

RESEARCH PROJECTS AND WORK EXPERIENCE

2017-now Chancellor's Fellow, University of Strathclyde, Scotland

- Investigation of frequency dependency of loads on horizontal axis tidal turbines.
- Coordination and teaching of the Physical Testing of Offshore Renewable Energy Devices MSc module

2013-2017 Research Associate at the Institute for Energy Systems, University of Edinburgh, Scotland

- Led the design, manufacturing, instrumentation, deployment and successful test of one of the largest and most comprehensively instrumented horizontal axis tidal turbine models to investigate extreme loads induced by waves and collisions with an unprecedented level of detail within the EPSRC X-MED project (EP/J010235/1).
- Leading the construction of two more instrumented turbine models based on the successful X-MED prototype to investigate array interaction and electrical network response within the EPSRC SuperGen + project (EP/M014738/1).

In addition to academic contributions, achievements have included:

- Contract negotiation with world leading flow testing facilities (UK and abroad)
- Managing manufacturing by technicians and supply chain to build model
- Managing project budget

May 2013 Consultant, Marine Current Turbines Ltd. UK (www.marineturbines.com)

- Reviewing of metocean methodologies
- Advising on sea conditions modelling techniques

October 2012 to April 2013 Research Associate at the Institute for Energy Systems, University of Edinburgh

Engineering design for the Reliable Data Acquisition Platform for Tidal (ReDAPT) project led by Alstom Ocean Energy (now General Electric).

- Mechanical design of a complete solution for the deployment of oceanographic instruments (ADCPs) in very high velocity currents. The system includes a concrete gravity base, stabilised gimbals and bespoke underwater containers for electronics and battery packs.
- Configuration of ADCPs for non-standard deployments
- Manufacturing and supply chain management

2012 Wave resource analyst at Aquamarine Power Ltd. Scotland

(February to September) MANAGEMENT

- Managing the collaboration with the Hebridean Marine Energy Futures (www.hebmarine.com) consortium aimed at providing resource data for the Lewis site development.
- Managing subcontracting process for metocean modelling

SUPPORTING FUNDING APPLICATIONS

Delivering energy production estimates for the Oyster wave energy converter, reporting to Senior Management, to support funding applications

NUMERICAL MODELLING

Run DHI Mike21 simulation to produce wave resource models for energy production estimates and weather windows calculations.

DATA ANALYSIS

Processing of waverider buoy and of acoustic wave and current profiler (AWAC) data for metocean model validation

Reason for leaving: made redundant due to a financial contraction experienced by the company.

2007-2012 Research Associate at the Institute for Energy Systems, University of Edinburgh

Design of an experimental model and of an experimental protocol for tank testing of a floating tidal turbine in collaboration with Marine Current Turbine

Worked for the EPSRC SuperGen Marine consortium (EP/E040136/1):

- Development and testing of a novel laser based optical wave gauge in collaboration with the company Laser and Imaging Sciences for accurate and non-intrusive wave measurement
- Development of the first set of guidance for the experimental tank testing of wave energy converters now widely used by the wave energy industry
- Development of a real-time computer based control system for a surging, heaving and pitching rig with MatLab / Simulink as a front end

2005-2006 Mechanical design engineer at Artemis Intelligent Power Ltd. UK (www.artemisip.com)

(part time, 2 days a week)

Development of a high efficiency hydraulic motor for power conversion for marine energy converters in collaboration with Pelamis Wave Power (www.pelamiswave.com).

- Mechanical design, manufacturing, commissioning and testing of a prototype motor
- Sourcing of subcontractors for key components of the hydraulic motor
- Numerical modelling of motor performance to estimate the gain in energy production brought about by the high efficiency hydraulic motor
- Survey of the leading marine energy developers (wave and tidal) to assess their requirements for power take-off technology
- Project management

2005-2006 Research Fellow at the Institute for Energy Systems, University of Edinburgh

(part time, 3 days a week)

Working for the SuperGen Marine consortium (GR/S26958/01).

Programming of a graphical interface under MatLab delivering an unprecedented level of user friendliness for WAMIT computations.

