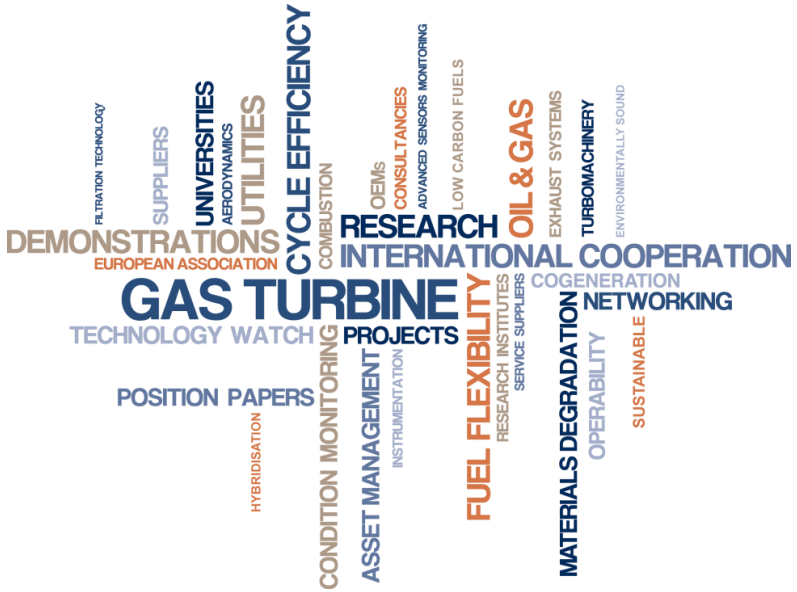
EUROPEAN TURBINE NETWORK

A European Platform for Gas Turbine Technology Development and Cooperation



Micro Gas Turbines Policy Considerations

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Brussels, 18 March 2016

Micro Gas Turbines

Hot topic in the energy world!

Is not everything addressed already!?

Why no major breakthrough?

- Competition to
  - cheap, large, fossil fuel fired power generation
  - subsidized renewables
- Price of MGT too high – not competitive now to ICE
- Emission requirements – no game changer yet
- Electric efficiency to be improved

- Technology was too early

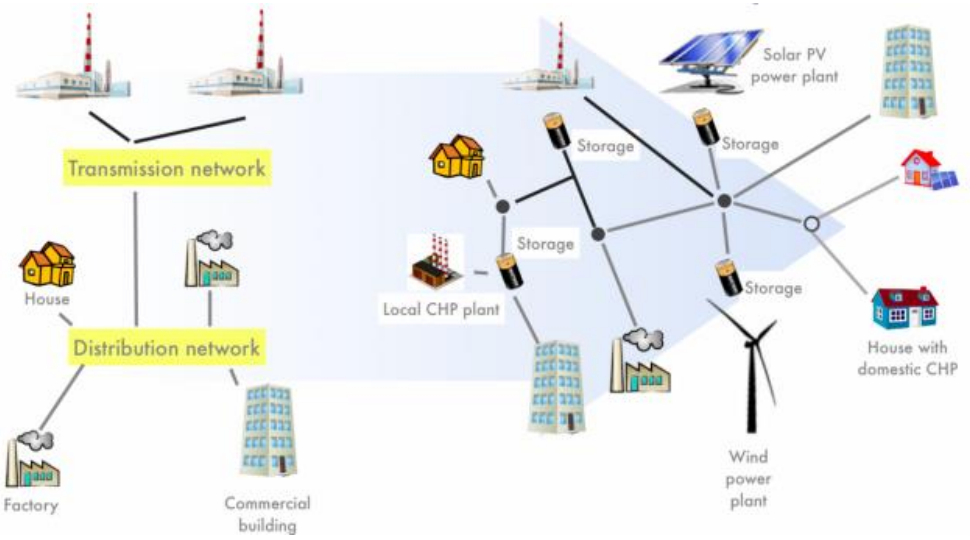
- Competitive in niche markets
- Very Competitive when versatility is required

- Current market changes, especially regarding renewables, lead to opportunities

EU energy system

Centralised Power Generation

Decentralised Power Generation



- Incorporates micro turbines, wind turbines, photovoltaic systems, fuel cells, energy storage to supply power to distributed systems connected close to the consumers load
- Energy production is on-site
- Requires no major transportation and conversion losses
- End consumer is provided with heat, in addition to electricity
- The process is more efficient, economical and environment friendly

