



energy

Department:
Energy
REPUBLIC OF SOUTH AFRICA

DRAFT INTEGRATED ENERGY PLANNING REPORT



energy

Department:
Energy
REPUBLIC OF SOUTH AFRICA

MACROECONOMIC AND DEMOGRAPHIC ASSUMPTIONS

Dr. Rebecca Maserumule
Demand Modelling Specialist

CONTENT



energy

Department:
Energy
REPUBLIC OF SOUTH AFRICA

- **MACROECONOMIC ASSUMPTIONS**
- **DEMOGRAPHIC 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 = α SOC + (1- α)SRTTP

EOCK

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%

Economic Opportunity Cost of Capital (EOCK)

| Ref | Description | Variables | Households | Business | Government | Foreign |
|-----|---|--|------------|----------|------------|---------|
| 1 | Savers: Share | S _i /S _p | 0.1429 | 0.5055 | 0.0000 | 0.3516 |
| 2 | Nominal interest rate | i _r | 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 _i /S _p) | 0.0714 | 0.0000 | 0.0000 | 0.5274 |
| | Group weight *real return | ε*(S _i /S _p)*rs | 0.0022 | | | 0.0047 |
| | Sum of Group weights | A | | | | 0.5989 |
| | Sum of Group weights * real return | B | | | | 0.00688 |
| | Investors: Share | I _j /S _t | | 0.6108 | 0.1369 | |
| | Nominal interest/earnings rate | i _r | | | | |
| | Real return on investment | rr = (i _r -p)/(1+p) | | 0.2120 | 0.1563 | |
| | Elasticity | η | | -1.0000 | 0.0000 | |
| | Group weight | η*(I _j /S _t) | | -0.6108 | | |
| | Group weight *real return | η*(I _j /S _t)*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% | | | |

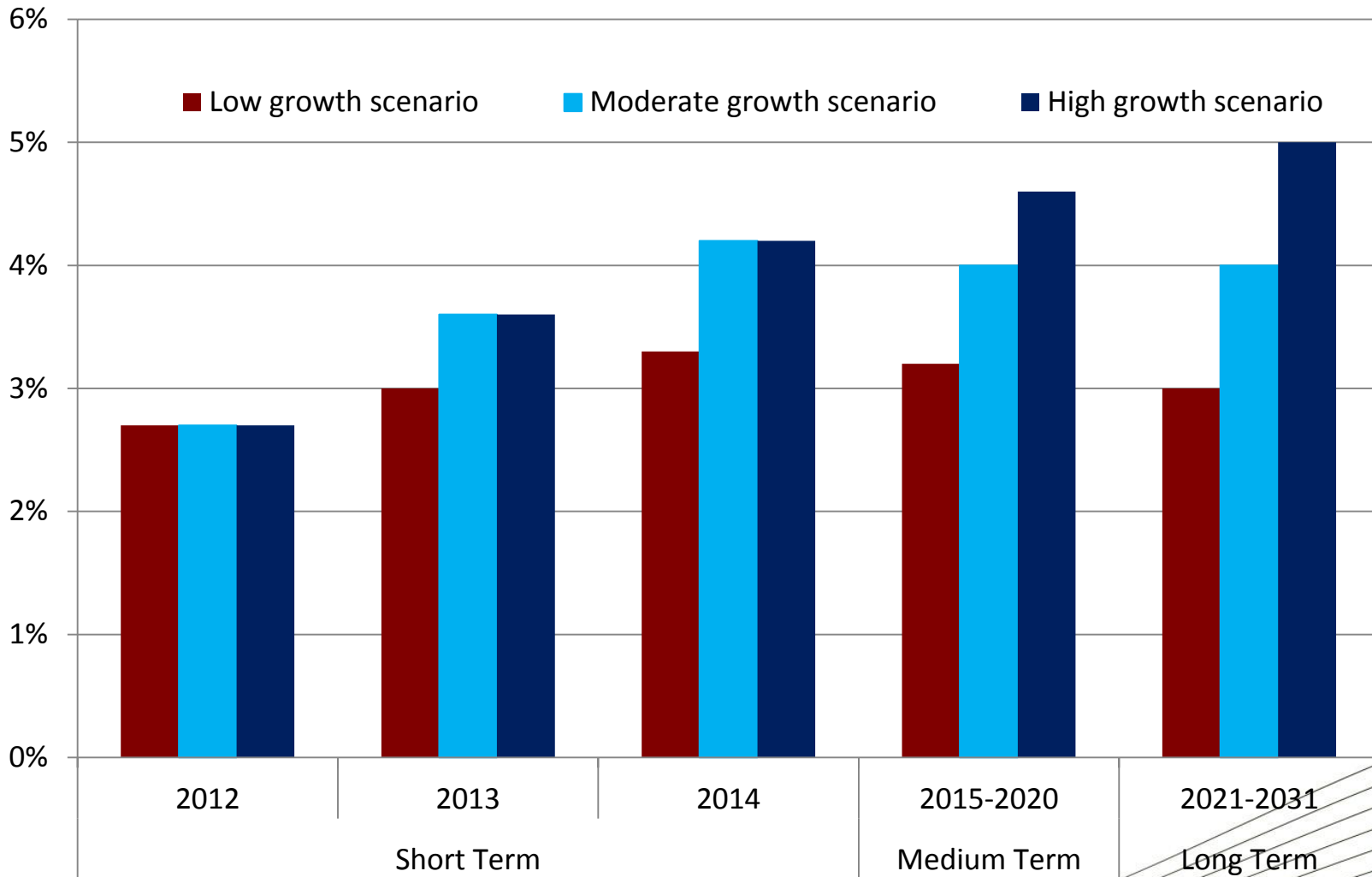
Note: need to determine whether foreign investment and **government investment** crowds-out private investment

ECONOMIC GROWTH



energy

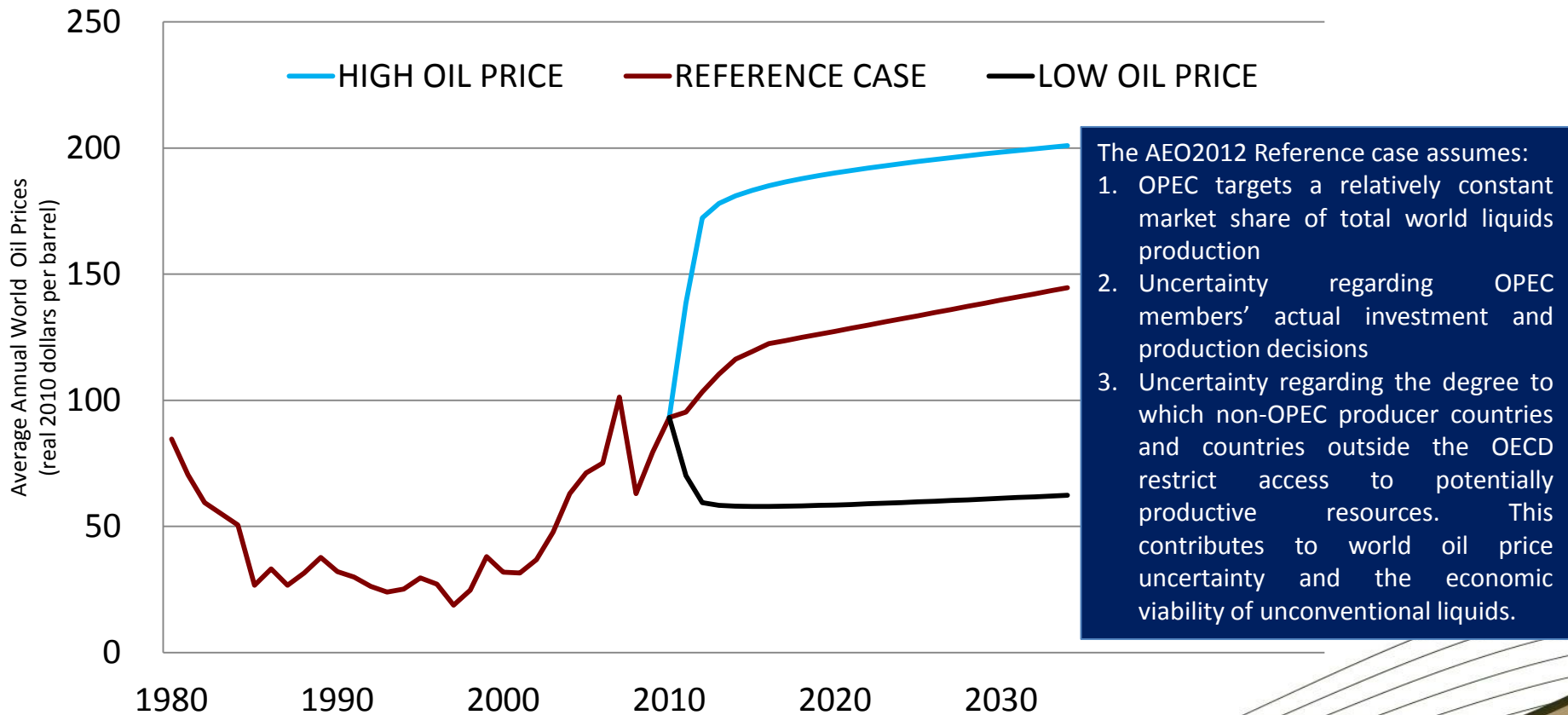
Department:
Energy
REPUBLIC OF SOUTH AFRICA



