the approval or refusal of national projects for the IPCEI funding. After the communication, Member States compare the number and scope of approved projects with their national budget and may adapt funding plans

(RIJKSDIENST VOOR ONDERNEMEND NEDERLAND, 2021a).

## 2.6 Remark on the identification as innovation framework

Official documents refer to IPCEI as a policy instrument on the one hand, and as the specific projects on the other hand. The IPCEI policy instrument refers to State Aid under conditions of openness and transparency. IPCEI projects can be understood as R&D&I projects where innovations are developed. In their joint call for a faster deployment of hydrogen refueling infrastructure, the organizations ACEA, IRU and Hydrogen Europe advocate for a stronger use of the IPCEI instrument. They associate IPCEI with industrial policy (ACEA, HYDROGEN EUROPE AND IRU, 2019, p. 3).

The EU and many other public institutions and organizations link the IPCEI instrument to innovation policy and industrial policy. IPCEI are an important part of the European industry as they fill funding gaps for research projects and innovations (THE STRATEGIC FORUM FOR IMPORTANT PROJECTS OF COMMON EUROPEAN INTEREST, 2019, p. 4). Projects accepted for IPCEI status can either be infrastructure projects or highly innovative R&D projects (“*beyond state of the art*”), or a combination of both. This means that IPCEI policy clearly aims at fostering innovation, and spreading knowledge (POLT et al., 2021, p. 9). In other words, IPCEI is an instrument for State Aid aimed at mobilizing private and public investment for the research and development of innovative technologies.

The center of this thesis and the IPCEI case are innovations. It is important to understand which types of innovation are to be stimulated. For the case of hydrogen, production techniques have been known for years. Current hydrogen production is mainly geared towards grey hydrogen, meaning that fossil fuels are used. IPCEI are targeted to accelerate green hydrogen production. The technology for green hydrogen production, e.g. forms of electrolysis using electricity from renewable sources, is also technically known, but not in commercial use. During the expert interviews, the interviewees stated that hydrogen technologies have a high technological readiness level from eight to nine, but the market is not existing yet. The technology is ready, but players in the market wait for the right moment to produce, transport and use hydrogen at a commercial scale. In Europe, mass production of hydrogen does not exist, so the upscaling of facilities is the novelty, because there is no practical experience with this yet. Hydrogen IPCEI can be seen as lighthouse projects for building the first medium- to large scale hydrogen facilities in the context of production, transport, use and storage, which are the type of innovation in question. Furthermore,

one interviewee stated that innovations are needed in green hydrogen production to make them more circular, in materials science, and the already mentioned upscaling (interview 3).

### **2.7 Relevance of the topic**

The expectations on IPCEI are high. Apart from the general goal of innovation promotion, the EU expects IPCEI to have more far-reaching, long-term positive effects. It is said that IPCEI contribute to knowledge creation, acquisition of high-quality research equipment, skill-sharing and job creation. Apart from that, as IPCEI focus on strategic value chains, they should also contribute to technological leadership and sovereignty of the European Union (EVROUX, 2022, p. 9). Furthermore, it is mentioned that gender equality can be improved by IPCEI as they could facilitate the entrance of girls and women in the fields of science, technology, engineering and math (STEM). As the EU is facing a shortage of highly-skilled workers, the support of R&D in firms and educational institutions is expected to have a positive impact on education, training and upskilling (EVROUX, 2022, p. 7).

Yet it needs to be investigated whether IPCEI can live up to these expectations, and how success can be measured. Usually, innovation is created in companies in the market, or universities. However, governments invest a lot in innovation, and the case of IPCEI creates an opportunity to assess the governmental potential to stimulate innovation.

As IPCEI are a rather new policy instrument, their impact has not been assessed yet. The European Parliamentary Research Service (ERPS) states in a briefing document in 2022 that no macroeconomic impact assessment about IPCEI has been conducted at that time yet. The ERPS suggests a comprehensive review of IPCEI's contribution to the EU's industrial strategy (EVROUX, 2022, p. 8). It must be ensured that knowledge and know-how gained from IPCEI are shared widely enough, especially with SMEs. Access to scientific publications or intellectual property rights (IPR) are proposed. This requires transparency and interactive governance (EVROUX, 2022, p. 9).

## 3 Theoretical Framework

### 3.1 Socio-Technical Systems

The MLP on system innovations, as in GEELS (2018), explains the dynamics in the transition process from one socio-technical system towards another. Thereby, the multi-level perspective is both a theoretical model and an analytical tool which can be used to evaluate governance tools or policy instruments. As STS are very complex, and sustainability transitions can be seen as wicked problems, the MLP is suitable for addressing the different dimensions of a system (PERENO & BARBERO, 2020, p. 118). The STS framework and the MLP explain how interacting processes within the socio-technical regime and external events in the socio-technical landscape reshape the socio-technical system so that radical niche innovations may enter the mainstream market, altering the socio-technical regime. An alignment of several actors and events is necessary.

Strategic niche management is a framework to explain the processes at the micro-level, or in other words, in the niche. The literature emphasizes the importance of innovation protection in the niche. Instruments to shield innovations from the market can be tax reliefs, subsidies, or support mechanisms.

HIELSCHER et al. (2013) add to the literature of socio-technical transitions a discussion of community-led energy projects and their potential to constitute a niche. They find that niche identity and niche interest are under-researched in the niche transitions literature. Moreover, the authors state that existing theories are vague about the influencing factors for the failure of transitions, e.g. the deflation of expectations and fragmentation of networks.

Several authors have researched the upscaling process for niche innovations in energy transitions. The topic has come into center of attention in the past 10 to 20 years, but literature on socio-technical systems and sustainable development has been published since the 1990s (PERENO & BARBERO, 2020, p. 117). Several theories are applied to explain innovation and sustainability transitions. Among others, the main theories applied are strategic niche management, socio-technical systems, multi-level perspective and actor-network models.

## 3.2 Strategic niche management

Different mechanisms and conditions have been found successful in promoting innovation.

The SNM literature suggests three characteristic processes for the development from niche to mass market level. These are actor network formation, learning, and expectation management (HATZL et al., 2016, p. 58). Innovations are first introduced in a protected niche where specific instruments, e.g. tax reliefs, protect them from the established market regime. Under certain circumstances, they enter the incumbent market.

The first key process is the creation of actor networks. These networks consist of actors that are active in the field of the innovation in question or similar innovations, but also of actors at regime level supporting the transition. It is advantageous for actor networks to be diverse on the one hand and to have strong cohesion and unity on the other hand. Comprehensive links between actors in the niche and actors from the regime increase the potential for transition (HATZL et al., 2016, p. 59).

Learning means the accumulation of data and facts which then leads to new assumptions and developments in cognitive frames. The agreement on shared expectations helps a network to steer the learning process, to have a common vision, and to gain legitimacy and representation (HATZL et al., 2016, p. 59).

The three key processes happen in single projects, and the SNM lens often is applied to individual projects. However, transformation in complex fields like energy, telecommunication or mobility depends on various innovations that are partially crosslinked. Therefore, the SNM literature also describes global niches that are formed by numerous local projects. Interaction processes between several similar local projects can lead to aggregation of expectations and shared rules, and a global niche can evolve (HATZL et al., 2016, p. 59). The SNM literature distinguishes market-based technological innovations and social innovations that are based on the civil society activism (grassroots innovations). Seyfang and Smith (2007) present a set of criteria to distinguish these two types of innovations. Nevertheless, both kinds have been investigated under the SNM framework by various authors (HATZL et al., 2016, p. 60).



### 3.3 The multi-level perspective

In the transitions literature, the multi-level approach is well established and seen as a practical tool to analyze complex systems and the interplay of different actors. Geels (2004) proposes three levels of investigation. At the macro-level, the socio-technical landscape characterized by external events and trends is described. The socio-technical regime acts at the meso-level. It consists of incumbent actors. The micro-level describes the niche where radical innovations occur. External events at the macro-level may create windows of opportunity for niche innovations to evolve, as they shape the socio-technical regime. Actors within the regime may support the innovation in question (HATZL et al., 2016, p. 59).

The current (socio-technical) system must be analyzed in the first place, and challenges must be identified. Moreover, it is important to develop desirable future scenarios, and to solve problems through the involvement of multiple actors (PERENO & BARBERO, 2020, p. 132).

### 3.4 Explanations for innovation in the literature

**Actor networks** The creation of a diverse actor network is important in niche-building because it leads to synergies and can build connections to actors at the regime level.

HATZL et al. (2016) investigated Austrian photovoltaic citizen participation initiatives (CPIs) and find that there are differences in the development of actor networks, expectations and learning between market-based and society-based CPIs. While civil society CPIs form a smaller actor network, market-based CPIs have a larger, more heterogeneous actor network. Both types lack intermediary actors between the niche and regime level to institutionalize knowledge and encourage other CPIs.

A case study about innovation dynamics of two regional energy storage solutions by KOIRALA et al. (2020) confirms that the alignment of various actors and social innovation is essential for the successful adoption of the innovations addressed. The case study shows that most actors involved were in the beginning of a learning process, and long-term involvement as well as participation offers are crucial for alignment. Engaging citizens and incumbent energy companies helps integrating the innovative technologies as well as stable, foreseeable governance which fairly allocates network costs (KOIRALA et al., 2020, p. 16). Likewise the study by HIELSCHER et al. (2013) identifies networking, collective organizing and the cooperation with intermediaries

as successful niche-building activities (HIELSCHER et al., 2013, p. 151).

As in HIELSCHER et al. (2013), a multi-level perspective and the theory of strategic niche management have been applied in ROESLER (2019). He touches upon the criticism on energy transition studies which is the neglect of scale, space, community actions and civil society. This means that for local projects, local events and contexts matter, and must be acknowledged in the broader picture of institutional, political and cultural embeddedness of the local regime (ROESLER, 2019, p. 269). The integration of the local community is found crucial for network formation and learning in community-led innovations in a bioenergy village in Germany. Additionally, power relations might play a role for the success of innovators and the socio-technical regime. The author states that the role of society and community needs to be investigated in innovation processes (ROESLER, 2019, p. 270). Their actions are facilitated by external resources and actions. The author highlights the added explanatory power of the spatial and scalar perspective in addition to the multi-level perspective (ROESLER, 2019, p. 275). In another case study on house innovation in Belgium, MLECNIK (2014) reflects on success factors for systemic innovation in SNM, and finds among others network formation and composition as a relevant activity.

**Learning** Learning reduces uncertainties about the innovation and aims at improving the innovation (GEELS & TURNHEIM, 2022, p. 24). Building on the strategic niche management approach, HATZL et al. (2016) investigated the success factors for citizen participation initiatives to outgrow the protected niche. The study shows that learning is more professionalized and formalized in market-based CPIs than in grassroots CPIs.

Learning was found as a success factor for SNM in a study regarding passive house innovation in Belgium (MLECNİK, 2014, p. 45). This means that a diverse multi-player network supports creating the market niche and stimulates synergies. Additionally, he states that engaging smaller and medium-sized innovators is important, as well as forming a regional enterprise network. He underlines that risk-sharing formalizes networks which enables long-term collaboration.

Accordingly, the investigation by PERENO and BARBERO (2020) shows that the establishment of learning processes, the establishment of multi-stakeholder networks, the creation of common visions for the future, and the enhancement of green niche innovations are relevant design principles to follow for sustainable transitions in urban and regional systems.

**Expectations formulation** Community niches develop collective ideas and translate these towards policy makers and businesses, which is crucial for successful niche-building (HIELSCHER et al., 2013, pp. 151 sq.).

Also the study by MLECNIK (2014) identifies envisioning as a success factor for SNM. The case of hydrogen and battery-electric vehicles has been researched by van BREE et al. (2010). The authors analyze the chicken-and-egg problem which describes the absence of hydrogen infrastructure that makes car manufacturers avoid the introduction of fuel cell electric vehicles (FCEVs). In their study, the interaction between car manufacturers and consumers and the success of supporting policy are highlighted. The study identifies the chicken-and-egg problem, high costs and unmatched consumer preferences as barriers for the introduction of niche innovations which are fuel cell electric vehicles (van BREE et al., 2010, p. 534). Environmental stresses and policy measures reacting to that, or changed consumer demands towards more fuel efficient vehicles may act as a transition seed (van BREE et al., 2010, p. 537).

**Governmental support** Governmental support provides direction and facilitates investment in innovations. For governments, MLECNIK (2014, p. 45) implies that public funding is crucial for enterprise networks to create successful initiatives. In the field of geothermal energy in Indonesia, YUDHA et al. (2017) find that the key enablers for transition on the macro-level are growing environmental concerns which are addressed via governmental commitments and regulations, which have an effect on the socio-technical regime at the meso-level and material transformations at the micro-level. They state that fiscal incentives are a starting point for sustainable energy transition (YUDHA et al., 2017, p. 19).

Subsidies can further be a pull factor and governmental regulation as push factor for network change and innovation upscaling, as found in a study about the upscaling of hydrocarbon-based synthetic fuels in Germany by SCHNUELLE et al. (2017, p. 4). They conclude that regulatory adaptations are crucial for the uptake of synthetic fuels, and high subsidies for start-ups facilitate capacity-building. However, it is emphasized that a comprehensive choice of several policy instruments such as subsidization, emission restrictions, and quotas for renewables are important (SCHNUELLE et al., 2017, p. 18). However, KEDRONA and BAGCHI-SEN (2017) find in their case that policy alone cannot disrupt an industry path, pointing at geographic, institutional and technical limitations. The study by van BREE et al. (2010, p. 535) underlines that policy support is necessary for upscaling as industry is not willing to take large

investments in niche innovations (van BREE et al., 2010, p. 535), highlighting the importance of governmental support for sustainable transitions (van BREE et al., 2010, p. 539).

The papers investigated show which factors explain the upscaling of sustainable innovations with the help of the multi-level perspective and other theories. However, most of them are regionally limited case studies in which a specific technology or a certain region is looked at. In that regard, the IPCEI framework differs from the literature in scale and scope. For the case of IPCEI, several technological solutions are included, and the policy is implemented in more than 15 European countries, with expected spillovers in the entire European Union. So, the literature in the field gives an initial insight into the driving factors for innovation upscaling and sustainable transitions. Nevertheless, the IPCEI case is considerably more complex. Furthermore, IPCEI is a specific policy. The studies discussed investigate certain technologies, but no specific policies. So, the potential of one governmental measure has not yet been specifically analyzed, which makes this paper add to the literature in the field.

It can be expected that the main niche management element of IPCEI is the financial support in itself. As seen in various studies, innovations depend on financial support. IPCEI provides capital that enables the purchase of critical, expensive resources for research and development. Especially SMEs benefit from that, as their R&D budget is lower and financial risks are higher. The inclusion of SMEs into IPCEI can be assumed as a success factor for innovation in the niche. Fair risk-sharing between governments and companies is crucial, as well as the long-term involvement of governments and other actors in the network.

The goal of IPCEI on hydrogen is innovation in key technologies, and fast upscaling of hydrogen installations. To achieve this goal, innovators should use capital and resources to implement improvements in their technologies and share the product-based learning with actors in the field. For learning and knowledge sharing, mandatory reports included in IPCEI can play an important role. The theory and studies also suggest that a multi-stakeholder network is important for good niche management and transitional processes at a later stage. Therefore, the pan-European nature of IPCEI projects can be a success factor. Though, the network's ability to identify and declare a common vision has an effect on good niche management, so communications are important. It seems that visions are set by the EU, so common visions are not expected to be a supporting feature of IPCEI.

**IPCEI in the literature** On IPCEI itself, no scientific research has been conducted yet. IPCEI participants are required to report regularly their state of play, but the information contained is only accessible for the European Commission which has not yet done any scientific review of the impacts or achievements (EVROUX, 2022, pp. 4 sq.). WIGGER (2023) discusses the necessity of IPCEI in the light of innovation, showing some critical points of the IPCEI program. He states that despite the integrative character, IPCEI in core is a subsidy program associated to active industry policy.

In general, governmental innovation policy is necessary because acquisitions in research, especially knowledge-intensive research, are very costly. Actors without large capital like start-ups depend on public investment to continue R&D. As it takes years and large resources to develop innovations, the risk of financial loss is often too high to invest in R&D with private capital alone (WIGGER, 2023, p. 322). WIGGER (2023) argues that there are other, probably more effective ways to stimulate innovation than via financing selected projects. For the case of Germany, he shows that the financial environment is not optimal for start-ups and researching enterprises as they must pay high taxes for several activities. Therefore, they will most likely choose other locations to settle. Improving the conditions for industry, e.g., through tax reliefs, creates a better innovation climate (WIGGER, 2023, p. 323). Though, the discussion only focuses on Germany. WIGGER (2023) states that in Germany, venture capital is considerably less than in other countries although public venture capital is high (WIGGER, 2023, p. 324). The author concludes that Germany shall improve the overall conditions for knowledge-intensive research instead of increasing public subsidies. However, this statement does not imply that IPCEI is ineffective, and its effect in other countries also is unknown. So, an analysis of the potential of IPCEI for innovation is purposeful.

Answering the question which features promote upscaling, the multi-level perspective plays an important role for IPCEI. As the literature suggests, it is crucial for the actor network to grow and to include and convince actors at all levels. This means that important politicians from regional and national governments must be convinced. 15 European countries participate in IPCEI on hydrogen. For a successful transition, governments from the remaining countries shall benefit from the findings of the project and get involved in hydrogen infrastructure. Interest groups and organizations can act as intermediary actors between the niche and the socio-technical regime. It must also be ensured that learnings from projects are shared with other businesses and research

institutions outside of the project. Moreover, incumbent actors, mainly energy companies and infrastructure providers, should be involved instead of competed against. Another important actor groups are consumers. Hydrogen applications like FCEVs or fuel cell heaters depend on consumer's interests. All those actor-interrelations can be incentivized and directed by policy. For this purpose, IPCEI needs to be embedded in other regulations, strategies, and restrictions. The European hydrogen strategy provides this overarching framework.

## 4 Methodology

### 4.1 Research approach in this study

This thesis investigates the practical case of IPCEI on hydrogen and its impact on sustainability transition in the European Union. A content analysis on both public documents and expert interviews has been chosen to answer the following research question: *In how far does the IPCEI on hydrogen framework provide the necessary conditions for the sustainability transition in Europe?*

To answer the general research question, three sub-questions are applied. They refer to Geels' (2018) theory of socio-technical systems, the multi-level perspective, and strategic niche management. Sub-question (1) *“Which features of the IPCEI framework promote better niche management?”* refers to activities protecting niche innovations from the mainstream market which are discussed in the STS and SNM literature. Sub-question (2) *“Which features promote upscaling?”* asks for aspects within the IPCEI framework that stimulate the upscaling of hydrogen innovations at a later stage. Theory suggests that socio-technical transitions start with experimentation in a protected niche. SQ1 refers to the activities within this protected space (GEELS & TURNHEIM, 2022, p. 25). When the innovations achieved to be improved and stabilized, diffusion into the mainstream market may happen, therefore SQ2 investigates which elements of the IPCEI framework support this move into markets, or upscaling. Thirdly, it is important to analyze what aspects of IPCEI could hinder the transition. Therefore, sub-question (3) *“Which features of IPCEI are counterproductive for innovation in Europe? Which elements of the framework may prevent an efficient energy transition?”* asks about potential weaknesses or room for improvement. SQ3 is empirical, so no expectations from the literature can be drawn in advance. The answers found in the documents are clustered into different categories, summarizing the addressed weaknesses.

### 4.2 Materials

The data collection includes public documents and expert interviews. The documents analyzed in this thesis are responses from companies and public authorities in Germany, France and the Netherlands and from European organizations to a European consultation. The European Commission had reviewed the conditions for State aid in respect to IPCEI and asked thereby for stakeholders' opinions on the

compatibility criteria in a public survey based on the “*draft Communication from the Commission criteria for the analysis of the compatibility with the internal market of State aid to promote the execution of important projects of common European interest*” (EUROPEAN COMMISSION, n.d.-d). The non-confidential reports provide the respondents’ views on the IPCEI communication which was reviewed in 2021.

39 documents were selected for qualitative content analysis. The reason for this selection was their country of origin, which was either Germany, the Netherlands, France, or Europe as a whole for the case of European organizations. The focus is set on those countries as they are at the forefront of hydrogen technology, as the interviewed experts indicate, and participate in all four IPCEI waves on hydrogen.

Additionally, five expert interviews were conducted. The selection of interviewees was done via purposive sampling. As the number of completed interviews must be proportional to the scope of this thesis, it is important to identify the optimal interviewees providing helpful information on the topic while not overstrain the time capacities. Originally, a number of three to six experts was regarded as proportional for the research design and goal.

The experts were chosen because of their experience in the field of IPCEI on hydrogen or the hydrogen sector in general. The respondents work in the German, Dutch, or whole European region, therefore they are likely to contribute to the information collection regarding the selected case study.

Originally, 20 experts were contacted via e-mail and asked for participation in an interview on hydrogen IPCEI. The list of potential experts contained German and Dutch public authorities responsible for the IPCEI application process, participating companies, one applicant company that was declined, a research and consulting institution, and associations and interest groups of the hydrogen or energy industry. The goal was to select a heterogeneous group of three to six experts having all a professional connection to hydrogen IPCEI. Heterogeneity refers here to the role in the IPCEI process, being either participant, creator, administrator or other form of stakeholder, and the country of operation (Germany, the Netherlands, or Europe-wide). Out of 20 potential experts, five agreed to conduct an interview. Additionally, one expert sent information on the IPCEI case from a former work project which is also integrated in this thesis.

The experts interviewed are anonymized in this thesis to comply with their wish to keep personal and industry-related data unpublished. One interviewed expert is specializing in industrial policy and trade, specifically in State aid, working in a



hydrogen industry association. In this context, the interviewee is also involved in IPCEI and has practical insights in the process. The second interviewee is responsible for European and international fundamental issues in another energy association, and deals with support mechanisms like IPCEI. Thirdly, an interview was completed with an expert in chemical and technical engineering. The fourth interview was done with two representants from a company which participates in IPCEI on hydrogen. The fifth interview partner has practical experience from being involved in the evaluation and selection of project applications for IPCEI. Additionally, one expert from a research and consulting organization provided written information on IPCEI. Because of their background knowledge on the issue, the experts delivered relevant information for the data collection in this thesis.

The five expert interviews were conducted online via video meeting and displayed in their preferred language, being either English, German or Dutch. As previously mentioned, the survey document analysis was completed before starting the expert interviews. This procedure allowed adjusting the interview guide in case of missing information that the stakeholders didn't elaborate on in their response documents. The interview guide is attached to this thesis. As the experts have different professional backgrounds and not all of them are aware of details about IPCEI like the application process in other Member States, the approach of semi-structured interviews was chosen. Where needed, clarifications of the questions or the topic were included during the interviews, and additional questions were added if the interviewees mentioned related topics.

The interviews lasted between 30 and 45 minutes. Beforehand, the interviewees were given an information sheet and a sheet of informed consent regarding the collection and use of their data. Moreover, the research project containing interviews was approved by the BMS ethical committee of the University of Twente and registered with the code 231400.

