

Netherlands Enterprise Agency

Recent developments for (Bio-)CCUS in the Netherlands

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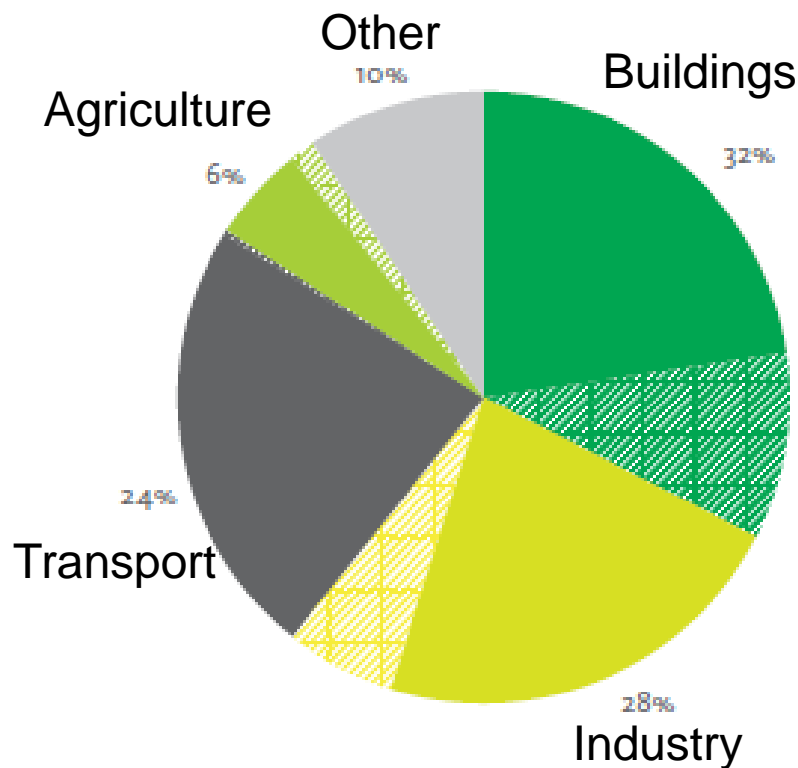
Netherlands Enterprise Agency

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Picture: Ludan Renewable Energy



Dutch energy landscape – final use 2015



- High industrial and transport use
- Energy agenda 2016: Reduce CO2 emissions for all energy functions
 - Space heating
 - High temperature heating
 - Transport
 - Power and lighting
 - Agriculture

Source: Nationale energieverkenning 2017
Dashed areas: electricity use in the sector



Coalition agreement – 49% by 2030

18+2 Mton CO2 reduction through CCS in 2030 ..indicative

Table: Indicative allocation of the 49% reduction by 2030		
Domain	Reduction by 2030 (Mt)	Measures
Industry	1	Recycling
	3	Process efficiency
	18	Carbon capture and storage
Transport	1.5	More fuel-efficient tyres, European standards, electric vehicles
	2	Biofuels and measures by cities
Built environment	3	Optimising energy use of office buildings
	2	Home insulation, district heating and heat pumps
	2	New builds that are more energy-efficient
Electricity	1	Energy-efficient lighting
	12	Shutting down coal-fired power plants
	2	Carbon capture and storage at waste incineration plants
	4	More offshore wind power
	1	More solar power
Land use and agriculture	1.5	Smarter use of available land
	1	Lower methane emissions
	1	Energy-producing greenhouses



In the coalition agreement:



- Climate and Energy Agreement
- Climate law
- Broaden SDE+ / Renewable Energy premium
- Budget of M€ 300/year for policies and demonstration (entire Climate package)
- Minimum price for CO₂ emissions in E-sector, increasing to € 43/ton in 2030
- Consultation with Rotterdam harbour, Amsterdam harbour, Westland area
- 2030: end of coal-fired power



