Centro Clima

CENTRO DE ESTUDOS INTEGRADOS SOBRE MEIO AMBIENTE E MUDANÇAS CLIMÁTICAS

# The 3rd Workshop of Japan-UK Joint Research Project "Roadmap to Low-Carbon World"

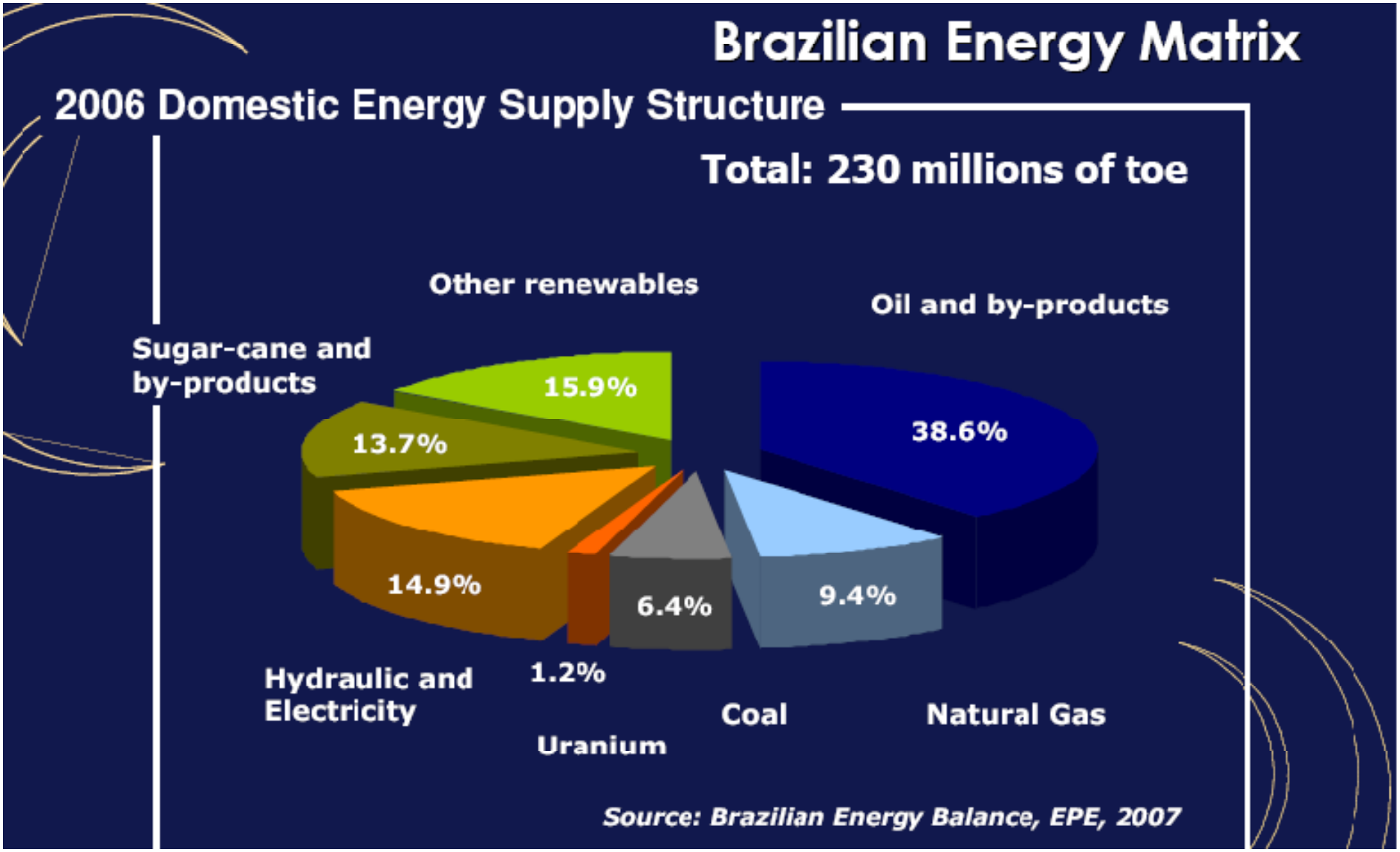
