CO_2 SMART GRID

FEASIBILITY PHASE

RESULTS OF 1 $^1/_2$ YEARS OF THOROUGH STUDY

www.co2smartgrid.com

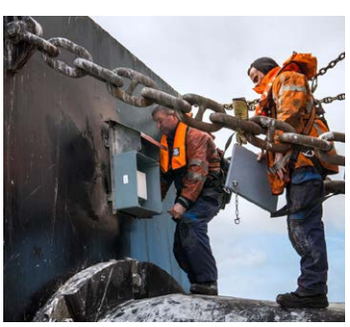
“The fundamental idea behind OCAP and the foundation of the CO2 Smart Grid is to capture CO2 and reuse it elsewhere in order to greatly reduce CO2 emissions in the atmosphere. In the recent years, the CO2 Smart Grid has satisfactorily proven its value. The government and private sector’s enthusiasm to make significant CO2 reductions a reality is very encouraging. OCAP will happily continue to work on the realisation of a CO2 Smart Grid in the future. The success of reusing CO2 in the greenhouse agriculture industry should be able to be replicated in other sectors as well. OCAP will gladly share its knowledge and experience to make this a reality.”

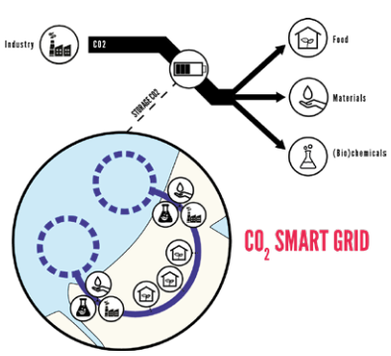
JACOB LIMBEEK - OCAP

Contents

"This has been an important journey. We have a lot of material on which we can build. There is so much happening in the Amsterdam area at the moment that now's the right time to invest in new opportunities."

MICHA HES - PORT OF AMSTERDAM





The Netherlands is the global knowledge and value-creation cluster for the development of CO2 as a raw material in the world of agriculture, mineralisation and chemistry.

2
HARBOUR AREAS

22
PARTNERS

8 - 9
POTENTIAL MEGATONS NOT EMITTED INTO THE ATMOSPHERE

"The greenhouse agriculture industry needs CO2 in order to become more sustainable. It is essential to integrate the various parties in the CO2 Smart Grid network in order to search for new CO2 sources and to develop the existing network."

DENNIS MEDEMA - LTO GLASKRACHT

1. MOTIVE

"The Paris Climate Agreement is a major breakthrough. 195 countries have committed to limiting the global increase in temperature to well below 2 degrees Celsius, while striving to further limit warming to 1.5 degrees Celsius. It is our duty to do everything possible to achieve this objective... The European Union has made strong commitments on behalf of all its member states to reduce greenhouse gas emissions by at least 40 percent compared to 1990. This commitment is a step in the right direction, but not enough to achieve the goal of 2 degrees Celsius, never mind the ambitious 1.5 degree Celsius target. For this, much more is needed. We have therefore set the bar higher than the commitment made by the EU. In the Netherlands, we are taking measures that will prepare us for a 49 percent reduction by 2030. We are drafting a national climate and energy agreement that gives sectors certainty about which objectives need to be met in the longer term... We are taking the lead in the EU to push the goal to 55 percent"

QUOTE TAKEN FROM THE 2017 GOVERNMENTAL AGREEMENT.

This is our framework. The inevitable need to take measures to stop climate change is self-evident to all the CO_2 Smart Grid partners and they are prepared to invest in this transition. The CO_2 Smart Grid Partners are investing in short-term measures that cost money but are cost-efficient. They are also investing in sustainable energy generation and in reducing our dependence on fossil fuels.

The 22 CO_2 Smart Grid partners have come together to meet the following challenge: How do we give economic potential to this enormous task? We can do this by approaching the problem as a solution and by using CO_2 as a raw material in the circular economy in areas such as greenhouse agriculture, in building materials and in the chemical industry. In this way, we can create a situation in which we become less dependent on the carbon found in fossil resources that are still the basis of many of sectors of our economy. By adopting this strategy, the Netherlands can lead the way and set an example for other countries.

This proposition was launched at the National Climate Summit in 2016 and was elaborated on in a so-called 'feasibility phase'. This report is the final outcome of this process. (Regional) authorities, waste energy companies, greenhouse agriculture, natural and environmental federations, knowledge institutes, steel producers, network companies and others have come together to meet this challenge. They have collaboratively given shape to the process and the products and they have lent their support to this report, its conclusions and its future implementation.

Indicative share per sector of 49% emission reduction plan for 2030

Sector	Reduction in 2030 (Mt)	Measures
Industry	1 3 18	Recycling Process efficiency CO2 capture and storage
Transport	1.5 2	Efficient tyres, European standards, electric cars Biofuels and urban initiatives
Built environment	3 2 2	Optimum energy use in office buildings Insultation of residential buildings, heat networks and heat pumps Energy efficient housing developments
Power production	1 12 2 4 1	Efficient lighting Closure of coal-fired power stations CO2 capture and storage from waste incineration plants Extra offshore wind developments Extra solar energy developments
Land use and agriculture	1.5 1 1	Intelligent land-use planning Reduction in methane emissions Energy production from greenhouse sector

Structure of the Strategy

Chapter 2 of this report describes the process. Chapter 3 discusses the results from all sub-products made and Chapter 4 draws conclusions from these reports. Chapter 5 describes the investments that partners have made in the CO_2 Smart Grid strategy and the considerable impact of the investments. This chapter then describes the challenges associated with the strategy. Chapter 6 concludes this phase with a description of the next steps from the feasibility phase to the development phase.

