

Innovation In Fuel Cell Technology In Korea

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In collaboration with The National Academy of Sciences**

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Korea Institute of Energy Research

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Outlines

- I. Energy R&D in Korea**
- II. Innovation Processes (Fuel Cell Technology)**
 - II-1. Organizational Network**
 - II-2. National Strategies**
(Programs, Budget, Promoting Measures, PRO)
 - II-3. Innovation Performance**
- III. External Factors to Influence Innovation**

I. Energy R&D in Korea

- O Energy Status:**
- **Security Concern (97% Import)**
 - **10th Largest Energy Consumption**
 - **Air Pollution High (Heavy Traffic)**

O Energy R&D as Top of The Energy Policy since 1990.

- **“Alternative Energy R&D Promotion Law” enacted.**
- **Scope: Energy Efficiency/ NRSE/Environment Technology**
 - ***Fuel Cell, PV and Wind: Selected as Core ones.**
- **R&D Budget at 10% Increase Annually on Avg.**

II. Innovation Processes (Fuel Cell Technology)

II-1. Organizational Network

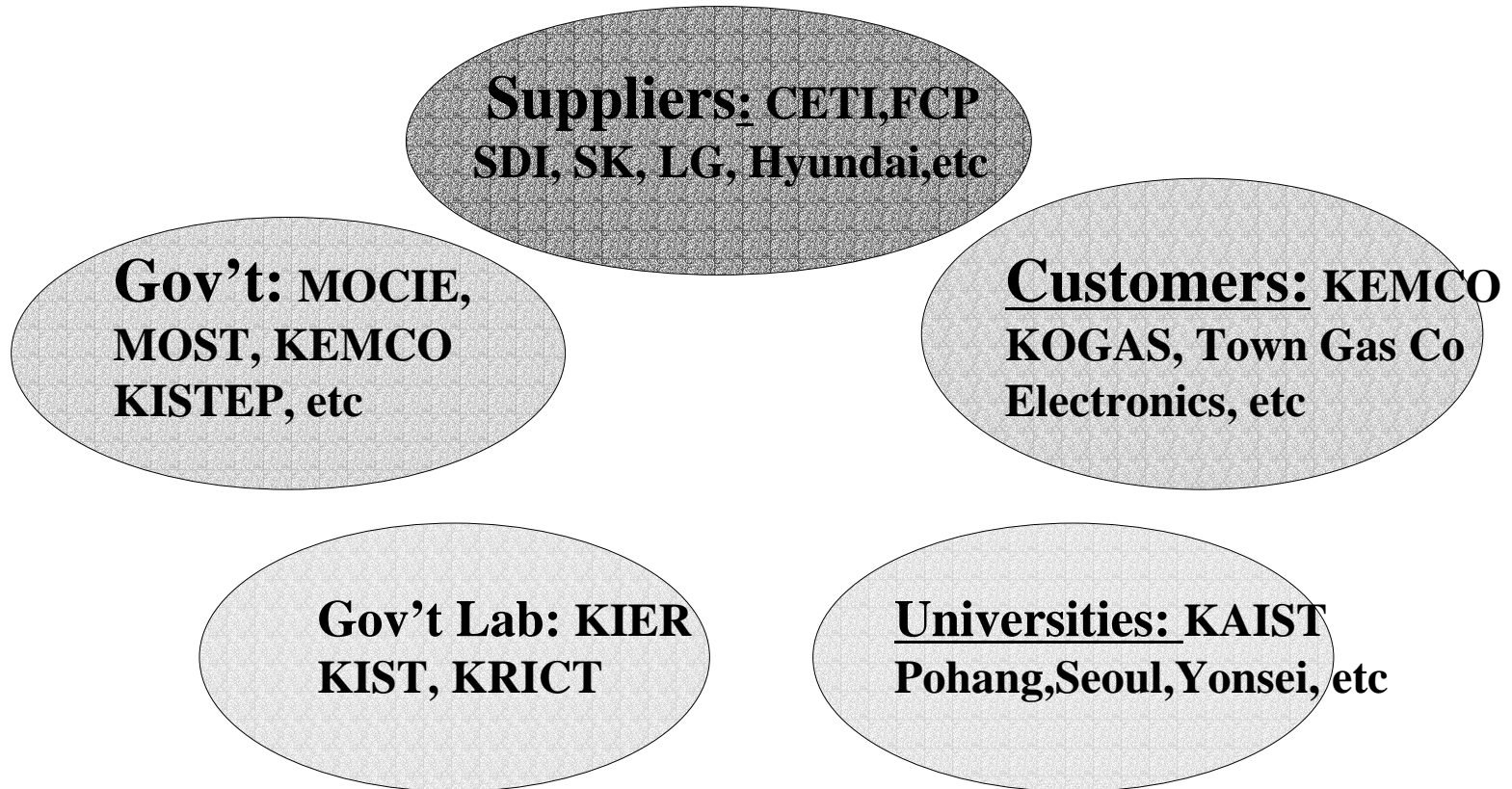
O Government: MOCIE & MOST

O PRO : 5 Organizations (KIER, KEPRI, KIST, KERI, KRICT)

O Academia : 15 Universities (Seoul National Univ, Yonsei Univ, KAIST, etc)

O Private : 18 Companies (Samsung SDI, Hyundai Motors, LG Chemicals, SKC, etc.)

Network (Fuel Cell)



II-2. National Strategies (Programs)

O MOCIE : “10yr Plan of Energy Technology R&D”

- Applied Technology/Demonstration/Deployment

*** “National Fuel Cell Technology Plan” is now under policy review.**

O MOST : “21Century Frontier R&D Program”

- Innovative Technology/Infrastructure/Basic

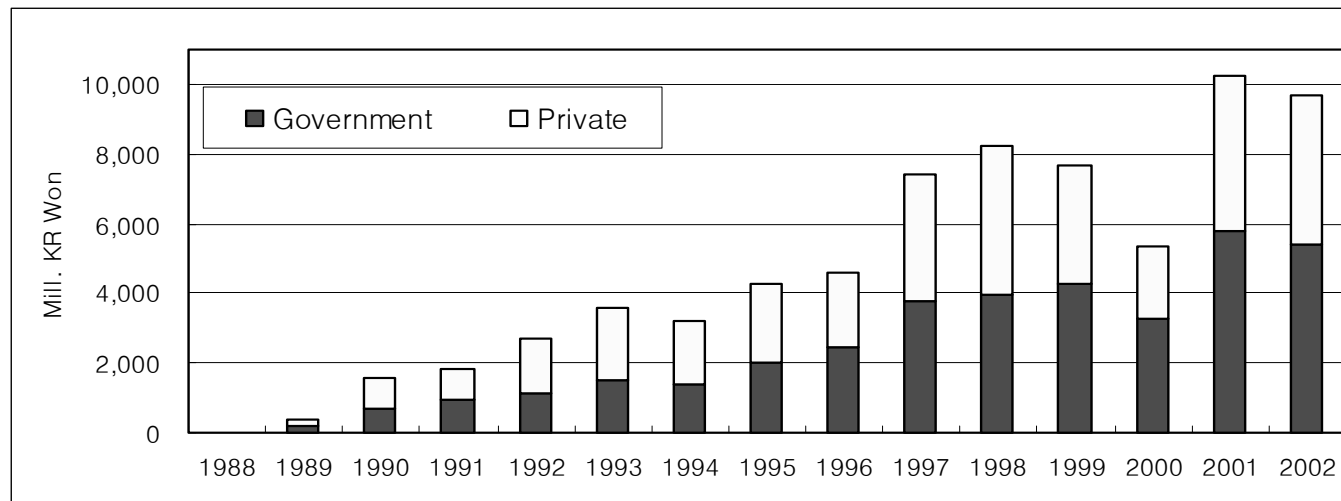
*** “Hydrogen Program” just launched (Sept. 2003)
“CO2 Mitigation & Sequestration Program” (2002)**

II-2. National Strategies (Budgets)

O R&D Budgets (MOCIE) : Approx. 70 M US\$ ('90~'03)

* Big jump in budget allocation expected next year...