### **4.3 Data analysis**

The survey responses as well as the transcripts of the interviews were analyzed via qualitative content analysis. A draft coding scheme was developed before reading and analyzing the documents, based on the theories of strategic niche management, socio-technical systems, and multilevel perspective. So, the draft coding scheme contained key supporting activities for niche management and upscaling as found in the literature review, corresponding to sub-questions 1 and 2. As sub-question 3

referring to weaknesses of the IPCEI framework is empirical and therefore without theoretical prior knowledge, no associated codes were created in the draft coding scheme. The draft coding scheme was reviewed after displaying the qualitative content analysis on three survey response documents. The final coding scheme is shown in Figure 4. The whole content analysis was run using the software ATLAS.ti.

The general activities supporting niche management and upscaling known in the literature were integrated as category codes and remained unchanged during the process of drafting and reviewing the coding scheme. These general categories were: niche protection, initial learning, network formation and expectations articulation associated with SNM, and knowledge sharing, network enlargement and new visions articulation associated with upscaling. During the analysis, suitable sub-codes were developed which express the key activities in the context of the specific case. Furthermore, category codes and sub-codes were developed to summarize the different focal points of criticism which refer to SQ3.

## 5 Results

### 5.1 General Results

Most stakeholders generally regard IPCEI as the key enabling tool for promoting innovations in strategic value chains. In the documents, the funding aspect of IPCEI was highlighted, enabling companies to ramp up hydrogen production and take the step into commercialization. The experts support this point, arguing that hydrogen technologies in Europe currently are held back because of high risks for first movers. Hydrogen facilities are very localized, and supply and demand currently are hardly connected. In the expert interviews, subject 1 and subject 5 state that the technology is ready, but actors are hesitant to implement it. IPCEI provides the necessary funding to realize medium- to large scale facilities and to offer green hydrogen at competitive prices, and also acts as a political signal for commitment to the transition (interview 1, interview 5). Besides niche protection via funding and delivering a vision, IPCEI is also regarded as a great networking opportunity. Both survey responses and experts underline that the IPCEI compatibility criteria enable Member States to interact and streamline their technological orientation, and larger and smaller enterprises to collaborate.

Subject 5 states in the interview that the integrative character of IPCEI allows a hydrogen infrastructure setup in Member States where hydrogen plays no role yet, leading to a connected European infrastructure (interview 5). IPCEI projects contain spillover requirements, mainly referred to as results sharing. Although not clearly regulated, participants are aware that results from the projects somehow will be published in the future (interview 4). The survey respondents welcome this exchange, but remark that excessive IPR dissemination should be avoided. The spillovers from IPCEI, especially knowledge exchange, might assist a faster upscaling of technologies and infrastructure setup in Europe, because leading Member States and larger companies pass best practices on to smaller, less developed countries and R&D organizations.

The weaknesses mentioned by survey respondents and interviewed experts are largely in line and refer to administrative burdens, restrictiveness of the framework, lengthiness, and uncertainties. In subchapter 6.3, these points of criticism are put into the context of their interests. The experts state that the lack of guidelines and evaluation criteria for project applications slow down procedures and lead to uncertainties about project starts. As an IPCEI wave includes at least four Member States,

project documents circulate between several public authorities and the Commission. Member States have different funding instruments and organizational structures, and subject 5 and subject 2 see a lack of coordination between the public bodies. The different requirements put also administrative burdens on participants (interview 5, interview 2).

Category Code	Number	Sub-codes	Number of sub-codes
<b>SQ1: Which features of the IPCEI framework promote better niche management?</b>			
Niche protection	36	Funding	34
		Pilot projects	2
		Resources	2
Network formation	51	Attract SMEs	19
		Connecting Member States	22
		Connecting actors/ stakeholders	16
Expectations articulation	15	European interest	11
		Direction / vision	5
Initial learning	5	(cost) improvements	0
		Development / breakthroughs	4
		Experiments	1
<b>SQ2: Which features promote upscaling?</b>			
Knowledge sharing	49	IPR access / spillovers	22
		First industrial deployment	19
		Complementing technologies	5
		Best practices	3
New visions articulation	4	Stronger policy support	2
		Campaigns	2
Network enlargement	0	Involvement of incumbent actors	0
		Professional groups	0
<b>SQ3: Which features of IPCEI are counterproductive for innovation in Europe? Which elements of the framework may prevent an efficient energy transition?</b>			
Weaknesses	118	Uncertainty	37
		Administrative burdens	35
		Restrictiveness	35
		Slow	22
Competition distortion	44	Competitive disadvantage	26
		Anti-trust, IPR exploitation	18
Total			322

Figure 1: Allocation of codes in the qualitative content analysis of survey responses

## 5.2 Features supporting niche management

The first sub-question of this research asks which features of the IPCEI framework provide better niche management. The corresponding category codes were niche protection, initial learning, network formation and expectations articulation.

In the document analysis, the four niche management practices are referred to very often, with a number of 107 associated codes. In the process, the most used category code is network formation with a number of 51 codes, followed by niche protection with 36 codes. The two other categories, namely expectations articulation and initial learning, are less represented with 15 and 5 codes. When looking at the sub-codes, it becomes visible that the most meaningful sub-code of the category niche protection is funding. This tendency was also reflected in the interviews.

**Funding** All five experts state that the production of green hydrogen is very expensive, especially at the time when hydrogen IPCEI projects were created. Subject 4a states in the interview that the company was looking for subsidies to make hydrogen production profitable and sell green hydrogen competitively on the market and found IPCEI suitable (interview 4). IPCEI provide the necessary funding for realizing larger production which leads to cost savings through economies of scale and learning. Adding to that, subject 4 says that the high costs of green hydrogen production imply that there is no business case for companies. IPCEI makes R&D projects possible and may lead to a final investment decision for companies (interview 2). As there is no hydrogen market yet, companies are hesitant to get involved in hydrogen use, but subject 1 affirms that the funding aspect incentivizes companies to create R&D projects that would hardly be realized without public investment. Public money works as a guarantee for first movers to cover with possible losses (interview 1).

The other two key aspects of the niche protection category, being coded as pilot projects and resources, are also reflected in in the expert statements, but less often than funding. Pilot projects are strongly connected to funding, as funding is the condition for their setup, and pilot projects are the central meaning of IPCEI. Subject 2 specifies that the market itself cannot accelerate green hydrogen production as the EU wishes to, so states must act as leaders of pilot projects (interview 2). Provisions of other resources like laboratories, industrial parks or research equipment that could also be a tool of niche protection (GEELS & TURNHEIM, 2022, p. 23) were not mentioned by any stakeholder.

**Actor networks** Regarding the category of network formation, all three sub-codes were used in a balanced way, meaning that the networking effect of IPCEI affects Member States, small and medium-sized enterprises (SME), as well as other stakeholders. It should be noted that the reviewed IPCEI communication has increased the minimal number of participating Member States from two to at least four Member States per IPCEI. Furthermore, the draft includes the initiative to involve more SMEs in IPCEI. Several stakeholders have commented on these changes, generally stating to welcome these adaptations. The collaborative character of IPCEI is classified as one of the strengths of the framework.

The increased number of Member States is controversially discussed. Some actors see it as “[...] *appropriate to slightly increase the minimum number of participating Member States to 4* [...]” (THE DUTCH AUTHORITIES, 2021, p. 5). On the other hand, some responses include criticism on this increase, categorizing it as too restrictive. Reasons for these statements are discussed in subchapter 6.3.

The networking effect of IPCEI is also reflected in the expert interviews. As already mentioned, Europe lacks a market for hydrogen and hydrogen infrastructure. Subject 1 says that production and hydrogen use are localized, and a connection between supply and demand is needed. IPCEI creates a valuable ecosystem by bringing together participants like component providers, public authorities, but also external third parties. The expert states that the networking opportunities are one of the main motivations to participate (interview 1). Subject 4b confirms that the company was integrated into several collaboratives through their participation (interview 4). Subject 5 highlights the collaborative character of IPCEI as one of the main spillovers of IPCEI. The framework makes Member States synchronize and exchange about partnerships with actors. Additionally, it boosts the development in Member States where hydrogen yet plays no role. Countries that are not at the forefront of hydrogen offtake are involved and elevate their technological status (interview 5).

Involved actors are put into a structure of information exchange at different levels. During the application, the project documents are first evaluated by domestic authorities or commissioned agencies, forwarded to the responsible national ministries, selected, notified to the Commission and then coordinated. Within an IPCEI wave, there are industry coordinators in each Member State which are the interface between participants and the Commission. The coordinators meet very regularly, as subject 5 states (interview 5). Subject 4b says that the company is in direct contact with the national coordinating authority and a local contact person. Furthermore, there are

communications within the wave, and a first conference on hydrogen IPCEI was held in December 2023 (interview 4). So, the actors are connected in different ways, but the majority of shared information stays within IPCEI without being published.

**Expectations** The activity of expectations articulation could not be identified in a considerable way in the survey responses. Some documents included statements about the European character of IPCEI and how they can contribute to European interests like technological leadership (SOLARPOWER EUROPE, 2021, p. 1), promoting strategic value chains (ATOMIC ENERGY AND ALTERNATIVE ENERGIES COMMISSION, 2021, p. 1), or tackling climate change (AFEP, 2021, p. 1). However, these expectations are formulated in the survey responses, and are also provided by the EU itself in the draft communication. They can potentially be picked up by the actor network in the set-up of an IPCEI, but the claim that IPCEI actively promote the creation and formulation of common expectations was not given in the response documents.

During the expert interviews, the European character of IPCEI was emphasized and can also be associated with expectations articulation. But the main expectation formed in IPCEI projects is probably large-scale hydrogen production, infrastructure setup and the creation of a European market for hydrogen. Subject 5 states that companies were waiting for the European commitment to focus on hydrogen. IPCEI provide the political signal, and participants share the vision to accelerate the technology and drive forward commercialization (interview 5). Subject 1 confirms that companies strive for visibility for being first movers, and the embedding in an IPCEI gives them an “EU-Seal”, providing representation. Therefore, IPCEI acts as a common vision and provide a direction towards a European hydrogen value chain (interview 1).

**Learning** As for expectations, the survey documents did also not refer to initial learning despite the fact that product improvements, especially decreasing production costs, are necessary for the success of an innovation. Nevertheless, learning through experiments and pilot projects is the very nature of IPCEI and perhaps too obvious to be raised. EUROCHAMBRES (2021, p. 1) state that IPCEI enabled the development of technological breakthroughs which included also learning. Subject 1 mentions that cost improvements will happen because of economies of scale, and expects the projects to materialize by 2025 (interview 1). However, learning and improvements can just happen when the projects already have started. This is not the case. As funding is not yet clarified in all Member States, subject 1 states that

only 50 to 60 percent of the projects could begin yet (interview 1). So, it will take more time to assess what kinds of learnings are achieved.

### 5.3 Features supporting upscaling

Although the setup of IPCEI includes intended processes supporting upscaling, it must be noted that the upscaling phase happens after successful niche management and happens in the future. So, the real upscaling effects cannot be named yet.

**Knowledge sharing** The document analysis clearly shows that knowledge sharing is the main driver of upscaling innovations. While the other category code new visions articulation was used 4 times, the category network enlargement could not at all be found in the survey responses. As the documents referred to the reviewed IPCEI communication, they mostly refer to the creation and planning of an IPCEI. The topic does not truly touch upon the later stage and the activities of the actors within the network then. However, most documents address the activity of knowledge sharing because this feature is one major characteristic of IPCEI. The category code was used 49 times in the document analysis. The draft and final communication on IPCEI do not define which knowledge and how knowledge will be shared in IPCEI projects. Therefore, the stakeholders provided their opinions on the procedure.

Among others, HYDROGEN EUROPE (2021, p. 12) demands guidelines for the information exchange, including rules for the use of confidential data and tools for data exchange. Adding to this call for clarification, ORGALIM (2021, p. 2) warns to not overload participants with publication requirements and intellectual property (IP) licensing. Besides these remarks on uncertainties and administrative burdens, many stakeholders are positive about the integrative character of IPCEI with spillovers and knowledge sharing, stating that the knowledge of researchers, SMEs, larger companies and regions is streamlined (EUROCHAMBRES, 2021, p. 1), and resources and knowledge spread across Europe are pooled (DGB, 2021, p. 3). This supports the upscaling of the necessary innovations. Nevertheless, several companies and industry representatives ask for a balance between IP accessibility and the protection of confidential business information.

Similar to other companies, BOSCH (2021, p. 2) claim that “[...] *IP exploitation should be balanced against a legitimate interest for beneficiaries to safeguard their knowledge assets*”. VCI (2021, p. 3) underlines that sensitive data like key performance indicator (KPI), milestones and trade secrets should be protected. Beyond the IPR



concerns, the response documents list several spillovers from IPCEI that can assist the upscaling of innovations and the realization of European goals. While the IPCEI communication is very broad in defining of positive spillover effects, stakeholders associate them with decarbonization (DIGITALEUROPE, 2021, p. 10), jobs and long term investments (INDUSTRIALL EUROPEAN TRADE UNION, 2021, p. 2), and better alignment of research initiatives (VCI, 2021, p. 1).

Also the interviewed experts underline that knowledge sharing a relevant factor for realizing a fast hydrogen infrastructure setup connecting Europe. As mentioned earlier, not all projects of wave one and wave two could already take off. Therefore, there are no results yet to be shared. Still, subject 1 articulates that companies are communicating and exchanging best practices (interview 1). Subject 5 explains that key figures are already announced in the project descriptions in the chapeau documents. These key figures are also shared in specialist conferences but express only the general idea. Companies do not disclose how they achieved them (interview 5). Subject 4b states that they regularly update the national authority about their state of play, and also the wave in a broader way. As participants are also competitors, they must find a balance between exchanging best practices and safeguarding business secrets. Subject 4a adds that they do not know at the moment how knowledge sharing is regulated when the projects materialize, and it comes to technological details. There seems to be no guideline for that. Additionally, it is not clear which knowledge will be accessible for external stakeholders (interview 4).

The sixth expert, L. v. d. Burg, was not interviewed for this thesis but provided information on IPCEI and hydrogen projects in the Netherlands, and a Dutch consultation on data sharing. The report suggests that clarifications on data and knowledge sharing are crucial for better progress of the projects. KPIs are not shared in IPCEI, and valid data on large-scale operating electrolyzers are needed for safety analysis and others. The document proposes to make data sharing mandatory for the pilot projects, and professionalizing the data collection through the use of digital knowledge platforms. An open access policy is regarded as a key accelerator of learning and upscaling. Platforms like EU TRUST and the EU Clean Hydrogen Knowledge Hub are recommended (van der BURG et al., 2023).

Another feature of IPCEI which supports upscaling of innovations is that since the review in 2021, IPCEI includes first industrial deployment (FID). This means that projects further in the development process are allowed to participate. A large majority of stakeholders welcomes this integration in their reports. Regardless of this

inclusion, the exclusion of commercial activities still hinders many projects to scale up their production in a economically reasonable manner. The subchapter 5.4 elaborates on this criticism. Subject 1 agrees that IPCEI allows the scaled industrialization of hydrogen because the extensive application process ties to set up an IPCEI in which the projects complement each other by linking production facilities with applications (interview 1).

Through the widened scope of IPCEI, BOSCH (2021, p. 1) regards IPCEI as a “[...] *suitable tool to support first industrialisation and scale-up of innovative technologies*”. Moreover, as IPCEI projects are set up in order to create a functioning value chain, complementing technologies along the value chain can also benefit from the innovation and support the transition. Together with the best practice exchange, the sub-code complementing technologies played a less important role in the document analysis, and was also not referred to in the interviews.

**Network enlargement** As already mentioned, the activity of network enlargement during the upscaling process was not discussed in the survey responses as it depends on various conditions. The IPCEI communication does not provide any paragraph describing how this enlargement could be assisted. It depends rather on the specific IPCEI project in how far the actor network interacts with other actors. Therefore, the role of different actors in the hydrogen industry was asked about in the interviews. It was asked which actors still must be convinced of hydrogen. The answers varied. Subject 1 states that traditional energy companies are reluctant to shift towards hydrogen as long as fossil fuels are profitable, especially with increased gas prices in the last years (interview 1). Also, subject 2 sees a hesitant approach where energy companies are involving in hydrogen but maintaining the fossil fuel business at the same time (interview 2). Subject 3 confirms this hesitation (interview 3). Subject 5 explains the hesitation with a lack of political signals, not with a lack of commitment. Energy companies have launched hydrogen initiatives, extending their portfolio. Instead, original equipment manufacturers (OEMs) are seen as the group of actors which is currently not on track (interview 5). Subject 4a finds hydrogen recipients important for a successful market uptake (interview 4). The first two waves of IPCEI on hydrogen include large energy companies and also several OEMs, so several actors of the established regime are getting involved in the hydrogen transition. Network enlargement can also happen through spillovers. As already said, the projects are about to start, but spillovers were already defined in the applications. As an

example, the participating company will work closer together with universities in the future and support research (interview 4).

#### 5.4 Features hindering the transition process

Because the European consultation regarding the review of the IPCEI communication asked openly for comments and feedback, the focus of the responses was on weaknesses of the communication and negative impacts to consider. Therefore, about half of all used codes (162 out of 322) refer to weaknesses of the reviewed IPCEI framework. In view of this, it should again be emphasized that all analyzed documents claim to generally support the IPCEI instrument. However, the critical points are detailed and focus on different topics, therefore a larger number of codes was used. Furthermore, the consultation asked for feedback on the reviewed communication, not about general opinions on IPCEI, therefore criticism dominates in the contents. Additionally, the participation on the consultation was voluntary, so stakeholders who have nothing to criticize on would rather not take the time of submitting a positive only position paper.

**Restrictiveness** This being said, the mentioned weaknesses hindering an efficient transformation can be clustered into four categories represented by sub-codes. The first criticism is that the eligibility criteria for IPCEI are too restrictive. The increased number of Member States is perceived as challenging by several actors, mainly from the industry. Hydrogen Europe claims that IPCEI projects on hydrogen were already in planning at that time and the obligation to involve more Member States would interfere with the project building (HYDROGEN EUROPE, 2021, p. 2). The German government further declares that smaller projects which would also contribute to European interests are excluded from IPCEI support (THE FEDERAL GOVERNMENT OF GERMANY, 2021, p. 7). The criticism of restrictiveness is also used in financial contexts. EUROFER (2021, p. 4) states: “*The draft Communication (point 25) specifies that First Industrial Deployment (FIDs) does not entail “mass production” nor “commercial activities” . This is seen problematic, as the successful deployment of low CO<sub>2</sub> steel production necessitates testing and implementation at industrial scale.*” Various actors argue in a similar way, stating that investments in mass production and industrial deployment are necessary for a successful project outcome, and therefore for the success of IPCEI. Restrictiveness was no relevant criterion in the expert interviews. They mostly referred to uncertainties, slow procedures, and administrative burdens,

which will be explained hereunder.

**Slow processes** Some actors of the consultation link the increase of Member States to increased lead time in the application process. Slow procedures are challenging for projects in competitive industries (ZVEI, 2021, p. 3) and are explained with a lack of coordination between Member States where different national procedures apply (BUNDESVERBAND DER DEUTSCHEN INDUSTRIE E.V., 2021, p. 4). Subject 2 touches upon this criticism of slow progress too. A lack of transparent deadlines in the application process is perceived as inconvenient for the companies because they wait six to twelve months for feedback from the Commission. Furthermore, public administration is poorly prepared in some Member States, and the processing speed varies (interview 2). Subject 5 also speaks about lengthiness, explaining that the number of involved actors and Member States leads to complexity and high coordination effort (interview 5).

**Uncertainty** The long time spans between application and project begin lead to uncertainty which is widely criticized. Hence, uncertainty is used in much different contexts. One of the major points in the survey responses is the claw-back mechanism which was newly added to the reviewed IPCEI communication which allows Member States to reclaim funding if projects perform better than expected. The stakeholders state that the lack of clarification about the conditions for this mechanism creates uncertainty and may punish projects for good performance (ETNO, 2021, p. 5). In the interviews, it was also mentioned that the absence of concrete guidelines and deadlines creates uncertainty for various actors. Subject 2 says that the EU and its Member States did not provide clear application requirements, so companies do not know what to submit, and according to which criteria they are evaluated (interview 2). Subject 5 confirms that there were no guidelines for applications, neither for evaluations, so the granting institution was not given criteria for review. The expert adds that the procedure differs in every wave (interview 5). It is mentioned by several stakeholders in the consultation documents that the uncertainties regarding application requirements, chances for acceptance, project start, project duration, publication of results and funding discourage SMEs from participating, which undermines IPCEI's goal to integrate more SMEs.

**Administrative burdens** Another important point of criticism are administrative burdens. Administration is closely linked to the criticism of slowness and uncer-

tainty. To participate in IPCEI, companies must submit several documents describing the project, potential spillovers, and cost calculations. However, the requirements and organizational structure of applications differ between Member States and lack common guidelines and templates. This is seen as overloading, and high expenditure of time and staff are regarded as dissuasive especially for SMEs (THE FEDERAL GOVERNMENT OF GERMANY, 2021, p. 2). During the project phase, participants are obliged to regularly report their interim status to national authorities and the Commission. Almost all stakeholders ask to simplify this process by providing best practice examples and guidelines (THE GOVERNMENT OF THE FRENCH REPUBLIC, 2021, p. 5). Administrative burdens and legal uncertainty are points that all stakeholders agree on, as they are found in the responses of public authorities, organizations and companies. Also the interviewed experts call out these weaknesses. Subject 4a states that the submission of documents and evaluation procedure at different levels is labor-intensive. Therefore, the company has employed additional staff for the reporting and administration (interview 4). Subject 1 sees the effect of hiring additional staff, in the project-related and technical area, as a positive spill-over from IPCEI (interview 1). Nevertheless, startups and SMEs might not have the capacity for the administrative effort.

Besides the weaknesses that mostly lie in poorly coordinated processes, bureaucracy and legal uncertainty, another more fundamental feature of IPCEI could potentially impair a sustainability transition in Europe. As already seen in the literature review, a smaller group of authors claims that the IPCEI instrument is too excessive, and not proportional. Whether there are better suiting policies for innovation stimulation for sustainability transition is hard to answer. Among the survey responses, stakeholders often underline that State aid is necessary to achieve strategic goals, but transparency is important and a balance must be found. Especially a balance between spillovers and IPR protection is emphasized (SIEMENS ENERGY, 2021, p. 3), but also a balance between transparency and administrative burden (ZVEI, 2021, p. 4) and a balance between supporting ambitious, risky projects and undermining effective markets (THE DUTCH AUTHORITIES, 2021, p. 2). So, the document analysis shows that stakeholders remark that in the set-up of an IPCEI it should be considered that some decisions might be distortive for the market. Because of this caution, a question about competition distortion was part of the interview guide. All experts declare that IPCEI is not distorting competition.

Subject 1 states that the market for hydrogen is very small (interview 1). Subject

2 confirms that a market that doesn't exist cannot be interfered with (interview 2). Subject 1 also says that the IPCEI instrument was supervised by DG Growth and DG Competition which are rather conservative. The granted State aid is high, but so are the risks for companies. IPCEI provides an incentive to engage in the hydrogen transition (interview 1). Subject 4a and subject 4b underline that in their country of operation, all applicants except one were granted, so the funding was very open. Furthermore, the strict conditions and spillover obligations bring the State aid in balance (interview 4). Subject 5 claims that IPCEI is a European control instrument letting smaller countries benefit from the leading ones. State aid in single countries would not have such an impact and spillovers as this European project (interview 5).

