**Curriculum Vitae**
**Dr. Lina Bertling Tjernberg (Tjernberg from 2011)**
**ORCID 0000-0003-4763-9429**

KTH Royal Institute of Technology School of Electrical Engineering and Computer Sciences (EECS) Department of Electromagnetic Engineering SE-100 44 Stockholm, Sweden Phone: +46-736441421, Email: linab@kth.se Web: www.kth.se/profile/linab, Twitter: https://twitter.com/linabertling

## Present position

- Professor in Power Grid Technology at Royal Institute of Technology (KTH), Stockholm, Sweden since September 2013. Director of the KTH Energy Platform, from November 2018.
- Visiting Scholar with the SP Group and Nanyang Technological University (NTU) joint lab for the Project 3 (Failure Mode Analysis and Mitigation Optimisation). (December 2022 to December 2023).

## Education qualification

- Docent degree in Electric Power Systems, KTH, Stockholm, 2008
- Ph.D. in Electric Power Systems, KTH, Stockholm, 2002
- M.Sc. in Vehicle Engineering, Systems Engineering, KTH, Stockholm, 1997.

## Previous employments

- Professor in Sustainable Electric Power Systems at Chalmers University of Technology (Chalmers) and Department of Energy and Environment and Division of Electric Power Engineering, Gothenburg. 2009 – 2013.
- Director of Research and Development at the National Grid (Svenska Kraftnät). 2007- 2009.
- Assistant Professor at KTH School of Electrical Engineering, Department of Electromagnetic Engineering, Stockholm. 2006-2009. (Part time leave 2007- 2009).
- Research Associate KTH School of Electrical Engineering, Division of Electrotechnical Design, Stockholm. 2003 – 2006.
- Researcher KTH School of Electrical Engineering, Division of Electrotechnical Design, Stockholm. 2002 – 2003.

## Other previous academic positions

- Visiting Professor at Stanford University and the Civil Engineering and Environmental Engineering Department, and the research group and laboratory for creating sustainable engineering systems with renewable energy systems. January-July 2014.
- Post-doctoral visitor at Dep. of Electrical Engineering, University of Toronto, associated with Kinectrics Inc., Toronto, Canada. November 2002 – July 2003.
- Visiting researcher with University of Saskatchewan, Saskatoon, Canada. February-July 2000.

## Research and research grants

Prof. Bertling Tjernberg leads the Reliability-Cantered asset management (RCAM) research group at KTH. The RCAM group was established by her directly following presenting her Ph.D. thesis in 2002. The group involves both students and researchers at KTH and visiting students and researchers. Several of the projects are performed in collaboration with industry. The models developed with the research group are generally validated by case studies performed in collaboration and with input data from industry (e.g. CheckWaytt, GreenByte, National Grid, Vattenfall, Hitachi Energy etc). There is also an extensive international collaboration currently e.g. including a working group with CIRED, and being advisor for international universities. Below is a brief overview of the current activities:

- The RCAM research group involves currently the following research projects:
    - 2 Ph.D. students at KTH (including one industrial Ph.D. student with SAAB, one with Addis Ababa University) .
    - 1 Ph.D student (just starting) jointly with Universidad Pontificia Comillas, Spain to be jointly supervised with professor Miguel Ángel Sanz Bobi.
    - Mentoring Associate professor Dr. Jonas Kristiansen Nøland, 2022-2026, within the Outstanding Academic Fellows Programme, Appointed by the president of Norwegian University of Science and Technology (NTNU).
    - One research assistant working on a short project "Initiative to solve the energy deficit and increase the low emission power generation (GreenGrids-Flex)", 2022-2023.
    - Visiting students, internships and master thesis students: currently two from China, one from France, one Erasmus student and three master thesis students from KTH.
- Co-convener of the CIRED working group on CIRED • Lifetime extension options for electrical equipment - WG 2020-1. The results will be presented in a paper and discusses at a round table discussion at the CIRED June conference in Rome 2023.) (Sponsored by KTH and Vattenfall).
- The following three projects, led by Prof. Bertling Tjernberg, were all sponsored by industry and run within the national center SweGRID hosted at KTH.

