



Third International Symposium on  
**ENERGY CHALLENGES  
& MECHANICS**

Towards a Big Picture



## Conference Guide

Hilton Aberdeen Treetops, 161 Springfield Road  
Aberdeen, AB15 7AQ, Scotland, United Kingdom

7 - 9 July 2015

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## WELCOME FROM ABERDEEN CITY COUNCIL



The ISECM 2015 Welcome Remarks will be delivered by Councillor Barney Crockett from Aberdeen City Council. Cllr. Crockett is the lead in European business issues, Chair of HyER, the European hydrogen and electro-mobility network of the region. He is also the Vice-Chair of the North Sea Commission's Economic Development Committee.

## WELCOME FROM THE CHAIR



Dear distinguished delegates,

It is an honour and great pleasure to welcome you all to Aberdeen, Scotland, the energy capital of Europe. We are delighted that those involved and working in the

energy industry and research will join us to again discuss and address the challenges facing us.

This symposium is about energy challenges, the underlying energetic basis (mechanics) for society, involving multiple disciplines in technology, science, management and policy-making. The topics include both fossil fuels and many different forms of renewable energy. In addition, we will discuss issues related to energy policy and economy, energy efficiency, safety and environment. The purpose is to gain a big picture about energy challenges and solutions.

As we are all aware, human civilization relies on a steady and robust supply of energy. With the current economic difficulties across the globe, this is a critical time for this form of debate.

Welcome to ISECM 2015!

Dr. Henry Tan, Conference Chair  
University of Aberdeen

## IMPORTANT POINTS

### Venue Info & Local Area

**Venue Address:** Hilton Aberdeen Treetops  
161 Springfield Road, Aberdeen, AB15 7AQ  
**Tel:** 01224 313377

A useful website for local information on Aberdeen city centre is <http://www.visitaberdeen.com/>

### Transport

#### By Taxi:

Rainbow – 01224 87 87 87 or 01224 49 49 49  
ComCab – 01224 35 35 35  
Aberdeen Taxis – 01224 68 68 68

#### By Bus:

The No 5 bus stops outside the front of the hotel on the main road and connects in the city centre. An adult day ticket is £4.00 and an adult evening ticket is £3.00. Further details including timetables can be found at [www.firstgroup.com](http://www.firstgroup.com)

### Conference Attire

All attendees are asked to wear business casual attire for the duration of the conference.

### Identification

All delegates must wear their lanyard and name

badge at all times. Your badge is your ticket and therefore gives you access to all sessions, lunch catering and the social programme. Badges are strictly non-transferable. Please ensure you keep these safe. If you cannot provide a badge or identification to verify your booking then you may be asked to leave the event.

## Certificate Of Attendance

All delegates had the opportunity to request a certificate during the online booking process (see your registration packet). If you did not request a certificate during booking, an electronic version can be sent to you following the conference. Please notify the organisers at the Information Desk if you will require an electronic certificate.

## Session Etiquette

**Speakers:** During the 20 minute break before your session slot, find your presentation room and upload your presentation files to the provided laptop. Please ensure that you **remain within your allotted timeslot** for your presentation and Q&A. It is essential that the conference runs on time. Also, be sure to **delete your slides** at the conclusion of each session.

**Moderators:** Please arrive for your session at least 5 minutes in advance so you are prepared and ready to begin the session on time.

**Audience members:** Please note that the use of photography during presentations is strictly forbidden. **It is unethical to take photographs without consent of a speaker** (you may be asked to delete images). Please respect the speakers and limit your photos to before/after the talks.

**Slide Copyright:** All slides presented at ISECM 2015 are the sole property of each speaker and cannot be copied or redistributed without permission.

## Photography Consent

We will also have an official photographer on-site. If you do not wish your photograph to be taken then please notify the organisers at the registration desk and try to ensure you are not in shot when photographs are being taken. Otherwise we will presume that you have authorised the organisers to take your photograph.

