The 5th IPHE Steering Committee Meeting
Vancouver, Canada

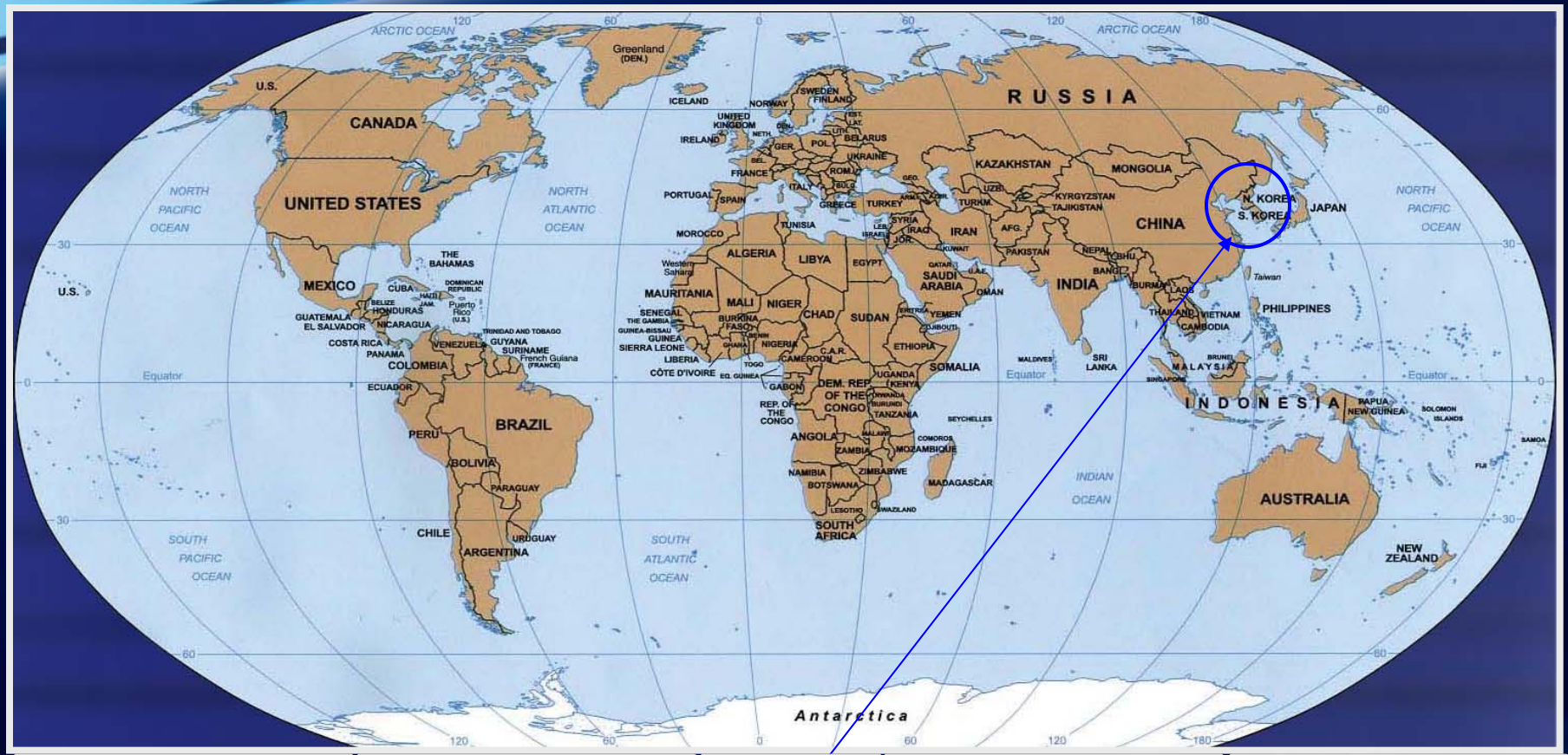
Hydrogen & Fuel cell Activities in Korea

March 28-29, 2006

Young-Sam Kim

Ministry of Commerce, Industry and Energy (MOCIE)

Energy Situation in Korea (2004)