    - **Fault detection framework using neural networks for condition monitoring of high voltage equipment in power grids (Sponsored by the national grid and Hitachi Energy (the latter with in-kind)).** Asset management is a coordinated activity for the organization to get value from an asset. As the main part of asset management, maintenance includes all the technical and corresponding administrative actions to keep or restore the asset to the desired state in which it can perform its required functions. Traditional maintenance is usually based on scheduled monitoring and physical inspections. With the industrial internet of things developing, more operation data could be accessible and condition-based maintenances show promising for electrical equipment. This project targets to utilize operation data and neural networks to identify underlying operational risks for condition monitoring and preventive maintenance of high voltage equipment.The project uses an online dataset as the main input. It built a framework using autoencoders and recurrent neural networks to model normal operations. Control charts are applied to evaluate current operating conditions and trigger alarms towards operational risks. The framework is tested with actual failure events.

      A framework for a reliability centered asset management (RCAM) has been developed at KTH (Bertling 2002). For the last years models have been proposed (Pramod, Yue and Bertling Tjernberg) using neural networks for preventive models using data from condition monitoring. This project, a post-doc project for Dr. Cui, continues on her Ph.D. student project with applications for wind turbines. In this project high voltage equipment in the transmission system will be analyzed. It built a framework using autoencoders and recurrent neural networks to model normal operations. Control charts are applied to evaluate current operating conditions and trigger alarms towards operational risks. The framework is tested with actual failure events. See reference [1].

    - **Energy Management System (EMS) models for the optimal real-time operation and control of Battery Energy Storage Systems (BESS) for peak shaving and frequency regulation (sponsored by National Grid and Vattenfall)** The scientific challenge is to propose an approach of optimal real-time operation and control of Battery Energy Storage System (BESS) for the correct delivery of peak shaving and frequency regulation services. The situational determination of the complexity of the models adopted for such an approach depending on the parametric requirements of the facility in question should also be considered. Academic literature is full of many complex optimization techniques that work very well on the utility scale, but a simpler approach is needed for smaller prosumers of electricity. This project proposes to design the approach of achieving the optimal balance between the design complexity of real-time operation and control models and the value generated by implementing such models. The Energy Management System (EMS) designed in [3] tries to optimize the planning and scheduling for peak shaving and frequency

regulation. A challenge in this project will be to design and implement an approach of correctly quantifying the inaccuracies associated with the planning and scheduling. These errors will then be used to complement the optimal real-time operation and control designs of the EMS. It is crucial to design and implement the real-time operation and control component of the EMS, as only this implementation can accurately validate the economic and technical viability of the integrated EMS before its commercial use. The expectation from this project is to design and test a fully integrated proof of concept of an EMS for BESS that performs peak shaving and frequency regulation.

This research has been further developed into the GreenGrids-Flex project which was selected by IVA 2022 for national projects with potential to create societal impact with project "GreenGrids-Flex". See reference [3].

- **Reliability and life cycle cost assessment of local energy systems (sponsored by Vattenfall, and E.ON).** The port industry is transforming towards smart ports by developing a sustainable maritime transportation system and greater electrification. In the process, approaches for the inclusion of renewables, emissions reduction are gathering momentum with advancements in technologies. Global containerization leads to high electricity demand at container terminals and the electricity demand is highly dynamic and dependent on different operation processes. A correctly forecasted electricity demand profile is crucial for less expensive and reliable power operation and planning.
  A pre-study performed within the RCAM group provide results of a forecast of the hourly peak load demand and short-term electricity demand profile in a container terminal in the Port of Gävle. Firstly, the Artificial Neural Network (ANN) method is used to predict the container terminal baseload demand. Second, the worst-case simultaneous peak load is estimated. Third, the day ahead load profile is modeled based on the handling operation scheduled for the day. This approach is implemented at the container terminal in Port of Gävle, and the results have been used in dialogue with the local energy company for the future predicted need of load.
  In this project inputs from this pre-study have been used to assess the possibility of a future local energy system covering the port area. Therefore, the current project focuses on obtaining a suitable sizing of Photo-Voltaic (PV) electricity generation and battery storage systems. This includes forecasting the PV generation, modeling and optimizing the size of grid-connected PV-battery system for the port area. The ultimate aim is to weigh the Life Cycle Cost (LCC) against the reliability of the systems to arrive at the smartest design decision.

