# AIM/Enduse Model for Thailand:Effects of CO2 Emission Constraints

Ram M. Shrestha
Asian Institute of Technology
Thailand

# Presentation Overview

- Introduction
- Energy Demand and Emissions
- Implications under Emission Constraints
- Implications of Limits of Natural Gas Import
- Conclusions

# Sector Classification

- Energy Demand Sectors
  - Agriculture
  - Transportation
    - Air, Rail, Road and Water
  - Commercial
  - Industrial
    - 8 sub-sectors (food, textile, paper, chemicals, cement, equipments, steel and others)
  - Residential
    - Bangkok metropolitan area (MEA) and rest household (PEA)
- Energy Conversion and Supply Sectors
  - Coal, biomass, power generation, natural gas production and supply and petroleum refineries and supply

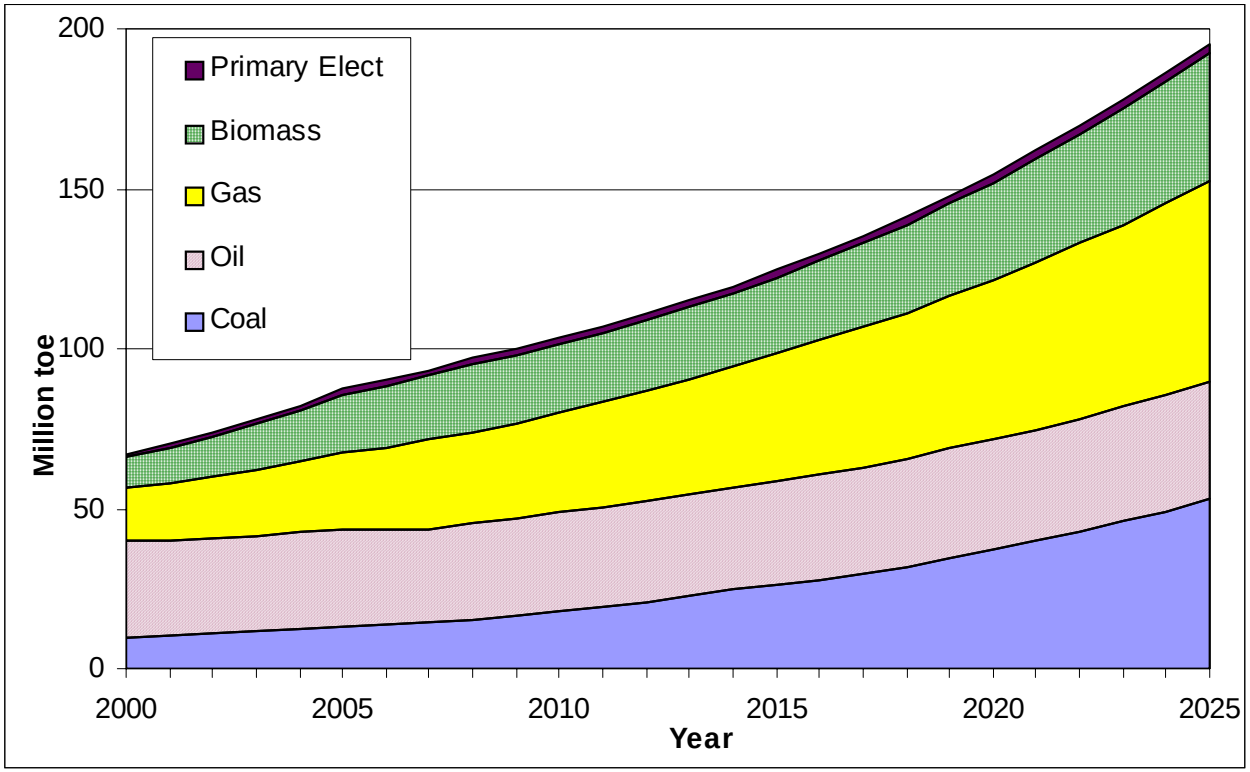
# Scenarios Description

- Base Case

- 3 cases of CO2 emission reduction targets
  - 5%, 10% and 15% reductions during 2010-2025 from that of base case defined as ER5, ER10 and ER15 respectively

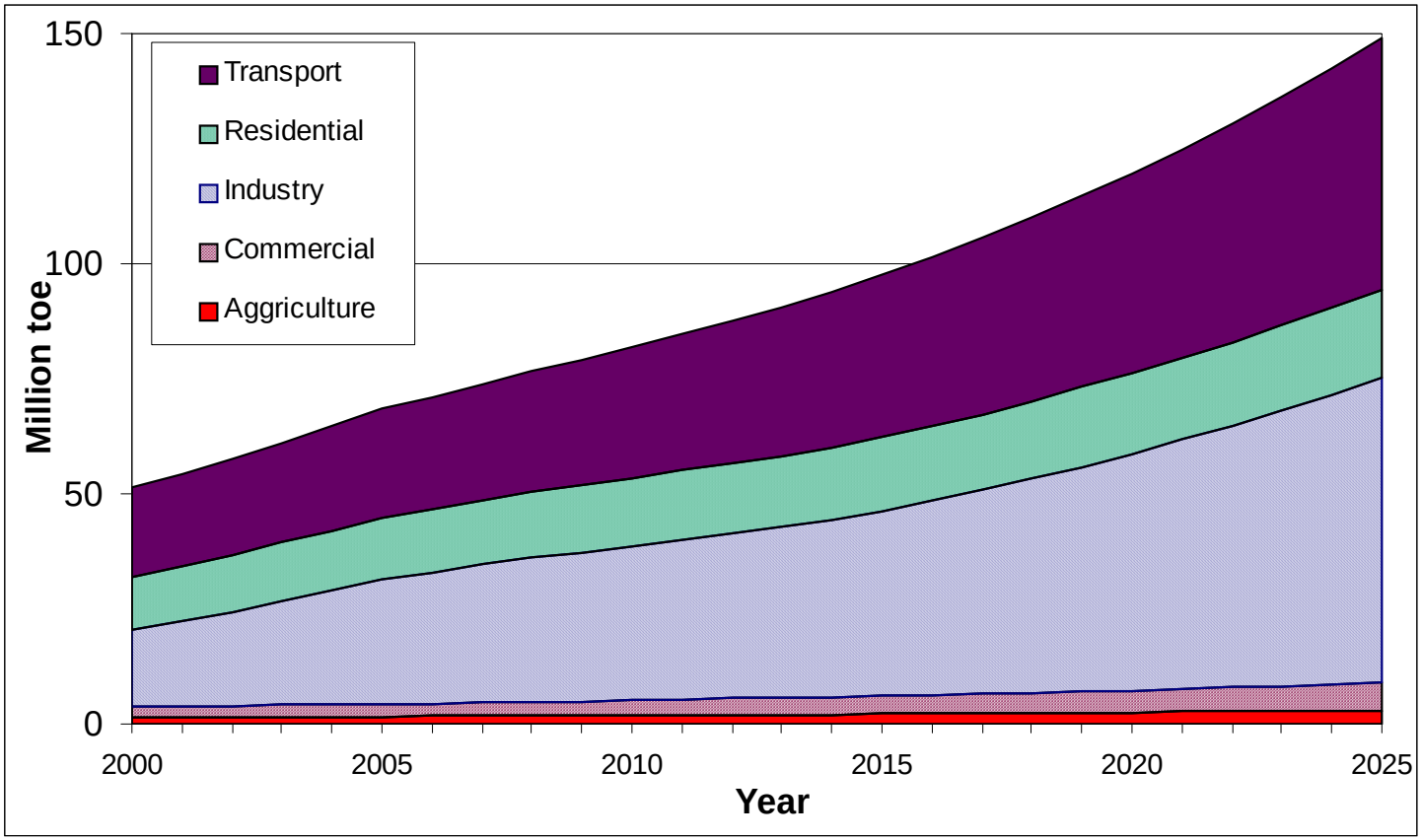
# Total Primary Energy Supply (Mtoe)

