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### Professor Phil Taylor

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### Background

#### Biography

Professor Phil Taylor is Director of the EPSRC **National Centre for Energy Systems Integration** (<http://www.ncl.ac.uk/cesi/>) (CESI), and Siemens Professor of Energy Systems. He is an internationally leading researcher and industrial expert in energy systems, electrical distribution networks, smart grids, and energy storage integration and control.

He is also the Leader of the EPSRC Supergen Energy Networks Hub.

**Electrical energy storage** is central to the world's energy future. It is vital to decarbonisation of the energy network, increases energy security and delivers energy user savings. Phil's research team is leading large-scale energy storage demonstration projects throughout the UK.

Phil and his research team are behind the (<http://www.ncl.ac.uk/sciencecentral/urban/smartgrid/>) **smart grid lab** (<http://www.ncl.ac.uk/sciencecentral/urban/smartgrid/>) (<http://www.ncl.ac.uk/press.office/press.release/item/securing-our-energy-networks>) in collaboration with Siemens, and the (<http://www.ncl.ac.uk/sustainability/news/archivednews/energystoragetestbedisofficiallyswitched-on.html>) **energy storage test bed** (<http://www.ncl.ac.uk/sustainability/news/archivednews/energystoragetestbedisofficiallyswitched-on.html>) facility at Newcastle University. Both are located at the Helix site. Newcastle University researchers at these unique facilities are working with industry to pave the way for the UK's future as an international leader in energy storage.

Phil works regularly with energy suppliers and distributors in the UK on the use of energy storage for power quality improvement in distribution networks.

#### Memberships

EPSRC, Strategic Advisory Network (SAN)

EPSRC Peer Review College.

#### Media

- **'We need an independent architect to redesign the UK energy industry** (<http://www.theguardian.com/big-energy-debate/energy-industry-independent-market-architect-redesign>)'. The Guardian
- **'Time for the new government to make the UK a world leader in energy storage** (<http://www.newpower.info/2015/06/time-for-the-new-government-to-make-the-uk-a-world-leader-in-energy-storage/>)'. New Power

- **'Grid scale energy storage ([http://icisenergy.podomatic.com/entry/2015-05-01T05\\_19\\_17-07\\_00](http://icisenergy.podomatic.com/entry/2015-05-01T05_19_17-07_00))'**. ICIS energy podcasts
- **'Solving the energy trilemma (<https://blogs.ncl.ac.uk/sustainability/2015/05/28/solving-the-energy-trilemma/>)'**. Blog on UN Sustainable Development Goals
- **'Energy Storage - Sheltering networks from the 'perfect storm (<http://www.abb.co.uk/cawp/seitp202/4a808cb15062d1b8c12578380055f70a.aspx>)'**. ABB

## Research

Publication profile can be viewed here <http://scholar.google.co.uk/citations?user=zEQu7cMAAAAJ>  
(<http://scholar.google.co.uk/citations?user=zEQu7cMAAAAJ>)

### Projects

EPSRC National Centre for Energy Systems Integration (Durham University, Heriot Watt University, Edinburgh University, Sussex University)

#### **The Autonomic Power System, EPSRC Grand Challenges in Energy Networks**

(<http://www.ncl.ac.uk/engineering/research/eee/projects/autonomicpowersystemsepsrcgrandchallenges.html>), (EPSRC, Strathclyde University, Imperial College, Cambridge University, Manchester University, SPRU)

**Customer Led Network Revolution** (<http://www.networkrevolution.co.uk/>), Low Carbon Networks Fund, Tier 2 (Ofgem, Northern Powergrid, British Gas, EA Technology)

Energy Storage Operating Strategies and Deployment, Low Carbon Networks Tier 1 (UK Power Networks, ABB)

Energy Storage for Electrical Distribution Networks, Technical, Commercial and Regulatory aspects (Electricity North West and Scottish Power)

#### **Mathematical Foundations for Energy Networks: buffering, storage and transmission**

(<http://www.ncl.ac.uk/engineering/research/eee/projects/mathematicalfoundationsforenergynetworksbufferingstorageandtransmissio.html>) (EPSRC, Heriot Watt University, Cambridge University)

**Interdisciplinary Cluster on Energy Systems, Equity and Vulnerability**, (<http://gow.epsrc.ac.uk/NGBOViewGrant.aspx?GrantRef=EP/G040176/1>) (ESRC/EPSRC, Kings College London, Lancaster University)

Real Time Ratings and Thermal State Estimation for Electrical Distribution Networks (Scottish Power, Infoterra)

Multi Agent Systems for Decentralised Control of Future Low Voltage Networks (EON)

Demand Side Participation, a Socio-Technical Approach. (Northern Powergrid)

Investigation into Electrical Distribution Network Risk. (Northern Powergrid)