**13th-15th February, 2008, Tokyo**

## Group 2: Devivering LCS trough Sustainable Development

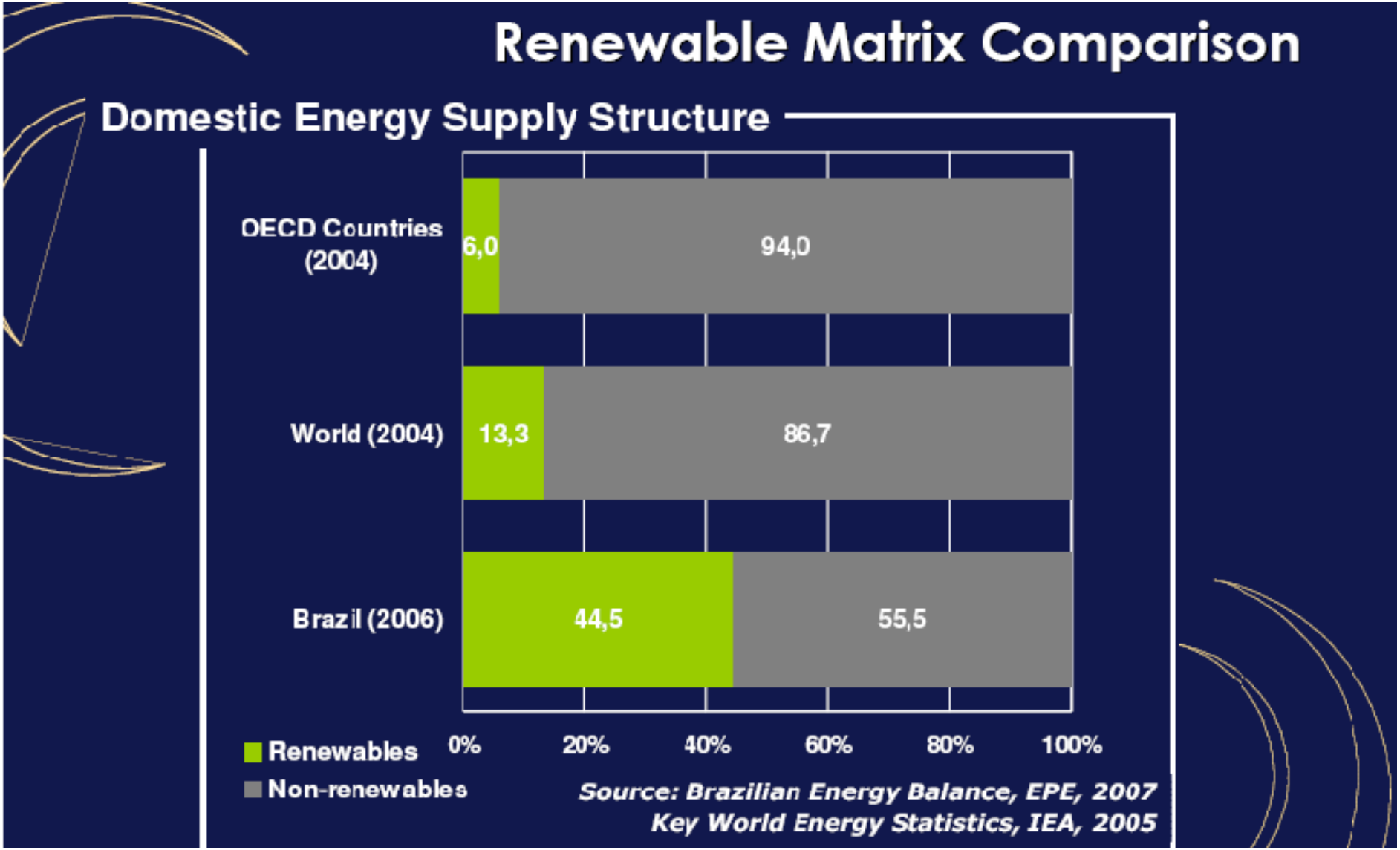
## Biomass and SD – Ethanol in Brazil, a single case

