

Operational Plant Optimisation & New Technology/ Projects

25 November - Afternoon Workshop
26 & 27 November 2019 - Conference

The Woodlands Event Centre
Wyboston Lakes
Wyboston
Bedfordshire
MK44 3AL
UK



ABOUT THE IDGTE CONFERENCE

Since the IDGTE International Gas Turbine conference was first introduced 20 years ago, IDGTE has successfully run this biennial event with top quality international speakers bringing the very latest developments in gas turbine technology and operations. The 2019 event is being held at the first class conference facility at Wyboston Lakes and is set to deliver an excellent technical programme, providing a great networking event. The theme for this year's conference is "*Operational Plan Optimisation & New Technology/Projects*".

THE BACKGROUND

Whilst the growth of renewables generation has become the major focus of attention with the power generation industry of recent years and this has impacted the demand for thermal generation, it is important to remember that power generation using conventional gas turbines is still highly relevant in all future energy scenarios due to the intermittency of renewables and the need for the electrical infrastructure utilised in all countries to be supported by synchronous machines providing inertia to stabilise and maintain grid conditions.

The introduction of highly competitive capacity markets across Europe (and especially in the UK) have also seen a large number of large scale, efficient combined cycle gas turbine (CCGT) development projects ready for construction being unable to secure the investment required to construct. Such new CCGT plants are highly flexible, less carbon intensive and offer higher efficiencies than any other thermal plants in operation. This is exactly what is needed to meet the future needs for more sustainable generation and the flexibility to accommodate large levels of non-synchronous renewable generation to be utilised.

This conference will explore (i) the approaches that existing generators of gas turbine plant are using to optimise their operations to meet the challenges faced by the current and future market conditions; (ii) the way in which gas turbine OEMs are preparing to meet the current and future requirements of the global power industry, and (iii) innovations across the industry to deliver new projects and meet global sustainability targets.

Presenters will share their experience and provide the ideal forum for networking. If you or your company has an interest in gas turbine technology, combined cycle power generation or energy industry challenges, then this is the place to be this November. Register as a delegate and join with others in the industry for this unique and prestigious event.

CONFERENCE WORKSHOP

Monday 25 November

13:00 Registration

13.30 Conference Workshop

There will be highly interactive workshop sessions, each facilitated by industry professionals. At our previous conferences we have found these sessions to be stimulating, with excellent interactive discussions bringing in a dynamic element as an important part of the conference. Presenting the material in open discussion style allows the presenters and delegates to check understanding, viewpoints and assess different operational needs and weigh different points of view in a less formal and extremely productive setting.

16.30 Close

19:00 Informal Dinner

CONFERENCE DAY 1

Tuesday 26 November

08:30 **Exhibition open.**

09:15 **Institution Welcome by the President and Day 1 Chairman**

09:30 Keynote Speaker

Paul Verrill - EnAppSys

Changing role of gas fired generation in Europe power markets

The presentation will give a brief overview of current generation fuel mix in Ireland, GB and Mainland Europe and then look in detail at how the generation pattern of existing gas fired generation has changed and how new flexible generation assets are being used around demand peaks and low renewable production periods. To give commercial context an overview of market prices and volatility including the effect of capacity market payment mechanisms will be presented along with how the growth of the provision of grid services is a significant part of the revenue of gas fired generation. A final overview of what the future fuel mix could look like and how gas fired generation can continue to play a part in meeting zero carbon targets and enabling the transition.

10:10 Paper 1

Hassan Joudi - WSP

Replanting of King's Lynn Power Station

The King's Lynn CCGT Replant project during 2017-18 included the replacement of a Siemens V94.3 gas turbine with two silo-type combustors, with a new Siemens SGT5-4000F gas turbine with annular combustor. With the original plant designed for baseload operation, the replant project objectives included improving the plant's flexibility, efficiency and reliability to enable reliable two-shifting operation to better meet the changing demands of the UK electricity market, whilst also giving a further 15-20 year's life extension and reducing the plant's environmental emissions, with the capital investment significantly lower than an equivalent new build plant of the same capacity.

WSP, in collaboration with Centrica, and with the support of the OEM Siemens, carried out an assessment of the feasibility of the project by comparing original vs post-replant performance based on intended future operating regime and process conditions. Required modifications and refurbishments work scopes to neighbouring plant and equipment, in particular the steam turbine, generator and Heat Recovery Steam Generator (HRSG), were also performed based on a risk-based and value engineering approach. The result is a plant which has significantly shorter start-up (cold, warm, hot) and shutdown times and higher load ramp rates in a wider load range.

