WP3: Electricity generation technologies and system integration

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Introduction

- Analysis of electricity generation technologies and integration into overall generation system, with emphasis on their future potential.
- Objective: identification of a realistic range of state-of-art technical, environmental and economic characterization parameters for each technology, with a time horizon of 2005-2030.
- WP3 is divided to 4 sub-WP:s and 17 subtasks.

Scope and partners

Sub-workingpackages and subtasks		Partners
3.1 Fossil-based electricity generation technologies:		**DEU**
1.	Coal fired technologies	DEU, DNK
2.	Oil & gas fired technologies	BEL
3.	Combined heat and power	BEL, DNK
4.	CO2 capture and storage	DEU
3.2 Nuclear electricity generation		**FRA**
1.	Nuclear fission	FRA
2.	Nuclear fusion	BEL
3.3 Renewable flows & 'alternative' technologies & carriers		**FIN**
1.	Wind power	DNK
2.	Photo-Voltaic conversion	FIN
3.	Biomass applications	GRB, FIN

Sub-workingpackages and subtasks (cont.)		Partners
3.3 Renewable flows & 'alternative' technologies & carriers		**FIN**
4.	Hydro power	SWE
5.	Geothermal conversion	SWE
6.	Fuel cells	GBR
7.	Hydrogen economy	GBR, BEL
8.	Electricity storage	SWE
9.	Less-conventional and specu-lative forms of renewables	SWE, FIN
3.4 System integration		**BEL**
1.	Integration of centralised and decentralised generation; grid	BEL, GBR, SWE
2.	Greenhouse-gas emissions due to interaction centralised and decentralised generation	BEL, ESP

RESULTS: 3.1 Fossil technologies

- Pulverised coal combustion
  - developing advanced steam conditions
- IGCC a promising technology under development
- CCGT most environmentally friendly fossil technology
  - applicable for natural gas and biogas
- CHP: many available technologies
  - a solution for a local and centralised heat demand
- CO_2 capture and storage
  - Geological storage not demonstrated
  - Injection of CO_2 to geological formations is routinely done in about 70 enchanted oil recovery sites worldwide

RESULTS: 3.2 Nuclear technologies

- State of art technology is based on low neutron reactions
- Nuclear benefits:
  - Almost GHG free fuel cycle
  - Cheap fuel that is more secure than oil and gas
- Safety tenfold higher in latest reactor generation
- Used fuel remains a disposal issue
- Future: fast reactors allow extended fuel resources
- Far future: cleaner fusion technology

RESULTS: 3.3 Renewables

- Wind power is growing fast
  - Nearing economic competitiveness
- Photovoltaic conversion is growing exponentially
  - Needs further subsidies
- Direct firing and co-firing typical biomass applications
  - Pyrolysis
  - CO_2 capture
- Large scale hydro a well developed source
  - Run-by-river capacity offers marginal capacity increase
- Geothermal energy a reliable and easy to regulate
  - CO_2 emissions site dependent
- Fuel cells have a wide range of potential applications
  - Modular and high partial load efficiency
  - Hydrogen as a CO_2 free fuel
  - More material research needed
- Hydrogen a promising future energy carrier
  - Still very small market
- Marine energy with free water flow offers a future potential
  - At demonstration stage

Conclusions

- Overall the work of WP3 has been successful
  - 16 of 17 subtasks have been completed
  - Technology details are available for all state-of-art technologies (although some limited).

- Future projections problematic
  - The future projections for technology details has proven too ambitious, as only few partners we able to provide them.