- Examiner and main supervisor of total 6 PhD and 9 TechLic students and around 50 MSc students (projects funded within EKC, EKC2, SWPTC, Vindforsk, Elforsk/Elektra, E.ON.,Gothenburg Energy, European Union (FP7), Swedish Energy Agency and SweGRIDS.

**Previous research founding and research supervision**

Prof. Bertling Tjernberg has in total been examiner and main supervisor of 15 P.hD. students of these have 6 finalized the PhD under her supervision and 9 the TechLic (around half of a PhD thesis). She has also supervised around 50 M.Sc. projects. The main funding for the research are from centers funded by the Swedish Energy Agency and industry (including EKC, EKC2, SWPTC and SweGRIDS). Prof. Bertling Tjernberg has taken an active role in all these centers including both as PI and leadership roles. Other main funding are for several years of research in wind power (mainly funded by Vattenfall but also by SWPTC and an earlier research program with industry). Other main funding are from E.ON and Gothenburg Energy. Several shorter projects have been funded directly from industry including the harbor in Gävle and SAAB. Below are some more details of the research funding and a list of the researchers. Most of the former research students are in the energy industry today.

***Larger research founding (indicating amount of funding with PI Bertling Tjernberg)***

2013-2021 SweGRIDS the *Swedish Centre for Smart Grids and Energy Storage*. A partnership of academia, industry and public utilities, with major funding from the Swedish Energy Agency as well as the corporate partners . Bertling Tjernberg has a role as international advisor and was PI for several projects (listed in recent research funding). (one post-doc and three shorter research projects (several of the projects being sponsored by the Swedish National Grid).

2010-2014 EU project Grid4Vechicles (one post doc project)

2009-2013 the Chalmers Energy Initiative (CEI) and the research area Large-scale renewable electricity generation and grid integration. Financed by the Governmental strategic funds. (Around 3 PhD student projects).

2012-2015 Gothenburg Energy Smart Meters (Industrial PhD student project).

2009-2013 E.ON Future Electric Power Systems (PostDoc project).

2006-2013 Wind power research funding.(Around 2 PhD students and one post doc)

- The first project 2005-2006 was funded by the Energiforsk
- 2006-2012 several projects funded within the research program Vindforsk
- 2009-2012 Gothenburg Energy (Post doc).
- 2009-2013 Swedish Wind Power Center (SWPTC)

2001-2007 Manager of the maintenance management program within EKC - Competence centre in Electric Power Engineering (EKC) respectively EKC2, at KTH. Financed by the Swedish Energy Authority and Industry. (Around 4 PhD students)

***Overview of the previous researchers***

*Researchers*

- Jose Eduardo Urrea Cabus 2021-2022 (currently with Hitachi Energy)
- Hamza Shafique 2020-2022 (currently with CheckWatt)
- Pavithra Gopalakrishnan 2021 -2021 (from 2021 with Power to Hydrogen Modeling Lead, from 2023 at RISE)
- Parnian Alikhani 2020-2021 (currently with Copernicus Institute of Sustainable Development, Utrecht University)

Post-doc

- Yue Cui 2021 (currently with Hitachi Energy)
- Carl Johan Wallnerström 2014 (currently with Energy Market Inspectorate)
- Chris Saunders, 2011-2013 (currently with KTH)
- Antonis Papaemmanouil, 2010-2013 (currently Lucerne University of Applied Sciences and Arts)
- Katharina Fischer, 2009-2012 (currently Fraunhofer Institute for Wind Energy Systems IWES)

*Visiting Ph.D. students*

- Li Yuan the Inner Mongolia University of Technology (IMUT), 2019-2020.
- Azim Heydari (currently visiting researcher at Alberta University), Meysam Majidi Nezhad (currently post-doc in Mälardalen University), Sapienza University of Rome, April to September 2019.
- Du Mian, Tsinghua University & China Electric Power Research Institute (currently with CEPRI), 2015-2016.