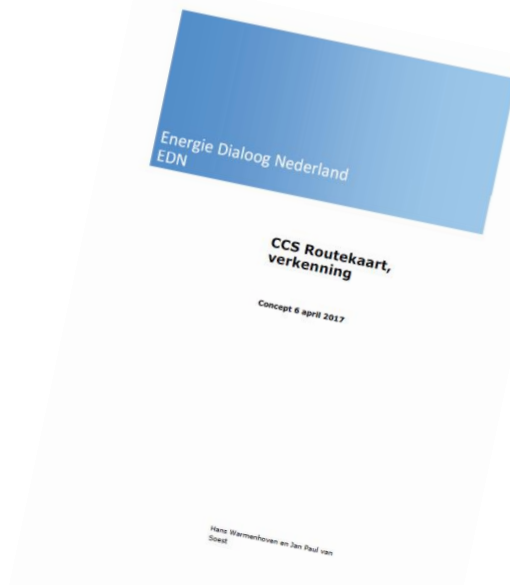
CCS, CCU and Bio-CCS and -CCU

- Prevention is better than cure – CCS is a last resort
- Today, CCS can contribute (much) more than CCU, Bio-CCS and Bio-CCU
- Future policies must necessarily focus on CCS, or the indicative targets can never be realised
- Past policies have built on ETS and investment subsidies – and have not launched CCS
- Negative emissions are not valued in ETS
 - No Dutch policy instruments foreseen to date to change this situation



CCS Policies: Roadmap (Early 2018)

- “Verkenning” – “scouting” for Roadmap finalised spring this year
- CCS for industry broadly accepted (though from different angles)
- Three-phase approach
 - Preparation
 - Demonstration
 - Implementation
- Roadmap will consider a.o.:
 - Communication / public support
 - Transport & Storage potential (ongoing)
 - Organisation (financial, public/private ...)
 - Juridical aspects
- Ministry Economic Affairs and Climate supports the process



Large-scale ideas...



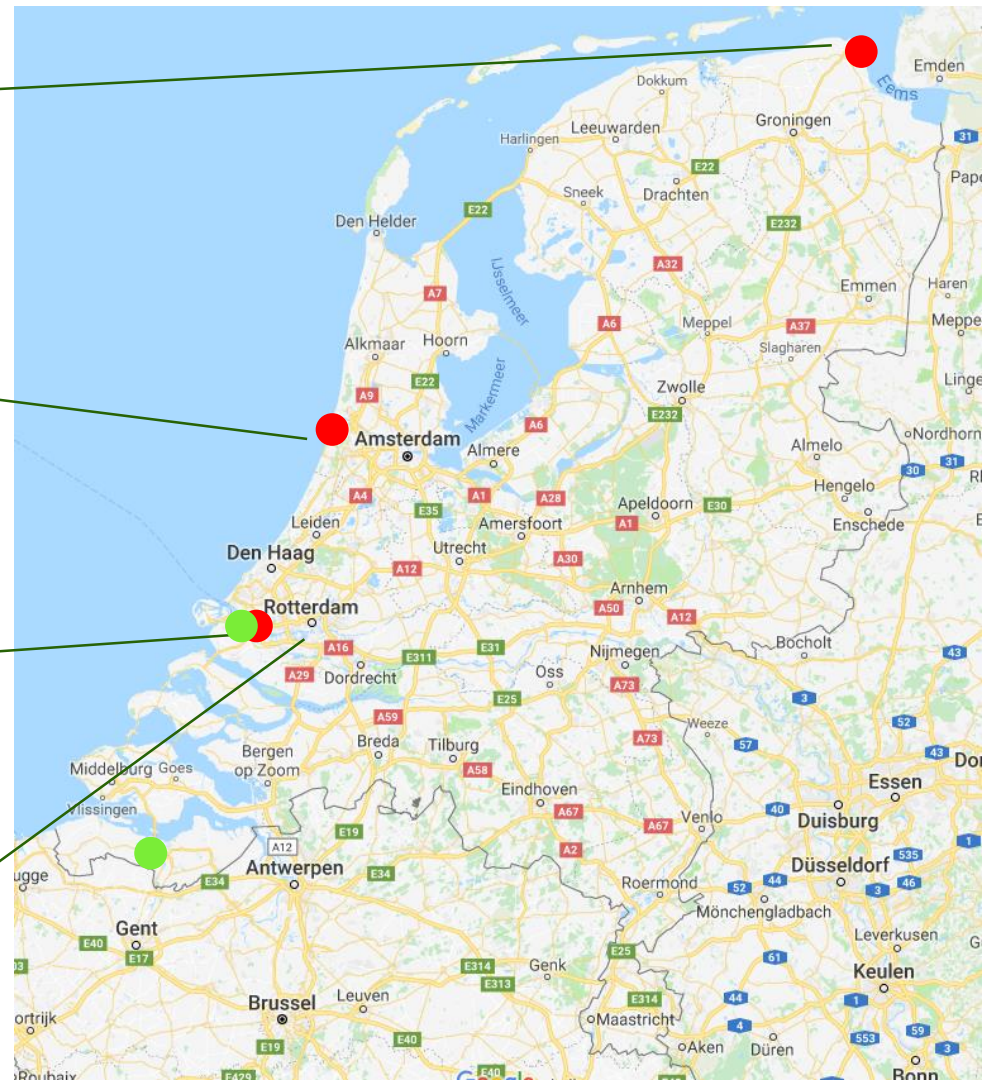
Not intended to be complete

Nuon Magnum:
H₂ fuelled, CO₂
to Norway

Tata Steel:
Hisarna, plus CO₂
stream

Rotterdam harbour,
EBN, Gasunie: CO₂
pipeline to the sea

From 'Blue hydrogen'
towards 'green hydrogen'





(Bio-)CCU a reality today!