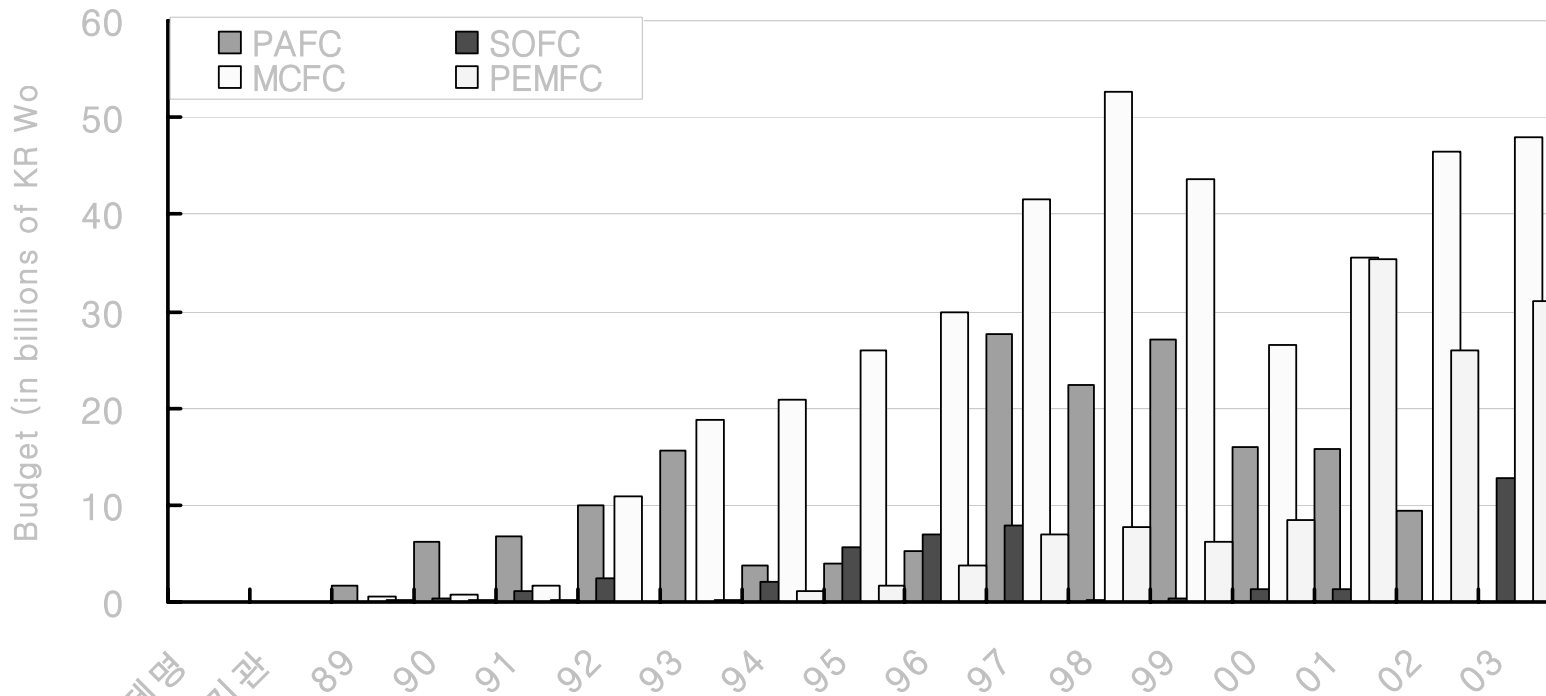
Fuel Cell R&D Budget



II-2. National Strategies (Budgets 2)

O R&D Budgets for Fuel Cell Types:

- MCFC : Major Share (50%)
- PEMFC (for RPG) : Increasing fast



과제명
수행기관

II-2. National Strategies (Projects)

