# PRIMES model scenario results for the EU25

**Ad hoc group 5 on "Long term energy future for the EU" of the High Level Group on Competitiveness, Energy and Environment**

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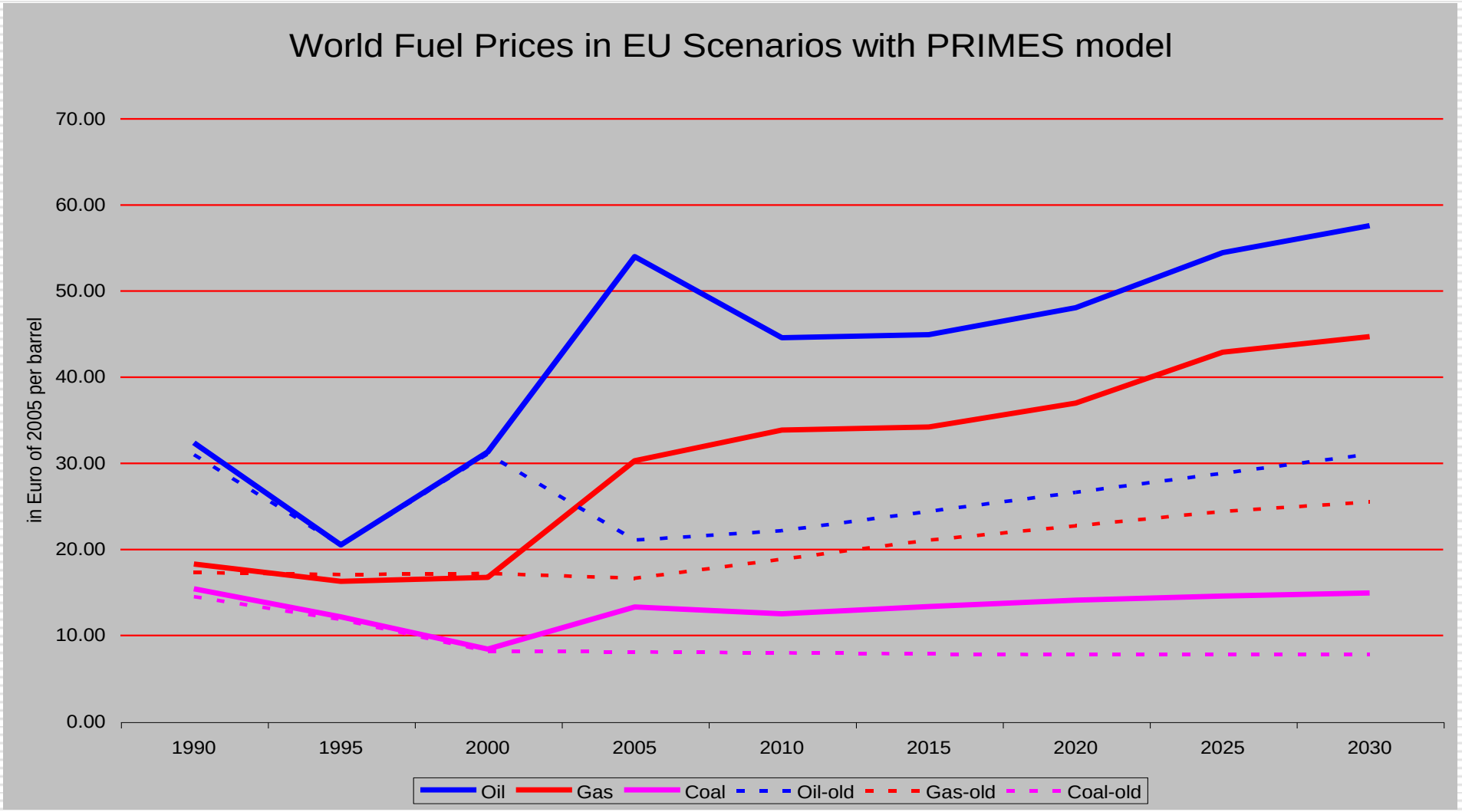
# Recent work with PRIMES model

