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Science for Clean Energy

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Competitive low-carbon energy

D8.1
Workflow for Students and Post-Doctoral Researchers EU-North American Exchanges

WP 8 – International Cooperation and Policy Recommendations

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Definitions and acronyms

Acronyms	Definitions
NCSU	North Carolina State University
OSU	Ohio State University
UT	University of Texas at Austin

1. Introduction

Science4CleanEnergy, S4CE, is a multi-disciplinary consortium, of world-leading academics, research laboratories, SMEs and industries. S4CE started its operations in September 2017. The research and development activities within the S4CE consortium span various sectors and specialisations, from fundamental studies of fluid transport and reactivity, development of new instruments and technologies, lab and field testing of such new technologies, and their deployment for detecting and quantifying environmental risks associated with sub-surface geo-energy operations. S4CE maintains a transparent dialogue with all stakeholders, via a series of public events and dissemination activities. Training of post-graduate students and post-doctoral researchers is at the core of S4CE. Critical part of training is the recognition that exchanges of ideas and approaches among leading institutions is critical for securing fast progress, critical in an important sector such as the energy one.

Within S4CE, Work Package 8 has been established to foster knowledge exchange, support training, and identify best practice procedures in the sub-surface geo-energy operations focus of the consortium. One of the tasks assigned to WP8 is “Student Exchanges with North American Institutions”.

To train the next generations of scientists in the multi-disciplinary topics relevant to the sustainable deployment of geo-energy resources, S4CE is committed to promoting student exchanges between the top academic institutions that are part of the S4CE consortium and the North American universities that can provide the highest synergism to the students’ learning. We have identified in particular the University of Texas at Austin (UT), the Ohio State University (OSU) and North Carolina State University (NCSU) as institutions with which S4CE will facilitate student exchanges. The objective of Deliverable 8.1 is to clarify how student exchanges will take place.

2. Methodological approach

S4CE has identified three key North American institutions with which it will facilitate student and post-doctoral exchanges. It should be made explicit that no dual degrees are expected from the exchanges. The purpose of the exchanges is to acquire a different perspective on how to address a problem of relevance to the sub-surface geo-energy operations of relevance to the S4CE consortium. It is understood that all costs associated with the exchanges are to be supported by the visiting personnel, and not by the host institution. The rationale behind the exchanges is that training of post-graduate students and post-doctoral researchers will be enhanced once these individuals have experienced different perspectives. It is anticipated that the benefits of such exchanges will be long lasting, most likely out-lasting the duration of the S4CE project. However, direct quantification of the benefits within the short lifespan of the S4CE consortium is difficult to attempt objectively. The three institutions have been chosen because S4CE partners have already established promising exchanges with individuals in such institutions. In what follows we summarise the key people and examples of successful visits.

A. North Carolina State University (NCSU)

S4CE has established collaborations with Associate Professor Mohammad Pour-Ghaz, within the Department of Civil, Construction and Environmental Engineering at NCSU.
Prof. Pour-Ghaz has expertise in the following research areas, related to S4CE:

- Durability of cementitious materials including: corrosion kinetics of steel in concrete, mass transport in concrete, fracture and damage mechanics of concrete, chemical degradation of cementitious materials;
- Electrical imaging of cementitious material;
- Simultaneous X-ray, neutron, and electrical imaging of materials;
- Large-area sensors (sensing skins).

When a S4CE post-graduate student desires to visit NCSU, s/he will take part in the NCSU Visitor Program. Government VISA is required for this purpose. The practicalities of the visit are arranged by personal communication of the student with the Office of International Services in NCSU.

The student exchanges that have occurred so far are part of the scientific collaboration between Dr. Pour-Ghaz and Dr Aku Seppanen of the UEF. Two student exchanges occurred recently, one of which within the realms of S4CE: the student Antti Voss, MSc, enrolled at UEF, visited NCSU for 2 months (September – October 2018).

B. Ohio State University (OSU)

S4CE has established collaborations with Prof. David Cole, within the School of Earth Sciences at OSU. Prof. Cole is a geochemist whose research interests address several fundamental challenge areas of relevance to sub-surface geo-energy operations:

- Reaction mechanisms, rates and transport processes of elements and isotopes in minerals, glasses and melts;
- Spatial and temporal evolution of natural water-rock systems;
- CO2 sequestration in geologic formations;
- Geochemical evolution of fluids and mudstones in unconventional gas shale systems;
- Evolution of micro- and nanoporosity in energy-related subsurface formations.

Prof. Cole welcomes short visits from post-graduates students and post-doctoral researchers. The visits should be short, and VISA requirements are those for short visits to the USA. Prof. Cole has been a collaborator of Prof. Striolo of UCL for a long time, and he is part of the External Science Advisory Board of the S4CE consortium.

In the recent past, one post-doctoral researcher from OSU, Dr. Siddharth Gautam visited UCL for 4 months. One manuscript resulted form this visit, although not within the scopes of the S4CE project.

C. University of Texas at Austin (UT)

S4CE has established collaborations with Prof. Joan Brennecke, within the McKetta Department of Chemical Engineering at UT. Prof. Brennecke's research interests are in the development of more environmentally friendly solvents and processes, for example for CO2 capture. Prof. Brennecke has been instrumental for facilitating visits from Prof. Striolo and his group members to UT, and she is also a member of the S4CE External Science Advisory Board.
At UT, additional academics with whom it is possible for S4CE post-graduate students and post-doctoral researchers to collaborate include:

- Prof. David Allen, who is an expert in the quantification of fugitive emissions from oil and gas operations;
- Prof. Keith Johnston, who is an expert in the design of nano-materials for characterizing the sub-surface;
- Prof. Venkat Ganesan, who is an expert in modelling fluid transport in porous materials.

All these research interests are pertinent to R&D activities conducted within the S4CE consortium. Prof. Brennecke, Prof. Allen and Prof. Johnston are members of the US National Academy of Engineering. Prof. Brennecke and her colleagues welcome short visits from post-graduates students and post-doctoral researchers, for up to a few days. VISA requirements are those for short visits to the USA. In the recent past, one post-graduate student from UCL, Ms Maria Apostolopoulou, visited UT and the research groups led by the academics just listed for one week.

3. Conclusions and future steps

S4CE has established a productive network of collaborations with North American institution. The objective of Deliverable 8.1 is to formalise the process for facilitating post-graduate students and post-doctoral researchers visit to North America to enhance their training and the impact of their research. The report focuses on three institutions, which have provided productive collaborations to S4CE partners in the recent past in areas related to sub-surface geo-energy operations. Other collaborations will inevitably develop during the course of the S4CE project, and the S4CE management team will encourage such exchanges.

Any post-graduate student and post-doctoral researcher involved in S4CE who is interested in visiting one of our international collaborators, even those not listed in this short

document, should contact the Project Coordinator to be introduced. Please initiate the process at least three months before the desired visit to North American institutions to allow for proper planning and documentation.