

**Development of Sustainable Urban City
at University of California - Irvine**

Prof. Scot Samuelsen

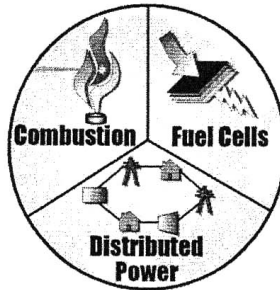
U.C.-Irvine 教授 (Combustion Labo.)

Advanced Power and Energy Program (APEP) ディレクター

National Fuel Cell Research Center 所長

同志社大学エネルギー変換研究センター 国際メンバー

(1) HYDROGEN ECONOMY (2) INTERNATIONAL SUSTAINABILITY INSTITUTE



DOSHISHA UNIVERSITY

PROFESSOR SCOTT SAMUELSEN
ADVANCED POWER AND ENERGY PROGRAM
UNIVERSITY OF CALIFORNIA, IRVINE
JULY 18, 2006

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PRESENTATION OUTLINE

- **(1) HYDROGEN ECONOMY**
 - ➔ **- UCI PROGRAMS**
 - CALIFORNIA PROGRAM**
 - DOE PROGRAM**

- **(2) INTERNATIONAL SUSTAINABILITY INSTITUTE**

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Advanced Power and Energy Program (APEP)

Ignition Delay Characteristics of H₂ Containing Fuels (DOE)

Fuel Cell Vehicle Deployment (Toyota)

Hydrogen-Fueled MTG (CEC)

FC Engineering Analysis Tools (DoD)

Hydrogen Refueling (AQMD)

Novel Fuel Processor with GE-GR (CEC)

Power Park (TIC)

CCHP RAC (DOE/CEC)

MTG Deployment (AQMD)

MTG Monitoring (AQMD)

H-T Fuel Cell CCHP (FCE)

ZEV•NET (Toyota)

Fuel Flexibility in MTGs (CEC)

Military Fuel Use in Fuel Cells (DoD)

Steady-State FC Analysis Tools (CEC)

Dynamic Fuel Cell Simulation (DOE, CEC)

Home Refueler (Toyota)

Fuel Cell/Gas Turbine Hybrid Technology (DOE)

Site Hydrogen and Bio Mass Generation (CEC)

Novel Reformer – Refueler (GE-GR, AQMD)

Vision 21 NG/Coal Central Power (DOE)

NG/H₂ Leveraging NG to Hydrogen (AQMD)

Co-Production of Hydrogen with H-T Fuel Cell (NFCRC)

PEMS: Predictive Emission Monitoring System (DoD)

FC Monitoring (residential, 150kW, 250kW) (AQMD)

Aerospace Fuel Cells (NASA, Boeing)

LNG Hot Gas (AQMD)

Reversible Fuel Cells (NFCRC)

FCTL Fuel Cell Systems Demonstration (AQMD)

Renewable Hydrogen Production (DOE)

MTG-CCHP Integration (APEP)

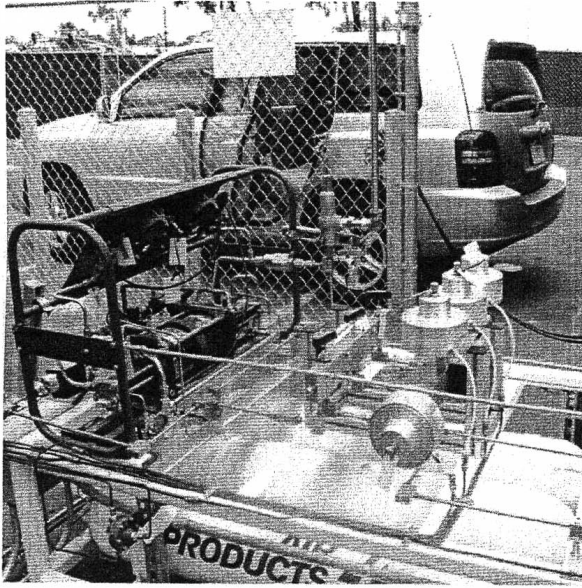
Information Technology for DER (DoD, NSF)