1. Since DG TREN publications ('Trends' and 'Key Drivers') a complete update of PRIMES database carried out
   - Eurostat statistics up to 2003 and available information for 2004, 2005
   - Revision of the power plant database, including information on new constructions and projects
   - Updated information on prices, taxes and tariffs
   - New database on electricity and gas interconnections and future projects
   - Updated information about renewables: potential, non linear cost curves, learning by doing, etc.
2. New improved electricity and steam sub-model: DC power flow and investment expansion over a set of regional electricity markets
3. With new projections for
   - Economic growth of the EU and sectoral structure
   - International fuel prices

# Scenarios on World Prices



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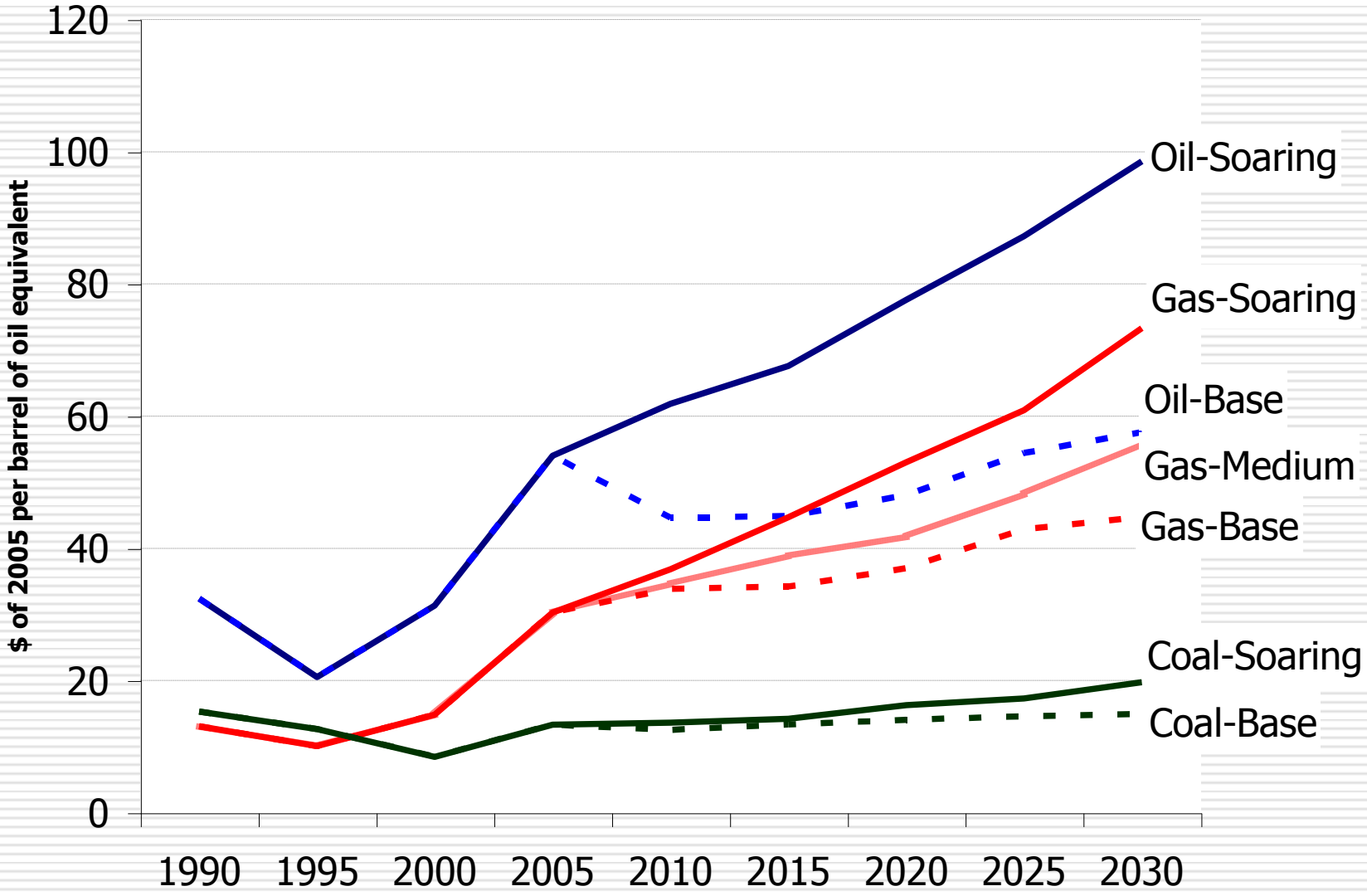