## Smoking Policy

It is forbidden to smoke inside anywhere inside a building in the UK so please smoke outside at a good distance from the hotel entrance and make use of disposal areas for cigarettes.

## SCHEDULE OVERVIEW

### Opening Remarks & Lecture

The ISECM opening remarks will be delivered by Dr. Henry Tan and Councillor Barney Crockett of Aberdeen City Council in the Cedar Suite at 9:00 am. This will be followed by a 10 minute talk by the Research Image Competition winner, Daryl DeJean, and Professor Dr Philippe A. Tanguy's Opening Lecture. See page 7 for details.

### Lunch

A lunch buffet will be served each day for all ISECM delegates in either the Reception Foyer, Sycamore Lounge or the Springfield Restaurant. You will receive a lunch ticket which tells you which area to use – please ensure you retain this ticket for all 3 days. There is no allocated seating within each area, please just find a seat and enjoy your lunch. Do note that lunch is not provided for accompanying persons.

### Welcome Reception

We will welcome you with a reception on the first evening where you can relax and network with your fellow delegates. Light refreshments, canapés, tea and coffee will be provided alongside a cash bar for additional beverages. All delegates are invited to attend, along with accompanying persons.

### Official ISECM 2015 Photo

Please note that the official ISECM 2015 photo will be taken at 18:00pm for all who wish to join us.

### A1 Poster Session

A poster session will take place on the partition wall between the Cedar and Sycamore suite on Day 1 from 18:30-19:30pm during the welcome reception. Please take the opportunity to view these as part of your evening.



## Principal Lectures

Three Principal Lectures will be delivered simultaneously at 8:30am on Day 2. Delegates should select one of the three lectures to attend. Please see page 7-8 for further details.

## Social Programme

You will be transported by coach for the tour and dinner on Day 2. Coaches will depart from the car park at 12:30pm, so please ensure you are on time (see column right for more details).

## Closing Lecture & Remarks

Prof. Joseph Fjelstad will deliver the closing lecture on Day 3 in the Sycamore Suite, followed by closing remarks by Dr. Henry Tan. See page 8 for details.

## SOCIAL PROGRAMME

### Departure

For delegates attending the social programme, please meet in the car park at 12:30pm to board the coaches. We will be departing at 12:45pm sharp so please do not be late. **Your badge is your ticket** and must be worn at all times during the conference and social programme.

If you are unwell and/or unable to attend this part of the conference, please notify the organisers at the Information Table.



### Castle Tour: Crathes Castle

Standing against a background of rolling hills and set in its own glorious gardens, this magical castle is a favourite destination for fans of Scottish history, gardeners and romantics.

Work began on Crathes Castle in the 1550s but it wasn't until 1596 that Alexander Burnett of Leys completed this superb tower house, typical of its period. The Burnett family made it their home for the next 350 years. The 13th Baronet of Leys, General Sir James Burnett, gifted Crathes Castle and part of the estate to the National Trust for Scotland in 1951. Tour the castle and view the turrets and towers, winding staircases, ornate ceilings and ancient yew trees.

Guided tours will be given in the Castle and then feel free to explore the grounds. Please ensure that you dress for all weathers.

During the visit, we will have an expert, Gordon Muir delivering a whisky tasting. Gordon has worked in the industry for 30 years and is passionate about whisky. This is your opportunity to taste some of Scotland's finest whiskies.

### Conference Dinner : Beach Ballroom, Aberdeen

The Beach Ballroom is an Art Deco building on the sea front of Aberdeen, Scotland. It is home to one of Scotland's finest dance floors- famous for its bounce- which floats on fixed steel springs. It was built in 1926, and is a Category B listed building.

During the evening we will experience a traditional Beat the Retreat from the Bucksburn Pipe Band. Beating Retreat has its origins in the early years of organised warfare when the beating of drums and the parading of Post Guards heralded the closing of camp gates and the lowering of flags at the end of the day. Beating Retreat still continues today and the ceremony has evolved into a colourful pageant of military music and precision drill carried out by many pipe bands.