Korea in Global Context

- 25th largest population; 48.292 million
- 11th largest GDP : $778 bil

Primary Energy Import

- Coal, Petroleum, Gas..
- $ 49 B
- 96% of Energy Consumed

Energy Consumption

- Coal: 34 B M/T
- Petroleum: 719 M bbl
- City gas: 15 B m3
- Electricity: 312 TWh
- No. 10 in World

Power Generation

- Hydro: 1.7 %
- Nuclear: 38.2 %
- Coal: 37.6 %
- Petroleum: 4.7 %
- Gas: 16.4 %

NRE Development Policy of Korea

Strategic Technology Development

- Selection of Top 3 Priority Technologies : PV, Wind Power, and Hydrogen- Fuel Cell
- Organize "Project Group" to support the whole process from technology development to creation of market
- Promote Hydrogen Economy as a feasible option to replace fossil fuels, though it takes time

Opening ceremony of "Project Group" (Wind, PV and Hydrogen&Fuel Cell) (May 18, 2004)

Vision of Hydrogen/Fuel Cells

Realization of the Hydrogen Economy (2040)

<National Plan for the Hydrogen Economy (2040)>

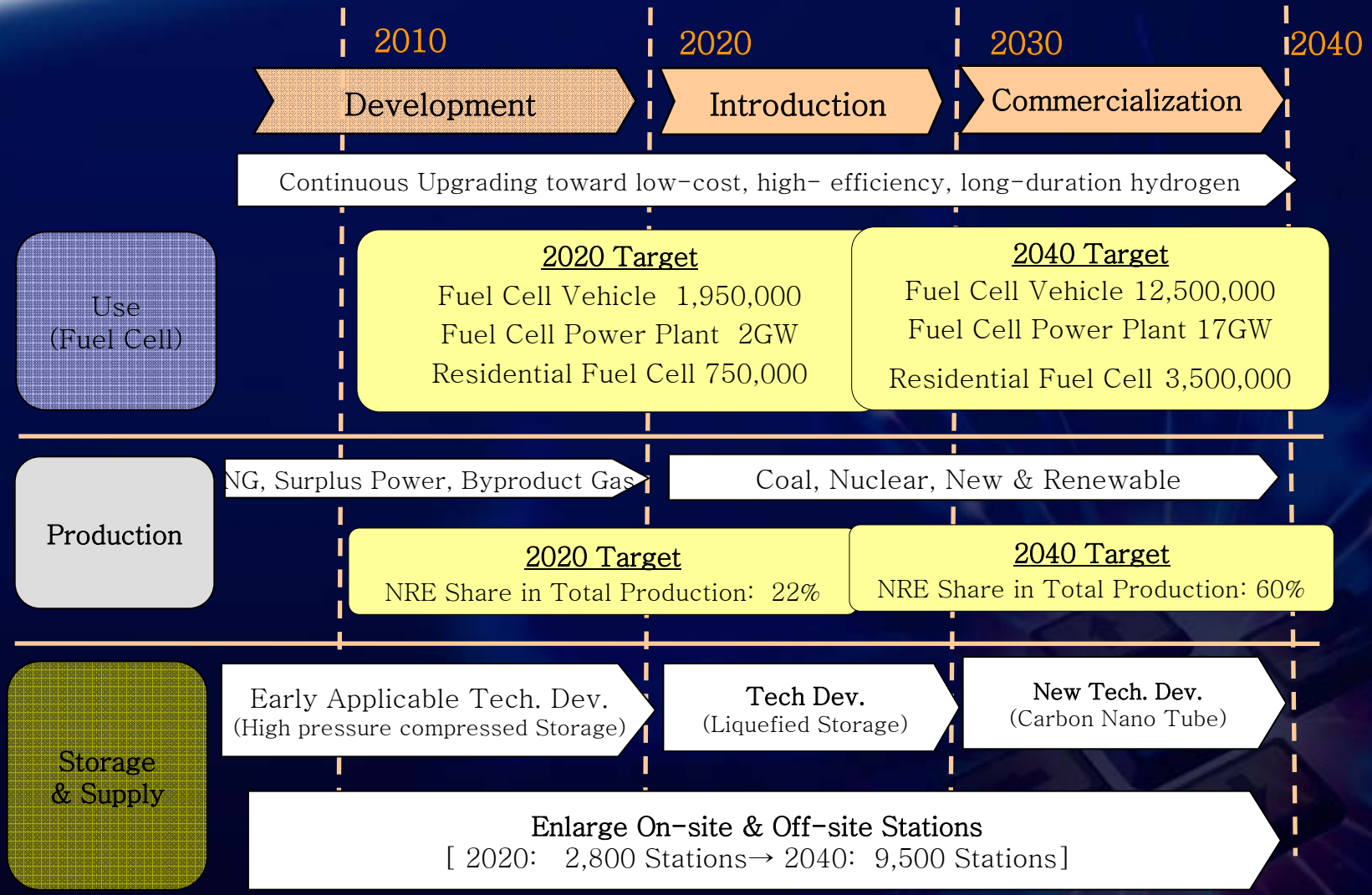
◇ Hydrogen energy portion in final energy : 15%

