ASSENT
(Contract number 244821)

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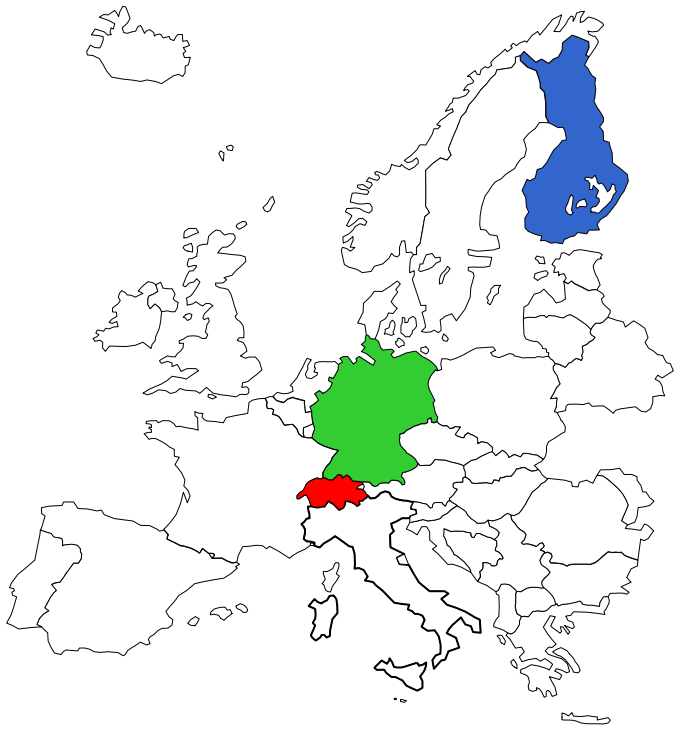
ASSENT Partnership & Budget



3 years project: 01-01-2010 to 31-12-2012

Total budget: 4 855 k€

Total funding: 1 955 k€

Participant	Country	Type
VTT	Finland	R&D
FZJ	Germany	R&D
HTc	Switzerland	SME
Hexis	Switzerland	SME
EBZ	Germany	SME
Wärtsilä	Finland	Industry