- Average Annual Growth Rate (AAGR) 4.4%
- Oil share decreasing from 45% in 2000 to 19% in 2025
- Coal share increasing (14% in 2000 to 27% in 2025),
- Gas share increasing (25% in 2000 to 32% in 2025)
- Biomass share increasing (14% in 2000 to 20% in 2025)



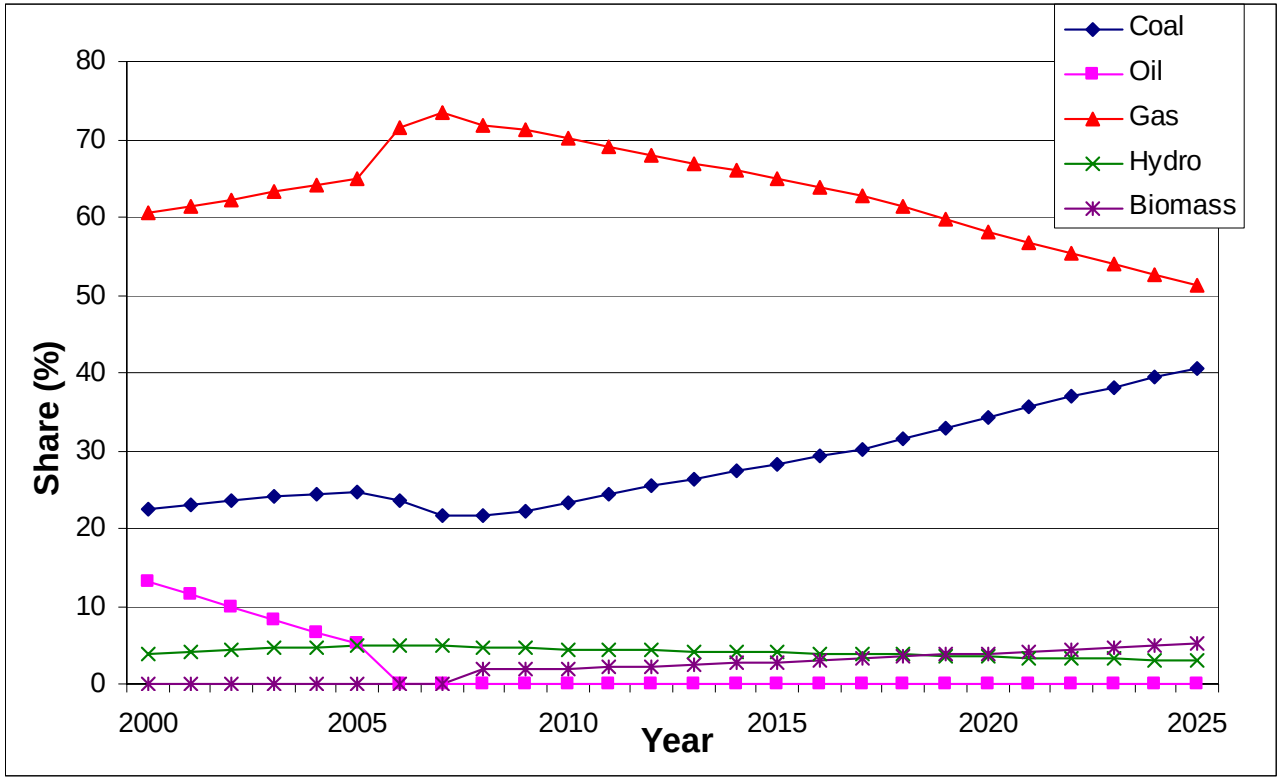
# Final Energy Demand by Sector (Base Case)

