

# Diversity and Flexibility is our Strength

Welcome to the 2016 CERE Annual Report! 2016 was a challenging year both for us in CERE and for several of our member companies due to modest oil prices and other reasons. Challenging years call for new solutions, new collaborations and new directions, while building further on our own expertise. The expertise of the center's faculties within e.g. applied thermodynamics, mathematical modeling, process simulation, geology and geophysics can be used in a variety of applications. Indeed this diversity and flexibility constitute strengths of CERE.

Two highly interdisciplinary projects, NextOil and HeHo, approach the conclusion of their planned durations. The former is focused on deep oil exploration – also known as HPHT (High Pressure, High Temperature) – while the latter investigates geothermal energy resources. Both projects have generated impressive results within modeling and experiments. We are confident that the advanced experimental facilities built in NextOil and the solid expertise on geothermal energy generated in HeHo will find use in future research projects.

## Highlights from a busy year

Thermodynamics is one of the main research areas of CERE and three PhD projects started this year, one experimental on multicomponent multiphase measurements for complex systems and two modeling ones on advanced theories for interfacial tensions and modeling of complex hydrate promoters for CO<sub>2</sub> capture. These three projects will tackle complex modeling and experimental aspects of applied thermodynamics. In all three projects we expect that advanced thermodynamic models like CPA and SAFT will be used. Advances in thermodynamics often yield new software. We expect significant new developments and further organization and presentation of software for the member companies during 2017.

A major event in 2016 was the Petrophase conference in June, shortly after the CERE Discussion Meeting. CERE faculties Nicolas von Solms and Wei Yan were the chairmen of the conference. This was the second time the conference was held in Denmark and with 150 contributions from 180 attendees (including 5 invited speakers and 40 plenary talks) we note this as a great success.

Several research activities at CERE within enhanced oil recovery and other upstream oil topics are based on funding from and collaboration with the Danish Hydrocarbon Research and Technology Center (DHRTC). CERE faculties gave invited lectures at the DHRTC conference in November, and DHRTC researchers attended the CERE discussion meeting in June. Further, some of our technical personnel are involved in DHRTC projects. In other words, there is strong synergy between CERE and DHRTC. We expect that this trend will not just continue but even intensify in the years to come.

## New frontiers opening up

Last year, a major project coordinated by CERE within bio-energy was initiated. The SYNFERON (optimized SYNgas FERmentation) for biofuels productions) is now at full speed. The project is funded by Innovation Fund Denmark and involves collaboration with several companies and three other research groups from DTU Chemical Engineering. It is a truly interdisciplinary project, where CERE expertise in process simulation is used, besides the coordination responsibility.

## Several new CERE projects were granted during 2016

The aim of the BIOCO<sub>2</sub> project is to develop and test a new efficient way of upgrading biogas for the combined production of bio-methane and high-quality CO<sub>2</sub> (bioCO<sub>2</sub>). The project involves collaboration between CERE, DTU, Union Engineering A/S, and Danish Gas Technology Centre and has a total budget of 14 million DKK (1.9 million EUR). The project has received funding from the Danish Energy Agency's Energy Technology Development and Demonstration Program (EUDP). Associate Professor Philip L. Fosbøl, CERE, is Principal Investigator.

CERE Professor Ida Fabricius is part of a consortium consisting of CERE, DTU, three industrial companies, and The Geological Survey of Denmark and Greenland (GEUS) who has received a grant from the Danish EUDP foundation for a research project on geothermal energy storage.

Finally, Senior Researcher Arne Døssing, member of the CERE faculty, has received funding for a new project on drones for high-quality magnetic surveying with relevance to applications such as discovery

of mineral or energy resources such as oil and gas, as well as geothermal reservoirs. External project partners are Sky-Watch, Geo, DONG Energy, and Royal Danish Navy EOD Service. Funding is provided mainly by Innovation Fund Denmark. The project has a total budget of 16 million DKK (2.2 million EUR).

## Looking ahead

2017 will include several new initiatives. I have already mentioned a clearer presentation of the software at the CERE members' website with more software tools being available for the consortium.

We celebrated five PhD defenses from CERE students during 2016, all of which were distributed to the CERE consortium, just as they are available at the CERE members' website. We are also happy to see so many of our previous PhD students and postdoctoral researchers keeping in touch and visiting the center. We have therefore decided to establish a CERE Alumni initiative consisting of all previous PhD and postdocs from CERE (and previously IVC-SEP) as we expect many of them may be interested in following the center's activities.

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Besides CERE's Discussion Meeting, no other conferences are planned for 2017, thus taking a break from two consecutive years in organizing international conferences. I wish to express my own and the center's gratitude to our industrial consortium for the continuing support in all ways, including extensive communication in existing and recently funded projects, as well as for being interested in participating in future research applications.

On a final note, we expect that 2017 will be an exciting year in many respects. While continuously building on our expertise, certain new broader collaborations may take place.

I hope you will find the annual report useful and informative. Any comments and suggestions from the CERE consortium members and other stakeholders are, as always, most welcome.

I hope to see you at the annual CERE Discussion Meeting 2017 in June!

Professor Georgios Kontogeorgis,  
Chairman of CERE