

Annual Report 2010



**Gas Technology Centre
NTNU-SINTEF**

Strategic partner:



Preface



Maria Barrio

Dear reader,

2010 was an intensive year for the Gas Technology Centre (GTS). The objectives and strategy that were set up early in the new 5-year period 2008-2012 have continued to guide the centre; primarily towards natural gas R&D - processing, liquefaction and conversion, while we have continued to support important efforts in hydrogen and CCS technologies.

Significant efforts were put into "*Visibility of R&D*", with the completion of two websites; a revitalized GTS website and a CCS educational website. In addition, we prepared and distributed the NTNU-SINTEF Gas Technology Activities report 2009 in order to show the extent, diversity and high scientific quality of our gas technology research. The report has been very well received by our external partners and proved to be as a useful tool for promotion of our competence. We will therefore launch updated reports regularly.



Hilde J. Venvik

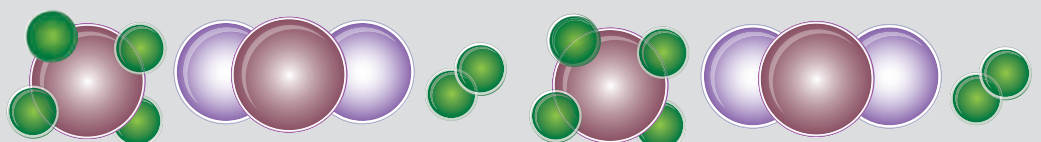
We have also made major efforts within "*Internationalization*" by establishing closer contact with R&D relevant partners in Brazil, China and Japan. Under "*Education*", the largest single effort was the IEAGHG International CCS Summer School that was arranged on Svalbard in August with close to 85 participants. Young scientist building networks, joining discussions, learning from and challenging established CCS experts in such inspiring landscape and geology creates long term value in terms of strengthening the CCS community and solving the climate change issues.

The challenges of supplying clean and sufficient energy for the future is receiving increasing attention worldwide. GTS works to raise awareness for the importance of natural gas as a contributor to emission reductions at a global scale, and to stress the role of gas in the transition to renewable energy. The competence in our community clearly shows the synergies between gas-to-liquids (GTL) and biomass-to-liquids (BTL) technologies. The use of natural gas on ships is another example of how gas can contribute to considerable emission reductions.

Where there are high levels of knowledge, understanding and innovation, new opportunities always materialize. The joint expertise at NTNU and SINTEF in gas technology should be seen in a long-term perspective, and our ambition is to deliver technological excellence and sustainable energy solutions to society and industry in Norway and abroad. We will continue our efforts to promote gas technology R&D in 2011 and to bring gas activities to the agenda.

Lastly, we want to thank Statoil, NTNU and SINTEF for their support to the GTS, without which our work would not be possible.

Maria Barrio and Hilde J. Venvik
Co-directors of the Gas Technology Centre NTNU-SINTEF



The Gas Technology Centre NTNU-SINTEF

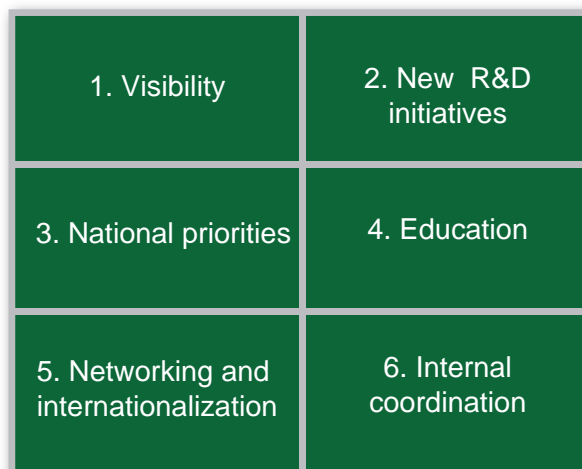
The Gas Technology Centre NTNU-SINTEF (GTS) was established in 2003 and is the largest centre for gas technology research and education in Norway. GTS provides new knowledge and technology which will contribute to efficient, environmentally friendly and profitable utilization of natural gas.

The GTS focuses on exploring and exploiting the synergism of multidisciplinary research based on NTNU and SINTEF's expertise that encompasses the entire value chain from the energy source to the end user.

The mission of GTS is to act as a common interface in gas technology R&D between NTNU/SINTEF and the market.

