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UCI Power Electronics Lab

# **POWER ELECTRONICS FOR FUEL CELLS**

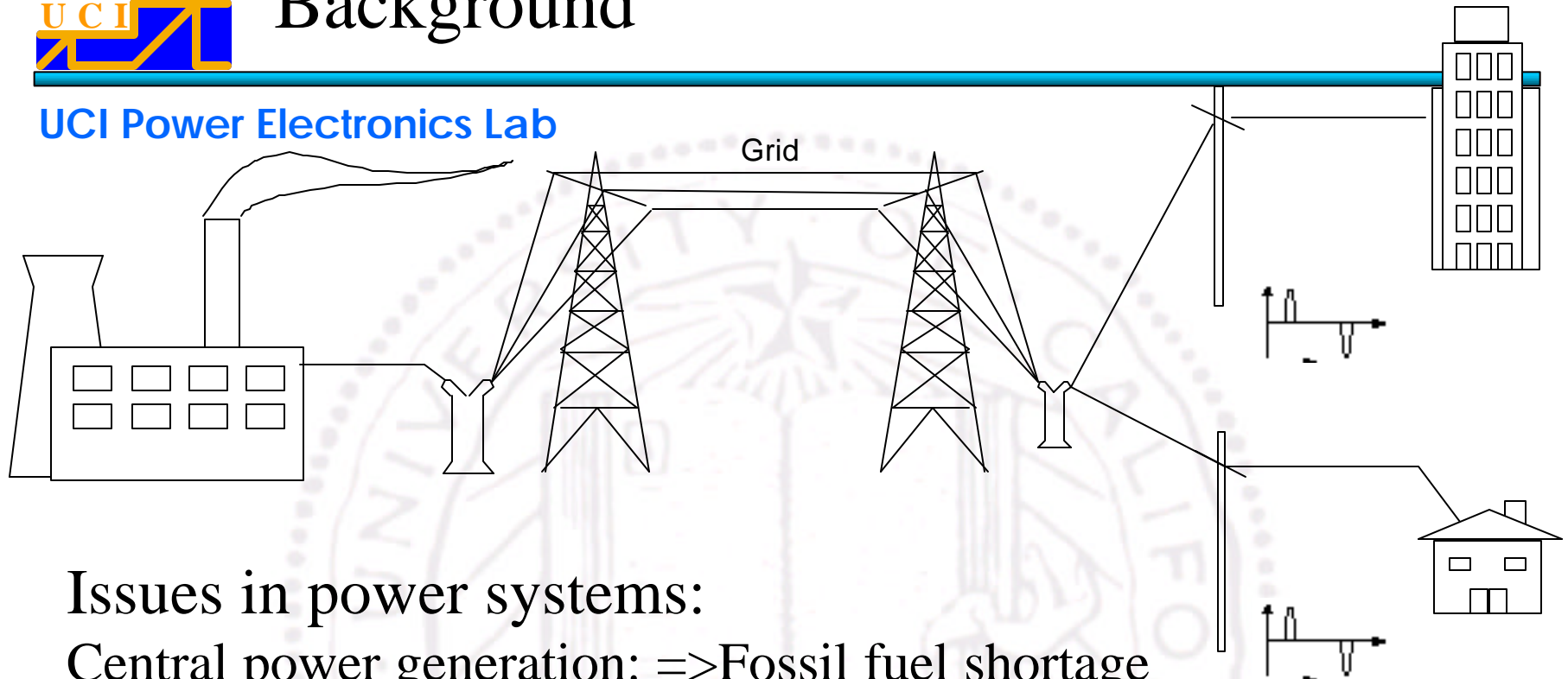
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# Background

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Issues in power systems:

Central power generation: =>Fossil fuel shortage

=>Environmental pollution

Long transmission line: =>electrical power loss

=>waste heat not used

Load harmonic current: =>transformer heating

=>reduced system capacity

=>disturbance to other equipment



# Power system road map

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Distributed power generation

Transmission planning

Power balance and storage

Flexible AC transmission System (FACTS)

Power system Protection

Power Line Communications

Renewable energy sources

Fuel Cells

Photo voltaic

Wind power

Biomass (gas)

Power quality control

Active power filters

Power factor corrected rectifies

FACTS



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### **Fuel Cell is an important element in the road map.**

Fuel cells convert fuel energy directly into electric energy:  
high efficiency  
clean and low noise processes.

