

# **Updates on the ROK Energy Sector and the ROK LEAP model, and Implications of a Regional Alternative Path for the ROK**

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- Updates on the ROK energy sector and the ROK LEAP model
- The ROK measures regarding energy and environment security
- Some comments on the proposal of the Regional Alternative Path relevant with the ROK

# Summary of Changes in the ROK's BAU Path (1/3)

Item	ROK2003	ROK2004
Base Year	2000	2001
Timeline	2000-2015	2001-2020
GDP (base year: 1995)	478.5 trillion won and 4.9% annual growth rate	See next page
Population	46.1 million and 4.9% annual growth rate	See next page
Households	14.3 million and 1.5% annual growth rate	See next page
Person per Household	3.21	See next page
TPE (M TOE)	192.9	198.4
TPE/Population	4.18	4.19

## Summary of Changes in the ROK's BAU Path (2/3)

Item	2001	2005	2010	2015	2020	Annual Increase (%)	
						'02-'10	'11-'20
GDP (1995 T Won)	493.4	614.8	786.9	980.7	1,193.1	5.3	4.2
Population (Million)	47.3	48.5	49.6	50.4	50.7	0.5	0.2
Households (Million)	14.7	15.9	17.1	18.1	18.7	1.7	0.9
Person per Household	3.2	3.0	2.9	2.8	2.7	-1.2	-0.7

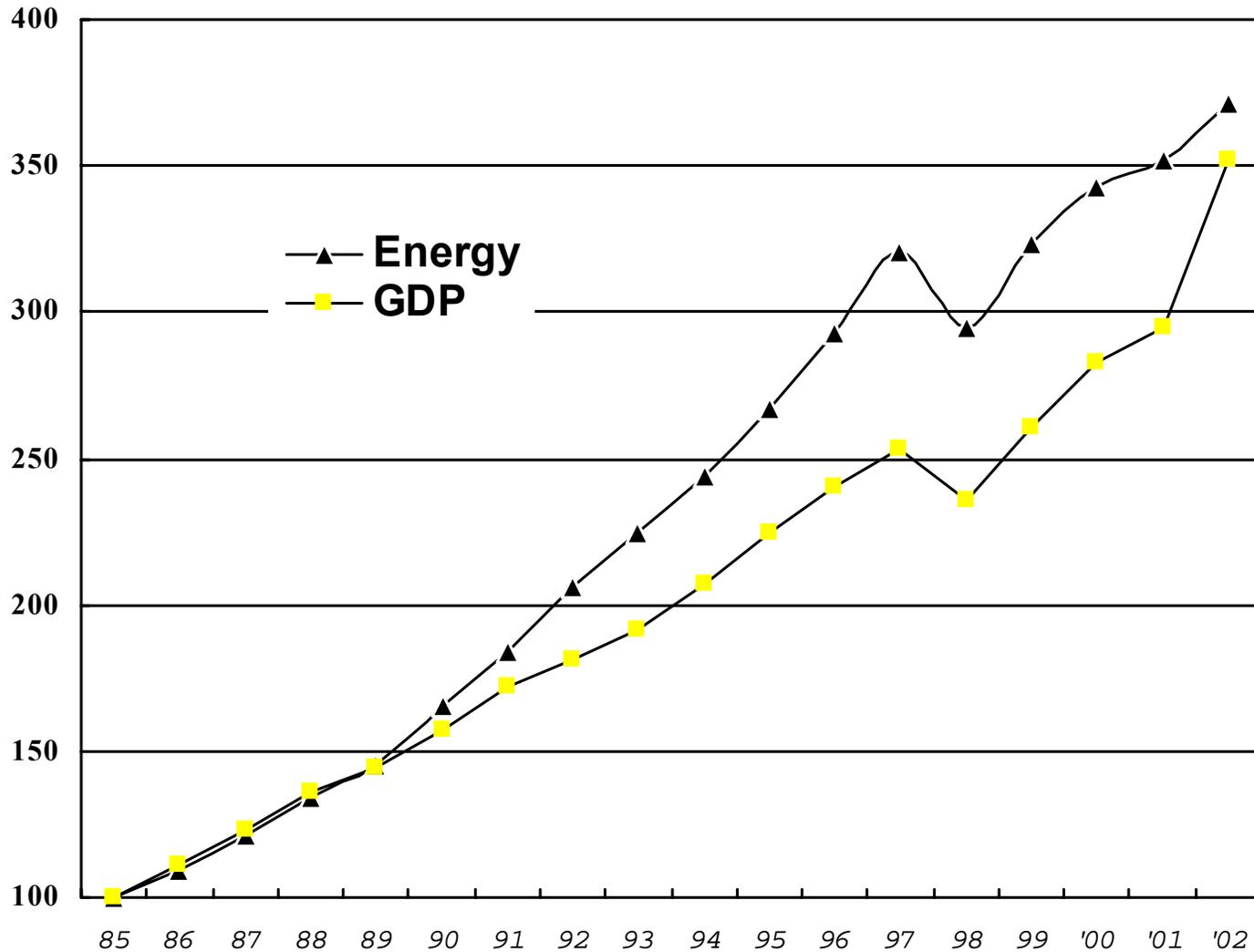
# Summary of Changes in the ROK's BAU Path (3/3)