*Ph.D. students (graduated)*

1. Yue Cui 2021 January (currently with Hitachi Energy).
2. Peyman Mazidi 2018 March (currently at Uniper).
3. Yasir Arafat 2015 August, LicEng (currently at Chalmers and Gothenburg Energy).
4. Pavan Balram 2014 August, LicEng (currently at Chalmers).
5. Pramod Bangalore 2014 May, LicEng (currently at Greenbyte).
6. Francois Besnard, 2013 Ph.D., 2009 LicEng (from 2013 with OX2, now with Vattenfall)
7. Feng Wang, 2013 LicEng (currently at ABB)
8. David Steen, 2012 LicEng (currently at Chalmers)
9. Mebtu Beza, 2012 LicEng (currently at Chalmers)
10. Mauro Rosso, 2010 Ph.D. (double degree with INESC Porto), (currently at INESC)
11. Julia Westberg (Nilsson), 2009 LicEng (currently at Ad Lantic Media)
12. Johan Setréus, 2009 LicEng (currently at Swedish National Grid)
13. Carl Johan Wallnerström, 2008 LicEng (currently at Swedish Energy Market Inspectorate)
14. Patrik Hilber, 2008 Ph.D., 2005 LicEng (currently at KTH)
15. Tommie Lindquist, 2008 Ph.D., 2005 LicEng (with National Grid 2008-2023, now with Ellevio)

**Scientific papers:**

- Complete list of publications is available from: https://www.kth.se/profile/linab/page/publications?l=en
    - In total 29 (journal papers) + 105 (conference papers with referee-system)
    - Google citations (230526) https://scholar.google.com/citations?user=avw6_okAAAAJ
        - All: 7149, h-index 34, 10-index 93
        - Since 2018: total: 2890, h-index, 25, 10-index 47
- Book L. Bertling Tjernberg, Infrastructure Asset Management with Power System Examples, CRC Press Taylor and Francis, April 2018.

**Leadership experience and managerial position**

- 2018 - Director of the KTH Energy platform.
    - KTH's Energy Platform supports and catalyses interdisciplinary research in the energy field. An important goal is to facilitate interaction between expertise at KTH and external partners within academia, public organisations and companies with an interest in energy research.
    - The platform arrange internal and external workshops and seminars including the annual KTH Energy Dialogue, which attracts around 300 persons (of which around 100 external from industry and policy makers). About the KTH Energy Dialogue | KTH

- 2009-2012. Professor and Head of the Electrical Engineering Division, Chalmers.
    - During the recruitment, a special leadership evaluation was performed led by an external expert on leadership.
    - A mentor program for leadership was followed with one mentor from the university and one from industry
    - Leadership evaluations from employees were conducted as well as self evaluations.
    - Several courses were followed including topics as: difficult discussions with employees, alcohol habits.

- 2007-2009 Research Director at the National Grid (Svk)
    - Direct recruitment by the technical director to take over the position as Research Director after Dag Holmberg (formally leaving his position in 2008).
    - Following a leadership program developed for management at Svk. This was a one year program including several full days of course days with practical training.

- 2003-2009 Assistant Professor at KTH

- Mentor program for Assistant Professors at KTH. Including an initiative with ten recruited female assistant professors at KTH.
- Part of a research project “Kvinnor som maktresurs”, by Pia Höök 2006-2007.
- KTH leadership program including a study visit at EPFL in Lausanne.

**Public and Professional Service**

Prof. Bertling Tjernberg has taken an extensive role in public related to energy research communication and expert in power grid technologies. The driver has been to contribute to bridging between academia, industry, policy makers and politicians (also leading to awards, like Power Women in 2021 and being on the Power in Energy List in 2022). At KTH she has a role to stimulate collaborations between researchers and also contributing to communication of the results to the society. In 2022 the KTH Energy platform published a popular science book collecting chapters from researchers explain various of energy related questions (she is the author of two chapters (see details in the publication list). She has for several years been a volunteer (and is now the vice chair representing the researchers) in the Society of Parliament members and researchers, hosted by the Swedish parliament, which arrange seminars in the parliament with the purpose to bridge between science and politics. In 2002 she was elected as a Fellow of the Royal Swedish Academy of Engineering (IVA) Division of Electrical Engineering , (IVA). IVA the most prominent organization in Sweden for scientists meeting industry, and IVA builds bridges between the business community, academia and policy makers. As a scientist, she got involved in IEEE and Power & Energy Society in early stage and she has been highly involved, both in technical activities and leadership. In 2006 she was the Conference chair of the 9th Probabilistic Methods Applied for Power Systems (PMAPS) which is co-sponsored by IEEE. She was elected for the board of the IEEE Power & Energy Society for two mandate periods (the only elected member outside North America).