10:50 **Coffee/tea break**

11:10 **Exhibitor Session:** Each exhibitor will give a short presentation to the conference.

12:00 Paper 2

Terry Raddings, Business Development Manager - GE Power, UK and Jeffrey Goldmeer, Director, GT Combustion & Fuels Solutions - GE Power, USA

Examination of carbon-neutral fuels for utility-scale power generation

Global interest in reducing or eliminating carbon emissions from the power generation industry continues to grow. A key point in reaching this goal is to maintain stable power grids which requires dispatchable generation assets, leading to the discussion of balancing renewables and the use existing power generation assets with carbon free or carbon neutral fuels. By shifting from conventional fossil fuels to carbon free or carbon neutral fuels, such as biofuels or hydrogen, it may be possible to reduce or eliminate carbon emissions from the power generation industry while using existing fuel supply and electricity distribution infrastructure installed and developed over many decades.

Biofuels are a broad category that represents a wide variety of renewable fuels, some of which may be carbon neutral. One category of carbon neutral biofuels is biomethane, also known as synthetic natural gas or renewable natural gas (RNG). Depending on the source, some biomethanes can have the advantage of being similar to traditional, fossil based natural gas as their composition may be 80-90% (by volume) methane. This could yield a fuel with

characteristics very similar to, if not the same as natural gas or LNG, allowing for a simple transition to this class of fuel.

Hydrogen, which can be produced from fossil fuels (reforming natural gas; gasification of coal) or via electrolysis of water, is also a viable gas turbine fuel. Although there are significant chemical and physical differences between hydrogen and natural gas, the use of hydrogen in gas turbine combustion systems has been demonstrated both in the lab and field. To date, GE has more than 4.5 million hours of operation on hydrogen and other low heating value fuels. In addition, as ammonia is combustible, it is also being considered as a carbon-free fuel for use in power generation. However, the use of ammonia will have special challenges due to the level of fuel bound nitrogen, lower chemical reactivity, as well as safety issues associated with toxicity.

This paper and presentation will examine the use of these fuels in gas turbines as part of a reduced or zero carbon energy ecosystem. Special attention will be paid to specific advantages or disadvantages related to use in gas turbines, as well as the impact of converting existing gas turbines (i.e. Frame 9 gas turbines) to operation on these fuels.

12:40 **Lunch**

14:00 Paper 3

Ian Macafee - Oxensis Ltd

Advanced Performance Monitoring in Combined Cycle Power Plants

The increasing demands made on lower emissions, fuel and load flexible combustion systems continue to challenge engine architectures and instrumentation systems. Direct mount high temperature combustion stability sensors are needed, and these are being integrated into gas turbine control systems, to allow machines to reliably operate Dry Low Emissions (DLE) systems within progressively tightening standards. Some engine OEMs and customers wish to move away from waveguide (indirect) measurement systems.

14:40 Paper 4

Dr Thorsten Osterhage - Ansaldo Energia

Ansaldo Energia GT technology supporting the energy change

The decarbonization energy sector is the ongoing challenge of the future. The integration of the additional renewable capacity will increase the requirements on the flexibility of the remaining gas plants to support grid stability.

On the one hand highly efficient Combined Cycle plants continue to play an important role. To fulfill their load balancing role, also very large gas turbines have to provide maximum operational flexibility already today. On the other hand reserve capacity has to be added. As these plants will not operate for long periods, open cycle plants with low specific cost but high availability and flexibility are the preferred solution.

Renewable overproduction can be used to produce hydrogen by electrolysis. This fuel can be used to substitute methane and to reduce the CO₂ footprint even further.

Ansaldo Energia supports the energy change with its products, offering outstanding operational flexibility and fuel flexibility in H- and F-class for combined cycle and open cycle projects. These features are highlighted by the example of the recently awarded projects Marghera Levante, the most efficient plant in Europe, and the German peaker projects.