### Research Interests

Active Network Management Techniques

Demand Side Management Techniques

Fuzzy Control

Integration of renewable energy into electrical networks (both interconnected and stand alone)

## Publications

- Wong LA, Ramachandramurthy VK, Taylor P, Ekanayake JB, Walker SL, Padmanaban S. **Review on the optimal placement, sizing and control of an energy storage system in the distribution network** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=253918](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=253918)). *Journal of Energy Storage* 2019, **21**, 489-504.
- Giaouris D, Papadopoulos A, Patsios C, Walker S, Ziogou C, Taylor P, Voutetakis S, Papadopoulou S, Seferlis P. **A Systems Approach for Management of Microgrids Considering Multiple Energy Carriers, Stochastic Loads, Forecasting and Demand Side Response** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=248704](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=248704)). *Applied Energy* 2018, **226**, 546-559.
- Etim N-BB, Giaouris D, Papadopoulos AI, Patsios H, Papadopoulou S, Voutetakis S, Seferlis P, Walker S, Taylor P, Gadoue S. **Adaptive Power Pinch Analysis for Energy management of Hybrid Energy Storage Systems** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=253506](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=253506)). In: *2018 IEEE International Symposium on Circuits and Systems (ISCAS)*. 2018, Florence, Italy: Institute of Electrical and Electronics Engineers Inc.
- Sayfutdinov T, Patsios C, Bialek JW, Greenwood DM, Taylor PC. **Incorporating variable lifetime and self-discharge into optimal sizing and technology selection of energy storage systems** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=252940](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=252940)). *IET Smart Grid* 2018, **1**(1), 11-18.
- Hosseini SHR, Allahham A, Taylor P. **Techno-Economic-Environmental Analysis of Integrated Operation of Gas and Electricity Networks** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=253498](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=253498)). In: *2018 IEEE International Symposium on Circuits and Systems (ISCAS)*. 2018, Florence, Italy: IEEE.
- Cameron C, Patsios C, Taylor PC, Pourmirza Z. **Using Self-Organizing Architectures to Mitigate the Impacts of Denial-of-Service Attacks on Voltage Control Schemes** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=252954](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=252954)). *IEEE Transactions on Smart Grid* 2018, epub ahead of print.
- Lim YS, Hau LC, Loh KY, Lim KY, Lyons PF, Taylor PC. **Viability of using energy storage for frequency regulation on power grid** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=249249](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=249249)). In: *7th International Conference on Clean and Green Energy (ICCGE 2018)*. 2018, Paris, France: Institute of Physics Publishing.
- Greenwood DM, Wade NS, Papadopoulos P, Heyward N, Taylor PC. **A Probabilistic Method combining Electrical Energy Storage and Real-Time Thermal Ratings to defer Network Reinforcement** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=212554](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=212554)). *IEEE Transactions on Sustainable Energy* 2017, **8**(1), 374-384.
- Spiliopoulos N, Wade N, Giaouris D, Taylor P, Rajarathnam U. **Benefits of lithium-ion batteries for domestic users under TOU tariffs** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=248328](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=248328)). In: *52nd International Universities Power Engineering Conference (UPEC)*. 2017, Heraklion, Greece: IEEE.
- Neaimeh M, Wade N, Blake S, Taylor P. **Charge control of second life EV batteries on the DC link of a back-to-back converter** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=248416](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=248416)). In: *24th International Conference & Exhibition on Electricity Distribution (CIRED)*. 2017, Glasgow: IET.
- Jenkins MJ, Patsios C, Taylor P, Olabisi O, Wade N, Blythe PT. **Creating virtual energy storage systems from aggregated smart charging electric vehicles** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=244751](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=244751)). *CIRED, Open Access Proceedings Journal* 2017, **2017**(1), 1664-1668.
- Vaca SM, Patsios C, Taylor P. **Enhancing frequency response of wind farms using hybrid energy storage systems** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=237670](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=237670)). In: *2016 IEEE International Conference on Renewable Energy Research and Applications, ICRERA 2016*. 2017, San Diego, California, USA: Institute of Electrical and Electronics Engineers Inc.
- Wang P, Yi J, Zangiabadi M, Lyons P, Taylor P. **Evaluation of Voltage Control Approaches for Future Smart Distribution Networks** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=242376](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=242376)). *Energies* 2017, **10**(8), 1138.
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- Vaca SM, Patsios C, Taylor P. **Sizing of hybrid energy storage systems for frequency response of solar farms in Ecuador** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=247037](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=247037)). In: *2017 IEEE PES Innovative Smart Grid Technologies Conference - Latin America, ISGT Latin America 2017*. 2017, Quito, Ecuador: Institute of Electrical and Electronics Engineers Inc.
- Greenwood DM, Wade NS, Taylor PC, Papadopoulos P, Heyward N, Alilat S. **A Forecasting, Optimization and Scheduling System for Energy Storage Systems in Distribution Networks** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=218948](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=218948)). In: *IEEE Power and Energy Society General Meeting 2016*. 2016, Boston, MA, USA: IEEE Power and Energy Society.
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- Taylor P, Patsios C, Munoz-Vaca S, Greenwood D, Wade N. **Energy Storage Integration** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=224493](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=224493)). In: Letcher, TM, ed. *Storing Energy: With Special Reference to Renewable Energy Sources*. Amsterdam, The Netherlands: Elsevier, 2016, pp.433-476.
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## Professor Phil Taylor

