

The 12th AIM International Workshop

Feb. 19-21, 2007
NIES, Tsukuba, Japan

Comparison of CO₂ Mitigation Costs

-- An Application of AIM/Enduse Model, Korea --

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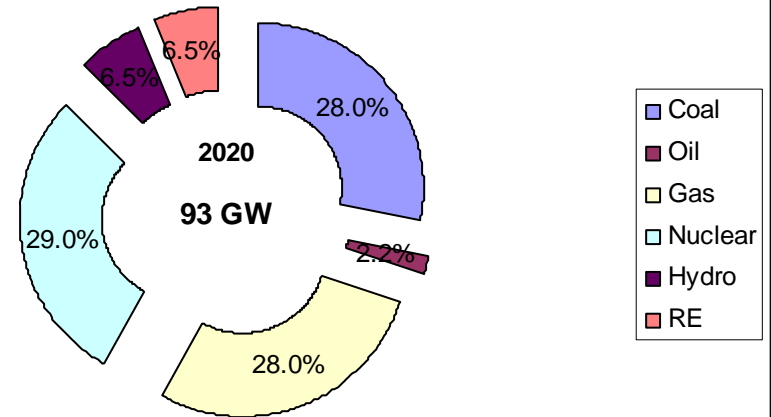
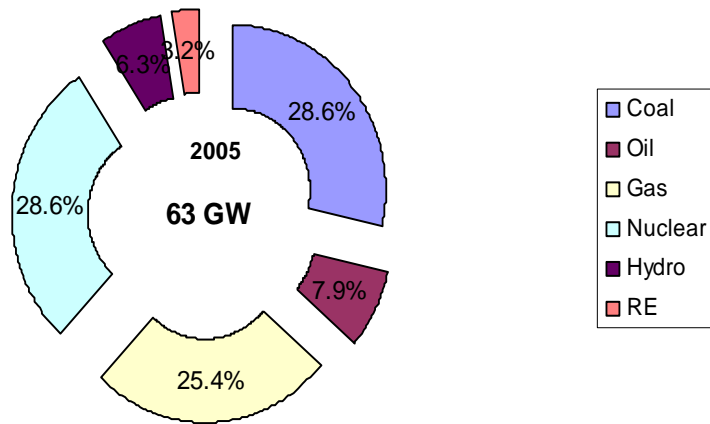
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Power Sector Plan (2005 – 2020)

Capacity

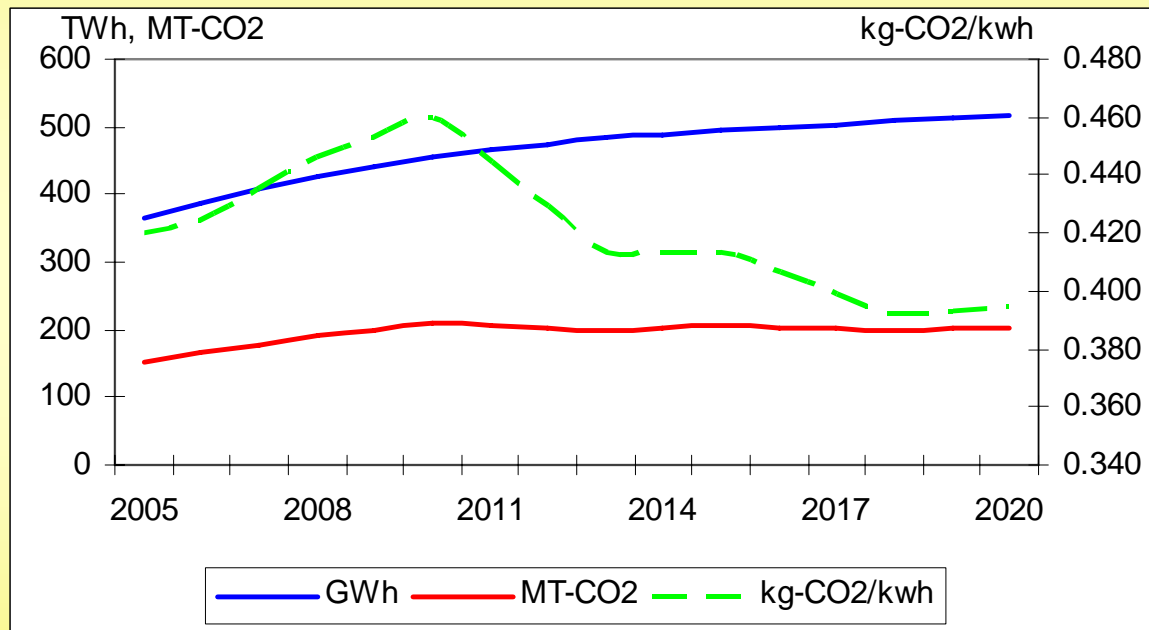


➤ **Average Annual Growth Rate (AAGR): 2.6%**

Source: the 3rd Basic Plan of Long-term Electricity Supply and Demand (2006-2020), MOCIE, Korea