André Santos Pereira and Emilo Lèbre La Rovere

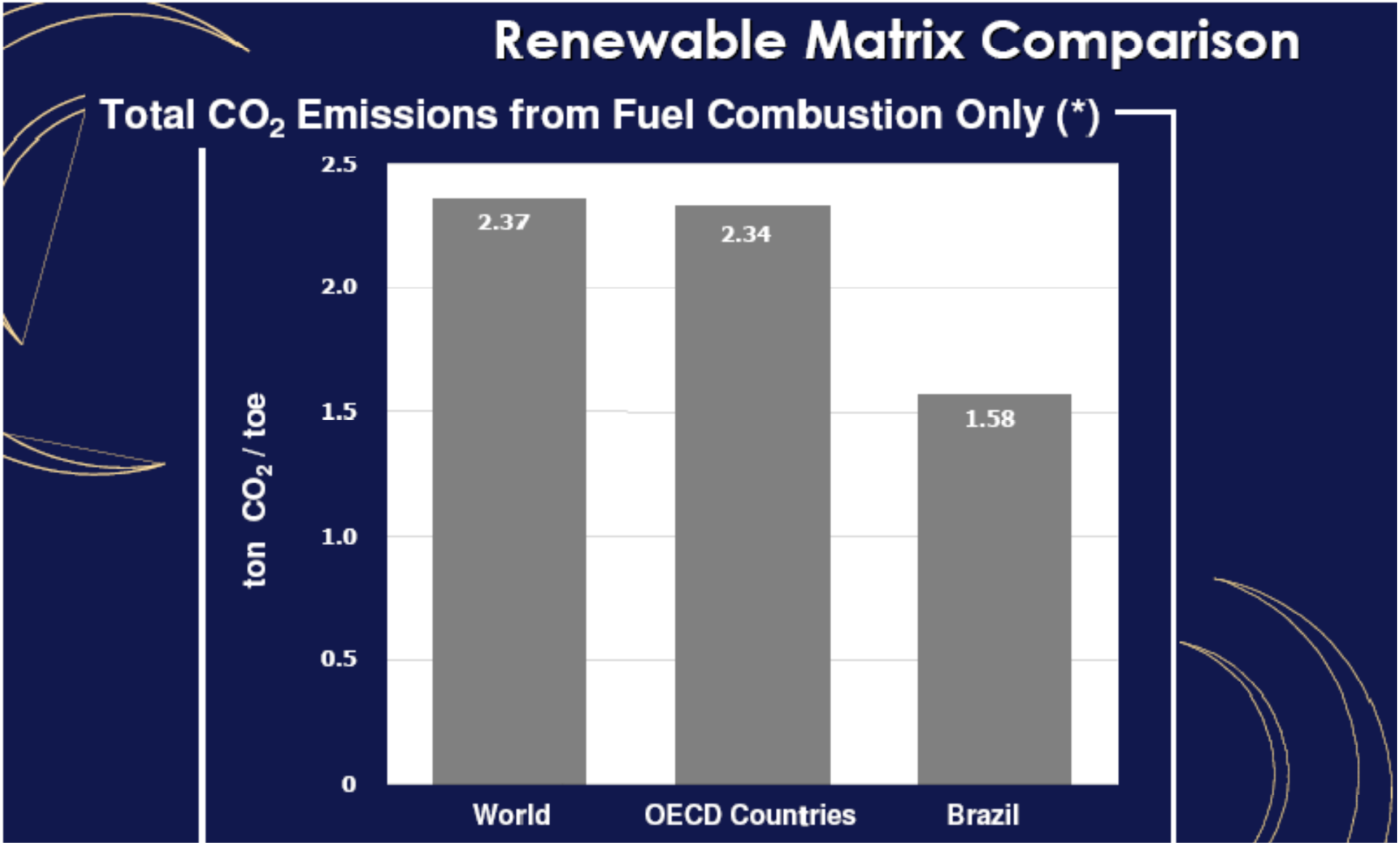
# Biomass share in the energy mix is almost 30%



