



# energy

Department:  
Energy  
**REPUBLIC OF SOUTH AFRICA**

DRAFT INTEGRATED ENERGY PLANNING REPORT



energy

Department:  
Energy  
REPUBLIC OF SOUTH AFRICA

# KEY MODELLING ASSUMPTIONS: MACROECONOMIC AND DEMOGRAPHIC

# CONTENT



energy

Department:  
Energy  
REPUBLIC OF SOUTH AFRICA

- **MACROECONOMIC ASSUMPTIONS**
- **DEMAND MODEL OUTPUTS**



# MACROECONOMIC ASSUMPTIONS

- Discount rate
- Aggregate economic growth
- Global oil prices
- Global natural gas prices

# DISCOUNT RATE



energy

Department:  
Energy  
REPUBLIC OF SOUTH AFRICA

| Simple function: Weighted Average = $\alpha$ SOC + (1- $\alpha$ )SRTP |   |  | EOCK<br>12.3%        | assume $\alpha =$ | 0.51       |         |
|---|---|--|----------------------|-------------------|------------|---------|
| $EOCK = f_1\gamma + f_2\pi$   |   |  |                      |                   |            |         |
| therefore   | $EOCK = \frac{\sum_i \varepsilon_i (S_i / S_p) \gamma_i - \sum_j \eta_j (I_j / S_p) \pi_j}{\sum_i \varepsilon_i (S_i / S_p) - \sum_j \eta_j (I_j / S_p)}$ |  | Discount rate: 11.3% |                   |            |         |
| <b>Economic Opportunity Cost of Capital (EOCK)</b>                    |   |  |                      |                   |            |         |
| Ref   | Description   | Variables                              | Households           | Business          | Government | Foreign |
| 1   | Savers: Share   | S <sub>i</sub> /S <sub>p</sub>         | 0.1429               | 0.5055            | 0.0000     | 0.3516  |
| 2   | Nominal interest rate   | i <sub>r</sub>                         | 0.1300               |                   | 0.1156     | 0.0325  |
| 3   | Tax rate  | t                                      | 0.3100               |                   | 0.0000     | 0.0000  |
| 4   | Proportion of total borrowing responsive to foreign interest rate   | k                                      |                      |                   |            | 0.4000  |
| 5   | Return on savings/nominal MC of foreign borrowing   | ns = i*(1-t)                           | 0.0897               | 0.0000            | 0.1156     | 0.0325  |
| 6   | Inflation rate  | p                                      | 0.0570               | 0.0570            | 0.0570     | 0.0260  |
| 7   | Real return/real MC of foreign borrowing  | rs = (ns-p)/(1+p)                      | 0.0309               | -0.0539           | 0.0555     | 0.0089  |
| 8   | Elasticities  | ε                                      | 0.5000               | 0.0000            | 0.0000     | 1.5000  |
|   | Group weight  | ε*(S <sub>i</sub> /S <sub>p</sub> )    | 0.0714               | 0.0000            | 0.0000     | 0.5274  |
|   | Group weight *real return   | ε*(S <sub>i</sub> /S <sub>p</sub> )*rs | 0.0022               |                   |            | 0.0047  |
|   | Sum of Group weights  | A                                      |                      |                   |            | 0.5989  |
|   | Sum of Group weights * real return  | B                                      |                      |                   |            | 0.00688 |
|   | Investors: Share  | I <sub>j</sub> /S <sub>t</sub>         |                      | 0.6108            | 0.1369     |         |
|   | Nominal interest/earnings rate  | i <sub>r</sub>                         |                      |                   |            |         |
|   | Real return on investment   | rr = (i <sub>r</sub> -p)/(1+p)         |                      | 0.2120            | 0.1563     |         |
|   | Elasticity  | η                                      |                      | -1.0000           | 0.0000     |         |
|   | Group weight  | η*(I <sub>j</sub> /S <sub>t</sub> )    |                      | -0.6108           |            |         |
|   | Group weight *real return   | η*(I <sub>j</sub> /S <sub>t</sub> )*rr |                      | -0.1295           |            |         |
|   | Sum of Group weights  | C                                      |                      |                   |            | -0.6108 |
|   | Sum of Group weights * real return  | D                                      |                      |                   |            | -0.1295 |
|   | EOCK  | EOCK = (B-D)/(A-C)                     | 11.3%                |                   |            |         |

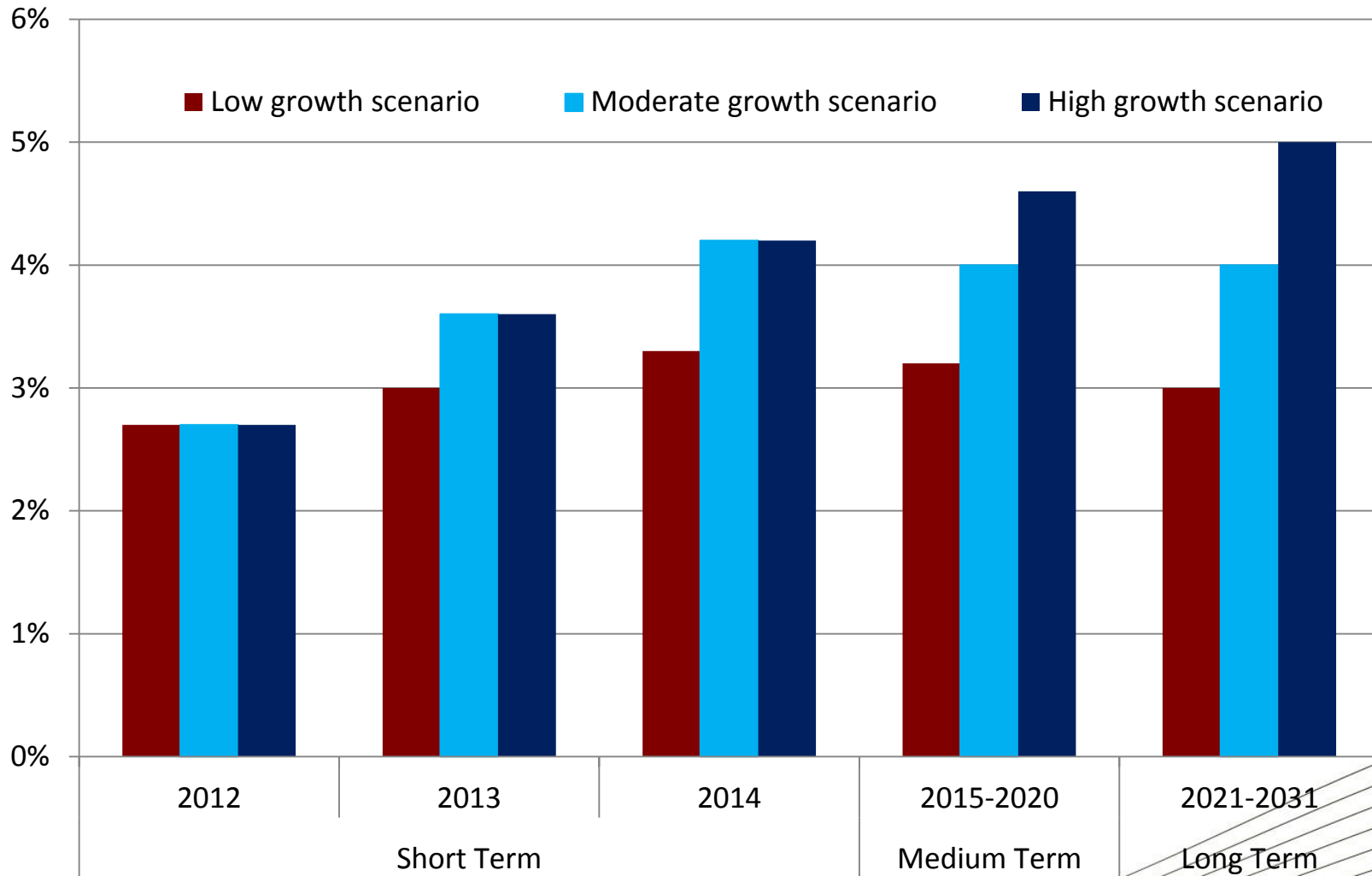
Note: need to determine whether foreign investment and **government investment** crowds-out private investment