Power Sector Plan (2005 – 2020)

Generation/CO2/CO2 Intensity

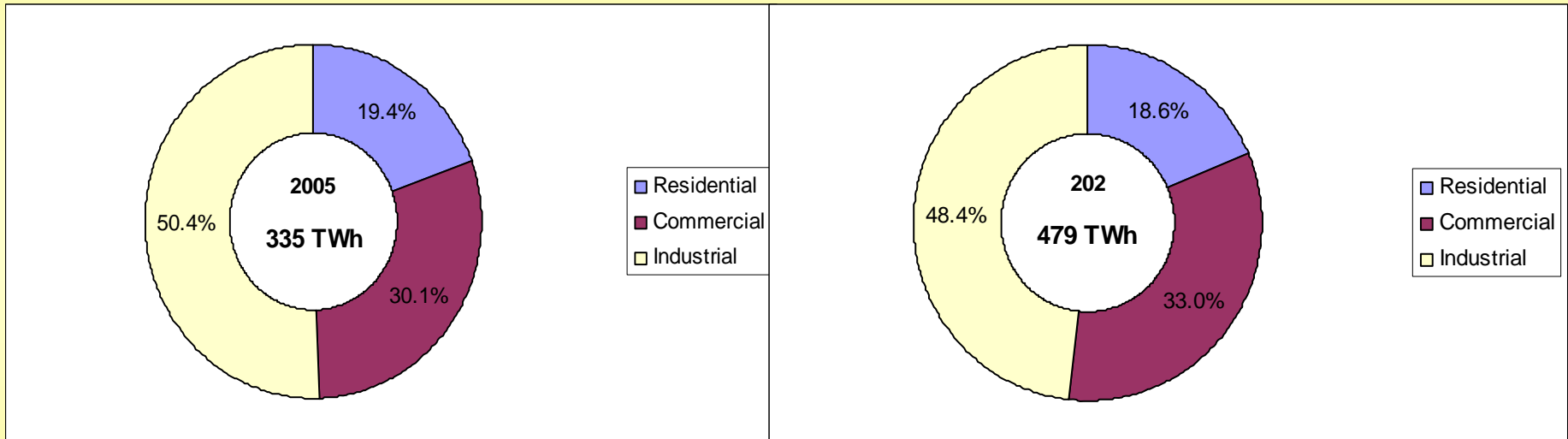


➤ **AAGR: CO2 (1.9%) = TWh (2.3%) + CO2/TWh (-0.4%)**

Source: the 3rd Basic Plan of Long-term Electricity Supply and Demand (2006-2020), MOCIE, Korea

Power Sector Plan (2005 – 2020)

Generation by Sector

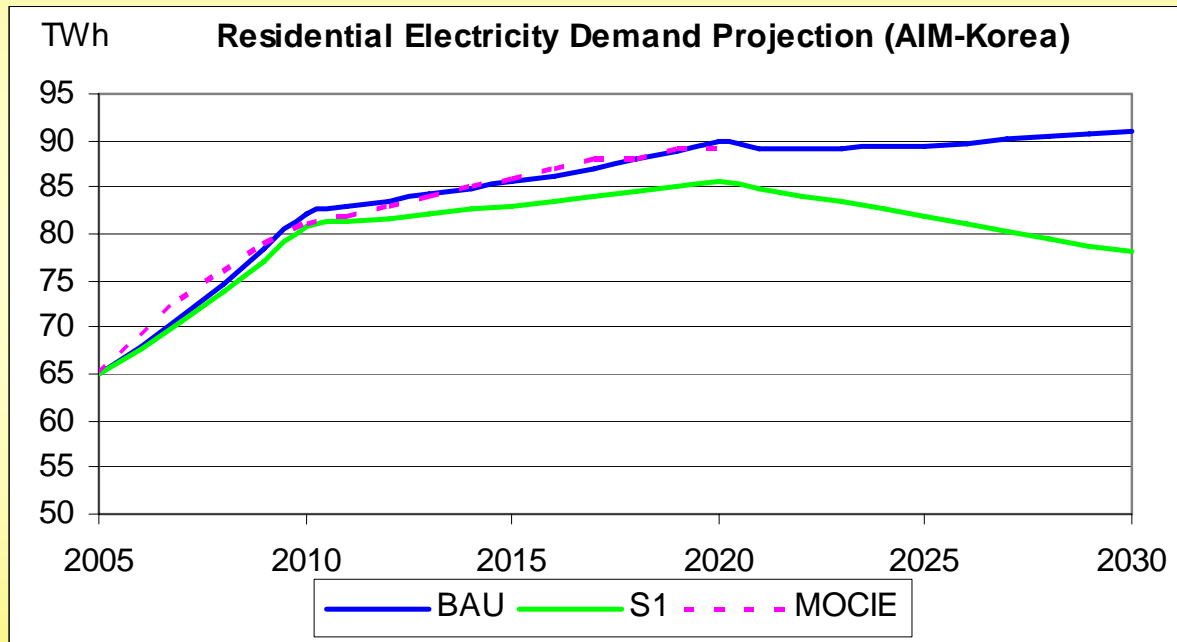


➤ AAGR: Res. 2.1% Com. 3.0% Ind. 2.1%

Source: the 3rd Basic Plan of Long-term Electricity Supply and Demand (2006-2020), MOCIE, Korea