- Transport and Industry shares over 70%



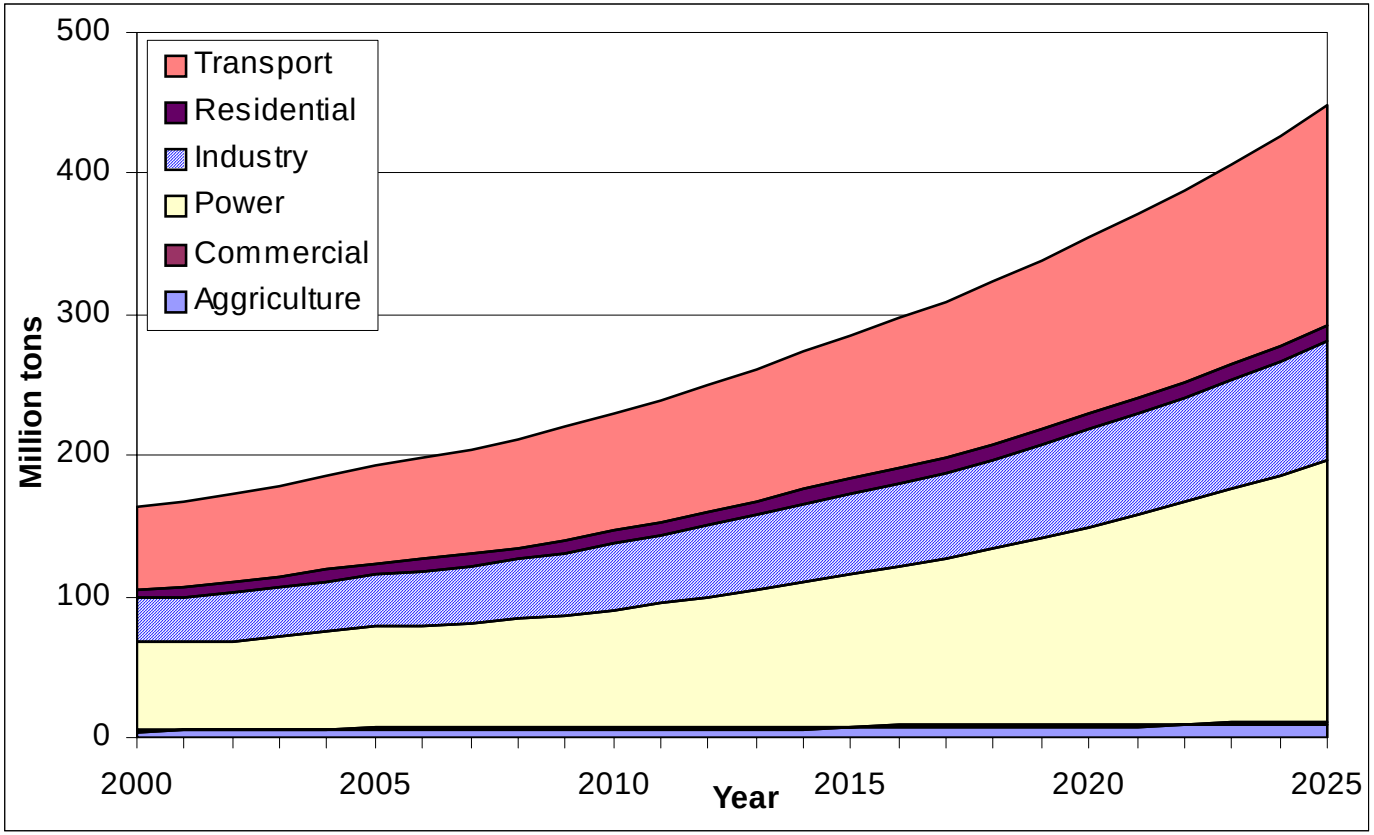
# Electricity Generation by Fuel Type

- Coal based power generation would increase from 2007 replacing gas based power plants



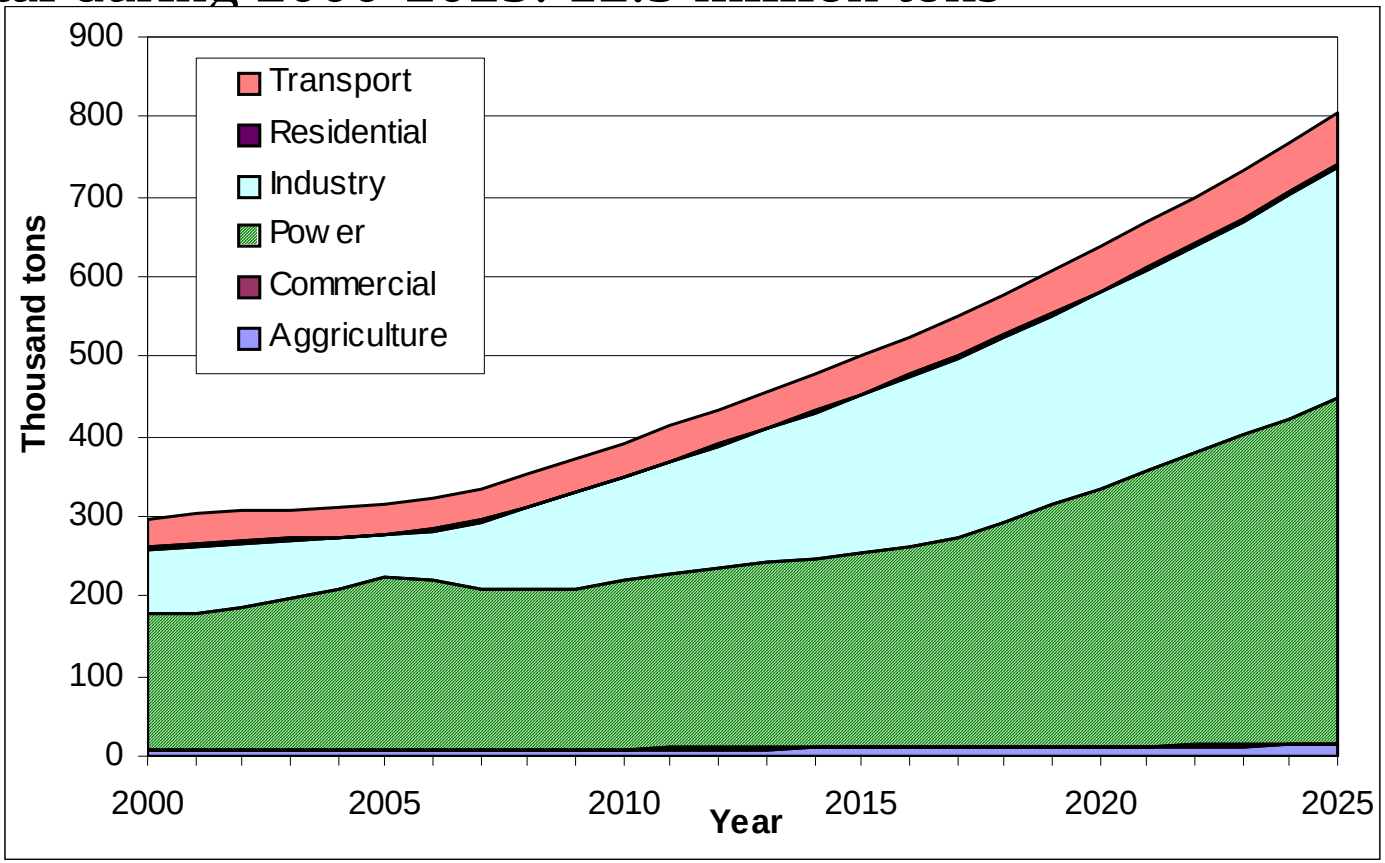
# $CO_2$ Emissions (Base Case)

- AAGR of 4.1%
- Power and Transport sector accounts for 72% of $CO_2$ emissions
- Total emission during 2000-2025: 7,097 million tons



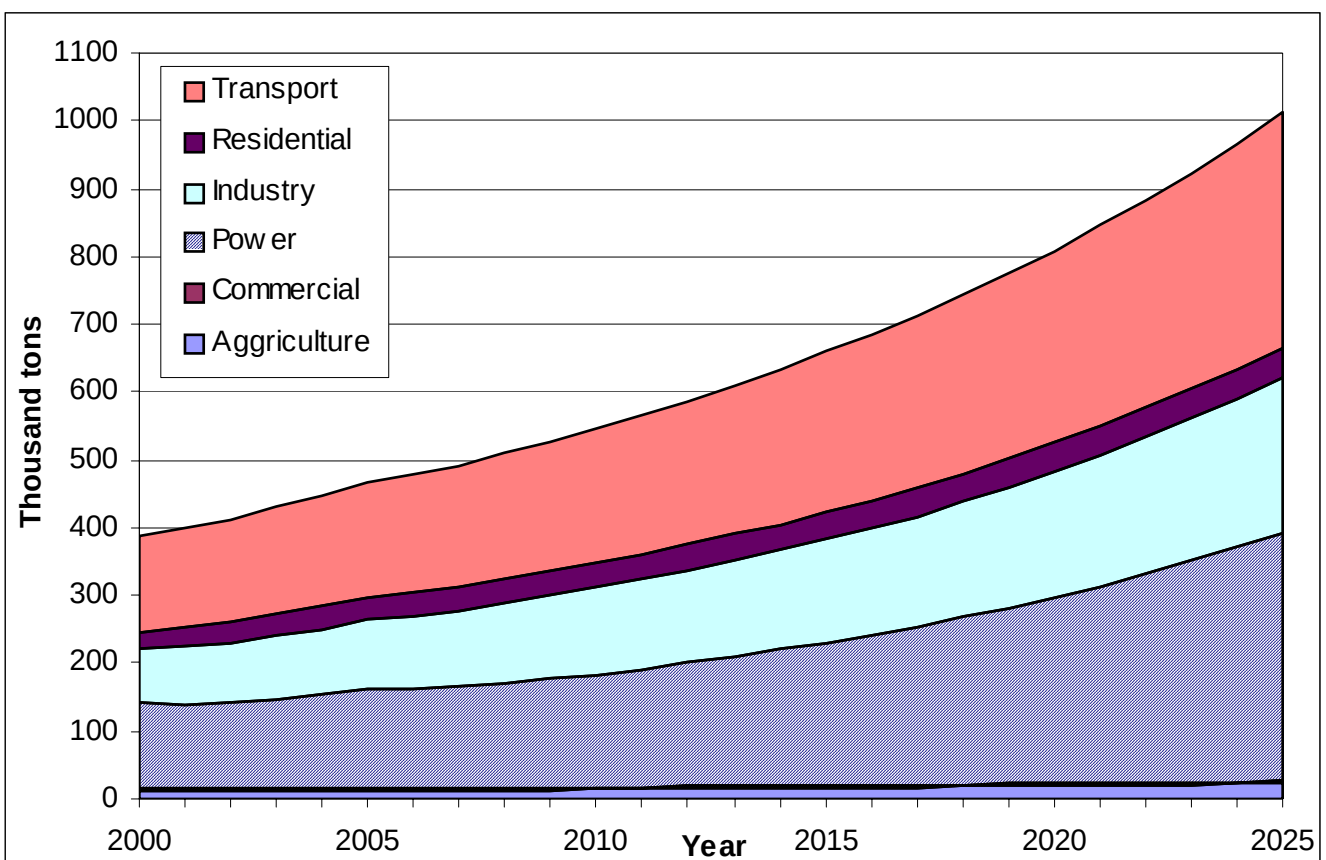
# $SO_2$ Emissions (Base Case)

