

# Ozan Keysan

## Curriculum Vitae

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### Experience

2014–Present	Assistant Professor	Middle East Technical University
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

### Research Interests

My main area of interests are power generation, renewable energy and design of electrical machines. In particular, I am working on novel electrical machine topologies such as 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

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 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	The 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.
2005–2008	METU	A novel method to estimate the rotor speed and position of an induction motor using the fringing flux out of the rotor cage is developed. An international patent has been awarded to this work.

## Teaching Experience

### 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.

### Middle East Technical University

#### Laboratory Supervision

- Electromechanical Energy Conversion I-II (EE361, EE362).
- Static Power Conversion (EE463).
- Laboratory coordinator (4 semesters).

## Honours & Awards

- 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

- 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, Fistrall 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

## Academic Work

- Associate Editor, IET Renewable Power Generation.
- EU Cost Action Rapporteur

Reviews for IEEE Transactions on Industrial Electronics  
 IEEE Transactions on Industrial Informatics  
 IEEE Transactions on Applied Superconductivity  
 IET Renewable Power Generation Journal  
 IEEE International Conference on Electrical Machines and Drives  
 IET Power Electronics, Machines and Drives Conference  
 IEEE International Conference on Electrical Machines

## 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. and M. Mueller (2015). A Modular and Cost-Effective Superconducting Generator Design for Offshore Wind Turbines. *Superconductor Science and Technology* **28**(3), 34004.
2. Keysan, O. and H. B. Ertan (2013). Real-Time Speed and Position Estimation Using Rotor Slot Harmonics. *IEEE Transactions on Industrial Informatics* **9**(2), 899–908.
3. Hodgins, N., O. Keysan, A. McDonald, and M. A. Mueller (2012). Design and Testing of a Linear Generator for Wave-Energy Applications. *IEEE Transactions on Industrial Electronics* **59**(5), 2094–2103.
4. Keysan, O., M. Mueller, A. McDonald, N. Hodgins, and J. Shek (2012). Designing the C-GEN lightweight direct drive generator for wave and tidal energy. *IET Renewable Power Generation* **6**(3), 161.
5. Keysan, O., D. Olczak, and M. A. Mueller (2012). A Modular Superconducting Generator for Offshore Wind Turbines. *Journal of Superconductivity and Novel Magnetism* **26**(5), 2103–2108.
6. Keysan, O. and M. A. Mueller (2011). A Homopolar HTSG Topology for Large Direct-Drive Wind Turbines. *IEEE Transactions on Applied Superconductivity* **21**(5), 3523–3531.
7. Keysan, O. and B. Ertan (2009). Determination of rotor slot number of an induction motor using an external search coil. *Facta universitatis - series: Electronics and Energetics* **22**(2), 227–234.

## Book Chapters

1. Keysan, O. (2015). Future Electrical Generator Technologies for Offshore Wind Turbines. *Engineering & Technology Reference* (December 2014), 1–20.
2. Keysan, O. (2013). “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, pp.219–252. ISBN: 84569-783-9.

## Patent

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

## Papers in Conference Proceedings

1. Macadré, L.-m., F. D. Mcauliffe, O. Keysan, M. H. Donovan, S. Armstrong, J. Murphy, and K. Lynch (2015). 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.
2. Keysan, O, J Burchell, M. Mueller, and P Radyjowski (2014). 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, pp.4.2.02–4.2.02. ISBN: 978-1-84919-815-8.
3. Keysan, O. and M. A. Mueller (2014). Sizing of Electrical Generators for a Floating OWC Array. In: *Euro-pean Wind Energy Conference*. Barcelona, pp.1–7.
4. Echenique, E. J., O. Keysan, and M. A. Mueller (2013). Rotor loss prediction in air-cored permanent magnet machines. In: *2013 International Electric Machines & Drives Conference*. Ed. by Chicago. IEEE, pp.303–310. ISBN: 978-1-4673-4974-1.
5. Keysan, O., J. Burchell, and M. A. Mueller (2013). Magnetic and structural analysis of a transverse flux claw pole linear machine. In: *2013 IEEE International Conference on Industrial Technology (ICIT)*. Cape Town: IEEE, pp.1904–1908. ISBN: 978-1-4673-4569-9.
6. Mueller, M. and O. Keysan (2013). 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, pp.3.15–3.15. ISBN: 978-1-84919-758-8.
7. Keysan, O and M. Mueller (2012). A linear superconducting generator for wave energy converters. In: *6th IET International Conference on Power Electronics, Machines and Drives (PEMD 2012)*. Bristol: IET, pp.B134–B134. ISBN: 978-1-84919-616-1.
8. Keysan, O. and M. A. Mueller (2012). A Transverse Flux High-Temperature Superconducting Generator Topology for Large Direct Drive Wind Turbines. *Physics Procedia* **36**, 759–764.
9. Keysan, O., A. McDonald, and M. Mueller (2011). A direct drive permanent magnet generator design for a tidal current turbine(SeaGen). In: *2011 IEEE International Electric Machines & Drives Conference (IEMDC)*. IEEE, pp.224–229. ISBN: 978-1-4577-0060-6.
10. Keysan, O. and M. Mueller (2011). Superconducting generators for renewable energy applications. In: *IET Conference on Renewable Power Generation (RPG 2011)*. Vol. 2020. Edinburgh: IET, pp.12–12. ISBN: 978-1-84919-536-2.
11. Hodgins, N., O. Keysan, A. McDonald, and M. Mueller (2010). Linear generator for direct drive wave energy applications. In: *The XIX International Conference on Electrical Machines - ICEM 2010*. IEEE, pp.1–6. ISBN: 978-1-4244-4174-7.
12. Keysan, O. and H. Bulent Ertan (2010). Higher order rotor slot harmonics for rotor speed & position estimation. In: *2010 12th International Conference on Optimization of Electrical and Electronic Equipment*. Brasov: IEEE, pp.416–421. ISBN: 978-1-4244-7019-8.
13. Keysan, O. and H. Bulent Ertan (2010). Speed & position estimation by demodulating rotor slot harmonics. In: *The XIX International Conference on Electrical Machines - ICEM 2010*. 3. IEEE, pp.1–6. ISBN: 978-1-4244-4174-7.
14. Keysan, O., A. McDonald, and M. Mueller (2010). 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.
15. Keysan, O., M. Mueller, R. Doherty, M. Hamilton, and A. McDonald (2010). 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, pp.244–244. ISBN: 978 1 84919 231 6.

16. Hodgins, N., A. McDonald, J. Shek, O. Keysan, and M. Mueller (2009). 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.

## National Papers

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

## Technical Reports

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

## Thesis

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

## Manuscripts in Preparation

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