MGT in Decentralised Power Generation

- **In the short term**

  Integration of RES into the energy system
  - MGT can absorb the fluctuations of the RES
  - By using natural gas, biogas, industry waste gas, landfill gas

- **In the long term**

  Decarbonisation of the energy system and full deployment of RES
  - Hybrid MGT applications can assure high utilisation of RES
  - Ensure security of energy supply thanks to the use of natural gas / other gas if needed

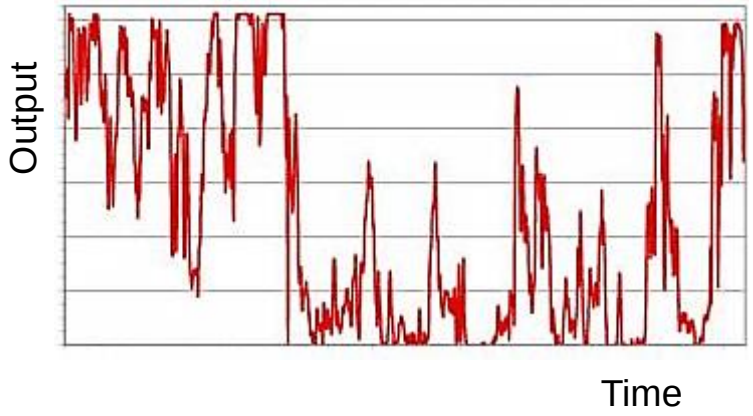
Role of the MGT
* Decentralised Energy System
* with Increasing Renewable Share

MGT technology can provide contribution to EU policy targets on renewables

MGT technology can provide contribution to EU policy targets on renewables (1)

Output is **fluctuating**	Output is **uncertain**	Resources are **location-specific**

Increased deployment of intermittent, **non-dispatchable renewables** leads to large fluctuations in electricity supply.



Back up capacity is required

- 'Simple' Technology to fill gaps / flatten output
- Hybrid technologies

MGT technology can provide contribution to EU policy targets on renewables (2)

Input is **fluctuating**

Input is **uncertain**

Resources are **location-specific**

Resources are often **smaller amount**

Conversion

Large variation in gas / liquid composition

Technology required able to handle

- Liquids &
- Gases

with variable composition

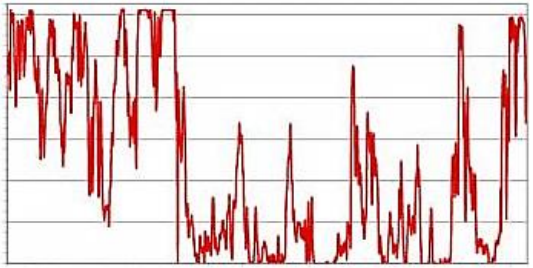
MGT technology can provide contribution to EU policy targets on renewables (3)

Input is **fluctuating**

Input is **uncertain**

Resources are **location-specific**

Resources are often **smaller amount**

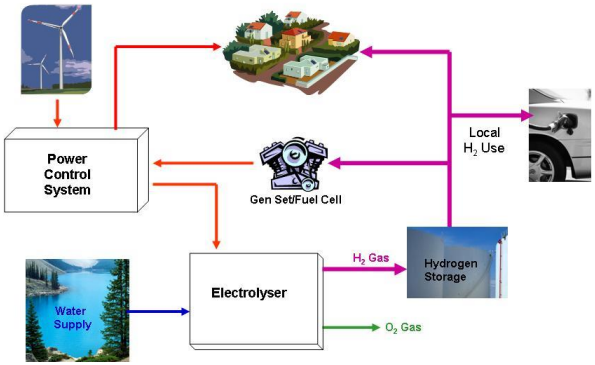


Power to gas

Storage

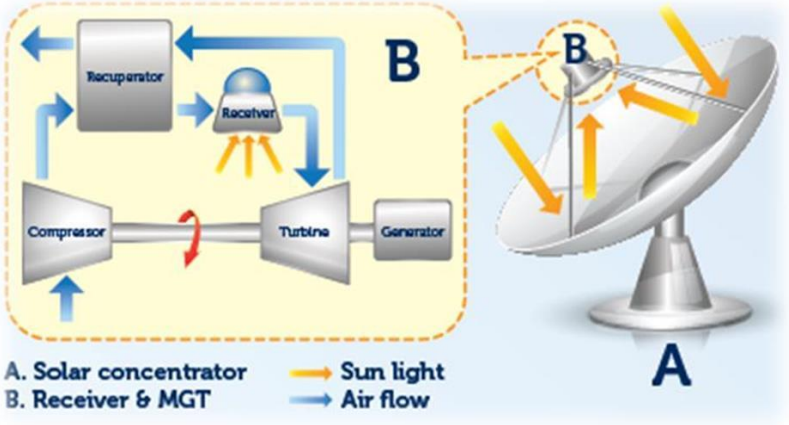
e.g.