DG Air Quality Impacts (CEC, ARB, AQMD)

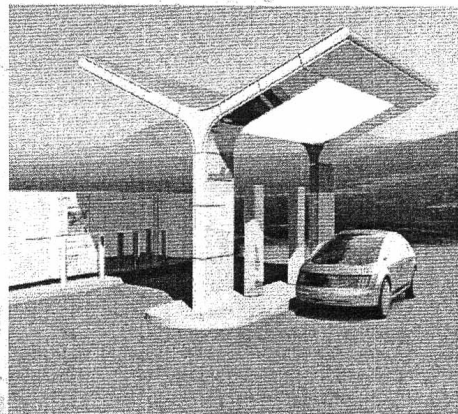
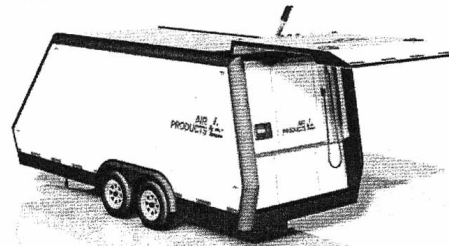
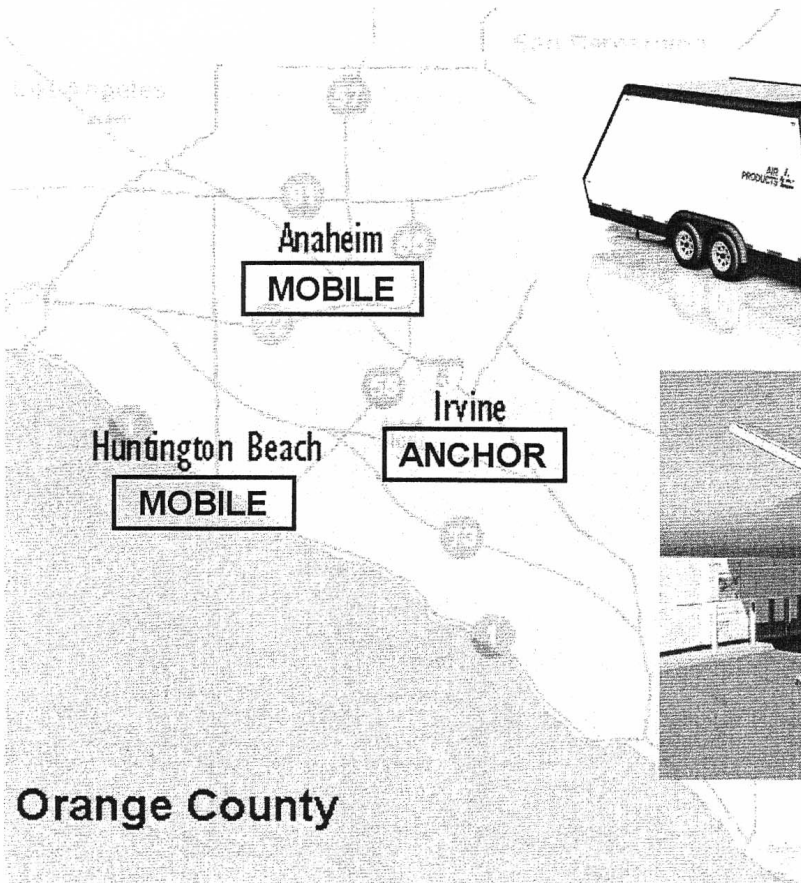
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