More specifically, GTS will:

1. Increase the visibility of gas technology R&D at NTNU/SINTEF, both externally and internally.
2. Promote new R&D opportunities and initiatives
3. Influence Norwegian national priorities
4. Ensure top quality education and recruitment of students and researchers
5. Be active in networking and internationalization activities
6. Promote internal coordination and synergism in gas technology R&D at NTNU/SINTEF

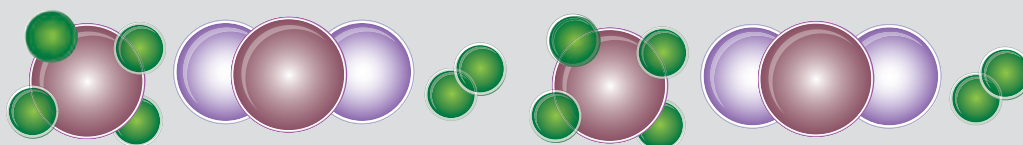


GTS Strategy

Main achievements in 2010

- Main organizer of the IEA GHG International CCS Summer School 22-28 August in Spitsbergen, Svalbard
- The Gas Technology Activities 2009 report
- Active support to the project "Biomass to liquid fuels"
- Internationalisation activities: Brasil, Japan, USA
- Success in EU's Fuel Cells and Hydrogen Joint Undertaking

CCS	Carbon dioxide Capture and Storage
FCH JU	Fuel Cells and Hydrogen Joint Undertaking
GTS	Gas Technology Centre NTNU-SINTEF
LNG	Liquefied Natural Gas
NFR	Research Council of Norway
NTNU	Norwegian University of Science and Technology
UNIS	University Centre in Svalbard
BIGCCS	International CCS Research Centre
SUCCESS	SUBsurface CO ₂ storage - Critical Elements and Superior Strategy



Activities in 2010

1. Visibility

Exhibition at GHGT10



www.ghgt10.info

The 10th International Conference on Greenhouse Gas Control Technologies (GHGT10) took place 19-23 September in Amsterdam, Netherlands. The conference had 1600 participants from 55 countries, with a total of 260 oral presentations and 650 poster presentations. SINTEF contributed with 7 oral presentations and 24 poster presentations, and NTNU contributed with 5 oral presentations and 21 poster presentations. GTS contributed with a poster wall together with the projects ECCSEL and BIGCCS.

Exhibition at Barents Sea Conference

www.barentshavkonferansen.no

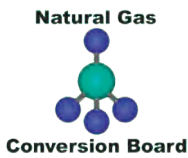
GTS presented a poster wall at the Barents Sea Conference, which took place 21 - 22 April in Hammerfest. Despite the air traffic problems caused by Icelandic volcanic ash, the conference was successfully held with participation from industry, research education and politics.



Natural gas is gaining increasing importance worldwide as energy source and chemical feedstock.
At NTNU and SINTEF about 400 people are working with gas technologies.



Participation in NGCS



www.ngcb.org/index.asp?sid=31

GTS participated in the 9th Novel Gas Conversion Symposium (NGCS), which took place 30 May to 3 June in Lyon, France. The conference had more than 450 participants from industry and academia.

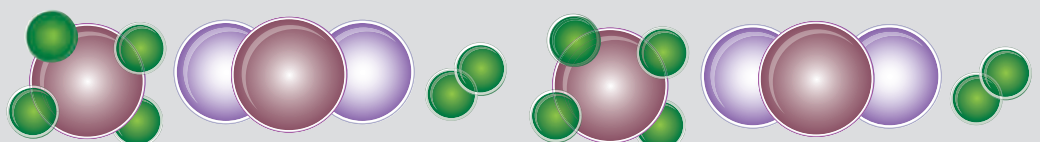
Proposal to arrange NGCS 2013 in Tromsø

GTS submitted, in collaboration with the University of Tromsø, a bid to arrange the 10th Novel Gas Conversion Symposium (NGCS) in Tromsø 2013. Eventually, Qatar was selected as venue, but the Tromsø-proposal received positive feedback and a bid for NGCS-11 in 2016 was encouraged.



Gas Technology Activities 2009 report

GTS produced the Gas Technology Activities 2009 report. The report provided an overview of the ongoing activities in gas technology at NTNU and SINTEF, and was widely distributed at conferences, meetings and other events to promote the NTNU/SINTEF gas community.



Fuel Cells and Hydrogen Joint Undertaking (FCH JU)

The 3rd Stakeholders' General Assembly (SGA) took place in Brussels in November and paved the road for the FCH JU to finally become autonomous. This also marks the initiation of the half way evaluation of the FCH JU, including assessment of the program itself, the organization as well as revision of the strategic documents. GTS contributed to the work through SINTEF's engagement in FCH JU's research association N.ERGHY.



www.fch-ju.eu/

N.ERGHY

During the 5th General Assembly (GA) of N.ERGHY in April, SINTEF's Steffen Møller-Holst was re-elected as Chairman for the Application Area Transportation and Refueling Infrastructure. In May a Brokerage Event was arranged in Essen to facilitate the establishment of consortia and new project proposals for the 4th call (closing October 2010). The 6th GA of N.ERGHY was held in November. The main achievements in 2010 was the renewal of Executive Board for the years 2010-2011 and the agreement with the Industry Grouping on a joint instrument for funding the Program Office of FCH JU.



Interview with GTS in "Tjeldbergodden"

In early 2010, Maria Barrio was interviewed for the "Tjeldbergodden" magazine about gas technology research at NTNU and SINTEF, and the outlook for natural gas in a Norwegian and a global perspective.



