

Faculty of Science and Engineering

Profile report: Geo Energy

Level: Associate or Full Professor ("UHD", "Hoogleraar 2")

FTE: 1.0

1. Scientific Discipline

Earth Sciences, focusing on energy carriers and materials.

2. Vacancy

The position is opened by the Board of the Faculty and will be embedded within the Energy and Sustainability Research Institute Groningen (ESRIG) of the Faculty of Science and Engineering (FSE) of the University of Groningen (RUG). The position falls within the framework of 'Career Paths in Science 4' ('Bèta's in Banen 4'). Please see link for [criteria and conditions](#).

3. Selection Committee

Prof. H.A.J. Meijer	Director of ESRIG and professor Isotope Research (chair)
Dr. E.J. Stamhuis	Programme director of the master Energy and Environmental Sciences and associate professor at OE, base unit of ESRIG
Ms. dr. S. Nonhebel	Associate professor at IVEM, base unit of ESRIG
Ms. Prof. A.G.J. Buma	Chair of Ocean Ecosystems, base unit of ESRIG
dr.ir. E.W. Meijles (tbc)	Faculty of Spatial Sciences
Prof. J.D. Jansen	Faculty of Civil Engineering and Geosciences TU Delft
N.N.	Student Energy and Environmental Sciences
Ms. A.M. van der Woude	HR advisor

4. Research Area

Keyword for the area of research is "Energy Transition": the road that inevitably has to be taken in the coming decades from the present era of fossil fuels into a future of renewable energy.

The research themes of the present Geo-Energy group are aimed at optimizing the exploration and production of fossil fuels and the search for new, renewable energy sources. This GE research is primarily focused on the Netherlands with its declining gas reserves and its "induced seismicity" (earthquake) problems associated with gas extraction. In the specific case of the tremors in the Groningen gasfield, a dedicated GE study subject is formed by the analysis of the effect of shallow soil composition on ground accelerations. This links directly to the activities in the region related to strengthening of building constructions.

Safe subsurface storage of CO₂ (CCS) is important in the transition towards renewable energy. The investigation of long-term post-injection behaviour of reservoir and seal lithologies is location-specific and essential to be able to warrant the absence of leakage. In this context long-term lab experiments have been carried out with interaction between rock samples and supercritical CO₂. The development of new energy-sources in the subsurface such as geothermal energy, heat/cold storage and in addition electrolysis at fresh/salt water transitions offers the opportunity to provide our country with sustainable energy. Yet, the core topic for research is whether such applications can be scaled up to levels which are economically attractive.

A new avenue to be explored, on a global scale, is the proliferation of mineral components which are a necessity for the transition towards new energy sources and storage facilities. Examples in this context are lithium for batteries or neodymium for magnets in windturbines. In cross fertilization with new metallurgical purification techniques, geological knowledge is key in determining provenance, reserve estimates and technical/economic recovery of these resources.

Finally, geoscientific research focuses on how we can meet the challenges around sustainable exploitation of the subsurface with simultaneous and multiple forms of energy extraction and storage in a densely populated country like the Netherlands.

5. Embedding: ESRIG (Geo Energy)

Energy and sustainability are two of the key focus areas of the Groningen University. Within the Faculty of Science and Engineering the Energy and Sustainability Research Institute Groningen (ESRIG) research institute covers the Energy and Sustainability themes. This growing institute comprises of 5 groups (“base units”) with a total of over 100 staff. These groups are, next to Geo-Energy, Ocean Ecosystems (oceanic carbon cycle, biomimetics), Centre for Isotope Research (atmospheric greenhouse gases, radiocarbon), Energy Conversion (both fuel cells and combustion studies in flames), and the combination IVEM-Science and Society Group (energy transition, analysis and modelling of energy and resource systems and the relation between science and society). With the other groups, Geo Energy plays an important role in the master program Energy and Environmental Sciences. This master within the Faculty of Science and Engineering is the only master program within the university that clearly addresses two of the key foci of the university (“Energy” and “Sustainable Society”).

