Efficient Use of Resources in Energy Convertig Applications

Grant Agreement N°303024

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www.project-eureca.com

PROJECT OVERVIEW

- Call topic: SP1-JTI-FCH.2011.3.1
- Application Area:
  Next generation stack and cell design
- 1st July 2012 – 31st August 2015
- Total Budget: 6.314.505 €
- Vision: Development of MT-PEMFC based CHP technology with high efficiency and long lifetime
- Stage of implementation: 80%

PROJECT TARGETS AND ACHIEVEMENTS

Programme objective/target	Project objective/ target	Project achievements to-date	Expected final achievement
MAIP			
4-5,000 €/kW	< 3,000 €/kW	< 5,000 €/kW	75%

PROJECT TARGETS AND ACHIEVEMENTS

Programme objective/target	Project objective/target	Project achievements to-date	Expected final achievement
AIP			
35% based on integrated reformer solution)	30% electrical efficiency	35% electrical efficiency has been calculated	80%
>10,000 hours (stack) >20,000 hours (system)	Prototype material 4000 h Serial material >2000 h	Prototype material 1583 h Serial material 3326h	39% 100%
< 3000 €/kW_{el} (hydrogen fuel cell system)	< 3000 €/kW_{el}	Cost Assessment is not yet finalised	80%

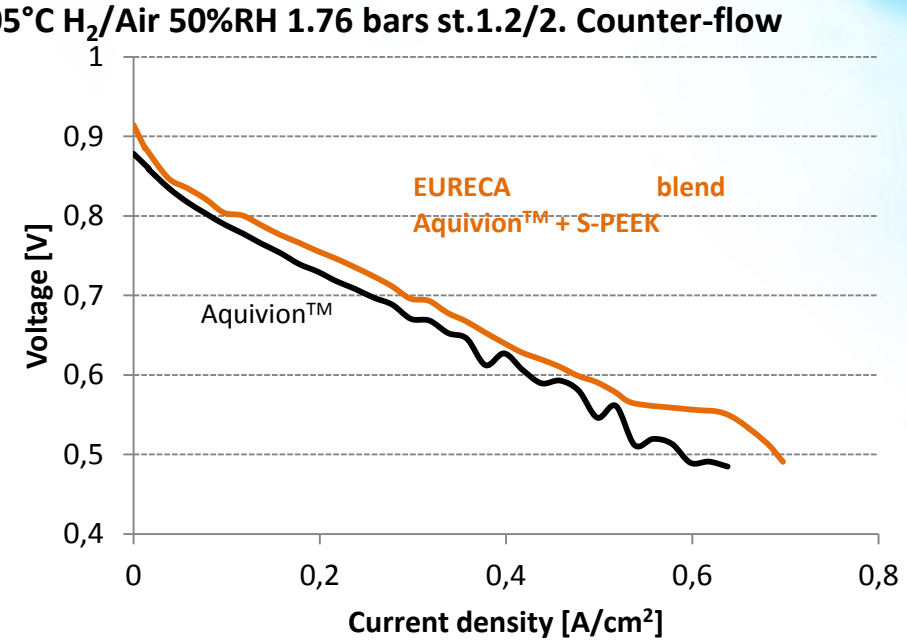
PROJECT TARGETS AND ACHIEVEMENTS

Membrane

- Two types of membrane material have been developed and integrated into fuel cells for testing