# ECONOMIC GROWTH



energy

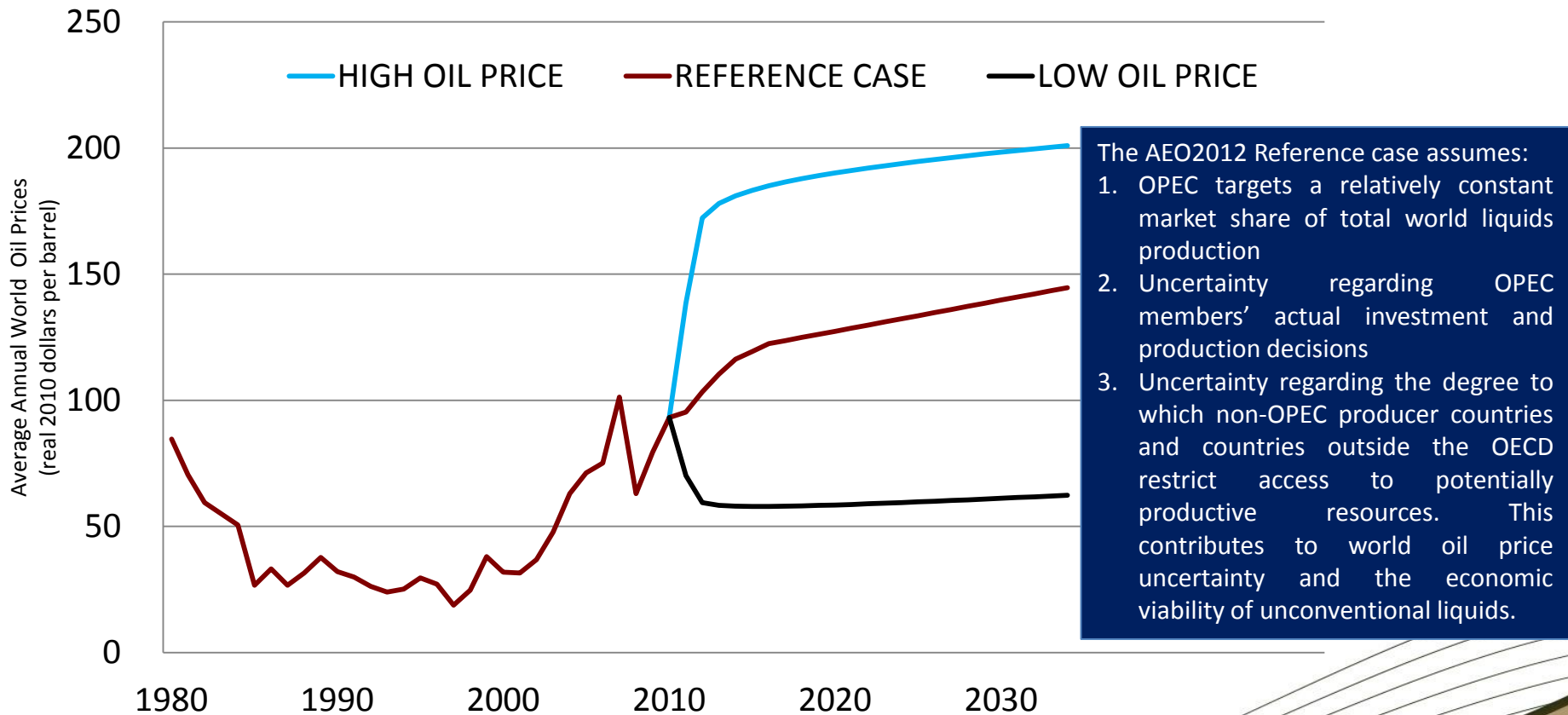
Department:  
Energy  
REPUBLIC OF SOUTH AFRICA





# GLOBAL OIL PRICES

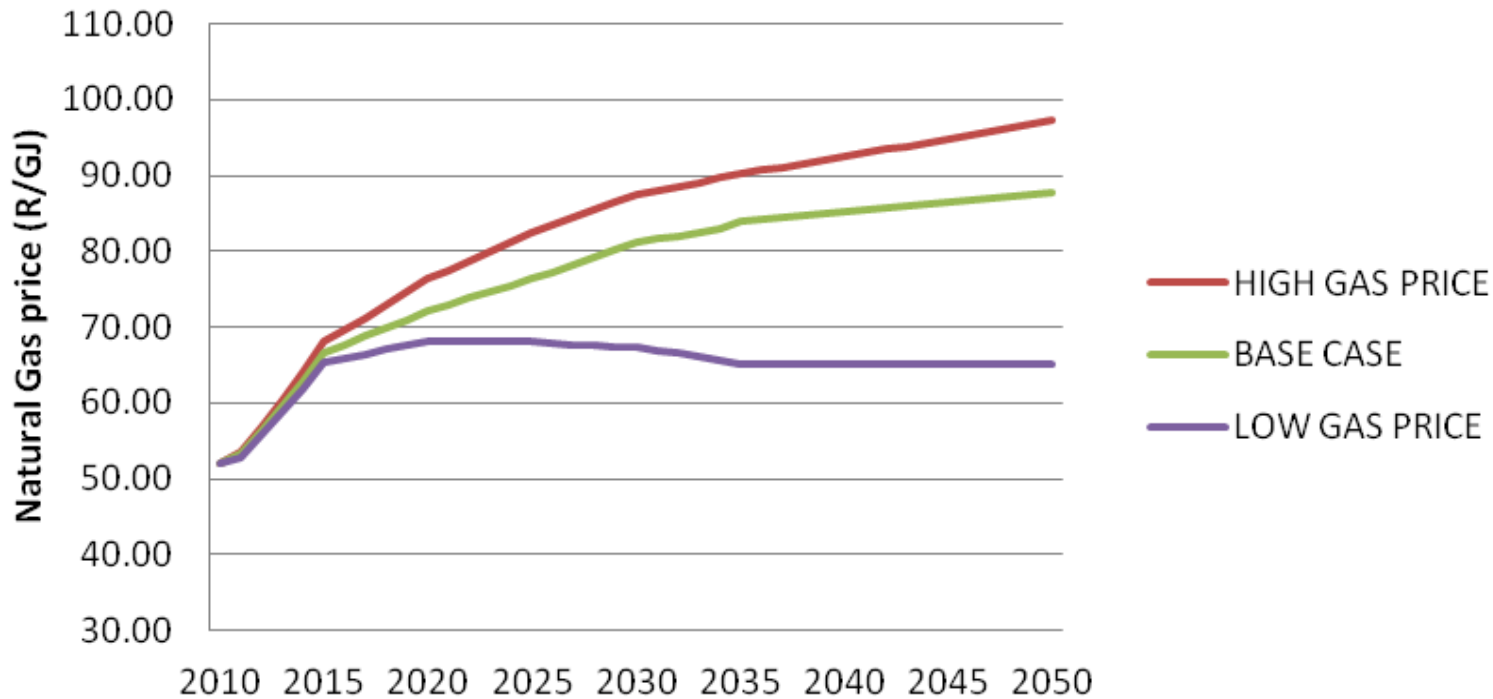
Average World Annual World Oil Price



The AEO2012 Reference case assumes:

1. OPEC targets a relatively constant market share of total world liquids production
2. Uncertainty regarding OPEC members' actual investment and production decisions
3. Uncertainty regarding the degree to which non-OPEC producer countries and countries outside the OECD restrict access to potentially productive resources. This contributes to world oil price uncertainty and the economic viability of unconventional liquids.

# PROJECTED NATURAL GAS PRICE



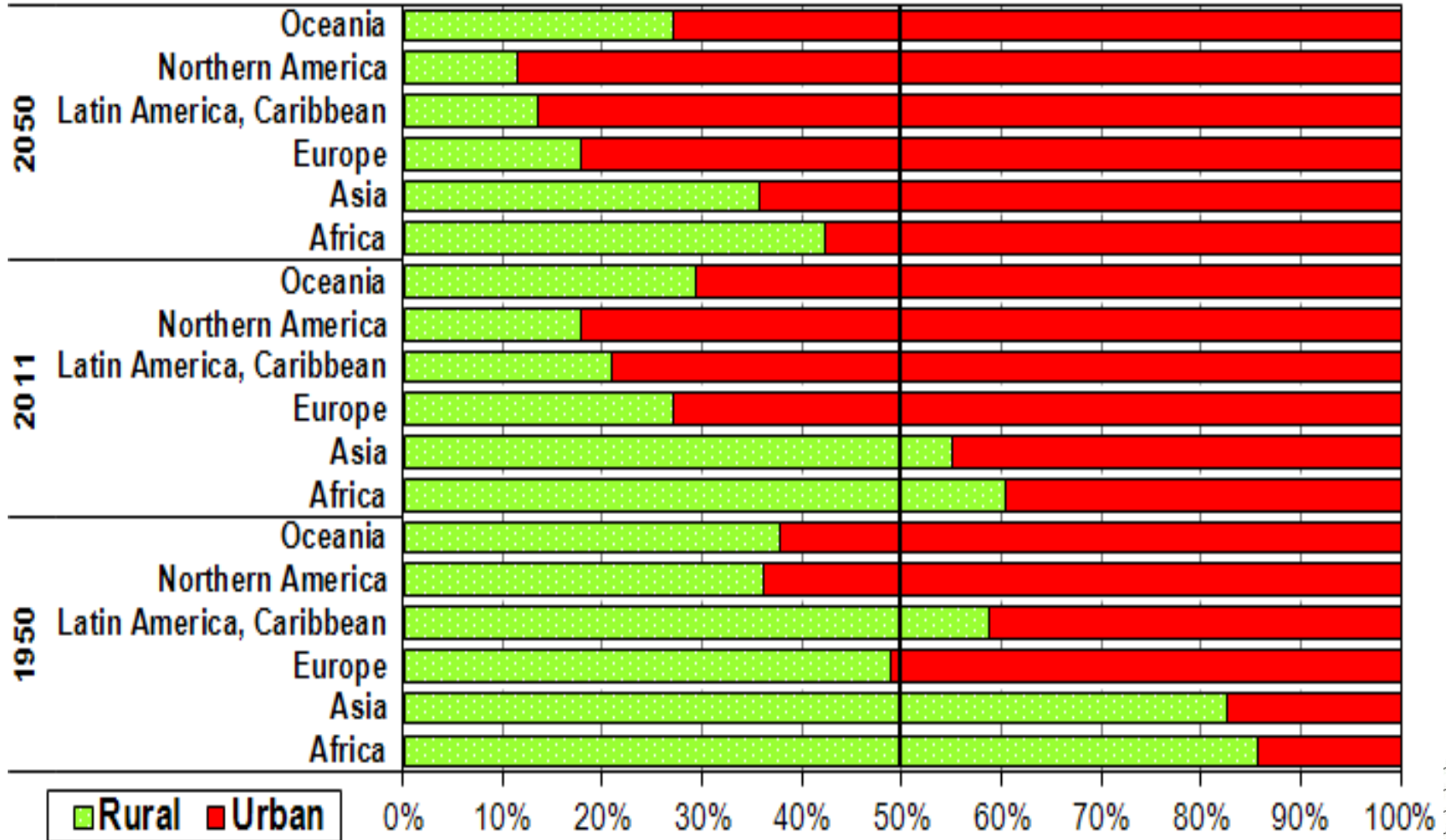
The **Base Case** natural gas price projections are based on the “**New Policies Scenario**” projections for **average gas import prices in Europe** in the 2011 World Energy Outlook