◇ GDP portion of fuel cell industry : 5%

◇ Vision : Creation of New Hydrogen·Fuel Cell Industry

- 60% of Hydrogen produced from renewables
- Replacement of 54% of automobile fuel by hydrogen energy
- Replacement of 22% of power plant by fuel cell generation
- Replacement of 23% of residential power by fuel cell generation

Hydrogen Economy Roadmap

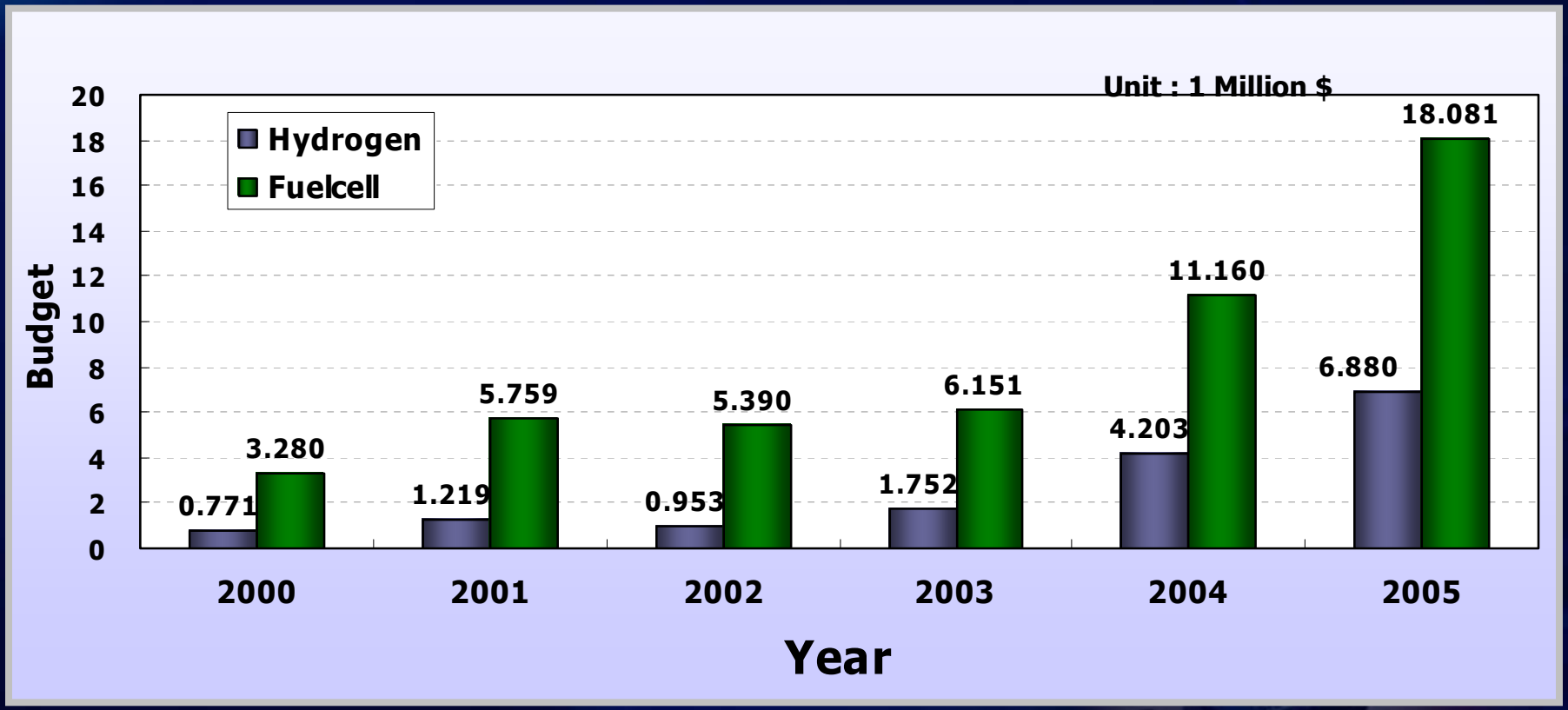


Current & Future Government Budget for H_2 and FC R&D

	Government Budget		
	MOCIE ('04-'08)	MOST ('03-'13)	Total
R&D for Hydrogen	$ 94 M	$ 90 M	$ 184 M
R&D for Fuel cells	$ 237 M		$ 237 M
Demo. & Dissemination	$ 175 M		$ 175 M

- **MOCIE** (Ministry of Commerce, Industry and Energy)
  : Short and medium-term projects, Development of industrial application technology
- **MOST** (Ministry of Science and Technology)
  : Long-term projects, Development of basic technology
- Total investment for H_2 and FC R&D ('89 ~ '04): about $ 116.9M

Recent MOCIE Budget for H_2 and FC R&D



National RD&D Program for Hydrogen and Fuel Cell (MOCIE)

