BESLUT

Datum för beslut:
2025-06-03

Diarienummer:
KTH-RPROJ-0276016

Beslut om ett strategiskt forskningsinitiativ, KTH ElectroLight

Detta beslut har undertecknats elektroniskt.

Beslutet

KTH:s vicerektor för forskning beslutar att:

- Finansiera *KTH ElectroLight* med 1 mnkr centrala medel under 2025.
- Utse Helena Lundberg, CBH-skolan, som ansvarig forskningsledare för satsningen.
- Återrapportering enligt utvärderingskriterier, för dialog om fortsatt bidrag ska vara Forskningsberedningen tillhanda 10 juni 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 22 maj inkom förslaget KTH ElectroLight, med lektor Helena Lundberg, CBH-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

Sändlista

För åtgärd:

Helena Lundberg, CBH-skolan

Kopia till:

Skolchef CBH-skolan

Controllergruppen, controller@kth.se

Chefen för avdelningen för forskningsstöd Maria Gustafson

Tf Kommunikationschef Gunilla Iverfelt

Anna Aminoff

Sanna Pehrson, avdelningen för forskningsstöd

Expeditionsdatum:

2025-06-03

Strategic Research Initiative Project Idea

Name: KTH ElectroLight

Main PI: Helena Lundberg, Associate Professor in Organic Chemistry, Department of Chemistry, CBH School

Co-PI:s Lars Kloo, Professor in Chemistry, Department of Chemistry, CBH School

Göran Lindbergh, Professor in Chemical Engineering, Department of Chemical Engineering, CBH School

Mårten Ahlquist, Professor in Theoretical Chemistry, Department of Chemistry, CBH School

Lina Bertling Tjernberg, Professor in Power Grid Technology, Department of Electrical Engineering, EECS School

Requested funding: 1 MSEK for year 1 (thereafter ~3 MSEK/year in a potential future extension)

Purpose

The aim of the present proposal for a KTH Strategic Initiative – KTH ElectroLight – is to explore and exploit electricity- and/or light-driven processes for resource efficient production of fine chemicals and energy-carrying compounds and as enabling technology for chemical recycling of waste. While the approach is receiving great interest from both industrial and academic actors, the national know-how in Sweden is yet marginal. Hence, there is currently a unique opportunity for KTH to take a leading role in this promising and emerging field.

The need for sustainable production of functional chemical compounds, spanning from molecular energy carriers, such as hydrogen and formic acid, to fertilizers, polymer components and advanced pharmaceuticals, is imperative to meet environmental and climate-related goals at national and European levels. Electricity- and light-driven production via economical waste- and energy-efficient processes that reduce the need for hazardous chemical reagents represent highly promising strategies.[1] In addition, the strategies show great potential for facilitating recycling of waste into circular flows, such as the depolymerization of plastic materials into new polymer precursors, degradation of the perfluorinated class of "forever chemicals" – PFAS – as well as conversion of sidestreams from the forestry and agricultural sectors into fuels and building blocks for the chemical industry. As an added benefit, electrosynthesis may serve the dual purpose of stabilizing the electricity grid at times of energy surplus due to high production of renewable energy like wind power. There is a great interest in this Power-to-Chemicals strategy, highlighted by, the Swedish Innovation and Chemical Industries (IKEM) and others in their strategies towards climate neutrality as response to the governmental initiative Fossilfritt Sverige,[2] since electricity- and light-driven processes can be achieved without the need for fossil resources. In an international context, the European Commission adopted the action plan "Transition Pathway for the Chemical Industry" in 2023 that list electrification as one of the important means to achieve a green transition in the chemical industry, in line with the updated EU industrial strategy.[3] Despite these initiatives*, the academic Swedish research landscape currently lacks a unified platform for such an approach – this is the gap that KTH ElectroLight will fill.* The focus of KTH ElectroLight – sustainable chemical production via light- and electricity-driven processes – is fully integrated with KTH's ambition to taking the lead for a sustainable society, bridging detailed technical advances with the systems perspective for tomorrow's energy- and resource-efficient production of chemical products. KTH ElectroLight will target incorporation of learning activities on this topic into the curricula of relevant undergraduate and life-long-learning education to promote dissemination of relevant technologies and their potential into the future workforce.