Findings	Example quote
SQ1: Which features of the IPCEI framework promote better niche management?	
<b>Funding</b> allows the project realization and makes hydrogen cost-competitive	"[...] green hydrogen which is produced according to the rules set by Europe, that kind of hydrogen is very expensive. [...] Yes, that's an amount that then doesn't get paid, so you need something from subsidy." (subject 4a, interview 4)
<b>Network formation</b> is facilitated through the involvement of many Member States and companies of different sizes, especially SMEs	"IPCEIs is a very relevant tool to support the integrated development of the hydrogen ecosystem across Member States and the H2 value chain." (Hydrogen Europe)
<b>Expectations</b> of participants are to accelerate hydrogen production and infrastructure setup in Europe	[the motivation to participate in IPCEI was] "very clearly the vision of going into mass production now and really driving this forward." (subject 5, interview 5)
<b>Learning</b> is mainly expected in the upscaling context because large-scale facilities do not exist yet in Europe	"EUROCHAMBRES believes that IPCEIs are relevant instruments for the development of technological breakthroughs, allowing businesses to advance their research, development and innovation efforts and act as an engine to help overcome the economic damage linked to the COVID-19 pandemic." (EUROCHAMBRES)
SQ2: Which features promote upscaling?	
<b>Knowledge sharing</b> can support upscaling because participants will exchange learnings from their project with each other and with external stakeholders	"[...] that's one of the best things of IPCEIs because best practices sharing among companies is happening." (subject 1, interview 1)
Whether the actor network grows in the process ( <b>network enlargement</b> ) and refines its expectations ( <b>new visions</b> ), cannot be predicted yet	"The most important thing is yet to come, like how are spillovers actually shared?" (subject 4a, interview 4)
SQ3: Which features of IPCEI are counterproductive for innovation in Europe? Which elements of the framework may prevent an efficient energy transition?	
Weaknesses of the policy can be drawn back to a lack of coordination and clarification which leads to <b>administrative burdens, slow processes, and uncertainties</b> . This may discourage actors to participate	"Finally, we are of the opinion that the application phase and the checks by DG Competition have proven to be too burdensome and propose to simplify the administrative procedure." (AECM)

Figure 2: Main findings

## 6 Discussion

The results section shows innovation-stimulating features of the IPCEI framework which refer to niche protection and upscaling. Furthermore, some weak points of the framework and the current handling are mentioned. In this discussion chapter, the findings are contextualized and linked to the socio-technical transition process described in the literature.

As the public consultation was as designed without questions, stakeholders could make any comments they considered important. This means that the responses varied in structure, scope and content. Furthermore, the sub-questions of this thesis were not always addressed in the survey responses. It also needs to be said that respondents commented on the draft IPCEI communication which refers to all future IPCEI projects in all strategic value chains that were identified then, so the case of hydrogen IPCEI is not specifically addressed. Though, hydrogen IPCEI projects were already in planning in 2021 and some stakeholders considered this development. The remarks provided refer to IPCEI in general. As the hydrogen IPCEI waves are part of IPCEI, the comments given on the general communication can also be drawn back to them but must be put in context. Despite the open form of consultation and the differences in the documents, a certain coherence can be identified in the totality of responses.

### 6.1 IPCEI on hydrogen as a tool for strategic niche management

GEELS (2018, p. 225) explains that radical innovations first emerge in peripheral niches, where governance incentives like subsidies create a protected space for the innovation. The theory suggests that in this first phase, markets for the innovations do not yet exist, and user preferences and final technological configurations are unknown (GEELS & TURNHEIM, 2022, p. 23). The findings implicate that the recent hydrogen sector in Europe is situated in this first phase. It was pointed out in the interviews that a market for (green) hydrogen is non-existent, as well as there is no infrastructure. Although hydrogen is applied in specific fields like chemical industries, and research institutions know how to produce green hydrogen, green hydrogen applications are not yet implemented, and innovations are needed. As subject 5 and subject 3 state, innovations in materials science and industrial deployment are the center of attention. Furthermore, as there is no large-scale production, the prices for green hydrogen are significantly higher than for other forms of hydrogen. So, recipients are hesitant to



purchase and producers are not incentivized to supply green hydrogen, creating a chicken-and-egg dilemma (interview 5, interview 3).

The SNM literature lists three processes fostering niche innovations, which are (1) learning, (2) network enlargement, and (3) visions and expectations articulation. The qualitative content analysis has shown that these activities can be observed in hydrogen IPCEI. The fourth category code niche protection was added to the scheme because funding plays a central role in IPCEI and was highlighted by most stakeholders. It needs to be said that funding is an activity which comes from the government, while the other three activities are exerted by innovators and actors in the niche. Funding via State aid is the R&D-stimulating mechanism of IPCEI which enables project realization through which learning, networking and vision formation happen. An important point here is that the eligibility criteria for IPCEI oblige participants to have significant co-funding by the beneficiary. So, IPCEI stimulates private investment by providing public investment. Subject 5 states in the interview that governance and political commitment are crucial for convincing investors about the innovation. The expert sees that the creation of hydrogen IPCEI in 2021 provided this necessary signal (interview 5). Accordingly, the formation of a social network was launched as interested companies, States and research institutions looked for synergies during the matchmaking process. Because it is a Europe-wide instrument, IPCEI connects Member States and industry bodies at different levels. The survey respondents indicate that the initiative to include SMEs is seen very positively. Subject 1 underlines the importance of SMEs for the internal market, and that they deliver many components for the hydrogen value chain (interview 1). So, an actor network is formed among cooperating companies, but external actors along the value chain are affected too.

Participating companies have articulated the common vision to go into mass production. Subject 1 says that IPCEI acts as a guarantee and gives companies visibility (interview 1). This expectation articulation helps niche innovators to get attention from external actors, also to be seen by the incumbent regime. IPCEI assists the formulation of expectations by defining spillovers for each project which are agreed upon and written into chapeau documents for each wave.

From the analysis, it can generally be drawn that IPCEI projects on hydrogen stimulate learning through the realization of pilot projects. It was mentioned in the interview with subject 5 that there is no practical experience in Europe with renewable hydrogen mass production. The participating companies are building the

first facilities of that kind, so the planning and set-up imply learning processes that the industry can benefit from (interview 5). This installation can lead to cost savings and improvements and reduce uncertainties about the technology and associated aspects. However, as the projects just have begun, it cannot be specified in this thesis what the actors learn in the process.

So, IPCEI entails several aspects supporting strategic niche management. The State aid supports companies with financial investments to set up R&D facilities. Especially by including SMEs, a heterogeneous actor network is formed. The companies share the expectation to start mass production of green hydrogen which will be first of its kind in Europe, so they will learn how to set this up.

## 6.2 IPCEI on hydrogen as an upscaling instrument

Geels'(2018) theory on socio-technical systems implies that niche innovations will break out of the protected niche at a certain point to enter a niche market or the mainstream market. This outbreak requires the alignment of several elements and openness of the socio-technical regime. External events can pressure the regime to adjust, creating windows of opportunity for the radical innovations (GEELS, 2018).

Climate change and international agreements like the Paris agreement can be understood as external events which have pushed the EU and Member States as parts of the socio-technical regime towards more sustainability policies. The Covid-19 pandemic and the Russian invasion of Ukraine have disrupted the economy and created a moment for increased State aid, subject 1 says (interview 1). Among others, these events drove the EU to implement temporary transition frameworks which can be interpreted as a change in the socio-technical regime.

The socio-technical regime consists of rules and institutions shaping the behavior of social groups and actors (GEELS & TURNHEIM, 2022, p. 9). Existing socio-technical systems are settled by several lock-in mechanisms. For the case of energy, this means that established infrastructure, standards, and consumer preferences stabilize the regime and favor incumbent actors. Subject 3 explains that fossil fuels are the status quo, as the industry is very optimized, cheap, and works in a seamless infrastructure (interview 3). So, fossil fuel companies are important actors in the regime and can be regarded as locked in. All interviewed experts state that the fossil fuel industry expands activities towards hydrogen applications, but is also hesitant to push forward the development. Still, a change in the regime through these R&D activities is visible. Subject 5 states that another important actor shaping the system are OEMs which

are not yet involved in hydrogen for the case of Germany. The expert explains this reluctance with lacking political commitment and regulatory obstacles. The creation of IPCEI on hydrogen acted as an important signal of commitment for hydrogen upscaling in Europe (interview 5). So, one can see that a shift in the socio-technical regime has happened, and IPCEI has confirmed this shift, incentivizing industry actors to approach the transformation process.

Spillovers are an important aspect of the transition towards a connected European hydrogen infrastructure and market. As previously mentioned, both are recently underdeveloped. According to the STS and MLP literature, the outbreak out of the niche is supported by the alignment of actors and activities, meaning that incumbent actors must join the transition, altering the regime. IPCEI on hydrogen can assist this alignment especially by providing spillovers. However, it must be noted that projects are still in the niche development phase. Although spillovers are intended and defined in the project notifications, the real outcomes are not known yet. Nevertheless, the design of IPCEI includes some upscaling potential through spillovers under the condition that the execution of projects is done as planned.

The most addressed spillover from IPCEI is IPR access and knowledge sharing. The survey responses highlight this feature as beneficial, implying that also external third parties might be picked up in the transformation process. However, it cannot clearly be derived how and which knowledge is shared as this process happens in the future after the projects materialize and there are no guidelines provided. Still, the companies are exchanging updates and best practices through reports and conferences, so a structure for communication is in place. It is not very transparent because of confidential contents. Other spillovers listed by the experts are employment and further education and skills development for staff. As some participants cooperate with universities, research is disseminated. With these effects, the actor network is extended, and legitimacy of the innovation is increased. As Member States in IPCEI had to create support programs to participate and public administration bodies were involved in the process, IPCEI has also already put the hydrogen topic on the agenda of public authorities.

Alignment of elements also implies the emergence of complementary innovations. Subject 3 emphasizes that hydrogen is an energy carrier, therefore energy production technologies like Photovoltaics (PV) and wind turbines are needed during hydrogen upscaling too (interview 3). It might be that in the further process, expectations on hydrogen are adjusted, but this statement cannot be drawn from the findings as it is

to happen.

The existing and the expected spillovers include various actors at various levels and can therefore push forward the upscaling of hydrogen applications in Europe. So, the jump out of the niche into the market can potentially be facilitated through IPCEI, but a final assessment cannot yet be provided. Here, the question of IPCEI's general goal is addressed. The goal of IPCEI is to strengthen strategic value chains like hydrogen. Whether this support must include upscaling and driving the innovation into society, can be discussed as it is not specified in the IPCEI description. This issue addresses differing views on the role of governments in innovation. The interventionist perspective on industrial policy defines the governmental role as identifying key technologies and setting priorities in their application. Further reaching is the concept of mission-oriented industrial policy where societal goals are defined and industrial policy is applied to achieve these. This requires strategic action in various sectors like demand stimulation, coordinated public investment, and market-shaping policy (BELITZ & GORNIG, 2021, pp. 2 sq.). The challenge of mission-oriented policy is the high coordination effort. Because IPCEI is a European policy instrument, one could argue that it is unproportional that the EU binds large resources to streamline industries and actors of the internal market and to ensure their integration into society. The principle of subsidiarity prioritizes Member States to shape domestic economy by providing State aid as they wish, and assigns the European Union a coordinating or supervising role only for a ensuring free competition in the internal market.

The assessment of the experts shows that incumbent actors like traditional energy companies are already engaged in hydrogen, so a change in the socio-technical regime is visible. However, this development is partly based on informed speculation as the process just has begun. It must also be noted that besides technology, industry and policy, the socio-technical regime includes user preferences, culture and science. The system is very complex and the interaction of IPCEI with customers or culture was not addressed in the content analysis. Additionally, the STS literature highlights the relevance of external shocks in the socio-technical landscape which cannot be foreseen.

### **6.3 Weaknesses of the IPCEI framework**

The previous section shows that IPCEI does provide relevant conditions for socio-technical transition in Europe. However, the findings also point out aspects of the framework deteriorating the performance of IPCEI. The four most addressed topics

of criticism are closely interlinked with each other. The strict eligibility criteria make IPCEI projects too restrictive for some companies. Restrictiveness is also expressed in complex coordination processes which create administrative burdens for companies, and slow down approval procedures. The long durations lead to uncertainty.

Although the criticism is valid, it must be put into some context. The first remark is on restrictiveness. Several stakeholders find the number of four Member States per wave challenging for project planning. However, as IPCEI is a powerful funding instrument providing high State aid, it shall not disproportionately disrupt the internal market or favor domestic industries. Therefore, the Dutch government welcome the increase in Member States (THE DUTCH AUTHORITIES, 2021, p. 7). Also required reporting and the intended knowledge publication are part of IPCEI to balance the market interference with benefits. As Member States are sovereign states, an extensive coordination procedure takes place. It must also be noted that that every policy must consider the public good. To avoid unwanted side effects in the use of much public money, IPCEI includes high reporting requirements or the claw-back mechanism, although it might charge participants with more work.

Some elements of IPCEI are burdensome for participants but necessary for the proportionality of the instrument, like strict eligibility criteria and an extensive application process. However, several points of criticism could easily be addressed by better governance. Both industry representatives and subject 5 who has practical experience from the approval process criticize the lack of best practices, guidelines and templates for applications and reporting documents (interview 5). With the provision of these guidelines, evaluation processes could probably be accelerated and uncertainties in this context could be reduced. Subject 2, subject 1 and subject 4a mention that the lengthiness has led to later project begins which imply less time to complete the project (interview 4). But completion is necessary to receive the totality of granted funding (interview 2). Therefore, some projects have already started with private money only (interview 1). Subject 1 and subject 4b pointed out that currently, only about half of the projects accomplished to have all of the subsidies clarified (interview 1, interview 4).

Another problem is that the delays confront projects which calculated project costs about two years ago with risen costs due to inflation, increased prices for steel and transport (interview 4). Provision of guidelines cannot solve the problem of outdated cost calculations but could at least speed up administration. Generally, better coordination between Member States is called for in the stakeholder documents and

the interviews. Time and resources could be saved by streamlining and unifying the application process. Especially SMEs are said to benefit from reduced administrative burdens and uncertainty. Subject 5 sums it up: *“So this process is lengthy, complex, not transparent, there is no planning security and the first to fall behind are the small and medium-sized companies, for whom the process is actually designed.”*

In this context, the unclear procedures regarding IPR access and technical knowledge sharing in the future leave room for clarification and therefore uncertainty reduction. Generally, the findings imply that the communication structure is in place but not very transparent. Also evaluations seem to be not yet exercised by the Commission because the experts have communicated their remarks directly or indirectly to the Commission, but no taking up of the remarks has been visible. Furthermore, the fact that the first conference on hydrogen IPCEI just has taken place in December 2023 shows that the progress of IPCEI on hydrogen is rather slow.

## 7 Conclusion

This thesis investigated how important projects of common European interest on hydrogen can shape the sustainability transition by providing necessary conditions for innovation. Research and development in the field are needed to scale up green hydrogen facilities and achieve the EU targets on hydrogen production and decarbonization. Three sub-questions were applied. The analysis has shown that IPCEI creates a protected space for the innovations via State aid, in which innovating companies can realize ambitious R&D&I projects that are not sufficiently funded by the market alone. Furthermore, especially the constitution of a heterogeneous actor network including larger and smaller Member States, larger companies, SMEs and startups can stimulate innovation in the niche. Regarding strategic niche management and SQ1, all key activities which could be expected from the literature review can be confirmed.

Regarding upscaling, the analysis has identified the spillover requirement of IPCEI as a potential accelerator of knowledge sharing and upscaling. Through conferences and reports, the participating companies are in contact with each other, and also smaller Member States and SMEs can benefit from the best practice sharing. The effect as political signal can also convince incumbent actors in the energy sector about green hydrogen and the associated political commitment in the transition.

Socio-technical transitions are subject to various developments at the micro-, meso-, and macro-level. GEELS (2018, p. 227) describes them as “multi-dimensional struggles between niche-innovations and existing regimes”, including business struggles, competition between technologies, political struggles over subsidies and regulations, discursive struggles over framings, and societal struggles over consumer preferences. It becomes clear that a transition process is very complex, and the MLP lens includes numerous actors and arenas. The IPCEI instrument is also very complex and includes several unknown factors because the projects are not yet realized. Therefore, the thematic restriction of this thesis can only provide an initial idea of the outcomes and the transition process. The concentration on Germany, the Netherlands and France might also set the focus too much on the leaders of technological development while less involved countries can have a different perspective on the topic.

Nevertheless, with regard to the literature in the field, some key elements for innovation stimulation in the protected niche and diffusion into the mainstream market could be seen in the framework. The European Union drives the transition

with additional policies and initiatives like the “hydrogen accelerator” concept, the European Hydrogen Bank, Clean Hydrogen Partnership, European Clean Hydrogen Alliance, and the Net-Zero Industry Act. Additionally, the Member States have own hydrogen strategies. So, IPCEI is embedded in various political measures that can lead to socio-technical transition towards a European hydrogen economy.

The analysis has identified various features of IPCEI which promote niche management, but for the upscaling phase, results are less clear. To be fair, the expressed goal of IPCEI is to strengthen the EU’s competitiveness, promote sustainable growth, tackle societal challenges or create value (SZCZEPAŃSKI, 2020, p. 3). Whether this includes also upscaling can be discussed. Generally, the IPCEI framework strengthens the EU’s role in terms of functionalism because a networking body is proven to be necessary. Because IPCEI is linked to industrial policy in tension with free competition in the internal market, the EU is needed as a coordinator between the Member States and industrial actors. The condition for this coordination must always be a common European objective and the Member States’ willingness to participate. But as IPCEI participation is voluntary, the EU’s action can be seen as proportional, adding European objectives to the market development.

State aid is always a complicated issue because the objective to push a certain industry must be balanced against potential competition distortion. Furthermore, as it includes taxpayers’ money, the public interest should carefully be considered, and public funding should only be spent if the expected benefits outweigh the costs. The IPCEI instrument therefore puts several requirements on participants to ensure that the technological and project-based results are shared within the European Union. Some of these requirements were regarded as burdensome and unclear, as found in the analysis answering sub-question three which focused on the weaknesses of the policy. Nonetheless, the internal market of the European Union is not an enclosed space, and companies must also compete globally. Both stakeholder documents and expert interviews have referred to the Inflation Reduction Act (IRA) in the USA and subsidies on renewable energy applications like electric cars in China which contain protectionist elements. The interviewed experts state that global competition in strategic value chains make support mechanisms like IPCEI necessary. Furthermore, the IPCEI framework goes beyond subsidies and creates positive spillover effects in the entire European Union.

The framework leaves room for improvement in respect to transparency, coordination and evaluation. The results of this thesis point out that the European Commission can



accelerate the setup of future IPCEI by providing common guidelines for applications and evaluations, and by making clearer specifications about deadlines and results sharing obligations. Furthermore, the EU could improve the policy by conducting an own policy evaluation. This thesis has provided a first impact assessment for the future roll-out of hydrogen IPCEI. All in all, it could identify innovation-stimulating aspects for niche management and upscaling of hydrogen in the socio-technical transition. The analysis confirms important concepts of strategic niche management which could be identified in elements of the IPCEI framework. Some issues in the structure of IPCEI could also be highlighted. The thesis adds to the literature of policy studies discussing the role of governments in innovation. Depending on the perspective, the governmental role varies, and so does the level of intervention considered appropriate. However, the IPCEI case provides a good example for broad industrial policy which is applied in a whole value chain, grants considerable State aid, but still leaves scope for concrete implementation and guarantees positive spillovers for the whole European Union. Here, the EU as a supranational organization takes over a coordinating role between the actors in the network.

The multi-level perspective allowed to include several actors at different levels in the observation. Further research can be done after the completion of the projects, potentially shifting the center of attention more towards non-participating actors or Member States. The influence of culture and society can also contribute to the general picture of the socio-technical system.

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## A Attachment

### A.1 Interview guide

	English	German	Dutch
1	Please give me a brief introduction about yourself. I am curious how you got involved in hydrogen or energy and what your professional connection to important projects of common European interest is.	Bitte stellen Sie sich kurz vor. Ich bin neugierig, wie Sie zum Thema Wasserstoff oder Energie gekommen sind und welche beruflichen Verbindungen Sie zu wichtigen Projekten von gemeinsamem europäischem Interesse haben.	Stel uzelf kort voor. Ik ben benieuwd hoe u op het onderwerp waterstof of energie bent gekomen en welke professionele connecties u hebt met belangrijke projecten van gemeenschappelijk Europees belang.
2	What are the main obstacles for hydrogen innovations currently?	Was sind derzeit die größten Hindernisse für Wasserstoffinnovationen?	Wat zijn momenteel de belangrijkste obstakels voor waterstofinnovaties?
3	In your opinion, which group of actors must still be convinced about hydrogen? How do traditional energy companies shape hydrogen development?	Welche Gruppe von Akteuren muss Ihrer Meinung nach noch von Wasserstoff überzeugt werden? Wie gestalten die traditionellen Energieunternehmen die Wasserstoffentwicklung?	Welke groep belanghebbenden moet volgens u nog worden overtuigd van waterstof? Hoe geven traditionele energiebedrijven vorm aan de ontwikkeling van waterstof?
4	How do projects benefit from the IPCEI status? Why would they apply for it?	Wie profitieren die Projekte vom IPCEI-Status? Was ist deren Motivation, teilzunehmen?	Waarom vraagt een bedrijf de IPCEI-status aan? Welke voordelen hoopt het te behalen?
5	How do the different participants interact with each other? Are there conferences, reports, or something else? Can we observe some kind of group formation?	Wie interagieren die verschiedenen Akteure miteinander? Gibt es Konferenzen, Berichte oder etwas anderes? Können wir eine Art Gruppenbildung beobachten?	Hoe communiceren de verschillende deelnemers met elkaar? Zijn er conferenties, verslagen of iets anders? Kunnen we een soort groepsvorming waarnemen?
6	What kind of spillover effects do you expect from IPCEI? How non-IPCEI actors (customers, start-ups, other companies) benefit from them?	Welche Art von Spillover-Effekten erwarten Sie von IPCEI? Wie profitieren Nicht-IPCEI-Akteure (Kunden, Start-ups, andere Unternehmen) von ihnen?	Wat voor overloopeffecten verwacht u van IPCEI? Hoe profiteren stakeholders van buiten het IPCEI (klanten, startups, andere bedrijven) hiervan?
7	Which weaknesses do you see in the IPCEI policy?	Welche Schwachstellen sehen Sie in der IPCEI-Politik?	Welke zwakke punten ziet u in het beleid van het IPCEI?
8	What is your opinion on competition distortion discussed in the context of IPCEI?	Was ist Ihre Meinung zu den im Zusammenhang mit den IPCEI diskutierten Wettbewerbsverzerrungen?	Wat is uw mening over concurrentievervalsing die wordt besproken in het kader van IPCEI?