Target : Commercialization of hydrogen and fuel cell technology for the hydrogen economy

Hydrogen

- Hydrogen Production/Storage for Commercialization
- Development and Demonstration of Hydrogen station
- Hydrogen Codes, Standards and Safety

Fuel Cell

- Development of 100kW class MCFC System for Stationary Application
- Development of 80kW Class PEMFC System for Transportation
- 3 kW PEMFC System for Residential Power Generation
- 50W class PEMFC System, DMFC system for Portable Application
- 3kW SOFC system for APU Application

21st Frontier Hydrogen Energy R&D Program (MOST)

Target : Fundamental technical development of hydrogen energy with funding $ 90 M for 10 years since 2003

Hydrogen Production Technology

- Hydrogen station technology (NG steam reforming)
- Water splitting using Biological, Thermo-chemical or Photocatalytic methods
- High/Low Temperature Water Electrolysis

Hydrogen Storage Technology

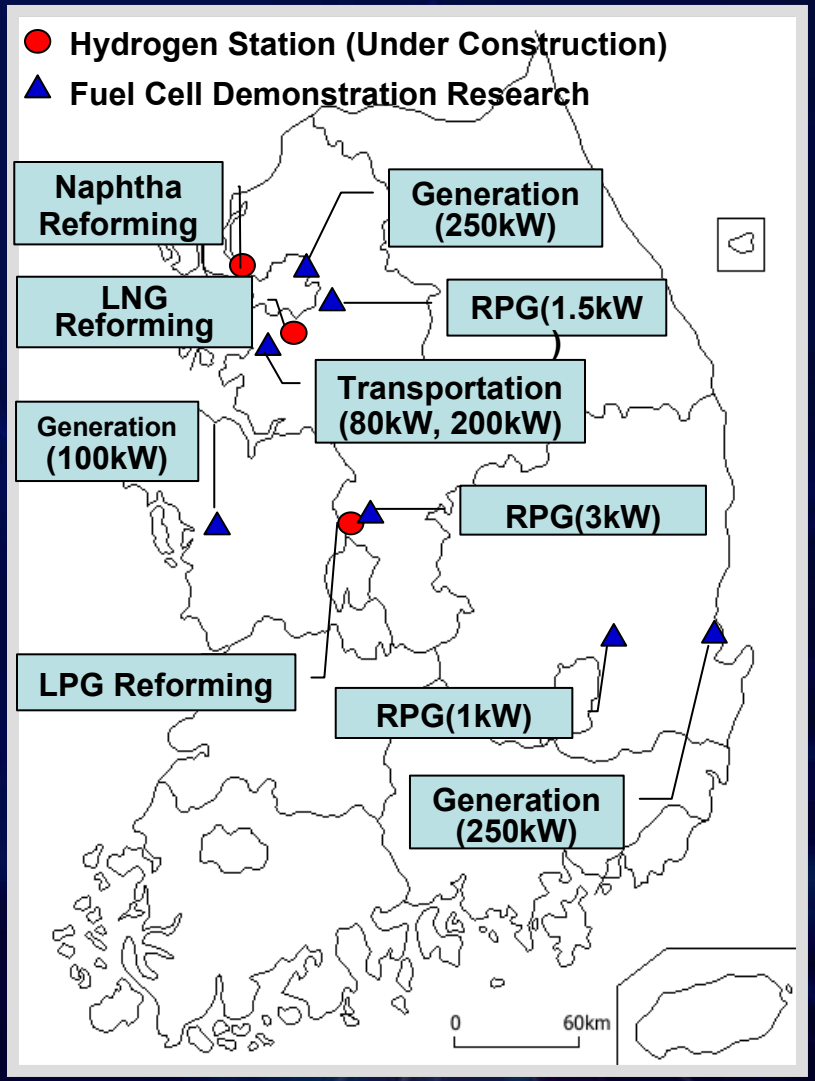
- Compressed hydrogen gas storage
- Hydrogen storage using Metal Hydrides, nano-structured materials or Chemical Hydrides