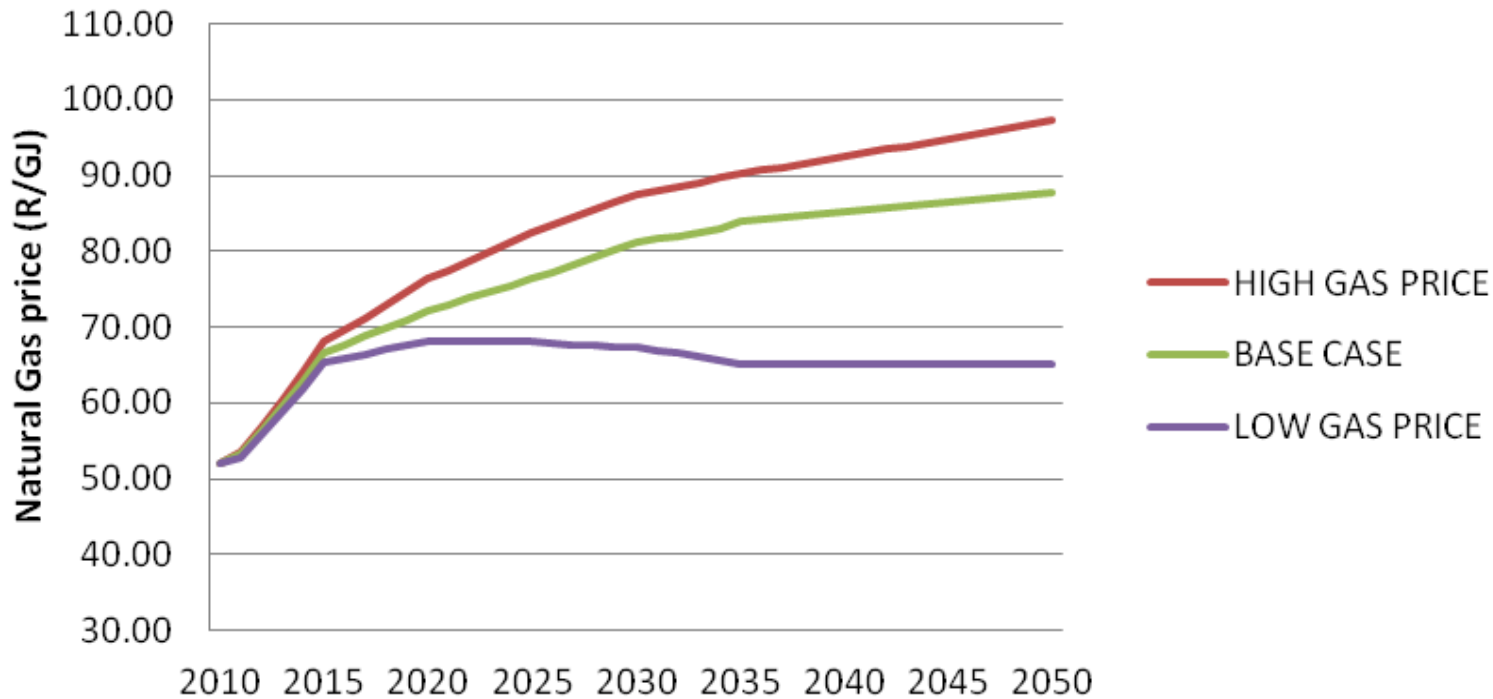


GLOBAL OIL PRICES

Average World Annual World Oil Price



PROJECTED NATURAL GAS PRICE

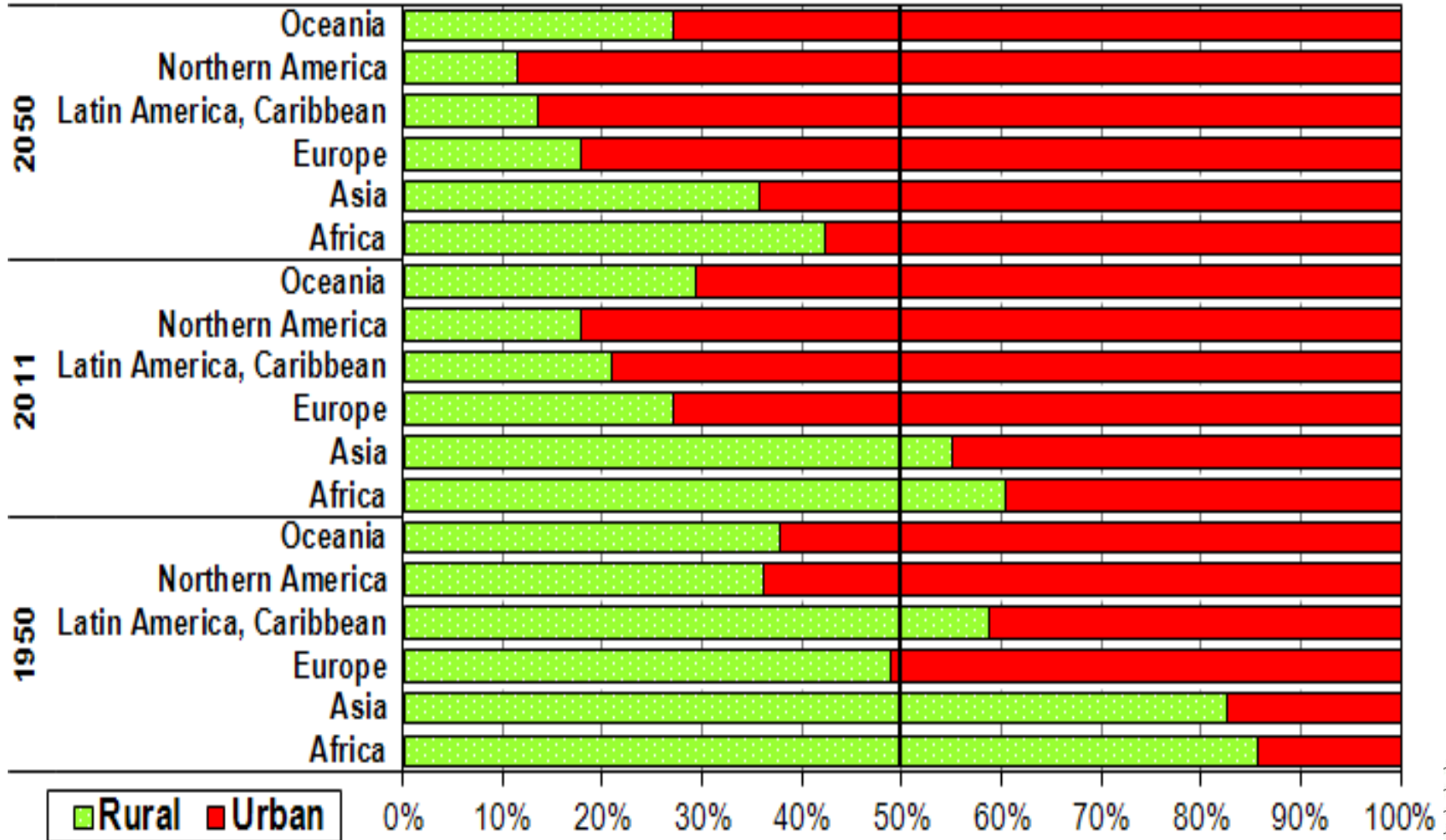


The **Base Case** natural gas price projections are based on the “**New Policies Scenario**” projections for **average gas import prices in Europe** in the 2011 World Energy Outlook

- 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’