- Historically natural gas prices in the OECD have been closely correlated to oil prices through indexation clauses in long-term supply contracts and also as a result of competition between gas and oil products in power generation and end-use markets. However different pricing mechanisms in different parts of the world lead to differences in the actual level of prices.
- When oil prices are high, oil-indexed gas prices also tend to be high (with a certain lag period).
- However gas prices which are driven by competition and supply/demand dynamics tend to be lower than oil-indexed prices as has been seen in Europe and the US.
- The ‘New Policies Scenario’ assumes that at a global level, existing policies are maintained and that recently announced commitments and plans, including those yet to be formally adopted, are implemented in a cautious manner
- The High Gas Price projections are based in the ‘Current Policies Scenario’
- The Low Gas Price projections are based on the ‘450 Scenario’





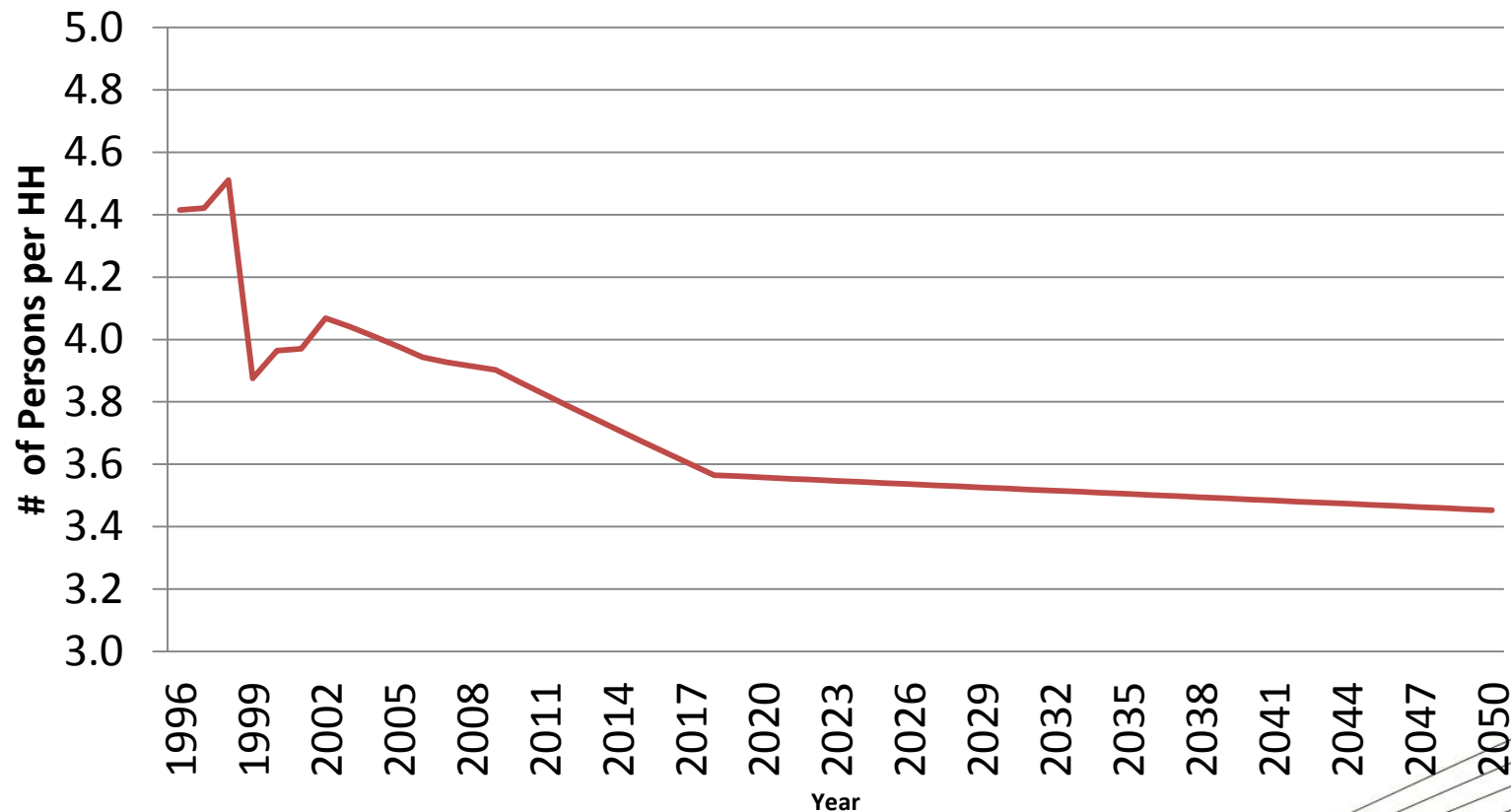
# DEMOGRAPHIC ASSUMPTIONS





# DEMOGRAPHIC (2)

Number of persons per household

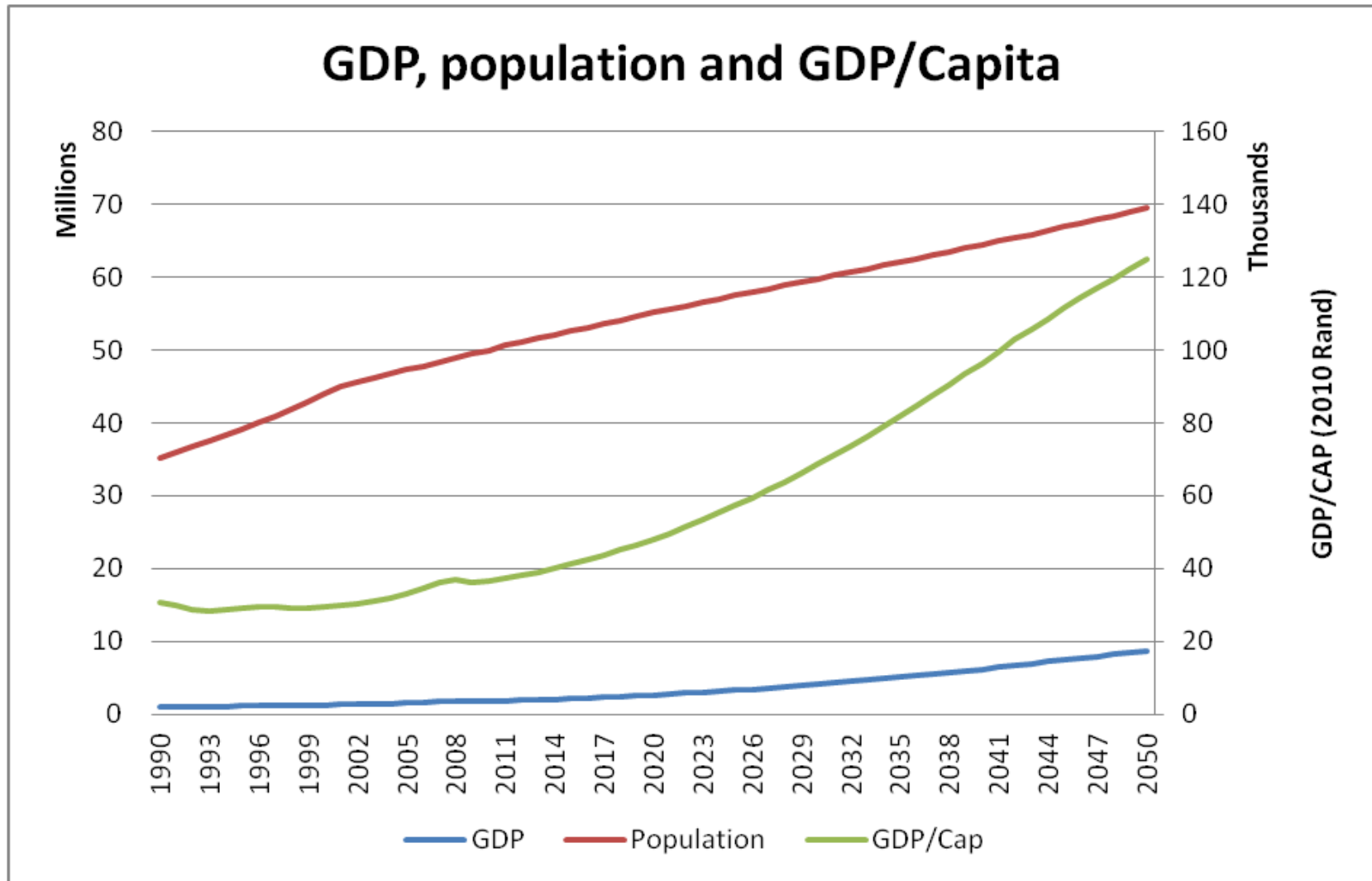


# DEMOGRAPHIC (3)



energy

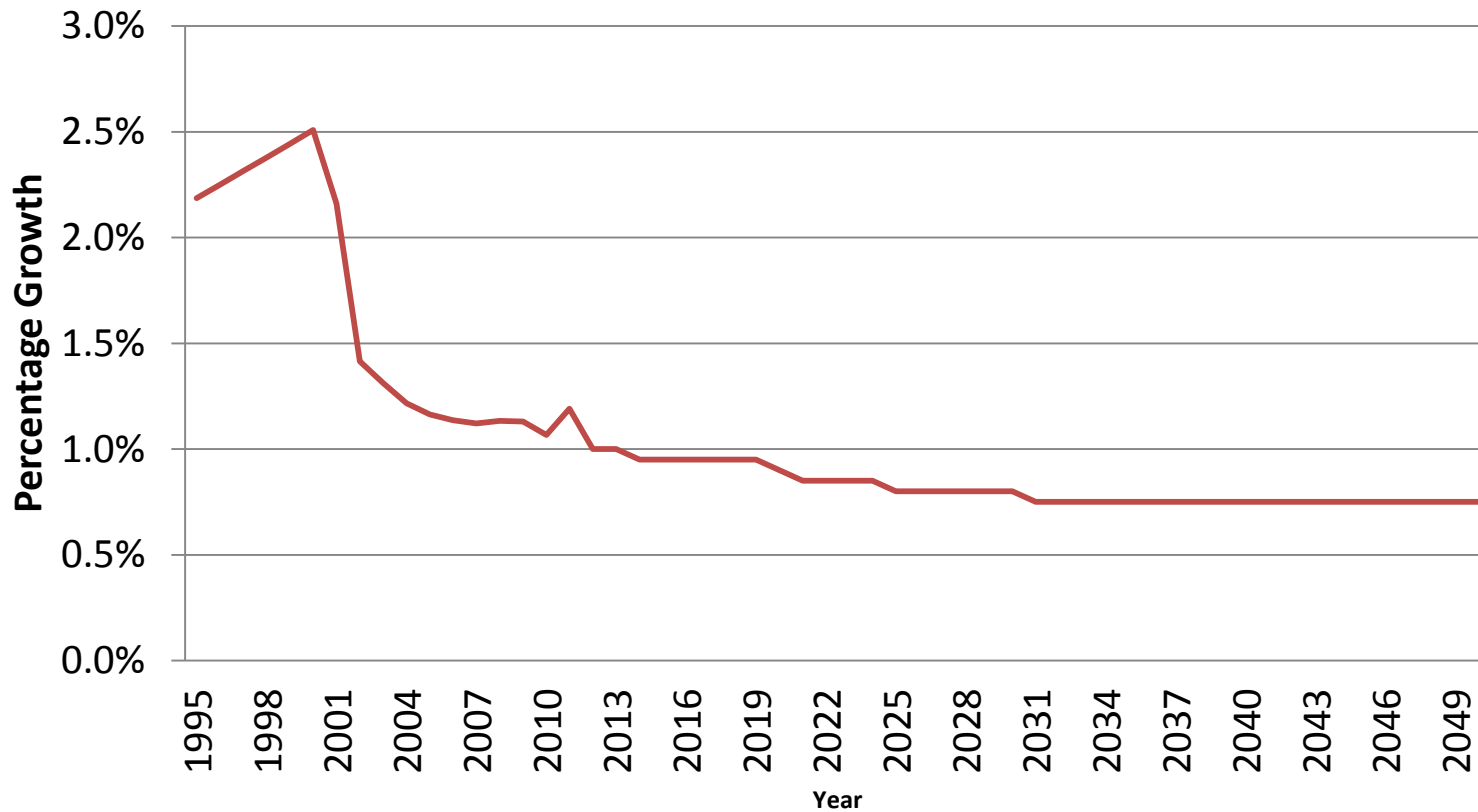
Department:  
Energy  
REPUBLIC OF SOUTH AFRICA