- Emissions in 2025 2.7 times that of 2000
- Power and Industry sector major source of NOx emissions
- Total during 2000-2025: 12.5 million tons



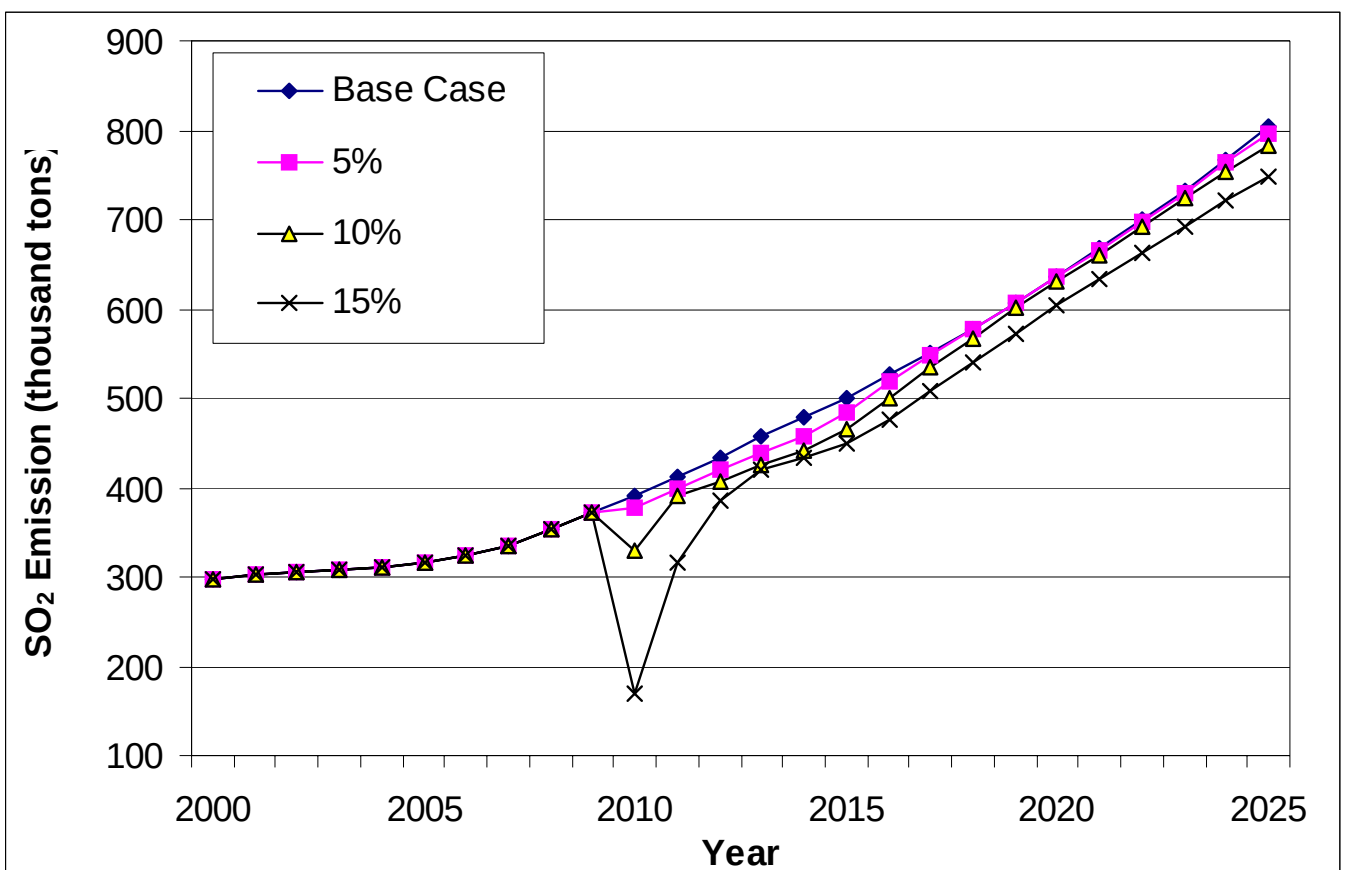
# $NO_x$ Emissions (Base Case)

- NOx emissions increases by 2.2 times in 2025 than in 2000
- Total during 2000-2025: 16.5 million tons