The welcome on the evening will be delivered by Cllr. Barney Crockett from Aberdeen City Council.

### Return Journey

On the return journey around 22:15, the coaches will stop in the city centre before returning to the conference hotel.

# CONFERENCE SCHEDULE

## PRE-REGISTRATION

Monday, 6 July 2015

### PRE-REGISTRATION

19:00 – 21:00

*Beechwood Suite*

*Come at any time to collect  
your badge and delegate pack*

## DAY 1

Tuesday, 7 July 2015

### REGISTRATION

8:00 - 9:00

*Beechwood Suite*

### WELCOME REMARKS

9:00 - 9:25

### OPENING LECTURE

9:25 - 10:15

*Cedar Suite*

### MORNING BREAK

20 minutes

### PARALLEL A

10:35 - 12:20

### LUNCH

12:30 - 13:30

*Accompanying persons  
are not catered for*

### PARALLEL B

13:40 - 15:25

### AFTERNOON BREAK

20 minutes

### PARALLEL C

15:45 - 17:30

### WELCOME RECEPTION AND CONFERENCE PHOTO

17:30 – 19:30

*Cedar Suite / Hotel Entrance  
For all Participants*

### A1 POSTER SESSION

18:30-19:30

*Partition wall between  
Cedar and Sycamore Suite*

## DAY 2

Wednesday, 8 July 2015

### PRINCIPAL LECTURES

8:30 - 9:20

*Beechwood Suite*

*Cedar Suite*

*Sycamore Suite*

### MORNING BREAK

20 minutes

### PARALLEL D

9:40 - 11:25

### LUNCH

11:30 - 12:30

*Accompanying persons  
are not catered for*

### A TRADITIONAL SCOTTISH OUTING

12:30 - 18:00

*Whisky tasting and Tours  
at Crathes Castle*

19:00 - 22:00

*Conference Dinner  
at Aberdeen's Beach  
Ballroom*

20:15 - 21:10

*Beating Retreat by  
Bucksburn Pipe Band*

*Bus transportation from and  
to the Hilton Treetops hotel  
will be provided.*

## DAY 3

Thursday, 9 July 2015

### PARALLEL E

8:30 - 10:15

### MORNING BREAK

20 minutes

### PARALLEL F

10:35 - 12:20

### LUNCH

12:30 - 13:30

*Accompanying persons  
are not catered for*

### PARALLEL G

13:40 - 15:25

### AFTERNOON BREAK

20 minutes

### CLOSING LECTURE

15:45 - 16:35

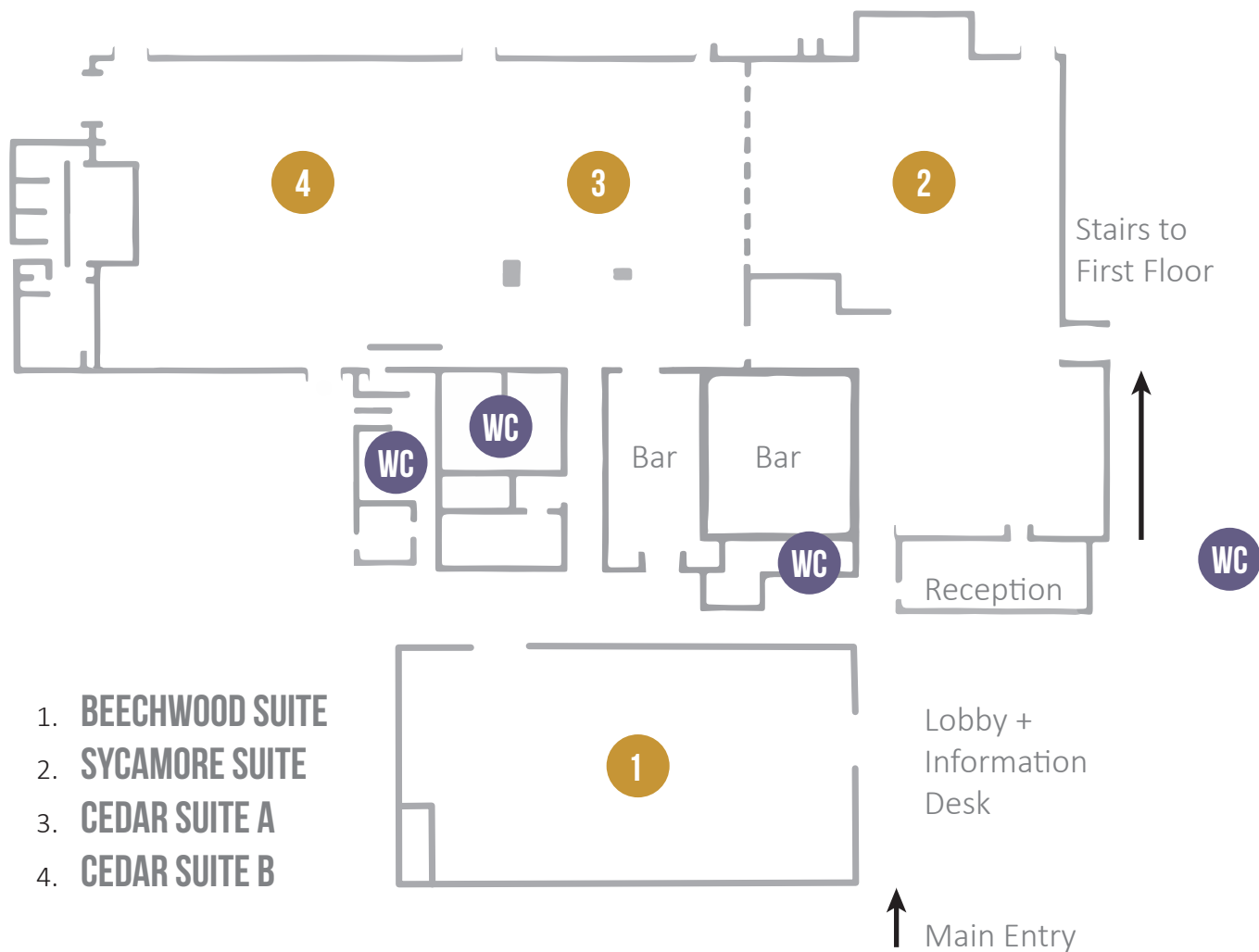
### CLOSING COMMENTS

16:35 - 16:45

*Beechwood Suite*

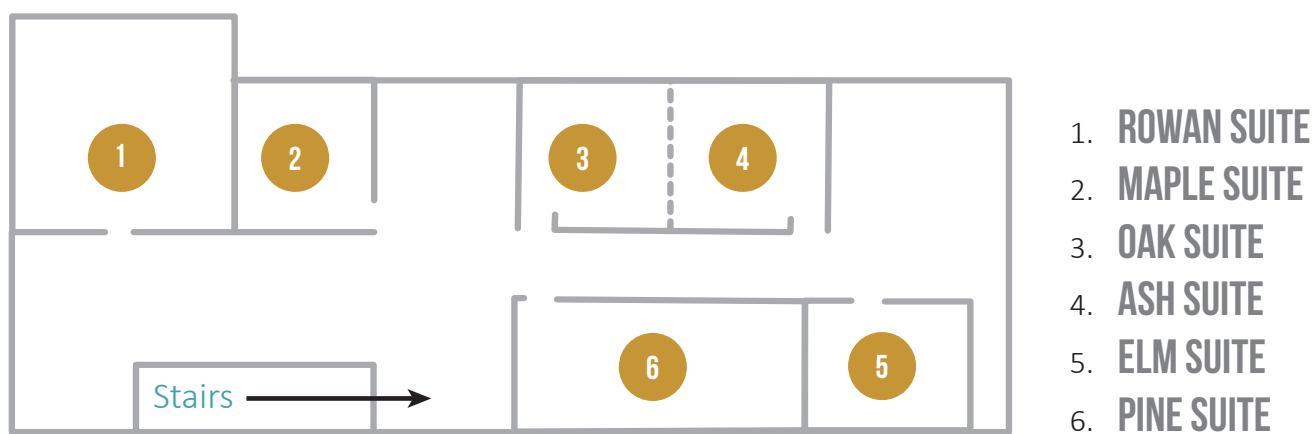