R&D History of Stationary Fuel Cell Technologies

	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	
PAFC	6kW Test (KIER, KEPRI)-KEPCO																				
				2kW Dev. (KIER)-MOST				50kW Dev. (KIER, LG Caltex)-MOCIE													
PEMFC										1kW (KOGAS)	5kW Dev. (KIER)-MOCIE					3kW Dev(KIER, CETI)-MOCIE					
MCFC										2kW (KEPRI, KIST)-MOCIE			25kW (KEPRI, KIST)-MOCIE			100kW (KEPRI, KIST)-MOCIE					
SOFC										100kW (Ssangyong) -MOCIE									1kW(KEPRI) MOCIE		
																		10kW(KIER) MOCIE			

II-2. National Strategies (Projects-2) : Who & What

<u>Who</u>	<u>What</u>
• KIER	- PEMFC, SOFC, DMFC, PAFC
• KIST	- MCFC, PEMFC, DMFC, SOFC
• Samsung SDI	- PEMFC, DMFC
• Hyundai Motor	- Fuel Cell Vehicle
• LG-Chemical	- MEA, DMFC
• LG-Electronics	- PEMFC, DMFC
• CETI	- PEMFC (small RPG)
• Fuel Cell Power	- MEA
• SK Corp.	- Reformer

II-2. National Strategies (Projects-3) : Pictures

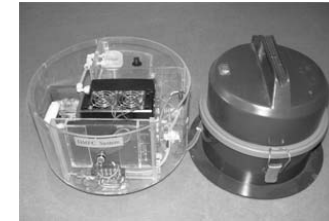
Battery Replacement



1w DMFC for Cell Phone



50W PEMFC for Computer



100W DMFC for Vacuum Cleaner

Transport/ Mobile



25kW FC/Battery Hybrid car

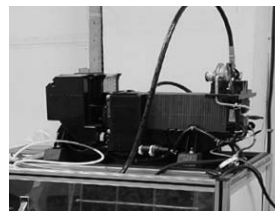


10kW PEMFC/Battery Hybrid car



75kW PEMFC vehicle

Utilities/ Stationary



1.2kW PEMFC for Residential power



5kW PEMFC for Residential power

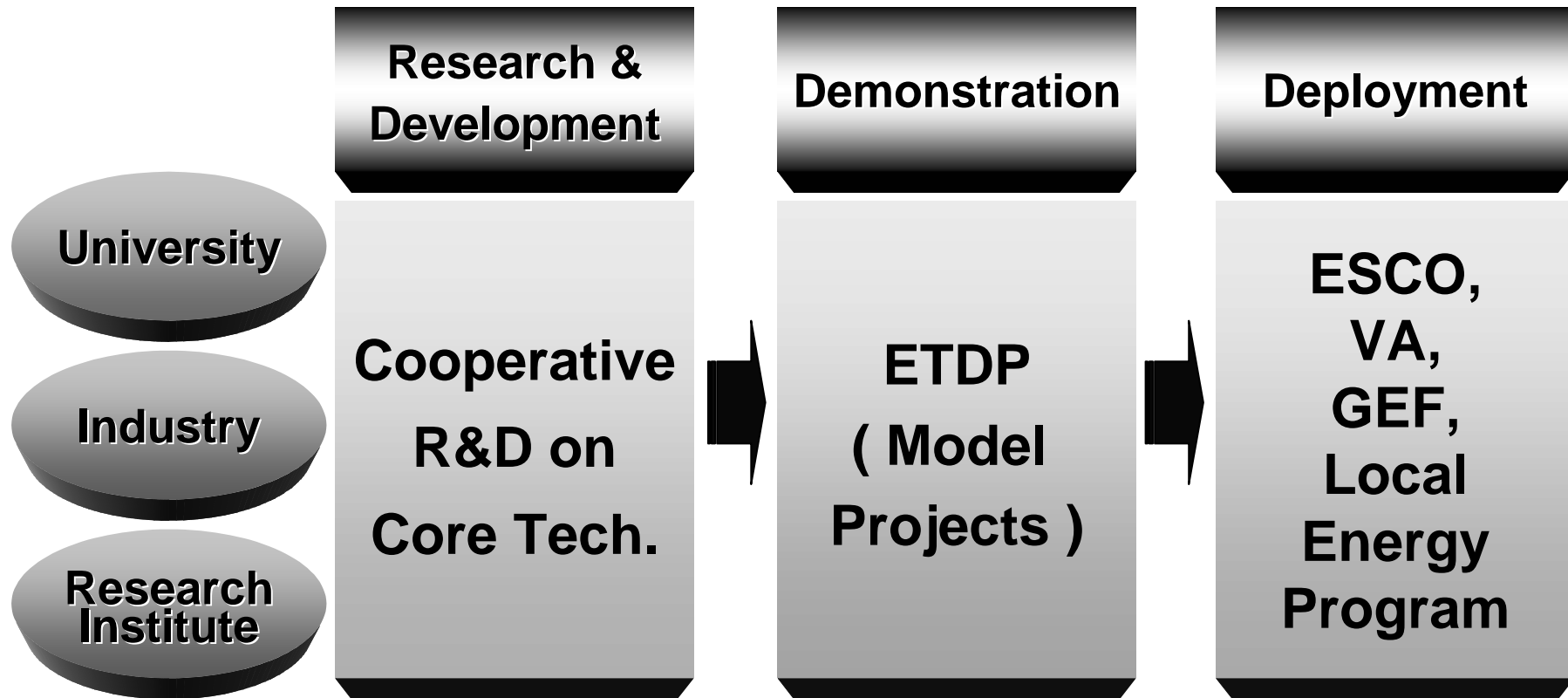


SOFC Mini Generator

II-2. National Strategies (Promoting Measures)

- O New Regulation to Mandate Installation of NRSE Technologies to the Public Sector – to begin 2004.**
- O Financial Support (Price-Differential Subsidy) to the Distributed Small Power Generation Business – 2003.**
- O Partnership with Private Sector to Receive Favor for R&D Award.**
- O Tax credits for NRSE Technology Investment & Financial Benefits**
- O Establishment of New Organization (e.g. “Hydrogen/Fuel Cell Promotion Center”) with All Stakeholders -2004**