# DEMOGRAPHIC (4)

## Population Growth





energy

Department:  
Energy  
REPUBLIC OF SOUTH AFRICA

# THANK YOU



# DEMAND MODEL OUTPUTS

Dr. Rebecca Maserumule  
Demand Modelling Specialist

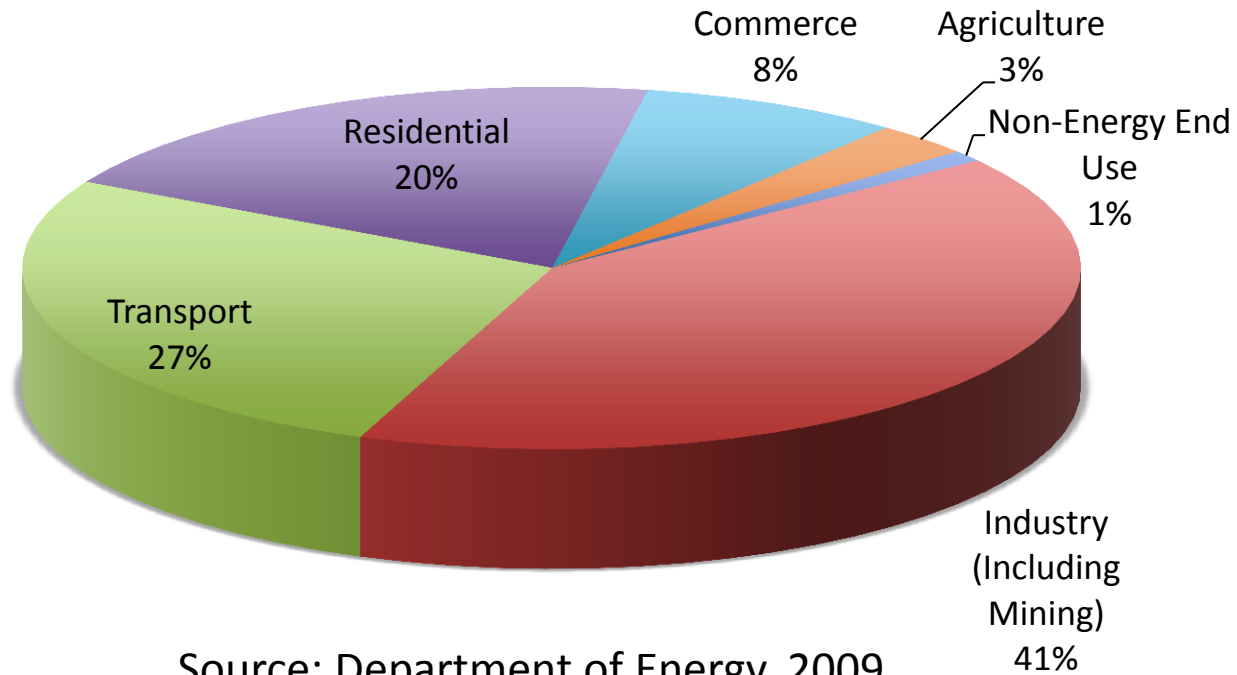


# CONTENTS

- MACROECONOMIC ASSUMPTIONS
- **DEMAND MODEL OUTPUTS**



# FINAL ENERGY CONSUMPTION



Source: Department of Energy, 2009



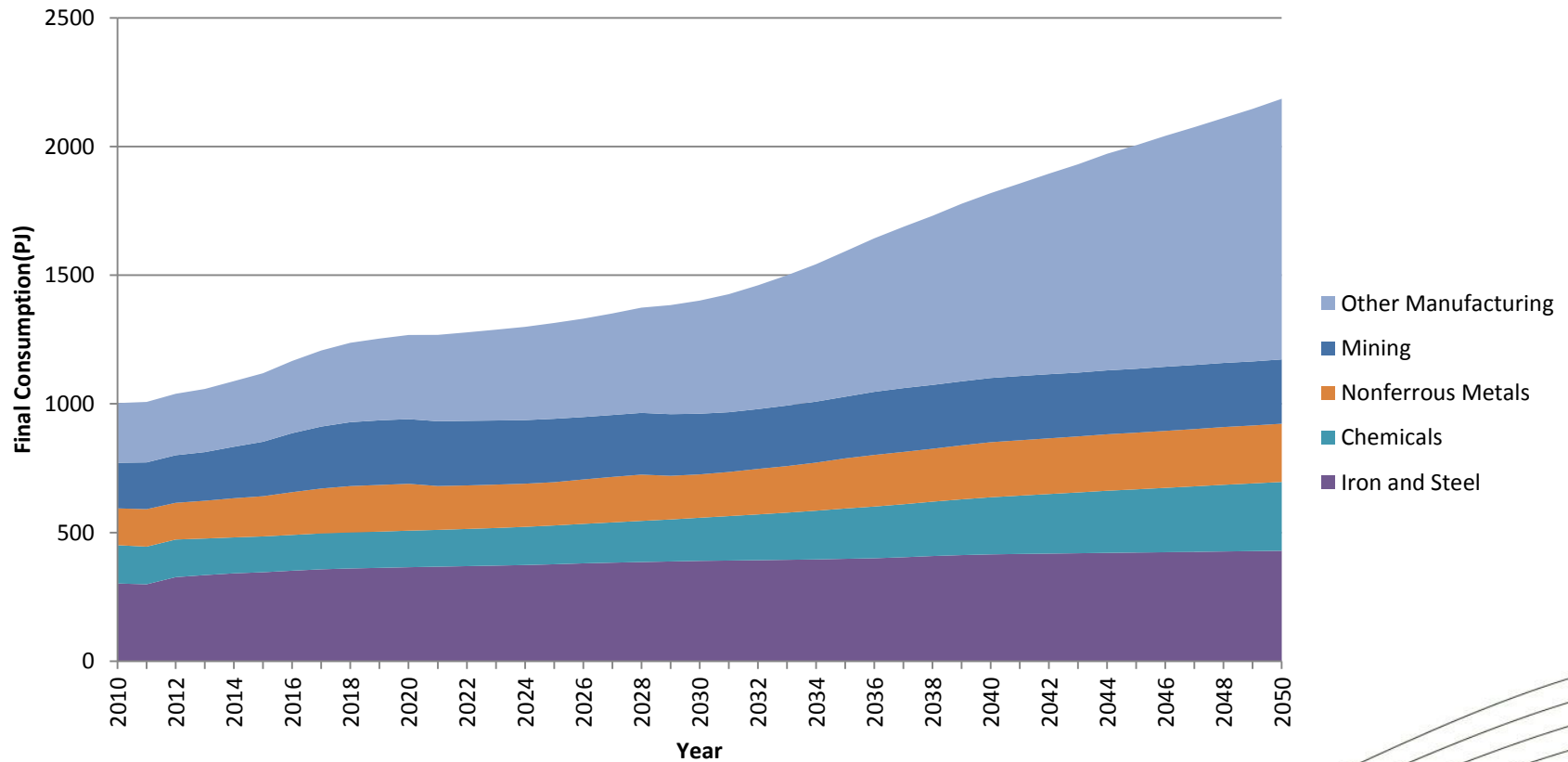
# INDUSTRIAL SECTOR



energy

Department:  
Energy  
REPUBLIC OF SOUTH AFRICA

## Total Energy Demand

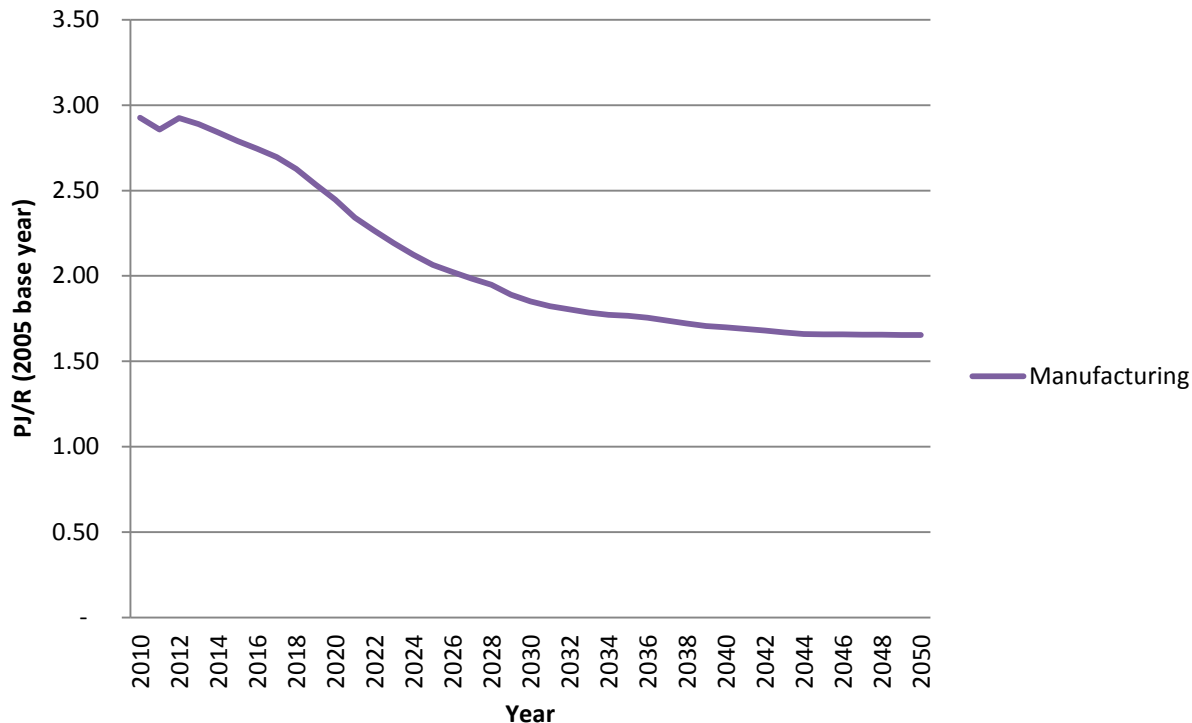


Source: Model Output



# MANUFACTURING SECTOR INTENSITY

Manufacturing Energy Consumption/Gross Value Added)