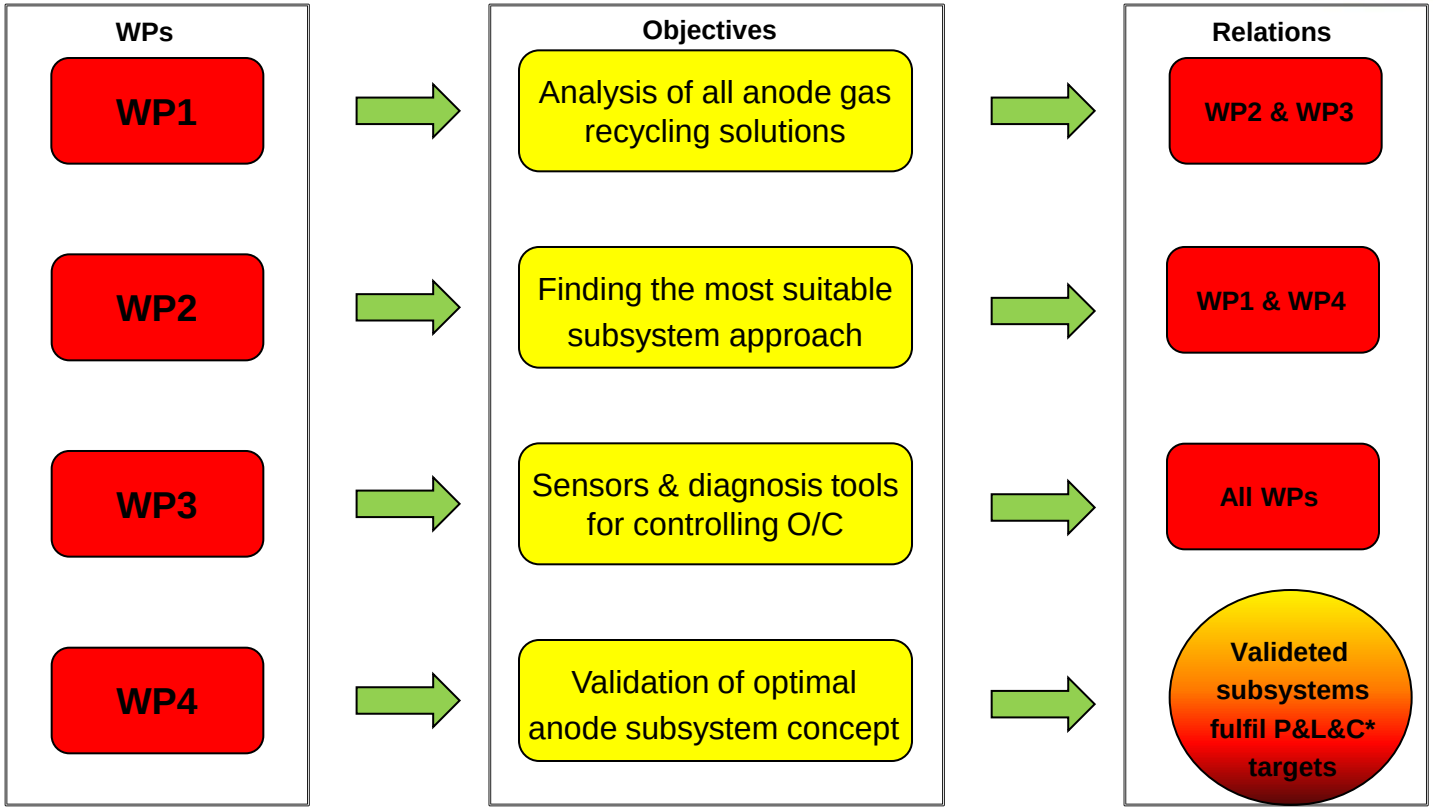
ASSENT Goals & Target

- The overall goal is to find optimal anode subsystem concepts that are validated for small-scale and large-scale SOFC system.

- Subsystem should fulfil performance, lifetime and cost targets for stationary applications:

  - ✓ 45 - 60% electrical efficiency
  - ✓ 40 000/60 000 hours (S/L)
  - ✓ Cost 3500/1750 €/kW_e (S/L)

ASSENT Approach



* = preformance, life-time and cost target

ASSENT Activities & Results (WP1)

- Analysis of all possible anode gas recycling solutions have been made

Lay-out	Rec. cooled by	NG	BG	Power kW AC_net	Cell type	Rec. ratio	u_F stack	Pre-ref.	Water cond.	variants	Calc. by
Type 0.1 (Ref.): Water condens., no recycling	–	2 x	–	250 3	ASC ESC	0	80%	heated	Yes	4	Jülich
Type 1.1: Blower (hot)	anode off-gas	2 x	2 x	250 3	ASC ESC	50/60/ 70	60/70/ 80%	not heated	No	72	VTT
Type 1.2: Blower (< 200°C))	air	2 x	2 x	250 3	ASC ESC	50/60/ 70%	60/70/ 80%	heated	No	72	Jülich
Type 1.3: Blower (< 100°C)	air + water	2 x	–	3	ESC	50/60/ 70%	60/70/ 80%	heated	Yes	18	Jülich
Type 2.1: Ejector steam driven	–	–	2 x	250	ASC	50/60/ 70%	60/70/ 80%	not heated	Yes	18	VTT
Type 2.2: Ejector Fuel driven	–	2 x	–	250 3	ASC ESC	50/60/ 70%	60/70/ 80%	not heated	No	36	Jülich

ASSENT Activities & Results (WP2)

Chosen large-scale prototypes:

- ✓ System based on a hot temperature blower
  - More mature and not high risk solution
- ✓ System based on a steam driven ejector
  - More potential and high risk solution

Chosen small-scale protypes:

- ✓ System based on recycled liquid water in Hexis
  - Suitable for current stack design
- ✓ System based on a medium temperature blower in HTc
  - Suitable for current stack design

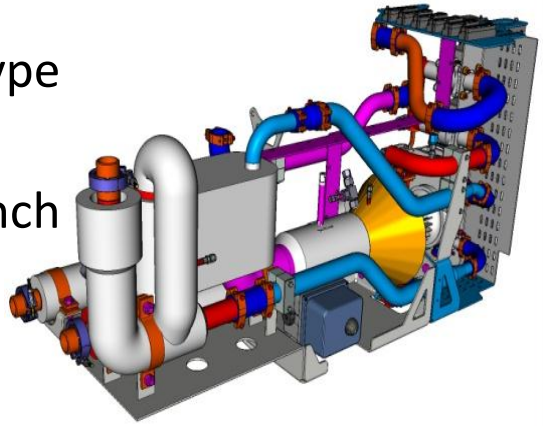
ASSENT Activities & Results (WP3)