Figure 3: Interview guide and translations



## A.2 Coding scheme

Code	Meaning	Example from survey responses
Niche protection <ul style="list-style-type: none"> <li>• Funding</li> <li>• Pilot projects</li> <li>• Resources</li> </ul>	Governmental support activities to protect a niche innovation from the established market regime, e.g. through tax reliefs, funding, provision of equipment and laboratories	"[...] access to funding is critical to develop innovative technologies at scale in record time and overcome potential risks" (BASF Europe)
Network formation <ul style="list-style-type: none"> <li>• Attract SMEs</li> <li>• Connecting Member States</li> <li>• Connecting actors/ stakeholders</li> </ul>	The creation of a network of actors that are active in the field of the innovation in question or similar innovations, but also of actors at regime level supporting the transition.	"We welcome the addition of Point 18 and Point 22 (d). They provide a more inclusive approach to project eligibility and aid granting. These additions will offer stronger incentives to create SME-relevant value networks shaped around given products or services." (Digitaleurope)
Expectations articulation <ul style="list-style-type: none"> <li>• European interest</li> <li>• Direction/ vision</li> </ul>	The actor network exchanges ideas and develops a common vision to gain legitimacy and representation.	For these reasons, IPCEIs will play a key role for Europe's ambition to strengthen its footprint in the key industries of the future. (Global Foundries)
Initial learning <ul style="list-style-type: none"> <li>• (Cost) improvements</li> <li>• Development/ breakthroughs</li> <li>• Experiments</li> </ul>	Learning means the accumulation of data and facts which then leads to new assumptions and developments, e.g. (cost) improvements of the product	"EUROCHAMBRES believes that IPCEIs are relevant instruments for the development of technological breakthroughs, allowing businesses to advance their research, development and innovation efforts and act as an engine to help overcome the economic damage linked to the COVID-19 pandemic." (EUROCHAMBRES)
Knowledge sharing <ul style="list-style-type: none"> <li>• IPR access/ spillovers</li> <li>• First industrial deployment</li> <li>• Complementing technologies</li> <li>• Best practices</li> </ul>	The learnings from pilot projects in the first phase are shared. Standards and dominant designs are developed, complementing technologies are developed.	"The first IPCEI projects have proven IPCEI to be a suitable tool to support first industrialisation and scale-up of innovative technologies." (Bosch)
New visions articulation <ul style="list-style-type: none"> <li>• Stronger policy support</li> <li>• Campaigns</li> </ul>	The expectations and visions are refined, politicians support the innovation, the network also reaches potential consumers of the product.	"Raise visibility about the opportunities offered by the IPCEI framework to SMEs through awareness-raising campaigns [...]" (EUROCHAMBRES)
Network enlargement <ul style="list-style-type: none"> <li>• Involvement of incumbent actors</li> <li>• Professional groups</li> </ul>	Network alliances become stronger, incumbent actors become involved. Professional groups form and help lobbying and communicating.	/
Weaknesses <ul style="list-style-type: none"> <li>• Uncertainty</li> <li>• Administrative burdens</li> <li>• Restrictiveness</li> <li>• Slow</li> </ul>	Any other unwanted outcomes of the IPCEI process	"For SMEs the administrative burden is a major obstacle for the participation in an IPCEI. For the sake of legal certainty it is important to know beforehand what kind of information an SME, wanting to participate in an IPCEI, has to submit in the notification process." (Dutch authorities)
Competition distortion <ul style="list-style-type: none"> <li>• Competitive disadvantage</li> <li>• Anti-trust, IPR exploitation</li> </ul>	Potential unproportional effects of the framework on the market	"In order to address actual or potential direct or indirect distortions of international trade, the Commission may take account of the fact that, directly or indirectly, competitors located outside the EU have received or are going to receive, aid of an equivalent intensity for similar projects and therefore can extend the reference period. European companies compete to a large extent on global markets. It should therefore be possible to also take aspects of global competition into account in the funding gap calculation." (Bitkom)

Figure 4: Coding scheme with definitions and examples

## TRANSCRIPT INTERVIEW 1

0:25

L. Pudollek

So to begin with, I want you to give me a little introduction about yourself.

So what is your professional link with IPCEI and Hydrogen?

What is your work connected to?

0:39

Sure. So very quickly. My name is [REDACTED]

So, yeah, it's already 2 years now working specifically on industrial policy and trade.

My main topics and my main work focus is industrial policy, which is quite broad and general. My portfolio is very general, spanning from one thing to another because industrial policy in the past two years has gained a high level of priority in the political agenda. Basically, I'm on everything that relies to pure industrial policy, to IPCEIs, state aid, manufacturing of technologies, final and use, support mechanism to kick start production of hydrogen, and other parts of the value chain.

Everything that may help companies liaise with member States and avoiding fragmentation of the internal market while at the same time enhance competitiveness, especially when comparing European Union situation with China or the United States.

In addition to this, because I work specifically on policy, we have also another branch within [REDACTED] that specially focuses on funding and financing. Perhaps all the questions, all the details that are coming specifically on funding schemes etcetera you might reach also to my colleagues if needed.

3:23

L. Pudollek

Oh cool.

3:23

And also I just missed that I'm carrying out the advocacy activities on behalf of [REDACTED] when it comes to the Net Zero Industry Act, which is the, let's say, the new industrial policy response to the effects of the Inflation reduction act and China competition, on a global scale.

And also tackling Green Deal objectives and to make sustainability and green activities and green technologies, let's say a sustainable and viable business with Europe being trying to emerge as a third industrial pole in the global competition.

And also on critical materials which are very important for the scale up of such of such technologies. I have just one very last comment on what you were mentioning before that you that you think that hydrogen technologies are not there yet.

And I would say that on the technology that's luckily not the case because hydrogen technologies are there also with high level of TRL, so technology readiness level around 8-9.

So basically pre commercialization or commercialization technologies the only thing that it's missing it's the market, actually because we just need to create a market that's completely novel. And so we're trying the best we can to break the famous chicken and egg dilemma: in other words, we need to create the hydrogen supply before or the demand. So we're trying to make a connection between

these two throughout different policy mechanism.

And one of these that was meant to break this kind of dilemma because was the IPCEI, important project of common European interest, which tried to create an ecosystem already for hydrogen with direct participants and external third parties, as to say providers of components etcetera and other skills, personnel etcetera... in order to create a valuable ecosystem in Europe to make this hydrogen technologies flourish.

IPCEIs as you know it's just a slice of the pie because but it's a very important one when it comes to public funding, especially when using taxpayers money.

6:35

L. Pudollek

Oh no, I think it's very well answered. You told me that the market is missing but the technologies are there. So what you what you say is the main obstacle now for hydrogen infrastructure or market buildup, who is hindering or what is hindering us?

6:52

I mean it's not an issue that you can have a look at it in silo because it's very cross cutting and spanning throughout the entire value chain from the very critical raw material to the final offtake. The market needs to find some sort of synchronization.

But in reality this market is not completely brand new because you have already hydrogen production in Europe: recalling for instance the REPowerEU objectives.

REPowerEU is meant to basically creating a market, a more thorough one by 2030, that is able to produce 10 million tons of hydrogen and aims to import 10 million tons additional to have an overall 20 million tons. Actually those 10 million tons domestically produced that should come from renewable sources or low carbon sources, depending on the final agreement that will come on some green deal negotiation.

10 million tons is actually the current European market for hydrogen. The only problem is that hydrogen is gray. So it's made from coal, made from fossil fuels, very polluting, et cetera.

And it's very targeted for chemical applications mainly and refining and also for the food sector, but tiny also medical applications et cetera. What we want to expand now in EU its use for the first of all for Heavy Industries, so steel, coal, cement, glass, paper et cetera. Anything like that is very energy intensive and it's hard to abate sector and very difficult to electrify especially for instance when it comes to steel when you need to reach very high temperature for long time. Also for long haul transport.

So for instance, when you need to do more than 500 kilometers trips, hydrogen is the most suited application for reducing refueling times because in 5 minutes you have a full tank for an hydrogen truck. Today we could have also other off-takes and uses.

For instance, you know to avoid electricity curtailment during renewable energy peaks and downs, let's say.

So to cover with those downs, let's say when you have the peak of the of the electricity in excess, you can transform it to hydrogen and then put it back into the system for curtailing this imbalance when it happens.

And it's very important for instance practical issues, for instance pretty important also for Germany because last year Germany for this curtailment reason has spent more than €4 billion in a year just to cope with electricity missing from the grid during peak times.

So this could be one way option but coming back on what we were saying before the, so the challenges for having this kind of hydrogen market a reality are let's say multiple-folded.

We can have a look at the regulations, the fit for 55 package at EU level is basically completed.

We are just missing a couple of those like the gas package and the energy performance of buildings directives but all the others are done from EU perspective.

Now it's time to reflect those in national legislation, which for instance Germany, it's not considering, for now at least. I'm talking a lot about Germany mostly because it's where the off take of hydrogen could be the most expected for due to the large industries, the main ports difficulty to decarbonise and the hard access to renewable electricity for instance.

So that's, let's say Germany is going to be #1 market for hydrogen use, not for production. But OK, So with this being said, so we have the regulatory uncertainty on one side.

Then we have still something that that relates to the funding that's still you know is a little bit creating some uncertainties or at different level because for instance Germany was quite ambitious on creating a network of hydrogen with pipelines, storage etcetera.

Recently the Supreme Court of Germany just declared that the 60 billion envelope that was dedicated to the clean energy transition is not constitutional. So in Germany now you have the 60 billion hole that was meant to cover the funding gap for that. So this is something that creates some kind of imbalance and some sort of discomfort for investors, for people that are trying to invest in hydrogen.

Then, we miss the infrastructure now because for instance, we see that the infrastructure and the market will be created in the next 10 years.

Of course this will happen because also the costs will go down due to the economies of scale. You know the more you produce, the less a technology costs. Basically, what happened with Fordism, you. So that's what the hydrogen market wants to achieve are economies of scale, but this is not the moment yet.

So now production and use of hydrogen are pretty much localized. So where you produce the most then you need to find an offtake.

But sometimes it's not the case because for instance RES, renewable energy sources availability and hydrogen offtake and use are not something are often coupled because for instance you have a lot of production at the extremes of Europe, north/south, but the Heavy Industries are mainly in Mitteleuropa, so Germany, Poland, France, Austria, the Netherlands, Belgium, et cetera.

So we need to solve this kind of dilemma and we need to do it with infrastructure, but infrastructure will not come tomorrow. So we will require time and effort and money to build it, to connect the dots.

And last but not least, this is why I was telling you about this chicken and egg dilemma at the very, very beginning. If you don't have a clear regulatory framework, if you don't have clear view on infrastructure and on funding and on the off taker, the ones that are going to use the hydrogen are not incentivized to implement it in their industrial processes, production processes et cetera. Because it's still too costly and the market it's still hesitant.

So this is also what the situation at this point is, even though the support from public institution has increased through hydrogen Bank, the Net Zero industry Act, the clean tech initiatives, the targets for industry when it comes to hydrogen and RFNBOs, renewable fuels of non-biological origins, so basically hydrogen. So you can see that this is becoming strategically very important for the EU because it can mean competitiveness on a global scale.

This might be an opportunity to create lots of jobs, renewing the economic fabric when it comes to clean tech. For instance, we have completely lost the train on digital and on PVs and partially for the wind sector.

Let's not repeat the same with hydrogen because we are the leaders now when it comes to the technology, but we needed to make it cheaper at scale and available for everyone in Europe and outside Europe.

So that's a little bit the context that you have all the preconditions, but still they need to be synchronized and it will come, next year 2024, the year of truth in my opinion.

But it's going to be 2025 where basically a lot of the final investment decisions will be taken and the majority of European projects are supposed to materialize. 2025, make it or break it. At least this is what the models are saying.

19:02

L. Pudollek

That's an interesting foresight.

19:05

[REDACTED]

Yeah.

19:05

L. Pudollek

But good to know.

19:07

[REDACTED]

This is just on paper and also for you to perhaps to have a look at: 2 weeks ago, we published our clean hydrogen monitor, which is the most updated source of information of the market in Europe. It's public in our website and basically you can see how much production, how many off takers and what's the level of the manufacturing capacity when it comes to electrolyzers we have in Europe. So it's very broad, it's worth a [REDACTED] year work condensed in 200 pages documents. So it's very extensive, very important.

20:06

L. Pudollek

Yeah, I will look into that.

So, coming back that you already told me that the politicians, they want to do this, the political will is there. So what would you think? Which actors are not on track? Which actors still need to be convinced about the hydrogen technology? And especially I would like to set the focus on the traditional energy companies that are now, I think, making the most money with, exactly, not renewables. What is their role? Do we need them to or are they already focusing on hydrogen as well?

20:48

[REDACTED]

Unfortunately, I guess that you that you gave yourself an answer already as long as fossil fuels will be a compelling business case, companies can just postpone. For instance, I can make you the example of Italy. You have major participated companies that are owning the energy system. Last years they had no interest to have a quick "turn of page" from fossil fuels to hydrogen because the gas prices were skyrocketing, and they were making loads of money. When you look at the hydrogen business case in the short term, it might look as a loss of money. So, they've said, "sure we will commit to this kind of transition, but gradually" From a business perspective it's not even wrong because you risk of throwing money to something that there is not there yet; fossil fuel business case is shooting the last cartouche, which is usually very remunerative.

Replying to your question, sure we need everyone on board from the big companies, for instance a very sheer representation has been given in COP 28 this year. It was a successful one, compared to the previous. Of course, we can always do better, but it's already something, for instance, companies and member states agreed already on certification of hydrogen and on some compelling targets and criteria when it comes to renewables deployment. So that's very good. But the main players of this COP 28 were the largest oil and gas companies, Saudi Aramco, I don't know the Masdar, Sonatrach, Total, BP et cetera. Last year they were not that present at least also because COP was not that well organised and we lacked commitments. We need them because those are the companies that can make a change.

But at the very same time also little and medium/small enterprises are the beating heart of Europe. So we need to make sure that they are on board as well because they are providing a lot of Tier 2 and Tier 3 components for the clean transition to making it possible. So you see the environment that we are within, it's very complex, it's a lot of companies and lot of reasons/interests behind. But I guess that one thing it's clear that at least that fossil fuels will come to an end sooner or later, let's hope as soon as possible but that's clear. Not sure in the following two years but soon also as been mentioned by the IEA so that that fossil fuels have not reached their peak yet but it's coming, it's very close.

25:53

L. Pudollek

Yeah, OK. But for example, BP also applied in a certain project for the IPCEI status. So I think for some companies we see that they also have identified hydrogen maybe as a future technology to make money with when the fossil fuels are over, something like that.

26:15

█  
I sure think, yeah, especially when you can get public money to cover with the possible losses. So because, I mean this is my personal view, I don't think that BP needs any additional money for starting a hydrogen project. But still, they are seeking guarantees. And these guarantees are basically public money because if they use only private money, it could be a complete loss there at the very beginning because the first movers are those that pay the higher stakes, with higher responsibilities. But this you know as we have seen IPCEI process was launched back in 2019 and it's 2023 and still it's not 100% accomplished. I would say around 60%.

27:23

L. Pudollek

OK. I would move on to the next questions. So, how do the projects benefit from the IPCEI status? So what are their motivations in your opinion to apply for the whole process and to become part of this large integrated project?

27:45

█  
First, I would say it's visibility because you have a lot of visibility of being one of the first movers on the hydrogen market. 2nd is the amount of money that we're talking about because it's a lot. Third is the networking opportunities, the possibility of creating an ecosystem. These are perhaps the most important reasons to apply for the IPCEI project and also receiving an "EU seal". I mean it's something, being backed by the EU. It's something that gives you a different level of certainty on the project.

28:50

L. Pudollek

Maybe also a good reputation or some representation, something like that?

28:51

██████████

Exactly!

28:54

L. Pudollek

But the networking interests me more because I didn't find a lot of sources online telling me how the communication works in an integrated project. So are there maybe reports or conferences? How much do the participants really interact with each other?

29:14

██████████

OK, that something that even our association doesn't have access to.

29:22

L. Pudollek

OK, yeah.

29:24

██████████

But this is something that's, the main issue of IPCEI, because it's very ambitious. But of course, when something is very ambitious, it's also very difficult to govern from mere governance perspective, because for instance, for being part of an IPCEI process, you need to have two main (not exhaustive). The first one is a strong degree of innovation and the second one is the networking part, I mean how much your project can be integrated with others, and to other companies and to create some sort of clustering and collaboration et cetera So when you talk about innovation and especially, you're talking about price and competitive edge technologies, the problem is that you're disclosing your competitiveness advantage for instance to others. So that's why it was a very closed door process because it was highly, highly competitive, and classified, because for instance companies are basically trying to get to industrialization prototypes or technologies with a strong degree of innovation. And that's what's actually the IPCEI rationale behind because also the providing public money and the single market perspective changed a lot from 2019 to today. So at that moment, a lot of innovation, collaboration was needed. For instance, today it's not the case anymore.

32:07

L. Pudollek

Yeah.

32:08

██████████

OK, yeah. So because I'm not sure how much of those information actually reach the public, they are improving transparency. Because for instance the conference I participated in was organized over two days. The first day was a more closed-door meeting, so General Assembly when you actually talk about the very problems, something that's not possible to be disclosed for competitiveness issues.

And then the second part, you had an open conference where I was allowed to participate too because I couldn't participate at the General Assembly.

33:25

L. Pudollek

Oh, OK.

33:26

[REDACTED]

For instance, because we're not involved and we are doing the interest of the of the hydrogen industry in general, more than 500 companies. You have also companies that are not our members. So it's impossible for us to participate in such detailed conferences. But yeah, so it's working like that.

So, from a governance perspective, you have the project coordinator that's organizing meetings, internal meetings and I guess they have also key deliverables in order to do some dissemination activities in order to get the money.

34:23

L. Pudollek

Yeah.

34:25

[REDACTED]

But OK, this is done at a project coordinator level, but then also projects will need to do their dissemination. And they are doing that. But I can tell you, because the companies involved are hundreds in the end and it's very difficult to attend hundreds of single conferences, organized by projects all over Europe. You see for instance Ansaldo doing a conference in Greece, another company in another Member State... So it's very difficult to track. But you know that the hydrogen IPCEI has a website?

35:10

L. Pudollek

Yeah.

35:10

[REDACTED]

So, OK, So and it was launched I guess six months ago.

35:15

L. Pudollek

Yeah, it's not that extensive yet.

35:15

[REDACTED]

For instance, not even the chapeau documents, that all the companies of a wave need to agree upon is yet public. You know, just to be delivered to the European Commission, to scrutinize it, to read it through, to approve it and to give the notification away, not the money because the European Commission, is not putting any money in it. So yeah. So that's one thing, and for wave one that the



notification happened already summer last year, we don't have the chapeau documents published on their website, on the DG competition's website because still they are having a look at the nitty gritty because as I was telling you that for the IPCEI the percentage of progress is just 50% or even less because DG competition has notified wave one.

Wave two, I'm assuming that you that you know what I'm talking about.

36:48

L. Pudollek

Yes sure.

36:49

[REDACTED]

Yeah because I don't know what's your level of understanding of competition policy of notification processes.

36:59

L. Pudollek

Yes, I now the compatibility criteria and the application process and so.

37:08

[REDACTED]

I mean you're also doing a master thesis on this. So, I guess that you know that the first two waves have been notified. So we know the participants, we know the funding envelope, the private envelope, the public one, et cetera, the location, et cetera. Good! What we don't know with certainty, it's which member states have already awarded money to those projects.

37:39

L. Pudollek

Oh, OK.

37:40

[REDACTED]

Yes, because for instance an IPCEI wave has a private part. So companies putting money.

37:49

L. Pudollek

Yeah.

37:49

[REDACTED]

And the and the public part coming from the member states, it's not coming from the European Commission. So the European Commission needs to ensure that all member states are on the same page at the same time and that the funding required to make those projects take off is put on the table actually from all the member states involved. But I can tell you that for wave 1 this is not the case. You have member states that have not provided money yet to their projects.

38:28

L. Pudollek  
It's very interesting.

38:29

It's very interesting a very threatening of the whole IPCEI process.

38:37

L. Pudollek  
Yeah, probably.

38:38

Acting this way may make you lose the integration or network criteria because some projects have started already with their own money only. So that's very critical, and risky.

38:54

L. Pudollek  
Yeah, that brings some uncertainty. Ok. Another important point I would like to ask you is, because the European Union frames IPCEI not only as a funding framework but also to give us a lot of spillovers, like they talk about resources and workplaces that are created but also that the knowledge is some somehow shared and then we can all benefit from the innovations or the infrastructure that is built. What do you think of what are the main spillovers from IPCEI?

39:30

I guess that you know perhaps that's one of the best things of IPCEIs because best practices sharing among companies is happening. So a lot of companies talk, so just to exchange best practices et cetera, that is good. But I would say that one of the most important effects is on employment because basically, and it is something that I learned a couple of days ago, that in order to participate to an IPCEI project, you need to ensure that you will hire a certain number of people.

40:24

L. Pudollek  
Oh, OK, so additional people.

40:25

So and this has to be additional, exactly! Only additional, and you need to provide skilling to your own employees that are already working at X facility. This is translated in form of KPIs for projects. So this is very good, but at the very same time very, very challenging because it's very tough to find for instance, 70 or 100 new people.

40:55

L. Pudollek  
Yes, because of the qualification.

41:00

Yes, this is a very young market. So, I'm not sure how many engineers you can find on the EU market or abroad that are able to express, a very effective and efficient level of knowledge on hydrogen technologies.

41:23

L. Pudollek

Yeah. OK.

41:25

But that is good. I mean, overall, the concept behind this is good and companies for these waves are managing to do that. Not sure what will happen in future, for instance, in 2025 when a lot of the projects will actually materialize, not sure whether there will be enough people to do that. So let's study hydrogen in school!

41:54

L. Pudollek

Yeah, I already made the wrong decisions. Another question I would like to ask you, what is your opinion about competition distortion? Because sometimes I saw this criticism on IPCEI that it favors too hard some specific projects and I also read that the other countries like US and China do the same. We have to compete with them. Do you have an opinion on this, is IPCEI distortive or is it distortive but we can live with that? So what do you think?

42:31

This is also a very tough question to answer because I'm not sure, the public support is a lot but also the risks are huge for companies. So companies that have decided to participate in IPCEIs have taken also their huge slice of risk because the market is not there. So I'm not saying that competition in this sense has been distorted because you cannot tell that there's a lot of companies in the hydrogen business. So that's from a mere perspective of the single market of the of the European Union. This was done in complete compliance with the State aid rules. So if you play within the boundaries and if you comply to the rules, I guess it's no problem because also this process has been supervised by DG Competition and DG Growth that are quite conservative, and not very open because, this links to one of the things that I was spelling out before, for instance this concept of competitiveness within the Union.

Lately, this EU paradigm of conservatism in state aid is changing. And you see at the time when IPCEIs were granted etcetera, competition rules were quite strict. Now we are coming into perspective in this kind of international competition with China, with the US, with the inflation reduction Act from the United States, subsidization coming from China taking over the global market et cetera.

The rules on State aid have been softened. But DG competition is not happy. It's not happy with that because it's saying "look the all the framework that we are putting into place for supporting the clean tech manufacturing, the recovery of from the COVID crisis, from the Russian aggression. This is going to be temporary". In fact you have a temporary crisis and transition framework it's called, that's up to 2025 and not beyond. So this is not only economy anymore. This is something political

and also that the State aid framework and competition has to be tweaked also with the necessities of the moment.

So I wouldn't say that the IPCEIs have distorted internal competitions. Currently other competitiveness rules might be distorting the market, but I would say that intervention of the state now in European policy and the economic fabric, it's needed if we want to compete. Still we need to understand and be conscious of the effects that this will have over time, providing enough safeties for the EU economic fabric.