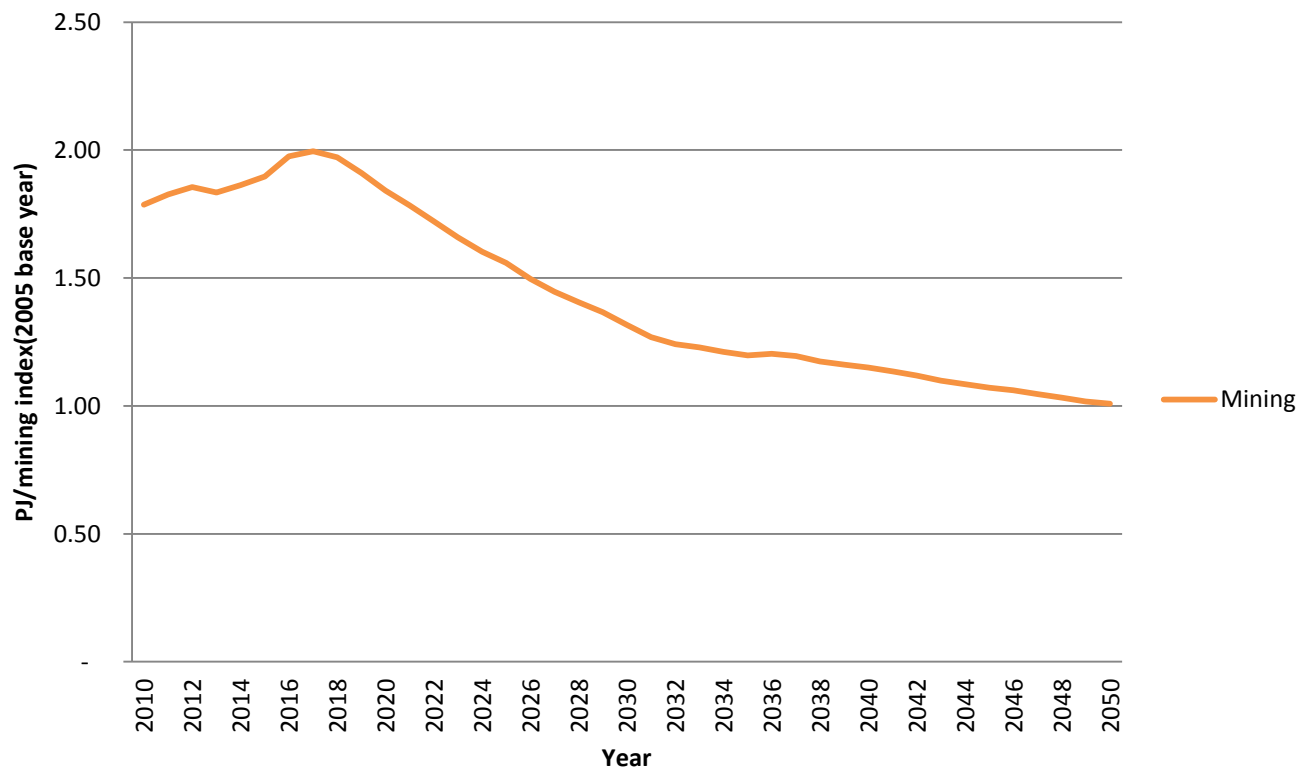


Source: DoE Analysis



# MINING SECTOR INTENSITY

## Mining Sector Energy Consumption/per Mining index

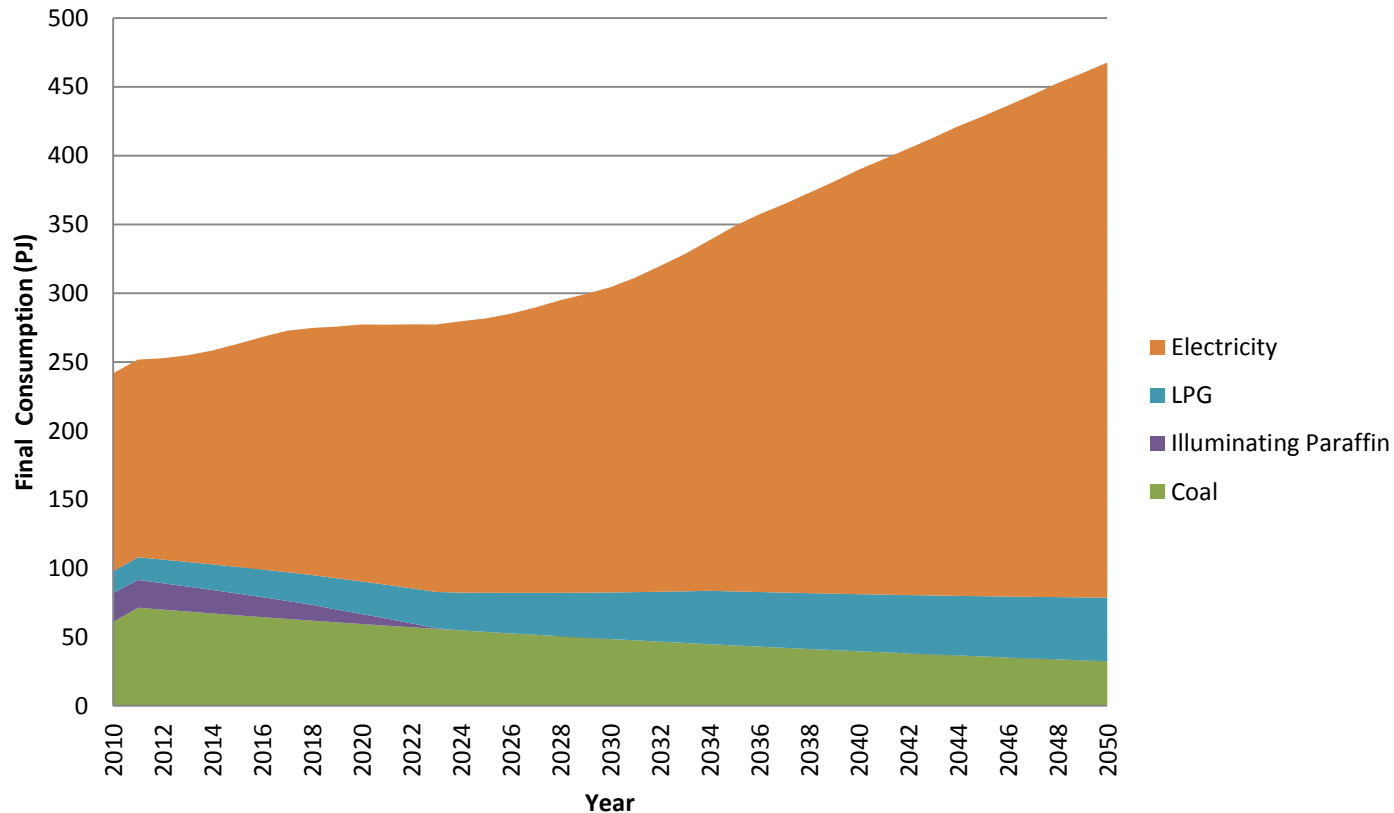


Source: DoE Analysis



# RESIDENTIAL SECTOR

## Total Energy Demand

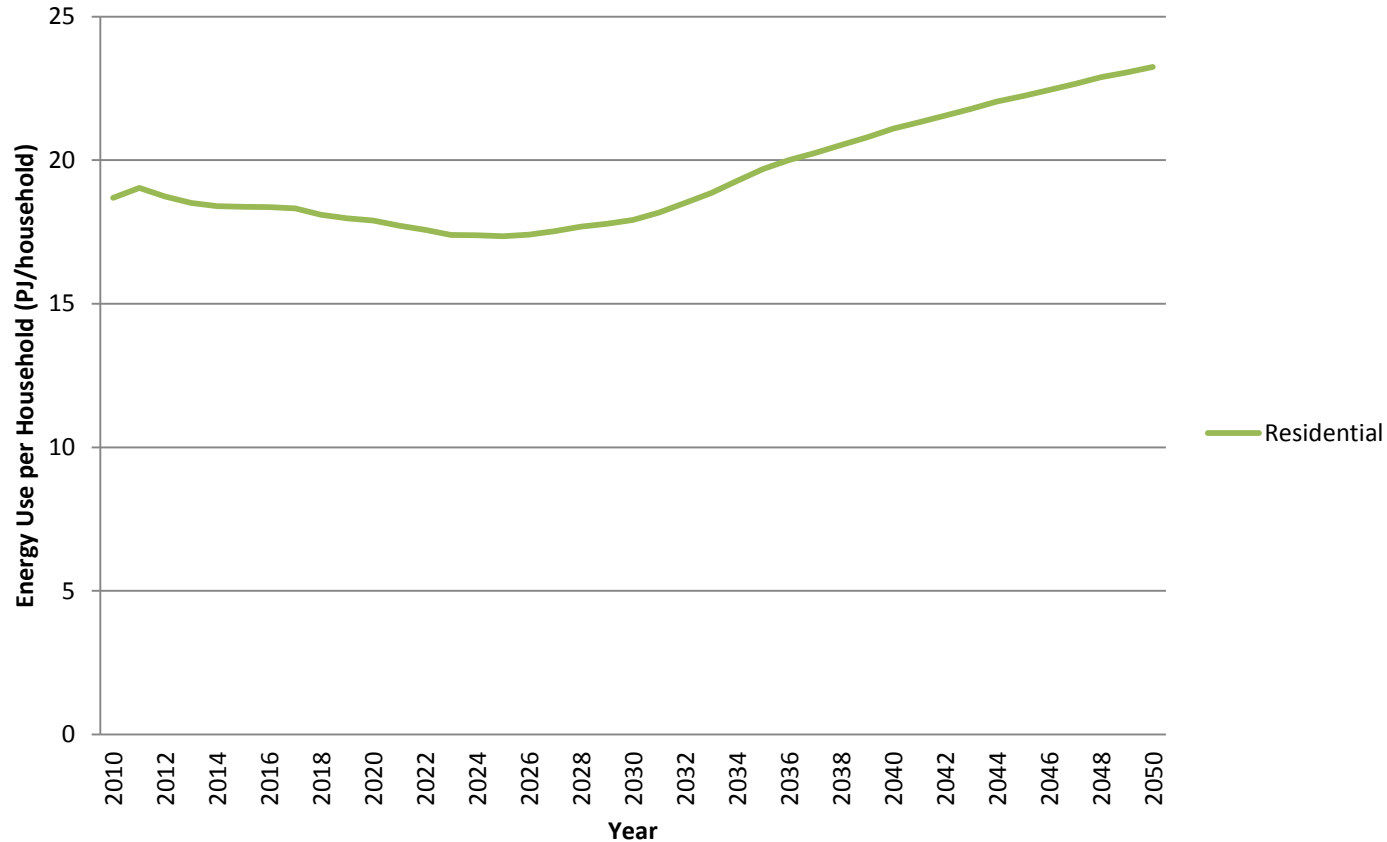


Source: Model Output



