



BESLUT

Datum för beslut:  
2025-04-03

Diarienummer:  
KTH-RPROJ-0276016

## Beslut om ett strategiskt forskningsinitiativ, KTH FLUX - A center for Fluid Science Driving Technology and Sustainability

Detta beslut har undertecknats elektroniskt.

### Beslutet

KTH:s vicerektor för forskning beslutar att:

- Finansiera *KTH FLUX - A center for Fluid Science Driving Technology and Sustainability* med 1 mnkr centrala medel under 2025.
- Utse Shervin Bagheri, SCI-skolan, som ansvarig forskningsledare för satsningen.
- Återrapportering enligt utvärderingskriterier, för dialog om fortsatt bidrag ska vara Forskningsberedningen tillhanda 13 april 2026.

### 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 föregående år har Forskningsberedningen arbetat vidare med att konkretisera förslaget, och kommit fram till ett antal kriterier för ett KTH Strategiskt initiativ samt kriterier för utvärdering (Protokoll 10/2024):

*Kriterier för KTH Strategiskt forskningsinitiativ:*

- Strategiska forskningsinitiativ är ett sätt för KTH att kraftsamla inom områden där det krävs nya samarbeten som är viktiga utifrån KTH:s vision och mål. Det kan dels vara att förstärka ett område som redan finns eller utveckla ett nytt.
- Strategiska forskningsinitiativ ska kunna initieras av både forskare, KTH:s ledning och forskningsberedningen.
- Strategiska forskningsinitiativ är satsningar med central finansiering på 0,5 - 3 mnkr per år i max fem år.
- Målsättningen för en beviljad satsning är att generera betydande externa bidrag till KTH om totalt minst 100 mnkr. Det kan vara externa bidrag från flera olika finansiärer som

tillsammans stärker området för forskningsinitiativet. Utväxlingen blir den viktigaste indikatorn som följs upp årligen.

*Kriterier för utvärdering av beviljat KTH Strategiskt forskningsinitiativ ska ske efter ett år enligt nedan:*

- Projektansökan – En eller flera projektansökningar.
- Kraftsamling - Vilka PI' s är med i projektansökan/ansökningar?
- Förberedelsearbete inför utlysningar.
- Exempel på nya forskningssamarbeten.

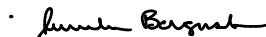
Dessutom kommer behov av central finansiering, budgetutrymme och strategisk relevans att vägas in vid Forskningsberedningens bedömning.

Till Forskningsberedningens möte den 26 mars inkom förslaget KTH FLUX - A center for Fluid Science Driving Technology and Sustainability, med professor Shervin Bagheri, SCI-skolan, som ansvarig forskningsledare, se bilaga 1.

Baserat på Forskningsberedningens diskussion rekommenderas Vicerektor för forskning att stödja att förslaget beviljas sökt budget, 1 mnkr för år 2025. En utvärdering ska ligga till grund för diskussion om fortsatt finansiering och i vilken omfattning. (KTH-RPROJ-0276016 Protokoll 10/2024).

**Detta beslut** har fattats av vicerektor för forskning Annika Borgenstam efter föredragning av forskningsrådgivare Johan Schuber.

Kungl. Tekniska högskolan



Annika Borgenstam, vicerektor för forskning KTH



Johan Schuber, forskningsrådgivare, avdelningen för forskningsstöd inom Verksamhetsstödet

Bilaga 1: projektförslag

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## Sändlista

### För åtgärd:

Shervin Bagheri, SCI-skolan

### Kopia till:

Skolchef SCI-skolan

Controllergruppen, [controller@kth.se](mailto:controller@kth.se)

Chefen för avdelningen för forskningsstöd Maria Gustafson

Tf Kommunikationschef Gunilla Iverfelt

Anna Aminoff

Sanna Pehrson, avdelningen för forskningsstöd

### Expeditionsdatum:

2025-04-03

## **KTH Strategic Research Initiative**

### ***Project Idea:***

Establish a center for fluid science to leverage the research excellence at KTH to target key strategic areas identified by Vinnova, KAW and EU and to prepare for upcoming excellence calls announced in the research bill.

### **Title:**

FLUX - A center for Fluid Science Driving Technology and Sustainability

### **Main applicant:**

Shervin Bagheri, Professor, Engineering Mechanics, SCI

Lisa Prahl Wittberg,, Professor, Engineering Mechanics SCI

Outi Tammisola, Professor, Engineering Mechanics SCI

Ricardo Vinuesa, Associate Professor, Engineering Mechanics SCI

Ozan Ötkem, Professor, Mathematics, SCI

Pär Olsson, Professor, Physics, SCI

Daniel Söderberg, Professor, Fibre and polymer technology, CBH

### **Funding request:**

1 MSEK for the first year (new application will be sent after review of first year).

## Purpose

### What will be achieved with the project? What's the vision?

In the coming years, Sweden is giving high priority to strategic areas that benefit Swedish economy and competitiveness, national security, as well as environmental and sustainable transition. In this context, fluid mechanics, which is an area where KTH is internationally leading, is directly related to several strategically important technology fields.

