

Ozan Keysan

Curriculum Vitae

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Experience

2014–Present	Assistant Professor	Department of Electrical and Electronics Engineering Middle East Technical University, Ankara, Turkey
2011–2014	Research Associate	Institute for Energy Systems, University of Edinburgh
2010–2012	Electrical Machine Design Consultant	NGenTec, Edinburgh
2009–2010	Research Associate	Institute for Energy Systems, University of Edinburgh
2005–2009	Research Assistant	Middle East Technical University

Education & Qualifications

2013	PhD	Electrical Engineering, University of Edinburgh, UK <i>Thesis Title: Superconducting Generators for Large Offshore Wind Turbines</i>
2008	MSc	Electrical-Electronics Engineering, Middle East Technical University <i>Thesis Title: A Non-Invasive Speed and Position Sensor for Induction Machines Using External Search Coils</i>
2005	BSc	Electrical-Electronics Engineering, Middle East Technical University

Academic & Administrative Work

- Vice Chair, Dept. of Electric-Electronics Engineering, 2018-Present.
- Advisor to Dean, 2016-2018.
- Member of the Executive Board, METU-Wind Center, 2016-Present
- Member of the Executive Board, Design Factory, 2016-2017.
- Associate Editor, IET Renewable Power Generation, 2016-Present.
- EU Cost Action Rapporteur, 2017

Research Interests

My main area of interests are renewable energy generation, smart-grids and design of electrical machines. In particular, I am working on novel electrical machine topologies such as integrated modular motor drives, superconducting machines and permanent-magnet machines. I also worked on the implementation of direct-drive systems to renewable energy systems such as wind, wave and tidal energy converters.

Research Experience & Projects

2018–2019	USTDA	USA, Trade and Development Agency, METU Smart Campus Project : This project is the only funded project from the Smart Cities call of 2016. In the project, feasibility analysis of smart city concepts for METU will be investigated. These include roof-top PVs, electric shuttle bus, electric bike network, smart LED lighting, combined heat and power generation facilities. The project aims to make METU campus a sustainable, self-sufficient green campus. Project has been signed in September 2017, and it is expected to be completed in April 2019. Project budget: \$830.000.
2017–2018	TUBITAK 3501	Development of a 7,5 kW Permanent Magnet Integrated Modular Motor Drive System : The aim of this project is to develop an IMMD system where the electric motor and its drive are integrated into a single package. The motor and drive will consist of several modules to increase fault tolerance. Gallium Nitride (GaN) power semiconductor devices will be used to reduce the size and increase the efficiency. Project budget: 177.000 TL.
2017–2019	ASELSAN SST	Electromagnetic Design and Optimization of a 10 MJ Electromagnetic Launcher - Phase II : Second phase of the TUFAN railgun project in which a 10 MJ prototype will be tested. Detailed 3D FEA models are developed to obtain electrical, mechanical force, and thermal characteristics of the railgun. Project budget: 392.000 TL.
2017–2018	ASELSAN MGEO	Design of a high performance linear servo actuator and PCB Motor : Two high performance actuators (linear and axial flux permanent magnet) will be designed and manufactured in this project. The aim is to manufacture these actuators in Turkey instead of exporting. Project budget: 198.000 TL.
2017–2018	EnerjiSa-H2020 Project	Pattern Recognition in Power Systems : The aim of EPR Project is to implement pattern recognition techniques for power systems to detect faults and plan predictive maintenance on system components. METU's work packages consist of synthetic inertia implementation in wind turbines to improve power system stability and analyze distribution level power quality to detect anomalies. Total Project budget: € 2.400.000.
2017	ASELSAN UGES	Feasibility analysis and design of a 2.5MW direct-drive wind turbine generator : In this project techno-economic analysis of different generator technologies are performed to find the most suitable generator technology for ASELSAN. A detailed electromagnetic, structural and thermal optimization of a direct-drive generator using FEA tools is presented. Project budget: 87.000TL.
2016–2017	ASELSAN SST	Electromagnetic Design and Optimization of a 200kJ-2MJ Electromagnetic Launcher : In this project electromagnetic and thermal analyses are performed on the TUFAN railgun project. Detailed 3D FEA models are developed to obtain electrical, mechanical force, and thermal characteristics of the railgun. Project budget: 397.000 TL.
2016	METU BAP	Design of a Modular Data Acquisition Board.
2016	ANDAR Servo	Design and Manufacturing of a Eddy Current Damper for Aerospace Application.
2016	ANDAR Servo	Design and Manufacturing of a Brushless PM Servo Motor.