Item	ROK2003	ROK2004
Structure of Demand Sector	-Industrial -Transportation -Residential -Commercial & Public	-Industrial -Transportation -Residential -Commercial -Public & etc.

# Energy and Economic Growth

Item	1981	1990	1995	2000	2002	Growth rate (%)	
						'81-'90	'90-'00
Primary Energy Consumption (M TOE)	45.7	93.2	150.4	192.9	208.6	8.2	7.5
Per Capita Energy Consumption (TOE)	1.18	2.17	3.34	4.08	4.38	7.0	6.5
Energy/GDP (TOE/'95 M Won)	0.37	0.35	0.40	0.40	0.40	-0.6	1.4
Overseas Dependency (%)	75.0	87.9	96.8	97.2	97.1	-	-
GDP ('95 T Won)	122.4	263.4	377.3	478.5	524.7	8.9	6.1
Population (M)	38.7	42.9	45.1	47.3	47.6	1.2	1.0

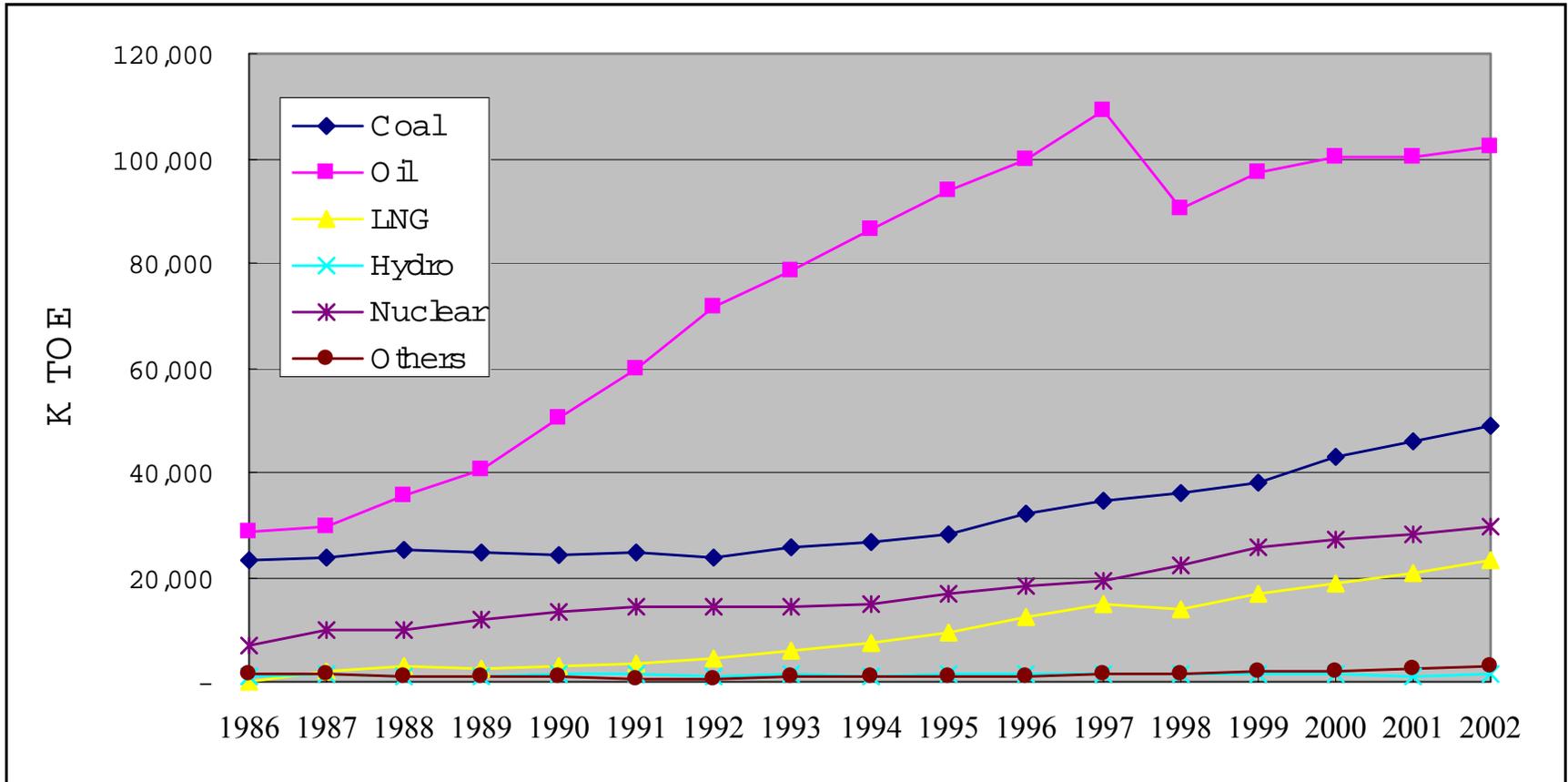
# Energy Consumption and Economic Growth