AIM-Enduse Model, Korea

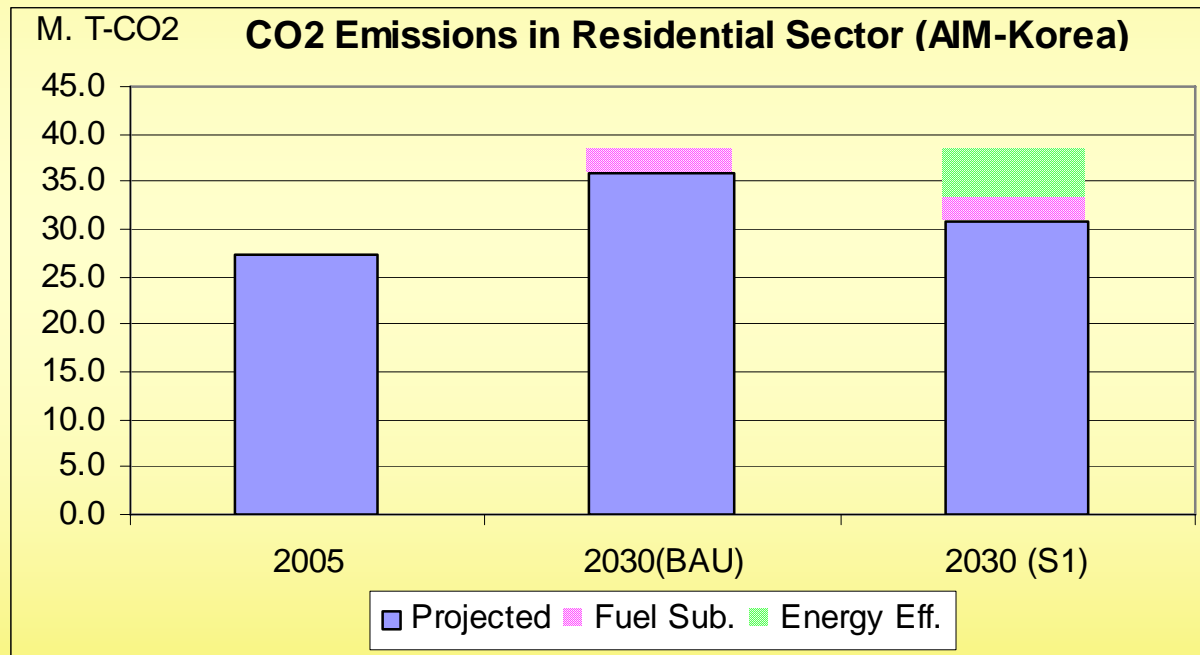
Residential Sector: Projections



- **S1 Scenario: Energy Efficient Choice of Services (Max. Potential of Energy Savings)**