Nærhet til Norges beste forskningsmiljø

Tjeldbergodden ligger nær NTNU, SINTEF og Gassteknikk Senter, det største forsknings- og utdanningsmiljøet i Norge innen naturgass. Aktører som vil etablere seg på Tjeldbergodden har derfor tilgang på kompetanse og teknologi i verdensklasse.

Gassteknikk Senter er en samarbeidsarena mellom NTNU og SINTEF og er en paraplyorganisasjon over all gasseteknisk forskning ved institusjonene. Til sammen er ca. 200 SINTEF-forskere, 75 NTNU-professorer og 200 doktorgrad og post-doc-forskere med gasseteknologi som arbeidsfelt tilknyttet senteret. Med kunnskap i verdensklasse når det gjelder naturgass, CO₂ fangst og lagring og hydrogen, utgjør senteret en enorm kompetansebase for industrien og samfunnet for øvrig. Forsknings- og kunnskapen omfatter hele spekteret fra utvinning, transport og fordeling til industribygging og miljøvennlig utnyttelse av naturgassen. Maria Barrio er direktør ved senteret.

Hvorfor har satsingen på industriell videnskapsforskning av naturgass i Norge vært så begrenset?

– Det er flere grunner. For det første mangler vi landbasert gassinfrastruktur, og denne er dyr å etablere. For det andre har gassprisene vært høye og de industrielle aktørene få. Mangelen på politisk vilje til å satse på denne type industri er også et argument som ofte trekkes fram. Industriell utnyttelse av gass krever store investeringer og innebærer høy økonomisk risiko, og for å gjøre det mer attraktivt å etablere seg må alle disse faktorene bli håndtert på en god måte. Politisk er det nå større vilje når det gjelder å legge til rette for industriell bruk av naturgass.

Hva kan Gassteknikk Senter bidra med for å hjelpe aktører som vil etablere seg?

– Vi kan bidra på flere måter. Vi kan lage et estimat på prosjekters lønnsomhet. Vi kan undersøke potensielle ringvirkninger

og effekter, blant annet, synergieffekter med integrasjon av metallurgiske prosesser med mineralt som finnes i nærheten. Vi kan også finne hvordan prosesser kan optimaliseres slik at de blir mindre energikrevende, og identifisere muligheter for varmeintegrasjon. En teknisk evaluering ved simulering og småskalalaboreringer er også mulig. Ved Gassteknikk Senter kan vi også analysere de samfunnsøkonomiske aspektene.

Hva er fordelene med å etablere seg på Tjeldbergodden?

– På Tjeldbergodden har man stor kunnskap, kompetanse og erfaring med å drive anlegg. Infrastrukturen er også på plass. At kunnskap og infrastruktur allerede er etablert gir et gunstig utgangspunkt for god økonomi. Muligheten for prosessintegrasjon er gode, og dette øker potensialet for energieffektivisering. Når flere industribedrifter legger sett er det desto mer rimeligere og lettere å implementere miljøtiltak enn når bedrifter ligger isolert.

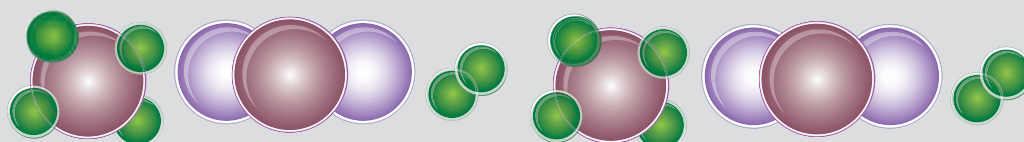
Mange er negative til industri basert på naturgass på grunn av CO₂ utslippene. Hva er Gassteknikk Senterets holdning til dette?

– Det finnes flere strategier som kan bidra til å løse CO₂ problematikken knyttet til gass. En ting som er svært viktig å forstå når det gjelder gass, er at den kan erstattes av andre og mer miljøvennlige energikilder. Gass inneholder mindre karbon enn f.eks kull eller olje, dermed blir det vesentlig mindre CO₂-utslipp ved å brenne gass enn ved å brenne kull eller olje. Mens gasskraftverk i andre land blir sett på som et

miljøforbedrende tiltak, tenker vi ikke slik i Norge, fordi vår kraftproduksjon for det meste har kommet fra fornybar vannkraft. I det globale bildet er imidlertid gass som en erstatning for kull og olje i seg selv en viktig klimaløsning. En annen strategi som vil redusere klimagassutslipp, er å fange og lagre CO₂. Norge har stor potensiell lagringsplass for CO₂, dessuten ligger vi helt i front når det gjelder teknologivalgning på dette området. For det tredje kan vi satse på energieffektive industriklustre. Ved å samkjøre gassbaser industri kan vi oppnå en mer effektiv energibruk gjennom prosessering og maksimal råvareutnyttelse. Alle disse strategiene kan kombineres og bidra til å løse klimaproblemet. Noen kritiserer fangst og lagring av CO₂, fordi det tar oppmerksomheten vekk fra satsing på fornybar energi?