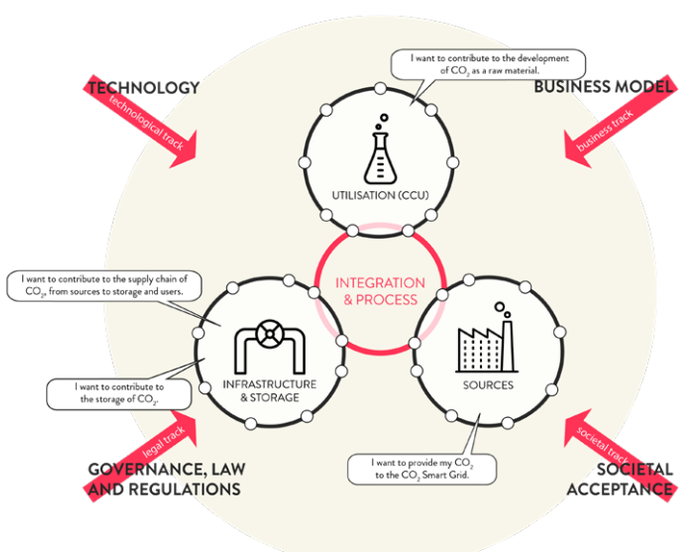
2. APPROACH

After the preparation and launch of the CO_2 Smart Grid coalition at the National Climate Summit in 2016, an integrated approach for the feasibility phase of CO_2 Smart Grid was prepared. This is contained in an action plan on which 22 investing partners started in March 2017 during the first Steering Committee meeting. The feasibility phase was aimed at answering the following questions:

1. What are the most important technological building blocks of a CO_2 Smart Grid, what is the market maturity of these building blocks and what are the most important questions to be answered for each building block?
2. What are the most important market prospects for the circular economy in combination with CO_2 storage/application and to what extent is the CO_2 Smart Grid a promising proposition from these perspectives?
3. Does all of the above offer sufficient perspectives on the intended market-driven strategy and, if so, how does it relate to legislation and regulations (to be developed)?
4. What is the right societal perspective on the CO_2 Smart Grid, what would be a good social embedding and how do we ensure that this perspective contributes to the development?
5. What implementation programme is needed and what decisions are needed to realise this strategy and what activities, partners and resources can we organise for this and how?
6. What does the CO_2 Smart Grid mean for us in terms of emissions reduction, cost-efficiency and economic prospects?

To help answer these questions, the following schematic framework has been introduced ⟶

In consultation with the core team some deviation from the initial approach in the completed process took place. This is because, for example, the 'Roadmap CCS' was developed in parallel with a situation where a number of topics were discussed – the results of the studies guided the follow-up. In the implementation, the perspective of the legislation and regulations in particular received relatively little attention. A lot of knowledge was gained on this topic about CCS during the developments through specialised parties. The CO_2 Smart Grid can use this knowledge development. All the choices for the next steps are still made in consultation with the core team and the Steering Committee. In this final report, the answers to the six questions can be traced back.



3. FEASIBILITY STUDY AND RESULTS

NB all products mentioned in this final report are attached to the report and can be downloaded from the website:

www.co$_2$smartgrid.com

FIGURE 1 - ALL THE REPORTS FROM THE FEASIBILITY PHASE

The partners started a **prefeasibility study (Ecofys, 2017),** the aim of which was to get a better feeling for the material. Is there a realistic chance that CO_2 could be used as a raw material? We know that this is true for greenhouse agriculture, but it was less clear for mineralisation and chemistry. Another question was, would there be a market for it in the Netherlands? Would it lead to substantial emission reductions and would it generate business? Also, how big is the market for CO_2 as a raw material? How does this strategy actually fit together with other major strategies, such as CCS? The Ecofys study provided the initial answers to all these questions. This study was established in a Steering Committee meeting in September 2017.

The pre-feasibility study showed that:

- There is a market for CCU in the Netherlands (estimate July 2017: 1.7 Mt/year within 10 years);
- The market in greenhouse agriculture (1.2 Mt in the western region of the Netherlands) exists today and is demand is urgent. There are short-term opportunities in mineralisation and large volumes could be achieved in the chemical industry in the medium-term;
- The CO_2 Smart Grid is unique in the world and might have a significant impact in terms of inspiring additional R&D, employment and the acceleration of knowledge in the field of CCUS;
- There is great synergy in the interaction between CCS and CCU when it comes to knowledge, volumes and security of supply.

This Steering Committee meeting was the immediate starting point for the following studies: the **technology assessment (TNO, 2018)** and the **Life Cycle Analysis (CE Delft, 2018).** The aim of the first study was to determine

whether the rollout of a CO_2 Smart Grid was technically possible and what barriers might be faced? What, broadly speaking, are the greatest challenges and how can they be overcome?

The Life Cycle Analysis (LCA) then aimed to answer the question of whether CO_2, as a raw material, leads to real emissions reductions compared to current practice. Aditionally, would it do so for the next ten years? In the case of CO_2 capture at various sources, and the calculation of its application in various sectors (agro, construction, chemistry), the study aimed to give a clear answer. Both studies were established in the third Steering Committee meeting, January 2018.

The Technology Assessment showed that:

- The physical rollout of the network is possible and that there aren't any insurmountable technological barriers;
- The only real challenge is establishing the connection between Amsterdam port and Tata Steel IJmuiden (about 30 km);
- Finding and connecting the right fields is the biggest challenge in storing CO_2;
- The real challenge is to develop new applications for CO_2 as a raw material.

The LCA says, regarding the actual emissions reduction with the application of CO_2 as a raw material, that:

- The net emissions reduction in the application of CO_2 in the examined methods is roughly 85-105% compared to the current use
- With the methanol applications, the emission reduction is highly dependent on the feedstock of hydrogen. The greener the energy (energy generated without CO_2 emissions), the better
- The volumes that can be applied for CCS are greater than the market for CCU in the next 10 years (the scope of the LCA).