Why at KTH

KTH ElectroLight connects excellent local research environments in a new synergistic constellation and creates a nationally unique and internationally highly competitive platform for energy- and resource-efficient chemical production via light- and electricity-driven processes. Recent decades have seen a tremendous technical development for the generation, storage and use of electricity in a chemistry context, internationally and nationally, as well as understanding of and strategies for the integration of these technologies into the energy systems at large. KTH is a stronghold in this context, with significant research output from the KTH ElectroLight faculty. The KTH research infrastructures Molecules and Materials at Interfaces Laboratory (2MILab) and the PDC Center for High Performance Computing are key platforms for KTH ElectroLight, as advanced materials characterization, as well as high-end computations and machine learning strategies, are integral parts of the research. As such, this research initiative bridges the interests of the recently discontinued Energy Platform, Materials Platform, and Digitalization Platform. At this time, there are several research groups spread over the KTH schools that work with topics related to KTH ElectroLight, but a structure to connect them for synergistic multidisciplinary interplay is lacking. We aim for KTH ElectroLight to serve as this currently missing link and over time develop the research initiative into a bottom-up platform open for KTH researchers in relevant areas.

There are several research environments that, apart from KTH, are strong in some of the constituting areas of KTH ElectroLight. For example, national competition in solar cell and battery research is found at Uppsala University and Chalmers. While the primary academic expertise in electrochemical synthesis is found at KTH, research in this field is also ongoing at Uppsala University. Individual groups at Chalmers, Stockholm University

[1] T. Elmfeldt, Y. Arafat, L. Bertling Tjernberg, A. Lugnet, and G. Nyström, Sector-coupling Green Hydrogen to Electrify Steel Production - A Case Study at Ovako Hofors, Proceedings of the International Conference on Probabilistic Methods Applied to Power Systems (PMAPS), Auckland, New Zealand, June 2024.

[2] Fossilfritt Sverige [online] https://fossilfrittsverige.se/roadmap/kemi-plast-och-lakemedelsindustrin/ Accessed 2025-02-07

[3] European Commission [online] https://ec.europa.eu/docsroom/documents/54595 Accessed 2025-02-07

and Uppsala University carry out electrocatalysis simulations, but KTH is the only institution with a major software development effort connected to the national infrastructures in supercomputing. In an international context, the NSF Center for Synthetic Organic Electrochemistry connects academic researchers in the subject area, and EU-funded programs, such as "New electrochemical conversion routes for the production of chemicals and materials in process industries (Processes4Planet Partnership)" and "New electrochemical solutions for industrial processing, which contribute to a reduction of carbon dioxide emissions" exist but are limited to certain technological aspects of electrochemical energy conversion. However, *to the best of our knowledge, there are currently no unified platforms that connect research on generation, storage and use of light- and electricity-driven energy and put these technologies into a systems perspective, ultimately targeting their feasibility for large-scale implementation for sustainable chemical production*. For this reason, KTH ElectroLight will have a unique niche to fill with significant opportunities for visibility and impact, as well as prospects for attracting investments and research funding from national and international sources. We foresee that the research initiative will serve as important link between the academic, institute and industry sectors within and outside Sweden. The members of the applicant team have, already at this time, ongoing collaborations on the topics on KTH ElectroLight with ongoing joint projects with AstraZeneca and RISE for electrochemical synthesis of organic products, as well as Hitachi Energy, ABB, Vattenfall Scania and Ericsson for various topics connected to electrification, and are partners to the industrial-academic platform WISE Research Arena on Sustainable Electrochemical Technologies (WIRA-SET), sponsored by the Knut and Alice Wallenberg foundation, indicating the interest from non-academic actors.