– Per i dag produserer ikke nok fornybar kraft til å dekke verdens behov for energi. Olje og gass vil derfor fortsette å være viktige fornyingskilder globalt i mange år framover. Vi må fortsette å utvikle fornybare energiløsninger, og samtidig satse parallelt på miljøvennlig gasseteknologi. I SINTEF og NTNU jobber vi f.eks med å finne ut hvordan man kan redusere kostnadene ved CO₂-fangst. Vi forsker på hvordan vi kan optimalisere prosesser slik at de blir mindre energikrevende ved hjelp av simulering og småskalalaboreringer. Det vi trenger er å kunne demonstrere dette i større skala, siden erfaring fra større pilotanlegg er viktig for å kunne validere teknologi og få kunnskap om hvordan prosessene fungerer i praksis.

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2. New R&D opportunities and initiatives

A GREEN Sea

The objective of the project is to identify and evaluate new technologies and concepts for removal of CO₂ and H₂S from natural gas, thereby avoiding CO₂ emissions to air and avoiding the use of harmful chemicals. GTS contributed in 2010 to the establishment of the Consortium Agreement and project kick-off. PETROMAKS (NFR) and industrial partners: Statoil, TOTAL, Gassco and Petrobras. This is a 5 year project with a total budget of 32 MNOK.

NTNU-SINTEF-Statoil BTL project

The main goal of the project Biomass to liquid fuels (BTL) is to develop the knowledge needed to select or design new catalysts and adsorbents in order to improve the technology for BTL based on gasification and Fischer-Tropsch synthesis, especially focusing on gas-phase pollutants (e.g. tar, alkali and sulphur) on the catalytic steps used to produce liquid fuels. NTNU and SINTEF perform the work, which is funded by Research Council of Norway RENERGI program, Statoil VISTA, and NTNU and SINTEF through the Gas Technology Centre. The total budget for the 3-year project is 8,6 MNOK.

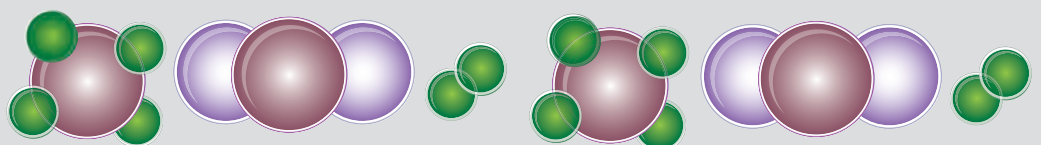
Initiatives at Transnova

GTS has taken the initiative to discuss with Transnova possible routes for the introduction of renewables in the transport sector. Several groups within SINTEF and NTNU have been involved, since the proposed study compares biodiesel, hydrogen, biogas and electricity as alternatives.

Hydrogen and fuel cell proposals granted support in 2010

Four new proposals were granted support by European FCH JU in which SINTEF is partner:

- STAYERS, Stationary PEM Fuel Cells (Coord. by NedStack, NL)
A 3-year R&D-project with total budget 4,2 M€.
- RAMSES, High Temperature Fuel Cells (Coord. by CEA, France)
A 3-year R&D-project with total budget of around 4,5 M€.
- HyLift-DEMO, Hydrogen & Fuel Cell powered Forlifts (Coord. by H2Logic, DK)
A 3-year DEMO-project with R&D-activity at SINTEF. Total budget 6,4 M€.
- H2movesScandinavia, Demonstration of hydrogen vehicles and refueling infrastructure in Oslo
A 3-year DEMO-project coordinated by LBST (D), in which SINTEF coordinates the activity co-funded by Transnova. Total budget 19,3 M€.



3. National priorities

Dialogue meeting with politicians

GTS had a meeting in September with Asbjørn Rønning and Dorte Bæe Solvand from Sør-Trøndelag fylkeskommune to discuss the role of gas technology in a low emission society, and transport and use of Norwegian biomass.



SØR-TRØNDELAG
FYLKESKOMMUNE

Active involvement in OG21

OG21 has elaborated a new strategy and the original eight Technology Target Areas (TTA) have been reduced to four:

1. Energy efficient and environmentally sustainable technologies
2. Exploration and increased recovery
3. Cost-efficient drilling and intervention
4. Future technologies for production, processing and transportation



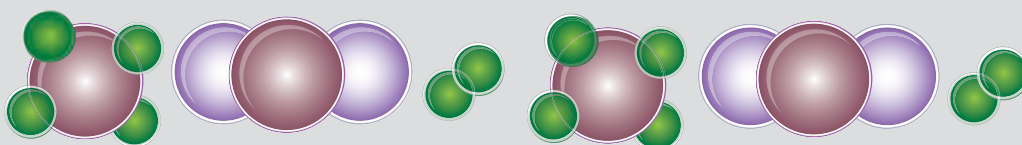
www.og21.org

Gas technology is mainly covered within the new TTA-4. Efforts are made from GTS for gas technology to be maintained as an important part of the OG21 strategy.

