

CV 2019-02-11 : Peter D. LUND (b. 1957), Professor

Education

1980 M.Sc. in Engineering Physics (Nuclear Engineering and Reactor Physics)
Helsinki University of Technology in Finland (HUT)
1980 18th Graduate Study Programme, United Nations, Geneva
1981 Lic.Sc. in Technology (Engineering Physics) HUT
1984 D.Sc. in Technology (Engineering Physics) HUT
1989 Accelerated Development Programme (ADP1), London Business School

Areas of Specialization

New and renewable energy systems; Energy and innovation; Sustainable energy policy; Interdisciplinary issues in energy; Science-to-policy advice.

Previous Appointments

Professor in Advanced Energy Systems (Eng. Physics) at Aalto University (formerly Helsinki University of Technology, HUT) 1998-; 1992-98 Assoc.Prof.; Chair of Aalto Energy Science Initiative (2011-18), Multi-Disciplinary Energy Programme (2013-); Board member Aalto Energy Platform (2013-18). Deputy and Head of Department (1998-2007). Director & coordinator of national new energy R&D for Finnish Funding Agency for Technology and Innovation (Tekes) (1988-98). Founding member & chairman of Energy Institute at HUT. Director of National Graduate School on Energy Science & Technology (2003-08). Part-time Visiting Professor Hubei University (China 2014-), Chutian Chair Professor Hubei University (2015-17). Overseas Teacher Southeast University (China 2015-17). TÜV Guest Professor Technische Universität Dresden (2015-16). Guest Professor Nanjing Xiaozhuan University (2017-20). Guest Professor Southeast University (China 2019-2024).

Professional Experience

EU: Chair of Advisory Group of Energy of the European Commission (2002-06). European Academies Science Advisory Council's Energy Panel (Chair 2013-17, member 2009-19). Steering committee member European Platform of Universities in Energy Research (2009-), Euro-CASE Energy Platform (2013-). Advisory roles to European Commission, Co-chair/Vice-Chair of E.C. Call Evaluations, EU Fuel Cell and Hydrogen Joint-Undertaking, European Institute of Innovation and Technology (EIT 2013, 16-17), ESFRI (2007-11).

Business: Board Member of Ahlstrom Capital Cleantech Management Ltd. (2010-), Fortum Foundation (2013-), Gasum Foundation (2004-18), Uniscience Ltd (1997-8), Founder Solpros (1994-). Senior Advisor Finnish Innovation Fund SITRA (2015-16). Member of DeTao Masters Academy (2015-). Co-founder (with Dr. X. Zhou) China-Finland Cleantech Business Platform (2017-). Co-founder (with Prof. B. Zhu, BGRIMM Ltd., 2017-) China-EU Open Joint @Lab on Adv. Fuel Cells (中欧燃料电池联合开放实验室合作协议).

National/Nordic: Team Lead for Nordic Council of Ministers, Prime Ministers' Initiative on Excellence in Research and Innovation on Energy, Environment and Climate (2008); Member of specialists Finnish Gov. foresight report on long-term climate and energy policy (2007-09). Member of advisory board Finnish Gov. Strategic Programme for Environmental Operations (2011-15), Finnish Gov. Cleantech Str.Programme (2012-15), TEKES Foresight (2006), TEKES Climtech (2000-02). Chair of Science Council of Strategic Centre for Science, Technology & Innovation of Finnish Energy and Environment Cluster (2011-15). Co-chair of Finnish-Russian S&T cooperation on new energies (1996-2000); Senior Officials energy efficiency group of Baltic Sea Region Cooperation (2004-05).

International R&D: IAB of National Center of Excellence at King Fahd Univ. of Petroleum and Materials/Ministry of Education, Saudi Arabia (2011-13). Steering committee member of Research Council of Norway Energy Programme (2000-08), European Strategy Forum on Research Infrastructures, Energy (2007-11), Scientific Adv. Board of Austrian Arsenal Research Centre (2005-08), Instituto Madrileño de Estudios Avanzados Energia Spain (2007-11), Swedish Fuel Cell Programme (STEM 2002-5). Executive Committee of IEA solar R&D programmes (1987-2004), vice-chair (1989-93).