- Evaluation of different sensors and diagnostics techniques that can be use in controlling anode recirculation subsystem have been made
  - ✓ Controlling O/C ratio
    - Gas analysis, Flow - and Temperature measurement
  - ✓ Valuable information about sensor and diagnostic options
  - ✓ First systematic approach
  - ✓ Availability, cost, accuracy and durability of sensors/techniques were evaluated → Three deliverables
    - Gas analysis by cheap methods - Difficult
    - Flow measurement by cheap methods - Possible
    - Temperature by cheap methods - Possible

ASSENT Activities & Results (WP4)

Large-scale:

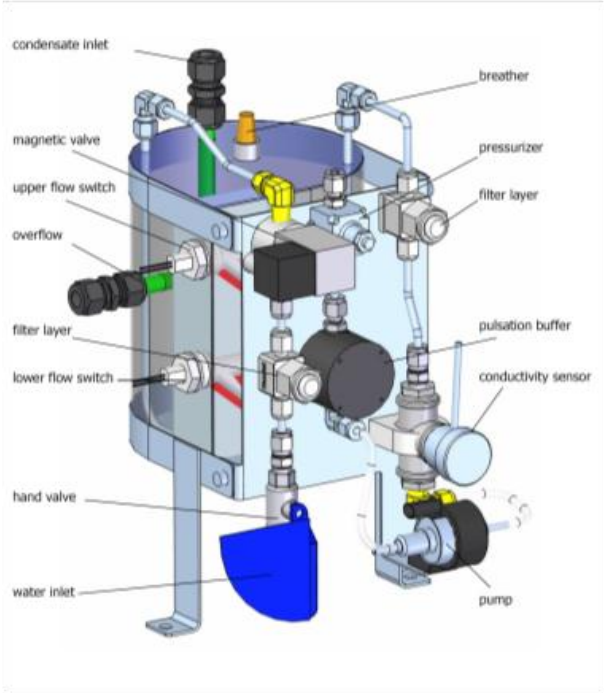
- AGB based approach currently being validated in 50 kW_e power class, feasible solution with little unknowns → potential near term solution for products
- Steam ejector based approach, apparently highly feasible solution with quite many question marks → potential solution for future longer-term development products
- Design and manufacture of AGB module prototype done, validation tests just begun
- Preparation of steam ejector subsystem test bench going-on, components under design/sourcing



ASSENT Activities & Results (WP4)

Small-scale:

- EBZ has designed, manufactured and tested a water storage and supply unit for chosen concept of Hexis
- EBZ in co-operation with HTCeramix has designed an anode gas cooler and a steam reformer for chosen concept
- HTCeramix has developed an own hot gas blower design.
- HTCeramix and EBZ have together selected medium temp membrane pumps for component testing by VTT and sub-system testing at HTCeramix



ASSENT Accomplishment

- All Milestones have been reached so far
- All deriverables were delivered within the schedule
- Progress are pretty much towards overall project plan
- Improvement coming from the project to the following topics:
  - ✓ Performance (45-60% electrical efficiency)
  - ✓ Lifetime (40 000/60 000 hours)
  - ✓ Cost (3500/1750 €/kW_e)
  - ✓ Component viable for massproduction
  - ✓ Availability of suitable sensor and diagnostic methods

ASSENT Alignment to MAIP/AIP

The project is contributing to the objectives of Call FCH-JU-2008-1, Area SP1-JTI-FCH.3: Stationary Power generation & CHP, Topic SP1-JTI-FCH.3.2:

Component and system improvement for stationary applications by following fuel cell functions and the corresponding components:

- Reforming and fuel processing
- Thermal management
- Humidification
- Fluid supply and management including pumps, valves and flow meters

- Gaps or bottlenecks were not identified so far

ASSENT Cross-cutting issues

- No special training and education activities arranged by the project but internal workshops and technical meeting were held
- No special contributes to develop regulations, codes and stadards but safety in developing subsystems is highly appreciated
- No dissemination activities during the first reporting periods but project will be actively involved such activities in last reporting period.

ASSENT Collaboration & Future Perspective

- Project used to has strong interlinkages with already terminated European Projects such as Large-SOFC and Real-SOFC projects
- Interaction with current FCH JU project like Cation, Genius and DeSign is strong.
- International working groups as IEA Annex 24 and with national projects as SofcPower 2007-2011 (Finland) and SOF-CH (Switzerland) are also linked.

- Great progress will be made in this project but world is not coming ready → System development including individual BOP component and whole sub-systems dvelopment must have important role also in future FCH JU programmes.

Thank you for your time !