2016	Newton Fund	Design of a superconducting wind turbine prototype.
2016	TUBITAK-2232	Design of modular and fault-tolerant generators for direct-drive wind turbines.
2014	NAREC	Design of next generation HVDC network for the offshore renewable energy industry. My role in the project is to design a high-frequency high-power transformer that can be coupled to the HVDC transmission line.
2011–2014	EU FP7 Project	Marina Platform Project is an EU FP7 project with 17 industrial and academic partners. I am working as a full-time researcher in the project, which aims to design combined wave and wind energy platforms. I've led the work package in the University of Edinburgh, the aim of which is to compare different generator topologies and power take-off systems in terms of efficiency and reliability.
2013	United Arab Emirates Uni.	Design of a 5 kW permanent-magnet linear generator test rig.
2013	General Electric	A project to validate the superconducting generator topology that I developed during my PhD. General Electric agreed to loan the superconducting coil, vacuum chamber and other test equipments for the cryogenic experiments.
2011	NGenTec	Design consultant for a medium-speed PM generator design . Electromagnetic optimization a 5 MW, 300 rpm permanent-magnet generator has been completed.
2010	NGenTec	Design and optimization of a 1 MW, 12 rpm direct-drive generator for a wind turbine. The machine has been manufactured and successfully tested.
2010	SMART R&D Grant	Design and testing of a 25 kW axial flux permanent-magnet generator. The experimental results have been used to evaluate the thermal performance of the generator and the cooling system.
2010	Hayward Tyler	Feasibility analysis of a submerged and flooded permanent-magnet generator. Thermal performance of the flooded generator has been investigated as well as the corrosion mechanisms and fluid drag losses.
2009–2010	NPower Project	Feasibility analysis of direct-drive PM generators for two wave energy converters (Aquamarine,AWS Ocean Power) and two tidal energy converters (Marine Current Turbines, Scotrenewables) have been investigated. An analytical and optimization tool is developed, and licensed by University of Edinburgh for further use.

Teaching Experience

Middle East Technical University

For a full list of courses that I taught please visit my courses webpage.

- Electromechanical Energy Conversion I–II (EE361, EE362).
- Static Power Conversion I–II (EE463, EE464).
- Utilization of Electral Energy (EE462).
- Design of Electrical Machines (EE564).
- Collaborative Design Studio (ID403)

School of Engineering, University of Edinburgh

Laboratory Supervision:

- Power Engineering Lab (2nd year): This course introduces students to the techniques and equipment used in the generation, transmission, distribution and utilisation of electrical power.
- Power Generation Lab (3rd year): The lab aims to give the students experience in working with rotating machines and power electronic equipment and synchronization to the grid.

Courses:

- The Industrial Doctoral Centre for Offshore Renewable Energy (four-year EngD programme), "Introduction to Superconductivity and Superconducting Generators".

Supervision:

- Mario Recio Lara, "Development of a mobile phone application to detect speed and faults of electrical machines", MSc Thesis, 2013.
- Marzia Akbari, "Comparison and control of power take-off systems for combined wind/wave energy platforms", MSc Thesis, 2013.

Honours & Awards

2018	Best Lecturer, 2017-2018 Spring semester (based on student evaluations), METU.
2017	Best Lecturer, 2017-2018 Fall semester (based on student evaluations), METU.
2017	Best Poster Award, Renewable Energy and Energy Efficiency Conference, DAAD.
2013	Staff Scholarship, University of Edinburgh.
2012	Young Researcher Support, International Conference on Superconductivity and Magnetism, ICSM.
2012-2013	PhD Overseas Fee Waiver and Stipend, University of Edinburgh.
2011	Young Researcher Award and Travel Grant, European Conference on Applied Superconductivity, EUCAS.
2011	IEEE Membership and Travel Grant, IEEE Power Electronics Society.
2011	Best Poster Award, IEEE International Electric Machines and Drives Conference, IEMDC.
2010	Best Paper Award, IEEE International Conference on Electrical Machines, ICEM.
2010-2012	PhD Scholarship on Renewable Energy, Hopewell Holdings, Hong Kong.
2005-2007	TUBITAK Graduate Fellowship.
2005	Ranked 2nd in the Academic Personnel and Graduate Education Exam (ALES).
2005	Finalist in the METU Entrepreneurship Competition (Yeni İşler Yeni Fikirler).
2001-2005	Dean's high honour list (3 times), Dean's honour list (3 times).