# RESIDENTIAL SECTOR INTENSITY

## Residential Energy Use Per Household

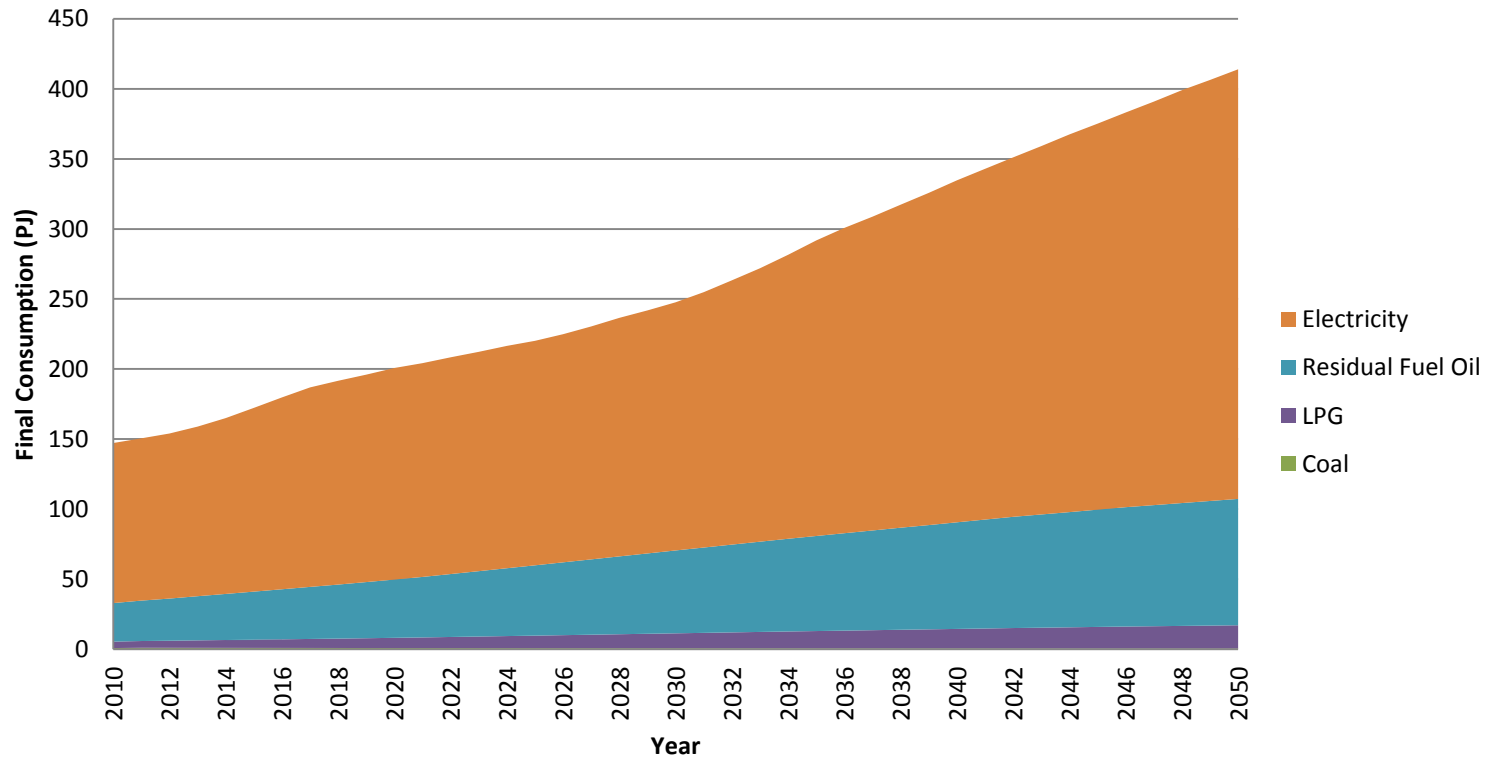


Source: DoE Analysis



# COMMERCIAL SECTOR

## Total Energy Demand

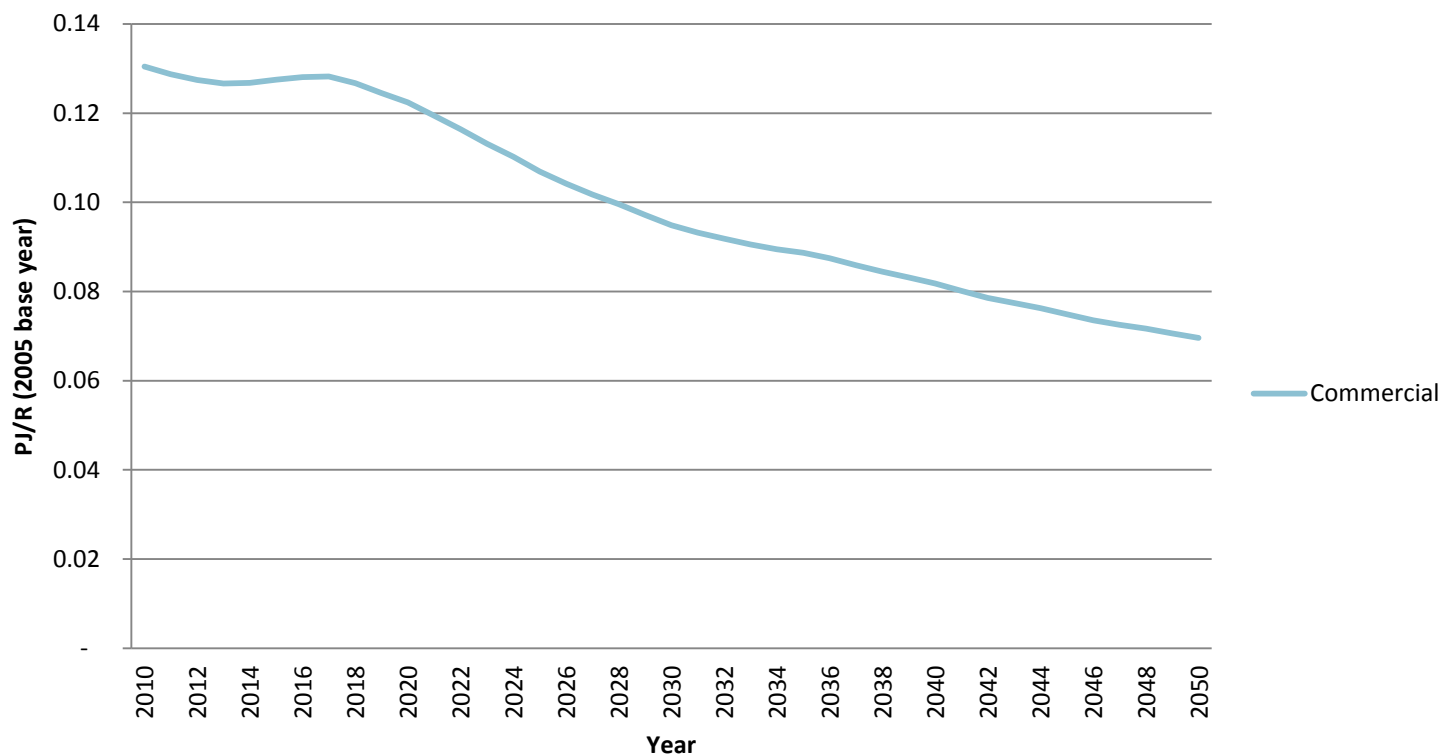


Source: Model Output



# COMMERCIAL SECTOR INTENSITY

Commercial Sector Energy Consumption/(per Gross Value Added)

