

Call for Proposals

No. 32

6 June 2016

Priority Programme “Hybrid and Multimodal Energy Systems: Systems Theory and Methods for the Transformation and Operation of Complex Networks” (SPP 1984)

In March 2016, the Senate of the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) has established the Priority Programme “Hybrid and Multimodal Energy Systems: Systems Theory and Methods for the Transformation and Operation of Complex Networks” (SPP 1984). The programme is designed to run for six years. In this present call, we invite proposal submissions for the first three-year funding period.

The energy system consists of interconnected and geographically distributed structures, which are required to meet highest reliability and security standards. The transformation towards sustainable and widely distributed renewable energy sources does not only significantly change established structures but also the system behaviour and dynamics. The electrical energy system is becoming interlinked with other energy grids transforming towards multimodal energy systems. The electrical grids themselves will incorporate HVDC-links into the AC-grid, which will lead to hybrid systems. All the above developments require completely new planning, control and operation strategies due to the changing overall system structure, dynamics and the growing complexity.

This Priority Programme targets new systems theories, concepts and methods for the transformation of the electrical energy system towards hybrid and multimodal networks that are pervaded by information and communication technologies. The research delivers a contribution for reliable and resilient energy systems under the condition of changing generation and supply paradigms.

The programme’s key objective is the research in system structures of different kinds of energy grids, technologies and operation schemes as well as appropriate modelling, analysis and optimisation concepts. New methodological approaches for systems prone to forecast errors and uncertainty shall be developed for their usage in resilient and complex energy network structures. These approaches could be based for instance on complex networks theory, distributed control and optimisation strategies or autonomous agent-based and self-organising systems. Because of the flexibilities and degrees of freedom for the planning and operation of such large-scale interconnected hybrid and multimodal energy systems, it is necessary to develop new methods, which enable probabilistic risk and uncertainty assessments for the provision of fault-tolerance and stabilising mechanisms and reserves.

Systems theory can deliver reduced but appropriate models to determine sensitivities, stable parameter ranges, phase transitions – and more generally – to gain insights into the complex non-linear interactions within multimodal systems. Further investigations with realistic scope and modelling detail

may only be conducted as numerical simulations based on statistical designs for scenarios and experiments. Results are expected to be technology-invariant and transferable to future energy systems in general.

The Priority Programme will cover the following areas:

- modelling and simulation of hybrid and multimodal energy systems with pervasive information and communication technologies
- systems theory for structuring, planning, design and operation of complex hybrid and multimodal energy networks
- new methods for dynamic stability assessment of hybrid and multimodal networks across different time scales
- concepts and methods for planning and operation of resilient multimodal energy systems
- control and optimisation approaches for large-scale complex energy systems-of-systems under uncertainty

Aspects like future energy scenarios with assessment of e.g. storage and flexibility demand, future market developments and products or specific components inside subsystems like high-voltage or power semi-conductor components or specific communication technologies as such are not part of the Priority Programme.

The Priority Programme intends to support the academic career of young researchers through intense contact between different groups, workshops, and summer schools. It will also provide a gender equality programme and family friendly working conditions.

Proposals for the first three-year funding period have to be submitted no later than **17 October 2016** via DFG's secured "elan" portal. Registered applicants select "Proposal Submission – New Project – Priority Programmes". General information on proposals in the framework of a Priority Programme (in particular concerning eligibility and admissible funding requests) can be found in guideline 50.05 (part B). See also guideline 54.01 for instructions how to prepare a proposal. The specific proposal has to be structured according to form 54.012. However, it is admissible to prepare the proposal as a pdf-file, e.g., using LaTeX, instead of using the rtf-file which is available online. The submission process itself can be reached by clicking on "Start online form", followed by selecting "SPP 1984".

If you have never before submitted a proposal to DFG through "elan", you need to register in advance. This can be done online by yourself – however, it takes one to two working days to be confirmed by DFG staff. If you need to register, please complete your registration before **1 October 2016**.

Note that the descriptions of the projects and all CVs need to be prepared in English. Further, DFG's rules for publication lists (guideline 1.91) need to be respected: Beside the general bibliography, every proposal should include a list of up to ten publications by the applicant(s) (and/or members of his group) that relate directly to the project. Any academic CV submitted to the DFG must not list more than ten publications, which describe best the scientist's profile. Publications in these lists need to be classified as a) refereed publications (published articles and monographs; accepted articles with note of acceptance by the journal) or b) other publications (e. g., preprints on arXiv), which need to be accessible online (please mention the arXiv number or provide links).

A review meeting with reviewers and applicants will be held in early 2017 at the TU Dortmund University. The date and place of this venue will be communicated through the programme's website and by a notification to the applicants. The envisaged start of funding is mid-2017.

There is an opportunity in this Priority Programme for German researchers to collaborate with U.S. partners but through separate proposals in each country. The German team would submit a proposal to DFG and the U.S. partners would submit another to NSF, each team noting the partnership within their proposals. The U.S. team need to specify the programme Energy, Power, Control, and Networks (EPCN) of the National Science Foundation (NSF), and need to submit their proposal in the regular unsolicited submission window of the EPCN programme. Applicants from Germany should feel free to submit such aligned project proposals with a U.S. partner. As the DFG funds only the German contribution, it is necessary for the German applicants to clarify the work plan and requested funds for each citizen in the proposal. As the submission windows in each country are different, it is important to submit the proposals respectively by the given deadlines. However, proposals with solely German participation will be treated equally. Indeed, NSF has not set aside dedicated funding for this specific topic, but will consider aligned proposals with German partners within its regular EPCN unsolicited proposals programme. The decision making will be done by the two funding organisations in separate procedures, and Germany-U.S. collaborative proposals should be written so as to be executable separately in case only one side's proposal is selected for funding.

Further information

The DFG's electronic proposal processing system elan with proposal instructions and guidelines can be found at: <https://elan.dfg.de>

Proposal guidelines and preparation instructions are outlined in DFG forms 50.05en and 54.01en, which can be found on the DFG's website at: www.dfg.de/foerderung/formulare

More details about the Priority Programme can be obtained by downloading the full text of the proposal under: www.ie3.tu-dortmund.de/SPP1984

For scientific enquiries about the scope of the programme please contact the coordinator:
Prof. Dr.-Ing. Christian Rehtanz, TU Dortmund University, phone: +49 231 755-2395,
christian.rehtanz@tu-dortmund.de

For administrative enquiries please contact at the DFG:
Dr.-Ing. Damian Dudek, Ingenieurwissenschaften, phone: +49 228 885-2573, damian.dudek@dfg.de
Gudrun Freitag, phone: +49 228 885-2623, Fax: +49 228 885-2777, gudrun.freitag@dfg.de