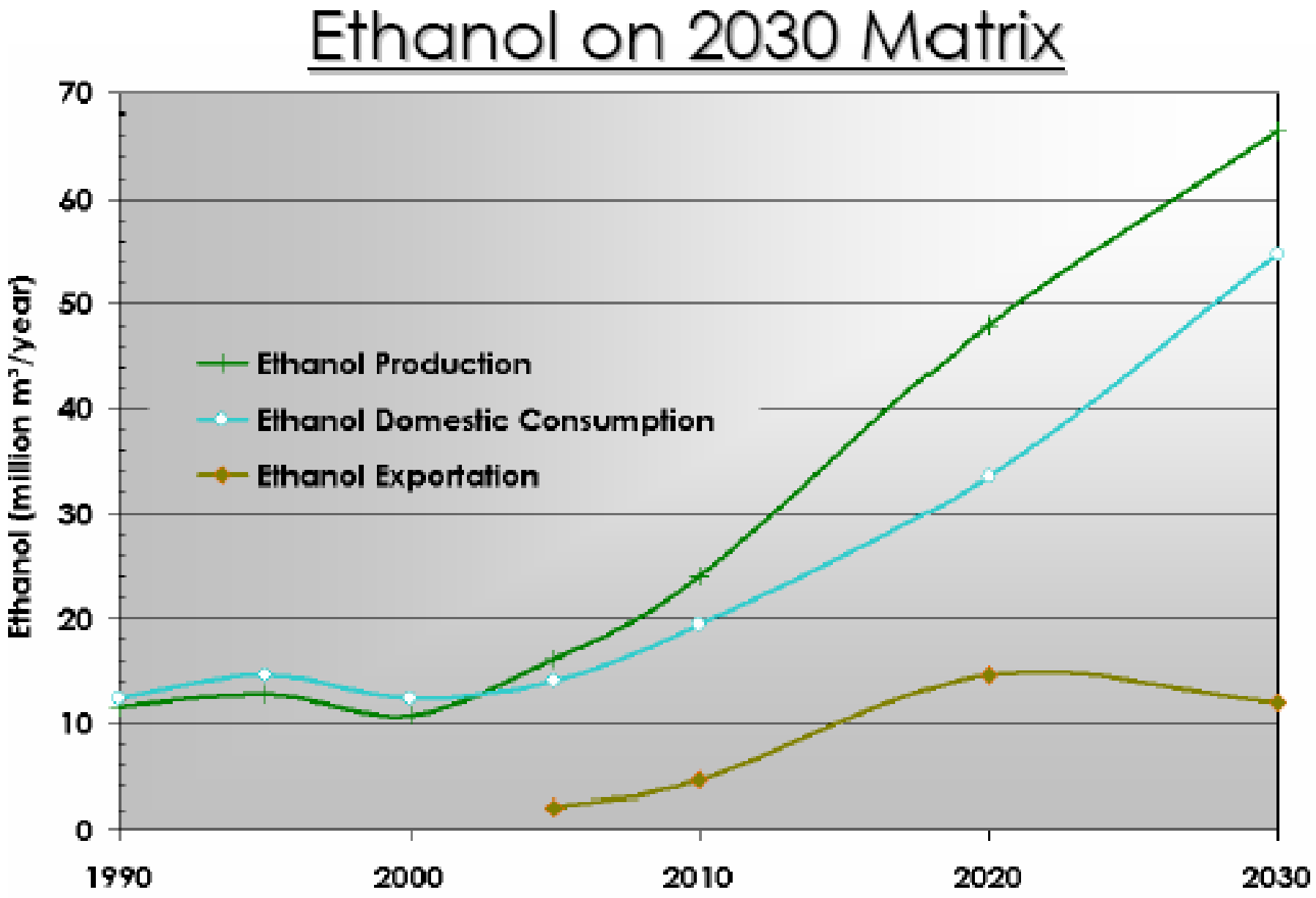
# Comparison


Renewable Matrix Comparison
Domestic Energy Supply Structure
OECD Countries (2004)
6,0
94,0
World (2004)
13,3
86,7
Brazil (2006)
44,5
55,5
0%
20%
40%
60%
80%
100%
Renewables
Non-renewables
Source: Brazilian Energy Balance, EPE, 2007
Key World Energy Statistics, IEA, 2005