47:03

L. Pudollek  
Yeah, Yeah.

47:04

██████████  
In Europe, prices are rising and it's not only due to energy costs. I mean actually we need more money, and in Europe, we don't have more resources available. So we need to make use of member states resources also to bolster and to push forward some topics for one of those being clean technologies where you can actually compete, as it's going to be the driver of the economy of the future. So it's a very critical moment for Europe. Also in six months, we will have elections and a new mandate for the European Commission and for the European Parliament, of course. So it's a very interesting moment to be alive and to work within.

48:06

L. Pudollek  
Yeah. Thank you! This, was a really elaborate and also diplomatic answer. But yeah, but yeah, that's how it is.

48:16

██████████  
But unfortunately, there's no correct answer. Also if you need to analyze these things from a neutral perspective, from a mere geopolitical perspective, I guess this is the boundaries that we're moving within. It's very tough. Congratulations also on the questions that you're asking me, they are quite difficult.

48:55

L. Pudollek  
OK. I take this as a compliment, thank you.

48:58

██████████  
Yeah, sure you should.

49:01

L. Pudollek  
Also like I don't have any questions left. So, yeah, thank you for your answers. This was really good and I can really work with that.

## TRANSCRIPT INTERVIEW 2

0:0:-6.0 --> 0:1:15.150

Pudollek, L. (Lissy, Student M-ES)

Okay, also genau, ich beschäftige mich ja eben wie gesagt mit diesem IPCEI Tool in meiner Masterarbeit. Was mich halt daran interessiert hat ist, dass ich so diesen Shift total interessant finde, dass eben die Politiker beziehungsweise die EU eben krasse Targets haben und Visionen und Strategien aber irgendwie wenn man sich umschaute, wie weit wir sind, da jetzt noch nicht so viel existiert und sozusagen die Fragestellung meiner Masterarbeit ist dann eben: kann dieses IPCEI Tool neben den ganzen anderen Politikinstrumenten, die es gibt, kann das dazu beitragen, dass wir eben dieses Scale-Up schnell wie möglich schaffen, so, das ist meine Fragestellung. Ich hab viele Dokumente analysiert, es gibt halt nicht wirklich viele Impact Assessments, die öffentlich available sind und deswegen frag ich Leute selber. Das ist sozusagen die Strategie, genau, und da hab ich so n kleinen Interview Guide und ich hab jetzt 6 Experten Interviews und 1 machen wir gleich mit dir, wenn jetzt du irgendwie eine Frage nicht beantworten kannst, dann ist ja auch nicht so schlimm, ist relativ offen gehalten und wenn du den Fokus auf was anderes legen willst, dann kannst du auch zu einem anderen Thema weiter ausführen.

0:1:13.800 --> 0:1:17.380

[REDACTED]

Okay, Mhm klingt gut.

0:1:16.910 --> 0:1:28.670

Pudollek, L. (Lissy, Student M-ES)

Jo, wenn du ready bist, dann würd ich am liebsten erstmal damit starten, dass du mir nochmal eine kurze Info gibst, wie du genau beruflich mit IPCEIs zu tun hast. Also was genau ist da die Connection?

0:1:29.50 --> 0:1:37.100

[REDACTED]

Die Connection ist insofern da, dass ich meine Stelle heißt [REDACTED] [REDACTED] und deswegen ist sozusagen die Connection da. Alle EU-Wasserstoff Themen, die irgendwie so auftauchen. Fördermechanismen sind halt so Dinge, mit denen ich mich beschäftige. Mit IPCEI hab ich mich dann jetzt sozusagen im Zuge von dir das erste Mal so richtig beschäftigt und da so ein bisschen so reinzukommen. Aber genauso. EU-Fördermechanismen ist ein Thema, das ich behandle und IPCEIs gehören eben dazu und das war dann nun eine wunderbare Gelegenheit, sich damit mal zu befassen.

0:2:22.450 --> 0:2:44.440

Pudollek, L. (Lissy, Student M-ES)

OK von dem, was du jetzt aus deiner Arbeit oder Studium oder was auch immer bisher gehört hast: Wie würdest du persönlich sagen, was sind gerade aktuell die größten Hindernisse? Dass da jetzt noch keine Wasserstoffinfrastruktur und kein Markt besteht, also wer oder was behindert uns da?

0:2:45.20 --> 0:5:51.240

[REDACTED]

Das ist eine Riesfrage, mit der wir uns die ganze Zeit beschäftigen. Woran liegt es? Ja, es gibt so viele, es gibt so viele Baustellen gleichzeitig bei dieser ganzen Thematik. Zum einen ist es irgendwie so, dass ich jetzt erst das tatsächlich jetzt erst dieser Shift irgendwie beginnt, bisschen spät vielleicht, aber gut. Und die Unternehmen sich irgendwie jetzt so richtig erst sich damit so konkret befassen, wie sie sich

eigentlich transformieren, würde ich sagen.

Und das Problem ist so ein bisschen jetzt gerade [REDACTED] hat beispielsweise, so ein so ein Markt-Hochlauf-Design-Papier entwickelt und sie sagen, jetzt gerade sind wir in einer Initialphase und brauchen jetzt Leuchtturmprojekte. Und das Ding ist, das ist dieses klassische Henne-Ei-Problem. Es gibt angedeutete Nachfrage und angedeutetes Angebot, aber das passt irgendwie alles noch nicht so richtig zusammen. Weil zu teuer, zu aufwendig und also will halt niemand so den First Move machen. Das finde ich sehr spannend, weil ich kenne das aus dem Studium irgendwie anders. Aus der Uni kenne ich immer den First Mover Advantage, hier wird ständig vom First Mover Disadvantage gesprochen, dass diejenigen, die den ersten Move machen, voll den Nachteil haben, weil sie viel zu hohe Kosten in Investitionen haben, und sich deswegen niemand so richtig bewegen möchte. Es ist natürlich, wenn du das vergleichst, die Preise von Wasserstoff - egal welche Farbe – sind ja viel höher als fossile Energien und das ist der erste Knackpunkt, und der zweite Knackpunkt ist einfach die Infrastruktur. Wir haben da intern schon mit meinen Kollegen sehr viel diskutiert und so wir kommen immer wieder, wenn wir diese Gedankenspiele machen, auf die Infrastruktur zurück. Es gibt halt keine so richtig und das fängt jetzt so an.

Es wurde jetzt vor 2 Wochen oder so wurde der Plan für dieses Wasserstoffkernnetz in Deutschland veröffentlicht das ist ja schon mal so ein erster guter Schritt, um ein leitungsgebundenes Wasserstoffnetz aufzubauen, aber auch das fängt jetzt gerade erst an. Und wenn man zum Beispiel sich so Importgeschichten anguckt. Man möchte Wasserstoff von überall her haben, aber der kann gar nicht hierher kommen.

0:5:54.690 --> 0:5:55.170

Pudollek, L. (Lissy, Student M-ES)  
Stimmt.

0:5:51.250 --> 0:6:17.620

[REDACTED]  
Es gibt einen Wasserstoff Tank auf dieser Welt und Ammoniak wird gehandelt als Derivat sozusagen. Das ist, das wäre ja auch möglich, aber auch das wird in nur sehr lokalem Maßstab gehandelt und auch nicht global durch die Welt geschifft hat natürlich auch ewig viele Nachteile und auch da fehlt die Infrastruktur dafür. Es gibt jetzt die LNG Terminals.

0:6:22.330 --> 0:6:23.150

Pudollek, L. (Lissy, Student M-ES)  
Genau ja.

0:6:19.380 --> 0:6:39.360

[REDACTED]  
Aber die sind nicht für Wasserstoff jetzt gerade, und für mein Empfinden ist das so, das Fundament sozusagen was gelegt werden muss, damit man dieses Henne-Ei-Problem so n bisschen versuchen kann zu beseitigen würde ich sagen.

0:6:38.940 --> 0:7:22.430

Pudollek, L. (Lissy, Student M-ES)

Ja ja, ich glaub das trifft zu. Ich hatte heute Morgen schon anderes Interview mit Hydrogen Europe und der Herr hat so eine ähnliche Antwort gegeben, also Hennen und Eier, das höre ich sehr oft. Ich hätte auch noch ne anknüpfende Frage und zwar was meinst denn du, welche Akteursgruppe muss noch überzeugt werden davon? Weil ich hab das Gefühl, die Politik, die findet das super, aber wenn man jetzt so anguckt, es gibt SMEs, es gibt Startups und es gibt die etablierten Energieunternehmen, die halt auch noch sehr viel Geld mit fossilen Energien machen. Wer ist denn da deiner Meinung nach noch nicht mit im Boot?

0:7:25.800 --> 0:9:10.20

Die sind schon irgendwie alle mit im Boot. Ich glaube, es ist echt so. Das Problem ist: sie verdienen zu viel mit fossiler Energie, das ist so, das würde ich sagen, Sie sind da schon. Auch diese ganzen, was ich jetzt so mitkriege, diese Gasunternehmen sind da schon mit im Boot, die wollen das schon irgendwie mitmachen, aber sie haben halt nicht so den krassen Incentive würde ich sagen, also sie machen schon was, gar keine Frage, und das ist halt auch irre teuer alles. Aber es fehlt ein bisschen die Pistole auf der Brust finde ich immer, in meiner persönlichen Wahrnehmung. Dass das die sich halt so richtig committen und bewegen, dass die Halt so richtig gezwungen sind, auch was zu tun. Die Akteurslandschaft ist natürlich auch ultra vielfältig, auch bei den Unternehmen. Das halt jeder auch da irgendwie noch so ein Stück weit von seinem Kuchen abhaben möchte. Und es ist für einige auch nicht so n richtiger Business Case. Das ist das Ding, gerade wenn man in der Gasinfrastruktur an diejenigen denkt, die nicht die die Ferngasleitungen, sondern eher das dann ins Kleine verteilen, zu uns in die in die in die Häuser und so. Ja, die haben halt vielleicht Schwierigkeiten und die sind auf jeden Fall noch nicht so noch nicht so ganz dabei würde ich sagen.

0:9:10.360 --> 0:9:10.790

Pudollek, L. (Lissy, Student M-ES)

Mhm.

0:9:12.890 --> 0:9:27.890

Und wahrscheinlich auch die Zivilgesellschaft würde ich auch sagen, was, wenn man sich so die aktuellen Debatten um Energiewende und Klimawandel und so anguckt, da gab es schon mal mehr Unterstützung für.

0:9:29.530 --> 0:9:30.290

Pudollek, L. (Lissy, Student M-ES)

Ja, stimmt.

0:9:30.460 --> 0:10:37.790

Und die sind ja irgendwie jetzt auch nicht so richtig dabei, weil du die Leute irgendwie mitnehmen musst, aber sie wollen halt auch nicht, oder? Man will es irgendwie sozial, was sozial verträglich ist, irgendwie nicht das richtige Wort, aber irgendwie so, man will es so ausgestalten, dass es niemandem wehtut. Aber ob das so geht, ist glaube ich die große Frage und irgendwie. Ich persönlich denke nicht, und das muss irgendwie wehtun, weil sonst verändert sich nichts. Und wahrscheinlich ist es die Zivilgesellschaft dann auch noch als zweiter Stakeholder, der irgendwie mehr mitgenommen werden muss, dem irgendwie mehr verklickert werden muss, dass es so nicht weitergeht am Ende des Tages. Auch, dass man ein bisschen langfristiger denken muss und nicht nur auf das Heute gucken, sondern eigentlich auch das Übermorgen und was kostet mich meine Gasheizung denn dann?

0:10:45.330 --> 0:10:45.680

Pudollek, L. (Lissy, Student M-ES)

Ja.

0:10:39.330 --> 0:10:48.540

Und dass es vielleicht nicht so sinnvoll ist, jetzt gerade nochmal eine neue Gasheizung sich einzubauen, was ja viele gemacht haben, ne mit diesem Heizungshammer und diese ganzen super Stichworte die es da gab.

0:10:55.390 --> 0:11:20.430

Pudollek, L. (Lissy, Student M-ES)

Jawoll, ich meine, gut dieses Thema betrifft auch ganz viele Bereiche des alltäglichen Lebens, dieses langfristige Denken. Okay dann würde ich mal weiter gehen, das hatte ich dir auch schon mal angekündigt, mich interessiert auch ein bisschen, warum sich Unternehmen bewerben für den IPCEI Status. Also welche Motivation steht dahinter, da teilzunehmen?

0:11:20.790 --> 0:13:32.650

[REDACTED]

Also ja, grundsätzlich ist es ja einfach so, dass diese Transformationen ultra kostenintensiv sind. Unternehmen haben, wenn sie viel Geld mit fossilen Energien verdienen und ihren Business Case mit irgendwie Wasserstoff, am besten grünem Wasserstoff, aber welche Farbe auch immer, wenn Sie den nicht sehen, wenn sie da kein Szenario haben, dann haben sie irgendeinen Anreiz so riesige Investitionen zu tätigen und dann sind so grundsätzlich so Förderprogramme ja eine nette Maßnahmen sich irgendwie in diese Richtung zu pushen und bei IPCEI ist es ja schon so, dass es unterschiedliche Möglichkeiten gibt, wie diese Förderung dann ausgestaltet werden kann. Je nach ich glaube, je nach Member State ist das unterschiedlich festgelegt. Und genau das ist so ein bisschen das Problem ich würde sagen. Dadurch, das IPCEI auch sehr auf Forschung und Entwicklung einen Schwerpunkt legt, ist es eher halt so dieses Zukunftsorientierte, wenn wir massiv erstmal in irgendwas erforschen müssen, irgendwie mehr oder weniger kleinere Projekte machen, dann ist es ist ja auch das super teuer und das kann das ja eben anreizen, dass man dann irgendwie was zur Marktreife eben bringt. Und grundsätzlich würde ich auch sagen, dass so Förderprogramme einfach auch helfen für Unternehmen sozusagen eine Final Investment Decision herbeizuführen, und das ist ja gerade beim Wasserstoff so ein ultra riesiges Problem, das immer Projekte angekündigt werden überall auf dieser ganzen Welt und die IEA sagt dass 4% davon nur eine Final Investment Decision haben, was halt ein bisschen mau ist und dann muss man irgendwie gucken, ob man staatliche Unterstützung irgendwie liefern kann. Dass diese Entscheidung dann eben doch getroffen wird, dass dieser Business Case nicht mehr ganz so unrealistisch ist, sozusagen.

0:13:33.900 --> 0:14:6.30

Pudollek, L. (Lissy, Student M-ES)

Ja okay, aber glaubst du, dass es von der Teilnahme an IPCEI auch noch andere Spillover gibt, also die EU erklärt ja, es ist irgendwie ein Förderprogramm, aber gleichzeitig wird dann auch noch viel geschrieben von Arbeitsplatzentwicklung und Upscaling und Knowledge Sharing. Siehst du das auch? Weißt du, was man da auch sonst noch von hat als Unternehmen oder auch die Gesellschaft an sich?

0:14:7.450 --> 0:14:53.970

[REDACTED]

Also Unternehmens-Insides hab ich da tatsächlich nicht in diesem Punkt, ich kann es mir schon vorstellen, also gerade so wenn es Projekte sind, die aus unterschiedlichen Member States kommen, klar wird es dann da Knowledge Sharing geben und auch wenn man so an die Arbeitsplätze denkt hat das natürlich auch einen wichtigen Effekt, dass dadurch dann irgendwie Arbeitsplätze transformiert werden. Mitunter kann ich mir auf jeden Fall vorstellen, dass das wichtig ist, aber ich denke, das sind jetzt keine Beweggründe aus einer unternehmerisch-kapitalistischen Sichtweise, die irgendwie dafür sprechen, oder dagegen sprechen sich dafür zu bewerben.

0:15:1.680 --> 0:15:2.190

Pudollek, L. (Lissy, Student M-ES)

Mhm.



0:14:53.980 --> 0:15:8.750

Das ist dann nice to have irgendwie, was dann wahrscheinlich politisch gut verkauft werden kann, wenn das dann der Fall ist. Ich glaube, aus unternehmerischer Sicht ist das eher nicht ganz so wichtig leider.

0:15:9.360 --> 0:15:21.240

Pudollek, L. (Lissy, Student M-ES)

Ja, wahrscheinlich. Aber kannst du so eine Art Networking irgendwie wahrnehmen? Ist da in [REDACTED] irgendwie da die Rede von, dass es wenigstens so ne Art Gruppenformierung oder sowas gibt?

0:15:22.300 --> 0:15:53.600

Ja, also dadurch findet natürlich schon so ein Austausch statt, es gab ja im Oktober glaub ich dieses Joint European Forum on IPCEIs von der Kommission das ist ja genau dafür da, dass dieses Knowledge Sharing und Austausch irgendwie hergestellt wird zwischen den einzelnen Akteuren und zwischen den Unternehmen. Es gab diese Woche im BMWK auch eine Veranstaltung zu IPCEI, da war ich leider nicht.

0:15:51.10 --> 0:15:55.310

Pudollek, L. (Lissy, Student M-ES)

Ja, genau, ich hab's auch versucht aber nee.

0:15:56.910 --> 0:16:59.120

Da wäre ich eigentlich gerne hingegangen, aber dadurch wird das natürlich schon connected. Da gibt es ja unterschiedliche Initiativen, die auch genau das in anderen oder ähnlichen Bereichen mit anderen Merkmalen sozusagen auch versuchen, beispielsweise dieser European Backbone, der ist ja auch genau dafür da, dass das ist sozusagen so eine grenzüberschreitende Versorgungssicherheit beispielsweise hergestellt werden soll. Also sowas gibt es ja schon, das ist irgendwie eher in den europäischen Kreisen auf jeden Fall gedacht und das ist schon immer auf jeden Fall sehr wichtig, dass du nicht nur so ne nationale Brille auf hast, sondern schon das immer alles in einem europäischen Kontext siehst, weil es sonst nicht ganz so gut funktioniert, würde ich sagen auch so mit Blick auf die Vergangenheit von Deutschland ist es so vielleicht ganz gut.

0:17:1.200 --> 0:17:32.200

Pudollek, L. (Lissy, Student M-ES)

Ja ok. Was mich auch noch interessieren würde weißt du irgendwas darüber, wie inwieweit zwischen den Projektteilnehmern Kommunikation besteht? Also ich find ganz schwierig da was raus zum Thema Reporting. Jetzt gab es die erste Konferenz. Aber hast du da eine Ahnung?

0:17:27.720 --> 0:18:6.290

Ich hab auch keine Infos von dieser ersten Konferenz leider was da so besprochen wurde. Ich weiß, dass der Fokus nicht nur auf Wasserstoff lag, sondern auch auf „wie kann ich IPCEI noch in andere Bereiche ausgebaut werden?“. Aber wir haben keine Infos bekommen, was da so geteilt wurde tatsächlich. Das ist ein bisschen schade ehrlich gesagt. Und die Unternehmen lassen sich da auch nicht allzu tief in die Karten blicken. Muss man leider sagen.

0:18:2.210 --> 0:18:11.30

Pudollek, L. (Lissy, Student M-ES)

Ja, das stimmt also, ich hab da ein bisschen mehr darüber gehört in anderen Interviews, ich habe auch noch einen IPCEI-Teilnehmer, also vielleicht solltest du irgendwann mal Masterarbeit lesen ich glaub ich.

0:18:10.410 --> 0:18:11.750

Ja voll, auf jeden Fall.

0:18:13.620 --> 0:18:32.890

Pudollek, L. (Lissy, Student M-ES)

OK dann jetzt mal so noch so 2 generelle Fragen. Zunächst: siehst du irgendwelche Schwachstellen oder hast du Kritik an IPCEI oder hast du von Kritik gehört? Ganz allgemeiner Natur, die Antwort kann alles sein.

0:18:31.630 --> 0:18:33.100

Ja, gibt es.

0:18:54.890 --> 0:18:55.260

Pudollek, L. (Lissy, Student M-ES)

Mhm.

0:18:35.230 --> 0:19:25.670

Die gibt es tatsächlich. Wir haben 4 Punkte, glaub ich entwickelt, die so unsere Kritikpunkte sind, die zielen sehr auf das Bewerbungsverfahren dieser Projekte ab, weil das fängt ja jetzt sozusagen gerade alles erst an. Das erste ist, dass es nicht so richtig klare und transparente Deadlines innerhalb dieses Bewerbungsprozesses wohl gibt oder gegeben hat. Dass Dokumente und Bewerbungen eingereicht werden und dann dauert es eine unbestimmte Zeit, bis die Unternehmen Feedback von der Kommission bekommen, wenn sie denn Feedback bekommen haben.

0:19:38.970 --> 0:19:39.230

Pudollek, L. (Lissy, Student M-ES)

Okay.

0:19:27.10 --> 0:20:21.630

Nach ich schätze jetzt mal 6 - 12 Monaten hatten sie quasi keine Zeit, irgendwelche fehlenden Informationen noch nachzureichen und wenn du nicht mal zwischen Stände hörst, das ist natürlich irgendwie ungünstig. Also wir hatten dann maximal ne Woche oder so ungefähr Zeit auf die darauf zu reagieren und wenn du das halt nicht tust, dann musst du halt schauen, und das ist so ein bisschen schwierig also zum Beispiel im Net Zero Industry Act oder in der neuen RED wird es klarer formuliert, dass solche Deadlines irgendwie transparenter gemacht werden müssen. Das wäre hier irgendwie gut. Das ist bisher wohl nicht der Fall.

0:20:29.490 --> 0:20:29.720

Pudollek, L. (Lissy, Student M-ES)

Ja.

0:20:23.760 --> 0:21:34.190

Dann ist es so, es wird ja auch immer in die Mitgliedstaaten gespiegelt, und davon hängt ja auch irgendwie vieles ab, wie dann so Bewertungs- und Bewerbungsprozesse ablaufen und da ist auch so

ein bisschen die Kritik, dass die Behörden in welchem Nationalstaat auch immer das dann so sein mag, dass teilweise die Verwaltung schlecht vorbereitet ist. Das soll doch bitte sichergestellt sein in den in den entsprechenden Behörden, damit du eben nicht so lange auf Rückmeldungen warten musst, was wohl da manchmal der Fall ist, kann das zu Schwierigkeiten führen. Das Dritte ist, dass nicht immer, und das merke ich tatsächlich jetzt auch gerade bei einem Fall der bei der Hydrogen Bank ist, das genau die gleiche Geschichte, dass in diesem Bewerbungsprozessen nicht so richtig klar ist, was muss denn eigentlich eingereicht werden?

0:21:34.730 --> 0:21:35.640

Pudollek, L. (Lissy, Student M-ES)

Ja, Mhm.

0:21:35.470 --> 0:21:43.930

Welche Dokumente braucht es für eine erfolgreiche Bewerbung? Und nach welchen Kriterien wird dann ausgewählt?

0:21:48.360 --> 0:21:48.630

Pudollek, L. (Lissy, Student M-ES)

Genau.

0:21:45.100 --> 0:22:2.720

Weil daraufhin würdest du deine Bewerbung irgendwie trimmen, das ist so ein bisschen das Problem. Dann gab es innerhalb des Bewerbungsprozesses wohl auch teilweise Parameter, die sich geändert haben.

0:22:8.560 --> 0:22:8.790

Pudollek, L. (Lissy, Student M-ES)

Ja.

