Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Department of the Environment, Transport, Energy and Communications DETEC

Swiss Federal Office of Energy SFOE
Energy Research and Cleantech

SWEET Call 1-2022: Call Guideline

Co-Evolution of the Swiss Energy System and Swiss Society and Its Representation in Coordinated Simulations

The call for pre-proposals closes on
16 June 2022 at 12:00 noon CEST

sweet swiss energy research for the energy transition

Table of contents

1 Introduction

1.1 SWEET – research for the energy transition

SWEET (SWiss Energy research for the Energy Transition) is a funding programme[1] owned and managed by the Swiss Federal Office of Energy (SFOE). The purpose of SWEET is to fund interdisciplinary and transdisciplinary research[2] and innovation activities with a focus on the goals of Switzerland's Energy Strategy 2050[3] and long-term climate policy[4]. SWEET targets solution-oriented research and innovation in the natural sciences and engineering as well as in the social sciences and humanities (SSH) in the domains of energy efficiency, renewable energy production and consumption, storage, networks, society and energy, and security and safety of critical energy infrastructures. Within these domains, the SFOE, after consulting the Federal Energy Research Commission CORE, set the guiding theme of the current call as "Co-Evolution of the Swiss Energy System and Swiss Society and Its Representation in Coordinated Simulations". Assisted by discussions with various stakeholders, the SFOE subsequently formulated the research challenge that is the subject of this call.

Meeting this research challenge specifically and Switzerland's energy- and climate-policy goals generally requires that solutions are developed not just from a technical perspective, but in the context of suitable legal and regulatory frameworks, innovative market designs, as well as social acceptance and agency. Therefore, interdisciplinary and transdisciplinary approaches that result from close collaborations between the SSH and the natural sciences and engineering are essential. Such collaborations, in

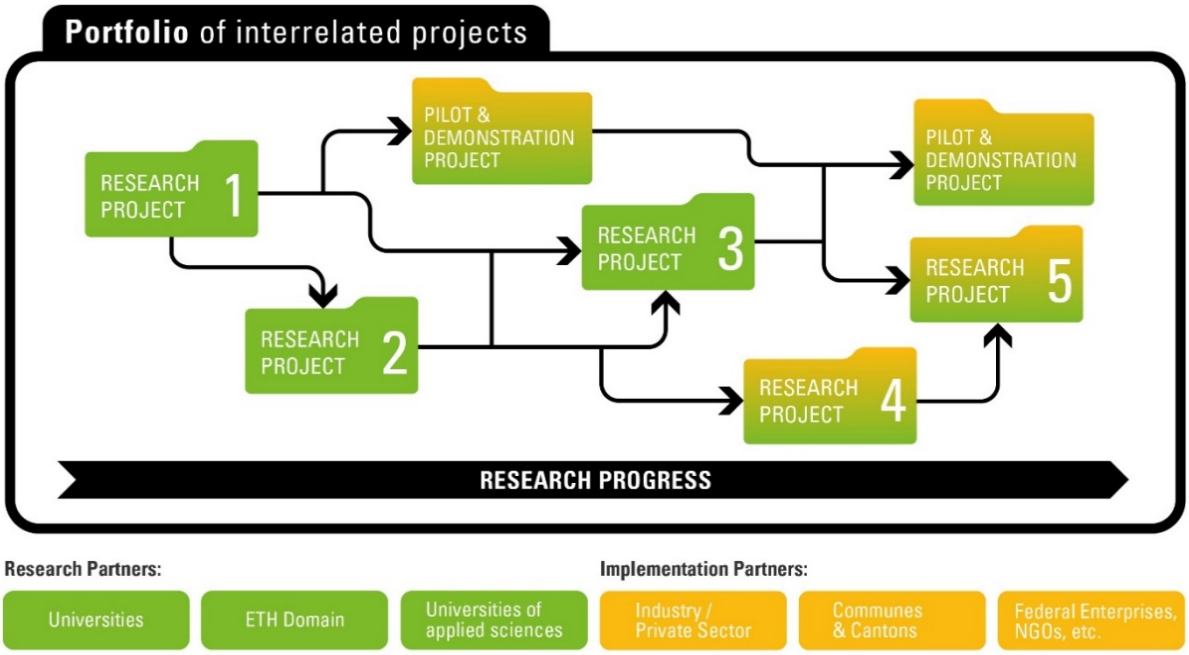

Figure 1-1: Schematic depiction of a portfolio of interrelated projects by a consortium of research and implementation partners.

[1] Further information is available at https://www.bfe.admin.ch/sweet.

[2] See the Appendix for descriptions of the terms "interdisciplinary research" and "transdisciplinary research".

[3] https://www.uvek.admin.ch/uvek/en/home/energy/energy-strategy-2050.html

[4] https://www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/emission-reduction/reduction-targets/2050-target/climate-strategy-2050.html

the form of consortia that reflect the diversity of Switzerland's research and innovation community, are central to the SWEET programme.

In response to SWEET calls, consortia consisting of research and implementation partners are invited to propose portfolios of interrelated research projects, including pilot and demonstration (P+D) projects, see Figure 1-1. The portfolio should be composed of projects focusing on research, development, demonstration, and deployment/implementation, structured such that the projects build on and feed into each other. The portfolio may include projects that involve real-world laboratories and other formats in which the effects on and the agency of people can be explored. As a result, the consortia and project portfolios should cover significant parts of the innovation system depicted in Figure 1-2. Some projects may start as soon as a consortium is launched, while other projects may follow at a later stage as they build on the output of earlier projects. Iterative feedback loops between the projects are encouraged.

Successful consortia will normally receive SFOE funding to pursue their projects over 6 to 8 years. As an exception, the consortium selected as part of this call will receive funding for 10 years. SFOE's funding is subject to the principles of subsidiarity. In the context of SWEET, this means that the consortium partners contribute financially, each according to its abilities, to supplement SWEET funding and thereby ensure that the total financial resources are sufficient for the work programme of the consortium.

SWEET consortia are managed by a host institution. Consortia should cover the best possible range of partners from the higher education sector, research institutes, private sector, as well as partners from the public sector such as cantons, cities, communes, and districts/regions. Consortia should strive for gender balance and reflect Switzerland's diversity in terms of languages and regions. It is expected that