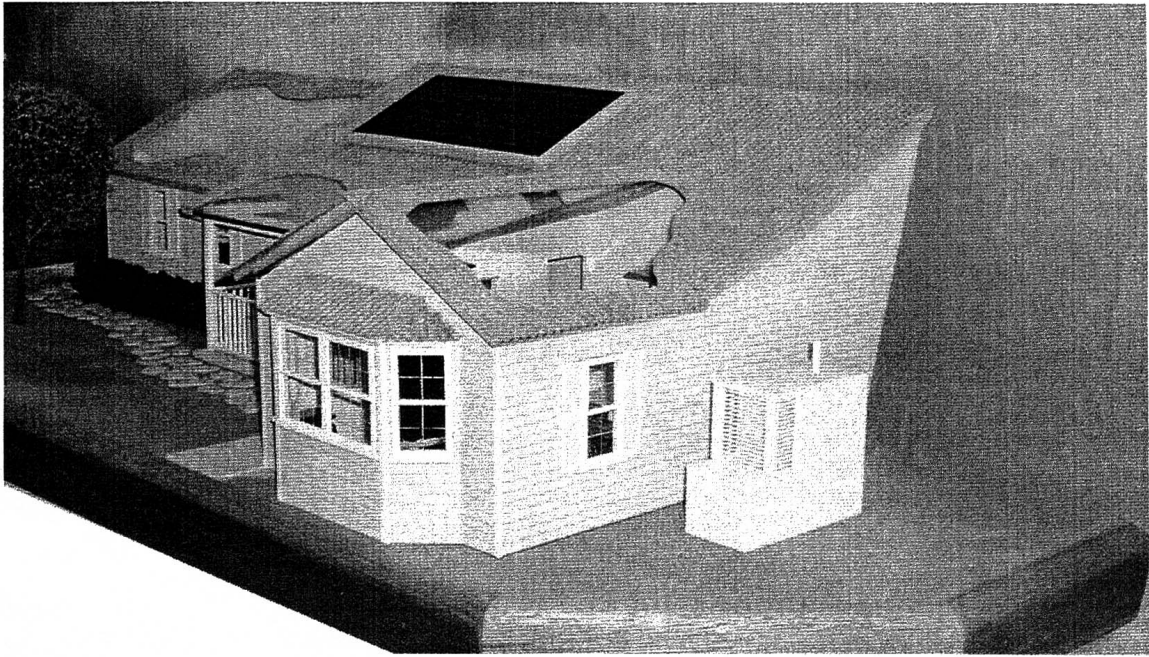
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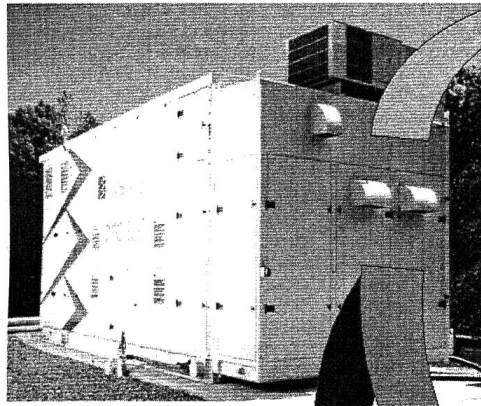
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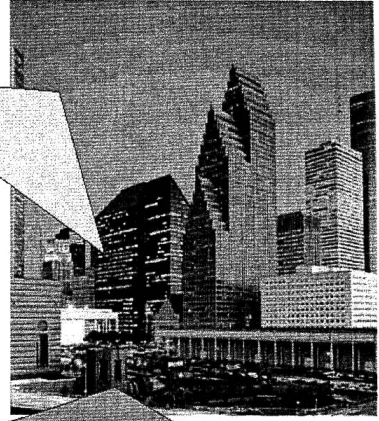