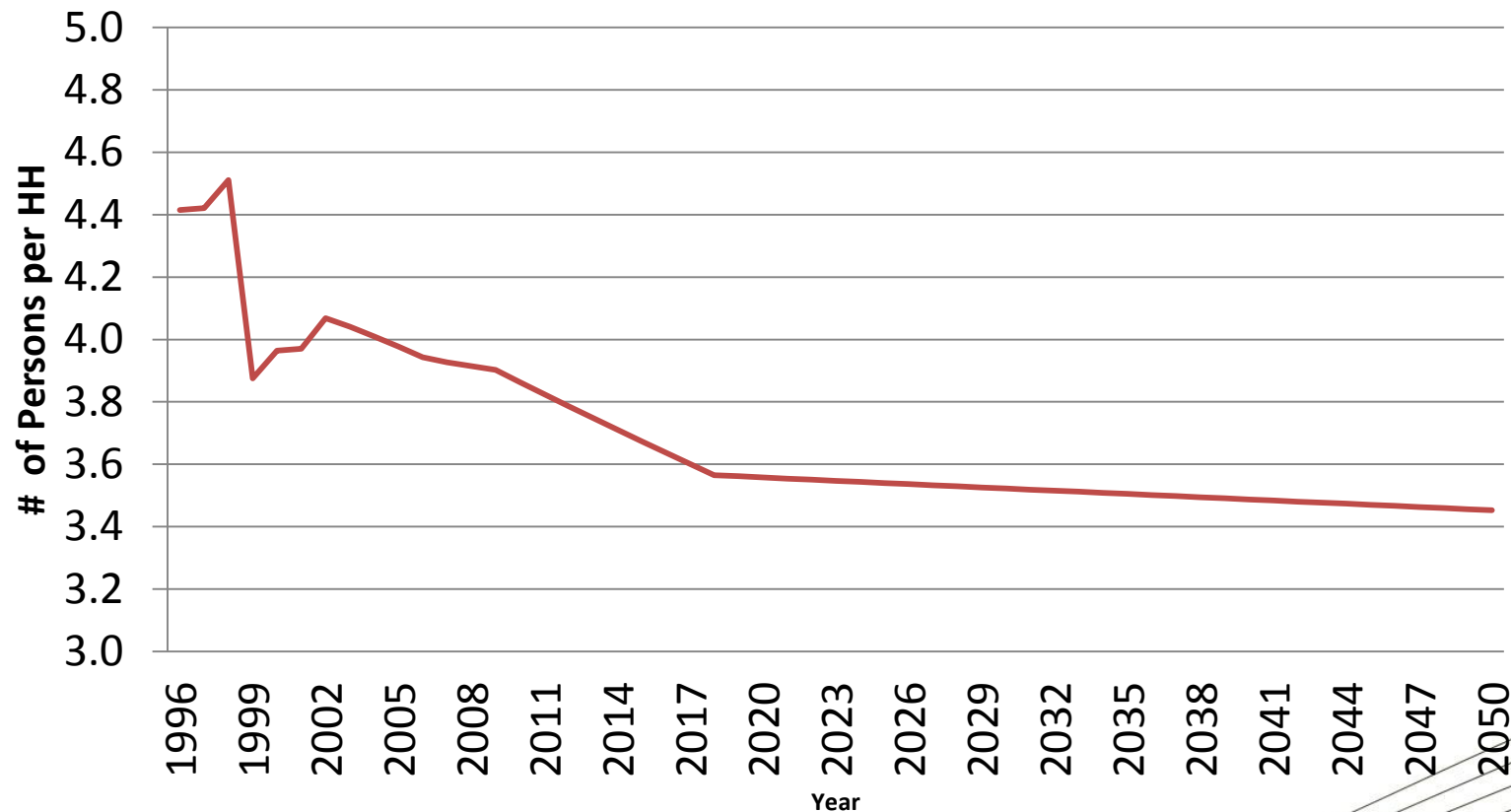
DEMOGRAPHIC ASSUMPTIONS





DEMOGRAPHIC (2)

Number of persons per household

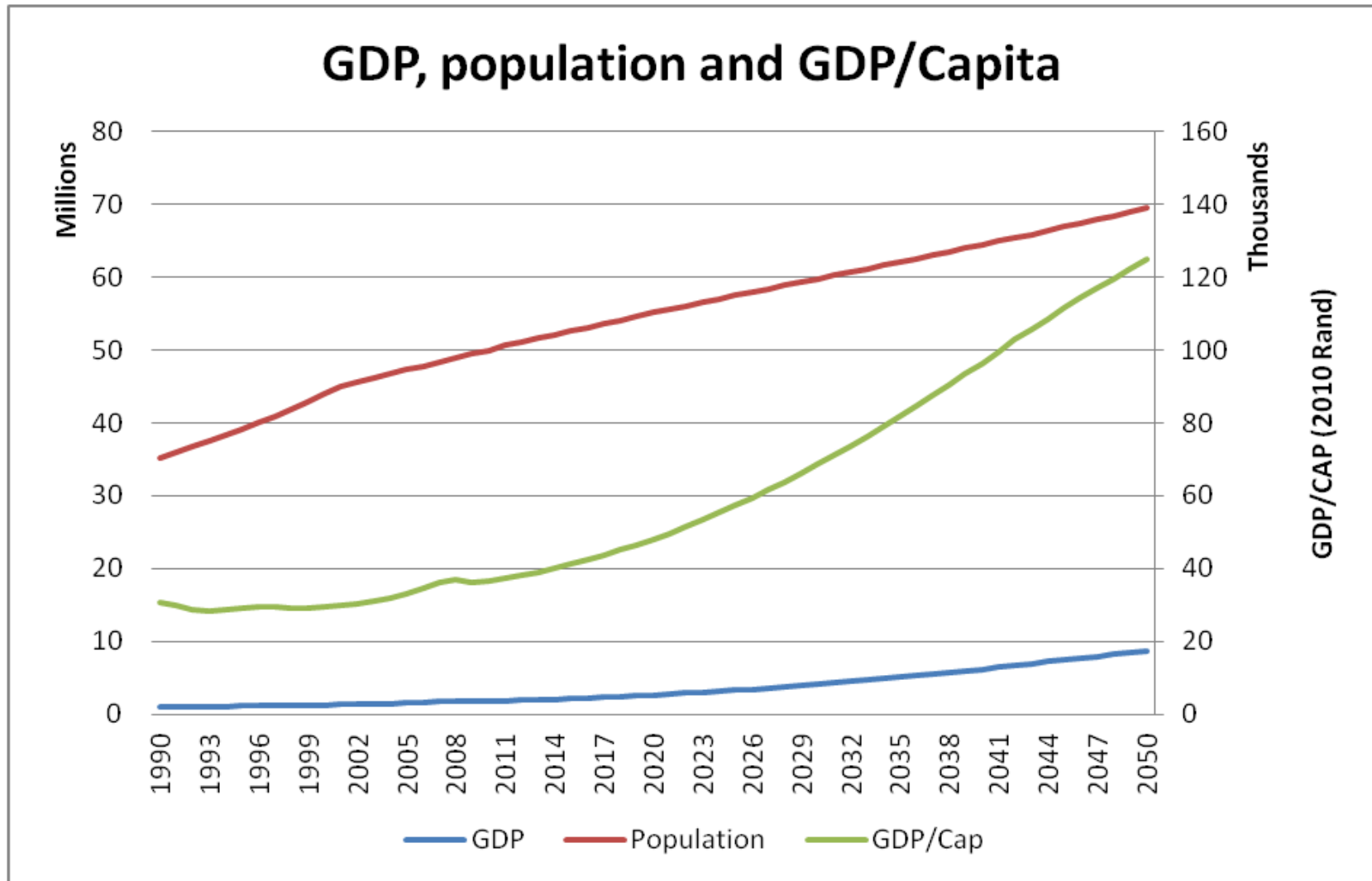


DEMOGRAPHIC (3)



energy

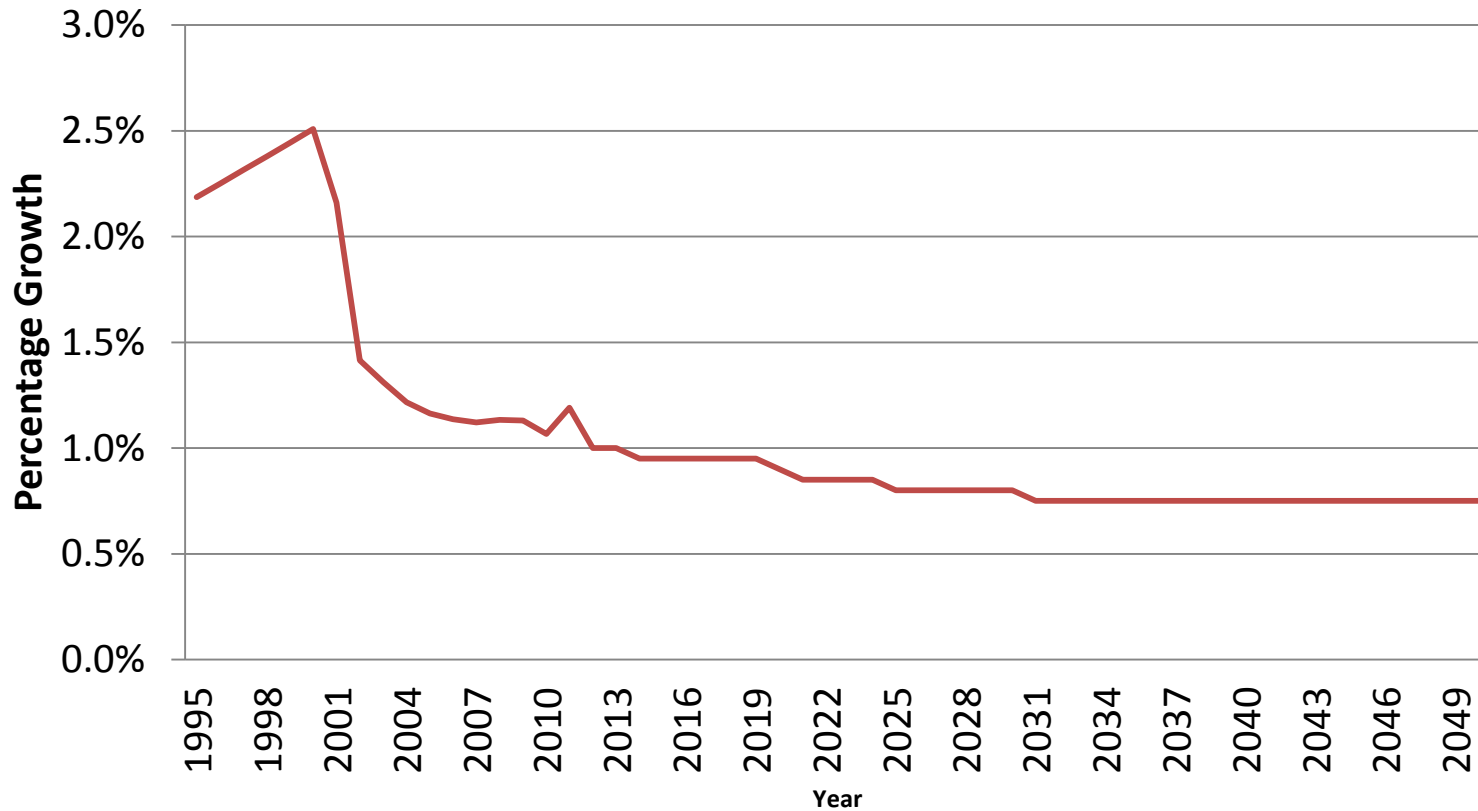
Department:
Energy
REPUBLIC OF SOUTH AFRICA