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## Background

### Biography

Professor Phil Taylor is Director of the EPSRC **National Centre for Energy Systems Integration** (<http://www.ncl.ac.uk/cesi/>) (CESI), and Siemens Professor of Energy Systems. He is an internationally leading researcher and industrial expert in energy systems, electrical distribution networks, smart grids, and energy storage integration and control.

He is also the Leader of the EPSRC Supergen Energy Networks Hub.

**Electrical energy storage** is central to the world's energy future. It is vital to decarbonisation of the energy network, increases energy security and delivers energy user savings. Phil's research team is leading large-scale energy storage demonstration projects throughout the UK.

Phil and his research team are behind the (<http://www.ncl.ac.uk/sciencecentral/urban/smartgrid/>) **smart grid lab** (<http://www.ncl.ac.uk/sciencecentral/urban/smartgrid/>) (<http://www.ncl.ac.uk/press.office/press.release/item/securing-our-energy-networks>) in collaboration with Siemens, and the (<http://www.ncl.ac.uk/sustainability/news/archivednews/energystoragetestbedisofficiallyswitched-on.html>) **energy storage test bed** (<http://www.ncl.ac.uk/sustainability/news/archivednews/energystoragetestbedisofficiallyswitched-on.html>) facility at Newcastle University. Both are located at the Helix site. Newcastle University researchers at these unique facilities are working with industry to pave the way for the UK's future as an international leader in energy storage.

Phil works regularly with energy suppliers and distributors in the UK on the use of energy storage for power quality improvement in distribution networks.

### Memberships

EPSRC, Strategic Advisory Network (SAN)

EPSRC Peer Review College.

### Media

- **'We need an independent architect to redesign the UK energy industry** (<http://www.theguardian.com/big-energy-debate/energy-industry-independent-market-architect-redesign>)'. The Guardian
- **'Time for the new government to make the UK a world leader in energy storage** (<http://www.newpower.info/2015/06/time-for-the-new-government-to-make-the-uk-a-world-leader-in-energy-storage/>)'. New Power



- **'Grid scale energy storage ([http://icisenergy.podomatic.com/entry/2015-05-01T05\\_19\\_17-07\\_00](http://icisenergy.podomatic.com/entry/2015-05-01T05_19_17-07_00))'**. ICIS energy podcasts
- **'Solving the energy trilemma (<https://blogs.ncl.ac.uk/sustainability/2015/05/28/solving-the-energy-trilemma/>)'**. Blog on UN Sustainable Development Goals
- **'Energy Storage - Sheltering networks from the 'perfect storm (<http://www.abb.co.uk/cawp/seitp202/4a808cb15062d1b8c12578380055f70a.aspx>)'**. ABB

## Research

Publication profile can be viewed here <http://scholar.google.co.uk/citations?user=zEQu7cMAAAAJ>  
(<http://scholar.google.co.uk/citations?user=zEQu7cMAAAAJ>)

### Projects

EPSRC National Centre for Energy Systems Integration (Durham University, Heriot Watt University, Edinburgh University, Sussex University)

#### **The Autonomic Power System, EPSRC Grand Challenges in Energy Networks**

(<http://www.ncl.ac.uk/engineering/research/eee/projects/autonomicpowersystemsepsrcgrandchallenges.html>), (EPSRC, Strathclyde University, Imperial College, Cambridge University, Manchester University, SPRU)

**Customer Led Network Revolution** (<http://www.networkrevolution.co.uk/>), Low Carbon Networks Fund, Tier 2 (Ofgem, Northern Powergrid, British Gas, EA Technology)

Energy Storage Operating Strategies and Deployment, Low Carbon Networks Tier 1 (UK Power Networks, ABB)

Energy Storage for Electrical Distribution Networks, Technical, Commercial and Regulatory aspects (Electricity North West and Scottish Power)

#### **Mathematical Foundations for Energy Networks: buffering, storage and transmission**

(<http://www.ncl.ac.uk/engineering/research/eee/projects/mathematicalfoundationsforenergynetworksbufferingstorageandtransmissio.html>) (EPSRC, Heriot Watt University, Cambridge University)