- OCAP and WarmCO₂ delivering about 500 kton/year CO₂ -> greenhouses
- CO₂ capture pilot at Waste Incinerator of Twence (2 kton/y) <http://co2sbc.eu/>
- 'Compensation stone' of DRBG, with 250 kg/m³ CO₂
- K12b 'enhanced gas recovery'
 - CO₂ injected into the reservoir
- 'Groen gas Almere' and Kloosterman deliver Bio-CO₂ to industrial gas companies





CO₂ Smart Grid

- Circular economy / raw materials for chemistry
- CO₂ Smart Grid, couple CO₂ valorization and storage
- Initiative BLOC
- 22 partners
- 'Invest in first CO₂ smart grid in the world'





Relevant (Bio-CCU) initiatives



- MWIs aim to capture CO₂ and deliver to greenhouses
- AVR announced plans for CO₂ capture in Duiven
- Green Deal CO₂ delivery north Holland
- Several companies offer decarbonisation technologies
 - Bright Biomethane, CarbonOro, Haffmans, CCS..)
- CO₂ capture, transport and 'binding' now in fiscal investment stimulation programme (MIA/Vamil)



Recent highlights in international collaboration

- SET Plan Action 9 CCUS: approved
 - Includes a target for Bio-CCS (1 pilot)
- ECCSEL: in operation
- 4 PCIs incl. Port of Rotterdam PCI: approved
- Mission Innovation (MI): PRDs being developed, and then...
- ACT: 2nd Call planned 2018 MI countries invited to join
- CCU 'Phoenix': DE, FR, ES, BE/FL?, NL?
- ZEP, NSBTF, CSLF: NL participates

The screenshot displays the SETIS (Strategic Energy Technologies Information System) website. The main navigation bar includes links for Home, About the SETIS, Legal notice, Contact, Search, and English. The header features the SETIS logo and the text 'Strategic Energy Technologies Information System'. Below the header, there is a navigation menu with options like 'SETIS in the Energy Union landscape', 'Advance towards implementing the Integrated SET Plan', 'Low Carbon Energy Technologies', 'SETIS Reports', 'Related JRC Publications', and 'Calendar'. The main content area is titled 'SET-Plan Implementation Progress Reports' and features a large circular diagram with 10 numbered nodes. Below this, there is a section for 'Energy Union Research, Innovation and Competitiveness Priorities' and 'SET-Plan 10 Key Actions'. The key actions are listed as follows:

1. Performant renewable technologies integrated in the system
2. Reduce costs of technologies
3. New technologies & services for consumers
4. Resilience & security of energy system
5. New materials & technologies for buildings
6. Energy efficiency for industry
7. Competitive in global battery sector and e-mobility
8. Renewable fuels and bioenergy
9. Carbon Capture Storage / Use
10. Nuclear safety

Additional sections on the page include 'Towards an Integrated Roadmap', 'SET-Plan Calendar', 'SETIS Magazine', 'Energy Systems Modeling', 'Energy System Modeling', 'Enter your email', 'Subscribe', 'Latest interviews', and 'JRC reports'. The JRC reports section lists several reports, including 'Smart specialisation benchmarking and assessment: pilot study on wind energy', 'Hydro-related modelling for the WATERPLEX Exploratory Research Project', 'JRC Ocean Energy Status Report - 2016 Edition', and 'JRC Wind Energy Status Report - 2016 Edition'. A profile picture of Marc Oliver Betzäuge, Director of the Institute of Energy Economics at the JRC, is also visible.



Conclusions and priorities



- Bio-CCS and Bio-CCU not a policy priority
- Priorities for CCS
 - Have a robust narrative
 - Dialogue with industrial partners
 - Incentives for demonstration and implementation
 - Governance questions
 - Questions around securing storage capacity, governance, liability
 - Stimulating innovation in CCUS
- Bio-CCS and Bio-CCU offer opportunities - should be stimulated alongside CCS