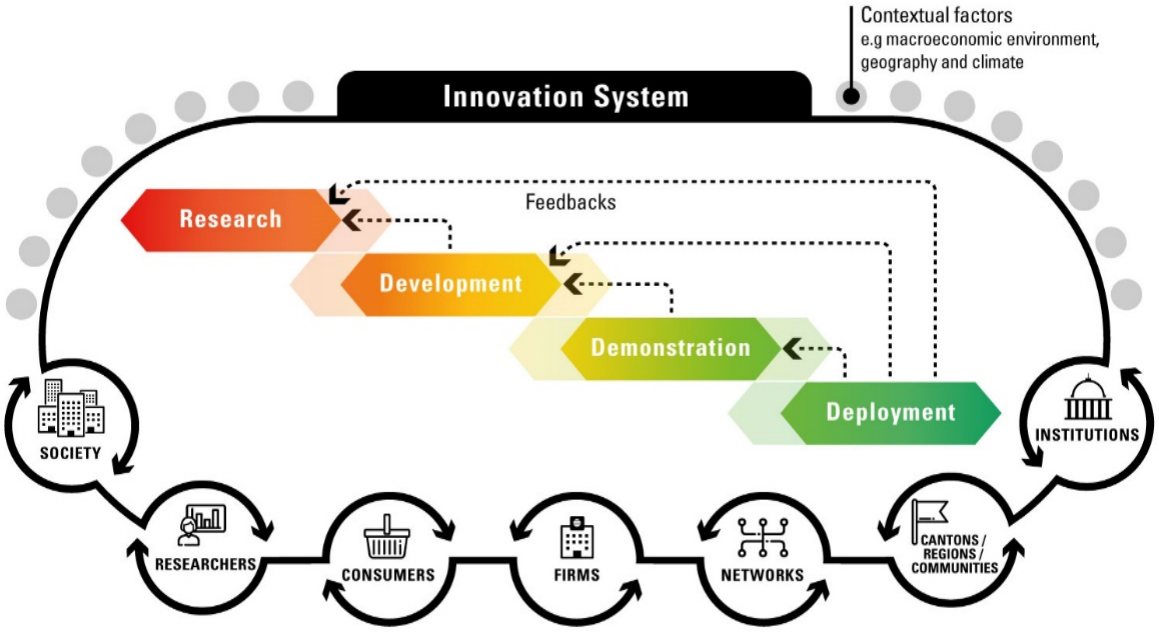

Figure 1-2: A schematic representation of the innovation system, significant parts of which should be covered by SWEET consortia and their project portfolios. The projects are expected to generate and exploit feedbacks, e.g., a market place or a community that demands innovations (deployment) is supplied with new knowledge and/or products from research, development, and demonstration. Adapted from International Energy Agency (2019), *Energy Technology Innovation Partnerships*, building on graphics and text sourced from Global Energy Assessment (2012), *Global Energy Assessment: Towards a Sustainable Energy Future*, Cambridge University Press and the International Institute for Applied Systems Analysis.

every member of a consortium delivers complementary and significant contributions to the consortium's work programme. Members from the SSH are expected to be equitably represented in the consortium and its management.

Since the outputs of the consortia are expected to be relevant to the implementation of Switzerland's Energy Strategy 2050 and climate policy, consortia will be closely accompanied by the SFOE, with particular attention being paid to knowledge and technology transfer (KTT).[5]

1.2 Guiding theme: Co-Evolution of the Swiss Energy System and Swiss Society and Its Representation in Coordinated Simulations

Discussions about how to reach the goals of the Energy Strategy 2050 and the long-term climate strategy are usually dominated by viewpoints from the natural sciences and engineering as well as the economic sciences. Viewpoints from the SSH often appear to be considered mostly as an afterthought, e.g., how to make technical solutions and the associated costs socially acceptable. (For the purposes of discussion, we distinguish between the economic sciences and the SSH. The distinction is helpful because with this call, the SFOE aims to encourage greater participation from especially those disciplines within the SSH that have so far been rather underrepresented in energy research. Thus, while recognizing that the distinction between the economic sciences and the SSH is not sharp, we refer to the natural sciences and engineering, economic sciences, and SSH branches in the following.) The focus on technical solutions and associated costs runs counter to the Energy Research Masterplan of the Federal Government,[6] which states that "[…] technological progress on its own will not suffice" and that "behavioural changes, altered incentives, and – possibly – adjustments to governance structures and policies" are required. It also runs counter to the International Energy Agency,[7] which regards behavioural changes as a key pillar of decarbonisation and writes that "[t]he wholescale transformation of the energy sector […] cannot be achieved without the active and willing participation of citizens."

The greater involvement of the SSH as well as citizens and other stakeholders has long been called for in the academic literature on energy research.[8,9,10,11] Relevant other stakeholders include politicians and representatives from federal, cantonal, and local levels; the private sector, especially utilities and transmission and distribution system operators; and professional and citizen associations. The calls for greater involvement are rooted in the observation that energy systems are socio-technical systems in which the various stakeholders interact with each other as they evolve. Transitions to decarbonized energy systems should therefore be understood as co-evolutionary processes and studied as socio-

[5] The SFOE has developed a toolbox with 30 suggestions for measures that SWEET consortia may use in planning their KTT activities. Further information on the toolbox is available from the SWEET Office.

[6] Federal Energy Research Commission, *Energy Research Masterplan of the Federal Government 2021-2024*, 2020.

[7] International Energy Agency, *Net Zero by 2050: A Roadmap for the Global Energy Sector*, 2021.

[8] D. Spreng, T. Flüeler, D. L. Goldblatt, and J. Minsch (Eds.), *Tackling long-term global energy problems: The contribution of social science*, Springer, 2012.

[9] B. K. Sovacool, *What are we doing here? Analyzing fifteen years of energy scholarship and proposing a social science research agenda*, Energy Research & Social Science, 1:1-29, 2014.

[10] D. Spreng, *Transdisciplinary energy research – Reflecting the context*, Energy Research & Social Science, 1:65-73, 2014.

[11] B. K. Sovacool, S. E. Ryan, P. C. Stern, K. Janda, G. Rochlin, D. Spreng, M. J. Pasquetti, H. Wilhite, and L. Lutzenhiser, *Integrating social science in energy research*, Energy Research & Social Science, 6:95-99, 2015.

technical energy transitions (STETs)[12,13,14] and sustainability transitions.[15,16] Such studies are inherently transdisciplinary because they require researchers from various disciplines within the three branches to collaborate and to involve stakeholders. The need for transdisciplinary approaches seems especially urgent in a direct democracy like Switzerland, in which citizens are not simply consumers but have the ultimate say over policy decisions. The study of the co-evolution of the Swiss energy system and Swiss society as they adapt to meet the goals of the Energy Strategy 2050 and long-term climate policy is the first pillar of this call.

The second pillar concerns simulations of the Swiss energy system and includes three aspects. The first is how the insights gained from the study of the co-evolution are incorporated in the simulations. Ideally, the insights influence the assumptions, scenarios, narratives/storylines underlying the simulations, result in improved or new models with which the simulations are carried out, and are also used to deduce, together with the results of the simulations, recommendations that are more likely to be socially accepted and politically feasible. The second aspect relates to the fact that simulations are carried out with a range of models by a variety of research groups from several SWEET consortia. To ensure that the results of the simulations can be compared in a meaningful manner and that dependable conclusions can be drawn, it is necessary that assumptions, scenarios, and narratives/storylines be harmonized and that sensitivities and uncertainties of the results be studied. The third and final aspect is the open documentation of models, assumptions, scenarios, narratives/storylines, and results to ensure transparency and reproducibility.

1.3 The application process

To render the application process more efficient for both consortia and evaluators, SWEET Call 1-2022 is organized into two steps, see Figure 1-3. In the first step, consortia submit a pre-proposal. All submitted pre-proposals will be subjected to an admissibility and eligibility check by the SFOE. The admissible and eligible pre-proposals will be evaluated and ranked by a panel of international experts. In this call, only the highest-ranked consortium will be invited by the SFOE to submit a more detailed full proposal. In the second step, the invited consortium submits a full proposal that will again be evaluated by the expert panel. If the evaluation is positive, the consortium will be awarded with SWEET funding.