**Interdisciplinary Cluster on Energy Systems, Equity and Vulnerability**, (<http://gow.epsrc.ac.uk/NGBOViewGrant.aspx?GrantRef=EP/G040176/1>) (ESRC/EPSRC, Kings College London, Lancaster University)

Real Time Ratings and Thermal State Estimation for Electrical Distribution Networks (Scottish Power, Infoterra)

Multi Agent Systems for Decentralised Control of Future Low Voltage Networks (EON)

Demand Side Participation, a Socio-Technical Approach. (Northern Powergrid)

Investigation into Electrical Distribution Network Risk. (Northern Powergrid)

### Research Interests

Active Network Management Techniques

Demand Side Management Techniques

Fuzzy Control

Integration of renewable energy into electrical networks (both interconnected and stand alone)

## Publications

- Wong LA, Ramachandaramurthy VK, Taylor P, Ekanayake JB, Walker SL, Padmanaban S. **Review on the optimal placement, sizing and control of an energy storage system in the distribution network** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=253918](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=253918)). *Journal of Energy Storage* 2019, **21**, 489-504.
- Giaouris D, Papadopoulos A, Patsios C, Walker S, Ziogou C, Taylor P, Voutetakis S, Papadopoulou S, Seferlis P. **A Systems Approach for Management of Microgrids Considering Multiple Energy Carriers, Stochastic Loads, Forecasting and Demand Side Response** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=248704](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=248704)). *Applied Energy* 2018, **226**, 546-559.
- Etim N-BB, Giaouris D, Papadopoulos AI, Patsios H, Papadopoulou S, Voutetakis S, Seferlis P, Walker S, Taylor P, Gadoue S. **Adaptive Power Pinch Analysis for Energy management of Hybrid Energy Storage Systems** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=253506](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=253506)). In: *2018 IEEE International Symposium on Circuits and Systems (ISCAS)*. 2018, Florence, Italy: Institute of Electrical and Electronics Engineers Inc.
- Sayfutdinov T, Patsios C, Bialek JW, Greenwood DM, Taylor PC. **Incorporating variable lifetime and self-discharge into optimal sizing and technology selection of energy storage systems** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=252940](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=252940)). *IET Smart Grid* 2018, **1**(1), 11-18.
- Hosseini SHR, Allahham A, Taylor P. **Techno-Economic-Environmental Analysis of Integrated Operation of Gas and Electricity Networks** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=253498](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=253498)). In: *2018 IEEE International Symposium on Circuits and Systems (ISCAS)*. 2018, Florence, Italy: IEEE.
- Cameron C, Patsios C, Taylor PC, Pourmirza Z. **Using Self-Organizing Architectures to Mitigate the Impacts of Denial-of-Service Attacks on Voltage Control Schemes** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=252954](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=252954)). *IEEE Transactions on Smart Grid* 2018, epub ahead of print.
- Lim YS, Hau LC, Loh KY, Lim KY, Lyons PF, Taylor PC. **Viability of using energy storage for frequency regulation on power grid** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=249249](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=249249)). In: *7th International Conference on Clean and Green Energy (ICCGE 2018)*. 2018, Paris, France: Institute of Physics Publishing.
- Greenwood DM, Wade NS, Papadopoulos P, Heyward N, Taylor PC. **A Probabilistic Method combining Electrical Energy Storage and Real-Time Thermal Ratings to defer Network Reinforcement** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=212554](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=212554)). *IEEE Transactions on Sustainable Energy* 2017, **8**(1), 374-384.
- Spiliopoulos N, Wade N, Giaouris D, Taylor P, Rajarathnam U. **Benefits of lithium-ion batteries for domestic users under TOU tariffs** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=248328](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=248328)). In: *52nd International Universities Power Engineering Conference (UPEC)*. 2017, Heraklion, Greece: IEEE.
- Neaimeh M, Wade N, Blake S, Taylor P. **Charge control of second life EV batteries on the DC link of a back-to-back converter** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=248416](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=248416)). In: *24th International Conference & Exhibition on Electricity Distribution (CIRED)*. 2017, Glasgow: IET.
- Jenkins MJ, Patsios C, Taylor P, Olabisi O, Wade N, Blythe PT. **Creating virtual energy storage systems from aggregated smart charging electric vehicles** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=244751](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=244751)). *CIRED, Open Access Proceedings Journal* 2017, **2017**(1), 1664-1668.
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- Greenwood DM, Wade NS, Taylor PC, Papadopoulos P, Heyward N, Alilat S. **A Forecasting, Optimization and Scheduling System for Energy Storage Systems in Distribution Networks** ([http://eprint.ncl.ac.uk/pub\\_details2.aspx?pub\\_id=218948](http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=218948)). In: *IEEE Power and Energy Society General Meeting 2016*. 2016, Boston, MA, USA: IEEE Power and Energy Society.
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