Academic/NGO: Member, Finnish Academy of Science and Letters (2018-), Swedish Engineering Academy in Finland (1998-). Member of advisory board Finland Futures Research Centre (2011-15), Lappeenranta Univ. of Technology REFLEX Platform (2018-), Johns Hopkins University ISEP (2017-).



Contact Information
Email: peter.lund@aalto.fi
Mobile: +358405150144

Aalto University
School of Science
Department of
Engineering Physics

Nanotalo Building
(2nd floor, room 212)
Puumiehenkuja 2 Street,
02150 Espoo-Otaniemi
PO Box 15100,
FI-00076 AALTO
(Espoo), Finland
<https://people.aalto.fi/peter.lund>

Board member Helsinki Institute of Physics (1999-06), Finnish Physical Society (1997-99), International Solar Energy Society (1996-99), Swedish Engineering Academy in Finland (2008-13), Finnish Solar Energy Society (1980-84) chairman (1984-85), WWF Finland vice-chair (2004-10) & board of trustees (2000-05). International Council for Thermal Energy Storage, chairman (1994-97); IEEE Technical Committee on Intelligent Green Production Systems, member (2006-); European Renewable Energy Research Centers EEIG, member (1995-2016).

Research/Programme Evaluations: Participated in 70 international evaluations, 20 countries (1992-). Austria (BMNT), Belgium (VITO), Canada (NRC, ORF), Denmark (Energistyrelsen, IRF), Estonia (ERC, Enterprise Estonia), Finland (Ministry of Trade and Industry), France (ANR), Germany, Hong Kong (RGC), Ireland (SFI), Israel (ISF), Kazakhstan (Ministry of Education and Science), Norway (Research Council of Norway), Portugal (FCT), Saudi-Arabia (Ministry of Higher Education), Sweden (STEM, Formas, NUTEK), Switzerland (Federal Office of Energy), USA (NSF), IEA, European Commission (many), FP4-FP7, EIT/KIC, JU FCH, Horizon 2020, FET-Flagship, FET, Era-Net, several foundations.

Academic evaluations: Austria, Australia, Belgium, Denmark, Estonia, Finland, India, Ireland, Israel, Jordan, Latvia, Norway, Pakistan, Qatar, Sweden, Turkey, UK.

Scientific Journals: Founding Co-Editor Global Challenges (Wiley, 2015-6, Exc. Adv. Committee 2017-); Co-Editor-in-Chief Interdisciplinary Reviews: Energy and Environment (Wiley, 2010-); Editor-Europe Energy Research (Wiley, 2004-2018); Associate Editor Nano Energy (Elsevier, 2014-5), Solar Energy (2001-5); Editorial board Applied Energy (Elsevier), Energy Sci. & Eng. (Wiley), Int. J. Low-Carbon Technologies (Oxford Univ. Press), Energies (MDPI), SCI (MDPI), Adv. Board of SCI (MDPI), Future Cities & Environment (Oxford). Guest Editor of special issues. Reviewer 45 journals.

Awards: World Society of Sustainable Energy Technologies Innovation Award 2018 (Power Generation Technologies, with Prof. B. Zhu), Jinling Friendship Award (Nanjing, China) 2016, Finnish Solar Industry Life-Work Award 2016, Poster Recognition Award (Nanoenergy 2017, Espoo; with M. Lin and group), Best Paper Award (World Society of Sustainable Energy Technologies, Geneva, 2014; with J. Lindgren), Finnish Nature League Award, 2014, Fortum Prize 2008, Lyceum Award of Pori City, 2006, Finnish Nature Conservation Society's Prize in 2004, ISES Löf-Duffie Award 1991, Imatran Voima Foundation 1987, Knight, First Class, of the Order of the White Rose of Finland 2007.

Conferences: Chairman (10), session chair (34), international committee (56), invited talks (84). General Chairman of Nano Energy Conference (2014-).

Societal: Frequently asked expert in parliamentary hearings, talks, and public/social media (@LUND_ENERGY). Public and private sector consulting (1995-).

Teaching: Supervised > 150 doctoral and master students. University courses for 35 years (basics & advances in new energy, thermodynamics, fuel cells & H₂, solar, wind, multidisciplinary), visiting lectures. Executive education.