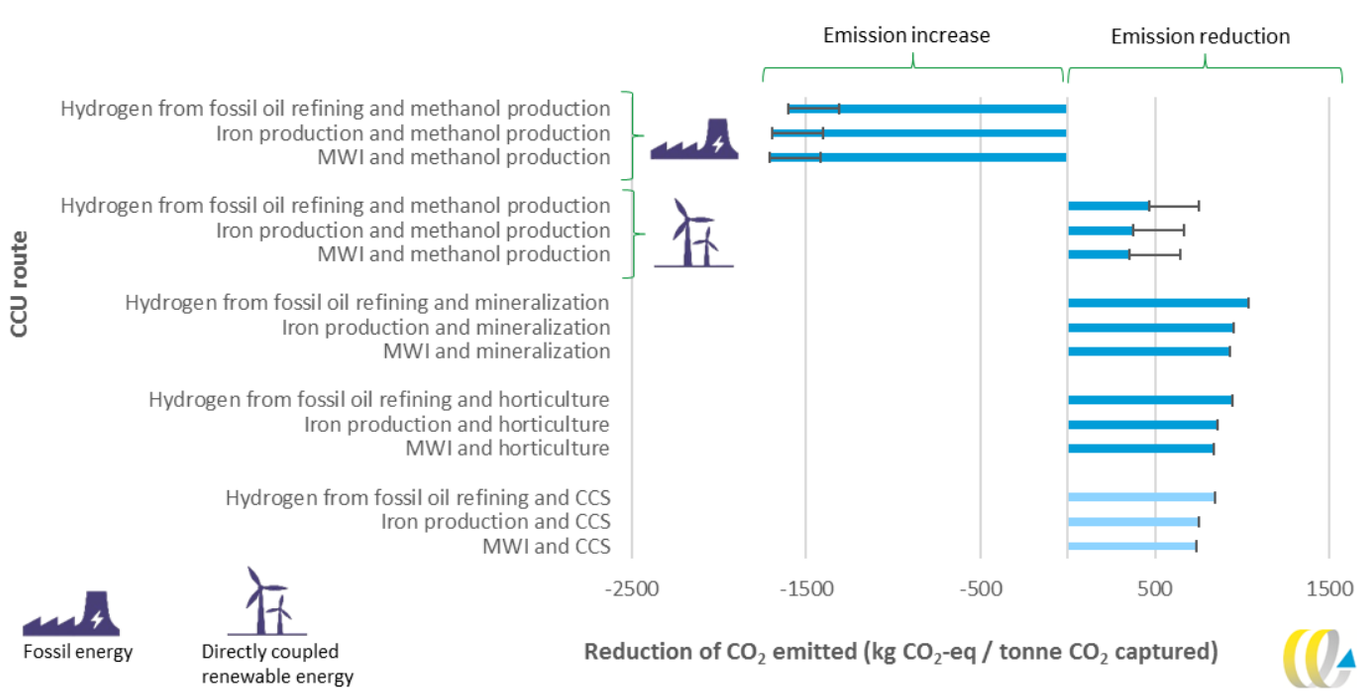


FIGURE 2 - REDUCTION OF CLIMATE CHANGE IMPACT PER CCU ROUTE IN COMPARISON TO NON-CAPTURE (SOURCE: CE DELFT2018)

The above studies together formed the basis for the next study, the **Social Cost-Benefit Analysis (CE Delft, 2018).** The purpose of this study was to visualise the entire pallet of investments and costs associated with CO_2 Smart Grid and to make a statement about the social robustness of the investment. This study therefore forms an important basis and justification for future investments. This study was discussed in broad terms at the fourth Steering Committee meeting, April 2018.

The Social Cost-Benefit Analysis revealed that:

- The CO_2 Smart Grid is a socially robust investment in the context of Climate Policy that fits the current political climate (**WLO Hoog** (Prosperity and Living Environment, 'high' scenario)) and has a market volume of approximately 3.3 Mt (estimated June 2018)
- For application in chemistry (methanol) the availability of affordable green hydrogen is essential
- In the context of a Climate Policy in line with the Paris Climate Agreement, only biogenic CO_2 can be used for reuse. In this sense, the social cost-benefit analysis is robust
- Great synergy can be achieved through cooperation between CCU and CCS.

A recurring theme was discussed in the same steering committee, namely the preparation of a **business community (BLOC, 2018).** This preparation aimed to show whether there is market demand for setting up such a community and, if so, what it should look like.

The investigation into the possible launch of a business community for CCU showed that:

- There is a lot of interest in CCU and a community, especially among companies
- Respondents would like to see an open community and are prepared to pay a small contribution
- The community must focus on knowledge development and especially on new collaborations
- The ultimate goal of the community is to help develop new business.

