MGT in the European Energy Scenario

18 March 2016, ETN office, Brussels

Attendees:

Luc Prieels	ACTE
Jori Sihvonen	AEBIOM
Enrico Bianchi	Ansaldo Energia
Michel Dubuisson	Bosal
Abdulnaser Sayma	City University London
Roberto Francia	COGEN
Mikael Swanteson	Compower
Hamidreza Darabkhani	Cranfield University
Ignacio Lescano	ETN
Ugo Simeoni	ETN
André Mom	ETN
Christer Björkqvist	ETN
Dominique Cornut	ETN
Kyriakos Maniatis	European Commission DG Energy
Andreea Strachinescu	European Commission DG Energy
Piero de Bonis	European Commission DG Research
Peter Breuhaus	IRIS
Willy Ahout	MTT
Federico Cernuschi	RSE
Luca Ratto	UNIGE
Giovanni Cerri	University Roma TRE

1. Welcome and Introduction

C. Björkqvist opened the meeting and welcomed all the participants. He thanked the participants for their attendance and highlighted the importance of gathering all the stakeholders around the same table, which is evidence of the interest from all parties on this technology.

C. Björkqvist stated that the main objective of the meeting is to highlight and discuss how Micro Gas Turbine (MGT) technology in a system approach with RES could contribute to the decarbonisation of the energy system.

2. SET-Plan remarks: presentation by Andreea Strachinescu, Head of Unit New energy technologies, innovation and clean coal, European Commission

A. Strachinescu presented the Strategic Energy Technology (SET) Plan, which defines the new European Research & Innovation (R&I) Strategy for the EU for the coming years. She mentioned that from the 30th of November to the 2nd of December 2016, a SET plan conference will take place.

A. Strachinescu then presented the new European Technology and Innovation Platform (ETIP) that will integrate the current smartgrid ETP and the SET Plan European Electricity Grids Initiative (EEGI). A. Strachinescu stated that the ETIP platform is planned to be announced the last week in March. However, the Terms of reference will only be made public by the end of May.

A. Strachinescu also introduced the European Energy Research Alliance (EERA) group that promotes a coordinated energy research for a low carbon Europe. She explained that 18 projects from H2020 were selected to participate in this network. C. Björkqvist asked if ETN could join the network without having a project. A. Strachinescu replied that up to now it has been a condition to have a H2020 project to be part of EERA but she would verify internally if ETN could join as it has an ongoing FP7 project?

R. Francia asked about the representation of flexible technologies in the new ETIP. A. Strachinescu replied that the flexible technologies will be included in the platform and that they should always be open to integrate new actors.

H. Darabkhani asked about CCS (Carbon Capture and Storage) technologies. He was interested to know if there are any studies regarding the affordability for EU 2050 targets to be met with or without CCS. He mentioned that this was done for the UK scenario and it was determined that CCS would be the most cost efficient solution. He asked why CCS isn't a priority in EU.

A. Strachinescu replied that there is an ongoing debate at high level in the European Commission and that the main issue is that there is no proper demonstration of the technology going on. She highlighted however that a lot of funding has been dedicated to address CCS. She concluded that a definitive answer cannot be given because there is still a political decision to be made.

K. Maniatis added that CCS doesn't seem to be the best solution and that CCU (Carbon Capture and Usage) might be a better solution as it would boost industry participation.

3. **MGT Policy recommendations:** presentation by André Mom, President Emeritus, ETN

A. Mom presented how MGT could contribute to achieve the EU 2030 targets being a technology suitable to be integrated with renewable energy sources.

K. Maniatis pointed out that microturbines can indeed operate with gas and liquid fuels, but he highlighted that those have to be clean fuels. He stated that if the fuel has to be cleaned, it loses a lot of efficiency in electricity which can result in that and the technology is no longer economically viable.

W. Ahout replied that this point is true for all conversion technologies, not only microturbines. However, he added that gas turbine can handle less clean renewable fuels.

A. Mom pointed out that Internal Combustion Engines (ICE) can also not handle particulates. He explained that the composition variation allowed in a gas turbine enables them to do much more than other technologies.

4. **MGT vision for the future and expected impacts:** presentation by Enrico Bianchi, Head of Unit Microturbine Business, Ansaldo Energia

E. Bianchi mentioned in his presentation the latest MGT project funded by the US Department of Energy (DoE) *"High Efficiency Microturbine With Integral Heat Recovery"*) and pointed out that it would entail a 59% reduction in CO_2 and 95% reduction in NOx. H. Darabkhani asked if these reductions were the result of the use of biofuels. E. Bianchi replied that it is just a direct consequence of increasing the electrical efficiency up to 42%.

5. **Deployment of Micro-CHP in the European Energy Framework:** presentation by Roberto Francia, Managing Director, COGEN

R. Francia presented the deployment of micro-CHP in Europe. He highlighted how Micro-CHP saves more than 25% of primary energy if compared to centralized power generation.

J. Sihvonen asked about the share of gas-fired and the share of biomass-fired CHP. R. Francia replied that about 95% of the CHP are gas-fired.

A. Mom pointed out that as CHP has to be available 24 hours a day, there is a need for constant supply of fuel. R. Francia agreed that this is a key issue for biomass-fired CHP.

A. Sayma asked if there is any Research & Development done within COGEN. R. Francia replied that COGEN does not get engaged in R&D, it is essentially a network focusing on Energy policy and legislation as well as for sharing best practices.

6. **State of the art and potential improvements of MGT for Micro-CHP:** presentation by Mikael Swanteson, CTO, Compower

M. Swanteson presented the state of the art of MGT technology and potentials improvements that could be carried out to allow a higher deployment of the technology in distributed power generation applications.