Research activities

Recent projects: EU 2020, Innovation pathways, strategies and policies for the Low-Carbon Transition in Europe; Strategic Research Council, Creative adaptation to wicked socio-environmental disruptions; Nordic Flagship, Flexibility for Variable Renewable Energy Integration in the Nordic Energy System; Academy of Finland, A novel single component fuel cell based on engineered nanocomposites, Decentralizing Finland's energy regime: The triggers & dynamics of transition. China-Finland collaboration.

Active research collaboration: China University of Geosciences, Hubei University, Southeast University, Nanjing Institute of Technology, Xi'an University, Tianjin University, Johns Hopkins University, University of Delaware, Indian Institute of Technology (Delhi), Comsat-Islamabad, Royal Institute of Technology (KTH), Danish Technical University (DTU), Riga University of Technology, Technical University of Dresden, Skolkovo Institute of Science and Technology, Finnish universities.

Research Interests

Future and multidisciplinary energy issues: Energy transition, smart urban energy, nanoenergy.

Keywords of research: Large-scale new energy schemes; solar & fuel cells & storage; distributed & urban systems; flexibility; modelling; innovation strategies; market penetration & diffusion; policy effectiveness & impact; multidisciplinary science.

Resume of Experience

Peter Lund has 40 years of experience in energy and science. He has a rich track-record from research and academia, working across disciplines and bridging sectors. He also applies science to useful human ends, putting experience and insight to lecturing, innovations, science-to-policy advice, and consultancy. His expertise comprises many sustainable energy systems. His academic interest is on materials and systems, with a multidisciplinary link to policies, transitions, and businesses.

He has served in different capacities; e.g. board memberships, evaluation of R&D programmes, coordination of RTD, involvement with breakthrough programmes world-wide, which together have resulted in profound insight on research and innovation. EU and China are in his special focus of international work.

Main Achievements

Dr. Lund has made original contributions in clean energy, in particular advanced fuel cells, 3rd generation solar cells, energy storage, energy system flexibility, but also in large R&D initiatives. He was among the first to start solar energy and energy storage research in Finland in late 1970. His achievements have been recognized with the Finnish Solar Industry Life-Work Award, Imatran Voima and Fortum Foundation Awards, among others.

He pioneered seasonal storage for solar energy. He was PI for world's 2nd large-scale solar storage pilot project; he did ground-breaking work in their optimization and design for which work he received the International Solar Energy Society's Löf-Duffie Award. Dr. Lund pioneered H₂ technology for energy storage (Power-to-H₂-to-Power), and piloted world's 2nd PV-H₂ seasonal storage system. He co-pioneered international cooperation on zero-energy houses and PV in buildings with the IEA. This contributed to first commercial BIPV panels. Using carbon nanomaterials, his team produced one of the best non-platinized counter electrode and world-record efficiency of metallic flexible dye solar cells. They found key ageing factors for DSC and developed pivotal DSC ageing tests. This work continues on perovskite solar cells.

In fuel cells, his team innovated 2D current density measurements for PEM fuel cells to optimize flow, also first open-cathode PEMFC with high power density inspiring both portable and aerial use. His group developed tertiary compounds with nanostructures yielding highest ever measured ionic conductivity at intermediate temperature for high-power ceramic fuel cells (>1Wcm⁻²). With Chinese groups he established a new field on ionic-semi-conductors. This work was recognized with the World Society of Sustainable Energy Technologies Innovation Award.

Dr. Lund's work has helped to integrate PV and wind into energy systems and develop flexibility measures. He showed that through power-to-thermal measures the self-consumption share of variable renewable power could be 2-3-folded almost anywhere globally. His work on market penetration of new renewable energy technologies presented at pre-COP13 conference in Copenhagen in 2006 received global coverage, and foresaw the coming development trends.

Dr. Lund has contributed to multi-disciplinary energy science by combining socio-economic and technical disciplines, which he has applied to energy poverty, inclusion, regime issues in sustainable energy transitions.