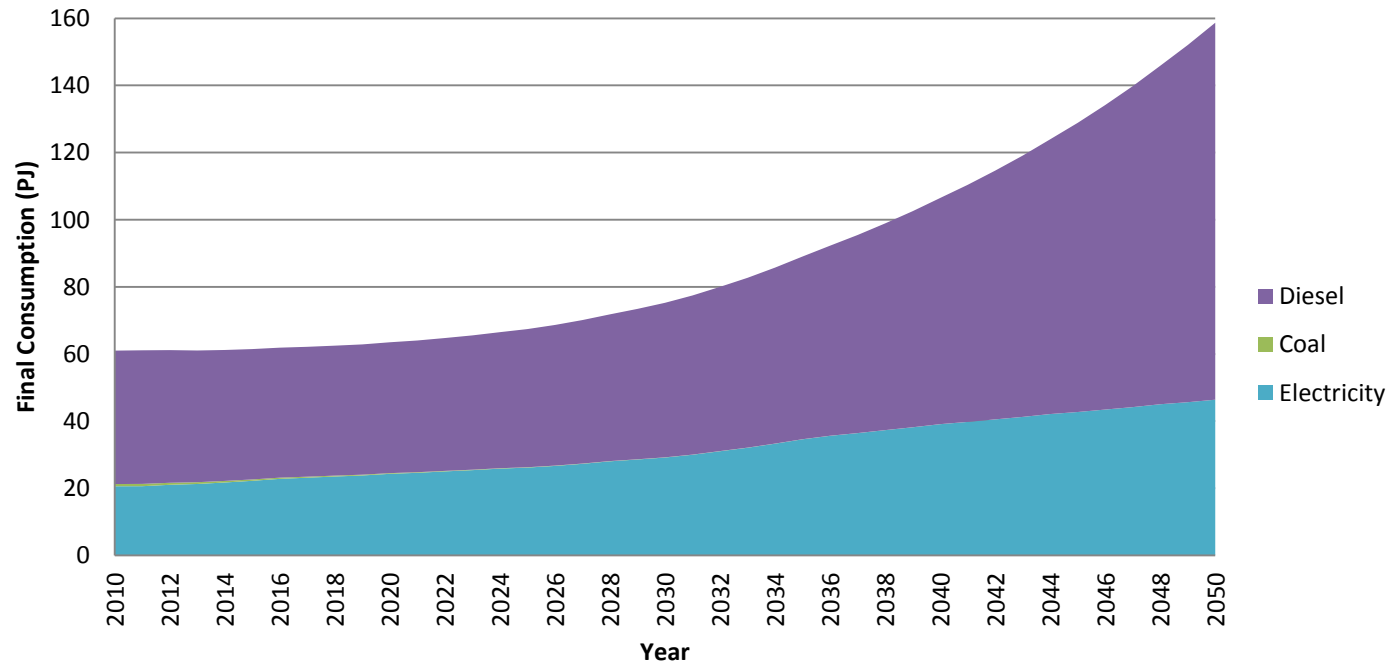


Source: DoE Analysis



# AGRICULTURAL SECTOR

## Total Demand



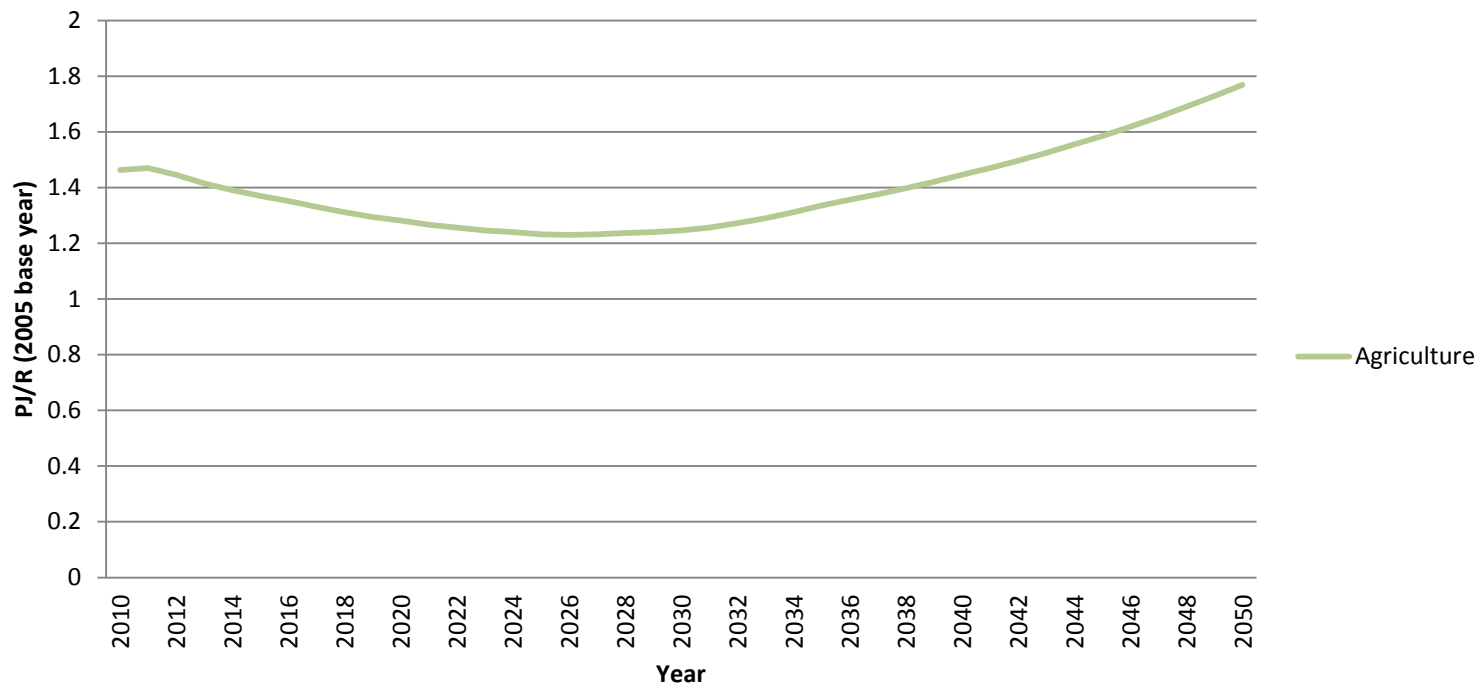
Source: Model Output





# AGRICULTURAL SECTOR INTENSITY

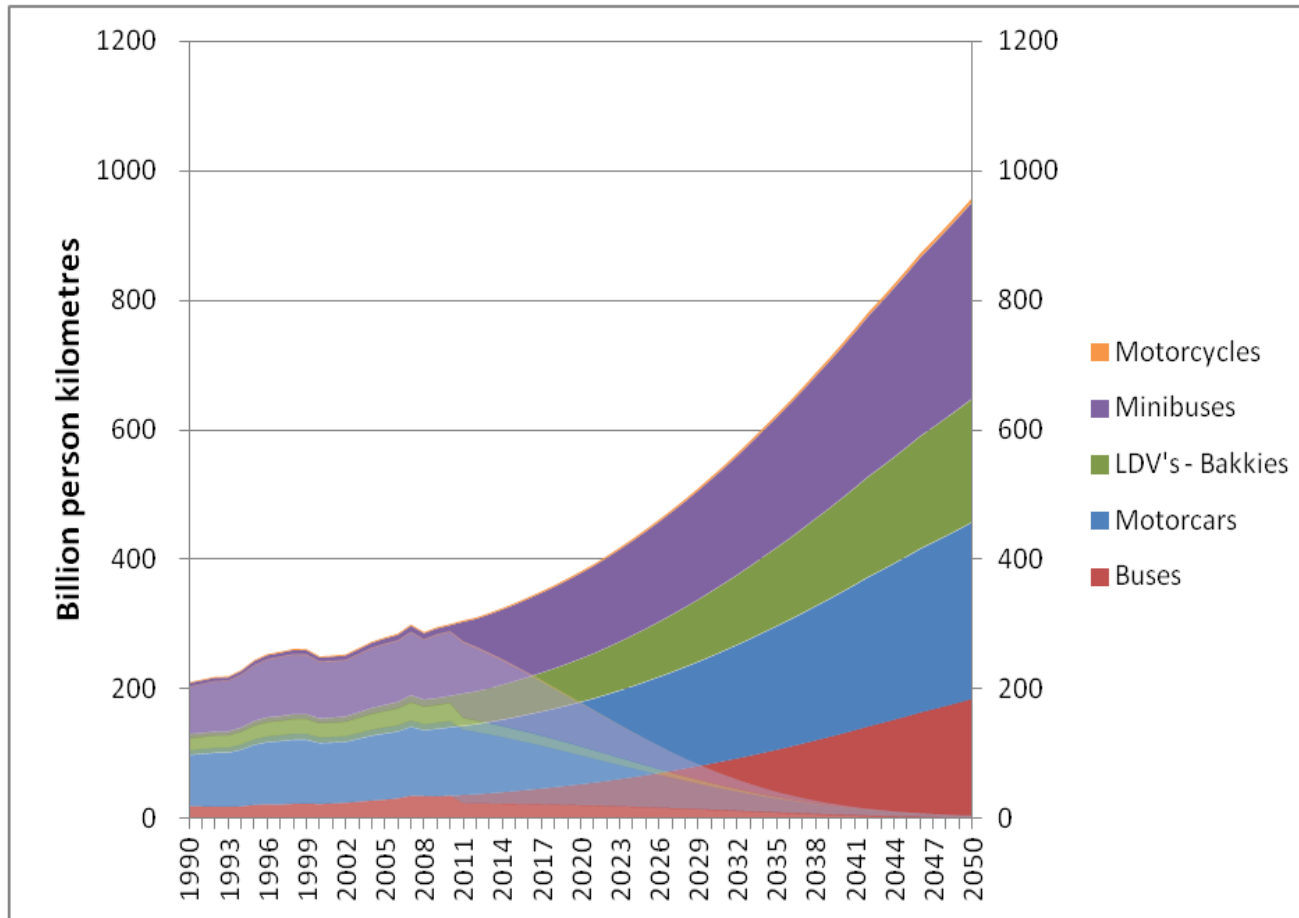