Klimakur 2020

GTS has been involved actively in the consultation from the Ministry of the Environment regarding the document Klimakur 2020 "Klimautslippsreduksjoner mot 2020". The feedback covered the general approach of Klimakur as well as specific comments to CCS, energy efficiency and about gas as a substitute for coal.

www.klimakur2020.no



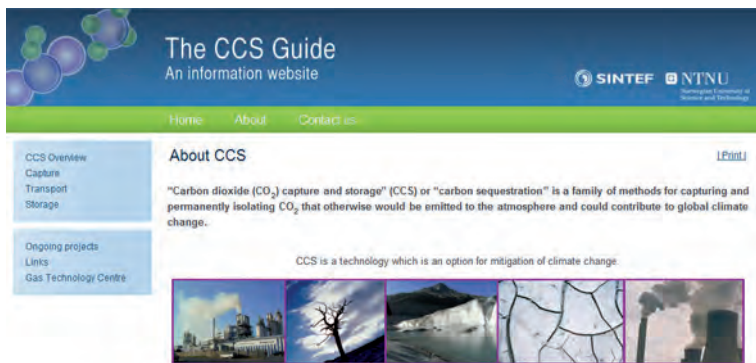
4. Education



Atle Mørk from SINTEF (red jacket, centre) shows some sandstone drill cores. Adventdalen outside Longyearbyen is the site of Norway's first experiment designed to investigate full-scale CO₂ storage technology. Photo: Astrid Lilliestråle

IEAGHG International CCS Summer School

The IEAGHG International CCS Summer School 2010 was arranged on 22-28 August by GTS in collaboration with BIGCCS, SUCCESS and UNIS. The venue for the summer school was the town Longyearbyen in Svalbard at 78°N. 56 students from 32 countries, and 30 expert lecturers and mentors attended the one-week programme. The target group for the summer school was young scientists, e.g. PhD students and Post docs with background in engineering, geo-technologies, socio-economics. The goal was to provide students with diverse backgrounds a broad understanding of CCS and encourage their active participation in this area.



www.ntnu.no/ccs

CCS website

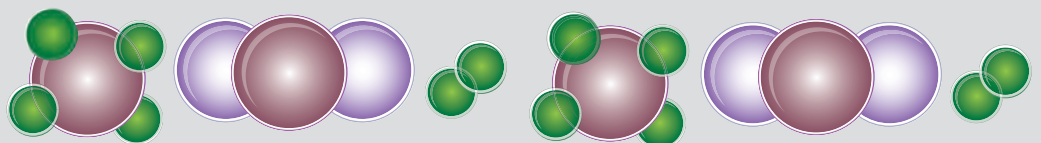
GTS has during 2010 produced an educational website on CCS. The website covers all aspects of CCS; from capture to transport and storage. It provides in depth knowledge about gas separation technology, thermodynamics, etc., necessary for public with a general technical background to understand the main principles behind CCS.



Students at Tjeldbergodden. Photo: Daham Gunawardana

Student excursion to Tjeldbergodden

In September, GTS in collaboration with Statoil organized a student excursion to Statoil Tjeldbergodden, one of the world's largest and most modern methanol plants. 12 MSc and PhD students from different engineering schools at NTNU participated in the 5 day programme. The purpose is to give the students an understanding for how a modern processing plant is operated.



European Course of Cryogenic 2010

GTS has partially supported the 2010 edition of the European Course of Cryogenics. This course was first established in 2008 as a cooperation between Technische Universität Dresden in Germany, the Wroclaw University of Technology in Poland and NTNU in Norway and since then, the course has taken place yearly.

The intention of the course is to bring cryogenic know-how of each university together and make it accessible for students from all over the world. Within three weeks all participants are taught in cryogenic fundamentals as well as in technologies for liquefaction of hydrogen, helium and natural gas.

In order to emphasize the international as well as the academic character of the course, each week of the course usually takes place at one of the three hosting universities. All participants get the extraordinary chance to meet other students from all over the world, to visit three impressive cities of Europe and to acquire cryogenic knowledge from respected local and international scientists.

PhD candidates and Post doc candidates

There are around 150 PhD and 45 Post doc candidates within gas technology at NTNU/SINTEF. Most of the doctoral and post-doctoral work is affiliated with larger research projects or ongoing activities within established research groups and centres.