15:20 **Coffee/tea break**

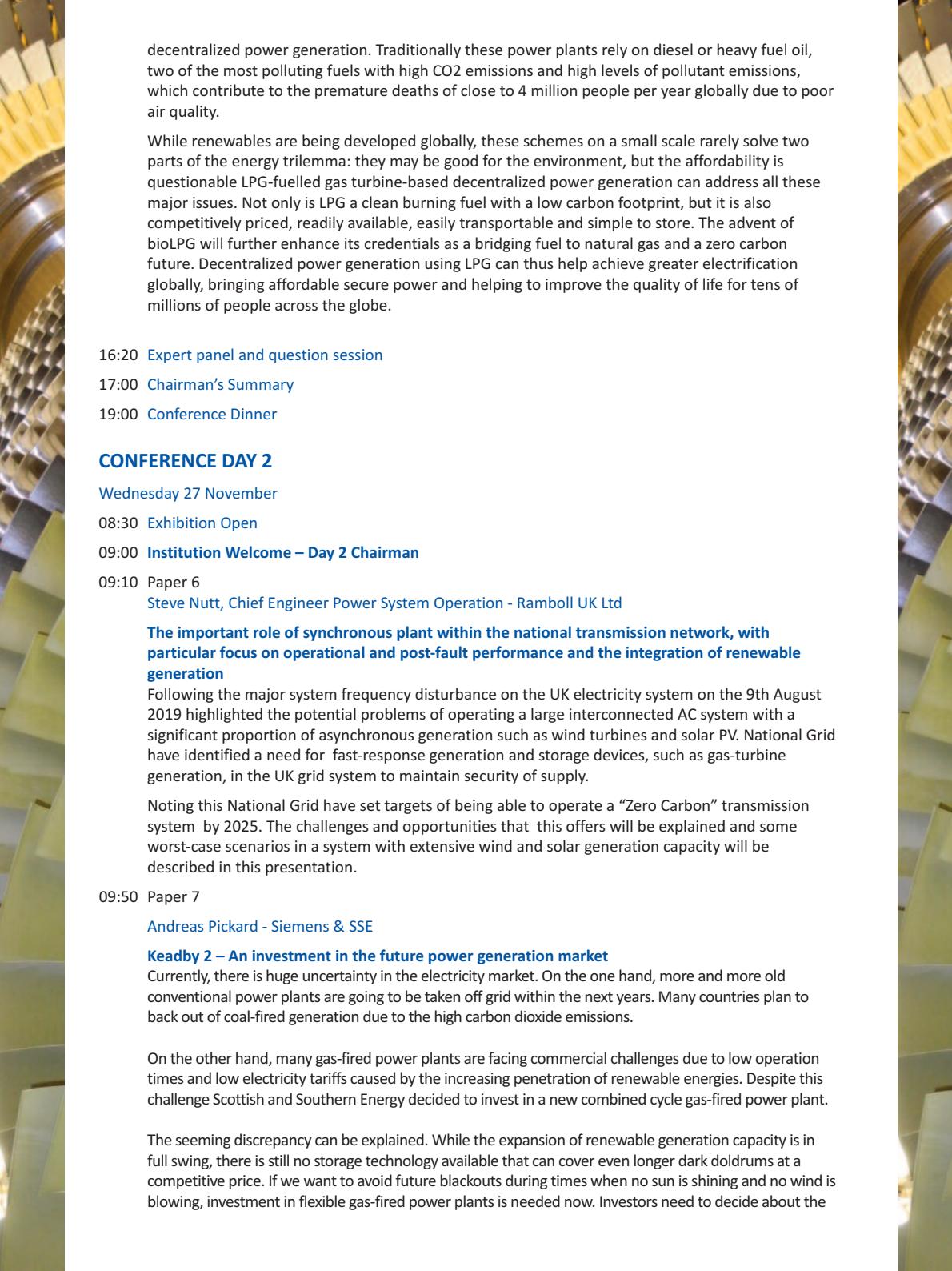
15:40 Paper 5

Michael Welch - Siemens

The benefits of LPG as the fuel for decentralised power generation

While Western Europe and parts of North America concentrate on deep decarbonization and net zero carbon emissions from power generation by 2050 or earlier, much of the rest of the world faces a different problem: access to secure, affordable electricity.

In the modern world, electricity is essential for economic growth and for improving the quality of life. With limited or no grid infrastructures in many places – and over 1 billion people still without access to any electricity – islands, rural towns and cities and related industries have relied on their own



decentralized power generation. Traditionally these power plants rely on diesel or heavy fuel oil, two of the most polluting fuels with high CO₂ emissions and high levels of pollutant emissions, which contribute to the premature deaths of close to 4 million people per year globally due to poor air quality.