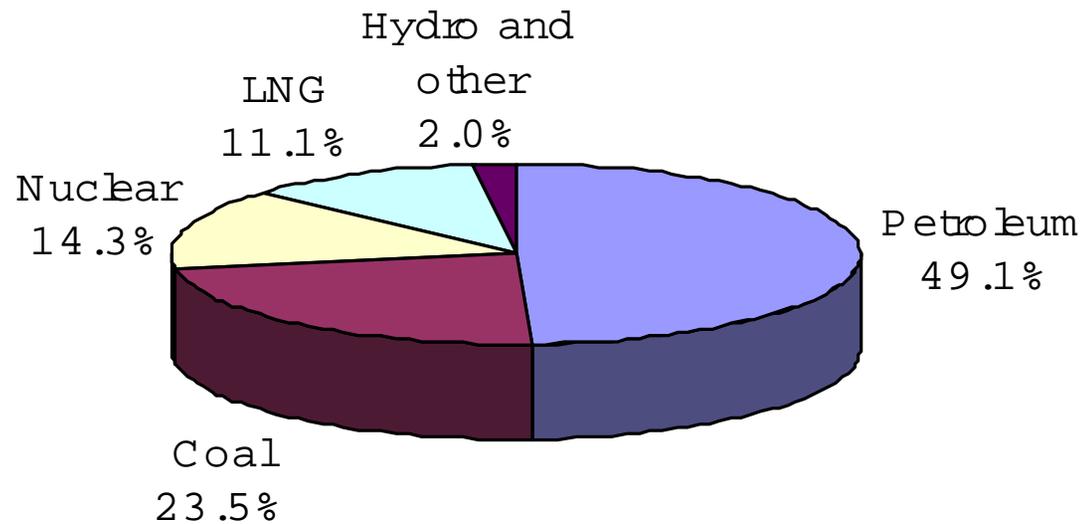
# Primary Energy Consumption by Fuel (unit: k TOE)

	Coal	Oil	LNG	Hydro	Nuclear	Others	TPES	Growth (%)
1991	24,535	59,627	3,503	1,263	14,078	617	103,619	11.2
1992	23,618	71,740	4,581	1,216	14,133	723	116,010	12
1993	25,882	78,495	5,723	1,502	14,535	742	126,879	9.4
1994	26,680	86,343	7,618	1,025	14,663	906	137,234	8.2
1995	28,091	93,955	9,213	1,369	16,757	1,051	150,437	9.6
1996	32,200	99,898	12,172	1,301	18,481	1,161	165,212	9.8
1997	34,799	109,080	14,792	1,351	19,272	1,344	180,638	9.3
1998	36,039	90,582	13,838	1,525	22,422	1,526	165,932	-8.1
1999	38,155	97,270	16,849	1,517	25,766	1,806	181,363	9.3
2000	42,911	100,279	18,924	1,402	27,241	2,130	192,887	6.4
2001	45,711	100,385	20,787	1,038	28,033	2,456	198,409	2.9
2002	49,096	102,414	23,099	1,327	29,776	2,925	208,636	5.2