Courses & Seminars

- HPI, Design Thinking Workshop, 3 days, 2016.
- Aalto Design Factory, Design factory crash course, 2 days, 2015.
- Future Reliable Renewable Energy Conversion Systems, 4th Flagship Seminar, Chongqing, China, 2012.
- Supervising Postgraduate Research, Iain Davidson, 2013.
- Large-Scale Parallel Computing, University of Edinburgh, 2013.
- Superconducting Machines, UK Magnetics Society, University of Oxford, 2012.

- Thermal and Mechanical Aspects of High Performance Electrical Machines, UK Magnetics Society, 2011.
- LaTeX for scientific publications, Skills Development Edinburgh, 2010.
- Opera 2D/3D FEA Analysis of Electrical Machines, Cobham Ltd. Vector Fields, 2009.
- Marine and Tidal Energy Workshop, Industrial Problems in Marine Energy Workshop, 2009.
- Project Management for Researchers, Fistrat Training & Consultancy Ltd., 2009.
- Project Presentation on International Venture Capital Forum, Athens, 2006.
- Project Management and Entrepreneurship Course, 30 days, METU Technopolis, 2005.

Memberships

2011–Present IEEE Member
 2011–Present IEEE Power and Energy Society Member
 2010–Present UK Magnetics Society Member
 2005–Present TMMOB Electrical Engineers Society Member

Software

- Programming: Python, R, Matlab, C++.
- Finite Element Analysis: Opera, FEMM, ANSYS, Gmsh, GetDP.
- Computer Aided Design: SolidWorks, AutoCad.
- Computational Fluid Dynamics: OpenFOAM.

Activities & Hobbies

Mountaineering Active Member of METU Mountaineering Club
 Sailing Dinghy and Yacht Sailing, Certificate of Competence For Operators of Pleasure Craft.
 Blogging asuyatuyolar.org

Languages

English (Fluent), Spanish (Intermediate), Chinese (Beginner)

Publications

Refereed Journal Papers

1. Keysan, O. Future Electrical Generator Technologies for Offshore Wind Turbines. *Engineering & Technology Reference* (December 2014) (2015), 1–20.
2. Keysan, O. and M. Mueller. A Modular and Cost-Effective Superconducting Generator Design for Offshore Wind Turbines. *Superconductor Science and Technology* **28**(3) (2015), 34004.
3. Keysan, O. and H. B. Ertan. Real-Time Speed and Position Estimation Using Rotor Slot Harmonics. *IEEE Transactions on Industrial Informatics* **9**(2) (2013), 899–908.
4. Hodgins, N., O. Keysan, A. McDonald, and M. A. Mueller. Design and Testing of a Linear Generator for Wave-Energy Applications. *IEEE Transactions on Industrial Electronics* **59**(5) (2012), 2094–2103.
5. Keysan, O., M. Mueller, A. McDonald, N. Hodgins, and J. Shek. Designing the C-GEN lightweight direct drive generator for wave and tidal energy. *IET Renewable Power Generation* **6**(3) (2012), 161.
6. Keysan, O., D. Olczak, and M. A. Mueller. A Modular Superconducting Generator for Offshore Wind Turbines. *Journal of Superconductivity and Novel Magnetism* **26**(5) (2012), 2103–2108.

7. Keysan, O. and M. A. Mueller. A Homopolar HTSG Topology for Large Direct-Drive Wind Turbines. *IEEE Transactions on Applied Superconductivity* **21**(5) (2011), 3523–3531.
8. Keysan, O. and B. Ertan. Determination of rotor slot number of an induction motor using an external search coil. *Facta universitatis - series: Electronics and Energetics* **22**(2) (2009), 227–234.

Book Chapters

1. Keysan, O. “Application of high-temperature superconducting machines to direct drive renewable energy systems”. In: *Electrical Drives for Direct Drive Renewable Energy Systems*. Ed. by M. Mueller and H. Polinder. Elsevier, 2013, pp.219–252. ISBN: 84569-783-9.

Patent

1. Keysan, O. and H. B. Ertan. *Speed and Rotor Position Estimation of Electrical Machines Using Rotor Slot Harmonics and Higher Order Rotor Slot Harmonics*. 2011.