The pre-proposal contains only brief descriptions of the consortium, the objectives, the overall concept and methodology, the work packages, and the budget. Only the host institution must submit a letter of commitment. For the other applicants, letters of intent are sufficient. The full proposal will have to describe the work packages and budget in more detail and include letters of commitment for all applicants.

[12] C. A. Miller, A. Iles, and C. F. Jones, *The social dimensions of energy transitions*, Science as Culture, 22(2):135-148, 2013.

[13] F. G. N. Li, E. Trutnevyte, and N. Strachan, *A review of socio-technical energy transition (STET) models*, Technological Forecasting & Social Change, 100:290-305, 2015.

[14] A. Cherp, V. Vinichenko, J. Jewell, E. Brutschin, and B. Sovacool, *Integrating techno-economic, socio-technical, and political perspectives on national energy transitions: A meta-theoretical framework*, Energy Research & Social Science, 37:175-190, 2018.

[15] J. Markard, R. Raven, and B. Truffer, *Sustainability transitions: An emerging field of research and its prospects*, Research Policy, 41:955-967, 2012.

[16] J. Köhler, F. W. Geels, F. Kern, J. Markard, E. Onsongo, A. Wieczorek, F. Alkemade, F. Avelino, A. Bergek, F. Boons, L. Fünfschilling, D. Hess, G. Holtz, S. Hyysalo, K. Jenkins, P. Kivimaa, M. Martiskainen, A. McMeekin, M. S. Mühlemeier, B. Nykvist, B. Pel, R. Raven, H. Rohracher, B. Sandén, J. Schot, B. Sovacool, B. Turnheim, D. Welch, and P. Wells, *An agenda for sustainability transition research: State of the art and future directions*, Environmental Innovation and Societal Transformations, 31:1-32, 2019.

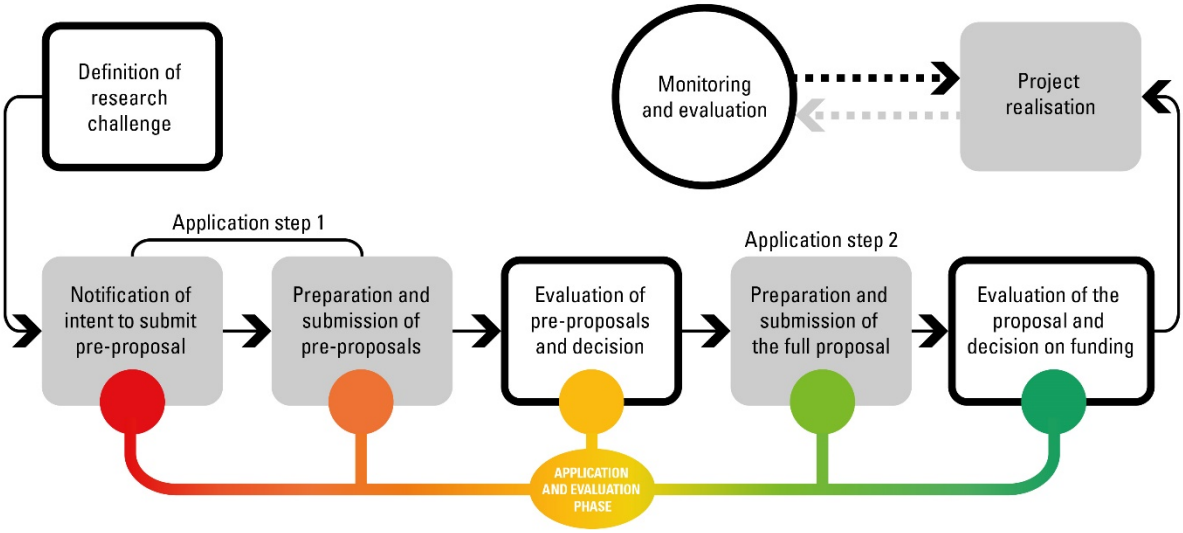

Figure 1-3: The two-step application process of SWEET Call 1-2022. The white boxes and grey boxes indicate activities by the SFOE and the consortia, respectively.

The process for submitting pre-proposals is described in Section 5.1. As explained in that section, consortia must notify the SFOE of their intent to submit a pre-proposal. The notification allows the SFOE to better prepare for the evaluation of the pre-proposals and in particular to appoint a sufficient number of evaluation panels. The relevant deadlines and other important dates associated with this call are given in Section 6.4.

2 Research challenge

This call comprises one research challenge. One consortium will be supported with a budget of CHF 10 Mio. to tackle the challenge over a period of 10 years. Supplementary funding of CHF 2 Mio. is available, see Section 3.4.2.

In addition to addressing the research questions stated in Section 2.1.1, the consortium will be required to submit so-called focus reports every two years. Each report will focus on a topic relevant to the goals of the Energy Strategy 2050 and the long-term climate strategy. The reports have several purposes: to support the development of the transdisciplinary collaboration by focusing it on research related to concrete topics, to provide regular opportunities to improve the collaboration using lessons learned from prior reports, and to enable the rapid diffusion of the consortium's results, conclusions, and recommendations. The activities underlying each focus report may be structured into one or more research and P+D projects. In other words, the activities underlying each focus report may be structured into a collection of projects akin to the portfolio of interrelated projects depicted in Figure 1-1. Further information on the focus reports is provided in Section 2.1.3.

2.1 Co-Evolution of the Swiss Energy System and Swiss Society and Its Representation in Coordinated Simulations

2.1.1 Research questions

Research question 1: *How will a transdisciplinary collaboration between the SSH, the natural sciences and engineering, the economic sciences, and stakeholders to study the co-evolution of the Swiss energy system and Swiss society be established and managed and how will this collaboration contribute to increasing the significance of conclusions derived from simulations?*

In responding to this research question, the consortium must pay particular attention to how the branches and stakeholders will develop a common understanding of the co-evolution through a common language and as well as an awareness of and dialogues on different thought models. In doing so, the consortium is expected to build on the experiences of previous collaborations in Switzerland, especially the Swiss Competence Center for Research (SCCER) in Energy, Society and Transition (CREST)[17] and where possible should build on the experiences of relevant international efforts, e.g., the Whole Systems Energy Modeling Consortium,[18] the UK Energy Research Centre,[19] the National Centre for Energy Systems Integration,[20] and the SHAPE-ID[21] and SHAPE-ENERGY[22] projects. Furthermore, the consortium must address how it will meet the challenges associated with establishing and managing transdisciplinary collaborations[23] and in particular how it plans to continually monitor and improve the collaboration. The consortium is strongly encouraged to draw upon the resources of the Network for Transdisciplinary Research[24] of the Swiss Academies of Arts and Sciences.

The consortium must explain how its structure and management will ensure equal treatment of the SSH, the natural sciences and engineering, and the economic sciences. The equal treatment should enable all branches to contribute to the full range of activities, including selecting possible topics for focus reports, formulating research questions relevant to these topics, defining scenarios and narratives/storylines, gathering data, extending existing or formulating new models (see Section 2.1.2), interpreting results, and formulating recommendations and communicating them to stakeholders. Among the SSH, any discipline that can contribute to improving the understanding of the co-evolution of the Swiss energy system and Swiss society should be represented in the consortium. Accordingly, the consortium must also explain how its structure and management will ensure that the contributions from the diverse disciplines within the SSH are incorporated.