Our vision is to establish a center, **FLUX**, for cutting-edge research in fluid mechanics that will

1. take a world-leading position in **AI for fluid mechanics** by developing and using advanced methods to accelerate impact on technology and sustainability.
2. address specific bottlenecks in **energy conversion, aviation, and defense industries** such as electrolyzers, hypersonic flows and thermal management for electronics and batteries.
3. intersect with biology and chemistry to accelerate **key areas in biotechnology and biomaterials**, including microfluidics for drug delivery, flow control for medical applications, and bio-based material production.
4. contribute the **transition to a sustainable society** by focusing on CO<sub>2</sub> separation, capture and storage (CCS), sustainable urban cooling and exchange processes in the climate.

### How will the proposed initiative strengthen KTH and how will it contribute to fulfill KTH:s vision and goals?

Fluid mechanics is one of the strongest research areas of KTH and in a global comparison, it is at the very forefront. The fluid mechanics division has **received 9 ERC grants** since the inception of excellence center FLOW in 2007. This makes the KTH research environment exceptional not only in Sweden, but also in Europe. The FLOW environment has played a key role in shaping the current generation of young faculty. By establishing FLUX, this new generation will build on that success, ensuring KTH's continued leadership in fluid mechanics. This will contribute to KTH's goal of being world-leading and have a major impact.

### How is it related to identified skills needed in society / industry and how is it connected to development of educational offerings?

Fluid science plays a central role in technologies listed above, which have been explicitly identified as strategic [1,2] and impactful [3]. Thus, fluid dynamics is crucial for the Swedish society and economy. Neglecting its role risks our future security and increases reliance on external expertise for essential engineering knowledge and innovation.

Fluid mechanics is also key to several industrial sectors, that have tapped into our expertise, employing our graduates. Annual revenues from Swedish companies where fluid mechanics plays a central role is **estimated to be 33 billion SEK (0.6% of GDP)**. Moreover ~6000-7000 employees in Sweden work directly with fluid mechanics in industry, whereas over 75 000 employees interact with the topic in some <sup>1</sup>way.

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<sup>1</sup> [1] Strategiska tekniker för Sverige. Ett underlag för nationella prioriteringar. *Vinnova*, 2024. [2] Forskning och innovation för framtid, nyfikenhet och nytta. *Regeringens proposition*, 2024.

## Why at KTH

What strengths are already in place at KTH in the form of established environments, strong collaborations and research infrastructure - synergies?

The computational and experimental infrastructure at KTH is world leading. Fluid mechanics is one of the most significant users of Sweden's high-performance computing infrastructure (NAISS) and has actively contributed to the development and governance of NAISS for many years. KTH's Fluid Physics Lab is unique in Sweden, combining state-of-the-art instruments—such as rheometers, goniometers, optical devices, and high-speed cameras—with world-class large-scale experimental rigs, including wind tunnels, water channels, and shock tubes. This infrastructure enables the characterization of complex multiscale physical phenomena.

KTH has a critical mass of faculty in fluid mechanics with **strong research profiles that branch off into strategically important areas such as artificial intelligence, energy technology, materials, biotechnology and sustainability**. The fluid mechanics faculty at KTH ties research excellence into strategic areas and leading national centers. Some of the most cited researchers at KTH work with fluid mechanics. Finally, the fluid mechanics at KTH has an extensive industrial network, spanning both strategic partners of KTH (Scania, Saab, Ericsson, Hitachi Energy) and industry that rely on fluid mechanics (Siemens Energy, Vattenfall, Volvo Group, GKN Aerospace, Alfa Laval, Tetra Pak, and Xylem).

Describe and relate to the competition in the field (local/regional, national, international).

KTH is at the forefront (in Sweden, Europe and the world) of cutting-edge fluid dynamics. This is exemplified by FLOW Centre, which since its establishment in 2017, has evolved into well-known fluid mechanics environment world-wide, tackling fundamental and relevant problems using state-of-the-art computational and experimental infrastructure.

## Research team

Describe the quality of the research team.

Several PIs in this proposal are established research leaders in fluid mechanics. **Ricardo Vinuesa** is a leading expert in applying AI to turbulence, **Shervin Bagheri** specializes in fluid processes for energy efficiency, **Lisa Prah** combines fluid dynamics with clinical research, and **Outi Tammi** focuses on complex fluids and materials. Notably, all four PIs currently hold ERC Consolidator Grants.

Beyond their individual expertise, these PIs are actively engaged in strategic and multidisciplinary research environments, including MedTechLabs (Prah), Digital Futures (Vinuesa, Bagheri, Prah), WISE (Bagheri), SeRC (Tammi, Vinuesa), and the Bolin Center (Tammi). From 2026, Vinuesa will spend 80% of his time at the University of Michigan, one of the leading institutions in generative AI. This presents a unique opportunity for researchers to visit, collaborate, and pursue funding opportunities.