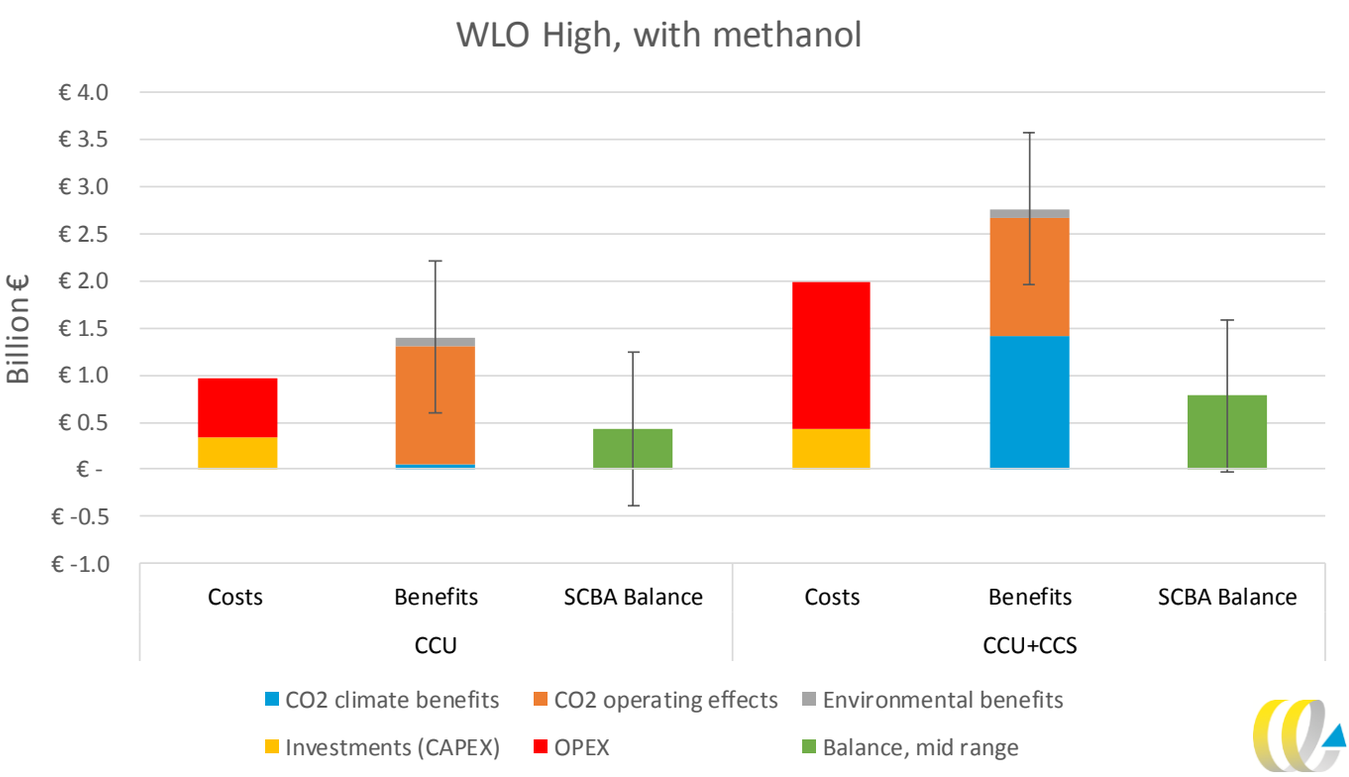


FIGURE 3 - SCBA RESULT IN METHANOL VARIANT 2018 -2068 (SOURCE: CE DELFT, 2018)

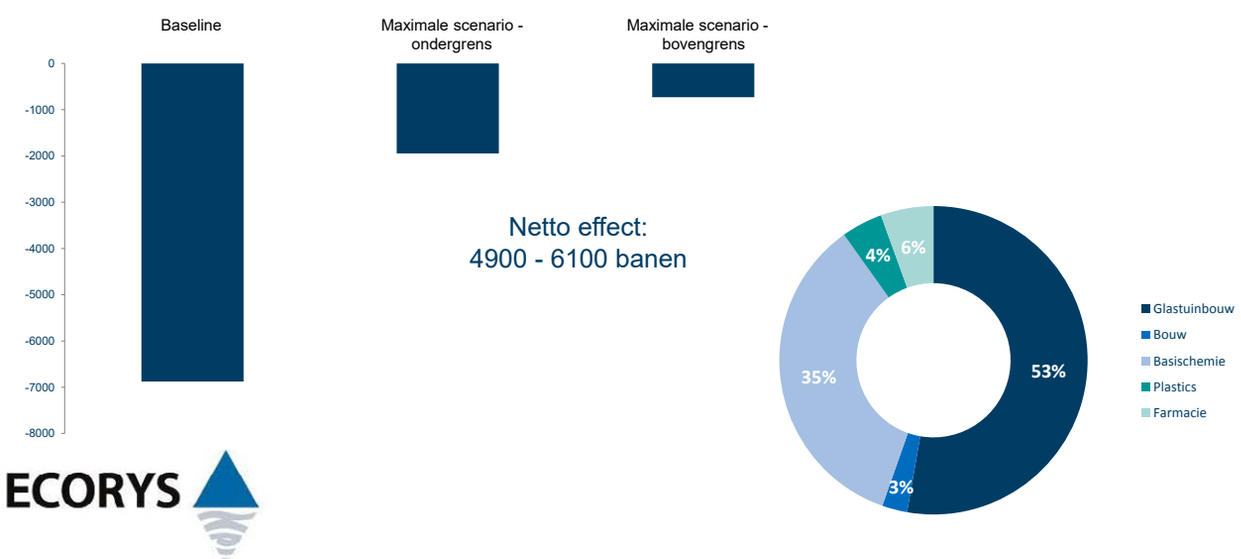


FIGURE 4 -EXPECTED EFFECTS OF CO2 SMART GRID FOR LOCAL EMPLOYMENT (SOURCE: ECORYS, 2018)

Finally, on the initiative of the municipality of Rotterdam, and on the agreement of the partners, a study was carried out into the **economic effects of CO_2 Smart Grid (Ecorys, 2018).** This study provided a more detailed answer to the question of which of the CO_2 Smart Grid's direct and indirect economic effects can be predicted (employment, external effects, etc.).

The additional study on the economic effects of CO_2 Smart Grid in the end showed that:

- The construction of the Smart Grid could lead to approximately 470 working years plus 80 extra jobs in the management phase (for the grid, including capture)
- The realisation of the CO_2 Smart Grid could lead to approximately 5,000 to 15,000 additional jobs, including approx. 200-400 R&D workplaces
- Many of these jobs would be lost without CO_2 Smart Grid (for example: greenhouse agriculture does not have a future without CO_2)

In the last Steering Committee meeting of the feasibility phase (July 2018), the Ecorys study and this final report were established. During this meeting, the partners said that this phase and this investment has met expectations and would also give rise to next phase investment.