While renewables are being developed globally, these schemes on a small scale rarely solve two parts of the energy trilemma: they may be good for the environment, but the affordability is questionable. LPG-fuelled gas turbine-based decentralized power generation can address all these major issues. Not only is LPG a clean burning fuel with a low carbon footprint, but it is also competitively priced, readily available, easily transportable and simple to store. The advent of bioLPG will further enhance its credentials as a bridging fuel to natural gas and a zero carbon future. Decentralized power generation using LPG can thus help achieve greater electrification globally, bringing affordable secure power and helping to improve the quality of life for tens of millions of people across the globe.

16:20 Expert panel and question session

17:00 Chairman's Summary

19:00 Conference Dinner

CONFERENCE DAY 2

Wednesday 27 November

08:30 Exhibition Open

09:00 Institution Welcome – Day 2 Chairman

09:10 Paper 6

Steve Nutt, Chief Engineer Power System Operation - Ramboll UK Ltd

The important role of synchronous plant within the national transmission network, with particular focus on operational and post-fault performance and the integration of renewable generation

Following the major system frequency disturbance on the UK electricity system on the 9th August 2019 highlighted the potential problems of operating a large interconnected AC system with a significant proportion of asynchronous generation such as wind turbines and solar PV. National Grid have identified a need for fast-response generation and storage devices, such as gas-turbine generation, in the UK grid system to maintain security of supply.

Noting this National Grid have set targets of being able to operate a “Zero Carbon” transmission system by 2025. The challenges and opportunities that this offers will be explained and some worst-case scenarios in a system with extensive wind and solar generation capacity will be described in this presentation.

09:50 Paper 7

Andreas Pickard - Siemens & SSE

Keadby 2 – An investment in the future power generation market

Currently, there is huge uncertainty in the electricity market. On the one hand, more and more old conventional power plants are going to be taken off grid within the next years. Many countries plan to back out of coal-fired generation due to the high carbon dioxide emissions.

On the other hand, many gas-fired power plants are facing commercial challenges due to low operation times and low electricity tariffs caused by the increasing penetration of renewable energies. Despite this challenge Scottish and Southern Energy decided to invest in a new combined cycle gas-fired power plant.

The seeming discrepancy can be explained. While the expansion of renewable generation capacity is in full swing, there is still no storage technology available that can cover even longer dark doldrums at a competitive price. If we want to avoid future blackouts during times when no sun is shining and no wind is blowing, investment in flexible gas-fired power plants is needed now. Investors need to decide about the

right technology that can help them to maximize revenues from both energy and capacity markets. This paper will present the project Keadby including SSE's reasons to invest in a HL-Class combined cycle power plant and the technology that makes it one of Europe's most efficient plants.

10:30 Coffee/tea break

10:50 Paper 8

Gianluca de Arcangelis - TT (Europe) Ltd
GT Air filters at Keadby 2 and Spalding OCGT

Latest developments are well summarised in the following 2 points:

- GT OEMs and the Market have now fully recognised the problem of water leaching through filters. As a result, new water test specifications have emerged by GT OEMs - some complex and costly to test, others simple yet still effective - and new ISO specifications are in progress: ISO:29461-5 and ISO:29461-7. These specifications challenge air filters - whether coalesces, pre-filters, fine filters or EPA filters - with water and also with water and salt. In this presentation the key specification requirements are summarised including the use of test videos.
- Furthermore, super-high-capacity EPA filters have now been introduced in the market. These are very large filters containing up to 125m² of media per m² of face ingress. The presentation provides details of these filters and explains the main advantages - which include water resistance, as well as providing references of implementation in power stations, smaller CHP plants and also offshore installations.

11:30 Paper 9

Marcus H Scholz - GE Gas Power
9HA.02 High efficiency gas turbine validation – the world's largest in operation

Following the introduction of the 7 & 9HA Gas Turbines in 2014, with the first 9HA.01 on the full load test facility, over 39 x 7&9HA Gas Turbines have achieved commercial operation with the fleet leader exceeding 20,000 hours.

The successful validation concept was repeated on the first 7HA.01 and subsequently on the first 7HA.02 to continue learning from innovative concepts that would be applied across the HA product family at some stage.

In today's environment, technology enhancements due to design methods and additive manufacturing are more often being applied to the latest generation of high efficient gas turbines, therefore further validation is highly appreciated and was made possible on the 9HA.02 Full Speed Full Load (FSFL) test, that has taken place this summer.

As with the previous Gas Turbine validation, also here, a rigorous test plan allows for characterization, well beyond any field and site testing capability, that provides insights on performance, reliability and life cycle assessment of latest components and materials.

This paper will discuss the validation process and results through providing snapshot of the full load testing of the world's largest 9HA.02 gas turbine, rated at 575MW.