Hydrogen Utilization Technology

- Hydrogen fueled Power/Generation system
- Hydrogen Sensor and Safety

Current Status of R&D

Type	Status
Hydrogen	Basic technology R&D for production and storage (2003~) Hydrogen station using LNG and naphtha (2004~2008)
MCFC	100kW demonstration plant under operation (2005) 250kW system development (2005~2009)
PEMFC for RPG	Proto-type 3kW system development (2004~2006)
PEMFC for Transportation	FC vehicle (80kW fuel cell) development (2004~2008) FC Bus (200kW fuel cell) development (2005~2009)
DMFC	50W portable power pack development (2004~2007)
SOFC	1kW RPG system (2003~2006) 3kW APU system (2004~2007)

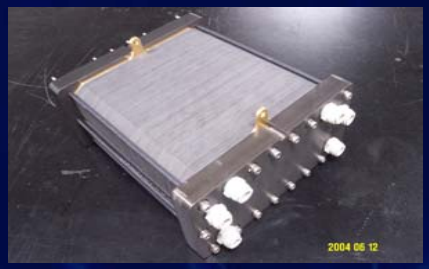


PEMFC for RPG

Participants

- **Main Contractor: GS FuelCell**
- **Sub Contractors: KOGAS, KIER, KITECH**

RPG System



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LNG Reformer

R&D Performance

Hydrogen Fuel Cell

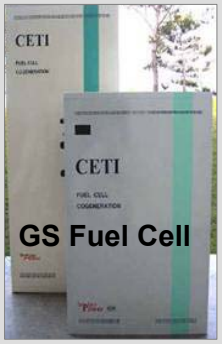
Portable

Power Plant

Hydrogen

Transportation

RPG



Education Program for H_2 & FC in Korea

- Core-Technology Research Center
  . Set-up the facilities for H_2 & FC researches and education
  . Develop a short-term re-education program for H_2 & FC industries
  . $ 9.5 Millions for 5 years

- Specialized Graduate Schools (2 Universities)
  . Develop interdisciplinary Education Program for H_2 & FC Master and Ph.D. Degrees
  . $ 4.5 Millions for 5 years

- Best Lab
  . Do In-depth researches to solve bottlenecks confronted by H_2 & FC industries, also with producing Master and Ph.D. students
  . $ 0.3 Millions for 3 years

Workshop/Conference/Symposium in Korea (2006)

Domestic Meetings

- Annual Meeting of Korean Hydrogen New Energy Society, in June 2006 (Seoul)
- Hydrogen & Fuel Cells Joint Symposium 2006 in Korea, in July 2006 (Ulsan)
- Annual Meeting of New &Renewable Energy Hydrogen Energy Society, in June 2006 (Jeju)
- Green Energy Expo in June 2006 (Daegu)

International Meeting

- Korea-Germany Renewable Energy Joint Workshop, in June 2006 (Seoul)
- 1st Int'l Forum on Hydrogen & Fuel Cell Education, in June 2006 (Jeonju)
- Int'l Forum on Hydrogen & Fuel Cell Technology, in September 2006 (Gwangju)

Thank you