Blended membrane

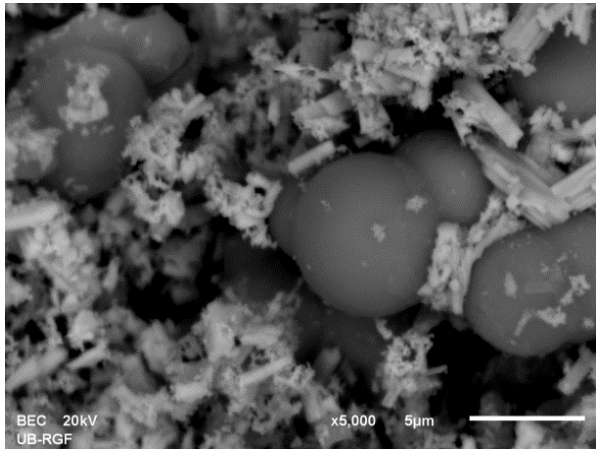
Patent pending: 14 50328

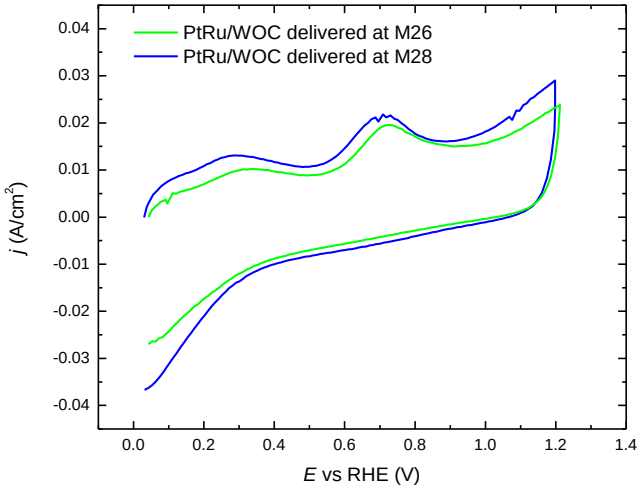


PROJECT TARGETS AND ACHIEVEMENTS

Catalyst

- Synthesis Route of Tungsten Carbide (WOC)as catalyst support has been improved as well as PtRu on WOC
- Catalyst shows higher mass activity towards HOR and improved CO tolerance than commercial, due to interaction between WOC support and PtRu particles
- Production and integration in MEA for final system