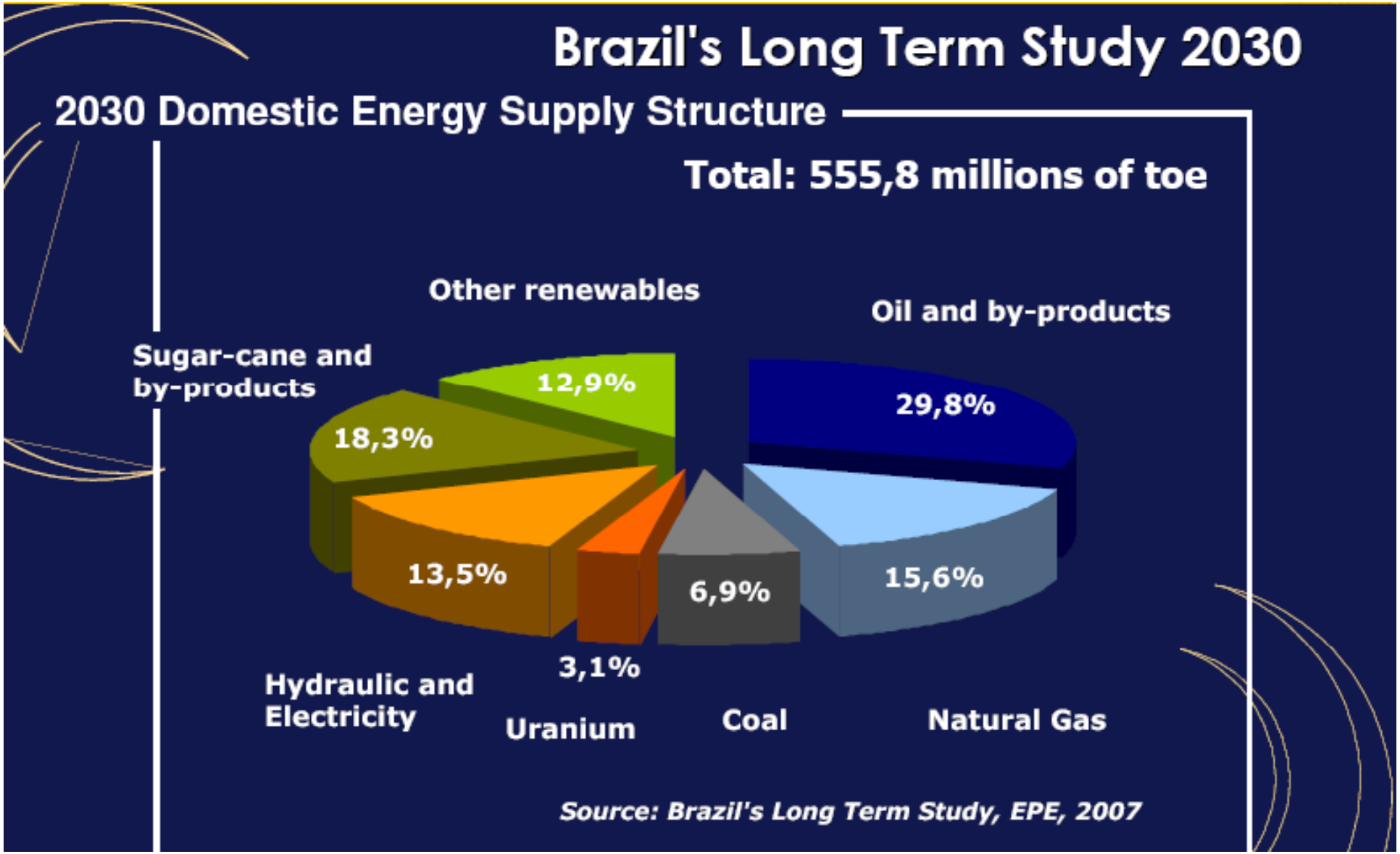
# Lower carbon intensity



# National Energy Plan - 2030



# National Energy Plan - 2030



# Sugar cane biomass and biofuel potential

| | 2005 | 2010 | 2020 | 2030 |
|---|---|---|---|---|
| Sugar cane | | | | |
| Production (Mt) | 431 | 518 | 849 | 1140 |
| Area (Mha) | 5.6 | 6.7 | 10.6 | 13.9 |
| Sugar (Mt) | | | | |
| Production | 28.2 | 32 | 52 | 78 |
| Exports | 17.8 | 21-23 | 28-30 | 31-37 |
| Ethanol (billion liters) | | | | |
| Production | 16 | 24 | 48 | 66.6 |
| Exports | 2.5 | 4.4 | 14.2 | 11.5 |
| Produced Biomass (Mt) | | | | |
| Bagasse | 58 | 70 | 119 | 154 |
| Straw | 60 | 73 | 119 | 160 |
| Share of biomass used (%) | | | | |
| Bagasse | 100% | 100% | 100% | 100% |
| Straw | 0 | 5% | 15% | 20% |