Research team

The multidisciplinary research initiative will be organized around activities on three levels: technical innovation for the generation, storage and use of renewable energy, process understanding and systems analysis (Figure 1). These activities are each headed by one of the five co-PI's for KTH ElectroLight, that jointly constitute the board for the strategic initiative, coordinated by Associate Professor Helena Lundberg.

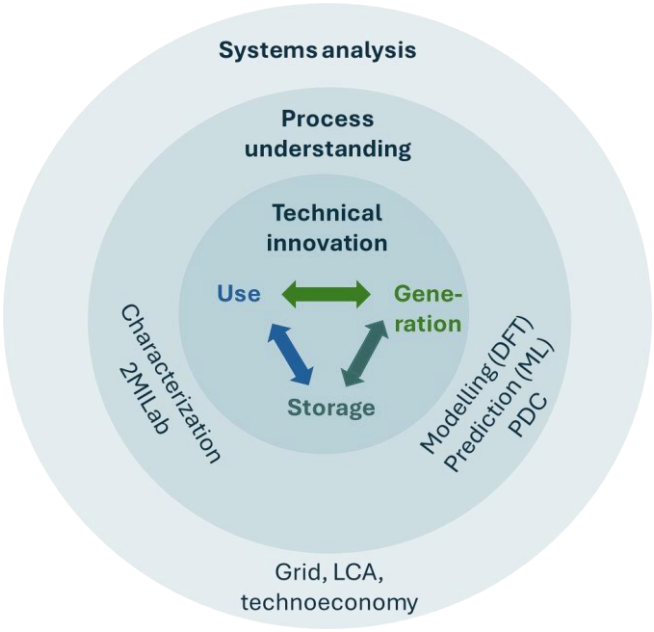

Figure 1. Structure of KTH ElectroLight activities

- *Generation* of renewable electricity: Professor Lars Kloo (light-responsive materials/solar cells, CBH)
- *Storage* of electricity in molecular energy carriers: Professor Göran Lindbergh (applied electrochemistry, CBH)
- *Use* of electricity for chemical synthesis: Associate Professor Helena Lundberg (synthetic electrochemistry, CBH)
- *Understanding* of electrochemical processes: Professor Mårten Ahlquist (theoretical chemistry and machine learning, CBH)
- *Systems* analysis of core technologies: Professor Lina Bertling Tjernberg (power grid technologies and integrations of fossil free generation and storage, reliability assessment and lifetime modelling, EECS)

These researchers have excellent track records with respect to attracting external funding from various sources, encompassing governmental and European agencies, private foundations and industrial collaborations. While KTH ElectroLight is a new initiative to synergistically connect research expertise and enable new solutions for sustainable energy conversion into chemical products, the applicants have previously collaborated in varying constellations. These established relations will be beneficial for the startup of KTH ElectroLight. To leverage research progression and creativity in the areas of interest for KTH ElectroLight, the strategic initiative will associate further researchers over time and serve as a center for bottom-up initiatives. Several researchers highly interested in the envisioned activities have been identified at this time, encompassing experts in photochemical transformations, synthesis and characterization of functional materials, alternative solvents/electrolytes, artificial intelligence, etc. We foresee that this list will continue to grow to include, *e.g.*, experts in reactor design and process engineering, as well as life-cycle assessment and technoeconomy.