0:22:4.160 --> 0:23:26.220

Da gab es die die Funding Gap Analysis, die auf einmal hinzu kam, wohl. Ja, da natürlich mehr Kommunikation und Kohärenz sind wichtig für die Unternehmen, die können natürlich schlecht dann auf einmal auf irgendwas reagieren und es braucht einfach klare Kommunikation. Das ist irgendwie total schwierig. Wenn nicht gefühlt so ne Auflistung, da ist was, was brauchen wir eigentlich, was sollen wir da überhaupt liefern, damit irgendwie das funktioniert? Und das vierte ist, dass die Deadlines für die Projektrealisierung teilweise zu kurz sind und das auch sowas wie die Rückmeldefristen oder sozusagen wenn du keine Rückmeldung hast, das wird darauf angerechnet und das ist natürlich auch ungünstig, wenn du dann Ewigkeiten auf Förderbescheide und Rückmeldung wartest und dann auf einmal ja in deinem anvisierten Projekt ein Jahr weniger Zeit hast und um das dann zu realisieren und du musst ja realisieren, damit du noch auf diese Förderung komplett bekommst.

0:23:29.940 --> 0:23:30.460

Pudollek, L. (Lissy, Student M-ES)

Mhm.

0:23:28.540 --> 0:23:54.640

Genau das ist so ein Punkt und gleichzeitig ist auch so, dass wenn man Projekte zusammen einreicht,

aus unterschiedlichen Mitgliedstaaten, dann sollten die auch zusammen entschieden werden und nicht irgendwie gesplittet nach Mitgliedstaat. Also die Kommission müsste es zusammen entscheiden und nicht

0:23:56.220 --> 0:24:33.190

Pudollek, L. (Lissy, Student M-ES)

Ah ja, das ist auch interessant, also das hast du vorher gesagt hast. Das deckt sich sehr, was ich gefunden habe, es gab 2021 eine public consultation von der EU. Da hab ich mir mal die Mühe gemacht, jetzt für die Masterarbeit eine selektierte Auswahl von 40 Antworten dazu zu analysieren und da ist sehr viel Kohärenz mit dem was du schon gesagt hast, viel Bürokratie, keine Guidelines, keine Best Practice ist was überhaupt in den Antrag gehört und ja kommt mir sehr bekannt vor.

0:24:29.500 --> 0:25:32.50

Ja, genau und das letzte ist irgendwie wohl so, dass die Nationalstaaten das dann selber entscheiden, die haben natürlich auch ihren unterschiedlichen Speed in den Genehmigungsprozessen, da haben wir das dann wieder, was ich vorher schon gesagt hab, ungünstig auf jeden Fall und das ist so ein bisschen ein Kommunikationsdefizit. Zum Beispiel bei der Hydrogen Bank fällt mir das jetzt ein, da gibt es gerade die erste Pilotausschreibung für Wasserstoffproduktion für grünen Wasserstoff in der EU. Und auch da sind total viele Fragen offen und keiner kann sie beantworten. Und die Kommission beantwortet sie auch nicht. Und wenn man konkret nachfragt bei der Kommission, dann kriegt man nur das zurück, was sie auch schon aufgeschrieben haben und das ist so mittel super.

0:25:33.270 --> 0:25:36.820

Pudollek, L. (Lissy, Student M-ES)

Ach krass okay, das hätte ich nicht gedacht, das ist ja ungünstig.

0:25:34.250 --> 0:26:32.120

Das ist so, dass da häufig... geht es um die Formulierung von Fördermitteln, weil das staatliche Beihilferecht und ist ja auch kompliziert, wenn du Förderung hast, darfst du nicht anderes bekommen und was weiß ich. Und dann werden also werden teilweise Ausnahmen definiert, aber sie werden nicht so richtig klar definiert, das ist dann so ein schwammiges Kriterium, keiner kann dir so richtig sagen was dann da darunterfällt, ob du das dann umformulieren darfst oder eben nicht. Das ist ein bisschen schwierig leider.

0:26:23.600 --> 0:27:5.630

Pudollek, L. (Lissy, Student M-ES)

Ja, glaube ich. OK, dann bin ich auch schon bei meiner letzten Frage, die ist jetzt vielleicht ein bisschen größer gestellt. Und zwar wird manchmal dieses IPCEI-Thema auch mit Wettbewerbsverzerrungen diskutiert, also manche Artikel sagen „picking winners“, wir selektieren ja irgendwelche Projekte und bewerfen die mit Geld, hindert das vielleicht den freien Wettbewerb würde man vielleicht anders mit weniger eingreifenden staatlichen Mitteln das Innovationsklima auch anders fördern können? Ob [REDACTED] oder bei dir persönlich, hast du dazu ne Meinung?

0:27:8.160 --> 0:27:53.400

Ja, ich würde sagen schon. Also ich würde nicht sagen, dass das innovationsfeindlich ist. Also ich verstehe total den Punkt dieses Picking Winners. Da kann ich mir vorstellen, dass das häufiger der Fall ist, dass sozusagen die Großen diese Förderung bekommen, weil sie auch einfach die Kapazitäten haben, für sowas Projekte zu entwickeln, sich durch solche Bewerbungsprozesse und so zu schlagen, das kann ich mir grundsätzlich schon vorstellen, dass das so ist.

0:27:58.150 --> 0:27:58.390

Pudollek, L. (Lissy, Student M-ES)

Ja.

0:27:55.330 --> 0:28:8.820

Das Problem ist ja hier aber beim Wasserstoff, es gibt ja keinen Markt, wir sind hier ganz am Anfang und wir beschäftigen uns ja noch nicht einmal mit Ramp ups, soweit sind wir ja noch gar nicht. Wir müssen erste Leuchttürme setzen, um zu zeigen, es funktioniert, und das kriegst du ja ohne Projekte wie IPCEI nicht hin.

0:28:58.700 --> 0:28:59.140

Pudollek, L. (Lissy, Student M-ES)

Ja.

0:28:21.570 --> 0:30:52.90

Einmal einfach, weil der weil der Incentive nicht gegeben ist und gleichzeitig würde ich auch sagen, dass es das schon auch braucht, weil es ja für die Unternehmen, durch das Pariser Abkommen und so irgendwie einigermaßen klare Vorgaben geben sollte, die man vielleicht einhalten und dann, irgendwie braucht es eben staatliche Unterstützung dafür, dass man das auch zumindest versucht anzugehen, würde ich sagen. Also es ist halt echt so bei dieser ganzen Wasserstoff-Geschichte. Man kann, man kann einfach den Staat als Akteur der Pilotprojekte gar nicht rauslassen und sagen, der Markt regelt das und sorgt für die Innovationen, dass wir nur noch grünen Wasserstoff haben, weil das ist ja de facto, den gibt es ja gar nicht, also in signifikanten Mengen, also es gibt grauen Wasserstoff, genauso gibt es kleine Pilotprojekte für das alles, aber mehr ja nicht. Es gibt den ja nicht in einer signifikanten Menge, weil es einfach viel zu teuer ist und weil einfach die Gegebenheiten für fossile Energien noch zu günstig sind, dass der Markt sich da alleine hin bewegt sozusagen. Und dann brauch es natürlich unterschiedliche staatliche Maßnahmen, würde ich sagen, dass du den Markt und die Akteure dahin bewegst. Und Förderprogramme sind halt ein essentieller Bestandteil davon. Das sind dann schon wieder sehr marktorientiert Preise könnte man sagen, indem man Preise für Co 2 oder sowas erhöht, könnte man den Markt bewegen, wenn man das täte aber es ist immer so ein Zusammenspiel würde ich sagen aus diesen unterschiedlichen Akteuren. Unternehmen sind am Ende sehr kapitalistisch gewinnorientiert. Das ist ja im Grunde der Unternehmenszweck, also Gewinnmaximierung und nicht irgendwelche anderen Sachen und deswegen ist es schon so, dass man dann die Basis dafür legen muss, dass sie auch ein Business Case von mir aus bekommen und ohne sowas geht es nicht.

0:30:53.420 --> 0:31:8.470

Pudollek, L. (Lissy, Student M-ES)

Ja, klingt gut. Vor allen Dingen liest man dann halt auch in Diskussionen sehr oft, das ja so die größten Konkurrenten, also USA und China, eben auch massive staatliche Beihilfen leisten. Und wenn man da irgendwie global mithalten möchte, muss man irgendwie auch mitmachen.

0:31:7.410 --> 0:32:17.650

Ja klar, gutes Stichwort eigentlich, ne IRA ist so ein massives Instrument, auch da wird sehr viel Geld wahrscheinlich rauf geschmissen und irgendwie glaube ich, angebotsseitig wird es gemacht bei Wasserstoff mit Tax Credits. Und dann musst du natürlich irgendetwas entgegensetzen, als globaler Player der Europäische Union. Sonst wandern ja deine ganzen Unternehmen ab, das willst du ja auch irgendwie nicht. Und man versucht das hier schon immer sehr, ich würde sagen, sehr ausgewogen zu

machen, dass man sowohl angebotsseitige, aber als auch nachfrageseitige Förderung und Mechanismen eben etabliert, und dann hast du natürlich super viele Stakeholder, das macht es super kompliziert. Aber man muss dem natürlich irgendwas entgegensetzen und irgendwie dafür sorgen, dass man auch irgendwie zukünftig noch wettbewerbsfähig ist, sonst ja, mhm.

0:32:12.500 --> 0:32:54.410

Pudollek, L. (Lissy, Student M-ES)

Ja ja, also ich muss sagen, das ist jetzt auch das Bild, was ich irgendwie immer klar bei mir jetzt durch die Interviews und durch die Dokumente ergibt. Das ist irgendwie total schwierig. Einerseits sagt man eben, man will jetzt nicht so krass in den Markt eingreifen und hier irgendwie Ungleichheiten erzeugen und deswegen hat die EU das so ausgestaltet, dass dann mindestens 4 Mitgliedstaaten beteiligt sind und so weiter und so fort, und dann liest man aber dann tatsächlich schon wieder Kritik von Unternehmen, die sagen „ja aber jetzt ist es zu streng geordnet und jetzt haben wir zu viel Administration“ und ich glaub das ist schwierig da so an also ein Trade off zu machen.

0:32:45.750 --> 0:34:3.20

Mhm, das ist total schwierig, da irgendwie so eine richtige Balance zu finden, aber was ich gesagt habe, wie will man in einem Markt eingreifen, den noch nicht so richtig gibt? Den muss man erstmal irgendwie bilden und [REDACTED], die setzen sich grundsätzlich immer sehr dafür ein. Die sind immer technologieoffen, weil das ja [REDACTED] Energiewirtschaft repräsentiert von-bis ist irgendwie alles dabei, deswegen musst du dann relativ offen und technologieoffen am Ende sein. Sie wollen schon auch immer sehr marktbasierend, oder haben ein sehr marktbasierendes Wettbewerbsbild, sag ich mal, aber sagen halt auch beim Wasserstoff beispielsweise, das ist genau das, wo wir hinwollen. Ab den 2040ern im Idealfall, dass wir da sozusagen einen eingeschwungenen Wasserstoffmarkt haben, aber vorher braucht es enge Begleitung, sonst kommen wir da nicht hin.

0:34:4.380 --> 0:34:4.630

Pudollek, L. (Lissy, Student M-ES)

Ja.

0:34:6.520 --> 0:34:13.910

Pudollek, L. (Lissy, Student M-ES)

Cool hast du sonst noch irgendwelche Punkte, die wo du sagst „dazu wollte ich noch was sagen“ oder sowas?

0:34:15.150 --> 0:34:19.760

Mhm. Nee, ich glaube nicht. Ich überleg grad nochmal... nee.

### TRANSCRIPT INTERVIEW 3

0:0:33.340 --> 0:0:44.980

Pudollek, L. (Lissy, Student M-ES)

OK, so to begin with, maybe you could tell me a little bit more about your professional connection to hydrogen. So, what are you working with? What are you involved in?

0:0:47.90 --> 0:3:26.760

So my background is both chemical and mechanical engineering. I did my bachelors and master's in chemical engineering and then I did my PhD in mechanical engineering. So of course, you know hydrogen, because even in middle school, there is this technique to split water. So when you look at the periodic table, it's the first one, but when I did my masters in [REDACTED], my Master's topic was hydrogen storage with metal hydrides. So, for the sake of risking my age here, I would say it's 16 years ago. I started working on modeling and experimental studies 16 years ago. So I have around 16 years of experience. For my PhD, I developed a system and I also did some optimization modeling studies on integrated systems, so not just to produce hydrogen, but also to produce electricity, heat, different products at the same time from a single source to reduce system utilization and effectiveness. And then I did my PhD in [REDACTED], so after spending five years in [REDACTED], five years in [REDACTED] in that community, I moved back to [REDACTED], which is my hometown. And I worked at the university there for a couple of years, and after that I came to [REDACTED] and started working at the engineering technology faculty of [REDACTED].

Here, my question is more also including like a simple question of what's the role of hydrogen in energy transition? Of course, it's very general and broad. What I use is the tools of like thermodynamics, technoeconomic analysis on integrated systems to find optimal solutions for the role of hydrogen. So in some cases, hydrogen might have no role at all, and might just be an energy storage. Some might be fuel, carrier, time, investigating them in existing and new systems. I guess it's in a nutshell enough, OK.

0:3:25.970 --> 0:3:50.500

Pudollek, L. (Lissy, Student M-ES)

Yeah, it is OK. And what would you say, because you're now more focusing on the general role of hydrogen in the transition, do we need actually innovation or is the technology already existing? Is it already there and we just have no market? How is the current state of the art of hydrogen technology?

0:3:50.410 --> 0:7:29.350

We definitely need innovation. First step is we need to make green hydrogen. For hydrogen you need two sources: one is an energy source, two is a material source. So hydrogen is a molecule that is unfortunately, even it is the most common element in the universe. You never see it alone, so it's in different chemical components with different elements, so it's water, it's you and me, it's biomass. It's fossil fuels. It's everything. So we need the material source, we need to apply the energy to the material source and take the hydrogen part. Both the material source and the energy source should be renewable replenishable, so we don't use out our sources and at some point, is a normal resource to it's not the point. But also we need to do that in responsible manners so that we do not harm the environment or we do not harm health, we need to consider things. So just for the sake of an absolute example, I would say if a source is renewable, they say it's replenished all the time, but using it creates enormous amount of damage to the environment then that's not good. Renewable is not essentially good. So it's been a bit of, the by the means of like, how do we do that? Where do we get

that from? Are we risking the future generations? Are we risking today's environment? Are we risking health, so we need to consider everything. So these criteria are very tough. None of these criteria were applied to fossil fuel industry. So now we're facing an industry that is very well optimized, you know working seamlessly and integrated into the infrastructure. Everything is built for them, so they're really efficient. They're very cheap, everything, so that's the status quo. So, first of all, this, renewable electricity, renewable hydrogen or whatever you say, still needs to be cost-competitive. Apart from efficiency, also we need infrastructure. We need systems that are resilient.

Umm, both batteries or any hydrogen production storage, use, we have material degradation issues. We create a lot of waste actually because of membranes and catalysts. Same with the batteries too, so we need to also find ways to make these systems more resilient to produce less waste. Maybe make them more circular, so we definitely need innovation in terms of materials science. That's one point. We also need to somehow revolutionize the infrastructure too, because we're talking about big change. Yeah, any transition is actually hard. And yeah, we need anything, any innovation to accelerate.

0:7:28.760 --> 0:8:16.850

Pudollek, L. (Lissy, Student M-ES)

Now, yeah, the term that is used very often in the literature is the chicken and the egg problem that there's no demand, no so supply. And also, the technology is not ready maybe to be commercialized in the large scale probably. So, what would you say is currently needed for building up?

What the European Union intends to do is building up a European hydrogen economy with infrastructure, with connecting all the facilities. What is the main obstacle for implementing this? Is it, for example, political will that is not there or is it just the technological readiness? What is hindering us from this?

0:8:18.860 --> 0:8:19.150

[REDACTED]

Umm.

0:8:16.860 --> 0:8:19.940

Pudollek, L. (Lissy, Student M-ES)

Because like you are working in this field for 16 years.

0:8:21.250 --> 0:8:34.790

[REDACTED]

The first thing is I think there's a lot of misunderstanding and confusion about what we are talking about. I always have this slide showing the headlines from Guardian.

0:8:35.460 --> 0:8:35.630

Pudollek, L. (Lissy, Student M-ES)

Yeah.

0:8:36.470 --> 0:9:53.640

[REDACTED]

One saying that Hydrogen is like the key, the other one saying hydrogen is as bad as nuclear, which is, to me, the epiphany of scientific illiteracy. Because how can you compare hydrogen to nuclear? One is an energy source, the other one is an energy carrier. It's like electricity and hydrogen. You need to produce some sources in different ways, so whether these energy carriers are good or bad depends on where you get them from and how you get them.

I'm always like boiling my blood reading, seeing that headlines, but I show it because, I'm sharing a lot of things on LinkedIn too, you know, news, not just like promoting my work, but also what's



happening outside. And it's always like this, people who think batteries will take over, as if I say something against batteries. The other confusion is, hydrogen is an energy carrier. End users need heat and electricity. Period.

0:9:54.940 --> 0:9:55.120

Pudollek, L. (Lissy, Student M-ES)

Yeah.

0:9:54.90 --> 0:11:49.130

[REDACTED]

Hydrogen is not going to replace electricity. And another confusion is, it doesn't make sense to convert this to electricity, electricity to hydrogen, hydrogen back to electricity. The point is not efficiency. The point is not cost only. We're looking at sources that are very fluctuating. We are looking at geographical varieties. We're looking at the need for seasonal energy storage, long-term, large-scale energy storage and also possibly transporting energy over long distances. And with electricity, it is really difficult. But hydrogen has advantages over that. I personally haven't seen any study comparing storage efficiency based on the storage duration for instance, or you know what is the cost of seasonal storage per amount of energy or what's the seasonal efficiency? We don't see that. Umm, so it's not that hydrogen is going to replace batteries. It's not the question, like, it's: how can these systems complement each other?

Because these two do not fight against each other, there's a common "enemy", which is the climate change and the root cause of the climate change is the greenhouse gas emissions. So the question should be: how do we combat that? So I think the scientific business polarization on that is very threatening. On top of that, there's always like... we see right wing on the rise.

0:11:50.850 --> 0:11:50.980

Pudollek, L. (Lissy, Student M-ES)

Yeah.

0:11:49.140 --> 0:13:45.650

[REDACTED]

We see this *being against* signs all on the rise, so it's also a challenge. So these are societal things. Umm, I personally think infrastructure is one of the most important. We all have high speed Internet at home because there were fiber optic cables coming to our home. Otherwise, it doesn't matter how much I want it. You know, all society might want high speed Internet, but it's not happening. So I really like the aspect of infrastructure being highlighted, that's important. Well, that's no no brainer. All the incentives going to cleaner, more responsible technologies. And again, right now, I find it funny because, why there's an attack? But it's kind of like these solutions fight for the same funding, but it should be clarified that we're in this together.

And as you said, it's a chicken and egg problem. If we aim for the best perfect, then we're going to miss the good. So we should start enhancing, we should maybe start with some steps and then reiterate then we just enhance our approach. So, the other thing is that, because it's like parallelizing us, I could say yeah, "but batteries use minerals." So, there's mining and it impacts the environment. Yeah, but hydrogen uses water. Yeah, but who are we hacking right now? We're penalizing all the progress, so the fossil fuel companies just operate.

0:13:47.390 --> 0:14:36.900

Pudollek, L. (Lissy, Student M-ES)

Yeah. And nobody stopping them. Nobody is correcting them. So OK, now I get a better understanding that we really need a large network at so many levels with so many technologies and

energy carriers and energy and producing facilities working together. And would you say that R&D institutions like companies or universities can do this alone or would you say governments need to support them in a regulatory or also in a financial way or can the market create this on its own?

0:14:39.320 --> 0:15:27.910

It's a challenging question because for me that's not my expertise. You know, it's not like I am an expert in financial governance. But to me, the capital or the incentive should move towards creating solutions or at least enhancing and the performance of the solutions We need that. Well, one thing is governments can ensure, that there is support, but not just financial but infrastructure and everything. It's just, this research is supported.

0:15:27.140 --> 0:15:30.580

Pudollek, L. (Lissy, Student M-ES)

OK, so the conditions or the framework, yeah.

0:15:30.280 --> 0:15:34.580

Yeah. And for the companies? Uh, it is important that they're willing to change.

0:15:35.280 --> 0:15:35.560

Pudollek, L. (Lissy, Student M-ES)

Umm.

0:15:35.960 --> 0:16:28.640

It is important to that they're willing to pay for the change. I still have like questions like yeah, "but it financially doesn't make sense". I just want to do the biggest face palm because we're not like trying to maximize your profit by minimizing your costs. I'm not talking about renewing your iPhone to get the latest model anymore. That's not that. It's just we have to do this change. Do you remember that we have climate change, we have climate crisis. We need to act now. And you're telling me it's not cheap? Yes, it is not cheap, but what would be the cost of, let's say having half of the Netherlands underwater?

0:16:30.400 --> 0:16:31.560

Pudollek, L. (Lissy, Student M-ES)

Yeah, probably larger.

0:16:30.840 --> 0:17:4.340

What would be the cost of having another wave of climate refugees? What would it cost that we have a lot of sick people due to heat waves? What would be the cost of collapsing entire ecosystems, or just? I don't know, all these species going extinct. There are so many things not even considered in economic evaluations.

0:17:5.250 --> 0:17:5.430

Pudollek, L. (Lissy, Student M-ES)

Yeah.

0:17:5.730 --> 0:17:8.590

What's the cost of being a species going extinct?

0:17:10.670 --> 0:17:23.900

Pudollek, L. (Lissy, Student M-ES)

Yeah, it's difficult to calculate, but probably with worse consequences for us, with expensive externalities.

0:17:22.140 --> 0:17:28.40

[REDACTED]

It's not considered at all. And yet I need to prove companies that this makes financial sense.

0:17:29.960 --> 0:18:8.390

Pudollek, L. (Lissy, Student M-ES)

Yeah. True. And so would you say, which group of actors must still be convinced about renewable energies or hydrogen? What is, for example, the role of the traditional energy companies that we are seeing? Are they on track? Because what I see is that they are still remaining in fossil fuels, but they are also now shifting some R&D also on renewables. They are like, what I observe is that they are a little bit diversifying their portfolio. Would you see that too?

0:18:9.470 --> 0:20:22.150

[REDACTED]

There are definitely hesitant. They're definitely using, you know, like kind of tipping their toes, but also they're on this cautious part, I would say. And personally, I wouldn't be bothered if my research is supported by a fossil fuel company if they are willing to change. Because of course you're going to pay for it. Look at us. We're here for you. So it doesn't matter the cause, I'm not like taking any advertisement or anything. You know, I'm not an influencer, so if I mentioned the companies name, it's not going to be anything.

But: all these big oil companies, dude, we know what you did. This is dirty money, but they need money. So you're going to pay for this change and you're going to show us the concrete steps. With key performance indicators and everything. What you did, you're going to show us the proof.

Yeah, changing your operation, you're not going to blah, blah, blah, blah. It's not like that because you know all these companies. Umm, that's how oil works. There are gas stations across and they're also trying to give us, like the delicious sandwiches or coffee. They listen to the consumers. They do a lot for attracting the consumer. And at some point they will be forced to change because that's where the money is.