The consortium must describe how the collaboration will integrate quantitative and qualitative approaches and contributions. This includes describing (a) how disciplines that are used to work in a quantitative manner can expand their approaches to account for qualitative results and insights and (b) how disciplines that are used to work in a qualitative manner can produce contributions that are more easily integrated into quantitative approaches.[25,26]

---

[17] https://www.sccer-crest.ch/

[18] http://www.wholesem.ac.uk/

[19] https://ukerc.ac.uk/

[20] https://www.ncl.ac.uk/cesi/

[21] https://www.shapeid.eu/

[22] https://shapeenergy.eu/

[23] See, e.g., D. Fam and M. O'Rourke (eds.), *Interdisciplinary and Transdisciplinary Failures: Lessons Learned from Cautionary Tales*, Routledge, 2020.

[24] https://transdisciplinarity.ch/en. Questions about the resources should be posed to the SWEET Office, which will forward them to the Network for Transdisciplinary Research.

[25] A. C. G. Cooper, *Building physics into the social: Enhancing the policy impact of energy studies and energy social science research*, Energy Research & Social Science, 26:80-86, 2017.

[26] B. K. Sovacool, S. E. Ryan, P. C. Stern, K. Janda, G. Rochlin, D. Spreng, M. J. Pasqualetti, H. Wilhite, and L. Lutzenhiser, *Integrating social science in energy research*, Energy Research & Social Science, 6:95-99, 2015.

Research question 2: *How will assumptions, scenarios, and narratives/storylines be harmonized and how will the simulations be coordinated to increase the significance of conclusions?*

The term "harmonization" is used to describe the process by which the branches and stakeholders jointly define assumptions, scenarios, and narratives/storylines to ensure that the results produced with different models can be meaningfully compared and that the conclusions deduced from the results are more significant. The term should *not* be understood as an enforced harmonization that restricts the range of assumptions, scenarios, and narratives/storylines to be investigated or that glosses over differences. If differences exist, they should be debated and if they are not resolved, their effects on the results should be assessed.

The second part of the research question originates in the observation that Swiss research groups already use a broad range of models to simulate the evolution of the Swiss energy system. Together with the extended models that may come out of the transdisciplinary collaboration (see Section 2.1.2), this observation raises the question of how the models can be used together in an intelligent manner. For instance, when carrying out simulations with similar models, this relates to the assessment of the sensitivities of the results to different assumptions and approaches. It also relates to how different models from different branches and disciplines can be used in an integrated manner and how uncertainties in one model may be reduced by linking it to another model with a more restricted scope but greater fidelity.

In addressing this research question, the consortium is expected to build on the experiences of the SCCER Joint Activity Scenarios and Modeling (JASM),[27] the SWEET Activity CROSS (Coordination of Scenarios for SWEET),[28] and relevant efforts abroad, e.g., the Stanford Energy Modeling Forum.[29,30,31] Furthermore, the consortium should take into account and exploit synergies with completed and ongoing work on energy and socioeconomic scenarios. This includes work by the federal administration (e.g., the Energy Perspectives 2050+,[32] the Transport Outlook 2050,[33] scenarios by sectors,[34] and scenarios of the GDP development[35]) and ongoing research (e.g., the socioeconomic scenarios to be developed in the framework of the "NCCS-Impacts: Decision Support for Dealing with Climate Change: A Cross-Sectoral Approach" Programme[36] by the National Centre for Climate Services).

2.1.2 Scope

The SFOE recognizes the benefits of a broad spectrum of models, which is why research question 2 in Section 2.1.1 is about the coordination of simulations and not about the coordination of model development. SWEET funds distributed through this call may not be used for the development or further development of technical, economic, and techno-economic models, except for extensions to facilitate the

[27] https://sccer-jasm.ch/

[28] https://sweet-cross.ch/

[29] https://emf.stanford.edu/

[30] H. G. Huntington, J. P. Weyant, and J. L. Sweeney, *Modeling for insight, not numbers: the experiences of the Energy Modeling Forum*, Omega, 10(5):449-462, 1982.

[31] H. G. Huntington, *Model evaluation for policy insights: Reflections on the forum process*, Energy Policy, 156:112365, 2021.

[32] https://www.bfe.admin.ch/bfe/en/home/policy/energy-perspectives-2050-plus.html

[33] https://www.are.admin.ch/are/en/home/mobility/data/transport-outlook.html

[34] https://www.bk.admin.ch/bk/de/home/dokumentation/fuehrungsunterstuetzung/wirtschaftsszenarien.html (available in German, French, and Italian)

[35] https://www.seco.admin.ch/seco/de/home/wirtschaftslage---wirtschaftspolitik/wirtschaftspolitik/Wachstumpolitik/szenarien_bip-entwicklung_schweiz.html (available in German, French, and Italian)

[36] https://www.nccs.admin.ch/nccs/en/home/climate-change-and-impacts/nccs-impacts.html. The NCCS has recently approved a project on qualitative socio-economic pathways for Switzerland in the spirit of shared socioeconomic pathways. More information on this project can be obtained through the SWEET office, which will forward questions to the NCCS.

comparison of models, to integrate insights or models by the SSH,[37] or to improve the representation of consumer behaviour. However, SWEET funds distributed through this call may be used for the development of models by the SSH.

2.1.3 Expected outcomes and outputs

The SFOE pursues two outcomes with this call. The first is a foundation for a long-term transdisciplinary collaboration between the SSH, the natural sciences and engineering, and the economic sciences on energy- and climate-related questions. This foundation should serve as a springboard from which researchers and stakeholders can apply for funding to pursue additional transdisciplinary projects focused on the goals of the Energy Strategy 2050 and the long-term climate strategy. The second is increasing the significance of the conclusions derived from simulations carried out within the SWEET programme.

The consortium's work is expected to result in two outputs. The first are the above-mentioned focus reports. The reports must be addressed to a broad audience and should contain specific recommendations addressed to the relevant stakeholders. In the pre-proposal, the consortium is expected to suggest at least five topics for the focus reports and to present brief descriptions of the planned activities. The topics should be relevant to the goals of the Energy Strategy 2050 and the long-term climate strategy, be sufficiently broad to require (or at least benefit from) a transdisciplinary approach, and be likely to deliver new insights into the co-evolution of the Swiss energy system and Swiss society. The suggested topics are subject to approval by the SFOE. The descriptions of the approved topics will be assessed by the evaluation panel. In the full proposal, the consortium will be required to present detailed descriptions of the planned activities for the first two focus reports. The intention is that once the subsidy contract is signed (see Section 3.1), the consortium can start working on the first two focus reports. For the subsequent focus reports, detailed descriptions of the planned activities, based on the brief descriptions in the pre-proposal, will need to be presented to and approved by the monitoring panel. As part of its work on a particular focus report, the consortium should build on relevant findings from other SWEET consortia. Incorporating relevant findings from projects outside the SWEET programme is desired, but not required.