He has contributed to key energy initiatives in EU (SET-Plan, EIT/KIC, FET Flagship), science-to-policy advice (EASAC), and Nordic collaboration. He chaired the Advisory Group of Energy of the European Commission 2002-06, which provided among the first input to the European Strategic Energy Technology Plan (SET-Plan), now the largest energy R&D effort in Europe. He was member of the European Commission's High-Level Group for Peer-Review on economic, social and environmental impacts of the Joint Technology Initiative on Fuel Cell and Hydrogen Technologies in 2007, which evolved to the 1billion €+ Joint-Undertaking on Fuel Cells and Hydrogen (JU FCH). He has also had several evaluator assignments to the European Institute for Innovation and Technology (EIT) and EU Future Emerging Technologies (FET) Flagship initiatives, which are major breakthrough initiatives in Europe. He is past Chair of the Energy Steering Panel of the European Academies Science Advisory Council, which provided science-to-policy advice to EU's decision-makers, e.g. on biofuels and bioenergy sustainability, shale gas, energy storage, nuclear waste.

He was the Chairman (2012-2015) of the Science Council for the Strategic Centre for Science, Technology and Innovation of the Finnish Energy and Environment Cluster, which was a major public-private effort to combine excellence and relevance for breakthroughs and commercialization of new energy technologies. He was team lead of Nordic Prime Minister's Research Excellence initiative in Energy and Climate (2008), the largest project in Nordic cooperation. He coordinated Finnish advanced energy R&D (TEKES) for 10 years, with unique industry-academia innovation ecosystems leading to ground-breaking innovations in arctic wind energy, BIPV, superconductive motors, among others. He has participated in 70 strategic reviews & evaluations in 20 countries with a R&D value of \$2B+.

Domestically he has actively contributed to science-to-policy activities on Finnish energy policies; he participates in parliamentary hearings. For his societal contributions in energy, he was awarded the Finnish Nature League Award in 2014 and the Finnish Nature Conservation Society's Prize in 2004.

He has actively pursued collaboration with China since 2008, including establishment of two EU-China collaboration platforms, visiting scholar in 3 universities, several keynotes, co-authored 20+ journal articles with scientists from 7 universities. His work with China has resulted in major science outcomes and new business initiatives, he is recipient of the prestigious Jinling Award (Nanjing) in 2016.

Selected publications

267 peer-reviewed journal articles, 500+ research papers. 24 book chapters and edited books. Google-Scholar h-index 50; 9,352 citations.

Energy materials:

M.I. Aghar, S. Jouttijärvi, R. Jokiranta, A.-M. Valtavirta, P. D.Lund. Wide bandgap oxides for low-temperature single-layered nanocomposite fuel cell. *Nano Energy* 53 (2018) 391-397. (Impact Factor=13.1)

A Tiihonen, K Miettunen, J Halme, P Lund, Perovskite solar cell ageing standards need reproducible data on failure mechanisms. *Science eLetter* 14.3.2018 <http://science.sciencemag.org/content/359/6374/388/tab-e-letters>

Jianbing Huang, Shunquan Tan, Peter Lund and Huanping Zhou. Impact of H₂O on organic-inorganic hybrid perovskite solar cells. *Energy & Environmental Science* 10 (2017) 2284-2311 (IF=30)

P.D. Lund et al. Standardized Procedures Important for Improving Single-Component Ceramic Fuel Cell Technology. *ACS Energy Letters* 2 (2017) 2752-2755. (IF=12.28)

B. Zhu, P. D. Lund, et al. Schottky junction effect on high performance fuel cells based on nanocomposite materials. *Adv. Energy Mater.* (2015). (IF=21.9)

Kemppainen, A. Bodin, B. Sebok, T. Pedersen, B. Seger, B. Mei, D. Bae, P. C. K. Vesborg, J. Halme, O. Hansen, P.D. Lund and I. Chorkendorff. Scalability and feasibility of photoelectrochemical H₂ evolution: The ultimate limit of Pt nanoparticle as an HER catalyst. *Energy & Environmental Science* 8(2015), 2991-2999. (IF=30)

Energy systems:

S.Yun, W. Fang, T. Du, X. Hu, X. Huang, X. Li, C- Zhang, P.D. Lund. Use of bio-based carbon materials for improving biogas yield and digestate stability. *Energy* 164(2018) 898-909. (IF=4.97)