## Agricultural Sector Energy Consumption/per Gross Value Added



Source: DoE Analysis



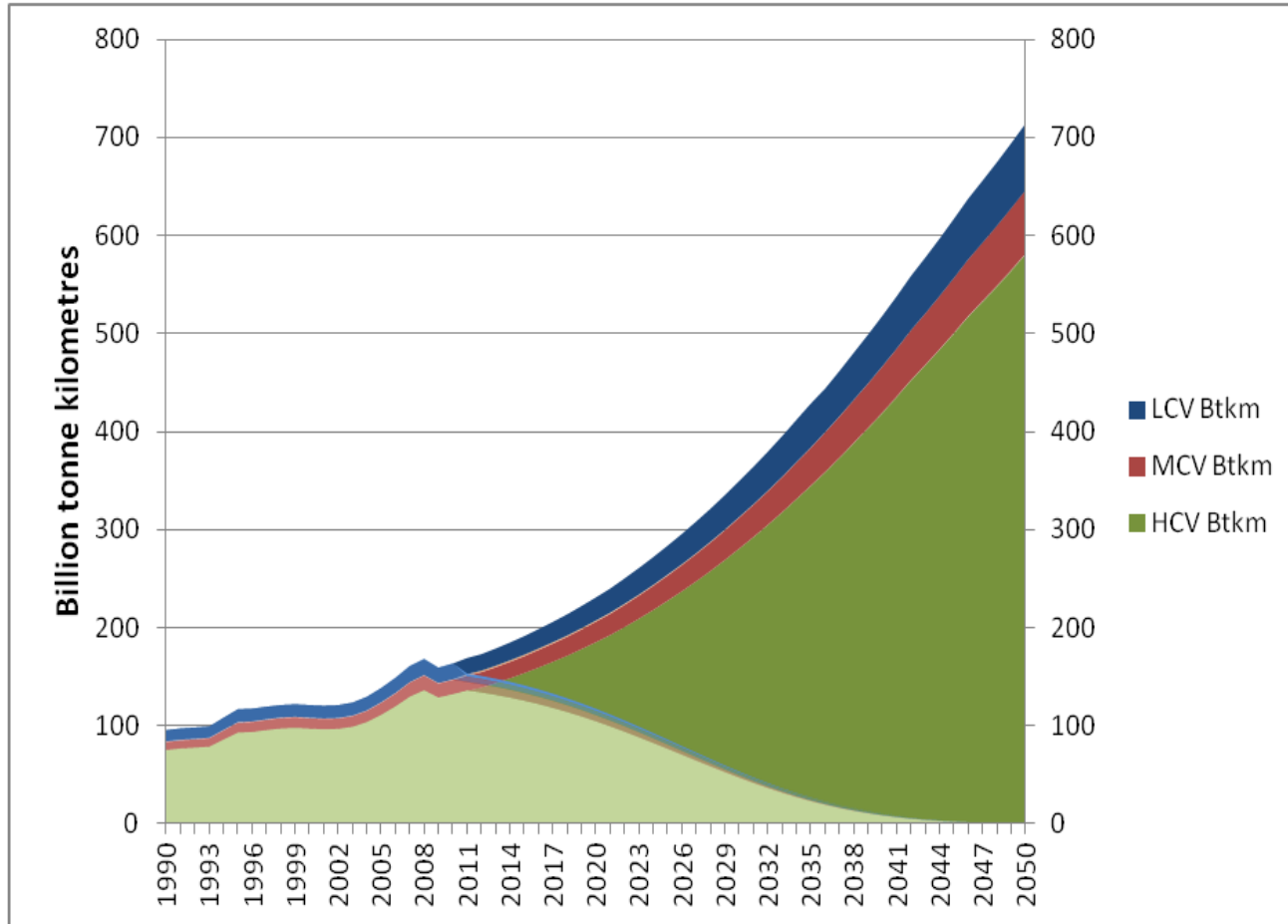
# TRANSPORT - PASSENGER



Source: Model Output



# TRANSPORT - FREIGHT



Source: Model Output



**energy**

Department:  
Energy  
REPUBLIC OF SOUTH AFRICA

# THANK YOU