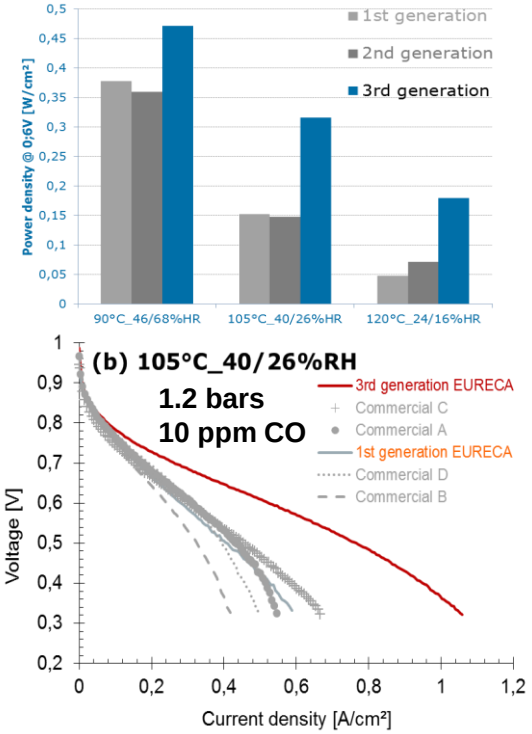


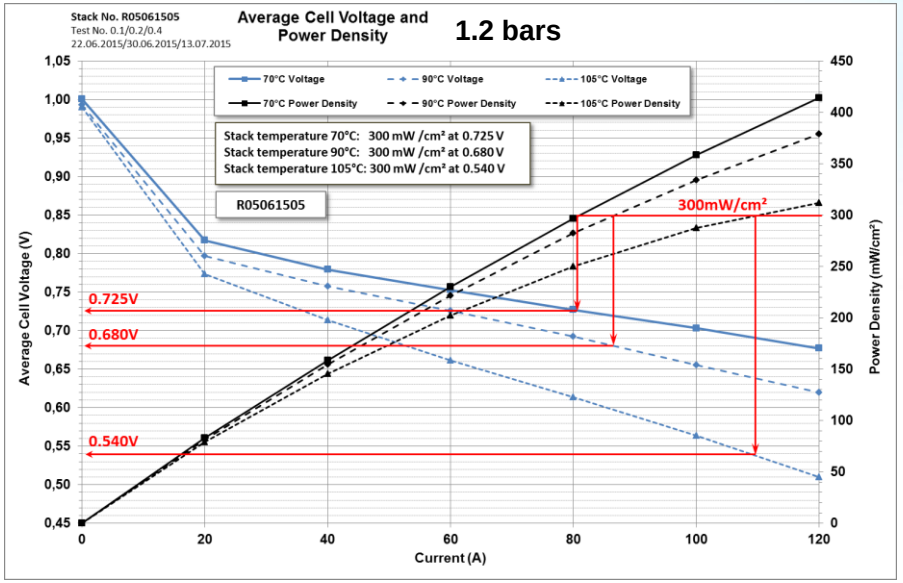
PROJECT TARGETS AND ACHIEVEMENTS

MEA

- Development of 3 generations of MEAs with progressive improvement
  - 1st: Commercial components → Small batch for stack development
  - 2nd: New catalyst from UB → Production ~100 pieces for final system
  - 3rd: Advanced → Small batch tested in 5 cells stack
- Improved performance vs all commercially available MEA

Single cell results



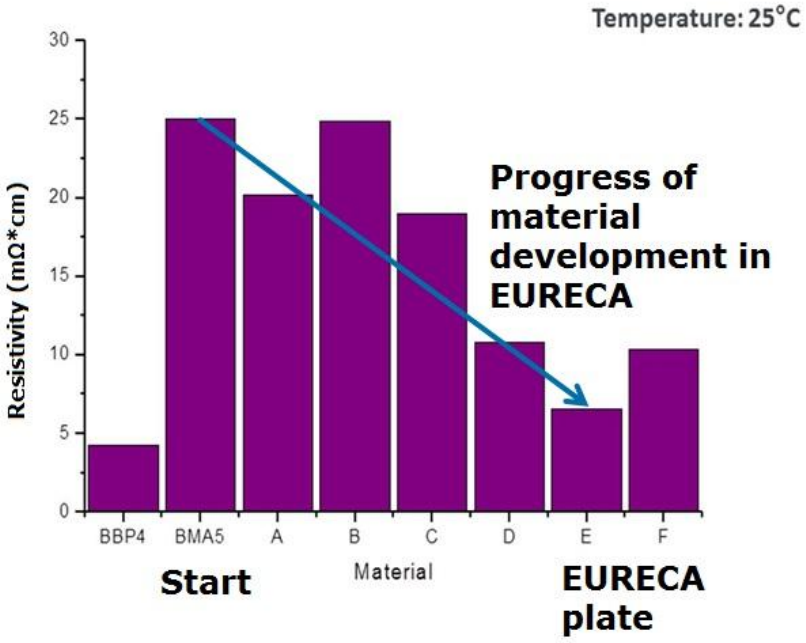


5 Cells Stack Results – 3rd generation MEA

PROJECT TARGETS AND ACHIEVEMENTS

Bipolar Plate

- Manufacturing process and quality control have been improved
- Resistivity of BPP has been decreased to <10mΩ/cm



PROJECT TARGETS AND ACHIEVEMENTS

Balance of Plant (BoP)

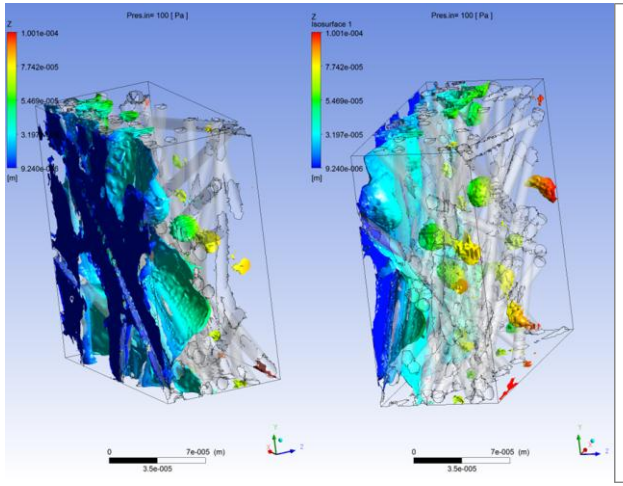
- Short stacks with different configuration have been set up and tested
- Full stack for system integration