6. Local and (inter)national position

Geo Energy has a strong track record in co-operation with groups from other faculties, such as energy law, energy economics, engineering and social psychology. This is borne from the fact that subsurface activities, though not new in the Netherlands and Western Europe, are under increasing scrutiny from the general public and are subject to new legal regulations, economic criteria and technological challenges. For the latter, cooperation with other, engineering-oriented groups within the Faculty is expected.

In 2012 the Energy Academy Europe, now the New Energy Coalition (NEC) was launched in Groningen. In this organisation the UG collaborates with the Hanzehogeschool Groningen (University of Applied Sciences, offering professional education), provincial and municipal authorities and energy companies to establish a firm base for high-level interdisciplinary energy education and research. NEC has developed into a knowledge and network organization, driving innovation and education by bringing together knowledge, policy and entrepreneurship.

Because of the overlap in aims and research themes, collaboration with the NEC will lead to mutual benefits. Knowledge of the subsurface is essential in many projects governed by NEC, in both research and teaching activities. In turn, the NEC provides a high-profile environment with significant international visibility. Its partnerships with businesses, governments and NGOs form a valuable interface and enable innovative forms of collaborations for knowledge production and circulation.

At the national level, Geo Energy at the UG is a member of AardNed, the recently founded collaboration network on research and education of all earth science groups from the Dutch universities and three other organisations. Collaboration in this network is key to success. Participation, through a successful grant, in the long-term research programme DeepNL by the Dutch Research Council NWO) is of high importance. DeepNL will address the scientific questions concerning subsidence, induced seismicity and the integrity of the subterranean system.

7. Expected contribution to Research

The candidate is expected to have a broad overview over the earth scientific field and associated methodologies, and will focus on the energy aspects of long term sustainability. Such an approach enables thorough and constructive analyses of existing and proposed energy sources, including

- developing approaches for safe and economic development of subsurface resources

- analysing the dynamics of energy and material (mineral) resources
- describing economic and social feasibility of geo energy solutions
- staying abreast of earth science innovations in the field of energy

The candidate should focus on local, national and international collaboration. Alignment of the programme with the other research groups in ESRIG, other institutes of the faculty (most prominently the Engineering and Technology Institute ENTEG), other faculties of the RUG, and the New Energy Coalition will thus be key to growth and international reputation. The programme should mainly be based on extramural funding.

Whether the existing research lines of the present group (CCS, induced seismicity, geothermal energy, all focussed on the region) will be continued, or other research lines (for example scarcity of minerals world-wide) are chosen is up to the candidate, as long as the research is internationally competitive and addresses the energy transition within its societal context, using fundamental geological principles.

The candidate's efforts will lead to world class, original contributions for these lines of research, and preferably also have societal impact ("outreach").

8. Expected contributions to teaching

Teaching is a very important part of the candidate's tasks. The candidate will lecture in the teaching programmes within the faculty (Bachelor- and Master levels), and contribute to Ph.D. student educational programs. The candidate will contribute to a series of bachelor programmes with substantial energy-related elements, most of all the course "geo-energy" for the "energy and environment" track in the Physics Bachelor's degree programme. In the Master Phase, the candidate will be mainly involved in the Energy and Environmental Science Master's degree programme (which is largely supported by ESRIG staff). This includes the supervision of master students during their final research.

Other roles can be in the intra-university minor programme Future Planet Innovation, and/or in the university-wide minor programme "Energy". Depending on the background and interests of the candidate, contributions to one of the disciplines in the faculty is also possible.

The successful candidate will supervise Ph.D. students and act as Ph.D. advisor ("promotor").

Furthermore, within the NEC framework, the candidate will contribute to courses and to the development of NEC programmes.

9. Expected contributions to the organisation

Next to leading the research group, the candidate is expected to have an active interest and to provide a positive contribution to the management and organizational tasks of the institute. At the level of the Faculty of Science and Engineering, the candidate will contribute to the organization of the faculty, for example by participating in working groups and committees, in the fields of teaching, research and management. The candidate will participate in relevant national and international organizations. Furthermore, a prominent role is foreseen in connection with the university-wide "Energy" theme, and, last but not least, in the NEC.