SET-Plan Implementation

The Steering Group of the SET-Plan in its last meeting on October 28th, 2010 agreed to speed-up the execution of activities of the Implementation Plans (IPs) of the European Industrial Initiatives (EIIs). It was decided to collectively identify the possibilities for launching joint actions between Member States and/or Member States and the European Commission.

The mapping exercise carried out through this questionnaire builds upon this decision of the Steering Group. It aims to identify topics for leveraging best ongoing efforts with complementary joint actions, as prioritized by the Implementation Plans. In this phase the mapping will focus on projects and activities with a total budget higher than 1 M€.

We trust that you also consider the success of this exercise important for the immediate implementation of the SET-Plan.

Mapping of Projects, Activities, Resources and Investments

To which EII(s) is your project, activity, resource or investment relevant? (multiple choices are possible)

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<thead>
<tr>
<th></th>
<th>WIND</th>
<th>SOLAR</th>
<th>GRIDS</th>
<th>CCS</th>
<th>NUCLEAR</th>
<th>BIOENERGY</th>
<th>FCs &amp; H2</th>
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A. Projects and Activities

General Information

Name of project: Development of materials and single cells for solid oxide and polymer electrolyte fuel cells, high-temperature electrolysers and supercapacitors

Acronym: -

Give project acronym, if applicable
### Location:
Applicable only for demo/pilot project; enter specific location(s) and Member State(s)

<table>
<thead>
<tr>
<th>Project partners:</th>
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<tbody>
<tr>
<td>List project partners; name coordinator first. For European &amp; international projects mention the country affiliation of each partner</td>
</tr>
<tr>
<td>Prof. Enn Lust, Institute of Chemistry, University of Tartu</td>
</tr>
<tr>
<td>Enn Õunpuu, AS Elcogen, Estonia</td>
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</tbody>
</table>

### Project website:

-  

### Contact details:
Name, affiliation and contact details of the project coordinator

<table>
<thead>
<tr>
<th>Contact details:</th>
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<tbody>
<tr>
<td>Prof. Enn Lust, Institute of Chemistry, 14a Ravila Street, 50411 Tartu, Estonia</td>
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### Start date:
mm-yyyy

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<th>Start date:</th>
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<tr>
<td>01- 2010</td>
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### Duration:
in months

<table>
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<tr>
<th>Duration:</th>
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<td>48</td>
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### SHORT PROJECT DESCRIPTION
Provide a short abstract of max. 100 words
Effective materials for solid oxide and polymer electrolyte fuel cells, high-temperature proton-conductive electrolyzers (HTPEL), electrical double layer and hybride supercapacitors will be developed and tested. New non-Pt-metal catalysts will be developed and evaluated. Small-size supercapacitors and solid oxide fuel cells will be completed and tested at different temperatures. New technology for preparation of HTPEL will be developed and tested in wind-farms and solar cell systems for production of $\text{H}_2$ and $\text{O}_2$ to secure power supply integrity for long-term scale. New cleaning methods for rare-earth metal compounds, produced in AS Silmet, will be worked out for applying the materials for production of cost-effective SOFCs and HTPELs. Highly qualified researchers will be educated and employed, and infrastructure will be modified to complete a research centre for developing the high-effective energy conversion and storage systems.

### PROJECT GOALS & OBJECTIVES

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<th>Goals:</th>
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<tbody>
<tr>
<td>Indicate main qualitative goals</td>
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<table>
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<th>Goals:</th>
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<tbody>
<tr>
<td>Preparation of single cells for solid oxide fuel cells working at temperatures from 500 to 700 °C and characterised with power density 500 mW cm$^{-2}$ (500 °C). Preparation of non-Pt-metal based PEMs with high energy and power densities.</td>
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</tbody>
</table>

Objectives:
Indicate quantitative objectives (similar to KPIs of the IPs of the EIIs). Also indicate intermediate milestones where applicable.

Working temperature from 300 to 700 °C, power density 800 mW cm\(^{-2}\) at 700 °C, time stability about 10000 working hours.