EDUCATION

2001-2005 PhD within the Wave Power Group of the University of Edinburgh, UK

Project: Investigating the range of applicability of the state of the art boundary element method package WAMIT for numerical modelling the Sloped IPS buoy wave energy converter. This project involved carrying out both numerical modelling and experimental tank testing.

Supervisor: Stephen Salter

1999-2000 Master of Science in Marine Technology, Cranfield University, UK

Thesis project: Review of marine renewable energies and preliminary studies of the mooring system of the Pelamis wave energy converter using computer modelling under MatLab in collaboration with the company Pelamis Wave Power.

1997-1999 Engineering degree at the ‘Ecole Supérieure d’Ingénieurs de Marseille’ (now Ecole Centrale Marseille), France

Specialisation in hydrodynamics and marine technology

RESEARCH LEADERSHIP AND MANAGEMENT

Supervision

2015 Rodrigo Martinez, PhD student project

2009-2012 Thomas Chabanne, EC Initial Training Network wavetrain2 fellow

2009 Guillaume Vaillant, visiting MSc student from the Ecole Normale Supérieure, Cachan, France

Supervision of numerous undergraduate and MSc student projects

Management

- 2009-2012 Co-investigator for the EC FP7 ITN wavetrain2 project (grant number: 215414, University of Edinburgh budget share: £155,700)
- 2008-2011 Research associate and postgraduate representative at the University of Edinburgh School of Engineering postgraduate experience committee
- 2007-2012 Management of the University of Edinburgh Curved tank facility
- Facility operation and usage planning.
 - External usage arrangement.
 - Student training.
 - Maintenance.

KNOWLEDGE EXCHANGE AND IMPACT

Public demonstration of University of Edinburgh facility (Edinburgh Curved Tank) and presenting University research (on wave energy) to international visitors, members of the public, school children, politicians (including former PM David Cameron), journalists and artists during visits of the Edinburgh Curved Tank.

- 09/2016 Third party verification due diligence of the tank tests of the wavetrain device developed by the company Joule Energy Efficiency Services as part of the Wave Energy Scotland Novel Wave Energy Converter Program
- 04/2016 Consultancy on design of wave energy converter tank model for Albatern Wave Energy
- 09/2015 Video recording of a presentation on the EPSRC X-MED project for the University of Edinburgh seminar YouTube channel (<https://youtu.be/GAAjM1bui-E>)
- 02/2014 Showcasing University of Edinburgh's Institute for Energy Systems research portfolio to industry at the Passerelles R&D Marine Renewables workshop in Deauville, France in partnership with the Scottish Executive.
- 2013-2014 Consultancy work within the Energy Technology Partnership for Trident Energy and for Hydrostatic Energy & Technologies Ltd
- 05/2013 Consultancy work on metocean methodologies for Marine Current Turbines Ltd.
- 2009-2012 Industrial collaboration with the company Laser and Imaging Sciences on the development of an innovative optical wave gauge.
- 10/2009 Consultancy work on wave tank testing for the Carbon Trust Marine Energy Accelerator program

ESTEEM

- Since 2017 Project leader for the International Electrotechnical Commission technical committee on scale testing of tidal stream energy systems.
- 05/2016 Experimental investigation of wave and turbulence induced loads on tidal turbines, invited speaker at the 10th Aotearoa Wave and Tidal Energy Association (AWATEA) conference organised by the Royal Society of New Zealand.
- 04/2016 Experimental considerations and testing for extreme loads on tidal turbines, invited presentation given at the University of Manchester
- 03/2016 Experimental considerations and testing for extreme loads on tidal turbines, invited presentation given at Imperial College London
- 02/2015 Design and testing of scaled models of Marine Energy converters, invited presentation given at the Swedish-UK Ocean Energy Technology Workshop, Stockholm
- 07/2010 Mapping the range of applicability of numerical modelling tools for wave energy applications, invited seminar, Ecole Centrale de Nantes, France
- 09/2009 Wave energy research at the University of Edinburgh, invited seminar, Institut d'Alembert, Université Pierre et Marie Curie, Paris
- 09/2007 Session co-chairman at the 7th European Wave and Tidal Energy Conference, Porto, Portugal.