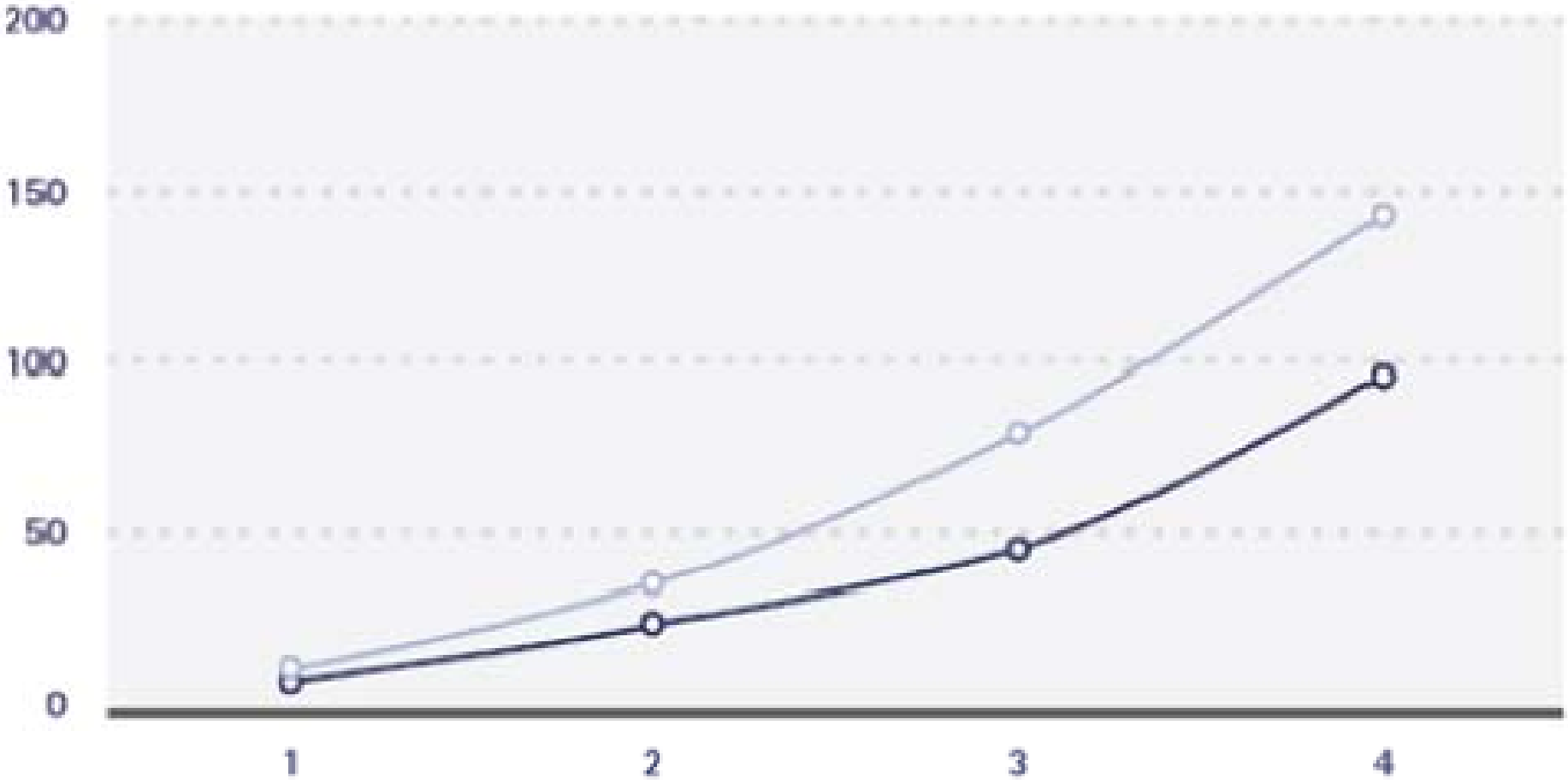
# Sugar cane biomass and biofuel potential

| | 2005 | 2010 | 2020 | 2030 |
|---|---|---|---|---|
| Used biomass (Mt) | 58 | 74 | 137 | 186 |
| Bagasse | 58 | 70 | 119 | 154 |
| Straw | 0 | 4 | 18 | 32 |
| | | | | |
| Biomass to produce: | | | | |
| Ethanol | 0 | 0.3 | 18 | 19 |
| Electricity | 58 | 73 | 115 | 167 |

| | | |
|---|---|---|
| Installed capacity (MW) | 2,822 | |
| Plants | 250 | |
| Share of national capacity | 14% | |
| Power supply | | |
| Current technology | 8,1 TWh/year | |
| Higher efficiency | 24,3 TWh/year | |