# EU-25: Overview

| Year 2005 | Prospects to 2030 |
|---|---|
| ✓ 460 million people | ✓ Stable |
| ✓ 9,715 billion € GDP | ✓ 2.0% per year |
| ✓ 1,744 Mtoe Gross Energy Needs | ✓ 0.3% per year |
| ✓ Energy Intensity of GDP | ✓ -1.7% per year |
| ✓ 904 Mtoe Imported Energy | ✓ 1.4% per year |
| ✓ 3,177 TWh Electricity Generation | ✓ 1.3% per year |
| ✓ 726 GW of Power Generation Capacity | ✓ 32 GW new Power Plants per year |
| ✓ 3,800 Mt of CO2 Emissions | ✓ 0.2% per year |

# Baseline scenario results

## EU-25 primary energy needs:

Structure by fuel

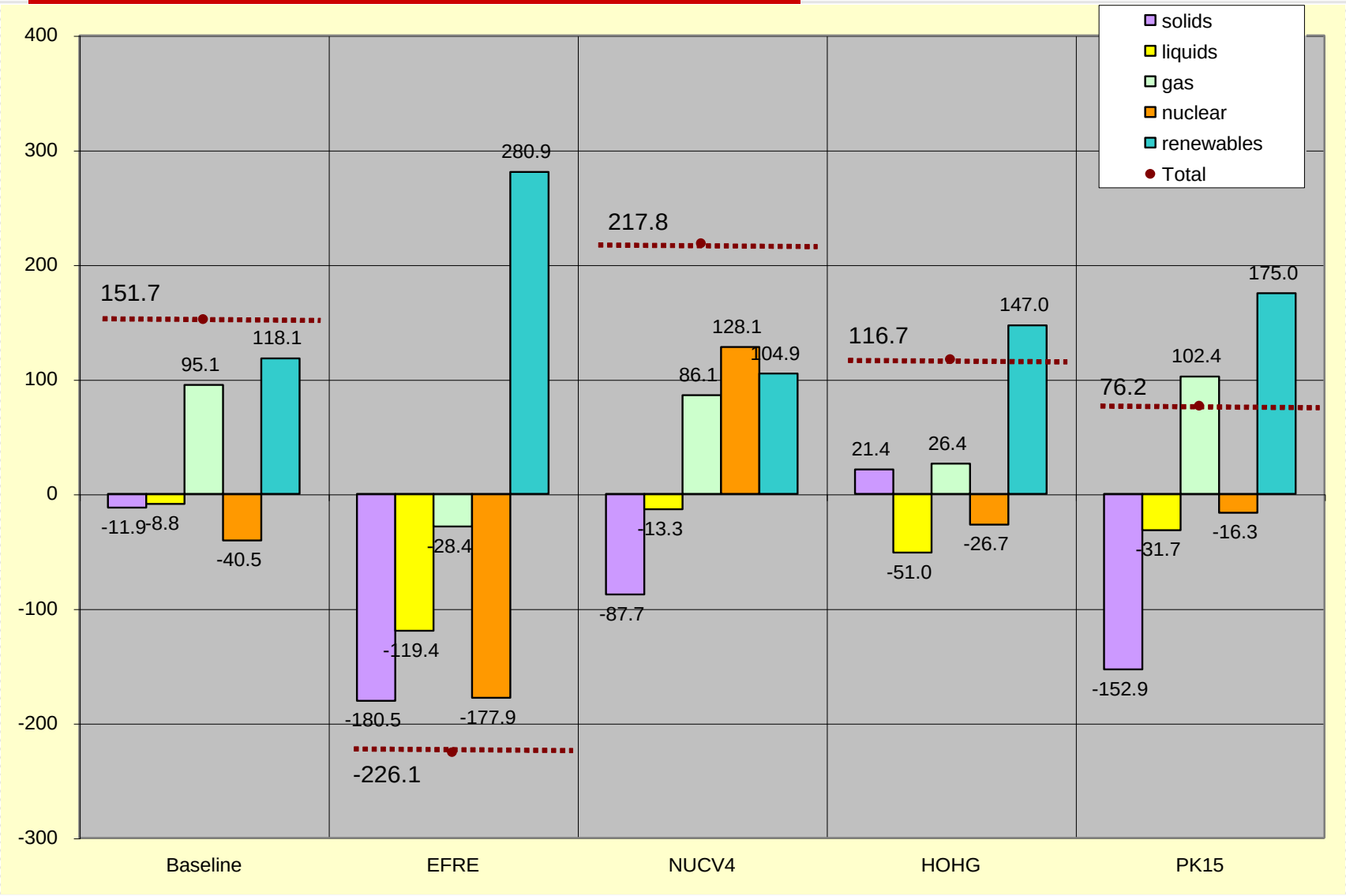
| | 2000 | | 2010 | | 2030 | | Increment 2030-2000 | |
|---|---|---|---|---|---|---|---|---|
| | Mtoe | % | Mtoe | % | Mtoe | % | Mtoe | % |
| **Solids** | 307 | *19%* | 287 | *16%* | 293 | *15%* | -13 | *-4%* |
| **Oil** | 635 | *38%* | 669 | *37%* | 640 | *34%* | 6 | *1%* |
| **Nat. Gas** | 376 | *23%* | 462 | *26%* | 518 | *27%* | 142 | *38%* |
| **Nuclear** | 238 | *14%* | 249 | *14%* | 211 | *11%* | -27 | *-11%* |
| **Renewables** | 96 | *6%* | 144 | *8%* | 231 | *12%* | 134 | *139%* |
| **Hydro** | 29 | *2%* | 30 | *2%* | 34 | *2%* | 5 | *17%* |
| **Biomass and waste** | 62 | *4%* | 92 | *5%* | 149 | *8%* | 87 | *141%* |
| **Wind** | 2 | *0%* | 16 | *1%* | 38 | *2%* | 36 | *1883%* |
| **Others** | 4 | *0%* | 6 | *0%* | 10 | *1%* | 6 | *171%* |
| **Gross Energy** | 1654 | *100%* | 1813 | *100%* | 1895 | *100%* | 241 | *15%* |

