CATION (Contract number 256627)

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CATION Partnership & Budget



3 years project: 01-01-2011 to 31-12-2013
Total budget: 7 175 k€
Total funding: 3 467 k€

Participant	Country Type		
VTT	Finland	R&D	
Wärtsilä	Finland	Industry	
AVL	Austria	Industry	
TOFC	Denmark	Industry	
Bosal	Belgium	Industry	
UNIGE	Italy	University	

CATION Goals & Target

- The main target of this proposal is to find optimal process and mechanical solutions for the cathode and stack subsystems for future ~250 kW_e atmospheric SOFC system developed by Wärtsilä.
- Scalability, electrical efficiency, controllability, mass production and costs effectiveness of the developed subsystems and the individual components are under special attention
- The development efforts are focused on improving the performance, availability, lifetime and cost-competitiveness of the cathode-side subsystem, including the stack/system interface, and components which are specifically addressed for large SOFC technology.

CATION Approach



CATION Activities & Results (WP1)

• Summary of steady state simulations for **sub-system alternatives**

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
Air Flow	High	High	Medium	Medium	Low	Low	High
HEX Pinch Point	Low	High	Low	High	Medium	High	High
HEX Conductance	High	Medium	Medium	Low	Medium	Low	Low
HEX Thermal Stress	Low	High	Low	High	Low	High	Low
Blower Power	High	High	Low	Low	Medium	Medium	High
Heat Sufficiency	Poor	Good	Poor	Good	Fair	Good	Good
Controllability	Fair	Fair	Fair	Fair	?	?	Poor
Feasibility	Fair	Fair	Fair	Fair	?	?	?



- **Development and testing of component** which could be optimal for cathode subsystem: heat exhangers, after burner and ejector
- Design of the costs (DtC) by down scaling of material specifications, reducing part counts, redesign for massproduction and cost down procedures
- Fully laser welded core by Bosal characterized → welding tool will be chosen and tested Q1/2012
- Burner modelling has been carried out → models need to be validated experimentally.
- New ejector geometry has been delivered to Wärtsilä for prototype design and testing → testing facilities ready and test will occur 10-12/2012 at real operation temperature

CATION Activities & Results (WP3)

• Balance of stack developement has reached testing phase

Phase Description / Main Milestone	Completed		
Prototype Hot#1 (Dummy stacks)	2011.02.01		
Prototype Hot#2 (Dummy stacks)	2011.04.01		
Prototype Hot#4 (1 stack, 1.9 kW)	2011.10.17		
Prototype Hot#5 (4 stacks, 7.5kW)	2011.12.01		
Prototype Hot#6 (4 stacks, 7.5kW)	2011.12.01		
Prototype Hot#7 (4 stacks, 7.5kW)	2012.01.01		
Prototype Hot#8 (4 stacks, 7.5kW)	2012.01.01		
Prototype Hot#9 (4 stacks, 7.5kW)	2012.03.01		
Prototype Hot#10 (4 stacks, 7.5kW)	2012.03.01		



CATION Accomplishment

- Progress are pretty much within the plan
- Two concept has been chosen for further sub-system evaluation
- Many components under development and testing
- Deliverbales and Milestones will be delivered in time
- Project is focusing following topics and will deliver valuable information:
 - ✓ Novel designs and optimization of non-stack components
 - ✓ Manufacturing process and control techniques for mature components
 - ✓ Durability/robustness in application environment
 - ✓ Costs assessment vs. target costs
 - $\checkmark\,$ Demonstration of End of Life specifications
 - ✓ Life Cycle Analysis (LCA)



The project is contributing to the objectives of Call FCH-JU-2009-1, Area SP1-JTI-FCH.3: Stationary Power generation & CHP, Topic SP1-JTIFCH.2009.3.4:

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

- Power generation unit (integrated stack/BoP)
- Heat exchangers/After burners/Thermal management
- Air and fluid flow equipments/Ejectors/Blowers/Air management
- Gaps or bottlenecks were not identified so far



- No special training and education activities arranged by the project but some 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 so far but some activities are planned to the last part of the project

CATION 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 ASSENT, Genius and DeSign is strong.
- International working groups as IEA Annex 24 and with national projects as SofcPower 2007-2011 (Finland) and "Improved Solid Oxide Fuel Cell Stacks: Power Density, Durability, and Modularity" 2009-2010 (Denmark).
- 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 !