A. Sayma pointed out that investment has been dedicated to ceramic material but they are still not used in the MGT manufacturing. W. Ahout added that currently there are no ceramic turbochargers in the field, they are only available in labs and can only run for a few hundred hours.

G. Cerri highlighted that the firing temperature of the MGT (and therefore the efficiency), could be increased cooling the hot gas path components. However this would require additional investments.

A. Mom asked whether we could have access to what the military industry is doing related to materials. A. Sayma replied that most of the information is public domain; he added that increasing the pressure ratio implies increasing the speed and therefore the stress on the moving parts up to a point that ceramic materials are still not able to withstand. F. Cernuschi also added that ceramic materials are less adaptable to a MGT running with flu gases.

M. Swanteson stated that one of the challenges for the MGT is to lower the cost of the recuperator; he also gave an overview of how this component is affecting the MGT CAPEX.
L. Prieels pointed out that in the recuperator industry they do not talk about price per kg but price per surface. He also suggested to always associate the price to the volume of production when talking about automotive industry, as significant cost reduction is achieve solely by reduced manufacturing costs as a result of large volume productions.

7. **State of the art of Biomass technologies for distributed power generation applications:** presentation by Jori Sihvonen, Bionergy Expert, AEBIOM

J. Sihvonen presented the state of the art of biomass technologies for distributed power generation applications.

U. Simeoni asked the technical experts if specific input and feedback could be given from the community regarding the required R&D activities for microturbine technology development that could be used to update the “Common Implementation Roadmap for Renewable Heating and Cooling Technologies”.

J. Sihvonen agreed to share with ETN the Biomass technology roadmap issued by the Renewable Heating and Cooling Platform.

8. **Technology challenges for biomass MGT applications:** presentation by Hamidreza Darabkhani, Academic fellow of Energy Processes, Cranfield University

H. Darabkhani presented the main technology challenges for biomass MGT applications.

M. Swanteson asked about the high price stated for an ICE (5600£/Kwe). H. Darabkhani explained that typically ICE are cheaper than microturbine, however, the study that he presented only related for very small machines, and within that scale it has been observed that ICE cost rise significantly.

A. Mom asked what would be the price for a Capstone microturbine. E. Bianchi replied that it is around 1,500€/KWe for the micro gas turbine and certain auxiliary systems for an output of around 100 kWe. He added that for ICE, the price would be around 1,000 €/KWe.

A. Mom asked about lower ranges, around 50 KWe. He suggested that the price difference should get narrower as ICE engines are more expensive towards that range. H. Darabkhani agreed.

H. Darabkhani asked if there are in EU national schemes for micro CHP burning biomass similar to those available in the UK. J. Sihvonen replied that these exist, but they are not as generous as in the UK.

9. OMSoP report - Technology challenges to integrate Solar with MGT: presentation by Abdulnaser Sayma, Professor of Energy Engineering, City University

A. Sayma presented the OMSoP (Optimised Microturbine Solar Power system) project funded under the European Union's 7th Framework Programme for Research & Technical Development. He stated that the components are being tested separately and a system demonstration test will be carried out at the end of the project. So far the technology shows potentialities to be used in renewable decentralized power generation even if further improvements are needed.

A. Sayma also described the Organic Rankine Cycle (ORC) integrated with Concentrated Solar Power (CSP) as bulky systems operating at lower temperatures than Micro Gas Turbines and not commercially available for low output powers (below 50 KWe). G. Cerri pointed out that his experience with ORC turbines is that none of them were obtaining more than 65% of their rated power and some of the operators weren't even conducting the appropriate repair and maintenance as they were not expecting the get a return on their investment.

10. Conclusions and next steps

U. Simeoni described the European Union Sustainable Energy Week (EUSEW) 2016 which will take place between the 13th and 17th of June. He invited the organisations to join the event in order to promote the potentialities of the MGTs integrated with RES. Also, He explained that ETN has submitted a proposal for a policy session in cooperation with AEBIOM and COGEN. The session "Micro Gas Turbine: A sustainable technology towards a decarbonised energy production" aims to raise awareness, present and evaluate current technology development and future opportunities for the reliable and environmentally-friendly combined generation of heating/cooling and power based on the MGT technology integrated

with Solar and Biomass energy sources, given the current climate and energy policies mentioned above. ETN should get an official answer from the EC by the mid of April. U. Simeoni also stated that to be considered as stakeholder in the SET Plan, ETN should submit comments or position papers for the following actions:

- Actions 1 and 2: No 1 in renewables – Solar thermal electricity
- Actions 3 and 4: The future smart EU energy system, with the consumer at the centre – Energy Systems
- Actions 5 and 6: Efficient Energy Systems – Energy Efficiency in Buildings

U. Simeoni pointed out that comments for the action 5 have already been submitted in collaboration with COGEN. The document is available for consultation on the ETN MGT webpage.

C. Björkqvist added that the main purpose is to show and raise awareness that micro gas turbine is not just an important transition technology but could also be integrated with renewable energy play an important role in decarbonized energy scenario.

The ETN office will coordinate the completion of the MGT Technology Summary with the help of the working groups and the EU organisations that could provide input. It was agreed that ETN should participate in the upcoming SET plan meetings and be part of the European Technology Platforms of relevance, in order to represent the MGT community.

Annex I: Action list

Action Owner	Description	Deadline date
ETN	To upload the infographic and presentations to the ETN website	29 March 2016
G. Cerri	To draft a short paragraph for the action 4 of the SET Plan	5 April 2016
A. Sayma	To draft a short paragraph for the action 1and 2 of the SET Plan	5 April 2016
ETN	To collect comments for the action 1,2 and 4 of the SET Plan	8 April 2016
ETN	To organize the ensuing actions to complete the MGT technology summary.	4 April 2016