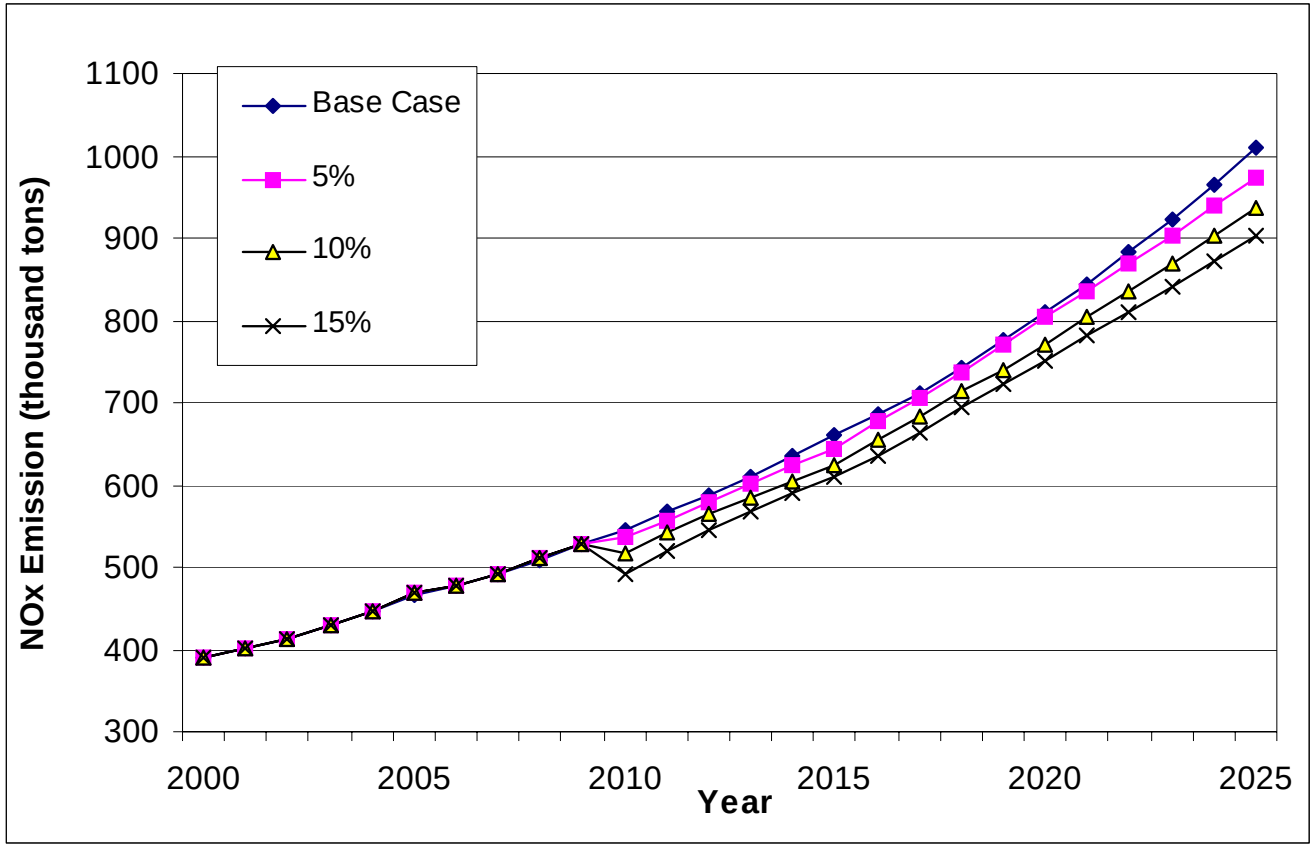
# $SO_2$ Emission under Emission Constraints

- Sudden and large mitigation in 2010 (starting year of reduction target) under higher reduction targets.



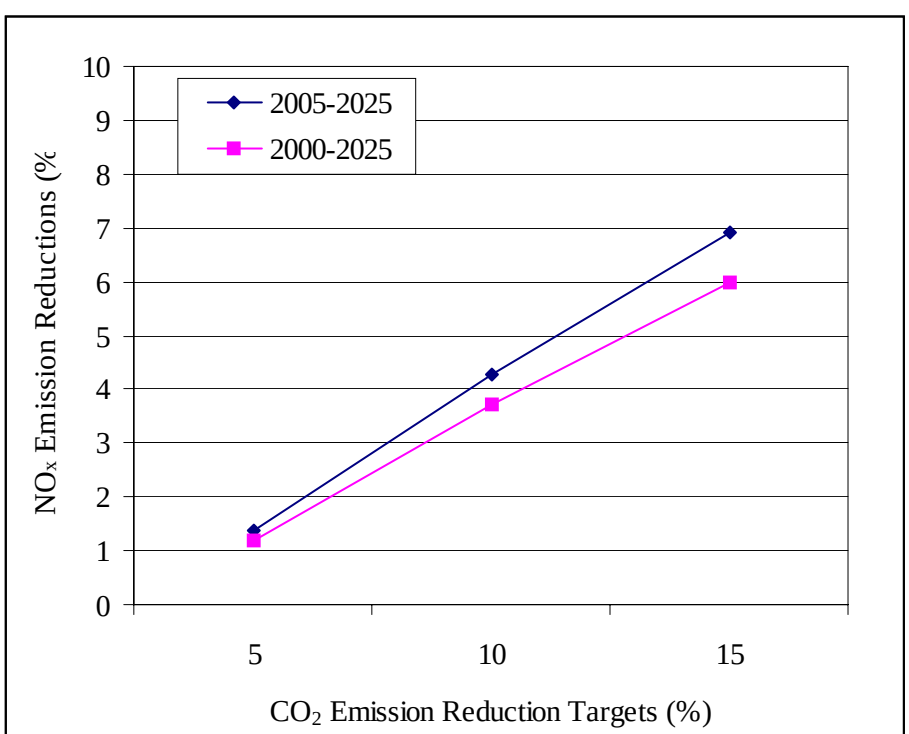
# $NO_x$ Emission under Emission Constraints

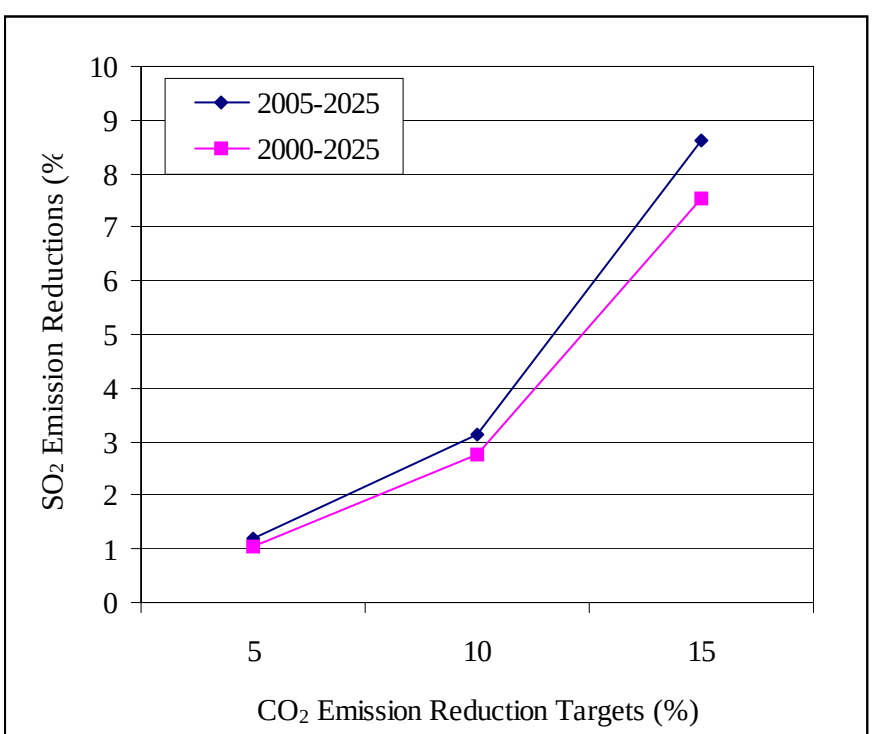
- Total reduction during 2000-2025: 16.3, 15.9 and 15.5 million tons (1.45, 4.3% and 6.0% reduction)