In addition, several PIs are established research leaders in strategic areas. This includes **Daniel Söderberg**, who leads Tresearch and has been a key figure in nano-cellulose-based biomaterials for over a decade, where complex fluid processes are central. **Pär Ohlsson**, who leads the SSF

program SUNRISE, focused on sustainable nuclear energy, where computational fluid mechanics plays a crucial role. **Ozan Ötkem**, whose expertise in inverse problems, Bayesian optimization, and AI will play a key role in developing AI-driven computational tools.

Finally, several key researchers will contribute to proposal writing in strategic areas. New assistant professors: **Shahab Mirjalili** (numerical multiphase flows), **Björn Eriksson** (fuel cells, electrolyzers), and **Ingrid Neunaber** (wind turbines), whose research will be important in the area of sustainable energy transition. Aviation and defense experts, including **Ardeshir Hanifi** (board member of SaRC), **Jens Fransson** (wind-tunnel aerodynamics), Mihai Mihaescu (aeroacoustics), and **Michel Liverts** (high-speed flows), contributing expertise to this highly important field.

### Strategy for funding

Describe how the target will be achieved: > 100 mnkr in external grants to KTH. What is the goal for external funding achieved in the short term 1-2 years, 3-5 years and 6-10 years?

The aim of FLUX is to reach 20MSEK/year by 2028 from funding agencies and industry with a continuous funding for 5 to 10 years. VR will announce new excellence centers in the coming years, targeting research groups that can drive excellence through multidisciplinary and international collaboration. The total budget for 2025-2028 is 625 MSEK, with each center receiving 10MSEK per year for 5-10 years. Building on our existing research excellence, **FLUX aims in the short term (1-2 years) to secure VR's excellence grant to conduct groundbreaking research in fluid science across strategic areas.** The evaluation criteria for these grants are similar to those of ERC, and each PI in FLUX has already demonstrated the ability to secure highly competitive grants under such conditions. The main PI was a successful in receiving a previous excellence grant from VR. Given the high level of competition, we will also adapt the proposal for submission to Knut & Alice Wallenberg and EU programs (EIC, ITN, Synergy).

Secondly, medium term (3-5 years) **a larger constellation involving industrial partners will be formed to establish FLUX as an excellence cluster for groundbreaking research.** Several major calls, ranging from 20-40 MSEK per year for 5-10 years, will be announced by VR and Vinnova. Our research areas have a two-thirds overlap with Vinnova's priority areas, including *domain-specific AI, electrification, biotechnology, biomaterials, defense and space industry*. FLUX will embed collaborations with the key departments at KTH and excellence centers depending on the strategic focus of each call.

Finally, in the long term (6-10 years) we will seek **industrial partners for R&D investments to FLUX and for joint proposals (Vinnova, EU)** via a structured three-step process: **1.** Initiate targeted meetings with companies in strategic areas to understand their current research activities, long-term vision, challenges, and technology needs, identifying potential synergies with FLUX. **2.** Align our expertise in fluid mechanics, AI, and experimental infrastructure to high-impact industrial challenges. **3.** Solidify relationships with selected partners, ensuring that fundamental fluid dynamics serves as a key enabler for addressing industrial challenges. As part of this partnership, we will propose a membership model for companies (roughly 0.3 MSEK/year per partner) to join FLUX, which provides access to state-of-the-art research infrastructure, expertise, strategic annual meetings, and cutting-edge research outcomes.

## Planned activities and budget allocation

1. Salary and travel support
  - We allocate funding to support **PIs and senior faculty** in dedicating time to **proposal development**.
  - Several **travel engagements** are planned to strengthen collaborations with **industrial and academic partners**, which will be critical in securing funding.
2. Half-day meetings at KTH
  - **Half-day meetings** will be held at KTH, bringing together **PIs and researchers** focusing on one strategic area (AI, aviation/defense, biotechnology, biomaterials, and sustainable societal transition).
  - The goal is to **identify key fundamental challenges in fluid science** that will enable breakthroughs in each area.
3. Proposal preparation for VR excellence center
  - Two **half-day meetings** and one **workshop** will be organized to prepare and design the **VR excellence center proposal**.
4. Industry-focused workshop (lunch-to-lunch format)
  - A **workshop with key industrial partners** will be organized to refine the **most impactful research ideas** and align them with **upcoming funding calls** (particularly Vinnova's Excellence Clusters).
  - The workshop will play a crucial role in **strengthening partnerships** and ensuring strategic alignment with future funding opportunities.



# KTH internt beslut med e-signatur: kth-proj-0276016\_ KTH FLUX - A center for Fluid Science Driving Technology and Sustainability

Slutgiltig revideringsrapport

2025-04-03

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