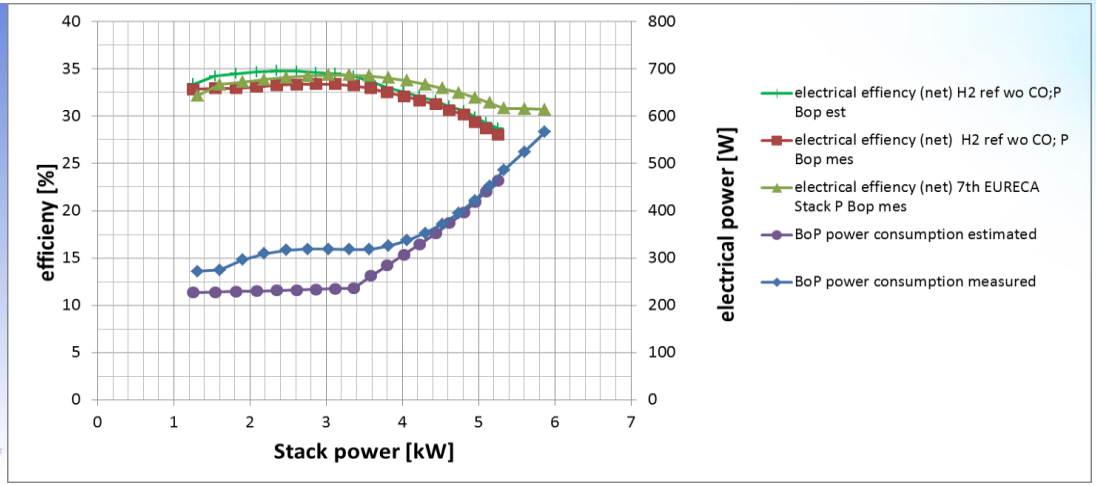
- Completion and testing of new system in a test bench

PROJECT TARGETS AND ACHIEVEMENTS

Modelling

- On Cell and System Level has been performed for
  - Two-phase flow in a reconstructed GDL
  - Gas pressure and velocity in BPP
  - System Efficiency





RISKS AND MITIGATION

- **> 30 % electrical efficiency:**
  - The calculated electrical efficiency using the obtained data from the material and stack testing is ~35%

- Remedial action:
  - To further improve the electrical efficiency BoP components have to be improved as well

SYNERGIES WITH OTHER PROJECTS AND INITIATIVES

- Interactions with EU-level projects (past & present)
  - CISTEM
  - PREMIUM ACT
  - Second Act
  - StackTEST
  - FCTESQA
  - FCTESNET
  - MATISSE

HORIZONTAL ACTIVITIES

- Number of PhD thesis: 1
- Workshop has been held in Freiburg on 2nd/3rd December 2014

  Title:
  Medium Temperature PEM FC – materials, stacks and systems

- General public awareness:
  - www.project-eureca.com
  - Project and Workshop Flyer
  - Fair support of FCH-JU booth by exhibit (HMI 2014/15)

DISSEMINATION ACTIVITIES

- Paper & Proceedings: 5 (+3 in preparation)
- Poster: 6
- Patents: 1
- Presentations: 19 (including Workshop)
- Fair-Attendance: e.g. Hannover Fair

EXPLOITATION PLAN/EXPECTED IMPACT

- Main result beyond international SoA:
  - MT-PEM FC prototype system with improved membrane, catalyst, BPP and BoP
- Achievements that allows progressing one step further to cost reductions:
  - Serial production of membrane, catalyst, BPP
- Main achievements with respect to TRL increase:
  - First MT-PEM FC system on prototype level (TRL 4) ready for demonstration (TRL 6)

Thank you very much for your attention!

FCH-JU funding is widely appreciated.

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