# $SO_2$ and $NO_x$ Emissions under Emission Constraints

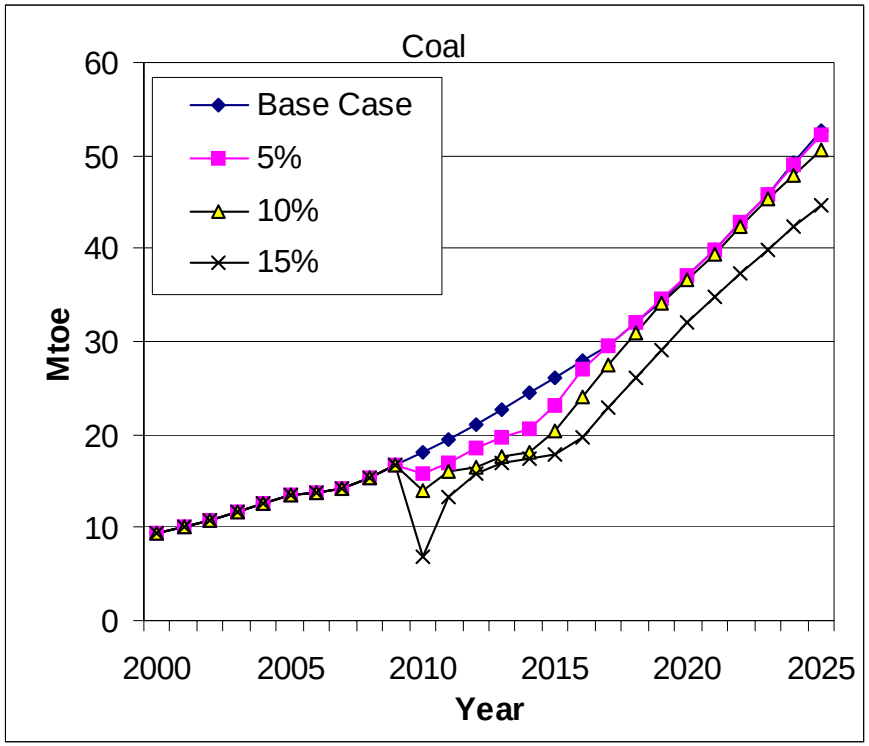
- Percentage of $SO_2$ emission reductions higher than NOx emission reductions under $CO_2$ emission constraints
- Percent of $SO_2$ reductions higher at higher emission reduction target