AIM-Enduse Model, Korea

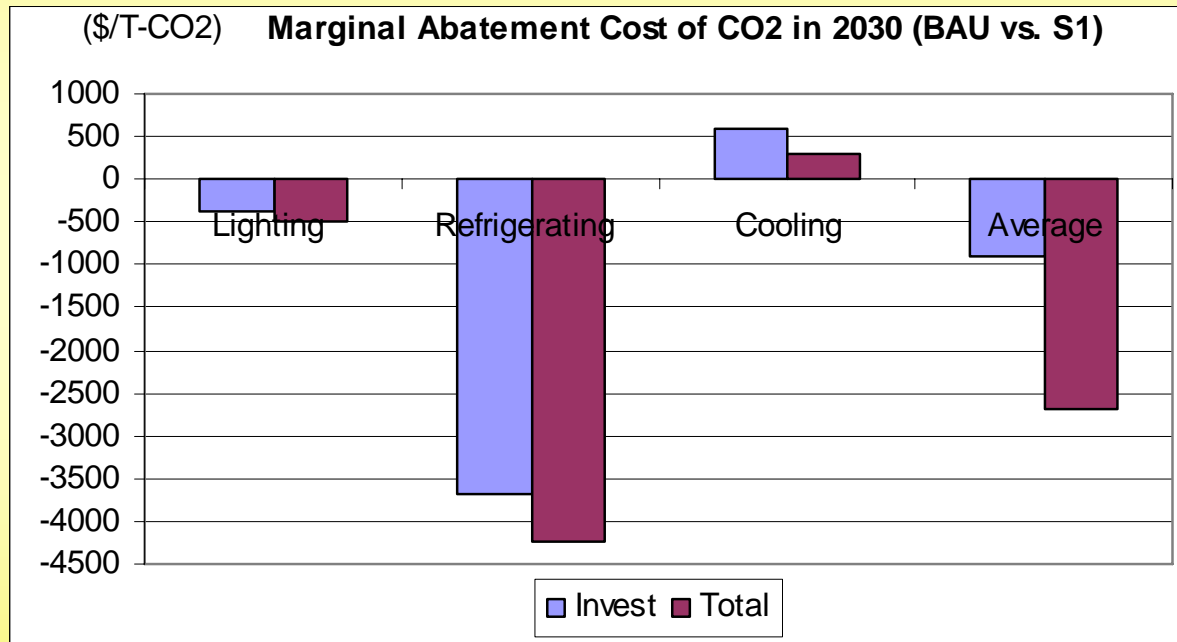
Residential Sector: CO2 Reduction



- **S1 Scenario: 5.1 Mill. T-CO2 Reduction in 2030 (vs. BAU)**
- **2.3 Mill. T-CO2 by the Improvement of CO2 intensity in Power Sector**

AIM-Enduse Model, Korea

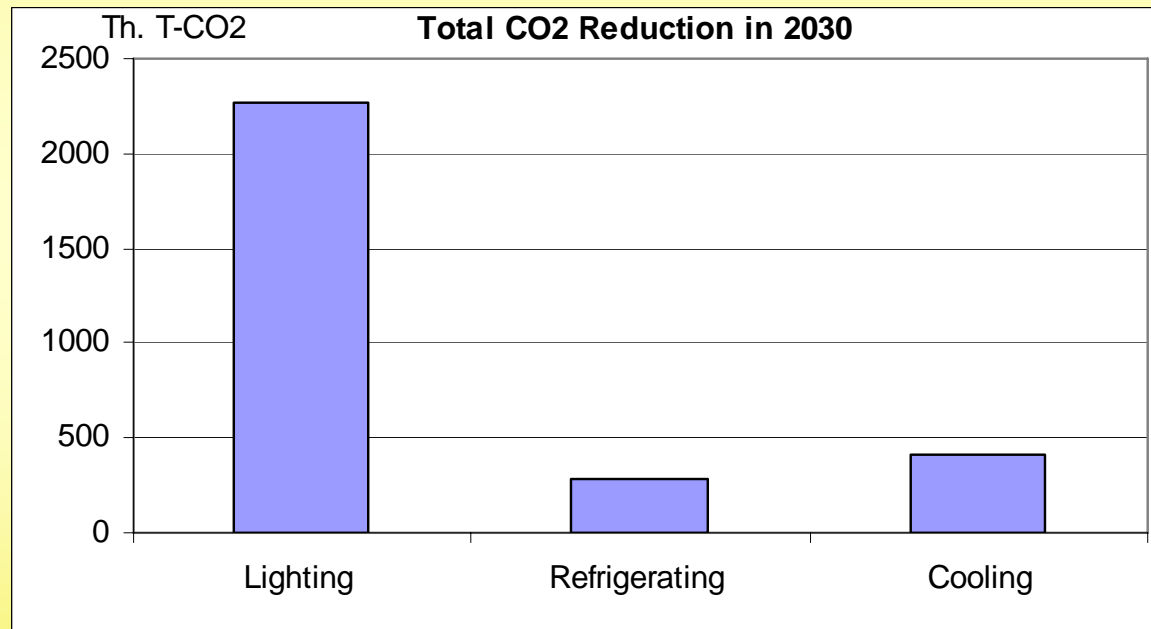
Residential Sector: Marginal Abatement Cost



- Discount Rate: 5%
- Average: Average of All Technology Selections in Every Service
- Total = Investment + Avoided Cost of Electricity Savings