The second output concerns the documentation of all models, assumptions, scenarios, narratives/storylines, and results that were contributed or generated by consortium members. The documentation must be openly and freely available (see Section 3.5.1) and must be detailed enough to allow results to be reproduced. In its KTT concept, the consortium must explain how the documentation will be disseminated within and beyond the SWEET programme. The consortium is encouraged to share models, including their source code.[38]

[37] Several strategies have been proposed for the integration of insights or models by the SSH, see, e.g., E. Trutnevyte, L. F. Hirt, N. Bauer, A. Cherp, A. Hawkes, O. Y. Edelenbosch, S. Pedde, and D. P. van Vuuren, *Societal transformation for energy and climate policy: The ambitious next step*, One Earth, 1:423-433, 2019 and L. F. Hirt, G. Schell, M. Sahakian, and E. Trutnevyte, *A review of linking models and socio-technical transitions theories for energy and climate solutions*, Environmental Innovation and Societal Transitions, 35:162-179, 2020.

[38] See, e.g., the Open Energy Modeling Initiative and S. Pfenninger, L. Hirth, I. Schlecht, E. Schmid, F. Wiese, T. Brown, C. Davis, M. Gidden, H. Heinrichs, C. Heuberger, S. Hilpert, U. Krien, C. Matke, A. Nebel, R. Morrison, B. Müller, G. Plessmann, M. Reeg, J. C. Richstein, A. Shivakumar, I. Staffell, T. Tröndle, and C. Wingenbach, *Opening the black box of energy modelling: Strategies and lessons learned*, Energy Strategy Reviews, 19:63-71, 2018.

3 Participation

3.1 Need for consortia

Answering the research challenge requires a transdisciplinary approach. To this end, the research and innovation community has to organize consortia consisting of diverse partners, see Figure 3-1, that establish portfolios of interrelated projects. A consortium is a network of several members that adhere to the rights and obligations set forth in their compulsory consortium agreement. The consortium is managed by a host institution that represents the consortium to the SFOE and signs a subsidy contract with the SFOE. The subsidy contract ensures, among other things, the flow of funds that support the consortium's work programme and specifies the beneficiaries that receive funds via the host institution.

3.2 Consortium structure

3.2.1 Host institution

The host institution must be a Swiss institution of higher education entitled to receive SFOE funding[39] and is the legal entity applying for the funding on behalf of a consortium. The host institution must provide a letter of commitment to demonstrate its commitment to fulfil the obligations associated with its role in the consortium (see Section 4.2.1). The obligations include

- appointing a member of its staff to act as the consortium coordinator

and, if the consortium is awarded funding,

- negotiating a subsidy contract between the host institution and the SFOE, and
- negotiating a consortium agreement with all the applicants.

The coordinator represents the consortium on behalf of both the consortium and the host institution and serves as the single point of contact for the SFOE regarding all administrative, legal, and financial matters. The coordinator is responsible and accountable for the preparation and submission of the pre-proposal and the full proposal.

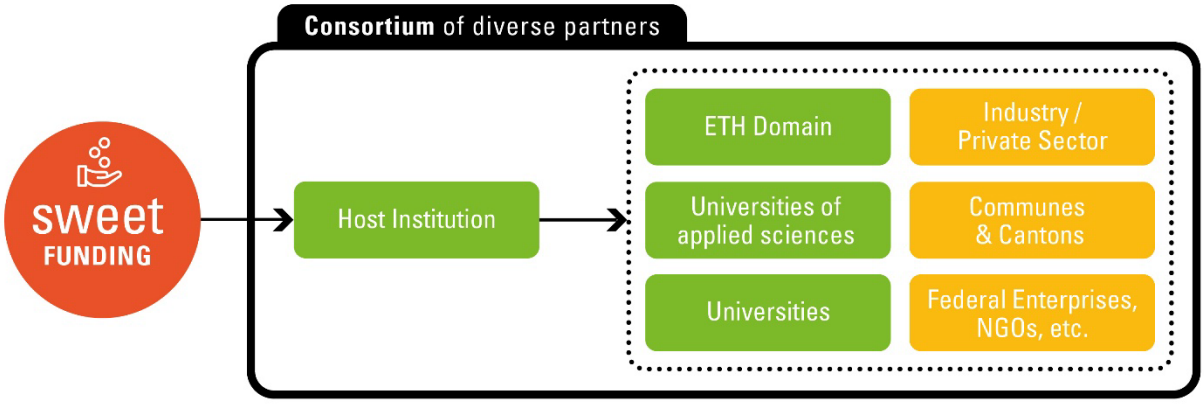

Figure 3-1: Structure of a SWEET consortium: The SFOE administers SWEET funding that flows via a host institution to the consortium partners. In return, the consortium implements a portfolio of interrelated projects that addresses the research challenge.

[39] All institutions pursuant to Article 4 letter c of the Federal Act on the Promotion of Research and Innovation (RIPA; SR 420.1) are eligible as host institutions, see www.fedlex.admin.ch/eli/cc/2013/786/en.

The consortium agreement must be signed by all the applicants and submitted to the SFOE before the SFOE will sign the subsidy contract. Once the subsidy contract is signed, the coordinator is responsible and accountable for the administrative and financial management of the consortium.

3.2.2 Applicants

Applicants request SWEET funding from the SFOE through the consortium. Each applicant is a legal entity with due representation. Each applicant must submit a letter of intent with the pre-proposal (see Section 4.2.2). Applicants may join more than one consortium provided that they inform the coordinators of all affected consortia and that they do not offer substantially the same contribution to more than one consortium.

Upon award, all applicants become beneficiaries of the subsidy contract between the SFOE and the host institution and are henceforth referred to as members of the consortium.

3.2.3 Cooperation partners

Partners that choose not to apply for funding may participate in the work programme of the consortium as so-called cooperation partners. Cooperation partners must finance their activities from sources other than SWEET. Cooperation partners may join more than one consortium.

3.2.4 Changes to the consortium structure

Upon request and subsequent SFOE approval, the host institution may change during the application phase and the consortium's execution phase, provided that the new host institution makes similar commitments and that contracts are reassigned.

During the application phase, applicants may change subject to the restrictions given in Section 6.3. Similarly, during the consortium's execution phase, members may change subject to approval by the monitoring panel and the SFOE. Changes in the cooperation partners must be reported to the SFOE. New members and cooperation partners must fulfil all previously mentioned requirements.

The consortium has the right to reallocate SWEET funds to its members provided that the funding rules (see Section 3.4) are adhered to and that a transparent and traceable process is in place.

3.3 Consortium requirements

A consortium must meet the following requirements:

1. It is led by one host institution.
2. It consists of at least 5 applicants from different legal entities.
3. It consists of at least one applicant from each of the following entities:
    a. Swiss university or institute of the ETH domain (ETH Zurich, EPF Lausanne, Empa, Eawag, PSI and WSL),
    b. Swiss university of applied sciences.
4. Applicants from the natural sciences and engineering, the economic sciences, and the SSH must be equitably represented in the consortium and its management.

In addition, a consortium should:

1. Consist of applicants and cooperation partners that span the innovation system (see Figure 1-2) and thereby enable a transdisciplinary approach commensurate with the research challenge.
2. Consist of applicants and cooperation partners that deliver complementary and significant contributions to the consortium's work programme.
3. Be gender-balanced[40] and reflect Switzerland's diversity in terms of languages and regions.

3.4 Funding rules

The SFOE funds in accordance with the principle of subsidiarity: To ensure that the overall funding is sufficient for the work programme of the consortium, members and cooperation partners contribute, each according to its abilities, with own and third-party contributions to supplement the requested SWEET funding. Own contributions are financial contributions (cash or in-kind) from applicants and cooperation partners, whereas third-party contributions are financial contributions (cash or in-kind) from sources other than the Federal Administration, applicants, and cooperation partners.