# Primary Energy Consumption by Fuel (unit: k TOE)



# Energy Consumption by Fuel (2002)

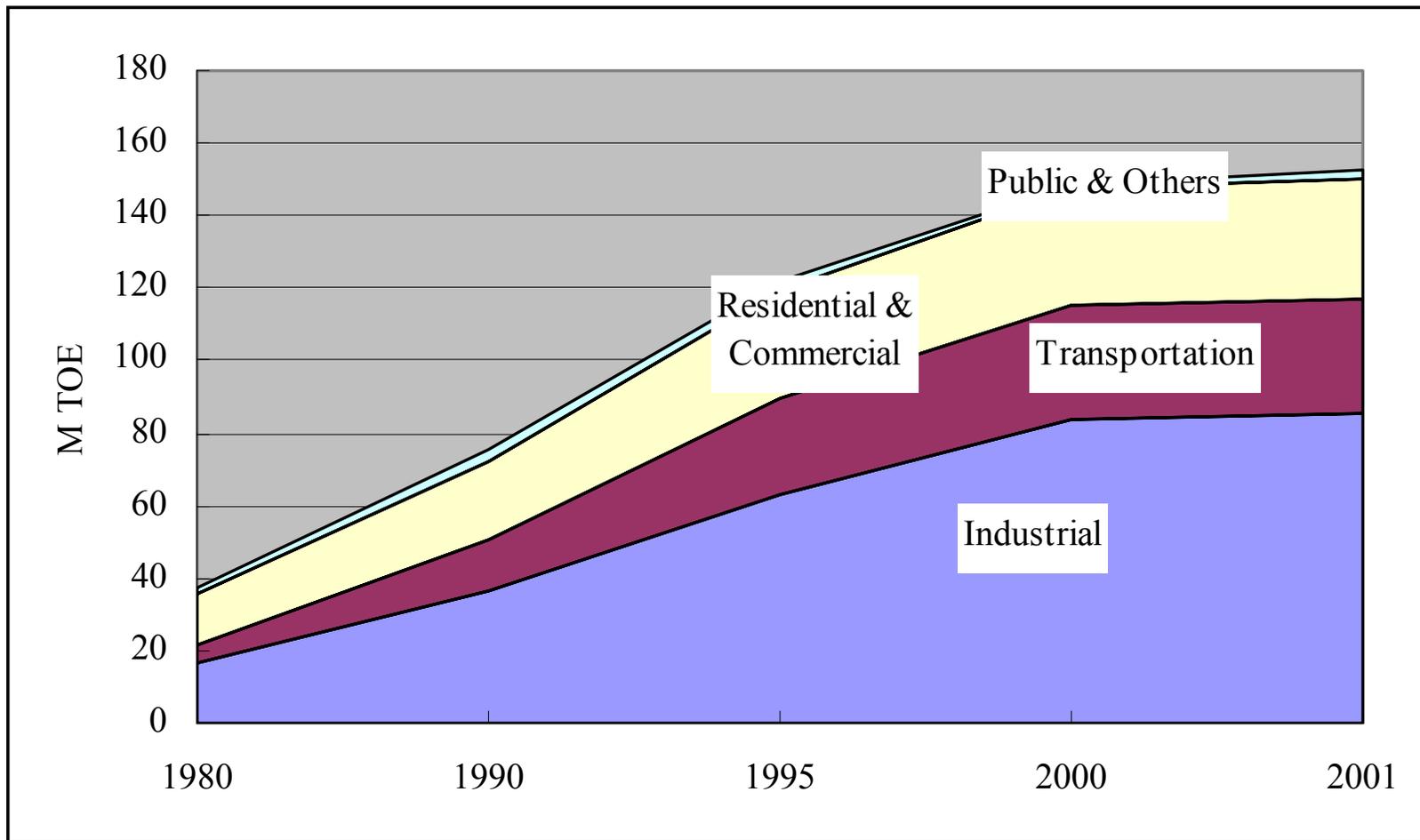


Total energy consumption: 208.6 M TOE

## Final Energy Consumption by Sector (unit: M TOE)

Item	1980	1990	1995	2000	2001	2002
Industrial	16.2	36.2	62.9	84.1	85.2	89.2
Transportation	5.1	14.2	27.1	30.9	31.9	33.8
Residential/Commercial	14.0	22.0	29.5	32.4	32.9	34.3
Public & etc.	2.3	2.8	2.4	1.2	3.0	3.2
TOTAL	37.8	75.1	122.0	150.1	153.0	160.5

# Final Energy Consumption by Sector (unit: M TOE)



# The ROK Measures Regarding Energy Security

- Traditional measures
  - Government intervention on energy imports and domestic supplies
  - Diversifying energy fuels and import sources
  - Encouraging energy developments in abroad
  - Oil stockpiling
  - Energy conservation
- New measures
  - Enforcing market force rather than government control
  - Continuously increasing oil stocks
  - Enhancing international/regional energy cooperation

# The ROK Attitude on Environment Security

- The ROK retains its status as a “developing country” in international climate-change negotiations. In the near future, however, it’s the ROK's role in climate-change negotiations should reflect its high per capita energy consumption. The ROK will introduce environmental costs into the prices of energy products in order to mitigate CO<sub>2</sub> emissions from the energy sector.