Also hybrids with Fuel Cell !

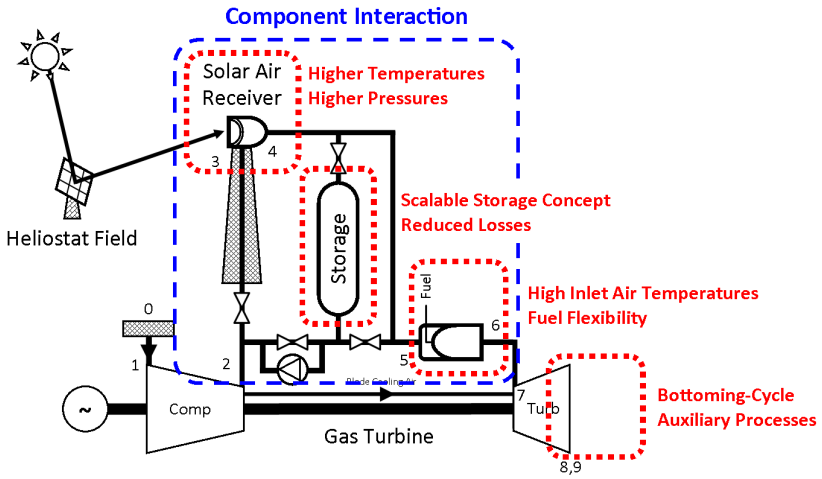


Need for a versatile, flexible technology which could be applied for all those areas: MGT technology (1)

Solar



Hybrid with solar energy (OMSOP)



Hybrid with solar energy + storage + bottoming cycle

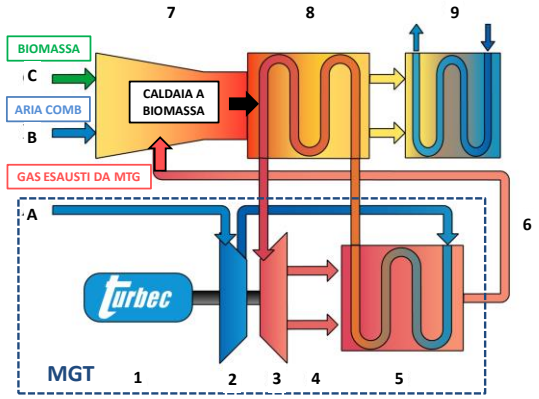
Need for a versatile, flexible technology which could be applied for all those areas: MGT technology (2)

Biomass and waste

Varying composition!

