



BESLUT

Datum för beslut:
2024-06-18

Diarienummer:
KTH-RPROJ-0276016

Beslut om ett strategiskt initiativ, KTH Nuclear Energy Initiative for Decarbonization & Industrial Transformation

Detta beslut har undertecknats elektroniskt.

Beslutet

KTH:s rektor beslutar att:

- Finansiera *KTH Nuclear Energy Initiative for Decarbonization & Industrial Transformation* med 1 mnkr centrala medel under 2024. Finansieringen sker genom centrala avsättningar för strategiska initiativ i FoFU enligt beslut om KTH:s resursfördelning 2024 (dnr V-2023-0881).
- Utse Pär Olsson, SCI-skolan, som ansvarig forskningsledare för satsningen.
- Återrapportering om fortsatt plan för att erhålla externa bidrag för dialog om fortsatt central finansiering ska ske med forskningsberedningen.

Ärendet

KTH:s initiativ för forskningssatsningar inrättades enligt förslag från Översyn av KTH:s särskilda forskningssatsningar (Dnr: KTH-RPROJ-0276016). Förslaget innebär att centrala medel ska kunna användas till direkt finansiering av tre- till femåriga forskningsinitiativ med det huvudsakliga målet att dra in externa forskningsanslag.

Under våren har forskningsberedningen arbetat vidare med att konkretisera förslaget, och kommit fram till ett antal kriterier:

- Strategiska forskningsinitiativ görs i områden som är viktiga för KTH att stärka utifrån KTH:s vision och mål. Det kan dels vara att förstärka ett område som redan finns eller utforska ett nytt.
- Forskningsinitiativ ska kunna initieras av både forskare, KTH:s ledning och av KTH:s forskningsberedning.
- Målsättningen för beviljade satsningar är att generera betydande externa bidrag, >100 mnkr. Utväxlingen blir den viktigaste indikatorn som följs upp årligen.
- Forskningsinitiativ är satsningar med central finansiering på 0,5 - 3 mnkr per år i max fem år.

Till forskningsberedningens möte den 22 maj inkom förslaget KTH Nuclear Energy Initiative for Decarbonization & Industrial Transformation, med professor Pär Olsson, SCI-skolan, som ansvarig forskningsledare, se bilaga 1.

Baserat på forskningsberedningens diskussion rekommenderar vicerektor för forskning att stödja förslaget med 1 mnkr 2024 (KTH-RPROJ-0276016 Protokoll 5/2024) eftersom det har en tydlig finansieringsstrategi och sedan invänta forskningspropositionen för vidare dialog om hur detta kan utvecklas.

Detta beslut har fattats av rektor Anders Söderholm efter föredragning av forskningsrådgivare Johan Schuber. Närvarande vid beslutet var universitetsdirektör Kerstin Jacobsson, ordförande för Tekniska högskolans studentkår Niklas Carlbaum och mötessekreterare Helene Rune.

Kungl. Tekniska högskolan

Anders Söderholm

Anders Söderholm, rektor KTH



Johan Schuber, forskningsrådgivare, avdelningen för forskningsstöd inom Verksamhetsstödet

Bilaga 1: projektförslag

Sändlista

För åtgärd:

Pär Olsson, SCI-skolan

Kopia till:

Skolchef SCI-skolan

Vicerektor för forskning Annika Borgenstam

Controllergruppen, controller@kth.se

Chefen för avdelningen för forskningsstöd Maria Gustafson

Anna Aminoff

Pierre Olofsson, avdelningen för forskningsstöd

Expeditionsdatum:

2024-06-19

KTH NEED-IT

KTH Nuclear EnErgy initiative for Decarbonization & Industrial Transformation

Why: Solutions to the global challenges of the modern days will require joining efforts and competences from different fields. It is clear that the current approach to decarbonization of heavy industry needs to be accelerated. The nuclear renaissance sets new, yet unexplored, opportunities not only for decarbonization but also for the re-industrialization of Europe. Today, the nuclear industry focus is almost exclusively on electricity generation while there is great potential to provide other heavy industries with decarbonization-enabling heat as well as indirect services to the electricity grid, hydrogen supply and society at large.

How: Pioneer actions, new knowledge and new competences are needed and KTH is very well placed to become a European and World leader in nuclear-powered decarbonization and industrial transformation with strong societal value.

What: An open and dynamic arena with a clear vision and a long-term strategy to mobilize existing competences and create expertise needed for the wide deployment of nuclear energy. This environment will attract more than 25 MSEK/y of new external funding by the year 2030 and grow further in the following decade.

Who: 30+ active researchers across all KTH schools. Joint coordination by P. Olsson (Nuclear energy expertise) and C. Duwig (Process and Industry expertise).

Vision

KTH NEED-IT will create novel and advanced knowledge as an enabler for total decarbonization of industry using reliable, efficient, and safe nuclear energy – both for heat and for electricity production. By leveraging existing strengths, pioneering new industrial applications, and fostering new partnerships, KTH will extend and develop its leadership in both nuclear energy and industry decarbonization research with impact in Europe and the world.