Strategy for funding

Due to the novelty and significant potential of the KTH ElectroLight initiative for sustainable chemical production and energy generation and storage, we expect it to trigger the interest of larger funding agents, such as private Swedish or Nordic foundations. Such funding bodies may include the Swedish Foundation for Strategic Research (SSF) (rambidrag and strategiska forskningscentra), Mistra and the Wallenberg foundations. A primary goal during the first year of activity will be to investigate the possibility for substantial and long-term funding from discussions with such funding bodies. In parallel, the ElectroLight initiative will build a KTH research environment, from which smaller and more targeted collaborative proposals to suitable calls can be coordinated. Initial funding opprunities include the future calls from Energimyndigheten (*e.g.* Clean Energy Transition Partnership, Framtidens elsystem, Hållbar batterivärdekedja and Bio+). Notably, Ahlquist has recently secured funding connected to KTH ElectroLight via Vinnova's call "Avancerad digitalisering" together with Lundberg and AstraZeneca for "Cloud based integration of advanced software for data generation and prediction in drug development". This project could enable further industrial collaborations related to ElectroLight, since many computational setups are of high relevance to ElectroLight research. With this funding in place, we foresee that ElectroLight-connected projects are likely recipients of further funds (up to 50 MSEK) in Vinnova's upcoming calls for "forsknings- och innovationsprojekt som bidrar till nya industriella lösningar inom AI för industriella tillämpningar, avancerad digital infrastruktur, industriell flexibel energistyrning eller människa-AI-interaktion för industrins elektrifiering". Furthermore, we see excellent opportunities for our constellation to submit competitive proposals to upcoming rounds of Knut & Alice Wallenberg Foundation call for *Research projects with high scientific potential* (up to 40 MSEK) and targeted initiatives within the Wallenberg Initiative Materials Science for Sustainability (WISE), in addition to upcoming calls from NordForsk, Formas and Vetenskapsrådet (VR). In addition to project funding, VR's funding scheme for research environments *Environmental research grant – Natural and engineering sciences* (up to 24 MSEK over 6 years) is of particular interest to KTH ElectroLight. In a European context, Horizon Europe's Pillar 2, with a particular emphasis on the calls launched in Cluster 5 (Climate, energy and mobility) as well as those connected to Cluster 4 (Digitalization, industry and space) and Cluster 6 (Food, bioeconomy, natural resources, agriculture and environment) will be relevant for KTH ElectroLight, as well as calls from the European Research Council (ERC) *including* Synergy grants and Marie Sklodowska Curie Actions (MSCA). In context of the latter, MSCA doctoral networks will be an excellent opportunity for KTH ElectroLight to connect with research partners outside Sweden.

The central KTH funding (1 MSEK for year 1) will be used to accelerate the establishment of KTH ElectroLight, lay the foundation for joint research activities and organize events for visibility and networking. More specifically, the internal funding may be used during this initial stage for coordination activities and (co-) funding of joint pilot studies with early career researchers for the support of future applications. The former will mainly be devoted to inventories of long-term funding opportunities and the formation of the KTH ElectroLight research environment. These activities will require both internal workshops to allow inter-connection between KTH researchers for the self-assembly of adapted research constellations for existing and coming funding calls, as well as exploiting the visionary perspectives provided by internationally recognized researchers in the field. An inventory of educational needs will also be initiated during this phase. The proposed budget for the first 12 months during 2025-26 of the KTH ElectroLight strategic initiative is shown in Table 1. In the intermediate phase of KTH ElectroLight (3-5 years), we propose to have secured funding for research activities in the range of 3-8 MSEK/year for 3-6 research projects (9-24 MSEK in total). For these years, we may seek internal funds to co-fund studies as well as for continued coordination of the strategic initiative (~3 MSEK/year). In the later stages of the research initiative (6-10 years), we expect a budget of around 8-15 MSEK/year for 8-10 research projects (40-75 MSEK in total) and to have acquired a larger grant for the research environment (25-50 MSEK in total) from VR, SSF, Mistra or similar funding agents.

Table 1. Budget for KTH ElectroLight (initial stage)

Activity	**Cost (kSEK)**
Coordination	400
Pilot studies	400
Workshops	100
Advanced seminar series	100
Total	1 000

KTH internt beslut med e-signatur: beslut- kth-proj-0276016_ KTH Electrolight

Slutgiltig revideringsrapport 2025-06-03

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Av:	Johan Schuber (jschuber@kth.se)
Status:	Signerat
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