DEMOGRAPHIC (4)

Population Growth





DEMAND MODEL OUTPUTS

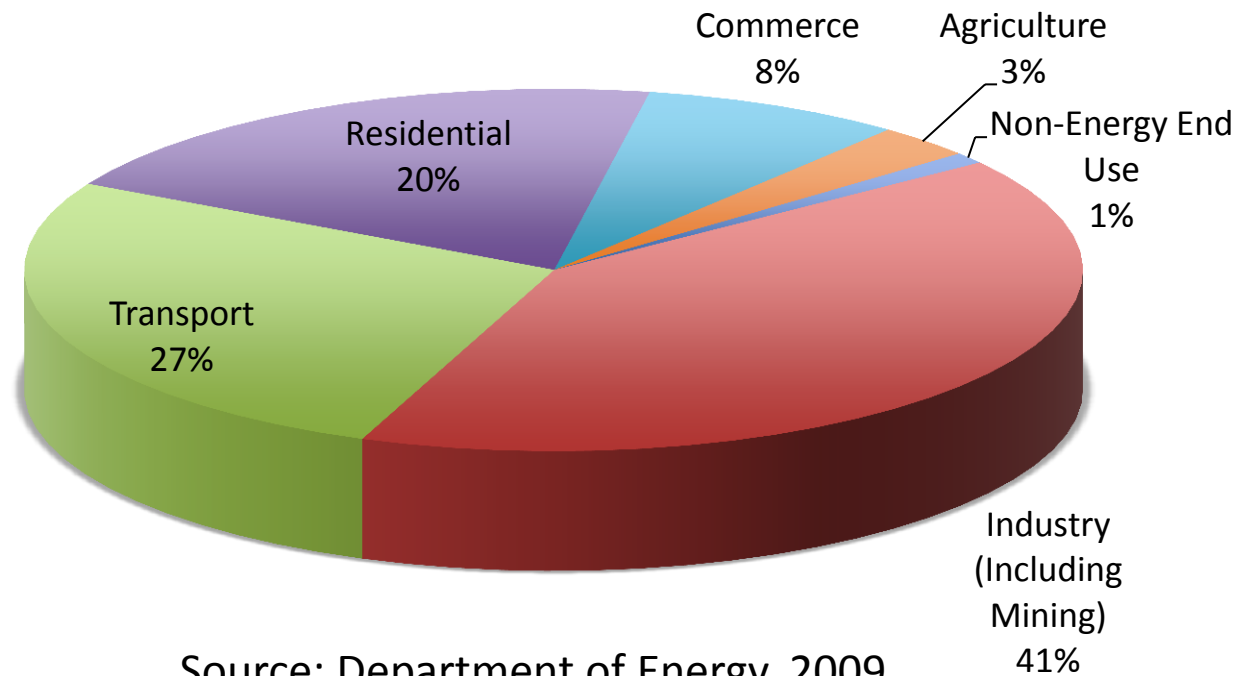


CONTENTS

- MACROECONOMIC ASSUMPTIONS
- **DEMAND MODEL OUTPUTS**



FINAL ENERGY CONSUMPTION



Source: Department of Energy, 2009

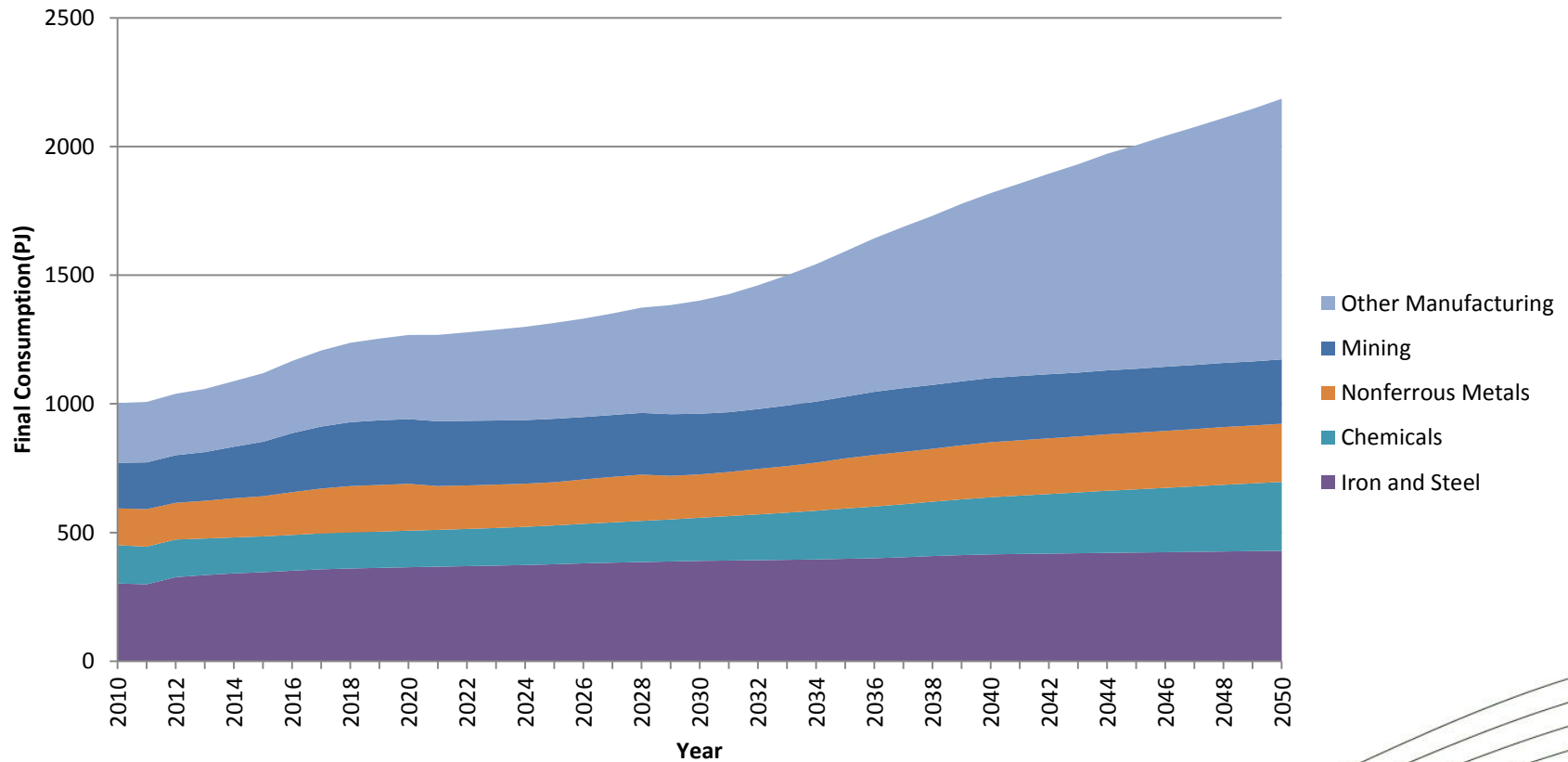
INDUSTRIAL SECTOR



energy

Department:
Energy
REPUBLIC OF SOUTH AFRICA

Total Energy Demand

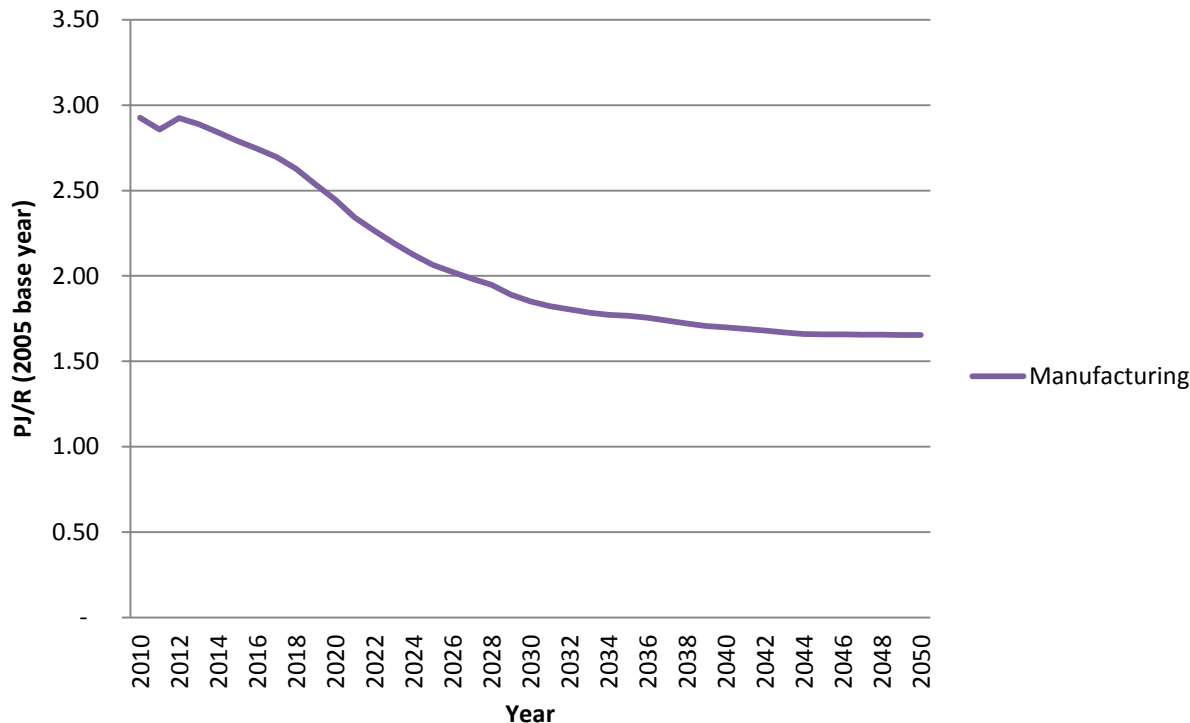


Source: Model Output



MANUFACTURING SECTOR INTENSITY

Manufacturing Energy Consumption/Gross Value Added)