“The CO2 Smart Grid consortium has been able to put the topic of CO2 reuse on the political agenda. The fact that a network with both members of the business world and regional & national governments has been built from scratch is praiseworthy. The added value of the project is not only the focus on the supply of CO2, but also the method of approaching the subject from the demand side. Analysing the CCU potential is a solid base for the future and one of the reasons why the AMEC Board is part of this consortium. BLOC has been proactive in developing the CO2 Smart Grid and has demonstrated perseverance in its execution. In doing so, they have been able to activate their network in a successful way.”

MARJOLEIN BRASZ - AMSTERDAM ECONOMIC BOARD

“My experiences so far have been very positive. Everything was well organised and I am very happy with the results we have been able to achieve together. I see a lot of potential for next steps and generating new business opportunities.’

FRED HAGE - LINDE GAS

"More insight was obtained into the possibilities, limitations, opportunities and risks of CO2 as a circular raw material for multiple CCU applications. The CO2 Smart Grid is a transitional way of thinking which presents CO2 as a circular opportunity instead of just a climate problem. According to NMZH, this feasibility study offers an excellent perspective on the future development of CO2 as a circular material."

ALEX OUWEHAND - NATURE AND ENVIRONMENT

FEDERATION SOUTH-HOLLAND (NMZH)

"Together with the CO2 Smart Grid network partners, we have put a great deal of work into researching public support and the foundations for developing a national CO2 market over the past few years. The most important themes for us were the possibilities of reusing CO2 in greenhouse agriculture, using it as a resource and building a network of relevant stakeholders. We were able to announce our first CCU project during the feasibility phase: namely the large scale CO2 capture at our AVR site in Duiven. We see the reuse of CO2 as an important step in utilising 100% of the (non-recyclable) residual waste."

MICHIEL TIMMERIJE - AVR

FIGURE 5 - THE AVR PLANT IN DUIVEN

4. CONCLUSIONS

Interpretation of the Reports' Conclusions

The conclusions of the various reports are remarkably congruent and logically follow on from each other. This creates a narrative that is convincing and positive, based on a market-driven proposition in which sustainability can be capitalised on in a socially profitable way.

Outlining the Primary Conclusion

The CO_2 Smart Grid is an intelligent network of resources, infrastructure and customers that use CO_2 as raw material in greenhouse agriculture, building materials and chemistry. It is embedded in the top worldwide chemical clusters, greenhouse agriculture, knowledge institutions, investment networks and in a stimulating public context. It's a socially robust investment with huge emissions reduction potential compared to the status quo. It is feasible and there is a market for it. It is essential that we continue to develop the innovation climate and that the social benefits are incorporated into the project business cases. In the coming years, the volumes will not compare to the volumes that could potentially be stored using CCS, but the synergy * with CCS is significant and the impact in the longer term could be substantial, including ancillary investments in R&D; plus there will also be substantial employment opportunities. A prerequisite is a public incentive framework in R&D and (operating aid for) CO_2 capture and transport (justified by social benefits), as long as they do not relate to the economic status quo and also, in the long run, the availability of green, affordable hydrogen for the chemical industry.

The possible synergy between CCS and CCU can consist of a large number of factors. In the first place, CO_2 must be captured and transported for storage and application. As part of this process, joint knowledge can be developed and functional cohesion can be realised. For example: if customers face a shortage of CO_2 in the summer based on existing CCU sources, this can be supplemented with CCS sources – and vice-versa in the winter. Synergy can also take place over time. Where large investments are now being prepared for CCS, these investments (in capture and transport) can be used for CCU in the long run (> 10 years).

This synergy only works if the stimulating framework for CCS and CCU is on a level playing field.

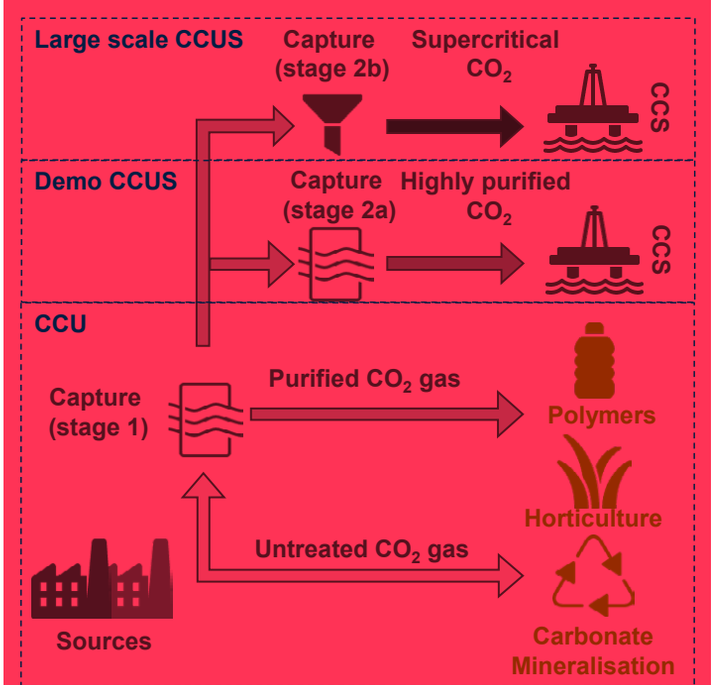


FIGURE 6 - SCOPE OF THE CO_2 SMART GRID (SOURCE: ECOFYS, 2017)

Core Proposition following from the Main Conclusion

Given the finite nature of fossil resources and fuels, CO_2 is an enormously important carrier for our new economy. The Netherlands is the global knowledge and value-creating cluster for the application of CO_2 as a raw material. All preconditions for this are already satisfied in terms of knowledge, physical and investment infrastructure and in greenhouse agriculture, building materials and chemistry. Investing in this economic strategy will provide us with jobs and prosperity for the coming generation and will put us in a leading position to transform our economy into one that is both sustainable and circular.

A start has already been made. There is an existing network with a capacity of 3 million tonnes of transport per year. Half a million tonnes of CO_2 are transported per year from two sources to greenhouse agriculture and there is a great deal of urgent demand. Investments are being made in the preparation of new capture projects and new applications. Investments are being made in the preparation of CCS and the synergy between them is in the pipeline. It's a solid foundation on which we can realise the core proposition.