# VENUE MAP

Ground floor



# VENUE MAP

First floor



## OPENING PLENARY LECTURE

7 July 2015, 09:25 - 10:15, Cedar Suite



### *Challenges of Energy Transition*

#### Professor Dr Philippe A. Tanguy

Vice-President, International Scientific Development, Total, Berlin, Germany  
Fellow of the Academy of Engineering, Canada

*"The energy transition is the shift to transform the present energy system mainly based on depleting commodities into a more sustainable mix by means of the use of renewable energy sources, an increase of the energy efficiency, energy sobriety and greenhouse gas mitigation measures.*

*"The development of technological innovation in [energy] fields is central to the success of the energy paradigm shift. However, depending on the energy applications considered, the degree of technological maturity varies significantly, as well as the capacity for practical deployment. [This] presentation will provide a comparison of the strategy followed by several leading countries to make their energy system more sustainable and a glimpse of some key challenges to address in order to make the energy transition a success."*

## PRINCIPAL LECTURES



8th July 2015, 8:30 - 9:20, Sycamore Suite

### *Polymeric Membranes for Clean Water and Clean Energy*

#### Professor Neal Tai-Shung Chung

Department of Chemical & Biomolecular Engineering  
National University of Singapore, Singapore  
Fellow of the Academy of Engineering, Singapore

*"In this presentation, we will introduce our efforts on novel membrane development for clean water production and osmotic power generation, then highlight our recent development on functional membranes for biofuel separation, natural and hydrogen purification and separation.*