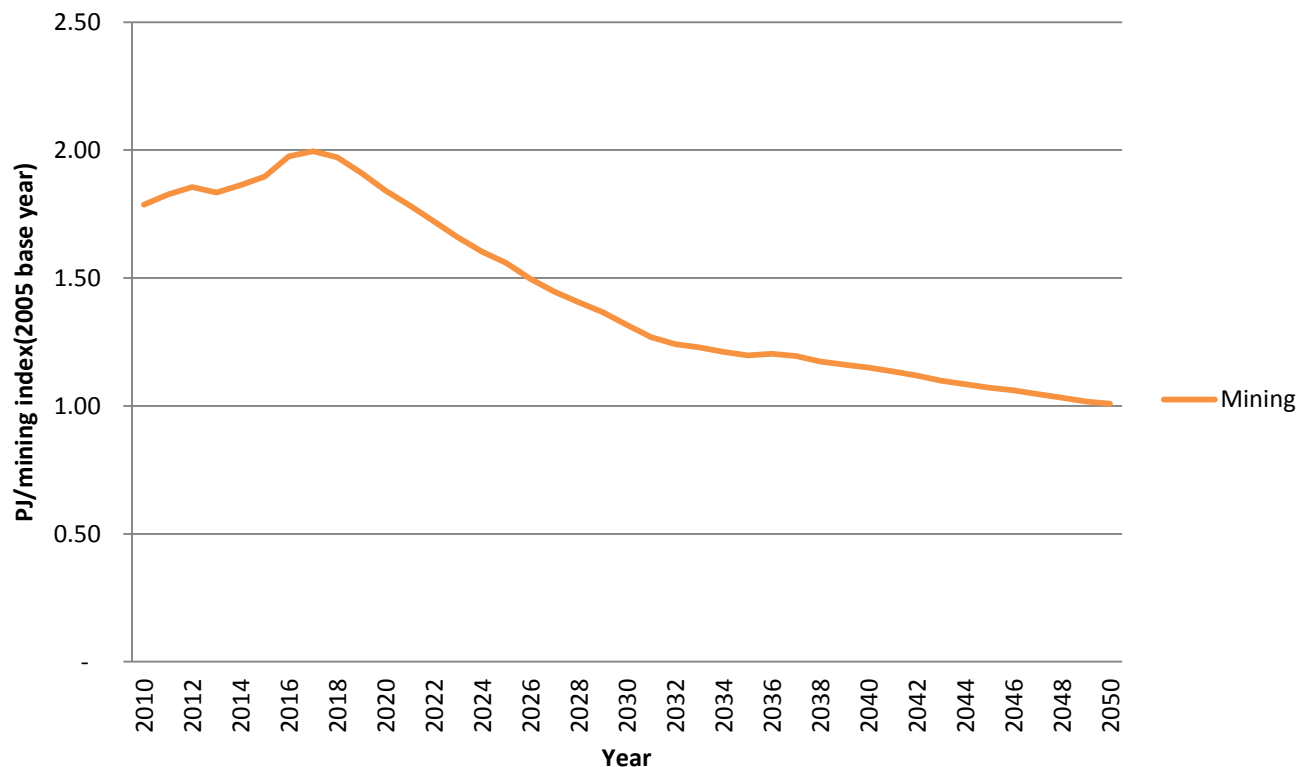


Source: DoE Analysis



MINING SECTOR INTENSITY

Mining Sector Energy Consumption/per Mining index

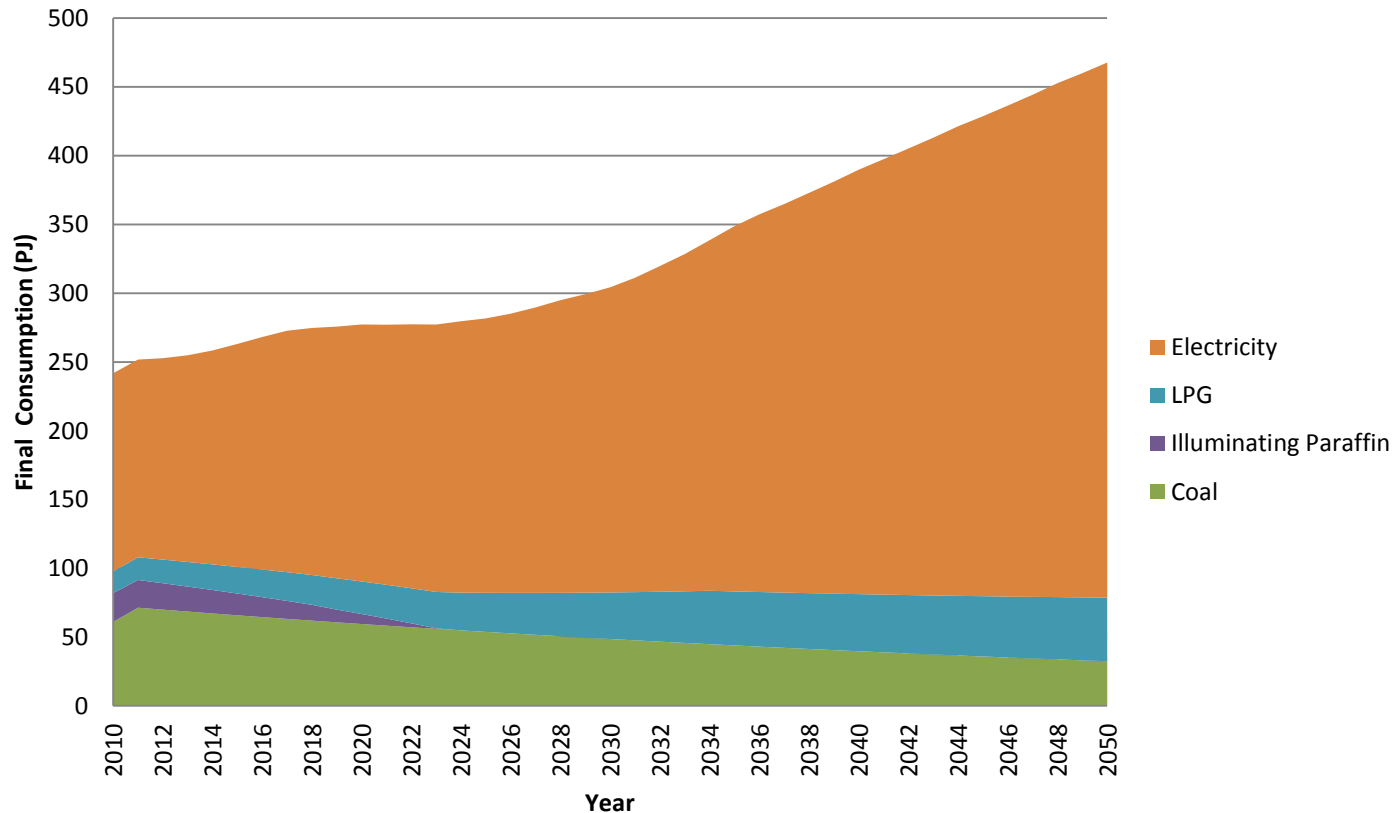


Source: DoE Analysis



RESIDENTIAL SECTOR

Total Energy Demand

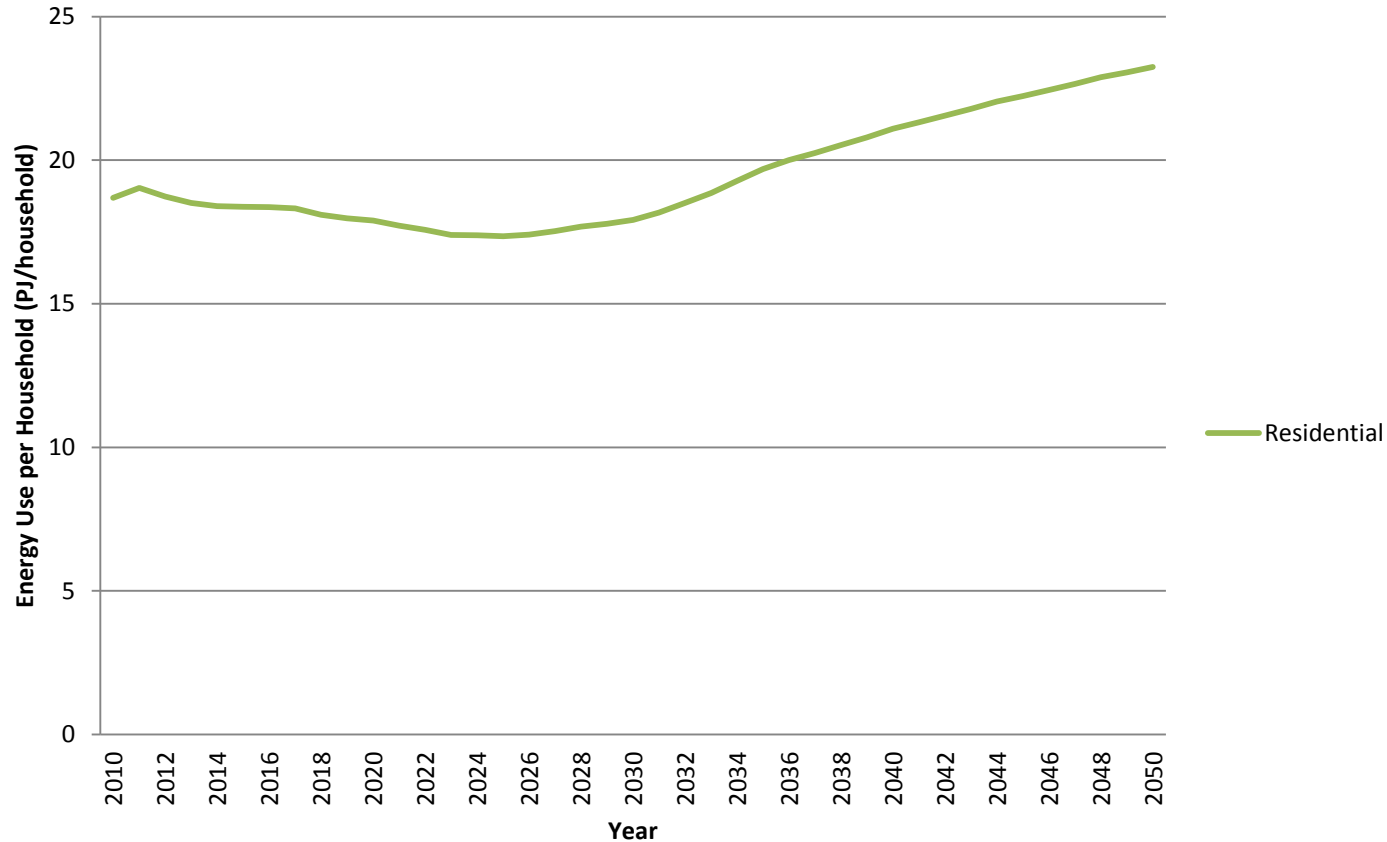


Source: Model Output