She has given numerous of invited talks for a large variety of audience, and has an extensive experience of in various type of media (interviews, recorded pods, and TV) the overall aim has been to contribute to the knowledge platform on energy contributing as an independent voice providing non bias information. From her web page are some listing of activities: www.kth.se/profile/linab

**Teaching and Pedagogic merits in brief**

Prof. Bertling Tjernberg has developed several new course on both undergraduate, graduate, research and further education courses. She teach today in several course given at the Department of Electrical Engineering and the Division of Power and Energy systems at KTH. In overall her teaching load over the year is 20% with additional time for master thesis supervision and research supervision (within the research group RCAM). The following list gives a brief overview of current and past teaching experience:

- New further education course on Sustainable Electric Power Systems (SEPS) EG110V and EG111V from autumn 2021. EG111V Introduction to Sustainable Electric Power Systems 3.0 credits and EG112V Introduction and Analysis of Sustainable electric Power Systems (minor edits and new course name from 2023.)
- Ph.D. student course Reliability evaluation of sustainable electric power systems (RSEPS), 2021. (Given on request.)
- Tutorial on Asset Management with power system applications for IEEE Power & Energy Society, T&D Exhibition and Conference, 2019 in Bangkok, (shorter versions given at several occasions including digital IEEE PES Big Data Tutorial series, July 2, 2020).
- Appointed as Distinguished Lecturer (DLP) of the IEEE Power & Energy Society (PES), 2016. Regularly giving invited lectures and webinars mainly on either of the topics of:
    - Asset Management, Reliability-centered maintenance, predictive maintenance with power system applications.

    - Sustainable power system and power grid developments.
    - Electrical vehicles with an European Perspectives.

- New master course on EI2525 (EG2330/EI2520) Electric Power Engineering Project, Examiner and main lecturer. From 2015.
- Ph.D. student course of Power System Reliability, 2013, Jointly with Prof. Liisa Haarla, Aalto University, Prof. Gerd Kjoelle, NTNU.
- New master course on ENM125 Sustainable Electric Power Systems, Chalmers. Examiner and main lecturer, 2011-2013.
- Completed course on Supervision of graduate students, and Supervisor forum course 2011 at Chalmers.
- Development of further education, undergraduate and contract course on Reliability assessment for electrical power systems. KTH, 2004-2007,
- Completed 10 credits pedagogy course on “Learning education part 1 and part 2 (LU1 and LU2)” given by KTH Learning Lab.

**Other selected current appointments:**

- Independent expert for the EU Horizon Europe call
- Program committee of the Swedish Electro mobility Center (SEC).
- National expert the ISGAN Academy of Smart Grid (appointed by the Swedish Energy Agency).
- Member of the Nomination Committee of Polhelmspriset.
- Vice chair of the Parliament Members and Researchers (Rifo), (appointed by IVA).
- National Committee of CIRED.
- Chairman of SEK Svensk Elstandard.
- Member of the Steering committee of the IEEE PES ISGT Europe.

**Other selected previous appointments:**

- Member of the Program Committee of the World Energy Council (WEC), 2020-2022.
- Member of the Strategic Council for Wind Power, Swedish Energy Agency, 2017-2021.
- Member of the Advisory council of the Energy Markets Inspectorate (EI), 2010-2019.
- Member of the Scientific Board of the Swedish Civil Contingencies Agency (MSB), 2009-2019
- Member of the Governing Board of the IEEE Power & Energy Society 2012-2016.
- Member of the Swedish Government Coordination Council for smart grid, 2012-2014.
- EU project Grid for vehicles (G4V), Partner representative and project leader, 2010-2011.
- Program Manager within Centre of Excellence on Electric Engineering (EKC), KTH, 2001-2008.
- Member of the IVA, Section I, and the Industrial Research Group (IFG) during 2007-2009.