AIM-Enduse Model, Korea

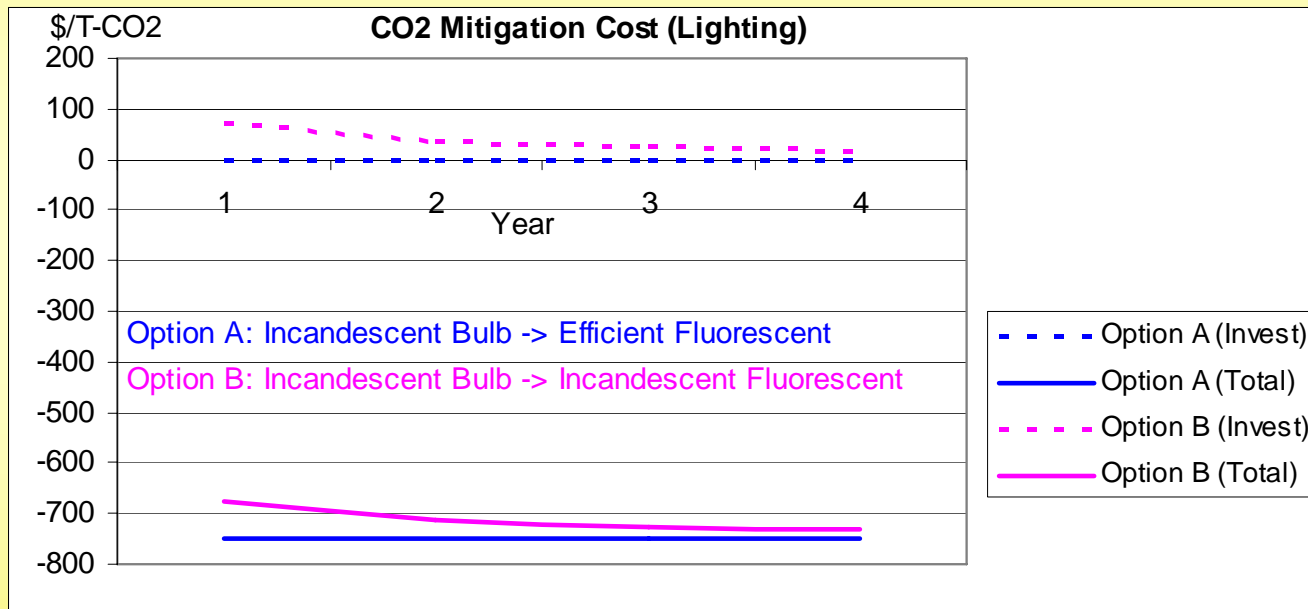
Residential Sector: Total CO2 Reduction



- Total CO2 Reduction in This Sector: 5.1 Mill. T-CO2 in 2030
- Total Discounted Investment Cost: 5.7 Bill. US \$ in 2030

AIM-Enduse Model, Korea

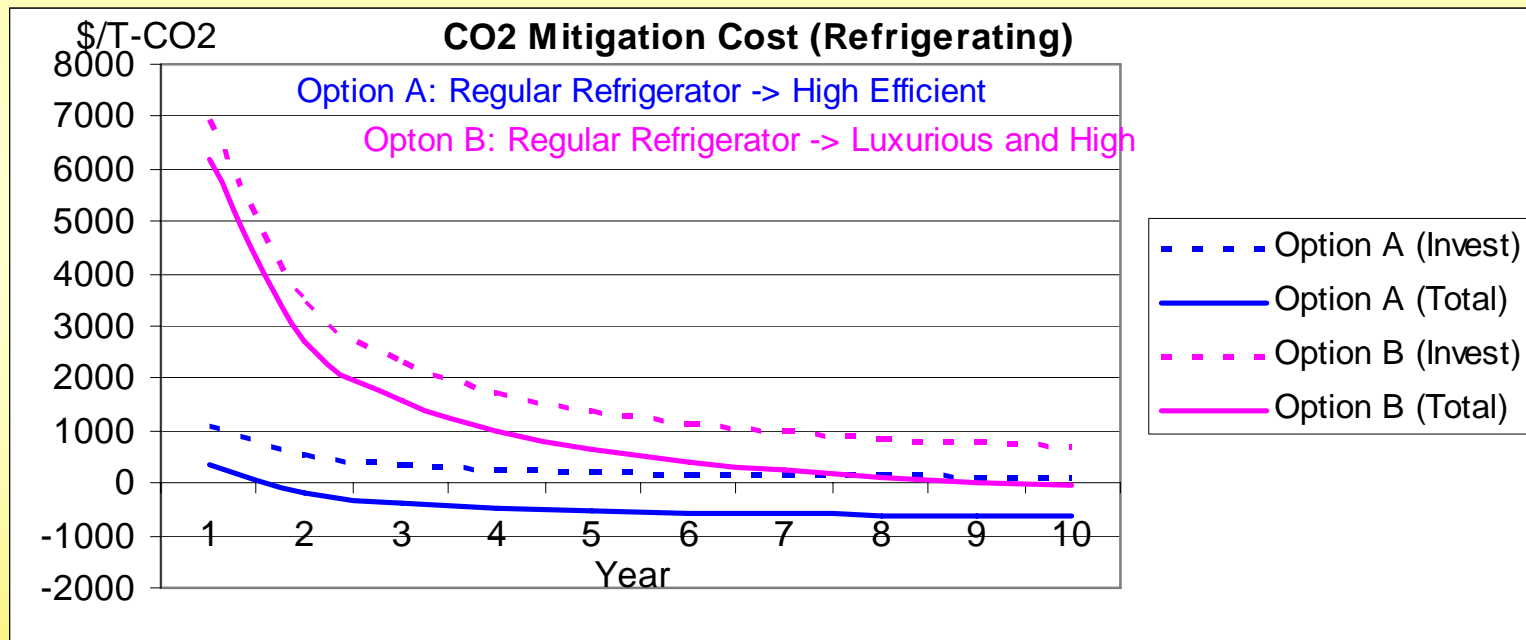
Residential Sector: Lighting Option



- Lighting: 32% of Electricity Consumption in 2030
- Lighting Bulb: Life time: 4 years, 7 hours/day
- Total = Investment + Avoided Cost of Electricity Savings