11:10 Expert panel and question session

12:40 Lunch

14:00 Paper 10

Burak Kaplan - MHI

The introduction of hydrogen energy is an effective option to obtain sustainable development of economic activity while helping prevent global warming

The Mitsubishi Heavy Industries Ltd. (MHI) Group is promoting research and development of a large gas turbine with hydrogen and natural gas co-firing capabilities. This effort is supported by the New Energy and Industrial Technology Development Organization (NEDO).

With a newly developed combustor, a 30% (vol) of hydrogen co-firing test has been successfully completed. This co-firing capability results in a reduction in carbon dioxide (CO₂) emissions of 10% when compared to conventional natural gas thermal power plant.

Alex Silin - Highview Power

Growing demand, changing consumption and increasing volumes of intermittent generation capacity mean that the global energy market is under pressure to find an affordable, scalable energy storage solution that can store electricity for many hours – even days

Highview Power's CRYOBattery delivers, clean, reliable, and cost-efficient long-duration energy storage to enable a 100% renewable energy future. The paper will discuss the technology and its operation across a range of market applications

15:20 Chairman's summary and conference closing remark

15:30 Conference Close

CONFERENCE PRICE

Delegate	£550 + VAT
IDGTE Member Delegate	£470 + VAT
Student*	£120 + VAT

*discount does not apply to Student fee



BOOKING

A booking form is also available from our website www.idgte.org Or, alternatively, email enquiries@idgte.org or call Christine/Sandra on 01234 214340.

ACCOMMODATION

B&B accommodation at The Woodlands Event Centre should be booked direct by phoning Wyboston Lakes Reservations on 01480 479300 or emailing reservations@wybostonlakes.co.uk, quoting reference PB25779A92LN25785 - £85.00 + VAT (single occupancy).

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- Siemens Industrial Turbomachinery Ltd
- TT (Europe) Ltd
- WSP

10th IDGTE International Gas Turbine Conference

The Woodlands Event Centre, Wyboston Lakes, St Neots MK44 3AL

26 & 27 November 2019

I wish to:

- | | |
|--|--------------------|
| <input type="checkbox"/> Register as a Delegate | Rate £550.00 + VAT |
| <input type="checkbox"/> Register as a Delegate (IDGTE member) | Rate £470.00 + VAT |

The delegate rate is per person and includes half-day pre-conference workshop, two-day conference, tea/coffee at breaks, two lunches and evening meal on the 26th. Single day delegate rates are available on request.

I wish to attend the pre-conference workshop (25 November) Yes No

Accommodation

B&B accommodation at the Woodlands Event Centre should be booked direct by phoning Wyboston Lakes Reservations on 01480 479300 or emailing reservations@wybostonlakes.co.uk, quoting reference PB25779A92LN25785 - £85.00 + VAT per night (single occupancy).

There are twelve places available for Student Delegates. Each registered Student Delegate will be given a one year free membership of the IDGTE.

- | | |
|---|--------------------------------|
| <input type="checkbox"/> Register as a Student Delegate | £120.00 + VAT |
| <input type="checkbox"/> Evening meal required for 26 November | Rate £25.00 + VAT Total £30.00 |
| <input type="checkbox"/> My company is interested in SPONSORING the conference, please send me more information. | |
| <input type="checkbox"/> My company is interested in EXHIBITING at the conference, please send me more information. | |

Registration Form

Mr/Mrs/Ms:	First Name:	Surname:
Job Title:		
Company Name:		
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Special Requirements (if any):		

Easy Ways to Pay

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| <input type="checkbox"/> Cheque. Enclosed is our cheque made payable to The Institution of Diesel and Gas Turbine Engineers. |
| <input type="checkbox"/> Please invoice quoting reference |
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| <input type="checkbox"/> Bank transfer payable to The Institution of Diesel and Gas Turbine Engineers to:
National Westminster Bank plc, Bedford, UK. Sort Code: 60 02 13 Account Number: 51275368 |

Conditions

No refunds shall be issued for cancellations received after 31 October 2019. However, a substitute delegate may attend in your place.

Disclaimer

The IDGTE is endeavouring to meet the needs of the industry by transfer of knowledge from presenters to delegates registered for the event. A condition of registration is that the IDGTE, or presenters, cannot be held responsible for the information provided, changes to the advertised information, or for the services provided by the hotel.

Venue Details

The Woodlands Event Centre, Wyboston Lakes, Great North Road, Wyboston, Bedfordshire MK44 3AR
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