Positioning in the Climate Agreement

The partners in CO_2 Smart Grid embrace this vision and are investing in it. In the first instance, this investment is within the framework of the Climate Agreement. This is evident from the efforts that the partners are making and the results of this. The CO_2 Smart Grid and its components are integrated in the input in the Climate Tables;

1. Agriculture: CO_2 supply in greenhouse agriculture is positioned as a precondition for achieving sustainability
2. Amsterdam industry: both the capture of CO_2 at AEB Amsterdam and the construction of infrastructure between Amsterdam and IJmuiden and CCUS at Tata Steel are within scope
3. Rotterdam Industry: Focus on CCS, CCU included in long-term projections
4. '25% table': CO_2 capture at waste-to-energy plants in the Netherlands and supply to greenhouse agriculture;
5. Innovation: CCU is one of the strategic methods of emissions reduction.

Furthermore, the vision of more than 30 organisations on the transition of our raw materials, issued in June 2018, puts the CO_2 Smart Grid at the heart of this transition.

Positioning in a Regional and International Context

This strategy is anchored in practically every conceivable public and regional framework: the energy agendas of Noord and Zuid Holland, the strategies of the Amsterdam Economic Board and the Next Economy Roadmap, The Industry's (Roadmap 2050 VNCI) and the Greenports (Boskoop Consultation). The strategy, or parts of it, is already laid down in all relevant places.

The most distinctive project in an international context is the joint initiative of the Netherlands, Germany, France and Cefic (European Chemical Industry Council). They launched the PHOENIX platform, an integrated European programme to enhance the value of CO_2 as a raw material. Nonetheless, the countries themselves and the international knowledge, research and industrial networks are already investing in CCU. There is momentum, but this momentum also means it's necessary to urgently realise the Netherlands' unique proposition.

5. INVESTMENTS AND CHALLENGES

The following table provides an overview of investments that the CO_2 Smart Grid partners are already making today, or intend to make in the short term.

SOURCES	
AEB Amsterdam	Investment in capture and appliance of 450.000 tons of CO2 per year in greenhouse agriculture
AVR Rotterdam	Investment in capture and appliance of 200.000 – 300.000 tons of CO2 per year in greenhouse agriculture
Tata Steel	Investment in CCS and CCU research. Volumes yet to be determined but uncontested
INFRASTRUCTURE	
OCAP	Investment in development of a CO2 Grid to apply 1,2 million tons of CO2 in greenhouse agriculture and after that a multitude in other industrial sectors
Havenbedrijf Amsterdam	Supports the development of CO2 Smart Grid and the related projects, by means of for instance creating permit flexibility and prepared to consider financial role
Havenbedrijf Rotterdam Gasunie EBN	Combined investment in the Porthos project, a large scale plan to capture and store CO2 from industrial emitters in depleted gas fields under the North Sea, combined with CO2 Smart Grid synergies
APPLIANCE	
LTO Glaskracht	Investment in research, coordination and lobby to make the greenhouse industry climate neutral as soon as possible
(Chemische) Industrie	Investment in development of new appliances for CO2 as a building block in the circular economy (see also page 18)
LOCATIONS	
Havenbedrijf Amsterdam	Reserves space at Prodock and other large scale locations (20 ha) for circular and CCU
Havenbedrijf Rotterdam	Investment in the transition of the industry, including large scale CCU in the long run
R&D	
Rijk – TKI	CCU is incorporated in the headlines of the Climate Accord, by means of the industry and agriculture tables
Markt	Investment in a large number of new research programs and pilots, often with support of government funds
SUPPORT	
Greenports	Network organization, invests in research, lobby and embedding of CO2 Smart Grid
Provincie Noord-Holland	Investment in business cases and networks regarding CO2 like the Green Deal CO2 Noord-Holland, NZKG and others
Provincie Zuid-Holland	Investment in various networks regarding CO2 appliance and willing to consider a financial role
Amsterdam Economic Board	Network organization, invests in research, lobby and embedding of CO2 Smart Grid
Deltalinqs	Investment via Deltalinqs Energy Forum in CCUS transition
Natuur- en Milieufederaties NH en ZH	Stimulating the development and realisation of CCU in West Netherlands.

TOTAL = A little under 50 FTE and a little under € 200 million (ex. CCS Rotterdam and Amsterdam)

NB Porthos = the joint project of the Port of Rotterdam Authority, Gasunie and EBN to achieve large-scale storage of industrial CO_2 emissions from the port in empty gas fields under the North Sea.