250 kW

kWs TO
ELECTRIC LOAD:
50%

HEAT TO
BUILDINGS
THERMAL LOAD:
30%

HYDROGEN:
20%



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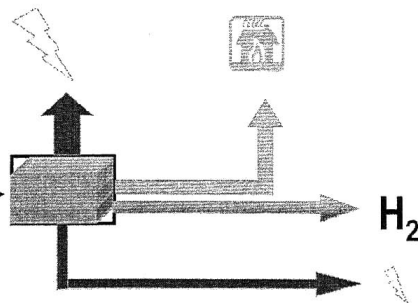
Products

Electricity

Thermal

Hydrogen

Natural Gas*



High Temperature Fuel Cell
with H₂ Co-Generation

* Fuel gas may be from renewable sources (e.g., bio mass, digester, land fill) and blends with NG

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CALIFORNIA PROGRAM

STATE OF CALIFORNIA

- GOVERNOR'S "HYDROGEN HIGHWAY NETWORK" INITIATIVE
- \$6.6M FOR FY06
- HYDROGEN VEHICLES
 - QUANTUM: 4 HYDROGEN-FUELED PRIUSES
 - FORD: 3 VANS
 - GM: 1 FCV (WITH NFCRC)
- HYDROGEN REFUELING STATIONS
 - AWARDS PENDING

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CALIFORNIA PROGRAM

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

- FIVE CITIES PROGRAM
 - HYDROGEN REFUELING STATION
 - FIVE VEHICLES PER STATION

- VEHICLES
 - QUANTUM: HYDROGEN-FUELED PRIUSES

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DOE PROGRAM

PRESIDENT'S HYDROGEN INITIATIVE

- JANUARY 2003: "THE FIRST CAR OF A CHILD BORN TODAY WILL BE A HYDROGEN-FUELED VEHICLE"

- \$450M FIVE-YEAR INFRASTRUCTURE PROGRAM

- MUST INCLUDE VEHICLE PARTNER
 - SHELL/GM
 - CHEVRON/HYUNDAI
 - APCI/TOYOTA, HONDA, NISSAN, BMW

- FOCUS ON SOUTHERN CALIFORNIA

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PRESENTATION OUTLINE

- (1) HYDROGEN ECONOMY

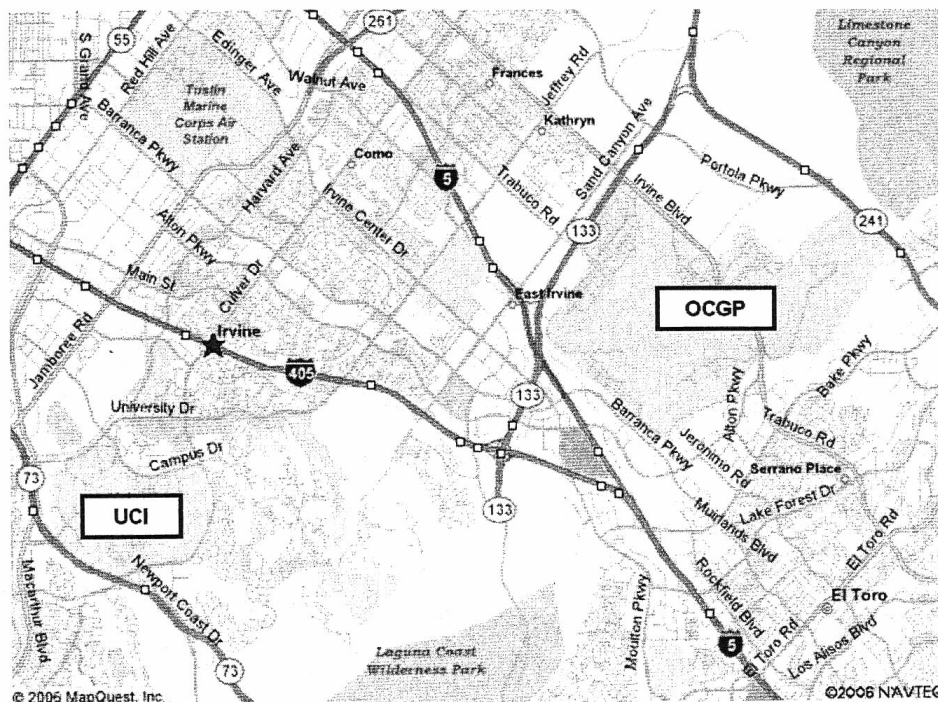
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- (2) INTERNATIONAL SUSTAINABILITY INSTITUTE