PERFORMANCE OF THE PROJECT

Assumed state-of-the-art:
Describe quantitatively the state-of-the-art that the project objectives are based upon

Micro-mesoporous electrodes based on activated rare-earth metal complex oxides and Ni-cermet or Ni-free anodes will be synthesized. Compact gadolinia-doped ceria electrolytes will be prepared for the anode-supported single cells. Non-Pt metal catalysts for polymer electrolyte fuel cells will be prepared and tested using various fuels (methanol, ethanol, etc.)

Achievements so far:
If intermediate results are available, please indicate the current achievements (qualitative and/or quantitative)

High energy density values have been achieved for fuel cell single cells (400…600 mW cm\(^{-2}\) at 600 °C in the case of H\(_2\) fuel). Patent application has been accepted.

Difficulties and potential risks:
Indicate briefly problems encountered or to be encountered in the short term (e.g. overall legislative context, public acceptance, permitting, etc.)

Short time scale for the project and limited amount of resources, including fundamental methods for surface analysis (HRTEM) in Estonia.

FUNDING & BUDGET

Funding programme:
Give the name of funding programme

Estonian Energy Technology program

Funding public entity:
Indicate which public entity is in charge of manages the programme

Archimedes (Estonian Ministry of Economy and Communication)

Total (public & private) project budget (€):

1 180 379.50

Public funding (€):

1 180 379.50
Total effort (person-months) | 300

**DISSEMINATION OF PROJECT RESULTS**

Publications, presentations in conferences and workshops, and other dissemination means:

*Give highlights only*


**TOWARDS COMMERCIALISATION**

Indicate (new) products and/or services expected from the project. Are new business models required for commercialisation of the project results?

*Highlight expected commercialisation benefits, e.g. patents, spin-offs, new products, business partnerships*

New patents (preparation of nanosstructural micro-meso-porous cathodes and anodes for SOFC, and non-Pt-metal catalysts for PEM). Common FW7 projects with AS Elcogen, VTT, Flexitallic, etc. will be proposed. Preparation and characterization of polymer electrolyte fuel cell single cells. Submission of patent applications.

**SYNERGIES WITH THE IMPLEMENTATION PLANS OF THE EUROPEAN INDUSTRIAL INITIATIVES – NETWORKING – KNOWLEDGE SHARING**

Contribution to/Relevance with the IPs: To your opinion, to which activities of the IPs of the EIIs is this project related to? Indicate contributions / complements.

*Please note that reference here is made to the activities of the IPs as published in http://setis.ec.europa.eu/activities/implementation-plans*

Potential synergies with other projects and activities: Can you identify any other project(s) in your country, another MS or at European level that could be synergetic with this project?

*Fuel Cell and Hydrogen Joint Technology Initiative*

Networking: Would you be willing to share results with the projects identified above?

*Indicate willingness to networking and also potential conditions*

**yes**

Knowledge sharing: Would the abovementioned Networking necessitate a formal knowledge sharing agreement? To your view would this be the preferred route?

*Yes, the networking is essential. This is an optimal route.*
Future steps: Are there any follow-up activities considered after the completion of your project? Is there a need to scale up activities in this topic at European level? 
Yes

B. RESOURCES AND INVESTMENTS

RESOURCES AND INVESTMENTS
Describe in short any RD&D infrastructures that your project relies on. Are these available or do they need to be developed?

All basic materials preparation, analysis and long-lasting testing systems for single cells development are completed (small-scale synthesis reactors, drying ovens, hot and isolating pressing systems, SEM, BET, XRD, XPS, XRF and FIB-SEM systems, electrochemical potentiostats and impedance analysis systems). The oxygen isotope surface exchange secondary mass spectrometry (SIMS) as well as in situ electrochemical test cells for synchrotron radiation based SAXS measurements must be developed to understand catalysts surface degradation processes.

If these are to be developed, what is the corresponding investment required? What is the allocated budget (€) for this investment in your project?
3 000 000 €

OTHER INFORMATION

Date: 07.03.2011
when the questionnaire was completed

Information provider: Enn Lust
Give the name and affiliation of the contact person for the questionnaire. If you are the project coordinator, check the box project coordinator

Please send the completed form to JeanLuc.Delplancke@fch.europa.eu set-plan-secretariat@ec.europa.eu preferably by MARCH 15.

Thank you for your cooperation!