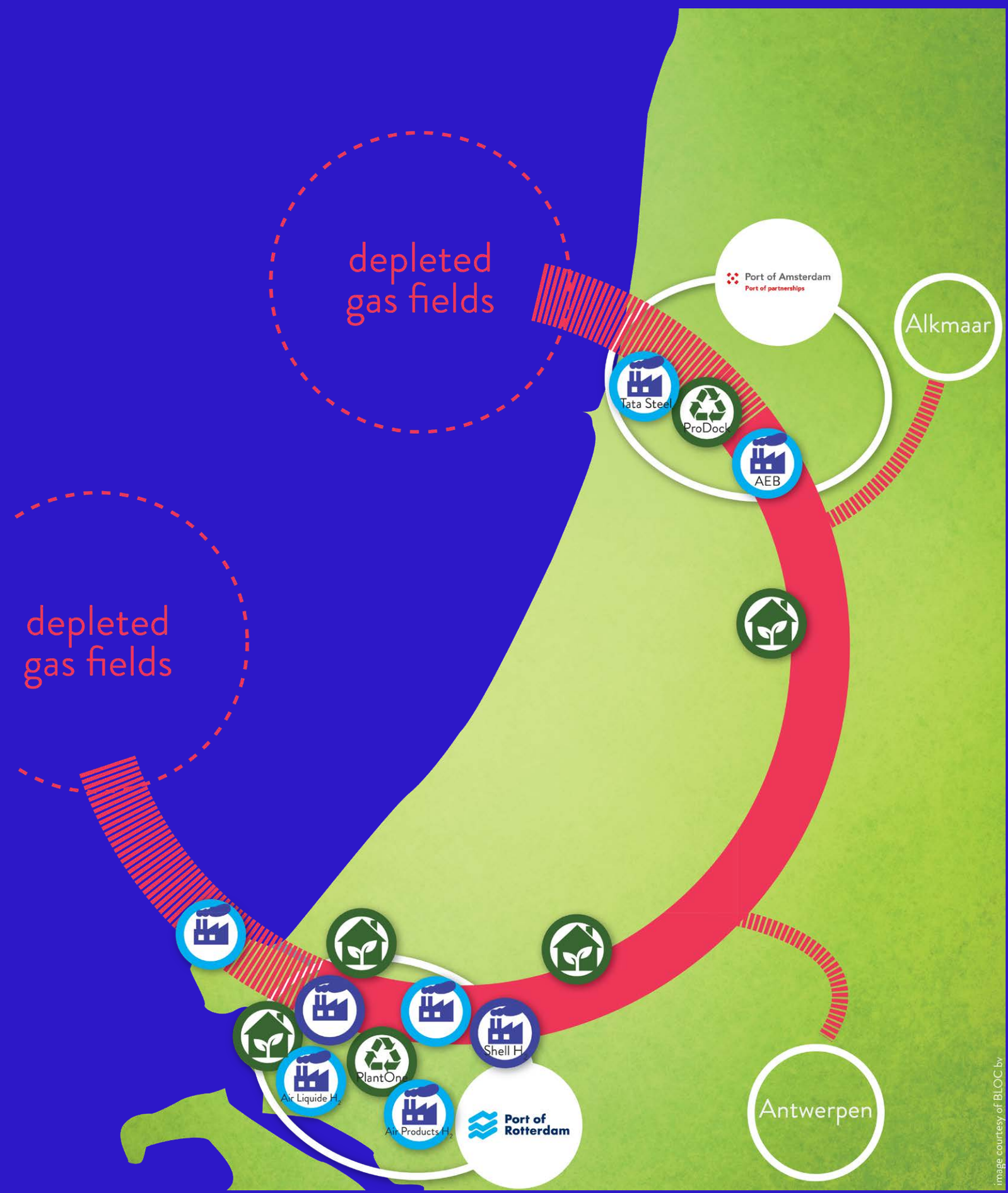


image courtesy of BLOC by

Synthesis and Relation to the Core Proposition

With a current and planned investment of around 50 FTE and an investment of a little under €200 million, the position that the regional partners are investing significantly in the CO_2 Smart Grid economic strategy can be easily defended. The partners are making every effort, within their scope, to make the CO_2 Smart Grid business model work and therefore realise the strategy.

Where the playing field has not yet been firmly decided, for example in the organisation of the roll-out of the grid from Amsterdam to IJmuiden, collaborations have been created to make progress on this front.

IN CONTEXT

Special developments parallel to this investment, outside the scope of the partners, are also taking place. Photanol will build its first full-scale demo in Delfzijl. The Greenport Aalsmeer will be connected to the OCAP network. BioMCN is going to build a bio methanol plant in Delfzijl based on green hydrogen and CO_2. Avantium will invest in technology and a pilot for CCU. Feyecon and Dyecoo will create a business out of the application of supercritical CO_2 in extraction and production processes. Alta is going to produce a high-end chemical from CO_2 on the Maasvlakte. AVR Duiven and HVC are going to capture CO_2 and supply glasshouse agriculture. In the last two years, the use side of CO_2 Smart Grid is moving very quickly. In fact, we are at the beginning of a huge innovation curve for CCU.

Cost-effectiveness

The SCBA provides (under the WLO 'high' scenario) a first indication of the total quantity of investment required to build CO_2 Smart Grid (to the extent it concerns capture, transport and distribution to agriculture). This indication amounts to €340 million excluding operating costs in the management phase. This is the sum of the subprojects that are at different stages of maturity. The social return on investment has been established and is robust. From the most urgent projects (which are also the most developed), namely the capture at waste-to-energy plants and the supply to agriculture, we have an initial indication of the cost-effectiveness of the projects in terms of euros per tonne of CO_2 emissions not emitted. The contributions requested from the State for these projects amount to €35 - 70 per tonne of CO_2 not emitted (depending on the distance to the grid and the availability of sustainable heat).

Challenges

By far the biggest challenge for CO_2 Smart Grid is to create the right innovation climate to speed up the proposed projects and bring new use routes to fruition. This will not be possible without an effort from the government along the same lines as what is already happening in the region in terms of positioning and investment.

Positioning: It is of the utmost importance that the government makes its position on the CO_2 Smart Grid proposition clear. Not only from the perspective of the Climate Agreement until 2030 – we know that the greatest emission reductions must be achieved in other ways – but also in the context of our Climate Commitments after 2030. This is when the CCU practice will really start to scale up (due to lack of fossil resources and/or their price) – also in the context of our raw materials transition.

This positioning must firstly be about what the public role in CCUS will be. Will the government immediately manage emission reductions through pricing/tax? Will CO_2 transport (for CCS and, when the market develops, for CCU) be a regulated environment? In other words, in which social framework will we make the CO_2 Smart Grid a success?

Investment: The production costs of materials and raw materials (for greenhouse agriculture as well) do not relate to the economic status quo based on fossil resources. In a number of markets, the demand for sustainable products will increase organically and, with some high-end products, the price of CO_2 as raw material can easily be discounted. Real volumes will only be achieved when the social benefits of CO_2 as a raw material have economic potential. The Climate envelope 2018 also clearly shows that the R&D budget for CCUS in the Netherlands will intensify. A lot of work is also being done on this at European level (PHOENIX).