Issues for Fuel cell power generation:  
reliability  
price  
interface with power system



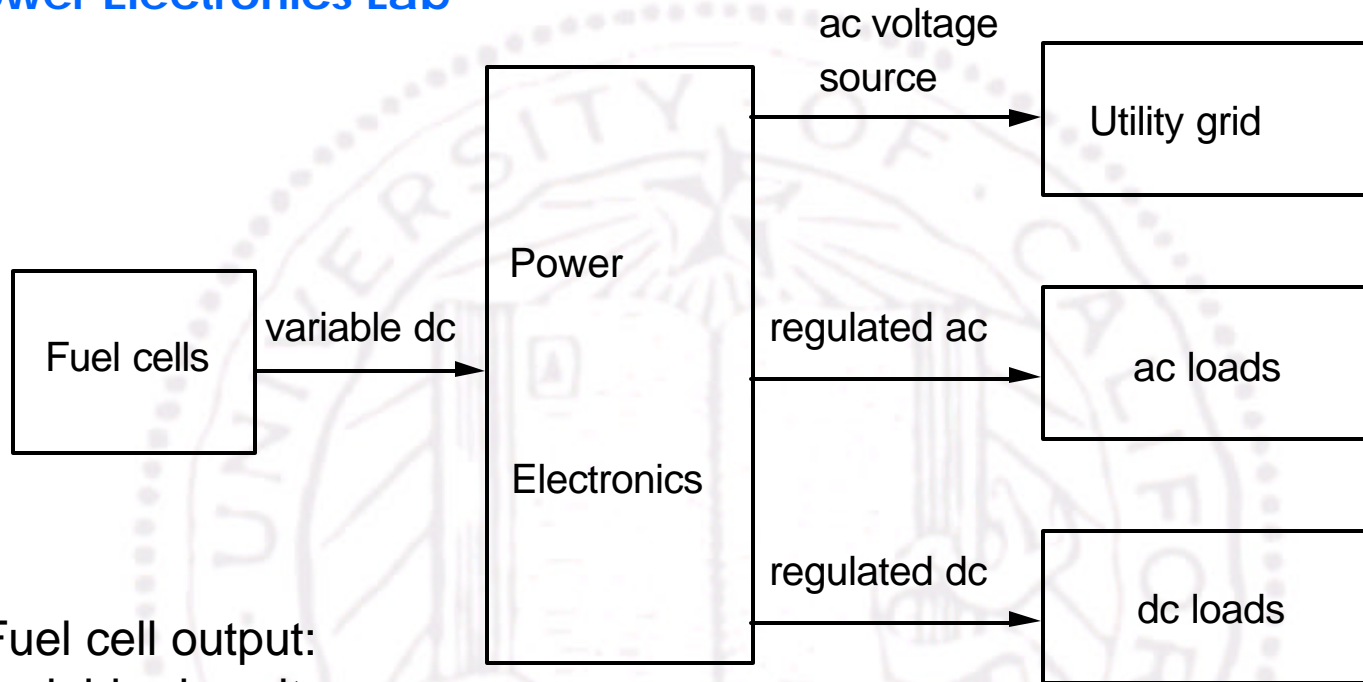
## **Vision of National Fuel Cell Research Center:**

A fuel industry with annual revenues exceeding ten billion dollars by the year 2010. Together with their supporting suppliers, manufacturers of fuel cells can significant economic benefit while supplying the market with-efficient, environmentally friendly energy sources for transportation, power generation, and power station applications.



# Power Electronics is a key element

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Fuel cell output:  
variable dc voltage

Applications:  
Ac grid-connected power generation  
ac or dc independent loads



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### **Proposed Mission:**

The mission of Power Electronics for Fuel Cells University Group is to promote and support the genesis of a fuel cell industry and the rapid growth of power electronics industry by providing technological leadership within a vigorous program of research, development and demonstration. By serving as a locus for academic talent of the highest caliber and a non-profit site for the objective evaluation and improvement of industrial products,



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**Proposed goal** of Power Electronics for Fuel Cells University Group is to become a focal point for advancing power electronics technology for fuel cells. By supporting industrial research and development, creating partnerships with State and Federal agencies, including the U.S. Department of Energy (DOE), National Science Foundation(NSF), and California Energy Commission (CEC), and overcoming key technical obstacles to fuel cell utilization, this group can become an invaluable technological coordinator for the fuel cell industry and power industry.



## Proposed Objectives

- To facilitate the evolution of a wide array of power electronics technologies for fuel cells
- To provide smooth interfaces between fuel cells to power system.
- To provide a clearinghouse of information and resources for universities, industry, agencies, and education of all ages
- To holistically instruct students, industry, and consumers regarding advanced power generation
- To build bridges between university research and industrial application of the research products
- To foster long-term relationships between academic institutions, agencies, and industrial partners



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## **Proposed activities:**

Publish the workshop document in the web,  
Organize future panel discussions and workshops,  
Form a research consortium,  
Provide advice to government agencies.