GTS fully finances a few PhD fellowships. In 2010, these include:

- Ezequiel Manavela Chiapero. PhD project: *Two phase flow instabilities and flow maldistribution in parallel channels.*
- Magnus Jacobsen. PhD project: *Optimal operation of LNG processes.*
- Tom-Gøran Skog. PhD project: *Development of polymeric hollow fiber membranes for removal of CO₂ from high-pressure natural gas.*
- Andreas Helland Lillebø. PhD project: *Conversion of synthesis gas from biomass to liquid fuels by the Fischer-Tropsch synthesis.*

GTS furthermore supplies a scholarship to:

- Luis Castillo, PhD project: *Multi-objective optimization of LNG processes.*

GTS has also partially financed four PhD candidates and one postdoctoral fellowship through the PhD pool funded by the Research Council of Norway (RENERGI program). These include:

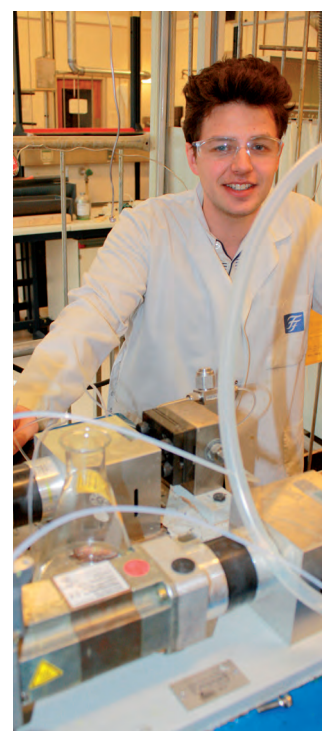
- Isabella Inzoli, PhD thesis 2008: *Coupled transports of heat and mass at the surface of and inside silicalite.*
- Astrid Lervik Mejdell, PhD thesis 2009: *Properties and application of 1-5 μm Pd/Ag23wt.% membranes for hydrogen separation.*
- Liyuan Deng, PhD thesis 2009: *Development of Novel PVAm/PVA Blend FSC Membrane for CO₂ Capture*
- Bjørn Lilleberg; PhD project: *Advanced computational modelling of non-conventional, lean premixed gas-turbine combustors.*

Professorship

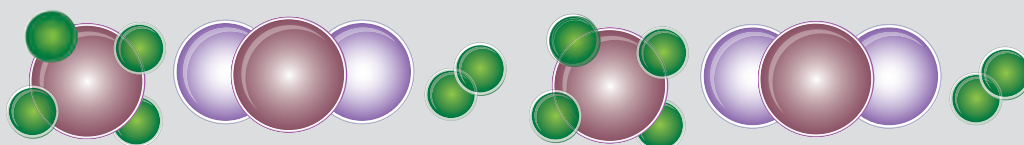
Since 2004 GTS has funded the position of Adjunct Professor in LNG technology held by Dr. Geir Owren. The position is affiliated with the Department of Energy and Process Engineering, NTNU. Geir Owren is Senior Advisor at the Statoil Research Centre, in the field of gas processing and LNG.



Students at the IEAGHG International Summer School arranged by GTS.



Tom-Gøran Skog, PhD candidate financed by GTS.



5. Networking and internationalization



Massachusetts
Institute of
Technology

<http://mit.edu>

Cooperation with the Massachusetts Institute of Technology (MIT)

GTS has supported further collaboration between NTNU and MIT in Boston. The research groups at NTNU and MIT are collaborating on the design and optimization of LNG plants, as well as new technologies for synthesis gas production. The collaboration also addresses mathematical models related to gas transport infrastructure.

Visit to Brazil

Brazil is becoming a major actor within gas technology and building long term strategic links to Brazil has been given priority in 2010. GTS took the initiative to visit Brazil in May where new contacts were established with Petrobras and Statoil in Brazil, and closer communication facilitated with SINTEF do Brasil. The topics covered were CCS, acid gas removal, energy efficiency and electro-coalescence.

EnergiCampus Nord



www.energicampus.no

GTS has established a close dialogue with EnergiCampus Nord in order to define common activities. As part of this, GTS participated in the seminar "Dialog konferanse om fornybar energi", organized by ECN in March 2010 in Hammerfest, presenting "the role of gas".

Gassco



www.gassco.no

The cooperation between GTS and Gassco has been strengthened during 2010. Gassco has increased its knowledge about the expertise available within Gas Technology and opinions regarding national priorities have been shared. This cooperation will continue and materialized in specific actions such as conferences, master projects and R&D initiatives.

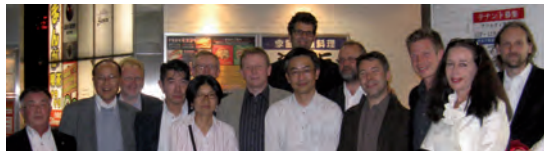
N.ERGHY



www.nerghy.eu

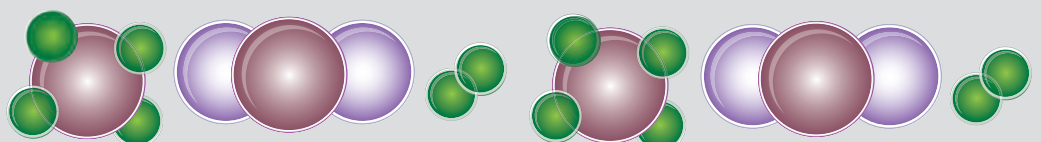
The New European Research Group for HYdrogen (N.ERGHY) represents around 60 R&D institutions in Europe with more than 1000 researchers working in the field of hydrogen and fuel cells. NTNU is a member of N.ERGHY and SINTEF is represented in the Executive Board.