Clarity about 1) structural and substantial R&D budgets and 2) operating support to cover unprofitable mis-starts are an essential precondition for achieving an innovation ecosystem for CCU.

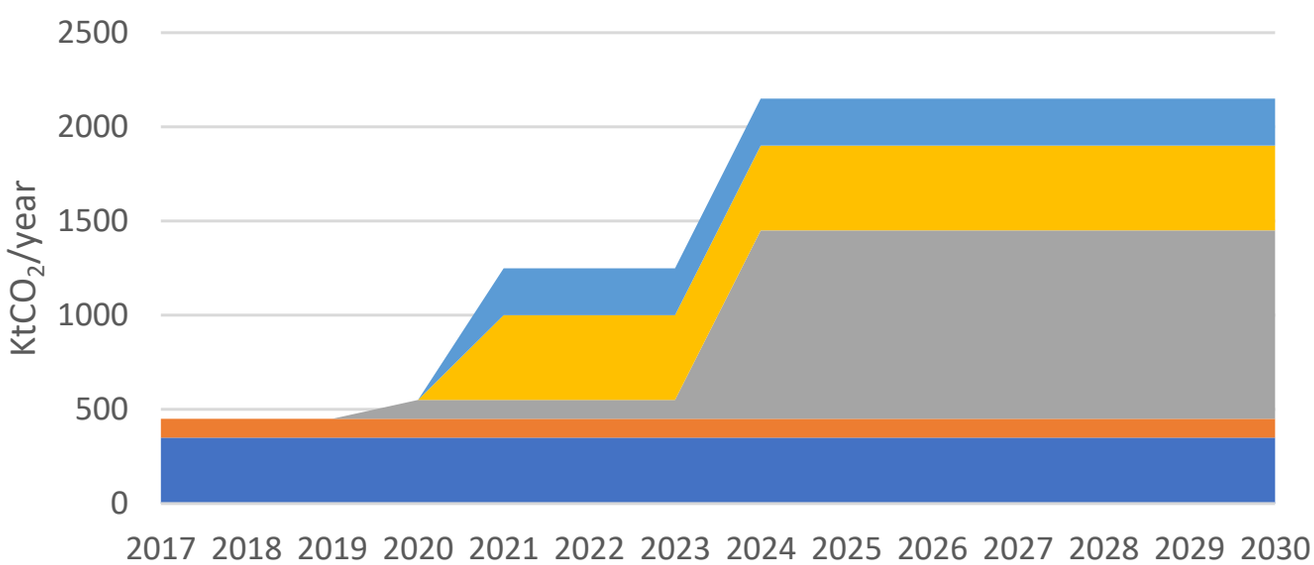


FIGURE 7 - POTENTIAL CO_2 SUPPLY TO THE CO2 SMART GRID 2017 - 2030 IN KILOTONS PER YEAR (SOURCE: TNO, 2018)

6. FOLLOW-UP

A collaboration which includes 22 partners who have all kinds of different backgrounds, roles and sometimes even partly competing interests, but who nonetheless remain committed to each other, is special. It says something about the extent to which the partners see the CO_2 Smart Grid as a real solution for our Climate Commitments and for the transitioning task in existing sectors (agriculture, waste, materials, chemicals, infrastructure). It also says something about the realisation that, in this transition, the parties will not be able to bring the projects to fruition without each other – market partners for the business, sectors for the connection, governments for the investment environment and help with that investment, all these elements are needed to make the CO_2 Smart Grid a success.

The CO_2 Smart Grid is an economic strategy with a substantial contribution to the Climate Commitment that guides the development of the Netherlands as the global knowledge and value-creating cluster for the application of CO_2 as raw material in greenhouse agriculture, mineralisation and the chemical industry.

The feasibility study and its components show that this strategy is realistic, feasible, substantial and socially profitable in the right conditions, such as those described in chapter 5. With this final report, the feasibility phase of CO_2 Smart Grid is concluded and the partners can start looking towards the next step: the development phase.

Development Phase

In the development phase of CO_2 Smart Grid, partners will work on their own project development (e.g. OCAP network roll-out, Tata Steel capture, AEB Amsterdam and AVR Rotterdam, CCUS infrastructure in the Rotterdam and Amsterdam regions). The CO_2 Smart Grid is not about theindividual project developments per se.

In its development phase, CO_2 Smart Grid will deal with two things: 1) providing an agenda-setting platform for coordination between projects and issues and 2) accelerating the value creation of use.

1. A Platform

CCU is on the map from the perspective of the CO_2 Smart Grid partners, but it requires constant attention to maintain the focus on the added value of CCU. The CO_2 Smart Grid therefore becomes an agenda-setting platform for CCU.

Partners autonomously manage project developments which take place in each other's neighbourhood, certainly in the western region of the Netherlands. This directly leads to partners searching for other parties and cooperating on relevant topics. Although partners independently manage their own project development in capture and infrastructure projects, they all operate in an unregulated framework which has a significant (social) dynamic. A number of prerequisite issues for the success of the projects play a role in this dynamic. This means that CO_2 Smart Grid is also a coordination and issue platform.

Many of the partners need to see how the proposition of CO_2 Smart Grid will actually be realised. To this end, the coalition, in collaboration with the national government and supported by the partners, will prepare a development plan/ roadmap in December 2018.

2. Value Creation

The development of CCU knowledge and projects happens at the intersection between R&D, knowledge and the market; between agriculture, construction and chemistry and between different regions. The CO_2 Smart Grid is launching the Beta version of the Carbon Club, the network organisation that accelerates knowledge and value creation about CCU in the Netherlands.

As of 1st January 2019, the Carbon Club will be expected to be independent with its own financing model. That will be the 'proof of the pudding' for the network's added value. In the second half of 2018, the work will consist of organising three meetings, building an online platform and recruiting paying members.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