# The ROK Alternative Scenarios

- Previous Alternative Scenarios (by Dr. H.S. Kim)
  - Introduction and expansion of Natural Gas Vehicle (NGV)
  - Introduction and expansion of LFG generation
  - Expansion of compact household vehicles
  - Introduction of ‘fuel cell’
  - Changes in energy/environmental technology
  - Structural change in electricity sector
  - Various regional cooperation
- Additional Near-term Scenarios
  - Strengthening renewable energy portion by the ROK government
  - Facing siting challenges of nuclear power plants from 2014

# Renewable Energy Plan of the ROK (2003) (1/2)

(Unit : GWh)

Item	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Photovoltaic	8.3	15.5	39.1	87.6	158.2	261.6	409.9	767.0	1,365.0	1,793.0
Wind Power	52.6	153.3	273.8	503.7	919.8	1,445.4	2,606.1	3,525.9	5,245.7	6,639.1
Small Hydro	202.2	223.9	247.6	444.6	681.2	917.7	1,193.6	1,469.5	1,785.9	2,139.7
IGCC					79.2	79.2	79.2	2,138.4	4,356.0	6,336.0
LFG	616.3	1,232.6	1,848.8	2,465.1	3,081.4	3,383.7	3,697.7	4,000.0	4,313.9	4,616.3
Fuel cell		0.8	0.6	4.6	12.6	42.2	175.4	894.3	1,710.9	2,621.7
Ocean Energy				3.0	3.0	573.0	573.0	843.0	1,726.0	1,726.0
Sub-total (b)	879.4	1,626.1	2,409.9	3,508.6	4,935.4	6,702.8	8,734.9	13,638.0	20,503.0	25,871.0
Total Generation (a)	288,594	299,981	311,051	321,179	330,452	339,452	347,673	355,321	362,924	369,973
Share (b/a, %)	0.3	0.5	0.8	1.1	1.5	2.0	2.5	3.9	5.6	7.0

## Renewable Energy Plan of the ROK (2003) (2/2)

- If the 2003 ROK plan on the renewable energy is implemented, the electricity generation capacity of the renewable energy would be approx 3,500MW, which corresponding to more than two 1,400 MW PWRs that are supposed to be deployed in 2014 and in 2015 in ROK.
- However, there is skepticism on the feasibility of the implementation of the 2003 ROK plan for the renewable energy.

# Siting Challenges of New Nuclear Power Plants

- There is no domestic sites for new nuclear power plants that are supposed to be deployed after 2014 in ROK, even though the ROK already has a national plan to deploy two 1,400 MW PWRs in 2014 and in 2015.
- Furthermore, there is great and growing resistance to the deployment of nuclear power plants and/or other nuclear waste facilities among local communities of ROK.
- Therefore, deployment of new nuclear power plants after 2014 in ROK is unlikely expected.

# Some Comments on the Proposal of Regional Alternative Path Relevant with ROK (1/3)

- About reducing the gas supply to ROK gradually at the RFE gas projects and LNG terminal project in DPRK
  - Could this assumption be practical ? How will ROK make up for the reduced gas in the situation that the ROK's gas demand increases.
  - What is the alternative sources for the reduced gas ?
- Is the building of LNG terminal in DPRK practical on the point of economic view ?
  - Transportation of gas from LNG terminal located in DPRK to ROK seems uneconomical because of the cost for long line pipeline from Nampo to ROK board

# Some Comments on the Proposal of Regional Alternative Path Relevant with ROK (2/3)

- Does Irkutsk gas go to only China and Mongolia
  - ROK and DPRK are also strong candidates for the Irkutsk gas. The feasibility study jointly carried out by ROK, Russia, and China was finished last year. This study reviewed the transportation from Irkutsk to China and ROK.
- Is Yakutsk promising area as a source of PNG to ROK?
  - The pre-feasibility study carried out by Russia and ROK in 1995 concluded tentatively that the project is uneconomical.
- Is the amount of the gas (about 30 BCM) for the ROK from RFE too much ?
  - In 2002, the ROK's gas demand was 13 BCM.

# Some Comments on the Proposal of Regional Alternative Path Relevant with ROK (3/3)

- Cooperation in Nuclear Research and Nuclear Waste Agreements
  - The idea about the nuclear research on the regional nuclear safety might not be so attractive to ROK, Japan and Taiwan that already have had close relationships with the IAEA on the same subject.
  - The idea about the nuclear research on the regional nuclear waste disposition would be very attractive since ROK, Japan and Taiwan have common serious concerns on the disposition of their spent nuclear fuels and high level wastes, including low level wastes as well.