RESIDENTIAL SECTOR INTENSITY

Residential Energy Use Per Household

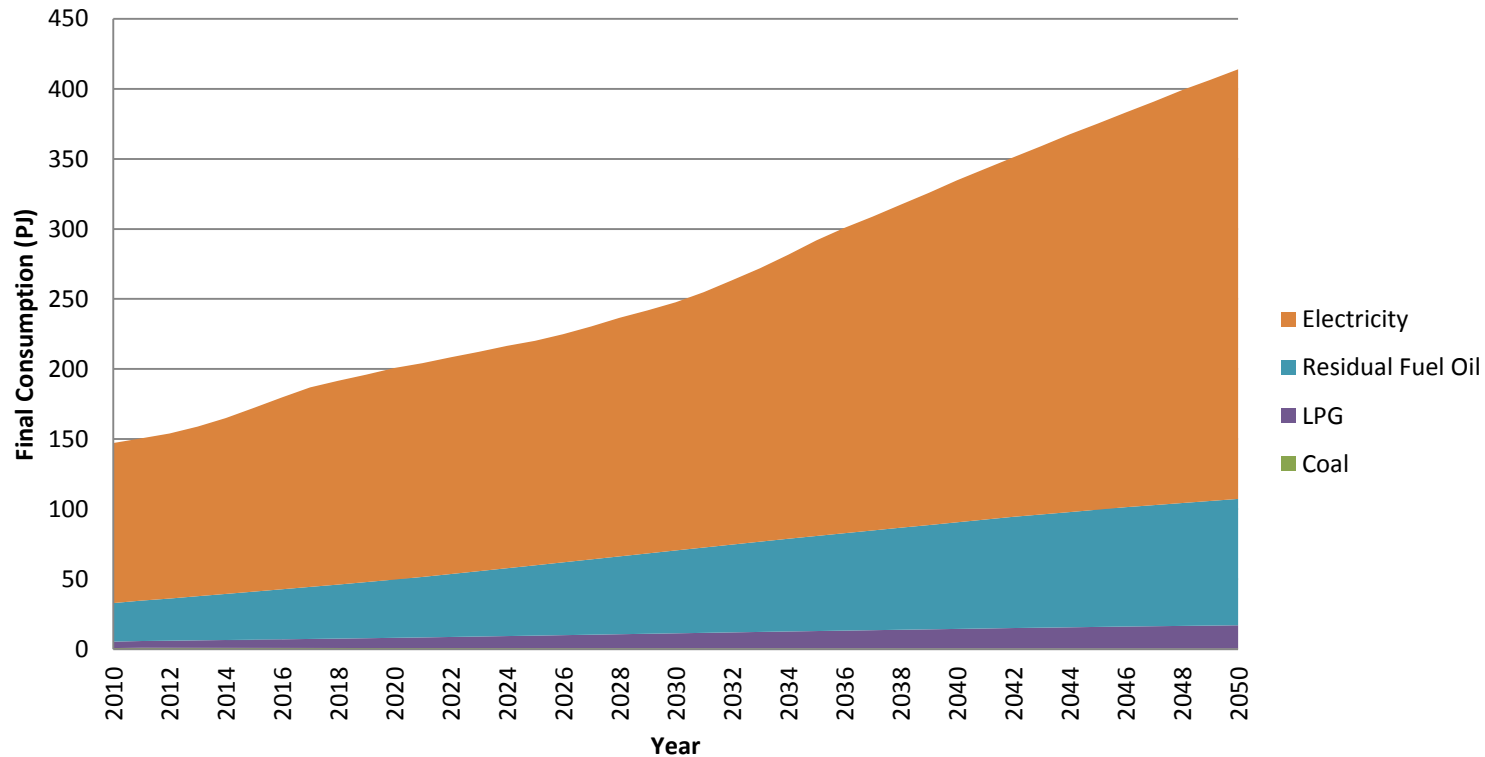


Source: DoE Analysis



COMMERCIAL SECTOR

Total Energy Demand

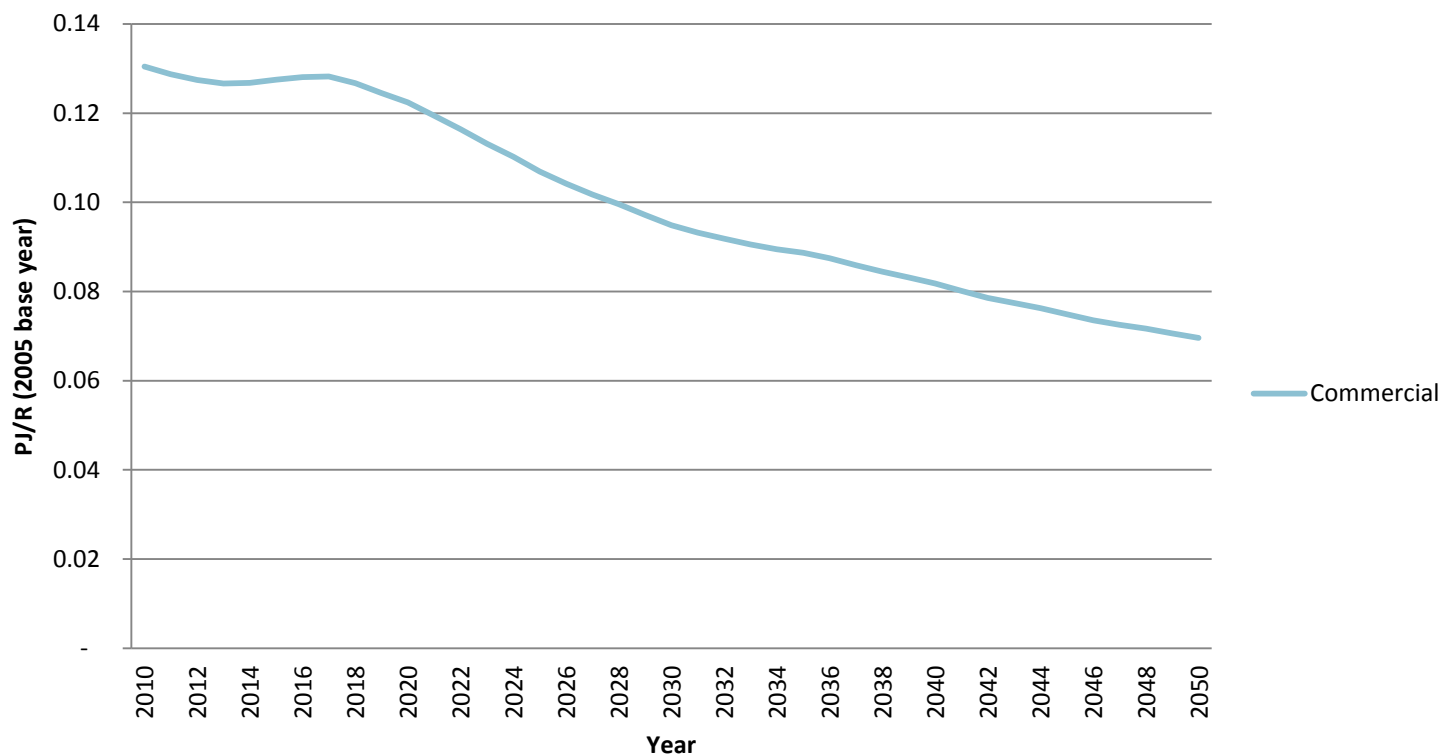


Source: Model Output



COMMERCIAL SECTOR INTENSITY

Commercial Sector Energy Consumption/(per Gross Value Added)