Purpose

KTH NEED-IT will mobilize related research at KTH, leverage existing strength and catalyze new collaborations to respond to the challenge of heavy industry decarbonization using efficiently nuclear energy. KTH NEED-IT will be a pioneering and dynamic environment that will attract major funding from national investments, national research programs, as well as European Euratom and Green Deal programs.

By embracing this vision and working together with our partners, KTH NEED-IT will pave the way for transforming industry toward sustainable operations, truly phasing-out fossil-fuels usage for baseload power generation, while securing economic growth, strategic supply security, environmental stewardship, and societal well-being.

Key Pillars

Research Excellence: KTH NEED-IT will bring together experts from diverse fields such as nuclear engineering, nuclear physics, materials science, solid mechanics, nuclear chemistry, process and chemical engineering, electrical engineering, and metallurgical engineering to explore fundamental and applied aspects of industry decarbonization using electricity, heat and hydrogen produced by

nuclear energy. Through truly collaborative and pioneering high-impact projects, we will tackle key challenges in development of advanced reactors, nuclear reactor safety and accident mitigation for current and future reactors, development and evolution of nuclear materials, advanced fuel development, fuel cycle back-end solutions, nuclear reactor integration, process safety and design, high temperature heat-transport, carbon capture from the atmosphere, direct thermo-chemical production of hydrogen, services to the electrical grid, concrete production, direct heating of metallurgical processes, and biomass conversion/pyrolysis.

Interdisciplinary Collaboration: Recognizing the systemic changes at play and nuclear energy as a powerful enabler, KTH NEED-IT will promote interdisciplinary collaboration, encouraging researchers to work across traditional boundaries of existing technologies and industries. By integrating knowledge from various disciplines, we will develop integration strategies that address technical, digital, environmental, and societal aspects of energy efficient integration of nuclear energy in the future decarbonized industry.

Value Chain Integration: KTH NEED-IT will focus on the entire value chain, from fuel preparation to safe industrial operation and back-end solutions, including nuclear reactor integration, energy and material efficiency, safety, and process re-design. With comprehensive expertise on each stage, we will identify opportunities for safety and efficiency improvements, cost reduction, grid services, and environmental sustainability. Our aim is to cover the entire nuclear fuel cycle and associated system integration technologies. It will be the first and pioneering effort combining nuclear energy and heavy industry with true direct and indirect value for Sweden.

Partnerships: KTH NEED-IT will actively engage with industry partners, including Westinghouse, Vattenfall, Studsvik, Uniper, Fortum, Blykalla, Alleima, Höganäs, Outokumpu, Vysus group, Kärnfull Next, LKAB, SSAB, Nynäs, ST1, Preem, Boliden, Jernkontoret, ... as well as the Radiation Safety Authorities (in Sweden and abroad) and relevant municipalities. Under KTH leadership, key academic collaboration partners in Sweden include Chalmers, Uppsala University, Luleå University of Technology and Linköping University. Internationally, there is a vast collaboration network with research institutes and universities established primarily through Euratom and Horizon Europe projects and partnerships, as well as through OECD and IAEA projects and frameworks and bilateral collaborations outside of Europe with key institutes. Through strategic collaborations, we will facilitate technology transfer, accelerate innovation, and address real-world challenges faced by the industry transformation.

Education, Training and Competence supply: KTH NEED-IT will play a crucial role in educating the next generation of engineers and experts covering the whole value chain. We are operating the highly successful and only Master program in Nuclear Engineering in Sweden and have means to find synergies with other Master programs in Chemical Engineering, Metallurgical Processes, Engineering Mechanics, and Energy Engineering. Our expertise will enable tailoring our degree programs, offer workshops, and training courses focused on the needs of industry and academia. By providing students with hands-on experience and exposure to cutting-edge research, we will equip them with the skills and knowledge required to drive future advancements in nuclear science and engineering and nuclear energy integration for industrial transformation.

Global Leadership and Impact: Through our collaborative efforts and high-impact research programs, KTH NEED-IT will establish itself as a pioneer and later global leader in nuclear energy and integration innovation. We will establish and advertise our brand in international research consortia, conferences,

and standardization efforts, contributing to the advancement of industry decarbonization worldwide. Our ultimate goal is to create knowledge and educate the experts and engineers that will decarbonize heavy industry and create a clean, sustainable and prosperous industry in Sweden and abroad.

People

The initiative already includes various researchers and will be an open arena that will foster new ideas and projects and that will act as a unique meeting place for different disciplines and for partners from different industries.