AIM-Enduse Model, Korea

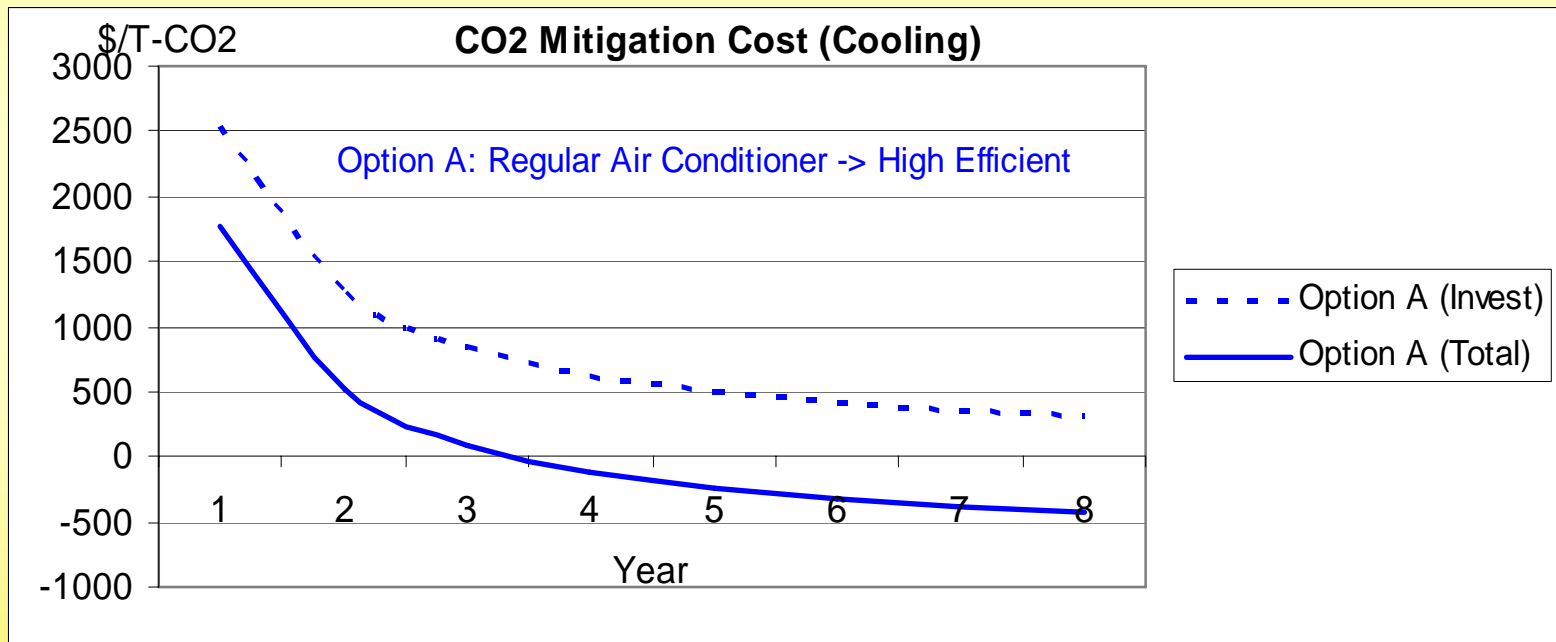
Residential Sector: Refrigerating Option



- Refrigerating: 3% of Electricity Consumption in 2030
- Refrigerator: Life time: 8 years, 24 hours/day

AIM-Enduse Model, Korea

Residential Sector: Cooling Option



- **Cooling: 9% of Electricity Consumption in 2030**
- **Air Conditioner: Life time: 8 years, 96.2 hours/year**