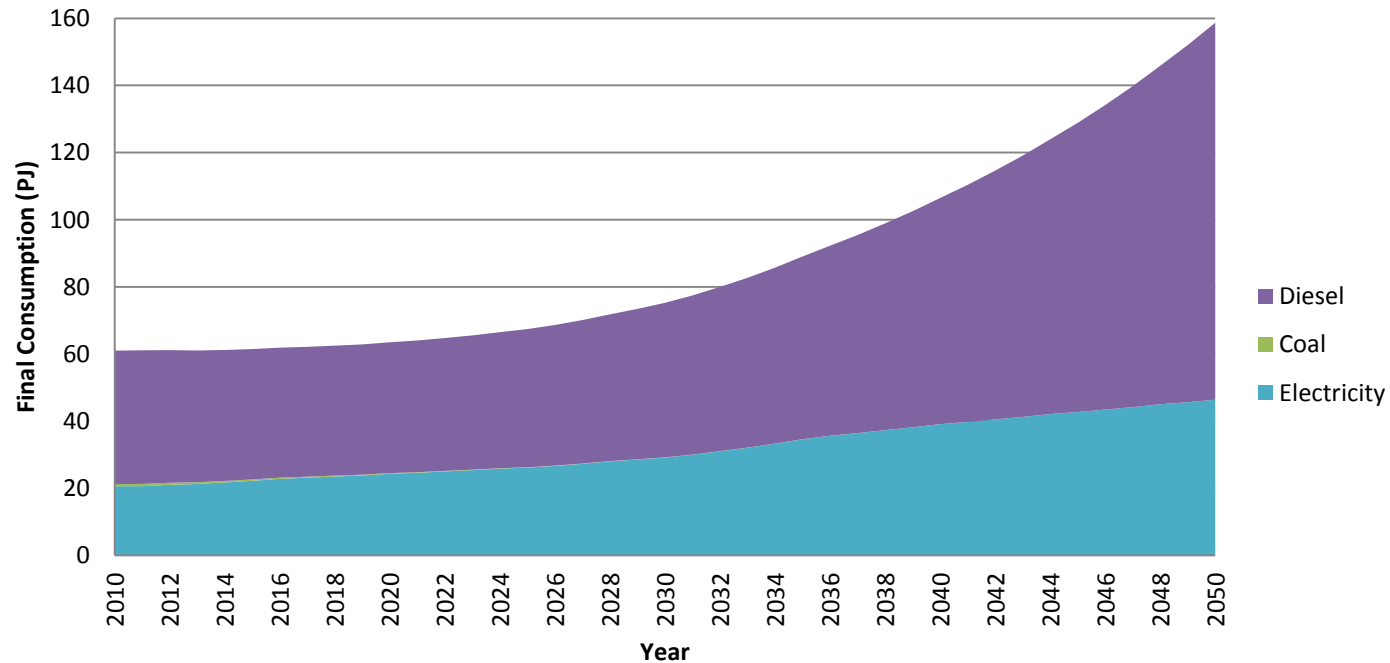


Source: DoE Analysis



AGRICULTURAL SECTOR

Total Demand

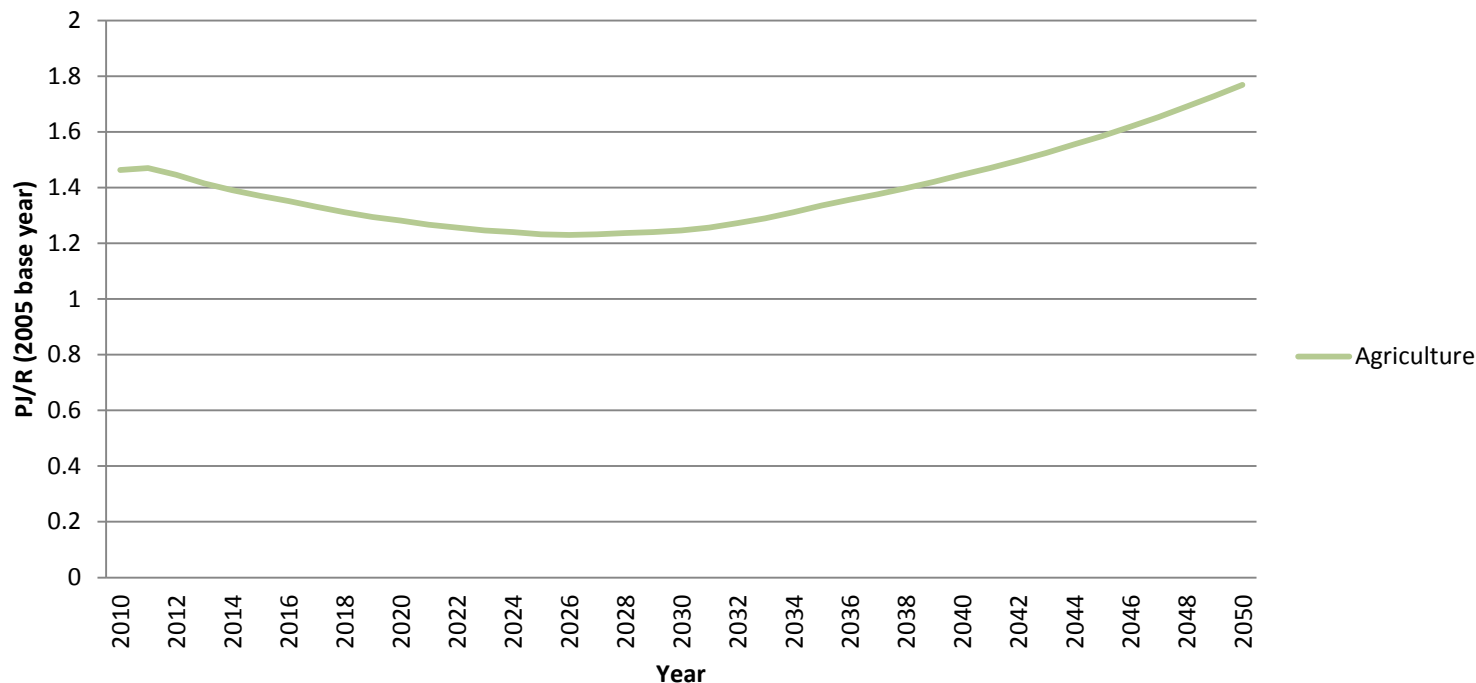


Source: Model Output



AGRICULTURAL SECTOR INTENSITY

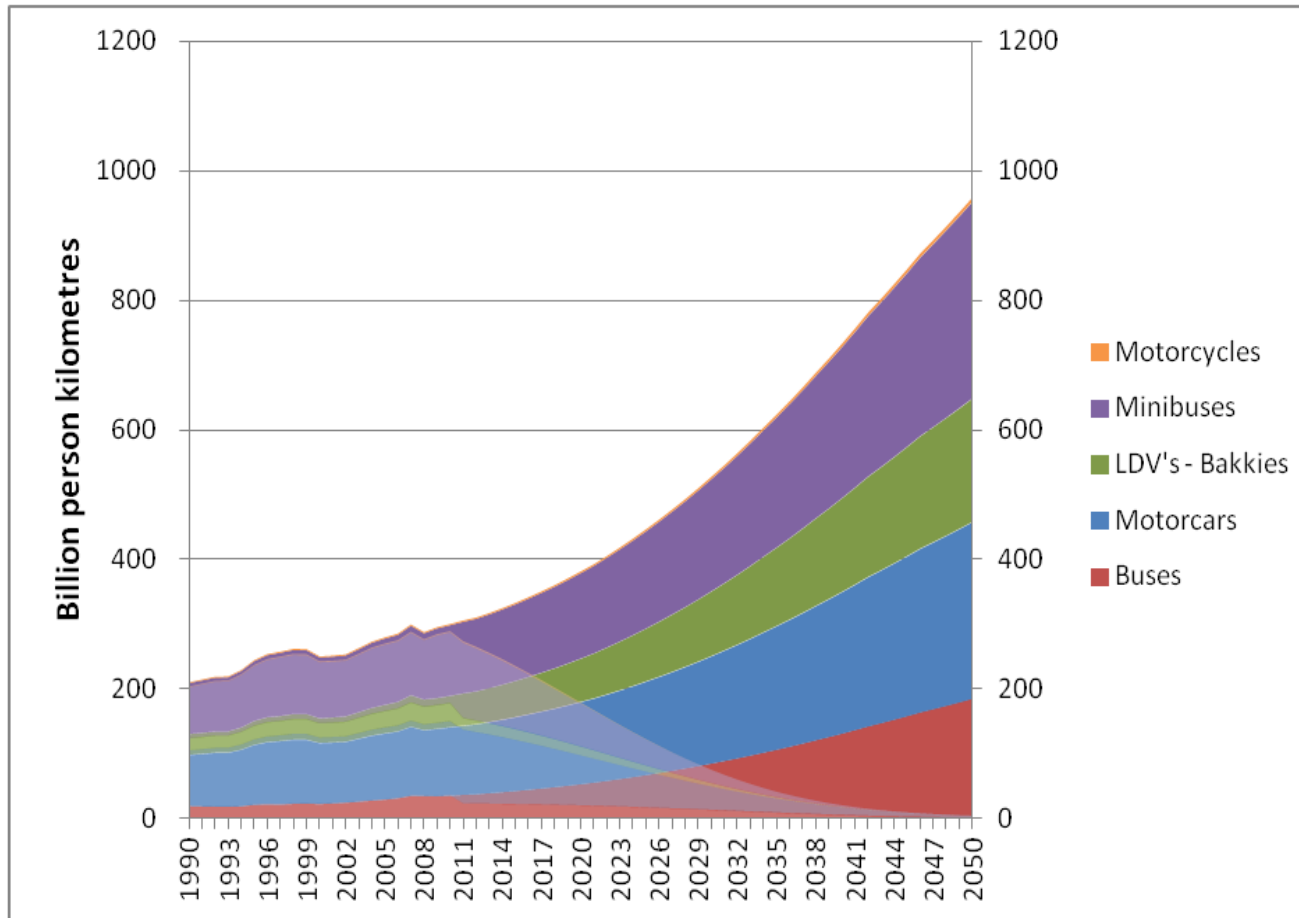