Reviewer for energies (published by MDPI, IF = 2.26)

Reviewer for Applied Ocean Research (published by Elsevier, IF = 1.6)

Reviewer for Ocean Engineering (published by Elsevier, IF = 1.49)

Reviewer for International Offshore and Polar Engineering Conference (ISOPE)

Reviewer for the European Wave and Tidal Energy Conference (EWTEC)

PUBLICATIONS AND CONFERENCES

Journals

- A. Reich, **G. Payne**, R. Pascal and J. Spinneken, (2018) “Investigation into wave basin calibration based on a focused wave approach”, *Ocean Engineering*, in press
- Payne, G. S.**, Stallard, T., & Martinez, R. (2017). Design and manufacture of a bed supported tidal turbine model for blade and shaft load measurement in turbulent flow and waves. *Renewable Energy*, 107, 312–326. <https://doi.org/10.1016/j.renene.2017.01.068>
- Ordonez-Sanchez, S., Sutherland, D., **Payne, G. S.**, Bruce, T., Gebreslassie, M., Belmont, M. R., & Moon, I. (2017). Experimental evaluation of the wake characteristics of cross flow turbine arrays. *Ocean Engineering*, 141(November 2016), 215–226. <https://doi.org/10.1016/j.oceaneng.2017.06.035>
- M.G. Gebreslassie, S.O. Sanchez, G.R. Tabor, M.R. Belmont, T. Bruce, **G. Payne** and I. Moon, 2016, “Experimental and CFD Analysis of the Wake Characteristics of Tidal Turbines”, *International Journal of Marine Energy*, vol. 16, p. 209–219
- R. Pascal and **G. Payne**, 2016, “Impact of motion limits on sloped wave energy converter optimization” *Proc. R. Soc. A*, 472: 20150768
- G. Payne**, R. Pascal, G. Vaillant, 2015, “On the concept of sloped motion for free-floating wave energy converters”, *Proc. R. Soc. A*, 471: 20150238
- S.F. Harding, **G. Payne**, I.G. Bryden, 2014, “Generating controllable velocity fluctuations using twin oscillating hydrofoils: experimental validation”, *Journal of Fluid Mechanics*, vol. 750, pp. 113-123.
- R. Pascal, **G. Payne**, C. Theobald, I; Bryden, 2012, “Parametric models for wave energy converters performance”, *Applied Ocean Research*, vol. 38, pp. 112-124.
- G. Payne**, J.R.M. Taylor, D. Ingram, 2009, “Best practice guidelines for tank testing of wave energy converters,” *Journal of Ocean Technology*, vol. 4, pp. 38-70.
- G. Payne**, J.R.M. Taylor, T. Bruce, P. Parkin, S.H. Salter, 2008, “Assessment of boundary-element method for modelling a free-floating sloped wave energy device. Part 1: numerical modelling,” *Ocean Engineering*, vol. 35, n° 3-4, pp. 333-341.
- G. Payne**, J.R.M. Taylor, T. Bruce, P. Parkin, S.H. Salter, 2008, “Assessment of boundary-element method for modelling a free-floating sloped wave energy device. Part 2: experimental validation,” *Ocean Engineering*, vol. 35, n° 3-4, pp. 342-357.
- G. Payne**, A. Kiprakis, M. Ehsan, W.H.S. Rampen, J. Chick, A.R. Wallace, 2007, “On the Efficiency and Dynamic Performance of Digital Displacement™ Hydraulic Transmission in Tidal Current Energy Converters,” *Proceedings of the Institution of Mechanical Engineers Part A, Journal of Power and Energy, Special Issue on the Status of Tidal Energy-based Power Generation*, invited paper, vol. 221, pp. 207-218.