- Solids: lower in the medium term but re-emerge in the long run
- Natural Gas: strategic importance, 58% of incremental demand
- Oil: sector-specific fuel, stable demand but maintains high share in consumption
- Renewables: high growth but still have a low share (12% in 2030)
- Nuclear: decreases after 2010, depends on plants' lifetime and nuclear phase-out policies

# Alternative cases examined

- **Renewable Energy Scenarios**: target about penetration of renewable energy in the EU energy system at a future period of time
  - 12% renewables in 2010 – renewables shadow value constant at 25 Euros per MWh from 2010 onwards
  - High renewables case – renewables shadow value increasing to 32.5 and 35 Euros per MWh in 2020 and 2030 respectively
- **Efficiency Energy Case**: takes into account all efficiency policies tabled by the Commission
- **Combined Efficiency and High Renewables Energy Scenario**: assumes simultaneous implementation of assumptions introduced in the above scenarios
  - Exploitation of possible synergies and trade-offs
- **Nuclear Energy Scenarios**: assume uplifting of nuclear phase-out policies, expansion of existing nuclear power plants lifetime up to 50 years and penetration of advanced nuclear technology in the horizon to 2030
  - Alternative combinations examined
- **Post Kyoto CO2 Emissions Reduction Scenarios**: targets of -15% and -30% from 1990 levels to be met by 2020
  - -15% with CCS requires a carbon value that reaches 100 Euros'05 per t of CO2 in 2030 (110 Euros'05 per t of CO2 if the option of CCS is not available)
  - -30% with CCS requires a carbon value of 250 Euros'05 per t of CO2 in 2030 (more than 350 Euros'05 per t of CO2 if the option of CCS is not available)