Papers in Conference Proceedings

1. Macadré, L.-m., F. D. Mcauliffe, O. Keysan, M. H. Donovan, S. Armstrong, J. Murphy, and K. Lynch. Optimal Power Aggregation Methods for Marine Renewable Energy Converters ; a Combined Economic and Reliability Approach. In: *EWTEC - European Wave and Tidal Energy Conference*. Nantes, France, 2015.
2. Keysan, O, J Burchell, M. Mueller, and P Radyjowski. Towards More Reliable and Cost Effective Superconducting Generators for Wind Turbines. In: *7th IET International Conference on Power Electronics, Machines and Drives (PEMD 2014)*. Manchester: Institution of Engineering and Technology, 2014, pp.4.2.02–4.2.02. ISBN: 978-1-84919-815-8.
3. Keysan, O. and M. A. Mueller. Sizing of Electrical Generators for a Floating OWC Array. In: *European Wind Energy Conference*. Barcelona, 2014, pp.1–7.
4. Echenique, E. J., O. Keysan, and M. A. Mueller. Rotor loss prediction in air-cored permanent magnet machines. In: *2013 International Electric Machines & Drives Conference*. Ed. by Chicago. IEEE, 2013, pp.303–310. ISBN: 978-1-4673-4974-1.
5. Keysan, O., J. Burchell, and M. A. Mueller. Magnetic and structural analysis of a transverse flux claw pole linear machine. In: *2013 IEEE International Conference on Industrial Technology (ICIT)*. Cape Town: IEEE, 2013, pp.1904–1908. ISBN: 978-1-4673-4569-9.
6. Mueller, M. and O. Keysan. An open source tool to estimate mass and efficiency of wind turbine power take-off systems. In: *2nd IET Renewable Power Generation Conference (RPG 2013)*. Beijing: Institution of Engineering and Technology, 2013, pp.3.15–3.15. ISBN: 978-1-84919-758-8.
7. Keysan, O and M. Mueller. A linear superconducting generator for wave energy converters. In: *6th IET International Conference on Power Electronics, Machines and Drives (PEMD 2012)*. Bristol: IET, 2012, pp.B134–B134. ISBN: 978-1-84919-616-1.
8. Keysan, O. and M. A. Mueller. A Transverse Flux High-Temperature Superconducting Generator Topology for Large Direct Drive Wind Turbines. *Physics Procedia* **36** (2012), 759–764.
9. Keysan, O., A. McDonald, and M. Mueller. A direct drive permanent magnet generator design for a tidal current turbine(SeaGen). In: *2011 IEEE International Electric Machines & Drives Conference (IEMDC)*. IEEE, 2011, pp.224–229. ISBN: 978-1-4577-0060-6.
10. Keysan, O. and M. Mueller. Superconducting generators for renewable energy applications. In: *IET Conference on Renewable Power Generation (RPG 2011)*. Vol. 2020. Edinburgh: IET, 2011, pp.12–12. ISBN: 978-1-84919-536-2.
11. Hodgins, N., O. Keysan, A. McDonald, and M. Mueller. Linear generator for direct drive wave energy applications. In: *The XIX International Conference on Electrical Machines - ICEM 2010*. IEEE, 2010, pp.1–6. ISBN: 978-1-4244-4174-7.
12. Keysan, O. and H. Bulent Ertan. Higher order rotor slot harmonics for rotor speed & position estimation. In: *2010 12th International Conference on Optimization of Electrical and Electronic Equipment*. Brasov: IEEE, 2010, pp.416–421. ISBN: 978-1-4244-7019-8.

13. Keysan, O. and H. Bulent Ertan. Speed & position estimation by demodulating rotor slot harmonics. In: *The XIX International Conference on Electrical Machines - ICEM 2010*. 3. IEEE, 2010, pp.1–6. ISBN: 978-1-4244-4174-7.
14. Keysan, O., A. McDonald, and M. Mueller. Integrated Design and Optimization of a Direct Drive Axial Flux Permanent Magnet Generator for a Tidal Turbine. In: *International Conference on Renewable Energies and Power Quality - ICREPQ'10*. Granada, 2010.
15. Keysan, O., M. Mueller, R. Doherty, M. Hamilton, and A. McDonald. C-GEN, a lightweight direct drive generator for marine energy converters. In: *5th IET International Conference on Power Electronics, Machines and Drives (PEMD 2010)*. Institution of Engineering and Technology, 2010, pp.244–244. ISBN: 978 1 84919 231 6.
16. Hodgins, N., A. McDonald, J. Shek, O. Keysan, and M. Mueller. Current and Future Developments of the C-GEN Lightweight Direct Drive Generator for Wave & Tidal Energy. In: *Proceedings of the 8th European Wave and Tidal Energy Conference*. Uppsala, 2009.