So if governments would make it very clear that these are the incentives going, but also there's a follow up. What did you do with that money? What did you change over the last year or over the six years? Was your phase out plan and what you do to follow?

0:20:24.810 --> 0:20:25.30

Pudollek, L. (Lissy, Student M-ES)

Yeah.

0:20:22.200 --> 0:21:30.440

[REDACTED]

Otherwise, it's Paris agreement. And I have nothing against Paris Agreement, but you learn conducting more, or anything like that. So but it's still happening. Every country, they declare their own target. First of all, you say that and there's no follow up if you don't follow this. So that's a very challenging thing because it's international law. And yeah, I mean, this is the most challenging part because technically we can get you there.

0:21:32.240 --> 0:21:46.50

Pudollek, L. (Lissy, Student M-ES)

OK, so the technology is there, but it needs several actors working together to, yeah, realize it, right?

0:21:43.670 --> 0:22:35.10

Yeah, we got to pay for the concrete steps and again for some... some would say "Don't get the fossil fuel money", but I'm like, why wouldn't I get the fossil fuel money? That's one thing. If I do research to help them operate the way it is, without reducing their emissions or diverting from fossil fuels, then that's a different story. But if we are developing strategies for circularity, for their waste reduction, greenhouse gas reduction. If we're taking concrete steps with them. Then what's the problem? Because we also should think about this, then it could be a class issue.

0:22:35.880 --> 0:22:36.60

Pudollek, L. (Lissy, Student M-ES)

Yeah.

0:22:35.20 --> 0:23:21.660

You know, because it's easier, might be easier for me to say that I only use renewable electricity in my home. But how can I say this to a poor person? So, we need to know that we need heat, we need to get from point A to B. We need a certain lifestyle and discussing if we need this lifestyle is a philosophical thing, and that's outside. But I know as an engineer I cannot recommend people to go back to hunting and gathering and living in caves.

0:23:22.130 --> 0:23:22.770

Pudollek, L. (Lissy, Student M-ES)

No. Yeah.

0:23:22.340 --> 0:23:58.410

So we need energy. And I can't tell anyone stop burning gas in your home. What are they going to do in the winter? Are they going to freeze? I cannot say to a single mom: Hey, don't you use single plastics. We have to be considering these two. So for me, maybe it's because it's the furthest away from my profession, the challenges are in governance, finance and social aspects. These are the challenges because for me, I don't know how to tackle that.

0:24:0.0 --> 0:24:6.690

Pudollek, L. (Lissy, Student M-ES)

Umm yeah, but your expertise in another field in which for example I have no idea about. I think we need good, motivated people everywhere to realize this.

0:24:45.540 --> 0:24:45.780

Hmm yes.

**TRANSCRIPT INTERVIEW 4**

0:0:16.233 --> 0:1:2.163

Pudollek, L. (Lissy, Student M-ES)

Yes OK, nu hebben we ook een opname en een Nederlands transcriptie. Mijn eerste vraag is of u zich kunt een beetje voorstellen, dus kort doorgeven wat de connectie van de werk is met IPCEI en ook met waterstof in het algemeen. Gewoon in een korte introductie.

[REDACTED]

0:2:13.813 --> 0:2:34.283

Pudollek, L. (Lissy, Student M-ES)

Ja precies, bedankt. Dat is eigenlijk al genoeg. Ik wilde voor mijn scriptie ook duidelijk maken waar de expertise vandaan komt, hoe de connecties zijn. En volgens u, wat zijn momenteel der belangrijkste obstakels voor waterstof innovaties in Europa?

[REDACTED]

0:4:3.13 --> 0:4:3.273

Pudollek, L. (Lissy, Student M-ES)

Ja.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[Redacted]

0:7:27.673 --> 0:8:5.763

Pudollek, L. (Lissy, Student M-ES)

[Redacted]

[Redacted] Welke groep van belanghebbenden moet volgens u nog overtuigd worden van waterstof? En nog een aansluitende vraag is, welke rol spelen de traditionele energiebedrijven? Dus is waterstof voor hun meer competitie of doen zij ook mee? Wat is daar de indruk?

[Redacted]

0:8:20.703 --> 0:8:21.13

Pudollek, L. (Lissy, Student M-ES)

Ja.

[Redacted]

[Redacted]

[Redacted]

0:9:9.413 --> 0:9:24.793

Pudollek, L. (Lissy, Student M-ES)

Maar is uw indruk dat politieke mensen daar al goed op de pad zijn? Of zijn ze niet daarvan overtuigd?

[Redacted]

0:9:51.323 --> 0:9:51.693

Pudollek, L. (Lissy, Student M-ES)

Ja.

[Redacted]

[Redacted]

0:10:3.783 --> 0:10:17.503

Pudollek, L. (Lissy, Student M-ES)

OK goed. Dan ga ik naar de volgende vraag. Waarom heeft het bedrijf voor het IPCEI-status aangevraagd? Welke voordelen hoopte het te behalen van de deelname?

[Redacted]

[Redacted]

[Redacted]

[Redacted]

0:13:34.853 --> 0:14:20.483

Pudollek, L. (Lissy, Student M-ES)



Oké. Ja dan ga ik nog verder naar de volgende vraag, want die sluit een beetje aan. [REDACTED]

[REDACTED]

[REDACTED] Hoe is de communicatie binnen IPCEI? Binnen de deelnemers, zijn er conferenties of rapportages, wat wordt met de Europese Unie gedeeld, wat wordt ook met de andere deelnemers gedeeld?

[REDACTED]

0:14:41.13 --> 0:14:41.293

Pudollek, L. (Lissy, Student M-ES)

Ja.

[REDACTED]

[REDACTED]

0:15:25.703 --> 0:15:49.173

Pudollek, L. (Lissy, Student M-ES)

[REDACTED] En, kunnen we zo een soort van groepsvorming waarnemen? Is een IPCEI voor een onderneming ook een soort netwerking, of doet daar iedereen zijn eigen ding?

[REDACTED]

0:16:38.363 --> 0:16:56.873

Pudollek, L. (Lissy, Student M-ES)

Oké, Dat is interessant. En welke soort van spillovers kunnen wij van IPCEI verwachten? De Europese Unie geeft veel aan met knowledge sharing en dat ook werkplaatsen worden gevormd. Maar volgens u: wat voor spillovers zijn er?

[Redacted]

[Redacted]

0:17:47.63 --> 0:17:47.513  
Pudollek, L. (Lissy, Student M-ES)  
Ja.

[Redacted]

0:18:4.593 --> 0:18:5.93  
Pudollek, L. (Lissy, Student M-ES)  
Oké.

[Redacted]

[Redacted]

0:18:54.693 --> 0:19:1.843  
Pudollek, L. (Lissy, Student M-ES)  
OK ja, dus verschillende spillovers op verschillende tijdpunten.

[Redacted]

[Redacted text block]

0:19:31.253 --> 0:19:42.913

Pudollek, L. (Lissy, Student M-ES)

Dank je, ja, dan heb ik nog een meer algemene vraag. Welke zwakke punten ziet u in het beleid van IPCEI? En het kan van alle soorten zijn.

[Redacted text block]

0:20:10.823 --> 0:20:11.243

Pudollek, L. (Lissy, Student M-ES)

Ja.

[Redacted text block]

0:20:47.583 --> 0:21:2.253

Pudollek, L. (Lissy, Student M-ES)

Ja, dat is een soort van kritiek, die lees ik ook overal, die is openbaar. Dat is ook een kritiek die van vele verschillende deelnemers komt.

[Redacted text block]

[Redacted]

[Redacted]

[Redacted]

0:23:48.873 --> 0:24:25.413

Pudollek, L. (Lissy, Student M-ES)

[Redacted]

[Redacted] Oké, dan heb ik nog de laatste vraag. Ik heb soms zo een kritiek over IPCEI gelezen dat het ook te doen heeft met concurrentievervalsing, omdat sommige projecten funding krijgen en andere niet. Wat denk u erover?

[Redacted]

0:25:25.103 --> 0:25:26.213

Pudollek, L. (Lissy, Student M-ES)

Oké ja.

[Redacted]

0:25:48.313 --> 0:26:14.843

Pudollek, L. (Lissy, Student M-ES)

[Redacted] Ja, dat zijn alle vragen geweest en ik denk dat de antwoorden me ook echt verder helpen voor mijn scriptie. Heeft u nog vragen aan me?

[REDACTED]

[REDACTED]

[REDACTED]

0:26:40.533 --> 0:26:40.923  
Pudollek, L. (Lissy, Student M-ES)  
Ja.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

0:27:23.653 --> 0:27:24.53  
Pudollek, L. (Lissy, Student M-ES)  
Ja.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

0:28:23.253 --> 0:28:32.573

Pudollek, L. (Lissy, Student M-ES)

Ja oké, dus ik, ik zou het hier afsluiten. Ik ga hem ook even de record stoppen.

## TRANSCRIPT INTERVIEW 5

0:1:31.702 --> 0:1:38.462

Ja genau, aber na gut, sie dürfen starten.

0:1:36.872 --> 0:1:59.302

Pudollek, L. (Lissy, Student M-ES)

Ok genau also so zum Anfang würde ich Sie gerne mal bitten, reicht auch für [REDACTED], Ihre Verbindung zu Wasserstoff zu erklären. Was ist also die berufliche Verbindung zu den IPCEI-Wasserstoffprojekten? Kurz erläutern wo ist da also, wie sind sie da in dem Bereich unterwegs?

0:1:59.952 --> 0:4:41.22

Mhm sehr gerne also erstens: [REDACTED]

[REDACTED] wir sind von BMDV beauftragt, mit verschiedenen Förderprogrammen Projekte umzusetzen oder Konzepte umzusetzen für klimafreundliche alternative Antriebe im Verkehr für alles. Also von Schiff, Flugzeug über Autos, über LKWs über alles machen wir, und ursprünglich gegründet, um Wasserstoff- und Brennstoffzellen-, so steht noch in unserem Namen, -Technologien zu fördern und im Zuge dieses IPCEIs, der ausgerufen wurde, hat [REDACTED] auch den Auftrag bekommen, diese IPCEI Projekte für das Verkehrsministerium, also mit dem Verkehrsanteil, zu koordinieren und zu unterstützen und umzusetzen. Genau das machen wir, und deswegen sind wir damit sehr tief verbandelt.

Tatsächlich, mittlerweile hab ich das Thema abgegeben, gerade mit einem Bumerang wieder bekommen, aber ich hab tatsächlich die ersten Stunden betreut, das allererste Jahr tatsächlich mit der Ausschreibung also die Auslobungsunterlagen zu erstellen. Im BMWK wurde das ja gemacht, mit Anteilen des BMDVs. Da war ich in der Schnittstelle in den Unterlagen. Wir haben alle Skizzen gelesen, bewertet, alle Projektanträge gelesen und bewertet mit [REDACTED] zusammen. Das hier ist eine besondere Konstellation, da wir hier in dem 4 Augen Prinzip arbeiten, mit [REDACTED], zusammen, das heißt 50/50. Wir bewerten den Inhalt, die Wirtschaftlichkeitsprüfung liegt beim [REDACTED]. Das ist der Projektträger, der das umsetzt. Im Rahmen des NIPs, des nationalen Innovationsprogramm für Wasserstoff und Brennstoffzellentechnologie, genau haben wir hier diese Beauftragung gekriegt, haben das koordiniert, haben die Bewertung gemacht haben Projekte empfohlen, Empfehlungen gegeben. Die wurden im BMDV dann auch ausgewählt. Diese Projekte sind dann tatsächlich in dem IPCEI Call dann auch gestartet. Also wir hatten ja auch noch eine nationale Auswahlmöglichkeit, genau die haben wir koordiniert und betreut und haben dann die Projekte an die EU gemeldet und das gesammelt und koordiniert.

Das waren deutschlandweit ja 62 Projekte, 8 Projekte aus dem Verkehr und genau, auch keine kleinen Projekte aus dem Verkehr. Es sind ja tatsächlich auch immer größere Projekte gerade im Verkehr, genau und wir haben natürlich auch da schon angefangen uns zu vernetzen und zu koordinieren. Auch die Projekte hatten ja schon dann... bei der EU musste man ja angeben mit wem will man was und wieso genau? Und tatsächlich hab ich die erste Welle auch noch... die H2Tech war das tatsächlich, genau, die heißen jetzt anders.

0:4:41.32 --> 0:5:5.422

Bei uns hießen sie noch anders, jetzt heißen Sie H2Tech, habe ich gelernt. Genau, die habe ich tatsächlich mit koordiniert die Projekte, Antragsteller begleitet, unterstützt und auch das Chapeaudokument mit erarbeitet und hab mit auch die Workshops koordiniert und begleitet. Zum ersten Chapeaudokument dann habe ich das ganze Ding abgegeben, dankenswerterweise.

0:5:7.272 --> 0:5:22.962

██████████  
Aber ich habe mich briefen lassen und habe versprochen, einzuspringen, wann immer es geht und jetzt ist gerade eine Einsprungspunkt, aber da Sie gerade den Anfang auch wissen wollten, genau, sind wir tatsächlich stark involviert, also von daher sie haben genau die Richtige getroffen, wenn sie den Anfangsprozess wissen wollen.

0:5:23.832 --> 0:5:28.52

Pudollek, L. (Lissy, Student M-ES)

Das ist super, das klingt auch sehr umfangreich, was sie da alles miterlebt haben, ja.

0:5:26.282 --> 0:5:33.12

██████████  
Ja, ich hab das auch nur nebenbei gemacht. Irgendwann wurde dann eine Person in Vollzeit eingestellt, die dann ausschließlich zu IPCEI arbeitet.

0:5:33.112 --> 0:5:33.472

Pudollek, L. (Lissy, Student M-ES)

Mhm.

0:5:33.42 --> 0:5:38.82

██████████  
Genau ich hatte das neben meiner täglichen Arbeit nebenbei gemacht aktuell, da am Anfang ja.

0:5:36.962 --> 0:5:58.362

Pudollek, L. (Lissy, Student M-ES)

Oha okay. Dann hätte ich mal so erstmal eine generelle Frage, bevor ich zu IPCEI gehe. Was sind so Ihrer Meinung nach aktuell die größten Hindernisse, dass wir jetzt noch keine Wasserstoffökonomie in Europa haben? Also woran fehlt es am meisten aktuell? Was ist so das Hindernis?

0:6:0.172 --> 0:6:52.772

██████████  
3 mindestens würde ich sagen. Also zum einen ist es ganz klar immer noch die Regulatorik, also einen Elektrolyseur zu beantragen, ihn hinzustellen und zu bestellen, ist tatsächlich ein Prozess von ungefähr gefühlt 3 - 4 Jahren, ein sehr langwieriger Prozess. Allein in Deutschland. EU-kordiniert, also sie reden ja wahrscheinlich aktuell von Deutschland und nicht von der EU, sondern deutschlandweit. Genau, also in Deutschland ist es sehr die Regulatorik dahinter, die Prozesse, die Verfahren, die Behördengänge sind einfach der Wahnsinn ist eine enorme bürokratische Hürde.

Das zweite sind tatsächlich immer diese Unverbindlichkeiten in der Politik, die tatsächlich da sind, nicht da sind, oder da sind, die Unverbindlichkeiten sind da, die Verbindlichkeiten fehlen, wodurch viele Investoren immer wieder abspringen.

0:7:2.322 --> 0:7:2.652

Pudollek, L. (Lissy, Student M-ES)

Ja.

0:6:54.22 --> 0:7:51.182

██████████  
Gerade in Deutschland ist tatsächlich eine riesige Hürde, die wir immer wieder haben, das hören sie wahrscheinlich auch viel aus der Industrie heraus, die sehen wir auch. Wir können uns auch nicht ändern, auch wenn sich das die Industrie mal wünscht. Aber auch wir können das nicht ändern.



Genau, und das Dritte ist tatsächlich, und das geht damit einher: wenn man keine Investoren hat, die an die Sachen glauben, weil die Regulatorik und die Prozesse so lang sind, dann ist halt einfach auch die Technologie. Also ich bin von Haus aus promovierte Physikochemikerin, ich habe die Brennstoffzellen schon in ihrem Molekül analysiert, und ich weiß, dass die das alles können. Aber der Schritt in die Massenproduktion, der passiert nicht, wenn da keine Verbindlichkeiten sind und wenn man weiß, dass die Prozesse so langwierig sind und das sind für mich einfach eine Kette an den 3 größten Hürden, die da einfach da sind.

Und ich weiß, dass die Technologie ready ist. Ich weiß, dass der Markt ready ist. Ich weiß, dass die Unternehmen ready sind. Ich weiß, dass die Zulieferunternehmen mittlerweile gezwungen sind, nach China oder so zu verkaufen, weil halt der deutsche Markt nicht da ist.

0:7:59.492 --> 0:8:1.232

Pudollek, L. (Lissy, Student M-ES)

Okay also die Abnehmer fehlen dann quasi auch.

0:7:51.192 --> 0:8:4.432

██████████

Die Abnehmer, genau, äh die fehlen gar nicht! Die wären auch da, wenn die Verbindlichkeiten da wären und es klar ist, dass man jetzt in die Richtung geht.

0:8:19.842 --> 0:8:20.202

Pudollek, L. (Lissy, Student M-ES)

Stimmt.

0:8:11.172 --> 0:8:28.292

██████████

Die Politik setzt sich ja nicht fest und hatte auch noch der ganzen Phase jetzt auch nochmal in Deutschland einen Regierungswechsel, der gerade im Verkehrsministerium ein anderes Haus hat, im Wirtschaftsministerium auch, tatsächlich nochmal andere Ideen hat.

0:8:29.82 --> 0:8:52.42

Pudollek, L. (Lissy, Student M-ES)

Ja, okay, das heißt, Sie haben jetzt gesagt, die Unternehmen und die Industrie, die ist ja an sich schon ready, aber welche Gruppe von Akteuren müsste man da jetzt noch von überzeugen? Also ich, weil ich habe das Gefühl von dem, was ich recherchiere, die Politik möchte das an sich schon, aber wenn ich jetzt höre, der Markt möchte das dann auch, also wer ist denn dann noch nicht mit im Boot?

0:8:51.132 --> 0:9:32.32

██████████

Aktuell sind tatsächlich die großen OEMs, die die stören, die das nicht machen, also die großen OEMs ruhen sich immer noch darauf aus, sie haben den Verbrenner, der funktioniert gut, das sieht man auch an den an den großen OEMs. VW muss jetzt einstellen, kommt in der Batterieproduktion nicht hinterher, und auch ein Daimler hat 91 das erste Brennstoffzellen-fahrende Auto auf der Straße gehabt mit einer Straßenzulassung und hat jetzt ihre gesamte Brennstoffzellenproduktion für die PKW-Serie komplett eingestellt und hat auch nur ein Demoprojekt. BMW macht nur Kleinserien, weil sie sagen, ich hab keine deutsche Konkurrenz.

0:9:39.692 --> 0:9:40.2

Pudollek, L. (Lissy, Student M-ES)

Okay.

0:9:34.592 --> 0:9:50.442

■■■■■■■■■■  
Für mich beziehungsweise für uns sind das ganz klar die OEMs, die wiederum schieben es auf die Politik der Unverbindlichkeit, genau, weil man sich nicht entscheidet in der Politik, haben die beides in der Schublade und wissen nicht, was sie vorantreiben sollen.

0:9:48.802 --> 0:10:1.902

Pudollek, L. (Lissy, Student M-ES)

Ja ok und welche Rolle spielen traditionellen Energieunternehmen, die jetzt ja eigentlich noch das meiste Geld mit fossilen Brennstoffen verdienen?

0:9:59.852 --> 0:10:39.362

■■■■■■■■■■  
Naja. Sie haben alle umgestellt, also Shell baut Ladestationen an jeder Tankstelle und Shell produziert Wasserstoff, Shell ist technologieoffen, genau und andere Energieunternehmen, EWE geht ganz klar in die Wasserstoffproduktion und nimmt die Gasspeicher raus und macht jetzt daraus Wasserstoffspeicher, also die im Norden also das sehe ich. Die Energieunternehmen haben den Markt und die sind auch ready, die können auch gerade keinen Wasserstoff liefern, weil keine Verbindlichkeit dazu da ist. Aber in den Technologien oder den Anlagen sind die ganz groß dabei.

0:10:42.522 --> 0:10:42.762

Pudollek, L. (Lissy, Student M-ES)

Ja.

0:10:39.392 --> 0:11:5.662

■■■■■■■■■■  
Also da sehe ich die Energieunternehmen weniger, tatsächlich, also ich würde auch ein kein Geschäftsmodell einstellen, was gut läuft. Warum sollte ich? Also warum sollte ich als Energieunternehmer ja weg vom Öl, aber die haben alle genug Forschungs- und Entwicklungsarbeiten, Stationen. Klassisch 2018 war die Shell-Studie und die hat schon gezeigt, wieviel Wasserstoff kann. Shell Studie heißt Shell Studie weil sie von Shell finanziert wurde, genau also von daher.

0:11:5.242 --> 0:11:14.72

Pudollek, L. (Lissy, Student M-ES)

Ok, Mhm ähm ja, das ist gut zu wissen. Das ist auch interessant, die verschiedenen Perspektiven zu sehen.

0:11:16.702 --> 0:11:17.72

■■■■■■■■■■  
Mhm.

0:11:14.102 --> 0:11:24.112

Pudollek, L. (Lissy, Student M-ES)

Also sie haben ja die Anträge gelesen und bearbeitet. Was ist Ihrer Meinung nach die die Motivation von den Unternehmen bei IPCEI mitzumachen, da teilzunehmen?

0:11:25.112 --> 0:12:8.782

■■■■■■■■■■  
Ganz klar die Vision, jetzt in die Massenproduktion zu gehen und das wirklich voranzutreiben. Also alle Firmen, die sich über das IPCEI beworben haben, auch die, die wir abgelehnt haben, die Projekte. Alle Firmen sind bereits bei uns auf nationaler Ebene sehr bekannt gewesen, haben schon bei uns

über nationale Förderprogramme Wasserstofftechnologien gefördert bekommen, haben auch schon die Entwicklungen. Viele sind bei uns in dem ersten Programm und am Anfang des zweiten Programms so weit gekommen, dass eben gerade das IPCEI für die großen technologischen Produktionen genau der richtige Zeitpunkt war, sodass sie auch tatsächlich sehr gerne und sehr schnell umgesetzt hätten.

0:12:16.152 --> 0:12:16.512

Pudollek, L. (Lissy, Student M-ES)

Ja.

0:12:8.862 --> 0:12:27.112

██████████

Keiner wollte uns glauben, dass das genauso lange dauert, wie beim Batterie-IPCEI, wo ja nur 5 Projekte eingereicht worden und es 5 Jahre gedauert hat, 3 Jahre bis zur Bewilligung gedauert hat. Also man kann sich sehr gut den Vergleich zum Batterie-IPCEI mal anschauen, fand ich ganz spannend das hab ich meinen Team erzählt das hat mir keiner geglaubt, dann haben sie mich alle gehasst und mittlerweile umarmen sie mich alle und sagen, Sie haben so recht.

0:12:36.642 --> 0:12:36.932

Pudollek, L. (Lissy, Student M-ES)

Ja.

0:12:29.632 --> 0:12:45.692

██████████

So ich glaube, das war das politische Zeichen aus der EU heraus und das Commitment, und das hat die dazu motiviert, auf alle Fälle da jetzt zu sagen ok, das ist das politische Commitment. Wir gehen auf Wasserstoff, jetzt reichen wir die Massenproduktion ein.