Agricultural Sector Energy Consumption/per Gross Value Added



Source: DoE Analysis



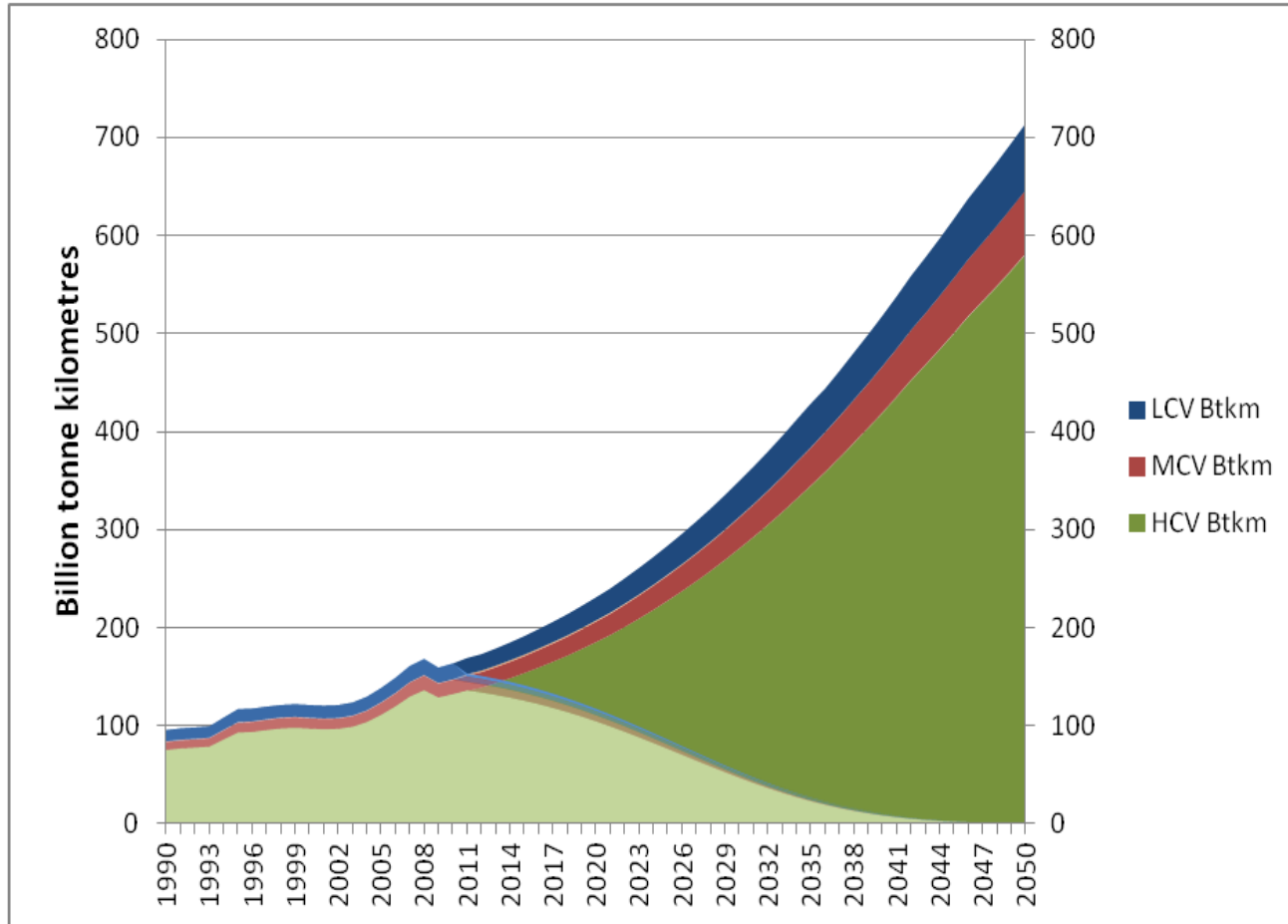
TRANSPORT - PASSENGER



Source: Model Output



TRANSPORT - FREIGHT



Source: Model Output



energy

Department:
Energy
REPUBLIC OF SOUTH AFRICA

THANK YOU