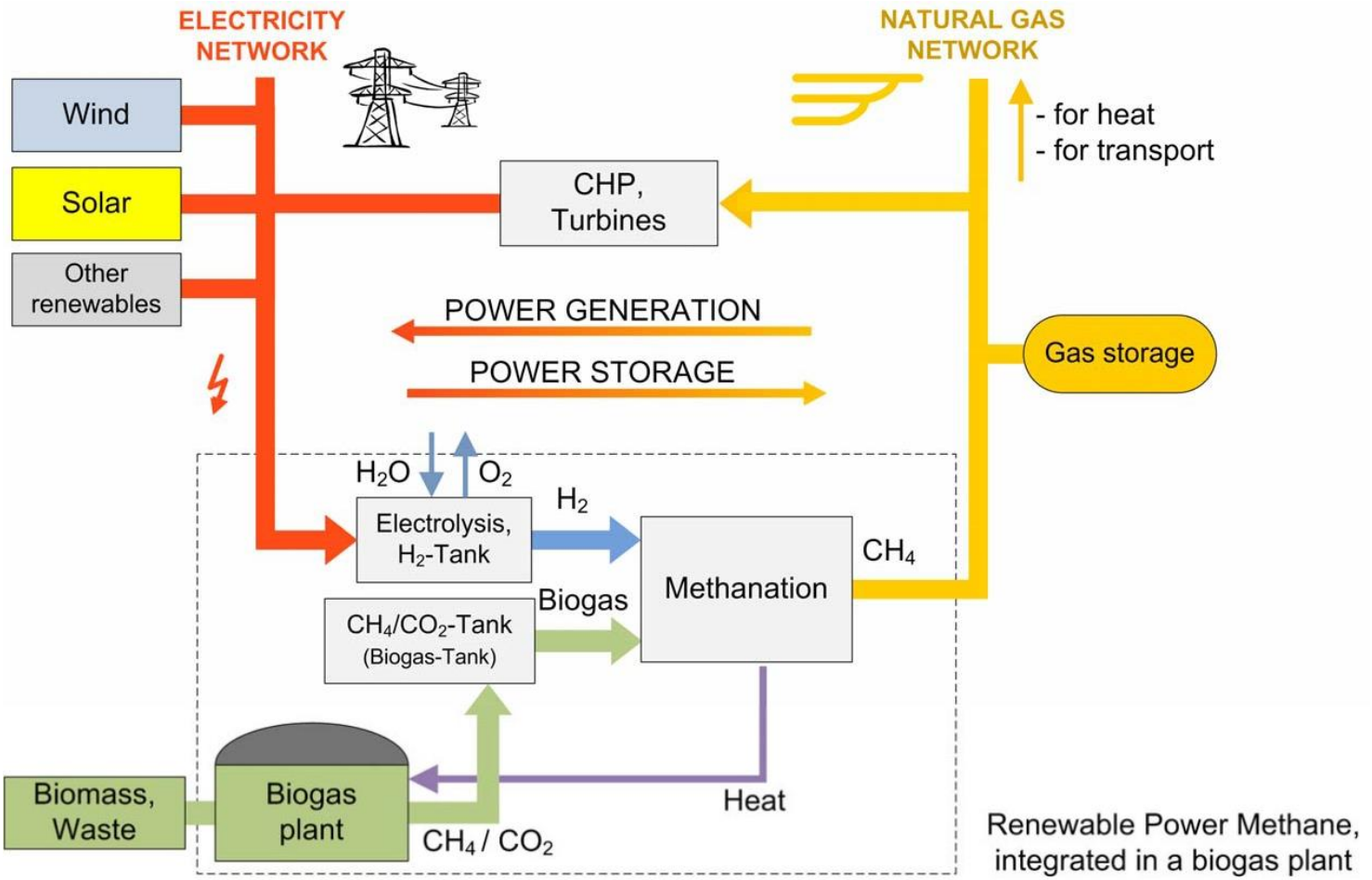
Gasification Fermentation Pyrolysis → **Gases Liquids** → **MGT combustion**

Direct combustion → External firing in MGT



Need for a versatile, flexible technology which could be applied for all those areas: MGT technology (3)

Storage and Hydrogen



MGT in the SET-Plan

Action 1 and 2 based on EU priority: Europe No 1 in renewables

- Issue paper "**Initiative for Global Leadership in CSP/STE**"
  - "By providing flexibility CSP/TSE can facilitate the integration of RES into the energy system"

Action 4: Increase the resilience, security and smartness of the energy system

- Issue paper "**Energy Systems**"
  - "Technologies, systems and services for more flexibility should be developed"

ETN/COGEN Europe submitted joint paper/statement

Action 5: Efficient Energy Systems

- Issue paper **"Develop new materials and technologies for energy efficiency solutions for buildings"**

MGT – European Technology Platforms

ETN is connecting to energy ETPs

- SmartGrids

- Renewable Heating and Cooling

RHC Renewable Heating & Cooling European Technology Platform

  - **Cross-cutting Technology Panel:** District heating and cooling, thermal energy storage, **hybrid systems** and heat pumps are key enabling technologies to realize the “Common Vision” of the RHC-Platform

Conclusions

To fully utilize potential of renewables, especially at local and regional level, MGT technology is required

- Compensation of intermittent character of RES
- Hybrids with solar
- Biomass
- Waste
- Storage
- Power to gas
- Small, regional scale, easy to integrate with decentralized generation / housing / small industry
- Electric flexibility (not to be realized with fixed speed gen.)
- Electric cars / range extender
- UAV's etc

EUROPEAN TURBINE NETWORK

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