Study-tour to Japan on hydrogen technologies



From left: Mr. Tani, Mr. Yasumi, Prof. Blekkan, Mr. Ikeda, Prof. Norby, Mr. Yokogawa, Mr. Konrad Pütz, Mr. Lund, Mr. Hasegawa, Mr. Ståle Oftedal, Dr. Steffen Møller-Holst, Mr. Bjørnar Kruse, Mr. Bjørn Simonsen, Ms. Inger Oftedal

A delegation counting 10 Norwegian representatives for R&D-institutions, industry and Transnova visited Japan in October aiming at fostering establishment of bilateral R&D-projects within hydrogen technologies. The delegation visited Kyushu University and Tokyo University and auto manufacturers Mazda, Toyota and Nissan. Potential areas of collaboration were identified and will be followed up under the auspice of the MoU between SINTEF and AIST (Japan). GTS contributed to the preparations and supported the arrangement.



6. Internal coordination

Technical seminar series 2010

Catalytic processes "in the GAP" from macro- to nano-science

Unni Olsbye, University of Oslo, 23 November

GTS in collaboration with the Petroleum Centre of Better Resource Utilization: Technological challenges of shale gas exploitation

Michael Golan, NTNU, 2 November

Making the impossible possible through clever use of thermodynamics - Using thermodynamics in a new way to design innovative and energy efficient processes - from combustion to natural gas liquefaction

Baraka Celestin Sempuga, University of Witwatersrand, South Africa, 14 September

Life Cycle Assessment of Carbon Capture and Storage Processes

Anders H. Strømman, NTNU, 11 May

Experience from start-up and operation of Europe's first and the world's northernmost LNG plant

Sivert Vist, Statoil, 26 April

Environmental impact of CO₂ capture solvents

Eirik Falck da Silva, SINTEF Materials and Chemistry, 18 February

Each seminar was attended by 30-50 scientists and students from NTNU and SINTEF as well as representatives from industry working with gas technology R&D.

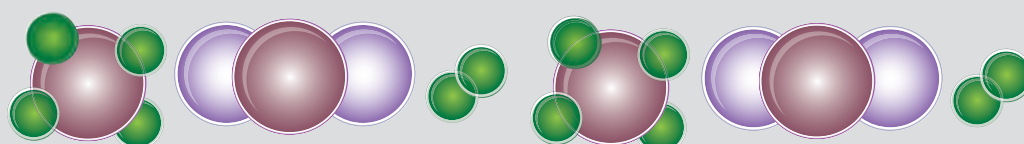
Scientific equipment

The following proposals received funding for scientific equipment. Total budget 300 kNOK.

Name	Scientific equipment	GTS funding
Bernd Wittgens, Thor Aarhaug, SINTEF	Portable GC/MS for monitoring of gases and semi-volatile components	120 000 NOK
Karen N. Seglem, May-Britt Hägg, NTNU	NDIR gas analyzer	80 000 NOK
Magnus Rønning, NTNU	Triple Pass Heaters	100 000 NOK



www.ntnu.no/gass/seminars



GTS website

During 2010 the GTS website was upgraded with new design and material.



www.ntnu.no/gass
www.sintef.no/gass

Contact meetings

GTS arranged several NTNU/SINTEF contact meetings to discuss R&D strategies and initiatives in gas technology.

LNG seminar

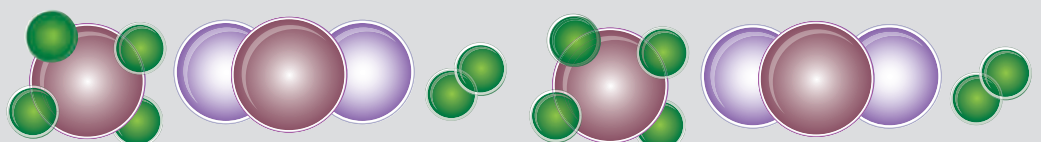
On 26 April, GTS arranged a seminar for PhD candidates and postdoctoral fellows working on LNG. The objective of the seminar was to enhance internal communication between LNG students, to promote interaction and to encourage new thinking. Approximately 10 PhD/post docs. and 5 supervisors/professors attended the seminar. During the seminar the participants presented their work and discussed their research topic with other fellows.

GTS strategy seminar

The GTS team went for an internal strategy seminar 2-3 December at Teveltunet outside Meråker. During the seminar, the strategy for 2011 was established and specific actions were agreed upon.