Articles under review

- G. Payne**, T. Stallard, R. Martinez and T. Bruce “Variation of loads on a three-bladed horizontal axis tidal turbine with frequency and blade position” submitted to *Journal of Fluids and Structures* (minor revisions and resubmit)

Peer reviewed conferences

- Payne, G. S.**, Stallard, T., Mullings, H. R., & Martinez, R. (2017). Experimental Investigation into Unsteady Loads on Horizontal Axis Tidal Turbines. In *Proceedings of the 12th European Wave and Tidal Energy Conference 2017*. Cork, Ireland.
- Martinez, R., **Payne, G. S.**, & Bruce, T. (2017). Preliminary results on the effects of oblique current and waves on the loadings and performance of tidal turbines. In *Proceedings of the 12th European Wave and Tidal Energy Conference 2017*. Cork, Ireland.
- Nambiar, A., Anderlini, E., **Payne, G. S.**, Forehand, D., Kiprakis, A., & Wallace, R. (2017). Reinforcement Learning Based Maximum Power Point Tracking Control of Tidal Turbines. In *Proceedings of the 12th European Wave and Tidal Energy Conference 2017*. Cork, Ireland.
- Mullings, H. R., Stallard, T., & **Payne, G. S.** (2017). Operational Loads on a Tidal Turbine due to Environmental Conditions. In *Proceedings of the 27th International Ocean and Polar Engineering Conference (ISOPE)* (pp. 222–229). San Francisco, USA.
- G. Payne**, T. Stallard, R. Martinez, 2015, “Experimental Investigation of Tidal Rotor Loading due to Wave, Current and Impact with Sea Animals” In: *11th European Wave and Tidal Energy Conference*, Nantes, France.
- J.C. McNatt, V. Venugopal, D. Forehand, **G. Payne**, 2015, “Experimental Analysis of Cylindrical Wave Fields” In: *11th European Wave and Tidal Energy Conference*, Nantes, France.
- R. Pascal, I. Bryden, **G. Payne**, 2011, “Parametric models for WEC performances” In: *9th European Wave and Tidal Energy Conference*, Southampton, UK.
- G. Payne**, J.-B. Richon, D. Ingram, J. Spinneken, 2009, “Development and preliminary assessment of an optical wave gauge” In: *8th European Wave and Tidal Energy Conference*, Uppsalla, Sweden.
- G. Payne**, 2007, A modular graphical user interface for WAMIT, In: *7th European Wave and Tidal Energy Conference*, Porto, Portugal.

- G. Payne**, J.R.M. Taylor, P. Parkin, S.H. Salter, 2006, "Numerical modelling of the Sloped IPS Buoy wave energy converter," In: *16th International Offshore and Polar Engineering Conference (ISOPE)*, San Francisco, USA.
- J. Cruz, **G. Payne**, 2006, "Preliminary numerical studies on a modified Edinburgh duck using WAMIT," In: *Marine Renewable Energy Conference (MAREC)*, London, UK.
- G. Payne**, U.B.P. Stein, M. Ehsan, N.J. Caldwell, W.H.S. Rampen, 2005, "Potential of Digital DisplacementTM hydraulics for wave energy conversion," In: *6th European Wave and Tidal Energy Conference*, Glasgow, UK
- G. Payne**, 2005, "Hydrodynamic modelling of a generic power take-off mechanism reacting against water inertia," In: *6th European Wave and Tidal Energy Conference*, Glasgow, UK.
- P. Parkin, **G. Payne**, J.R.M. Taylor, 2003, "Numerical simulation and tank tests of the free-floating Sloped IPS buoy," In: *5th European Wave Energy Conference*, Cork, Ireland.
- G. Payne**, 2002, "Preliminary numerical simulations of the Sloped IPS Buoy," In: *Marine Renewable Energy Conference (MAREC)*, Newcastle upon Tyne, UK.

Book

- G. Payne**, 1999, *La politique environnementale : une priorité de la ville de Stockholm* (The environmental policy: a priority of the city of Stockholm), Ambassade de France en Suède, ISBN: 2-913263-05-4.

TEACHING

Coordination and teaching of the Physical Testing of Offshore Renewable Energy Devices MSc module
Guest lecturer for the EC FP7 ITN wavetrain2 postgraduate course in Portaferry (UK) on hydraulic power take-off
Host and delivery co-ordinator of the SuperGen Doctoral Training Programme on tank testing labs
Led fluid mechanics 2 tutorials for 2nd year engineering students. Mechanics and thermodynamics labs for 2nd year engineering students.
Authoring the 2nd year lab sheets for mechanics and thermodynamics labs.

LANGUAGE SKILLS

English: native speaker level

French: native speaker

German: basic

Russian: basic