J. Salpakari, T. Rasku, J. Lindgren, P. D. Lund. Flexibility of electric vehicles and space heating in net zero energy houses: an optimal control model with thermal dynamics and battery degradation. *Applied Energy* (2017)190, 800-812. (IF=7.9)

J Wang, S Yang, C Jiang, Q Yan, P Lund. A novel 2-stage dish concentrator with improved optical performance for concentrating solar power plants. *Ren Energy* 108 (2017) 92-97. (IF=4.9)

Lindgren, J., Lund, P. D., Effect of extreme temperatures on battery charging and performance of electric vehicles. *J Power Sources* 2016, 328, 37-45. (IF=6.95)

Lund, P., Mikkola, J., Ypyä, J., Smart energy system design for large clean power schemes in urban areas. *J Clean Prod.* 103, 437-445 (2015). (IF=5.7)

Energy policy:

Bolwig, S., Bazbauers, G., Klitkou, A., Lund, P.D., et al. Review of modelling energy transitions pathways with application to energy system flexibility. *Renewable & Sustainable Energy Reviews* 101 (2019) 440-452. (IF=9.18)

P.D. Lund. Implications of Finland's plan to ban coal and cutting oil use. *Energy Policy* 108 (2017) 78-80. (IF=4.0)

P. Lund. How fast can businesses in the new energy sector grow? *Ren. Energy* 66 (2014) 33-40. (IF=4.9)

P.D. Lund. Energy policy planning near grid parity using a price-driven technology penetration model. *Technol Forecast Soc Change* 90 (2015) 389-399. (IF=3.1)

P.D. Lund: Effects of energy policies on industry expansion in renewable energy. *Ren Energy* 34 (2009)53-64(IF=4.9)

P.D. Lund. Impacts of EU carbon emission trade directive on energy-intensive industries – indicative micro-economic analyses. *Ecol. Econ.* 63 (2007) 799-806. (IF=3.9)

Keynote and invited talks

84 invited talks 2001-; examples of talks:

Market transformation perspective and stakeholder aspects in IEA cases; IEA Technology Needs Markets, Paris, Nov 2001

Creating effective innovation and research approaches to meet society's megachallenges – examples from energy; Nordic Council of Ministers Conference on Investing in Research and Innovation, Copenhagen, Oct 2006

New technologies for clean air; EU-USA Transatlantic Cooperation in Clean Air, Brussels, Apr 2007

Modelling and effective use of LT SOFC for polygeneration applications; Hong Kong Polytechnic University, Feb 2010

Bridging energy and climate gap– can science and innovations provide mainstream solutions? Univ. Rovira i Virgili, Jun 2011

Major energy impacts and emission reductions through integrated green energy approaches in urban scale – lessons learned and way forward; International Green Energy Economy Conference, Washington DC, Jul 2011

Large-scale urban renewable electricity schemes - integration and interfacing aspects; SET-2011, Turkey, Sept 2011

Scaling-up of Nanotechnology Enabled Electrochemical Energy Conversion; World Resources Forum, Beijing, Oct 2012

Leapfrogging Energy System Flexibility for Integrating High Shares of Renewable Electricity; IEEE International Conference on Smart Energy Grid Engineering (SEGE'13), Oshawa, Canada, Aug 2013

Emerging energy technologies; ESOF 2014, Copenhagen, Denmark, Jun 2014

Energy in transition in EU - the role of new and renewable energy technologies; 2nd Jiangsu-Europe International Conference on New Energy (JSSUN2015), Nanjing, China, Nov 2015

How to bridge old and new in energy? Importance of system integration; 8th International Exergy, Energy and Environment Symposium (IEEEES-8), Antalya, Turkey, May 2016

Moving single-component fuel cell technology towards practical applications; H₂ & Fuel Cell Forum Wuhan, Dec 2017

Policies on energy system flexibility accelerating clean energy transition; Nordic Clean Energy Week, Copenhagen, May 2018

Moving to a new phase in sustainable energy through advanced flexibility; SET 2018, Wuhan Aug 2018

Generic storage strategies for PV-intensive systems; 3. Herbstworkshop Energiespeichersysteme, TUD Dresden, Nov 2018