Maria Barrio, Hilde Venvik and Steffen Møller-Holst during strategy planning at Teveltunet.
Photo: Astrid Lilliestråle



Development of strategic R&D interaction

Cooperation with strategic partner

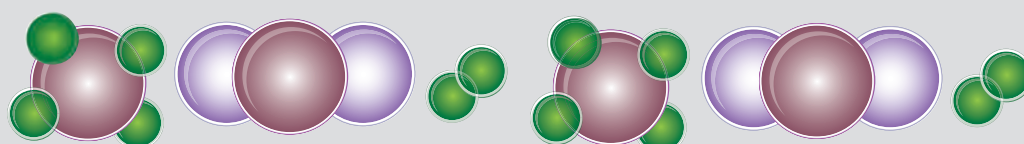
Statoil is an integrated oil and gas company with substantial international activities and is a strategic partner of GTS. The resources from Statoil finance cooperation projects and activities relevant for realizing the New Energy strategy of Statoil. The resources fund PhD and postdoctoral fellowships, laboratory equipment, network building and management of the GTS. During 2004-2009 a full professorship in hydrogen technology was funded by Statoil under the GTS cooperation. The position was held by Professor Hilde J. Venvik, Department of Chemical Engineering, NTNU. The agreement aimed to further develop the cooperation between NTNU/SINTEF and Statoil.

New partners and sponsors

During the new working period (2008-2012), GTS is open for new partners and sponsors to join the strategic R&D interaction.



www.statoil.com



GTS in short

Board of Directors

- Chairman: Director Sverre Aam, SINTEF Energy Research
- Department Manager Gas Conversion Morten Rønnekleiv, Statoil
- Research Director Ole Wærnes, SINTEF Materials and Chemistry
- Professor Arne M. Bredesen, NTNU Director of the Strategic Area, Energy and Petroleum – Resources and Environment
- Professor May-Britt Hägg, NTNU Department of Chemical Engineering

Management

- SINTEF’s director of GTS, Vice President, Dr. Maria Barrio
- NTNU’s director of GTS, Professor Hilde J. Venvik



Maria Barrio



Hilde J. Venvik



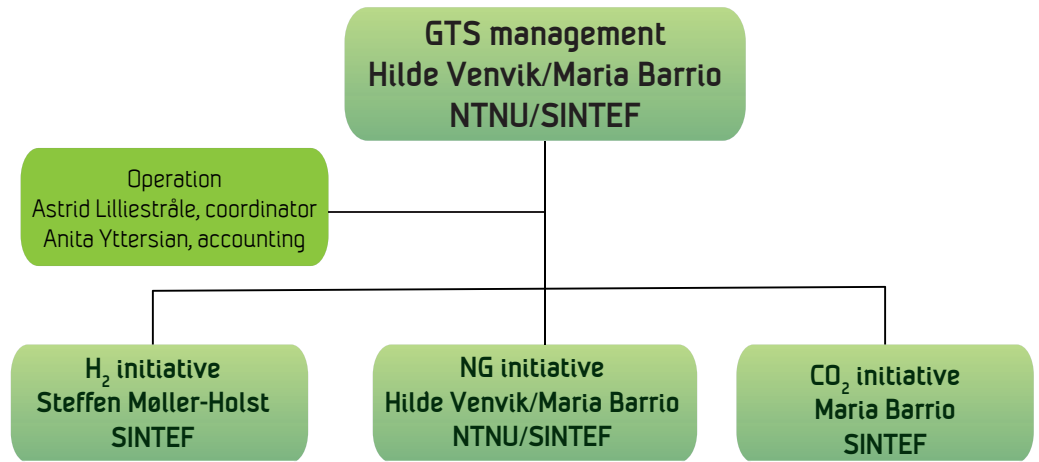
Steffen Møller-Holst



Astrid Lilliestråle



Anita Yttersian



GTS Organization chart

Staff

Approximately 75 professors/associate professors, 10 adjunct professors, 150 PhD candidates, 25 Post Doc researchers at NTNU and 200 research scientists at SINTEF are associated with GTS.



www.ntnu.no

Norwegian University of Science and Technology (NTNU)

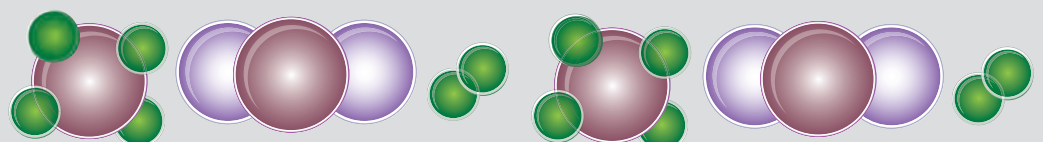
NTNU represents academic eminence in technology and natural sciences as well as in other academic disciplines. Its academic scope ranges from technology, the natural sciences, the social sciences, the humanities, medicine, architecture to fine art. Cross-disciplinary cooperation at NTNU results in innovative and creative solutions.

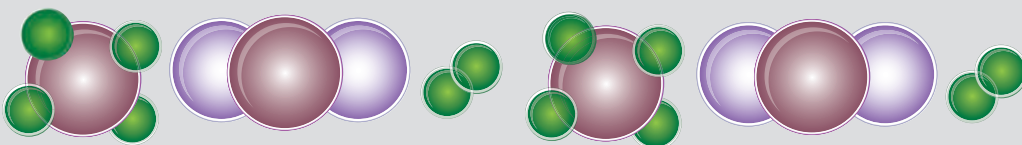


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SINTEF

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Strategic partner:

