CATION
(Contract number 256627)

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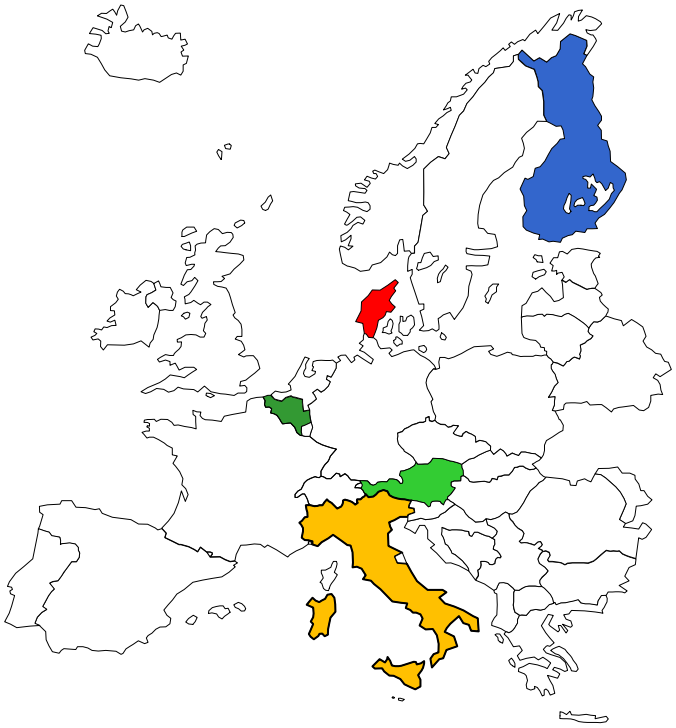
CATION / General Overview



3 years project: 01-01-2011 to 31-12-2013

Total budget: 7 175 k€

Total funding: 3 467 k€ (+ national 230 k€)

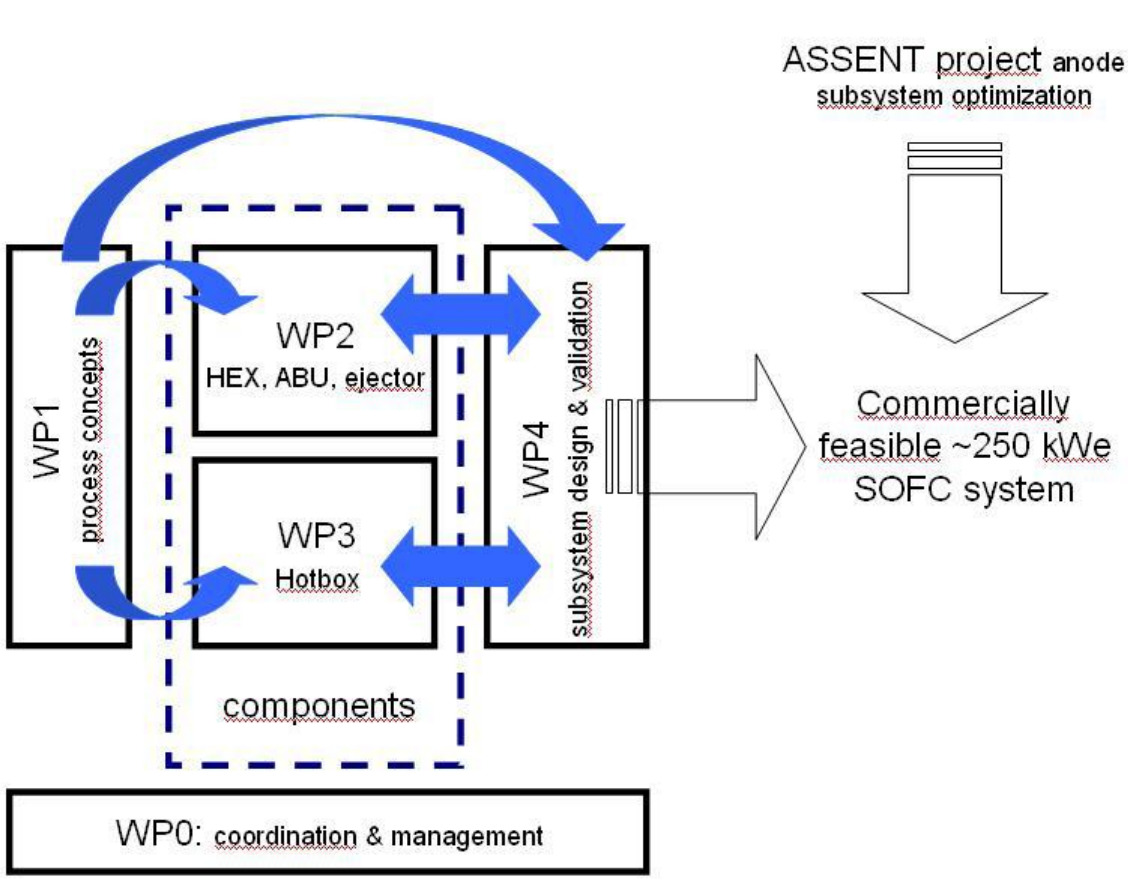
Participant	Country	Type
VTT	Finland	R&D
Wärtsilä	Finland	Industry
AVL	Austria	Industry
TOFC	Denmark	Industry
Bosal	Belgium	Industry
UNIGE	Italy	University

CATION Goals, Target & Milestones

- To find **novel solutions for the cathode and stack subsystems** for future ~250 kW_e atmospheric SOFC system developed by Wärtsilä.
  - ✓ Electrical efficiency 55%
  - ✓ Lifetime 40 000h
  - ✓ Availability > 90%

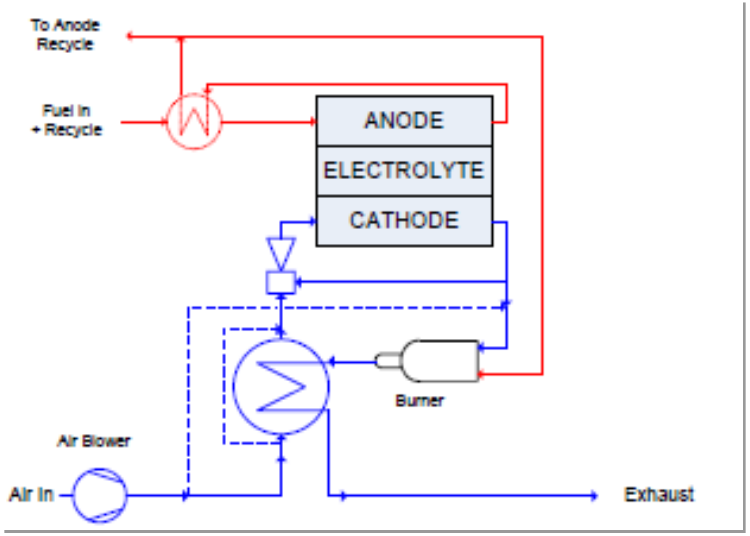
- Scalability, controllability, mass production and costs effectiveness of the subsystems and the components are under special attention
  - ✓ < 2000 €/kW_e (250 kW_e systems)

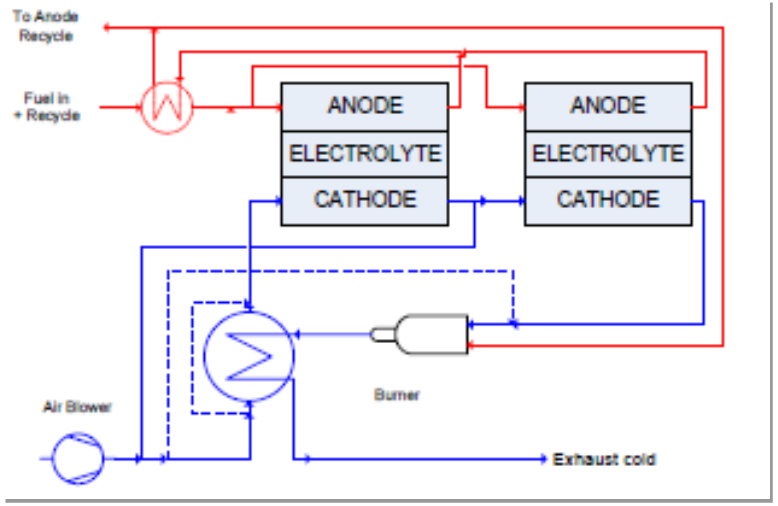
CATION / Approach



CATION / Progress (WP1)

- WP is completed (M17)
- Steady state system modelling and reliability analysis for several lay-out concepts were done succesfully → two concept were chosen for futher analysis
  - ✓ Cathode recirculation with ejector
  - ✓ The air-in-serie concept
  - ✓ Additional finding → burner before cathode HEX





CATION / Progress (WP2)

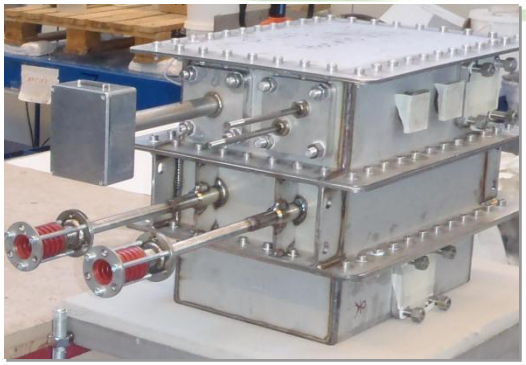
- Succesful modelling and testing of relevant component

  - ✓ **Heat exhangers** → new tools to optimise recuperator core, laser welding manufacturing and automated assembly process
  - ✓ **After burner** → feasible for the concept given by WP1
  - ✓ **Ejector** → feasible for the concept given by WP1

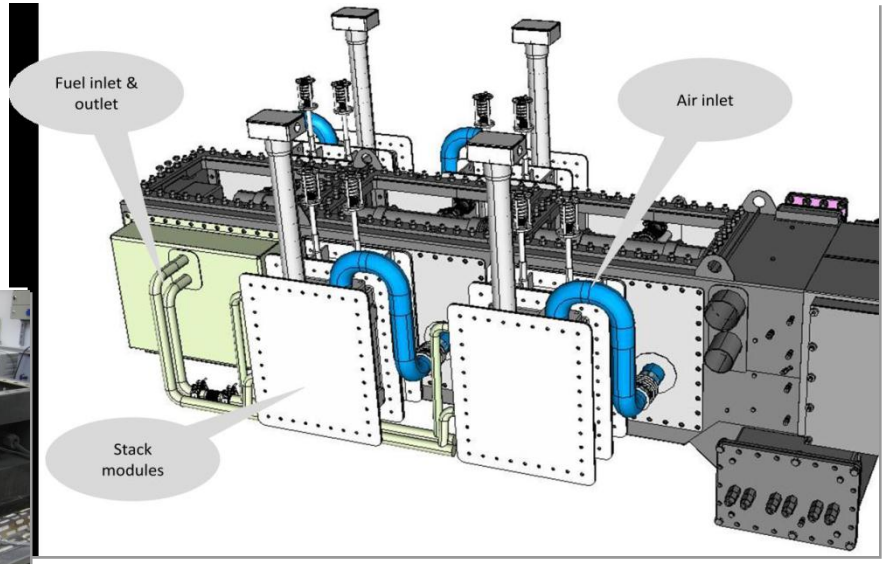
- Models validated by experimental data

CATION / Progress (WP3)

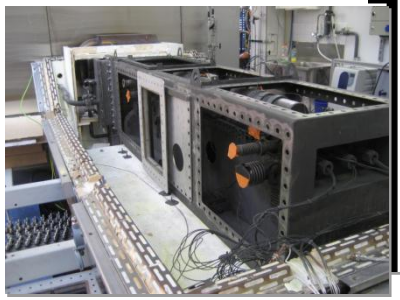
- Open air manifold stack module (OAM) developed and tested succesfully



- Failure Mode and Effect Analysis done
- CFD analysis for gas distribution done
- Mechanical integration of two OAMs into Wärtislä FC Power module done



- Final tests are running (M33)



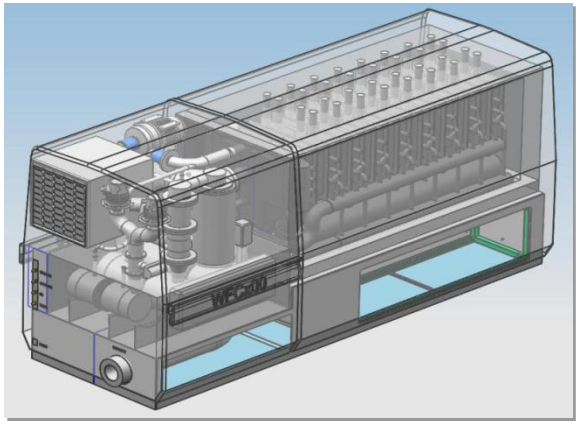
CATION / Progress (WP4)

- Based on WP3 work → system lay-out design done for two different power scales
  - ✓ 115 kWe (16 stack modules)
  - ✓ 232 kWe (32 stack modules)

- 115 kWe was chosen for validation tests
  - ✓ Pre-commercial system for in 100+ kW range
  - ✓ Dimensions of this system was comparable to previous 50WFC system

- Wärtsilä withdrawn from the project (M18)
  → validation test with 115 kWe system cancelled

- New validation test plan under preparation by the other partners



CATION / Accomplishment

- Progress is very much within the plan
- Two concept has been chosen for further sub-system evaluation
- Many components developed and tested
- Deliverbales and Milestones will be delivered in time
- Project is delivering valuable information in following topics:
  - ✓ Stack and stack module designs
  - ✓ Novel designs and optimization of non-stack components
  - ✓ Durability/robustness in application environment
  - ✓ Costs assessment vs. target costs
  - ✓ Life Cycle Analysis (LCA)

CATION / Alignment to MAIP/AIP

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 → Wärtsilä's decision to withdrawn

CATION / Cross-cutting issues

- 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

- Dissemination activities:
  - ✓ 2 patent applications

CATION / Collaboration & Future Perspective

- Project has strong interlinkages with already terminated European Projects such as Large-SOFC and Real-SOFC projects
- Interaction with current FCH JU projects as ASSENT, Genius and DeSign and SOFCOM.
- International working groups as IEA Annex 23 and Annex 24
- National projects as SofcPower 2007-2011, RealDemo 2012-2013 (Finland) and "Improved Solid Oxide Fuel Cell Stacks: Power Density, Durability, and Modularity" 2009-2010 (Denmark).
- Nice progress have been made but world is not coming ready
- System development including individual BOP component and whole sub-systems development must have role in future FCH JU programmes.
- Wärtsilä withdrawn form the FC Business → New action plan for the Cation project

Thank you for your time !