INSIGHT

"ImplementatioN in real SOFC Systems of monItoring and diaGnostic tools using signal analysis to increase tHeir lifeTime"

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Research and Innovation Project

Deliverable D7.5 Teaching module for graduate courses

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Document Abstract

The D7.5 presents the contents of the Task 7.5 “Education and Training Activities”.
The consortium integrated this work in dissemination actions. The deliverable will show how project results are used during the project in the field of education. The project input is considered part of a teaching module or course, together with other input.

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1. Introduction

Solid Oxide Fuel Cell (SOFC) technology is moving towards demonstration and commercialization. In addition to comprehensive knowledge from laboratory test campaigns, more and more results from field and demonstration tests at system level are achieved, helping to identify the major critical issues under real operating conditions. Detailed information about electrochemical and micro structural properties from laboratory studies together with the input from field tests make it possible to establish methods for identifying the state-of-health of SOFC cells/stacks in the real system environment and to counteract potentially critical states. Such methods – as established in the Insight project – are an important tool for engineers of the future and are therefore implemented into teaching courses.
The slides in this deliverable will be used for a PhD course level, with the title: Introduction to SOFC and SOEC, and particularly in the lecture: "Degradation in SOFC / SOEC". This course is part of a bigger Joint European Summer School comprising new energy conversion and storage technologies, which is held annually by a group of strong research and industry players in the relevant technologies. More detailed information is available at: http://www.jess-summerschool.eu/.
Project results are integrated in the course, together with other teaching material.

2. Teaching module

The topic was presented using the slides given below. The module is under further development and will be adjusted according to the needs in future courses.

State-of-health

Objective:
- Monitor the state-of-health of cells/stacks while operating in the system in the field
- Identify potentially faulty states in order to be able to counteract and thus increase lifetime

Requirements:
- Simple, cheap, robust method
- Preferably detection of a variety of realistic faults using one or few methods

Approach:
- Test fault states in the lab with high degree of instrumentation
- Identify one or few unique parameters, which react specifically and early to be able to react on the fault

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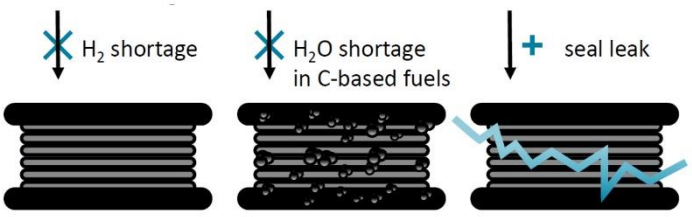
State-of-health

Realistic faults for operation of combined heat & power systems operating with natural gas fuel:



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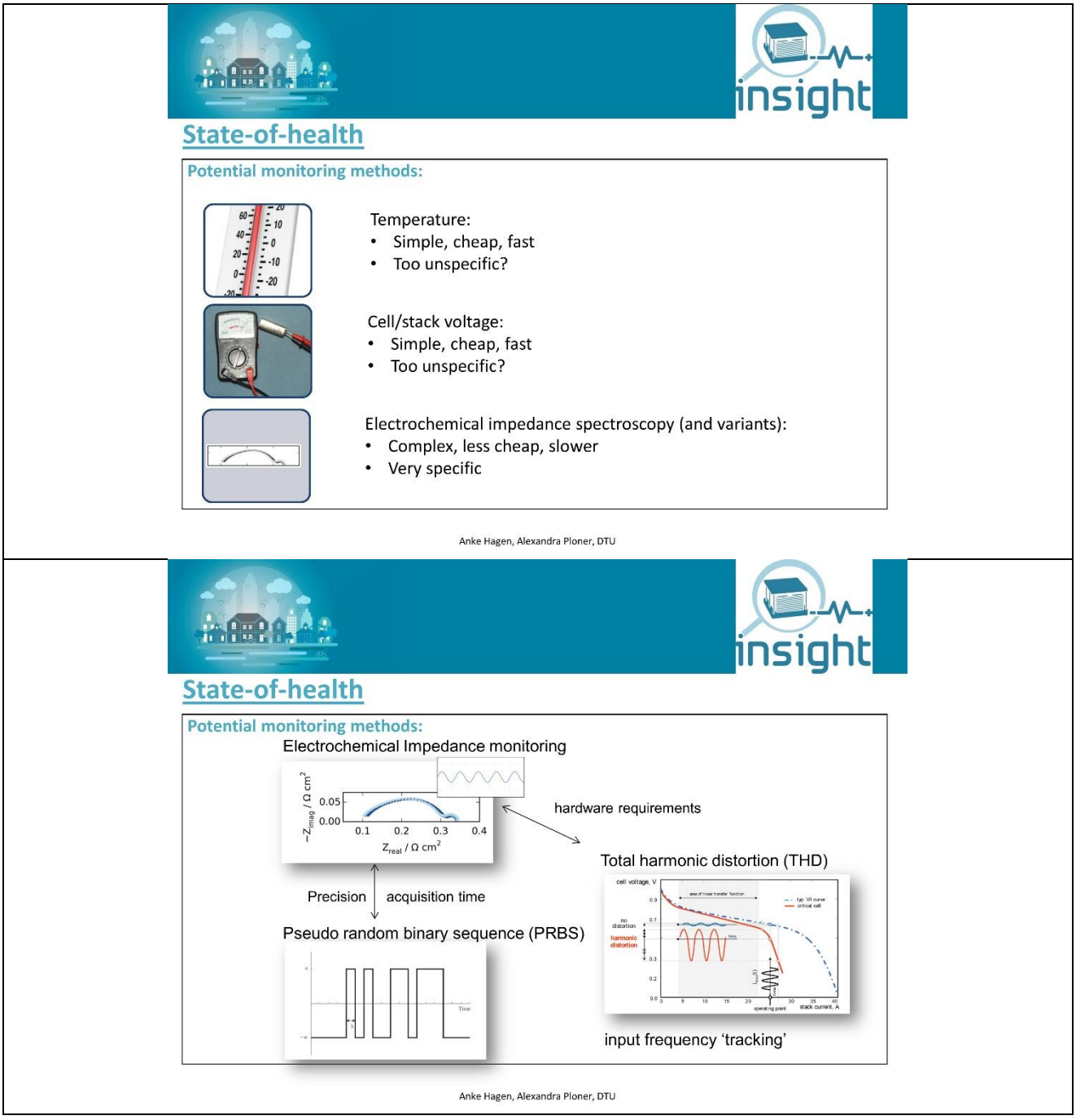

Figure 1 : Example of set of slides for teaching course

3. Conclusion

The slides shown here will be used for forthcoming PhD courses, also after end of the project.
They are also usable for other teaching partners, both, from the project and also the teaching community as such. Because the specific type of course can be very diverse, these few basic slides are suggested, which can be enriched or detailed with more relevant information depending on audience and graduate level of the students.