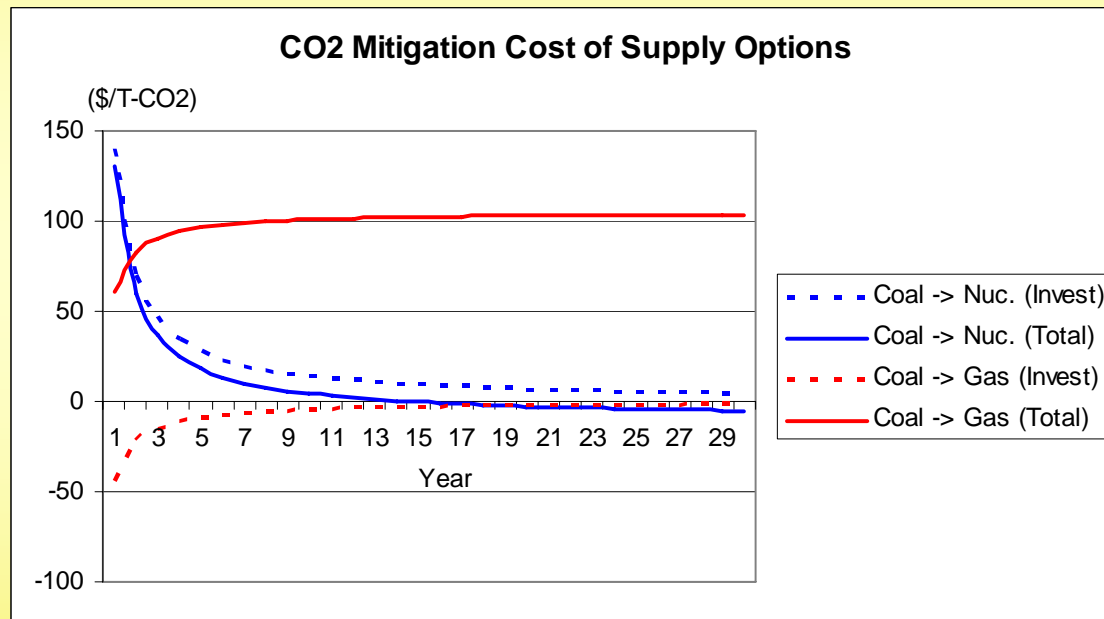
CO2 Mitigation Cost in Power Sector

○ Basic Assumptions

- **No Discount Rate**
- **Investment Cost: Annualized Cost**
- **Base Case: Coal Fired Power Plant (1000MW)**
- **Objective: Compare the incremental CO2 Mitigation Cost → Marginal Abatement Cost of Options**
- **Power Sector Options: Supply Side/Demand Side**

CO2 Mitigation Cost in Power Sector

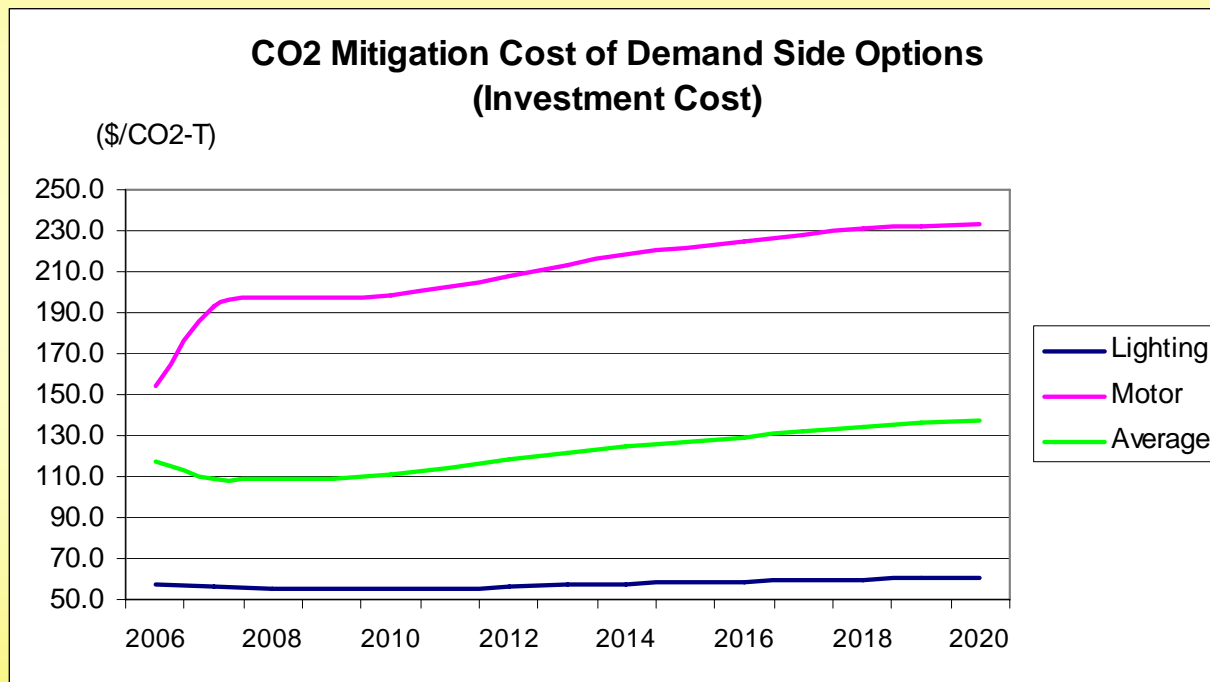
Supply Side



- Coal: 1000MW, Nuclear: 1000MW, Gas: LNG CC 500MW
- Total = Investment Cost + Variable Cost (Fuel + O&M)