**Other position of trust within KTH (current and past):**

- Vice chair of the School Assembly at KTH EECS, from 2022.
- Coordination for lifelong learning at KTH EECS, 2021-2023.
- Faculty representative for industrial collaboration with Hitachi ABB Power Grids, 2020.
- KTH representative in the program board of the Swedish Electro mobility Center (SEC), 2019-
- Scientific Liaison Officer in the Swedish Centre for Smart Grids and Energy Storage (SweGRIDS) at KTH, 2013-2021.
- Program Manager within the Centre of Excellence on Electric Engineering (EKC) at KTH. 2001-2008.
- Faculty board of KTH 2007-2008 (ended prior the term due to external position).
- Program Manager within the Centre of Excellence on Electric Engineering, EKC at KTH. 2001-2008.
- University board of KTH. 2001-2002.
- Head of the PhD student union at KTH. 2000-2001.

**Other position of trust within IEEE (current and past)**

- Member of the IEEE Herman Halperin Electric Transmission and Distribution Award committee.
- Member of the IEEE PES Industry Technical Support Leadership Committee.
- Treasurer of the IEEE Reliability Society and the joint IEEE Sweden and Norway Reliability Society Joint Section Chapter.
- Member of the IEEE PES ISGT Europe Steering Committee.
- IEEE PES Uno Lamm High Voltage Direct Current Award committee, 2013-2019
- IEEE Power & Energy Society Ramakumar Family Renewable Energy Excellence Award committee, 2014 – 2019.
- Chair on Swedish PE/PEL Chapter 2009-2019.
- Secretary of IEEE Power & Energy Society Governing Board (PES GB), 2014-2016.
- Treasurer of IEEE Power & Energy Society Governing Board (PES GB), 2012-2014.
- Editor board member of the IEEE Transactions of Smart Grid, 2010-2015.
- Chair of the IEEE PES ISGT Europe steering committee, 2010-2014.
- Chair of the IEEE Reliability Risk and Probability Applications (RRPA) Subcommittee, 2011-2013.
- Conference chair of the 1st IEEE PES Innovative Smart Grid Technologies (ISGT) Europe, 2010.
- Vice chair of the IEEE RRPA, 2009-2010.
- Secretary of the IEEE RRPA, 2007-2009.
- Board member of IEEE Sweden Section, 2006-2008.
- Chair of the 9th International conference on probabilistic methods applied for power systems (PMAPS) (co-sponsored by IEEE PES Society and the Sweden Section), 2006.

**Distinctions, scholarships and awards**

2022: Elected as Fellow of the Royal Swedish Academy of Engineering (IVA) Division of Electrical Engineering. (IVA has 1.300 elected national and international Fellows. They are decision-makers, experts and researchers from the academia, private sector and public administration. H.M King Carl XVI Gustaf is the patron and participates in IVA's activities.)

2022: Bonnier Power List in Energy by Dagens Industri. (Interview: Lina Bertling Tjernberg among the most influential figures in Swedish energy sector | KTH Intranet)

2022: IVAs list of 100 national projects important for the future industry "GreenGrids-Flex".

2021: Power Women of the Year 2021, Kraftkvinnorna.

2019: IVAs list of 100 national projects important for the future industry "RCAM and predictive maintenance".

2016: Appointed as Distinguished Lecturer of IEEE PES.

2013: Wenner-Gren Foundation, sabbatical scholarship for visit with Stanford University.

2013: Barbro Osher Pro Suecia Foundation for research exchange with Stanford University.

2011: Super Talent 2010 by Veckans Affärer.

2008: Senior member of IEEE.

2007: Travel scholarship within the research exchange program between IVA and Chinese Wind Energy Association (CWEA).

2007: Torsten Lindströms Electrical power system award at KTH.

2003: E.ON. Research scholarship (for the Ph.D.)

2002: Sweden-America Foundation, scholarship for Postdoctoral research studies in Canada.

2000: Elforsk prize awarded for scientific work within the field of maintenance (for the LicEng).

1999: IEEE PES Student poster award (third prize), Edmonton.

**Referees**

***Professor Emeritus Göran Andersson***

Role: former supervisor at KTH, continued collaboration and mentor role.

Contact: andersson@eeh.ee.ethz.ch

***Bo Normark Industrial Strategy Executive EIT InnoEnergy and Honorary doctor at KTH***

Role: various interaction within IVA, governmental task on smart grid, etc.

Contact: bo.normark@gmail.com