*"The osmotic power generation via the mixing of water streams with different salinities across a semipermeable pressure retarded osmosis (PRO) membrane will be our focus. If the osmotic power generator is integrated with the reverse osmosis (RO) plant using its retentate as the draw solution, not only are we able to mitigate the disposal issues of RO retentate, but also lower the overall energy consumption for RO plants. As a result, seawater desalination will be much cost-effective and this integration will entirely revolutionize the future desalination industry and energy production."*



8th July 2015, 8:30 - 9:20, Beechwood Suite

### *Toward Post Carbon Cities*

#### Professor Patrizia Lombardi

MILESECURE-2050 coordinator  
Interuniversity Department of Urban and Regional Studies and Planning,  
Politecnico di Torino, Turin, Italy

*"Cities are directly affected by climate change and energy challenges, accounting for about 67-76 % of energy use and 71-76 % of energy-related GHG emissions. Cities have an important role to play in implementing new energy technologies and in controlling the key levers to a successful transition to a post carbon society, including land and urban planning, public transport, social housing, hazard protection and water systems, green areas, urban heating, local mobility management and taxation."*

## PRINCIPAL LECTURES (CONT.)



8th July 2015, 8:30 - 9:20, Cedar Suite

*Marine Mammals and Tidal-stream Turbines: What Are the Issues of Concern and How Are They Being Resolved?*

Professor Ben Wilson

The University of the Highlands and Islands, Inverness, United Kingdom

*"The possibility that marine mammals will be injured by striking tidal-stream turbines or avoid them to the extent of excessive area exclusion are among the most pressing environmental consenting issues facing this emerging family of technologies...*

*Unfortunately, due to the inherent difficulties of studying marine mammal distribution and behaviour underwater as well as the novelty of the machines themselves, information upon which to base robust assessments of risk are extremely limited. [A] variety of research projects in multiple countries are underway to investigate different components of these questions."*