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ORANGE COUNTY GREAT PARK

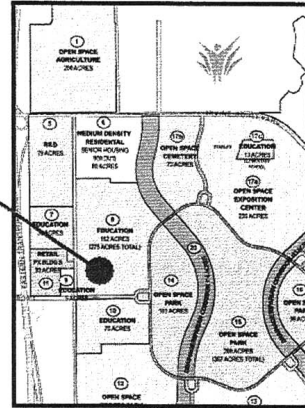


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INTERNATIONAL SUSTAINABILITY INSTITUTE

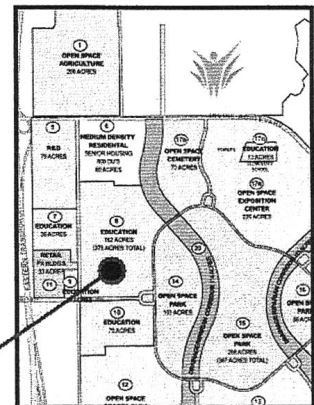
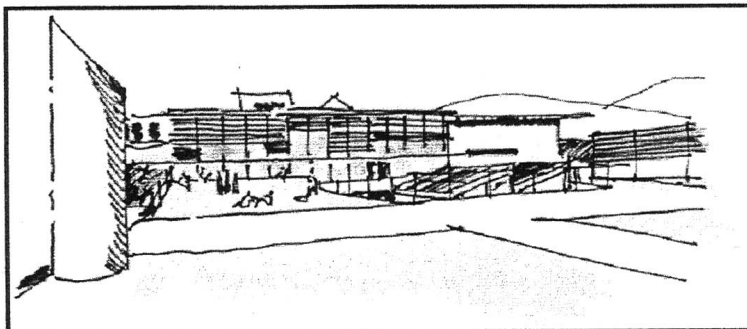
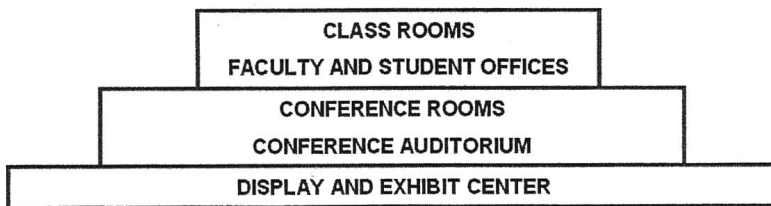
INTERNATIONAL SUSTAINABILITY CENTER

- CLASS ROOMS
- OFFICES: FACULTY AND STUDENT EXCHANGES
- CONFERENCE ROOMS
- CONFERENCE AUDITORIUM
- DISPLAY AND EXHIBIT CENTER



INTERNATIONAL SUSTAINABILITY INSTITUTE

BUILDING



INTERNATIONAL SUSTAINABILITY INSTITUTE

INTERNATIONAL SUSTAINABILITY CENTER

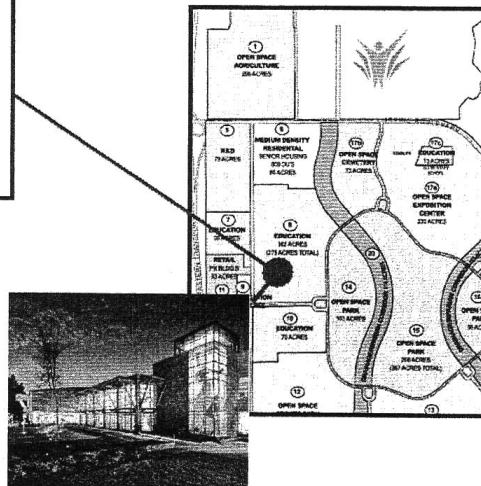
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INTERNATIONAL UNIVERSITIES

- DOSHISHA UNIVERSITY, JAPAN
- TSINGHUA UNIVERSITY, CHINA
- SEOUL NATIONAL UNIVERSITY, KOREA
- UNIVERSITY OF BARCELONA, SPAIN
- UNIVERSITY OF GENOA, ITALY
-

PROGRAM

- STUDENT EXCHANGE PROGRAM
- FACULTY EXCHANGE PROGRAM
- INSTRUCTION
- COLLABORATIVE RESEARCH
- CONFERENCES
-



NEXT STEPS

- DESIGN OF BUILDING
- DESIGN OF ACADEMIC PROGRAM
- IDENTIFICATION OF BENEFACTORS
— \$80M
- INTERNATIONAL AGREEMENTS