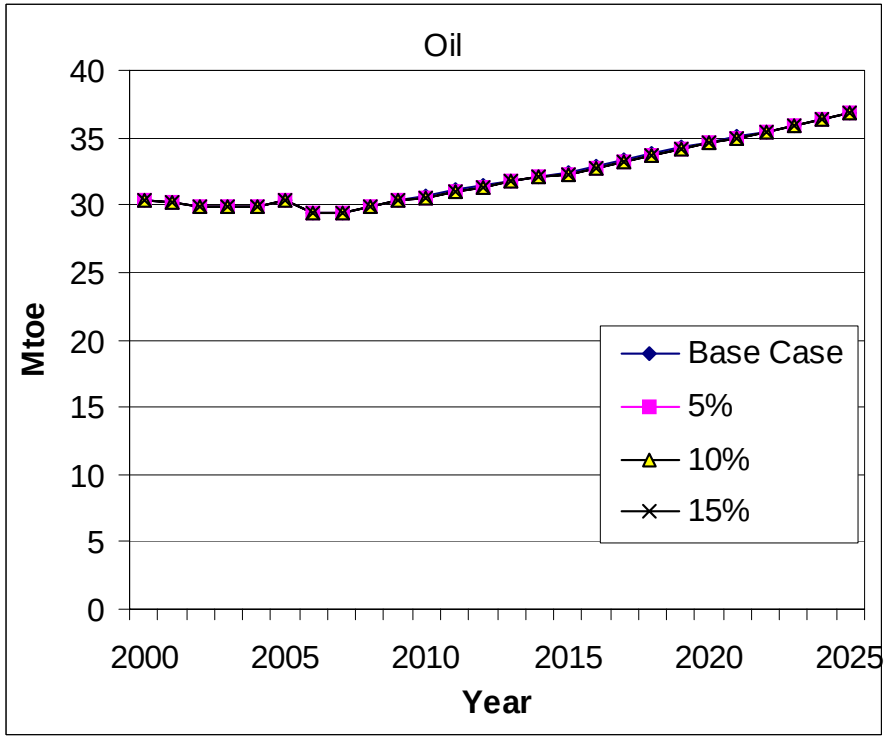


# Energy Demand by Fuel Types under Emission Constraints

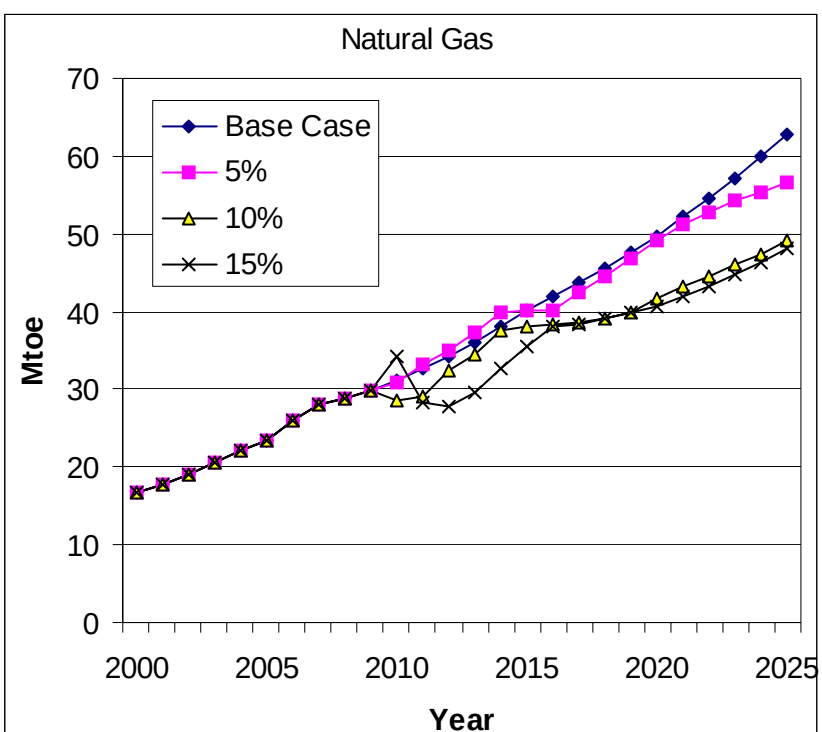
- Coal use lower
- No change in oil use

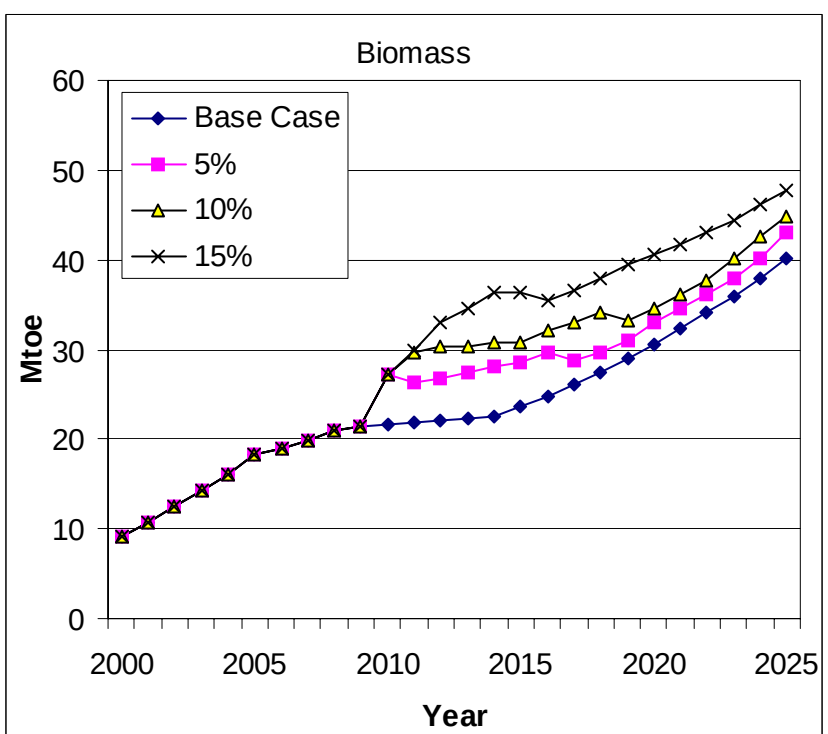


# Energy Demand by Fuel Types under Emission Constraints

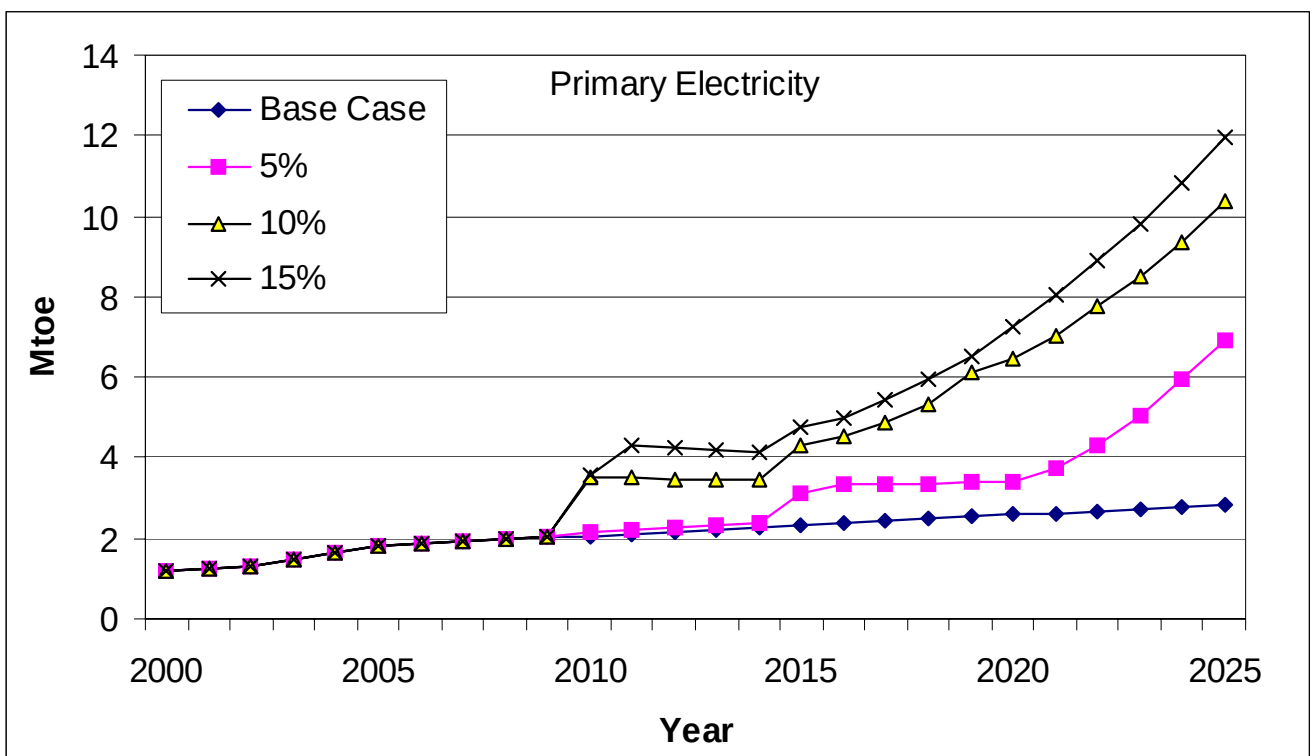
- Natural gas use lower
- Biomass use increased



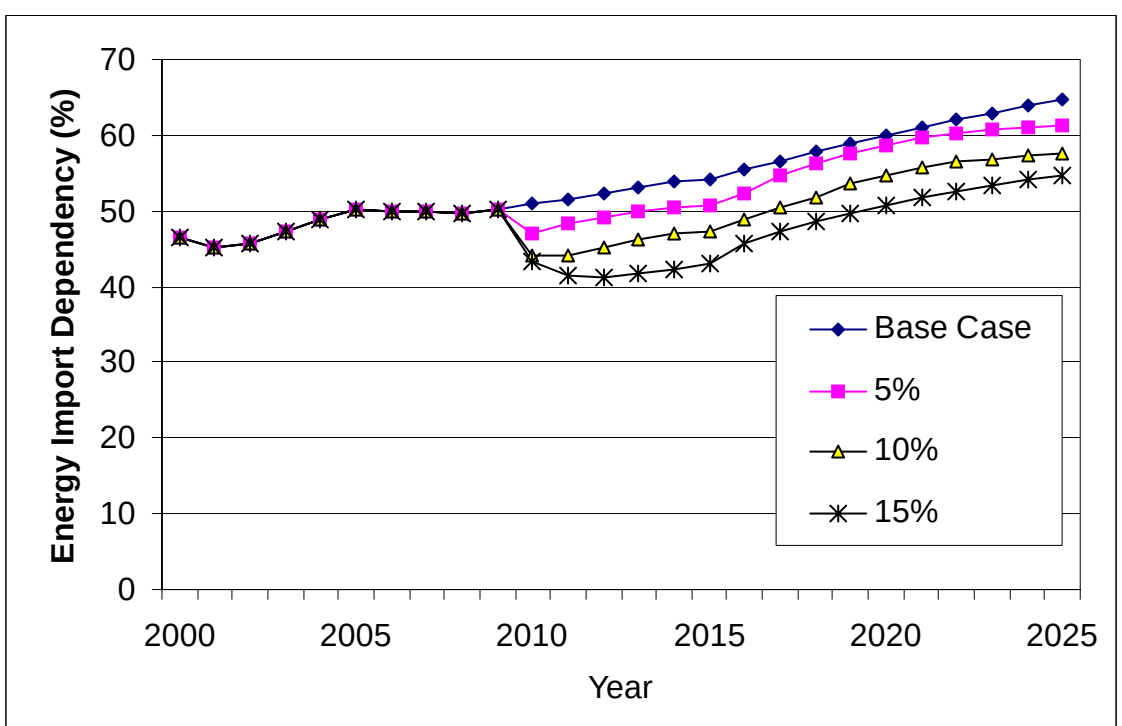
# Energy Demand by Fuel Types under Emission Constraints