National Papers

1. Ertan, H. B. and O. Keysan. Rotor Oluk Harmoniklerini Kullanarak Asenkron Motorlar İçin Gerçek Zamanında Sensörsüz Hız ve Konum Kestirimi. In: *Elektrik-Elektronik ve Bilgisayar Mühendisliği Sempozyumu*. 2012, pp.1–6.
2. Keysan, O. and H. B. Ertan. Asenkron Motorlarda Oluk Sayısının Gövde Dışına Takılan Bir Bobinle Belirlenmesi. *EMO Bilimsel Dergi* 2(3) (2012), 29–35.
3. Ertan, H. B. and O. Keysan. Govde disina yerlestirilmis bobin ile asenkron motor hizinin olculmesi. In: *Elektrik-Elektronik, Bilgisayar, Biyomedikal Mühendisliği 13. Ulusal Kongresi*. Vol. 2. 3. 2009, pp.37–43.

Technical Reports

1. Keysan, O. and M. A. Mueller. *Marina Platform Deliverable 7.2.2, Wind Energy System Components*. Tech. rep. 2012, pp. 1–67.
2. Keysan, O. and M. A. Mueller. *Marina Platform Deliverable 7.3, Critical Components for Wave Energy Converter Power Take-off Systems*. Tech. rep. 2012, pp. 1–48.
3. Keysan, O. Hayward Tyler, *Marinisation of a Direct Drive Permanent Magnet Machine*. Tech. rep. 2010, pp. 1–30.
4. Keysan, O. *Aquamarine Power, Oyster C-Gen Rotary Machine Design*. Tech. rep. 2009, pp. 1–45.
5. Keysan, O. *Archimedes Wave Swing, C-Gen Direct Drive Linear Machine Design*. Tech. rep. 2009, pp. 1–28.
6. Keysan, O. *Marine Current Turbines, C-Gen Direct Drive Machine Design*. Tech. rep. 2009, pp. 1–31.
7. Keysan, O. *Scotrenewables, Tidal Turbine C-Gen Direct Drive Machine Design*. Tech. rep. 2009, pp. 1–48.

Theses

1. Keysan, O. “Superconducting Generators for Large Offshore Wind Turbines”. PhD Dissertation. University of Edinburgh, 2014, p. 228.
2. Keysan, O. “A Non-Invasive Speed and Position Sensor for Induction Machines Using External Search Coils”. MSc. Middle East Technical University, 2008, p. 213.

Theses Supervised

1. Doğa Ceylan, Electromagnetic Simulation and Optimization of an Electromagnetic Launcher, MSc 2018.
2. Mert Bildirici, Reducing the Cost of Electric Transmission and Distribution Systems with Wind Generation by Means of Energy Storage and Demand Side Management, MSc 2018.
3. Aydın Başkaya, Design of a Modular, Axial-flux Direct Drive Permanent Magnet Generator For Wind Turbines, MSc 2018.

4. Melih Var, Improvement of the Electric Field Distribution in the Medium Voltage Gas Insulated Inductive Voltage Transformer, MSc 2017.
5. Öztürk Şahin Alemdar, Design and Implementation of an Unregulated DC/DC Transformer Module Using LLC Resonant Converter, MSc 2016.
6. Mario Recio Lara, Development of a mobile phone application to detect speed and faults of electrical machines*, MSc 2013.
7. Marzia Akbari, Comparison and control of power take-off systems for combined wind/wave energy platforms, MSc 2013.

Manuscripts in Preparation

1. Alemdar, O. and O Keysan. Design and implementation of an unregulated DC-DC transformer module using LLC resonant converter. In: *Power Electronics, Machines and Drives (PEMD 2016), 8th IET International Conference on*. 2016, pp.(In Press).
2. Bernholz, J, O Keysan, and M. Mueller. Analytical Model for Superconducting Generators for Wave Energy Systems. In: *Power Electronics, Machines and Drives (PEMD 2016), 8th IET International Conference on*. 2016, pp.(In Press).
3. Radyjowski, P, O Keysan, J Burchell, and M. Mueller. Development of a Superconducting Claw-Pole Motor. *Superconductor Science and Technology* (2015), (In Press).
4. Mueller, M. A., O. Keysan, A. Kumaraperumal, and M. Galbraith. "Heat Pipes in Air Cored Windings for Improved Thermal Performance". 2014.
5. Lara, M. R. and O. Keysan. "Detection of Electrical Machine Faults Using Smart Phones". 2013.