CO2 Mitigation Cost in Power Sector

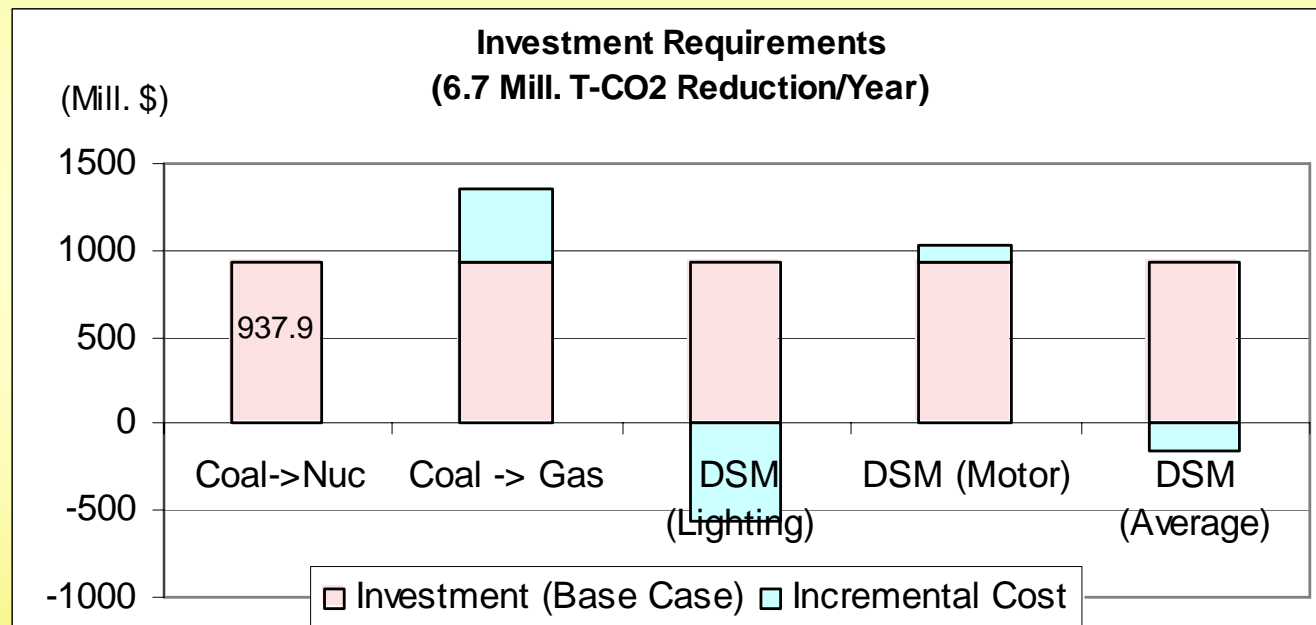
Demand Side



- Based on Government Plan on DSM
- Average: Calculated by total investment and total capacity savings

CO2 Mitigation Cost in Power Sector

Cost Comparison



- **Base Case: Coal → Nuclear (6.7 Mill. T-CO2 Savings/Year)**
- **Incremental Investment Requirements by Option: Blue Area**

Policy Issues



○ Criteria for the Policy Choice

- **Supply Side vs. Demand Side Options**
- **Financial Requirement & Financing Method**
- **Unit Cost of Mitigating CO₂ (Marginal Abatement Cost)**
- **Total Volumes of CO₂ Reduction Potentials**
- **Priority**
- **Target Indicators (Total CO₂, Intensity, Sectoral Target...)**

Clean Investment Framework (WB)



- G8 Meeting in 2005 → WB/IEA
- Development Committee of the WB → Accept the clean investment framework (Sept. 2006)
- 2nd Stage: Case Study on +5 countries (China/India/Brazil/Mexico/South Africa)
- Report to G8 Meeting in 2008 (Japan)

Clean Investment Framework (WB)



- Pillar 1: Energy for Development and Access for the Poor
- Pillar 2: Policies and Financial Requirements to Support a Transition to a Low Carbon Economy
- Pillar 3: Need for Investments to Reduce Vulnerability to Climate Variability and Risk

Clean Investment Framework (WB)

Pillar 1

- Energy for Development and Access for the Poor
 - 1.4 billion people will not have access to electricity by 2030. (IEA estimates)
 - Electricity supply needs \$165 billion p.a.
 - Current private and public sector resources fund \$80 billion p.a.
- Energy has an important role in economic growth and poverty alleviation
- The challenges are
 - to provide the poor with access to modern clean energy
 - to enable these financial instruments to bridge financial gap

Clean Investment Framework (WB)

Pillar 2



- Transition to a Low Carbon Economy
 - Multi-Gas/Multi-Sector Strategies and International Emission Trading
→ Reducing Financial Needs
 - Technologies (currently available and will be)
 - Requires tens of billions of dollars p.a. of Incremental Investments in energy sector (especially Power Sector)
- Scaling up
 - Energy Efficiency Improvement Programs
 - Renewable Energy
 - Financial Instruments