- Wind, Solar and Nuclear increased



# Energy Import Dependency under Emission Constraints

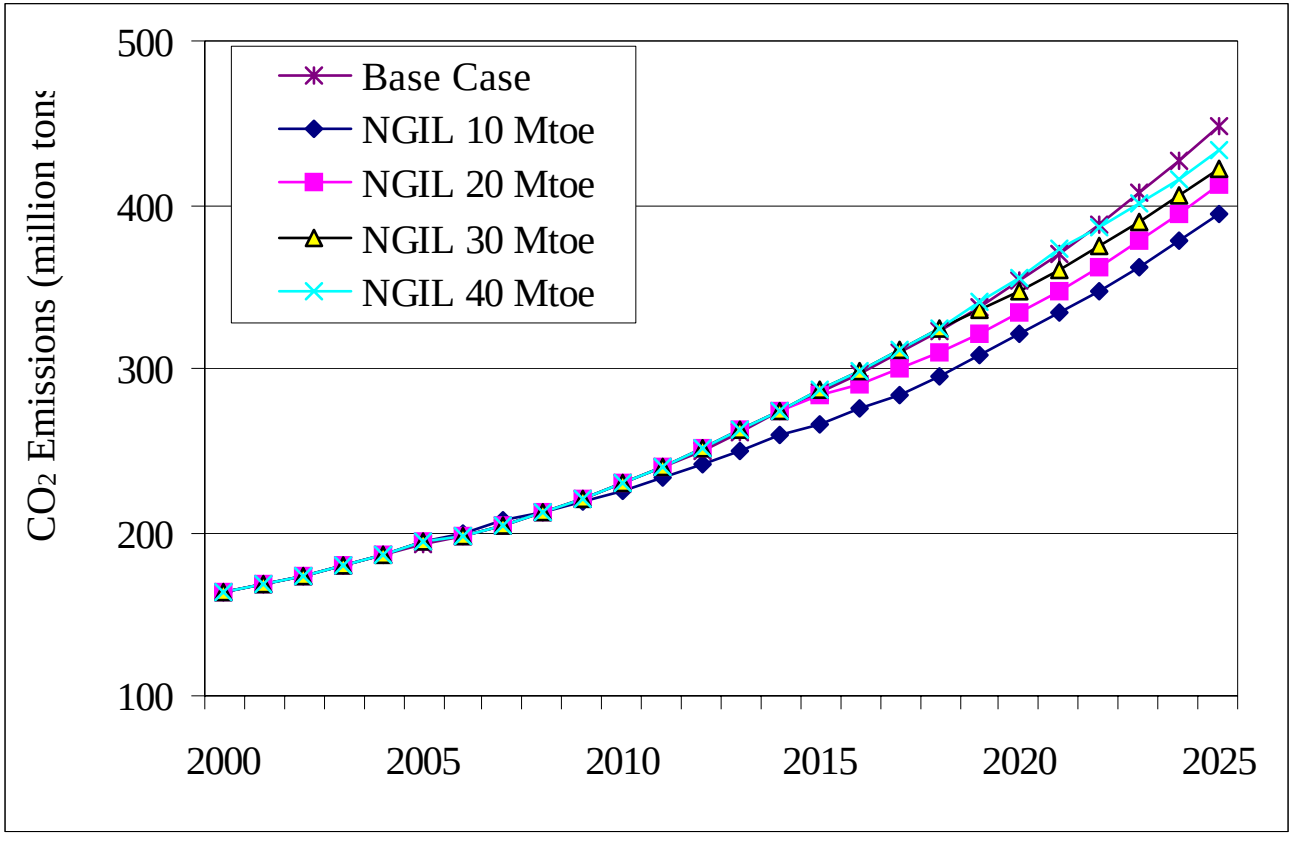
- Energy import dependency decreases by
  - 4% in ER5
  - 11% in ER10
  - 15% in ER15
- imported coal and gas replaced by biomass and primary electricity generation (nuclear, wind and solar)



# Implications of Natural Gas Import Limits

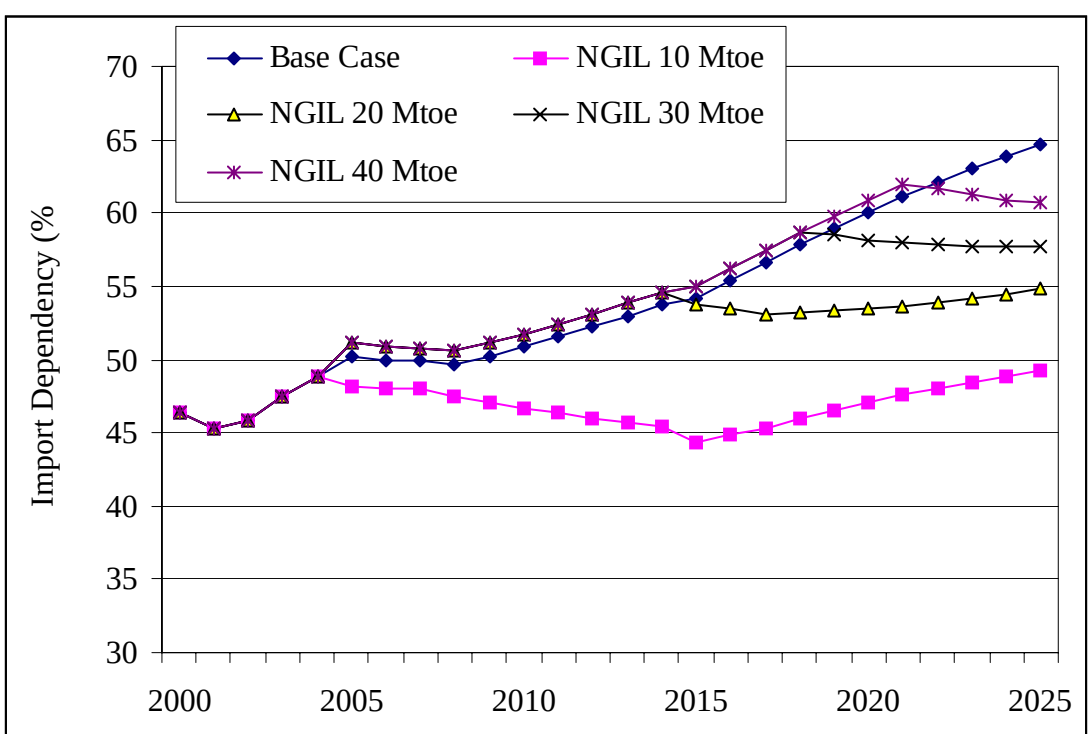
# $CO_2$ Emissions under Natural Gas Import Limitations

- Lower $CO_2$ Emissions at stringent gas import limitations



# Energy Import Dependency under Natural Gas Import Limitations

- Import dependency would decrease under stringent natural gas import limits



# Thank you