It should be noted that the SFOE does not require that the requested SWEET funding be matched with own or third-party contributions. Therefore, own and third-party contributions by applicants and cooperation partners do not enter into the evaluation of pre-proposals and full proposals. However, these contributions may be considered as a tie-breaking criterion when multiple full proposals have equal weighted scores (see Section 6.2.2).

Consortia are encouraged to apply for additional funding through other national and international programmes.

3.4.1 Core budget

The potential financial award as specified in the subsidy contract is referred to as the core budget and represents the SFOE's funding for research projects as well as management and coordination and KTT activities. P+D projects are not funded through the core budget, but may be funded through the SFOE's P+D programme, see Section 3.4.3.

The core budget is subject to annual parliamentary appropriations, the federal council's decision to release the second tranche of SWEET funding that will include this call's core budget for 2029-2032, and the schedule of payments agreed to in the subsidy contract. The core budget cannot be revised to higher amounts.

3.4.2 Supplementary budget

Subject to the availability of additional funds, the SFOE may grant a supplementary budget in response to a request by the consortium or by the SWEET Office. The supplementary budget is limited to 20% of the core budget over the term of the consortium and will only be granted to activities with a clear focus on the SSH. The supplementary budget is intended to support activities that were not included in the

[40] The Swiss Confederation attaches great importance to the adequate representation of women in management positions. Through its involvement in the Technology Collaboration Programme "Clean Energy Education and Empowerment (C3E)" (https://www.c3e-international.org) of the International Energy Agency (IEA), the SFOE actively supports the development of a community of women leaders in the field of clean energy across various sectors.

proposals and that are primarily designed to answer questions prompted by the transdisciplinary collaboration. A consortium may receive a supplementary budget no earlier than 3 years after the launch of the consortium.

3.4.3 Pilot and demonstration projects

Given this call's focus on improving the understanding of the co-evolution of the Swiss energy system and Swiss society and the coordination of simulations, the SFOE does not expect the consortium's project portfolio to contain P+D projects. Nevertheless, through the SFOE's P+D programme,[41] additional funds are available to support such projects. To apply for these funds, legal and budgetary considerations require that a separate formal application be submitted, just like for P+D projects that are not part of a SWEET project portfolio.

It is important to note that consortia are not expected to propose fully elaborated P+D projects in the pre-proposal and the full proposal. Instead, the proposals should describe P+D projects at a conceptual level only, akin to a P+D project note. Once the activities of the consortium are under way and a P+D project has been fully elaborated, the above-mentioned formal application for funding must be submitted to the P+D programme.

The conceptual descriptions of the P+D projects will be assessed by the evaluation panel, including whether they are well integrated into the project portfolio. Favourable assessments of these projects do not guarantee funding by the P+D programme, however. Any decisions by the SFOE on P+D projects are subject to legal hearings and formal objections.

3.4.4 Further particulars

SWEET funding is primarily envisaged for research and innovation activities that are undertaken by Swiss institutions of higher education and non-commercial research organisations. For other entities, the following rules apply:

- Foreign institutions of higher education and foreign non-commercial research organisations may apply for SWEET funding if their contributions are essential to achieving the consortium's objectives and cannot be provided by Swiss applicants. The inclusion of foreign applicants must be justified in the notification of intent to submit a pre-proposal (see Section 5.1.1) and is subject to approval by the SFOE.
- Swiss private for-profit entities may be allocated SWEET funding provided that their contributions to the consortium's work programme, including P+D projects, is in the form of pre-competitive research.
- Swiss cantons, cities, communes, districts/regions, and enterprises affiliated with the Swiss Confederation may be allocated SWEET funding.
- Federal departments and their administrative units are prohibited from receiving SWEET funding. As a result, employees of federal departments and their administrative units may not participate in SWEET consortia.

Research projects at technology readiness levels[42] (TRL) 1 to 4 may be fully funded by SWEET, while research projects at TRL 5 and 6 may be partially funded. P+D projects cover TRL 4 to 9, will be financed

[41] https://www.bfe.admin.ch/bfe/en/home/research-and-cleantech/pilot-and-demonstration-programme.html

[42] See Appendix I of the SFOE's "Directive on the submission and evaluation of applications for financial support of energy research, pilot and demonstration projects", available at https://pubdb.bfe.admin.ch/en/publication/download/9952.

at the agreed level, but at no more than 40% of the non-amortisable supplementary costs.[43] Research projects in the SSH may be fully funded by SWEET.

In preparing their budgets, consortia must take into account the following:

- For research projects, the maximum remuneration must follow specified hourly rates.[44] For P+D projects, the maximum remuneration for applicants from institutions of higher education must follow these rates, while the maximum remuneration for other applicants should follow these rates.
- At least 10% of the core budget must be allocated to two work packages on management and coordination as well as KTT. While these work packages need not yet be detailed in the pre-proposal, the fraction of the core budget allocated to them must be reflected in the budget that must be submitted with the pre-proposal. The work packages on management and coordination as well as KTT may be fully funded by SWEET.
- The SFOE funds research activities through its SWEET programme pursuant to Article 16 of the Federal Act on the Promotion of Research and Innovation Promotion Act (RIPA).[45] Overhead costs are therefore not eligible.
- The cumulation of federal financial assistance to fund a project is inadmissible if the legal provisions or rules of any of the concerned funding instruments are breached. For instance, if funding from one instrument has been secured and that assistance is sufficient for the project to go ahead, applying for assistance from other instruments for the same project would result in an inadmissible cumulation (Article 6 letter c and Article 7 letters c and d of the Federal Subsidy Act[46]). Similarly, an inadmissible cumulation would occur if the maximum funding rate of one instrument is violated by the assistance from other instruments. To prevent inadmissible cumulations, applicants that seek financial assistance from several federal instruments must clearly disclose all sources of financing and inform all concerned authorities (Article 12 of the Federal Subsidy Act).

There is no entitlement to funding.

3.5 Data availability

3.5.1 Open science

The SFOE subscribes to the notion of Open Science and expects that results and data generated by funded projects are publicly accessible. Should legal restrictions prevent public access to the data as originally generated, the consortium is expected to create a publicly accessible version through aggregation, anonymization, or normalization. Furthermore, the consortium is encouraged to publish data that is of national interest on the Swiss public administration's central portal for open government data.[47] In the full proposal, the consortium will need to present a data management plan.

[43] See Section 2 and Appendix II of the SFOE's "Directive on the submission and evaluation of applications for financial support of energy research, pilot and demonstration projects", available at https://pubdb.bfe.admin.ch/en/publication/download/9952.

[44] See Appendix VI of the SFOE's "Directive on the submission and evaluation of applications for financial support of energy research, pilot and demonstration projects", available at https://pubdb.bfe.admin.ch/en/publication/download/9952.

[45] https://www.fedlex.admin.ch/eli/cc/2013/786/en

[46] https://www.fedlex.admin.ch/eli/cc/1991/857_857_857/de (available in German, French, and Italian)

[47] https://opendata.swiss/en. The SFOE can be consulted at ogd@bfe.admin.ch for advice about publishing data on the portal.

Measures must be included to provide open access (free on-line access, such as the 'gold' model) to peer-reviewed scientific publications that result from the project.