## CLOSING PLENARY LECTURE

9th July 2015, 15:45-16:35, Sycamore Suite



*Designing for Sustainability in Electronics - If Not Now, When?... And How?*

Joseph Fjelstad

Verdant Electronics, Seattle, Washington, United States

*"In 2014 population of the Earth crossed over the 7 billion mark. By 2020, barring a global catastrophe or pandemic, the number will be bumping up against 8 billion. "Life's love of itself" might well serve the poet's effort to explain the reasons behind this explosive growth, however a less poetic reason is because of the lack of education in developing nations. In fact it has been shown that there is an inverse relationship between education and birth rate and countries around the globe.*

*"Thus it is imperative that those in developed nations focus more attention on getting tools for education, which today typically means Internet devices and access to both them and the Internet. How might that be done? By making electronics with an eye to sustainability through improved reliability."*

## PROCEEDINGS

All presentation abstracts and speaker bios are available on our website.

[Http://www.nscj.co.uk](http://www.nscj.co.uk)

High quality papers will be selected for publication on the open access Journal of Energy Challenges and Mechanics,

<http://www.nscj.co.uk/JECM>

## THANK YOU

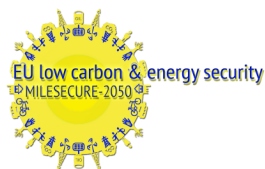
To all the organisers, committee members, speakers, volunteers, and vendors of the Third International Symposium on Energy Challenges and Mechanics: We thank you for your support! It is only through your dedication, commitment and tireless work that this conference could be a success.



## SESSION TOPICS

- 01:** Energy Efficiency
- 02:** Renewable Energy
- 03:** Energy, Development & Sustainability
- 06:** Safety and Integrity Management for Offshore Energy
- 07:** Energy and Environment
- 08:** Clean Energy
- 09:** Oil, Gas and Water Pipelines
- 10:** Bioenergy
- 11:** Nuclear Energy
- 12:** Future Europe (Milesecure-2050 special session)

*Note: Milesecure-2050 has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no. 32016.*



- 13:** Smart Grid
- 14:** Technology for Energy Applications
- 15:** Oil and Gas
- 16:** Energy Policy and Economy
- 17:** Microgrids and Distributed Power Generation
- 21:** Carbon Capture and Storage
- 23:** Electric Vehicles
- 25:** Geomechanics for Energy and the Environment

## ORGANISER & SCIENTIFIC COMMITTEE

### Organiser

North Sea Conference & Journal Ltd  
Aberdeen, Scotland, UK  
Emergency Contact Number: +44 (0)7898 700203

### Scientific Committee

Dr Henry Tan, School of Engineering, University of Aberdeen, UK

Dr. Ming Yang, Global Environment Facility, World Bank Group, USA

Prof. Patrizia Lombardi, Politecnico and Università di Torino, Italy

Dr. Ben Amaba, IBM, USA

Dr. Gerasimos Rigatos, Industrial Systems Institute, Greece

Dr. Anupam Sanyal, International Environmental & Energy Consultants, Inc., USA

Mr. Moty Kuperberg, NRGPrice: the Energy Security Agency, Israel

Prof. Lakshmi N Reddi, Florida International University, USA

Prof. Hai Guo, The Hong Kong Polytechnic University, China

Dr. Geoffrey Thyne, ESaI, LLC, USA

Dr. Shengke Zhi, AMEC, UK

Prof. Dianne Rahm, Texas State University, USA

Mr. Paolo Finocchiaro, Istituto Nazionale di Fisica Nucleare, Italy

Mr. James Pettigrew, Ocean Energy Safety Institute, Texas A&M University, USA

Prof. Abraham Kribus, Tel Aviv University, Israel

Dr. Naoum Jamous, Otto-von-Guericke University Magdeburg, Germany

Prof. Simone-Pront van Bommel, Amsterdam Centre for Energy, University of Amsterdam, The Netherlands



## Research Image Competition

Winner of the ISECM 2015 Research Image Competition

Author(s): Concept by Daryl DeJean, Executive Vice President

Graphic representation by Markia Maye

This image is the property of: Resource Productivity Associates,  
United States