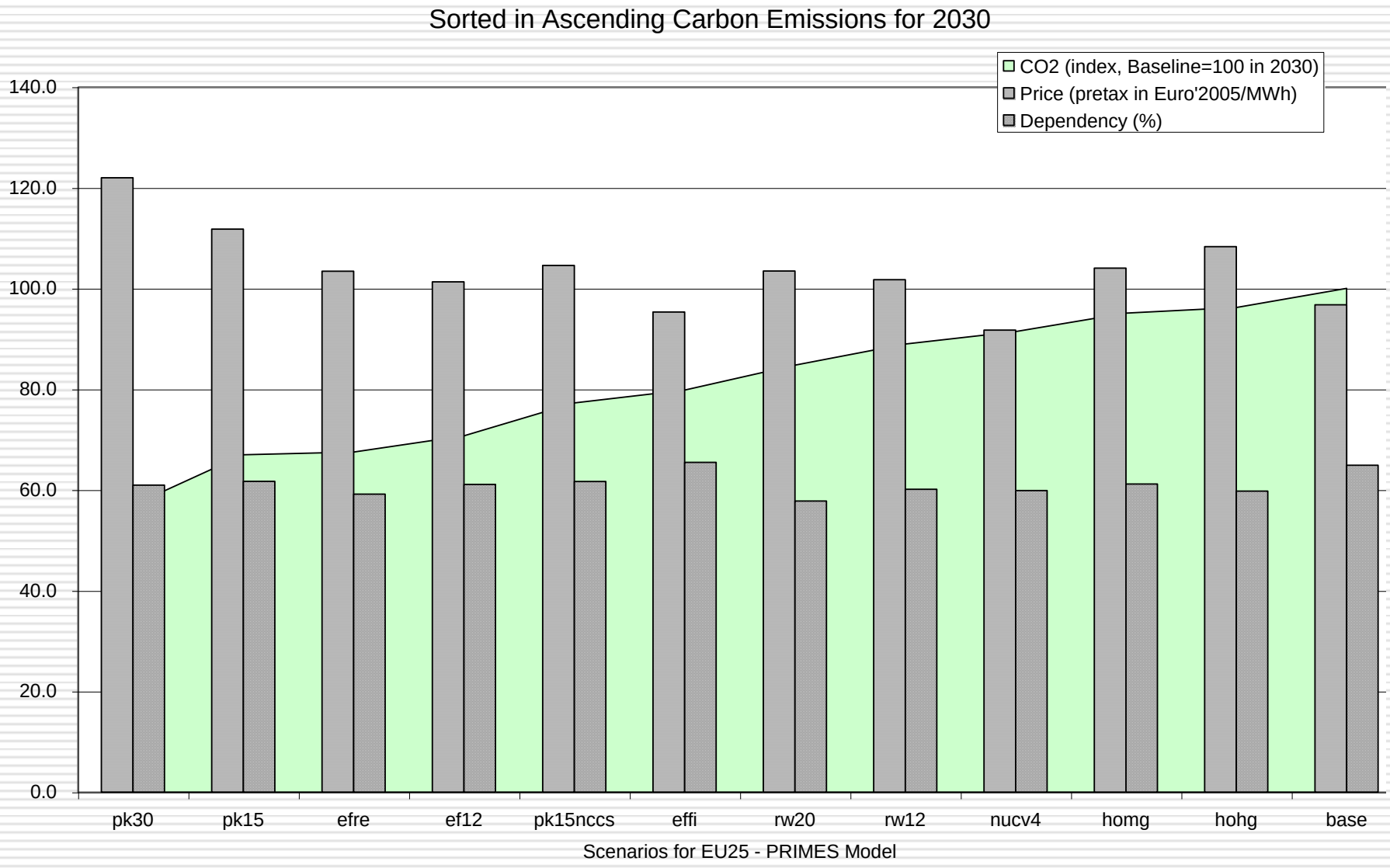
# Incremental primary energy needs
## in 2005-2030 for different cases examined



# CO2 emissions in scenarios

| CO2 Emissions (Mt of CO2) | 2030 | Index (1990=100) |
|---|---|---|
| Baseline scenario | 3955.0 | *104.7* |
| Soaring oil and gas prices case | 3804.6 | *100.8* |
| Medium gas and soaring oil prices case | 3761.3 | *99.6* |
| Nuclear case - Variant 4 | 3615.7 | *95.8* |
| Efficiency case | 3156.3 | *83.6* |
| High renewables case | 3352.9 | *88.8* |
| Combined high renewables and efficiency case | 2669.5 | *70.7* |
| Carbon value in 2030: 100 Euro per t of CO2 | 2648.8 | *70.1* |
| Carbon value in 2030: 250 Euro per t of CO2 | 2252.6 | *59.7* |

# Key EU25 energy system indicators
## for different cases examined



# Thank you for your attention

Results and publications will be diffused by DG TREN