3.5.2 ARAMIS publication

By signing the pre-proposal on behalf of all applicants and cooperation partners, the consortium coordinator declares that they agree to the publication and distribution of the findings gained from the project in compliance with the Federal Act on Freedom of Information in the Administration (FoIA).[48] Specifically, final reports and the main project information will be published on the ARAMIS information platform[49] and, if deemed beneficial, on the geoportal of the Confederation.[50]

4 Application

The application to be submitted in response to this call for pre-proposals consists of the pre-proposal and letters of commitment and intent.

4.1 Pre-proposal

The pre-proposal must be prepared in English using the template that is available on the SWEET website. The font, font size, line spacing, and margins must not be changed, otherwise the pre-proposal will not be considered for evaluation. Furthermore, the page limits specified in the template must be obeyed. Content that exceeds a specified limit or that was not specifically requested will be removed before the pre-proposal is forwarded to the evaluation panel.

4.2 Letters of commitment and intent

The host institution must submit a letter of commitment whereas applicants must submit letters of intent. There are no templates for the letters. They must be printed on the host institution's or applicant's official stationery, be addressed to the SFOE, and be signed by authorized representatives.

Cooperation partners are not required to submit letters of commitment or intent as part of the application. It is the responsibility of the host institution to secure appropriate letters from cooperation partners, especially if their contributions are critical to the consortium's work programme.

4.2.1 Letter of commitment of the host institution

The letter of commitment must demonstrate the host institution's commitment to fulfil its obligations (see Section 3.2.1). Since the host institution will be the contractual partner of the SFOE, the commitment must be confirmed by the institution's board. The letter must contain the full name and contact information of the person who is authorized to act as the consortium coordinator. Own and third-party contributions must be specified in the letter.

The letter must be submitted with the pre-proposal and the full proposal.

[48] https://www.fedlex.admin.ch/eli/cc/2006/355/en
[49] http://www.aramis.admin.ch
[50] http://map.geo.admin.ch

4.2.2 Letters of intent of applicants

By submitting a letter of intent, applicants express their intent to become members of the consortium should it be awarded funding. The letter must include a list of the work packages that the applicant intends to participate in and outline the nature of the applicant's contributions. Own and third-party contributions must be specified in the letter.

If the consortium is invited to submit a full proposal, applicants will be required to submit letters of commitment.

5 Submission

5.1 Submission process

5.1.1 Notification of intent to submit a pre-proposal

Consortia that intend to submit a pre-proposal must inform the SFOE by sending a notification of intent to submit to sweet@bfe.admin.ch no later than **28 April 2022**. The notification must be prepared in English using the template that is available on the SWEET website. The SFOE will acknowledge having received the notification by contacting the coordinator named in the notification.

The template includes sections that must be completed if the consortium includes foreign applicants (see Section 3.4.4). The SFOE will strive to inform the coordinator within 10 working days whether the applicants are approved.

The notification is mandatory, i.e., if a consortium did not submit a notification by the deadline given above, its pre-proposal will fail the admissibility check and hence not be evaluated (see Section 6.1). However, the notification is not binding, i.e., a consortium may choose not to submit a pre-proposal although it had previously notified the SFOE of its intention to do so.

5.1.2 Submission of application

The coordinator submits the application by sending it to sweet@bfe.admin.ch no later than **16 June 2022 at 12:00 noon CEST**. A complete application must consist of:

1. A Microsoft Word document containing only the pre-proposal, named *Acronym*_preproposal (where *Acronym* is replaced by the consortium's acronym).
2. A single pdf document containing the pre-proposal (distilled from the Microsoft Word document) and all letters of commitment and intent, named *Acronym*_ALL.

The SFOE will acknowledge having received the application by informing the coordinator.

If the combined size of the two documents exceeds 20 MB, they must be submitted via the file transfer system of the Swiss federal administration (www.filetransfer.admin.ch). To receive the required access credentials, the SWEET Office should be contacted well in advance of the submission deadline.

5.2 Data protection

Proposals submitted in response to this call will be treated confidentially. They will be checked by the SFOE and evaluated by an expert panel. Following the selection of a consortium for funding, the proposals will be studied by the SFOE and the monitoring panel (see Section 7).

Proposals and evaluation reports will be stored on secure servers. The experts will be required to sign declarations concerning confidentiality and conflicts of interest before they will be granted permission to access proposals.

By submitting proposals, consortia agree to them being forwarded to experts for the purposes of evaluation and monitoring.

6 Evaluation

6.1 Admissibility and eligibility check by the SFOE

The SFOE will check all applications for admissibility (completeness of the application and satisfaction of pre-proposal requirements) and eligibility (satisfaction of consortium and applicant requirements) prior to the pre-proposal being evaluated by the expert panel. An application is admissible and eligible if all of the questions in Table 6-1 have been answered with “yes”.

If any admissibility and eligibility criteria are not fulfilled, the application will be rejected and not evaluated. The SFOE will inform the coordinator of the rejected application in writing and state which of the criteria were not met.

Table 6-1: The admissibility and eligibility criteria.

Admissibility	
A1	Did the consortium notify the SFOE of its intention to submit a pre-proposal and did it do so by the deadline given in the call text (see Section 5.1.1)?
A2	Was the application received before the deadline given in the call text (see Section 5.1.2)?
A3	Is the application complete (see Section 5.1.2)?
A4	Was the pre-proposal prepared with the correct template and formatting (see Section 4.1)?
A5	Did the host institution submit a duly signed letter of commitment with the requested minimum content (see Section 4.2.1)?
A6	Did all applicants submit letters of intent (see Section 4.2.2)?
A7	Has at least 10% of the core budget been allocated to the two work packages on management and coordination as well as KTT (see Section 3.4.4)?
Eligibility	
E1	Is the host institution entitled to receive SFOE funding and has one consortium coordinator been appointed on its behalf (see Section 3.2.1)?
E2	Does the consortium consist of at least 5 applicants from different legal entities (see Section 3.3)?
E3	Does the consortium consist of at least one applicant from (a) Swiss universities or an institute of the ETH domain and (b) Swiss universities of applied sciences (see Section 3.3)?
E4	Did the SFOE approve all foreign applicants (see Section 3.4.4)?

6.2 Evaluation by the expert panel

Admissible and eligible pre-proposals will be evaluated by an independent panel appointed by the SFOE. The panel will consist of recognized experts from fields relevant to this call.

6.2.1 Overview of evaluation process

The evaluation process consists of the following steps:

1. The panel will use the criteria given in Section 6.2.2 to determine a weighted score and compile an evaluation report for each pre-proposal.
2. The panel will rank the pre-proposals according to their weighted score. If two or more pre-proposals have equal weighted scores, the pre-proposal with the better gender balance at the levels of coordinator and work-package leaders will be ranked higher.
3. The panel will produce a shortlist of the highest-ranking pre-proposals. To be shortlisted, a pre-proposal must reach two thresholds:
   - Individual threshold: The score of each criterion must be at least 3.
   - Overall threshold: The scores of the criteria must sum to at least 10.

   For this call, at most one pre-proposal will be shortlisted.
4. The SFOE will inform coordinators about their pre-proposal's rank and provide them with the evaluation report. The coordinator of the shortlisted pre-proposal will be invited to submit a full proposal and provided with the corresponding templates and instructions.