0:12:46.782 --> 0:13:15.372

Pudollek, L. (Lissy, Student M-ES)

Okay, ähm und die nächste Frage ist für mich am interessantesten. Wissen Sie das, inwieweit findet Kommunikation innerhalb eines IPCEIs statt zwischen den Teilnehmern? Weil jetzt haben wir mindestens 4 Mitgliedstaaten und wir haben die nationalen Akteure und die EU, und ich kriege dazu nicht wirklich im Internet viel raus ob es sowas wie Konferenzen gibt, ob es irgendwie Berichterstattung gibt.

0:13:15.382 --> 0:13:18.302

██████████

Ich kann Ihnen total viel dazu sagen und ich darf das sogar sagen.

0:13:18.982 --> 0:13:21.72

Pudollek, L. (Lissy, Student M-ES)

Das ist super!

0:13:20.712 --> 0:13:42.542

██████████

Ich habe Antworten auf Ihre Fragen! Genau so, es gibt tatsächlich, ich habe mir das extra aufgeschrieben, also es gibt den Erfahrungsaustausch innerhalb einer Welle. Der läuft total gut, es gibt für jede Welle sozusagen sogenannte Industriekoordination oder Koordinatoren, die nutzen auch ihre Rolle.

0:13:49.212 --> 0:13:49.702

Pudollek, L. (Lissy, Student M-ES)

Mhm.

0:13:44.532 --> 0:14:42.672

██████████

Und die sind im sehr guten Austausch mit der Kommission, aber auch mit den direkten Austauschpartnern und das ist relativ komplex, weil man, wenn man ein Chapeaudokument schreibt für eine Welle, müssen ja alle Staaten da drin vereint werden mit ihren Projekten. Das heißt, es gibt tatsächlich Koordinatoren, die das Chapeaudokument koordinieren. Das sind meistens 2,3 federführende Industrieprojekte, die die Kleinen so ein bisschen auch mitziehen. Alles, was in dem Chapeaudokument steht, muss mit allen Mitgliedstaaten abgestimmt werden.

Und das passiert auch und das machen die auch in regelmäßigen Meetings und in Workshops und tatsächlich sind auch alle Mitgliedstaaten gleichberechtigt, das heißt, alle müssen ja auch immer diesen Schritten oder dieser Entscheidung der Texte zustimmen, und das passiert tatsächlich auch. Und die treffen sich regelmäßig, aber tatsächlich sind ja natürlich auch die kleineren Mitgliedstaaten, die weniger Kapazität haben, eigentlich ganz froh, wenn das so ein paar federführende sind.

0:14:45.82 --> 0:14:45.452

Pudollek, L. (Lissy, Student M-ES)

Ja.

0:14:42.702 --> 0:14:55.532

██████████

Es gibt tatsächlich federführende in jeder Welle genau, und die treffen sich tatsächlich auch total häufig. Bis zum 14-Tagesrhythmus teilweise sogar.

0:14:55.772 --> 0:14:56.642

Pudollek, L. (Lissy, Student M-ES)

Okay, Mhm.

0:14:57.172 --> 0:15:39.842

██████████

Und haben natürlich alle digitale Videokonferenzen und machen alles auch zusammen und sprechen sich auch immer wieder ab, ne, wo sind die thematischen Schwerpunkte? Was schreiben wir in das Chapeau rein, welche Unternehmen sind was, wieviel Bedarfe sind? Das ist mega viel Arbeit, das verzögert das auch alles natürlich, viele Köche verderben den Brei und so.

Deswegen sind dadurch auch viele Verzögerungen da. Wie gesagt, und diese Koordination muss ich ja dann noch nach der Mitgliedstaaten-Abstimmung dann ja noch weiter abstimmen mit der Kommission und so weiter und so weiter. Also sind tatsächlich unglaublich viele Schritte, die da anstehen, ich bin auch unglaublich froh, dass ich das abgegeben habe. Wir ██████████ begleiten das komplett, unterstützen das auch, also sitzen noch in jedem Meeting drin.

0:15:41.712 --> 0:15:42.82

Pudollek, L. (Lissy, Student M-ES)

Mhm.

0:15:39.852 --> 0:16:3.112

██████████

Meine Kollegin sitzt im Meeting drin und war sehr froh, dass ich dafür dieses Interview übernehme. Genau, aber da sind sie tatsächlich sehr gut koordiniert, arbeiten sehr gut zusammen und haben

glaube ich ein sehr guten, was ich immer auch mitkriege, sehr guten Entscheidungswillen da auch was zu machen. Also das machen sie tatsächlich viel, genau.

0:16:3.182 --> 0:16:37.792

Pudollek, L. (Lissy, Student M-ES)

Das ist gut zu wissen. Wie ist denn das dann aber mit Spillover-Effekten, weil so IPCEI, so wie ich das verstehe, das ist ja irgendwie staatliche, also Industriepolitik, aber unter der Bedingung, dass dann zum Beispiel ja auch die Gesellschaft davon profitiert oder dass irgendwie die Innovation, dass da alle was von haben. Jetzt sind aber durch die Unternehmen, die da teilnehmen, teilweise auch miteinander in Konkurrenz, da frage ich mich dann schon so wie macht man das denn? Also wie ist das geregelt? Was teilt man miteinander, wenn es jetzt wirklich an die Technik geht und was nicht? Und wer erfährt davon?

0:16:38.502 --> 0:16:56.942

Ja, das ist ja tatsächlich, das steht hier nicht, aber ich kenne den Prozess. Tatsächlich steht ja im Chapeau-Dokument schon, was man machen will, das beschreibt ja nur die gesamte Welle mit den Projekten die daran teilnehmen, und so weit sind sie tatsächlich auch transparent und schreiben das auch rein.

0:17:0.622 --> 0:17:0.982

Pudollek, L. (Lissy, Student M-ES)

Mhm.

0:16:56.972 --> 0:17:22.902

Da stehen aber einfach auch wirklich Kennzahlen drin, die aber auch anderweitig sowieso kommuniziert sind, genau. Was dann im Einzelnen im Detail sein soll, also klassisches Beispiel vielleicht mal: wenn man ein Stack machen will, dann hat man verschiedene Taktraten, in dem der gestapelt wird und dann schreibt man vielleicht noch rein, welche Taktrate man erreichen will.

0:17:41.982 --> 0:17:42.312

Pudollek, L. (Lissy, Student M-ES)

Ja.

0:17:24.422 --> 0:18:7.102

Aber wie man diese Taktrate erreichen will, ob man jetzt 2 oder 3 Roboter hinsetzt oder sowas das steht da nicht drin und das heißt, das ist dann wieder in den Einzelanträgen, die dann die dann wieder voneinander getrennt werden. Man reicht ja ein Chapeaudokument ein und dann reicht jede Nation noch oder jeder Industrieteilnehmer noch sein Projekt dazu noch ein und hat eine Woche Zeit, das hochzuladen oder so ich weiß nicht, wie jetzt die Regeln sind. Früher war es eine Woche beim H2Tech, so mussten alle ihren ganzen Unterlagen einreichen und dann muss man warten, bis alle Unterlagen zusammen hatten.

Das dauert dann auch wieder und dann kann man endlich das Chapeaudokument, weil, dann haben wir nur eine Woche Zeit, ihre Unterlagen hochzuladen, und die werden dann wieder differenziert natürlich von der EU betrachtet, aber im Chapeaudokument stehen schon, also es muss natürlich alles da rein passen, dazu gehören, und da stehen natürlich auch Kennzahlen auf jeden Fall drin.

0:18:7.882 --> 0:18:8.202

Pudollek, L. (Lissy, Student M-ES)

Mhm.

0:18:8.292 --> 0:18:35.112

Genau, aber die sind jetzt auch keine gravierenden Kennzahlen. Also ist jetzt klassisch ne Taktrate für ein Stack Sampling. Da gibt es Fachkonferenzen, auch wir machen solche Fachkonferenzen, wo die Leute sich auch zu den Taktzahlen austauschen, also tatsächlich. Ich weiß nicht, ob China zuhört, aber innerhalb der EU glaube ich sind die bekannt.

0:18:35.722 --> 0:18:36.662

Pudollek, L. (Lissy, Student M-ES)  
Ja ok.

0:18:36.982 --> 0:18:40.102

Aber die Frage ist halt, wie man dahin kommt, das verschweigt natürlich jeder.

0:18:40.522 --> 0:18:44.32

Pudollek, L. (Lissy, Student M-ES)  
Das ist dann sozusagen ein Geheimnis ja.

0:18:42.962 --> 0:18:52.662

Genau, so bau ich vier Anlagen oder bei euch nur eine, aber dafür viermal so schnell so ne, das ist so kann man also genau.

0:18:51.152 --> 0:18:56.472

Pudollek, L. (Lissy, Student M-ES)  
Macht jeder für sich, ok, aber was kann man denn dann sagen? Was also, was haben wir alles von einem IPCEI? Was sind so die Spillover-Effekte?

0:19:2.302 --> 0:19:38.962

Genau ich glaub die Spillover—Effekte sind ganz klar die die Kommunikation untereinander. Dadurch, dass die Mitgliedstaaten sich mehr abstimmen über die Technologien „ach, du machst das mit dem und dem und dem und dem Okay, dann mache ich das mit dem und dem“, und dadurch können die Technologien besser ineinander übergreifen, besser miteinander kommunizieren.

Ich glaub, der Markt ist auch mega aufgerüttelt dadurch, und die Spillover-Effekte, ob ich jetzt Stacks takte für Lkws oder hinterher Stacks takte für Schiffe, ist dann auch schon wieder völlig egal, also der technologische Spillover-Effekt.

0:19:39.72 --> 0:20:17.822

Das dann zu adoptieren auf andere Systeme und Technologien ist relativ einfach, wenn ich es einmal geschafft habe, in die Masse zu kommen. Dann ist es mir egal ob ich einen 100 KW Stack oder einen 140 KW Stack stacke, aber 140 KW würde ich vielleicht im Schiff einbauen oder, mir ist egal wie groß die Platten jetzt sind, in einem Range von – bis, und so kann ich halt dann vielleicht kleiner komprimierter werden, aber mit mehr Leistung oder was auch immer, also die technologischen, aber ich hab es erst mal geschafft, dass in die Masse zu bringen und kann dann halt diese Erkenntnisse auf andere Bereiche und Anwendungen überleiten und tatsächlich gerade im Wasserstoff finde ich das sehr breit.

0:20:18.582 --> 0:20:26.422

Pudollek, L. (Lissy, Student M-ES)

Ja okay, also sozusagen ist das jetzt auch eine Form von der Innovation, weil es da gleichzeitig noch nicht so viel Erfahrung mit gibt? Dieses Upscaling vor allen Dingen.

0:20:26.722 --> 0:21:13.292

Genau das Upscalen und diese Massenproduktion gibt es halt im Wasserstoff noch nicht. Jeder weiß, wie es im Labor funktioniert und das seit 30 Jahren, aber wie es jetzt wirklich in der Masse funktioniert? China macht das vor, tatsächlich China baut halt einfach, also, wenn man mal da war, ich war auch mal da und hab mir die Anlagen angeschaut, die haben halt nicht eine Firma auf 10 Quadratmetern, sondern halt auf hundert Quadratmetern, und die haben die Anlage halt nicht einmal gebaut, sondern halt hundertmal, so das ist halt die Reform. Den Platz haben wir gar nicht tatsächlich und die Menschen darin zu arbeiten. Also wir brauchen andere Sachen, genau, und das ist vielleicht auch nicht die sinnvollste Art, die Technologie, also ich glaube, da sind große Spillover-Effekte, damit kann man China schon wieder überholen, wenn man will.

0:21:14.212 --> 0:21:51.652

Pudollek, L. (Lissy, Student M-ES)

Mhm ja, dann bin ich auch schon bei meiner letzten Frage. Das ist noch so eine generelle Frage. Ich hab immer noch wieder mal im Internet ein paar Kritiken dazu gelesen, dass IPCEI nicht verhältnismäßig ist, sondern dass das mit sehr viel Geld hantiert wird, wobei man vielleicht den Wettbewerb oder den Markt auch mit anderen politischen Mitteln sozusagen proportional besser stellen könnte, das da sowas passiert wie Innovation und Zusammenarbeit. Wie sehen Sie das?

0:21:56.92 --> 0:22:59.2

Ja, nein also eher nein, also IPCEI ist ein europäischer Gedanke. Man muss ganz klar sagen, dass wir mit den Wasserstoffanwendungen und mit der Wasserstoffförderung in Deutschland einfach Platz 1 sind und da einfach wahnsinnig führend sind.

Genau, das ist aber in anderen Ländern, und jetzt fahre ich einfach aus Deutschland raus und gucke, das sieht in Polen ganz anders aus. Also ich komme mit meinem Brennstoffzellen-Lkw oder Batterie-Lkw, völlig egal welcher, einfach nur innerhalb der deutschen Grenzen und Deutschland ist auch noch ein Transitland, das heißt, da fahren ja auch noch die polnischen Lkws durch und so und man merkt es halt, Holland und auch Frankreich, die sind da ganz gut dabei. Auch Dänemark oder so. Aber global betrachtet ist IPCEI ein europäisches Steuerungsinstrument und ich glaube halt, wenn man das global betrachtet, dann sehe ich da überhaupt keine Wettbewerbsverzerrung, sondern eher wirklich die großen Länder ziehen die Kleinen mit, um eine innereuropäische komplette Gesamtlösung zu haben.

0:22:59.872 --> 0:23:0.252

Pudollek, L. (Lissy, Student M-ES)

Ja.

0:22:59.802 --> 0:23:29.562

Und wenn man, wenn man das betrachtet, dann kann man das mit nationaler Förderung gar nicht auffangen. Also da ist, auch wenn man das so will, das Spillover-Effekt halt wahnsinnig riesig. Der schwappt auf die kleinen von den großen, also ich will nicht sagen „weiterentwickelten“, die haben einfach andere Prioritäten, die Länder, und das schwappt einfach so rüber und die bekommen plötzlich so einen Technologiestatus und auch generell ist die Wertschöpfung von Antrieben eigentlich immer europäische, also ne?

0:23:30.142 --> 0:23:30.422

Pudollek, L. (Lissy, Student M-ES)

Ja.

0:23:29.572 --> 0:24:59.102

██████████

Wir haben die Autos, die Motoren werden in Tschechien gebaut und die Schrauben in Budapest, oder ich weiß nicht was und das schickt sich so einher, und das ist ja, sollte beim Wasserstoff oder auch generell ein europäischer Gedanke sein. Und wenn man sich das anschaut, dann ist sehe ich das überhaupt nicht, also es ist eher dramatisch, dass es noch so lange dauert, und IPCEI soll ja auch tatsächlich diese kleinen und mittelständischen Unternehmen unterstützen und ich glaube, da sind die großen ganz guter Motor, das zu ziehen und gerade, wie gesagt in den etwas kleineren EU-Ländern zieht das glaub ich ganz gut, und da sehe ich tatsächlich überhaupt nicht.

Erstens gibt es solche Förderprogramme da nicht, also in meiner Zeit, als ich mich mit IPCEI auseinandergesetzt hab, da haben wir ganz viel mit Ungarn gesprochen, tatsächlich die uns angerufen haben, „was macht ihr überhaupt und wie macht ihr das?“ und das ist tatsächlich, wenn wir, wenn wir in den europäischen Gedanken, ist es ein europäisches Projekt, und den europäischen Gedanken hier leben wollen, vielleicht auch, also man muss nicht unbedingt rausholen, aber die Keule irgendwie China, USA. Dann ist Europa nur global wettbewerbsfähig, wenn sie das ganzheitlich denken und das ist die, da stellt sich die Frage nach den nationalen Forderungen gar nicht.

0:24:59.672 --> 0:25:4.222

Pudollek, L. (Lissy, Student M-ES)

Okay, dann hätte ich noch eine ganz kurze Frage.

0:25:2.982 --> 0:25:6.732

██████████

Ja, Sie können auch noch 2 stellen wir sind gut in der Zeit.

0:25:7.352 --> 0:25:22.922

Pudollek, L. (Lissy, Student M-ES)

Ja, wenn sie irgendwas an dem Prozess oder an dem Design von den IPCEI Projekten verbessern könnten, was wäre das? Also ich hab jetzt schon Langwierigkeit aufgeschrieben, dass alles ein bisschen langsam ist, aber hätten sie da noch irgendeine andere Form von Kritik oder Besserungswunsch?

0:25:23.532 --> 0:26:21.472

██████████

Ja, also tatsächlich ist die Langwierigkeit muss man nochmal differenzieren, also das ist total schwierig. Wir haben die schnellen Unternehmen in Deutschland beziehungsweise in ein paar Ländern von Europa, und dann haben wir die langsamen und das Problem ist ja, die dürfen nur innerhalb von einer Woche alle, also das ist tatsächlich nicht nur langwierig, sondern das hat einen hohen koordinativen Aufwand, extrem hohen Koordinierungsaufwand, also niemand... Blöd gesagt: die Großen wollen es unbedingt, brauchen aber die Kleinen, ziehen sie mit, und dann müssen wir aber wieder warten und wenn die so warten mit den enormen bürokratischen Hürden, dann springen wieder Investoren ab. Also das ist tatsächlich halt extrem komplex und dann auch noch zwischen den unterschiedlichen Ländern. Ich finde es gut, dass diese Regel da drin ist, aber es gibt da sehr wenig Unterstützung aus der Kommission heraus. Es gibt gar keinen Prozess, der aufgeschrieben ist. Woran musst du dich halten und wie musst du das machen?



0:26:21.692 --> 0:26:24.722

Pudollek, L. (Lissy, Student M-ES)

Stimmt, es gibt keine Guide Lines für Bewerbungen und sowas ja.

0:26:21.502 --> 0:27:0.242

██████████

Und das wird in jeder, genau es gibt keine Guide Lines, es gibt kein gar nichts, das wird in jeder Welle anders gemacht, so die lernen auch nicht, also sie versuchen voneinander zu lernen. Aber dann wollen die einen nicht mit den anderen, weil dies ist Industrie und das ist der Verkehr, und die reden schon miteinander, aber nur so ein bisschen und eventuell, und dann wird was geleakt und dann muss man hier gucken und das finde ich extrem schwierig und das ist halt überhaupt nicht transparent. Also dieser Prozess ist langwierig, komplex, nicht transparent, es gibt keine Planungssicherheit und die ersten die hinten runterfallen sind die kleinen und mittelständischen Unternehmen, für die der Prozess ja eigentlich gemacht ist.

0:27:1.142 --> 0:27:3.282

Pudollek, L. (Lissy, Student M-ES)

Ja, das war ein bisschen kontraproduktiv.

0:27:3.662 --> 0:27:25.942

██████████

Ja, das sind so ein bisschen die Hürden glaube ich, und das würde ich, das würde ich auf alle Fälle verbessern. Allein die Tatsache, Inhaltsverzeichnis für das Chapeaudokument oder Bewertungsrichtlinien, nach denen das bewertet wird, damit man weiß, was man reinschreiben muss, also beim ersten Chapeaudokument. Wir wussten ja nicht mal, nach welchen Kriterien bewertet wird.

0:27:25.322 --> 0:27:30.212

Pudollek, L. (Lissy, Student M-ES)

Ja, das hab ich auch schon jetzt häufiger gehört dass einfach Vorlagen so n bisschen fehlen, ja.

0:27:28.282 --> 0:27:53.542

██████████

Wir haben irgendwas geschrieben in Anlehnung an den Batterie-IPCEI, uns wurde das Chapeaudokument vom Batterie-IPCEI geleakt und da haben wir versucht, in Anlehnung dessen was Neues zu schreiben und dann kam die EU zurück, das sei alles falsch. Aber was soll man denn schreiben, sag doch mal, was wir schreiben sollen, dann kann ich auch, dann weiß ich, was ich falsch mache, aber genau, das war also das war wirklich. Es ist ein mächtiges Instrument und für dieses mächtige Instrument gibt es keine einzige Vorgabe.

0:27:54.422 --> 0:27:54.902

Pudollek, L. (Lissy, Student M-ES)

Hm.

0:27:53.582 --> 0:28:0.272

██████████

Das ist, was ich mir wünschen würde, wäre tatsächlich, und die haben sich ja connected, ich weiß nicht, ob Sie das wissen, es gibt jetzt ne IPCEI-Homepage und sowas.

0:28:0.462 --> 0:28:5.662

Pudollek, L. (Lissy, Student M-ES)

Ja, ich finde man könnte da ein bisschen, da muss noch ein bisschen mehr rein meiner Meinung nach.

0:28:4.832 --> 0:28:7.972

[REDACTED]

Ja, ja, die bauen sich gerade erst auf wir sind denen immer noch Texte schuldig.

0:28:7.982 --> 0:28:14.172

[REDACTED]

Tatsächlich aber es gab jetzt auch die erste IPCEI-Konferenz oder so was.

0:28:11.342 --> 0:28:12.602

Pudollek, L. (Lissy, Student M-ES)

Genau in Berlin, ja.

0:28:15.922 --> 0:28:33.452

[REDACTED]

Das kann man auch so öfter machen und da rein, und das ist tatsächlich so. Der größte Pain war wirklich, man weiß gar nicht, nach welchen Kriterien, was muss man abgeben? Und wir sollen auf Wirtschaftlichkeit prüfen. Ja, in welchem Sinne denn, mit welcher Wirtschaftlichkeitsbrille prüfen wir denn?

0:28:37.872 --> 0:28:40.22

Pudollek, L. (Lissy, Student M-ES)

Stimmt genau ja.

0:28:34.102 --> 0:29:10.912

[REDACTED]

Und dann müssen die Anträge, wenn alles bewilligt ist, dann ja nochmal national durch. Und dann muss man national dann auch wieder einen Antrag stellen. Dafür braucht man ein Förderinstrument, was man bei der EU erstmal genehmigen lassen muss. Also die kleineren Länder, in Deutschland haben sie Förderrichtlinien, aber kleinere Länder haben das nicht. Mit ihren genehmigten Prozessen kommen sie wieder in ihr Land zurück und sagen „jetzt müssen wir erstmal was schreiben“. Und dann braucht die EU aber wieder total lange, um über die Förderrichtlinie zu prüfen, damit das überhaupt umgesetzt werden kann, dann sind alle anderen schon losgelaufen und die Kleinen hinken schon wieder hinterher. Also das ist, bisschen Transparenz wär schön.

0:29:11.402 --> 0:29:19.972

Pudollek, L. (Lissy, Student M-ES)

Mhm das nehme ich auf jeden Fall mit, also das hör ich auch an jeder Stelle und von jedem, der irgendwie beteiligt ist, dass das ist so unklar ist, was man einreichen muss, wonach dann bewertet wird, und so weiter.

0:29:22.922 --> 0:29:23.162

[REDACTED]

Genau.

0:29:32.752 --> 0:29:33.992

[REDACTED]

Ja, sehr gut, sehr gut.

0:29:19.982 --> 0:29:40.582

Pudollek, L. (Lissy, Student M-ES)

Okay ja, also tatsächlich, das hat mir richtig gut weitergeholfen, vor allen Dingen mit der Kommunikation, niemand konnte mir dazu irgendwas sagen, inwieweit man da miteinander sich austauscht, also vielen Dank nochmal also ja, das hilft mir wirklich weiter.