Initial team:

SCI – Physics: Pär Olsson, Janne Wallenius, Pavel Kudinov, Sevostian Bechta, Weimin Ma, Jan Dufek, Torbjörn Bäck, Ayse Atac Nyberg, Chong Qi (Nuclear Science and Engineering)

SCI – Engineering Mechanics: Jonas Faleskog, Pål Efsing, Carl Dahlberg (Solid Mechanics)

CBH – Chemistry: Mats Jonsson (Nuclear Chemistry)

CBH – Chemical Engineering: Christophe Duwig, Efthymios Kantarelis, Klas Engvall (Process technology), Shareq Mohd Nazir (Energy Processes), Kerstin Forsberg (Resource Recovery)

CBH – Fiber and Polymer Technologies: Daniel Söderberg (Fiber Processes)

ITM – Materials Science: Christopher Hulme (Metallurgical processes), Malin Selleby (Thermodynamics), Levente Vitos (Materials theory)

ITM - Energy Technology: Jens Fridh, Nenad Glodic (Turbomachinery), Rafael Guedez, Silvia Trevisan, Wujun Wang (Heat and Power Technology), Viktoria Martin, William Usher (System Analysis)

EECS – Electrical Engineering: Lina Bertling Tjernberg, Lars Nordström, Hans Edin (power grid integration), Hans Peter Nee, Staffan Norrga (Power Grid Components)

ABE – Civil and Architectural Engineering: Adnan Ploskic (Constructional Engineering and Design), Annik Gram (Concrete Processes)

Activities

An open meeting place.

Recognizing the challenge of bringing together disciplines and industries that have been historically separated and the urgency of the transformation, KTH NEED-IT will be an open meeting place, welcoming all researchers who want to contribute. We address the challenge of having the right people by putting people together during events, workshops, and seminars so that they can learn from each other, connect, and build trust.

Preparation of joint applications

The strategic dimension of KTH NEED-IT is clear, and we will work on it from day 1. In the **short-term** (0-2 years), the priority will be to establish a Strategic Research Area (SFO) and to build interdisciplinary project proposals. In particular, we will identify suitable national and international calls, have dedicated workshops, and mobilize the researchers as well as their network. KTH NEED-IT will also act as a contact point for industries and stakeholders. This activity will build trust and mutual understanding while starting the KTH NEED-IT brand. The Energy Agency, SSF, VR, Vinnova and SSM are key national research funding agencies of relevance.

The **medium-term** (2-5 years) strategy will build upon the people and sketch an environment for research excellence. We will leverage the first projects and identify additional gaps. Together we will mobilize industries and aim at larger financing. We aim for establishing dedicated governmental investments, additional competence centers (Vinnova, Swedish Energy Agency, SSF, ...) as well as large national programs for industrial transformation and decarbonization (Klimatklivet, Industriklivet).

Pioneer project start-up

In the short term, we aim to work on establishing an SFO, on the assumption on that the government will devote funding for this in the near term. Additionally, in the short-term, we see gaps and areas where KTH NEED-IT should pioneer joint activities between different groups. We will launch accordingly smaller but well-targeted high-value pioneering projects (2 post-doc, 2 * 2 years) that will provide the base for larger activities.

Organization, Budget and Management

KTH NEED-IT will be co-led by Pär Olsson (Nuclear) and Christophe Duwig (Process) that will organize the events and mobilize the researchers as well as handled the contacts with stakeholders in Sweden (industry, jernkontoret, ...) and abroad.

A board with relevant stakeholders (KTH and industry) will make decisions regarding financing and decide on strategic questions as well as giving directions to the directors.

Budget overview

Year 1: 1 MSEK – start-up, coordination, potential establishment of an SFO, organization of events, meet up, planning of proposals.

Year 2: 3 MSEK from KTH + SFO funding (~15 MSEK) + additional external funding (3 MSEK) – coordination, events, planning activities, start-up projects 2 post-doctoral researchers and 2 research projects with external financing.

Year 3: 3 MSEK from KTH + SFO funding (~15 MSEK) + additional external funding (4-5 MSEK) – events, coordination, large projects applications, start-up projects 2 post-doctoral researchers and 3-4 research projects with external financing.

Year 4: 3 MSEK from KTH + SFO funding (~15 MSEK) + additional external funding (8-12 MSEK) – events, coordination, planning activities projects and planning large applications, start-up projects 2 post-doctoral researchers and 5-6 research projects with external financing.

Year 5: 3 MSEK from KTH + SFO funding (~15 MSEK) + additional external funding (15-20 MSEK) – events, coordination, planning activities, start-up projects 2 post-doctoral researchers and 5-6 research projects with external financing.

At Year 5, we will have educated approx. 10-15 experts with connection to the initiative that will go to industry and academia and be pioneers as well as ambassadors.

Year 5-10: SFO funding (~15 MSEK) + 20-25 MSEK/year external funding.


KTH internt beslut med e-signatur: : KTH-RPROJ-0276016 Beslut om ett strategiskt initiativ, KTH Nuclear Energy Initiative for Decarbonization & Industrial Transformation

Slutgiltig revideringsrapport

2024-06-19

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