The panel's evaluation cannot be rebutted. The coordinators of pre-proposals that are not shortlisted can submit a formal objection within 30 days. After this period, the SFOE's decision to invite the coordinator of the shortlisted pre-proposal to submit a full proposal enters into force.

If a pre-proposal is not short-listed, suitably improved and expanded parts of it may be submitted to the research programmes and the P+D programme of the SFOE.

6.2.2 Evaluation criteria and scores

Pre-proposals will be evaluated according to the criteria shown in Table 6-2. For each criterion, the evaluation panel will assign a score from the scale 1 (poor), 2 (fair), 3 (good), 4 (very good), 5 (excellent). From the scores assigned to each criterion, a weighted score will be determined using the weights given in Table 6-2.

Table 6-2: Evaluation criteria and their weights.

Criterion 1: Excellence	**Weight: 35%**
a. Clarity of the objectives and pertinence to the research challenge b. Soundness of the proposed concept c. Credibility of the proposed methodology (transdisciplinary approach and scientific merit) d. Novelty and originality, extent to which proposed work is beyond the state of the art and demonstrates innovation potential (e.g., ground-breaking objectives; novel concept and methodology; new products, services, or business and organizational models)	

Criterion 2: Impact	Weight: 35%
a. Extent to which the consortium's results are likely to attain the expected outcomes and outputs b. Appropriateness of the KTT concept c. Appropriateness of the collaboration with stakeholders	
Criterion 3: Implementation	**Weight: 30%**
a. Consortium as a whole: • Gender balance and reflection of Switzerland's diversity in terms of languages and regions • Complementarity of the applicants and cooperation partners and extent to which the consortium as a whole brings together the necessary expertise and enables a transdisciplinary approach • Appropriateness of the roles and extent to which all applicants and cooperation partners have a substantial role and adequate resources in the project to fulfil their roles b. Work programme: • Quality and effectiveness of the work programme, including the extent to which the resources assigned to work packages are in line with their objectives and deliverables • Appropriateness of the project portfolio given the consortium objectives, including the interrelation of research and P+D projects (if P+D projects are part of the portfolio) c. Management and coordination: • Appropriateness of the management (of the consortium) • Appropriateness of the coordination (with other SWEET consortia)	

6.3 Preparation of full proposal

The consortium that has been invited to submit a full proposal will be expected to take into account the feedback contained in the evaluation report. Changes to the work programme between the pre-proposal and the full proposal will have to be detailed in a dedicated section of the full-proposal template. Changes to the consortium through the addition or departure of applicants will also have to be detailed and will be permitted only if the associated total redistribution of SWEET funding amounts to less than 30% of the total requested SWEET funding.

6.4 Schedule

Important dates relevant to this call are:

28 April 2022	Deadline for notifying SFOE of intention to submit pre-proposal
16 June 2022	Deadline for submission of pre-proposals
Late August 2022	Announcement of evaluation results
Late August 2022	Invitation to submit full proposal sent to shortlisted consortium
Early November 2022	Deadline for submission of full proposal
December 2022	Announcement of funding decision
January 2023	Consortium starts operations

Dates in italics are provisional. The deadline for submission of the full proposal will be announced together with the invitation to submit full proposals.

7 Consortium monitoring and reporting

The SFOE will appoint a panel to monitor the consortium. Beyond standard reporting (final reports on research and P+D projects), the consortium will be required to provide annual progress and finance reports. Detailed monitoring guidelines including reporting templates will be provided after the publication of the funding decision.

8 Contacts and further information

Questions about this call, including questions directed at the Network for Transdisciplinary Research of the Swiss Academies of Arts and Sciences and the NCCS, should be directed via email or letter to the SWEET office:

Swiss Federal Office of Energy
SWEET Office
Section Energy Research and Cleantech
P.O. Box
CH-3003 Berne / Switzerland
sweet@bfe.admin.ch

The questions and answers will be published on the SWEET website and regularly updated.

Appendix: Descriptions of interdisciplinary and transdisciplinary research

As stated in Section 1.1, the purpose of SWEET is to fund interdisciplinary and transdisciplinary research. Because these terms are not well defined, the following provides brief descriptions of them as interpreted by the SFOE in the context of the SWEET programme.[51]

To clarify the characteristics of interdisciplinary and transdisciplinary research, it is instructive to contrast them with multidisciplinary research. In multidisciplinary research, each discipline receives input from other disciplines, for example in the form of knowledge and data, but the discipline boundaries remain distinct. However, each discipline retains its paradigms, nomenclature, knowledge, and methods and hence there is little to no lasting impact of the research on the disciplines. Multidisciplinary research is adequate for problems that can be solved by a single discipline but where the solution benefits from the input of other disciplines.

In interdisciplinary research, the disciplines provide inputs to each other to solve a problem that could not be solved by one discipline by itself. Thus, although the discipline boundaries remain distinct, there is an integration of the disciplines. The integration enriches each discipline's paradigms, nomenclature, knowledge, and methods. The enrichment in turn leads to the development of new knowledge, methods, and tools, thereby having a lasting impact on the disciplines.

Transdisciplinary research may be viewed as a deeper and broader form of interdisciplinary research. It is deeper because it transcends disciplines and thereby blurs discipline boundaries. It is broader because it includes not just scientists, but also stakeholders such as citizens and authorities, who should ideally participate in all phases of the research process. Transdisciplinary research represents a unified

[51] A comprehensive overview of definitions of transdisciplinarity may be found in Annex A1 of C. Pohl and G. Hirsch Hadorn, *Principles for Designing Transdisciplinary Research, Proposed by the Swiss Academies of Arts and Sciences*, oekom Verlag, Munich, Germany, 2007.

problem-solving approach in which problems are tackled not only from a disciplinary perspective but grappled with in their entire complexity. Therefore, transdisciplinary research is necessary to solve problems that arise at the intersection of science and society or what is sometimes referred to as the "life-world".[52] The outcomes of transdisciplinary research cannot be assigned to a single discipline and include not just new knowledge and methods but also new paradigms.

Transdisciplinary research that tackles problems at the intersection of science and society may be thought of as research that generates not only systems knowledge (what is?), but also target knowledge (what are desirable target states?) and transformation knowledge (how to change?).[53] Each discipline and stakeholder contributes to the three types of knowledge, depending on its methods, its approach to framing and formulating research questions, and its capacity to link abstract and context-specific knowledge. This heterogeneity of contributions is viewed as an asset in transdisciplinary research, but also requires a respectful collaboration that begins with a joint framing of the problem.

[52] See, e.g., G. Hirsch Hadorn, S. Biber-Klemm, W. Grossenbacher-Mansuy, C. Pohl, U. Wiesmann, and E. Zemp, The Emergence of Transdisciplinarity as a Form of Research, in: *Handbook of Transdisciplinary Research*, G. Hirsch Hadorn, H. Hoffmann-Riem, S. Biber-Klemm, W. Grossenbacher-Mansuy, D. Joye, C. Pohl, U. Wiesmann, and E. Zemp (eds.), Springer, 2008, pp. 19-39.

[53] A description of the three types of knowledge may be found in C. Pohl and G. Hirsch Hadorn, *Principles for Designing Transdisciplinary Research, Proposed by the Swiss Academies of Arts and Sciences*. oekom Verlag, Munich, 2007, pp. 36-39.