II-2. National Strategies (Promoting Measures -2)



II-2. National Strategies (PRO) : KIER Case

- Established in 1977
- Manpower : 480 (Ph.D. 138)
- Budget : US\$ 54 Million

○ Major R&D Areas

- New and Renewable Energy Technology
- Hydrogen and Fuel Cell Technology
- Advanced Energy Materials and Application Technology
- Clean Energy Technology
- High Efficiency Energy System Technology



II-3. National Strategies (Innovation Performance-1)

O Procedure of Performance Evaluation :

- 1 Step: Survey of Candidate Projects (Bottom-Up) & Selection Process (Committee)**
- 2 Step: Solicitation & Competition → Winner Awarded**
- 3 Step: An Onsite Inspection & Evaluation of Mid-term Progress Report**
- 4 Step: Final Report & Performance Evaluation(Committee)**

O Evaluation Results: 4 Grades (Success, Moderate-1,2, Fail)

II-3. National Strategies (Innovation Performance-2)

O Key Findings (Evaluation Results of Energy Technology R&D Programs, July 2003, KEMCO)

- Insufficient/Inefficient Budget**
- Lack of Strategies (No Roadmap, No Vision)**
- Absence of Objective/Transparent Evaluation Method**
- Government's Quest for Short-term Outcomes**

O Recommendations : To Resolve “The Key Findings” ASAP.

III. External Factors to Influence Innovation

- O Shifts in Government's R&D Policy : Fuel Cell selected as one of the most important technologies this year → Positive.**
- O Change of Market Situations: Restructuring of Network Industries (e.g. Power) to shrink Long-term R&D Efforts**
- O Regulatory Constraints : Level-up of Pollutants Control and Mandatory Installation of NRSE for the Public Sector.**
- O Technology Advances in Basic Science: Advancement of Novel Technologies (IT, NT, BT) and Integration with ET**
- O International Cooperation: HCG(IEA) and IPHE**

Thank you !