# Sugar cane biomass to power (TWh/year)

(based on present the present 400 Mt/year sugar cane production level)




Dark blue (without straw) - Light blue (including part of the straw)

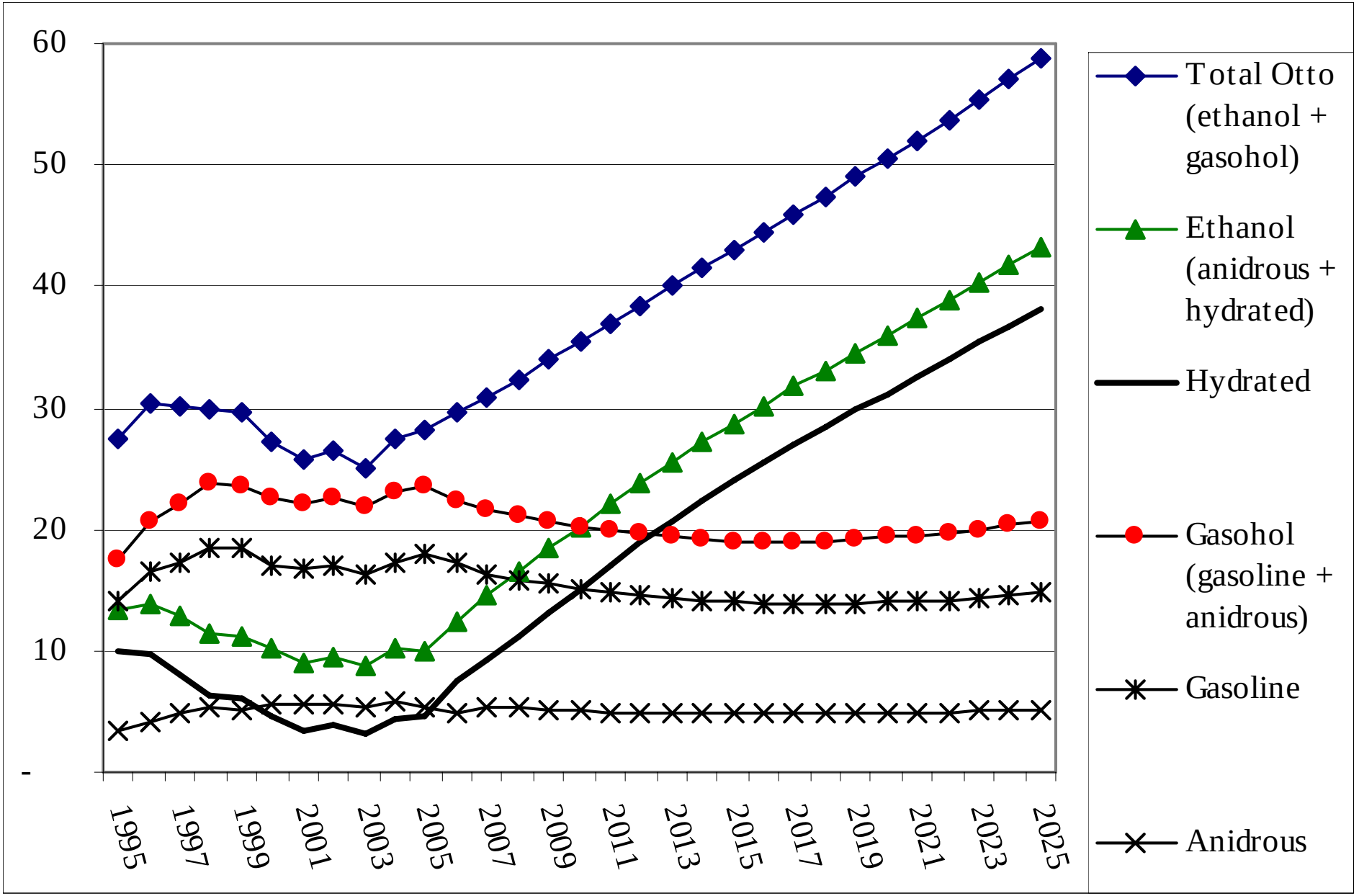
1- Counter pressure cycle (present technology)

2- Counter pressure cycle with higher efficiency

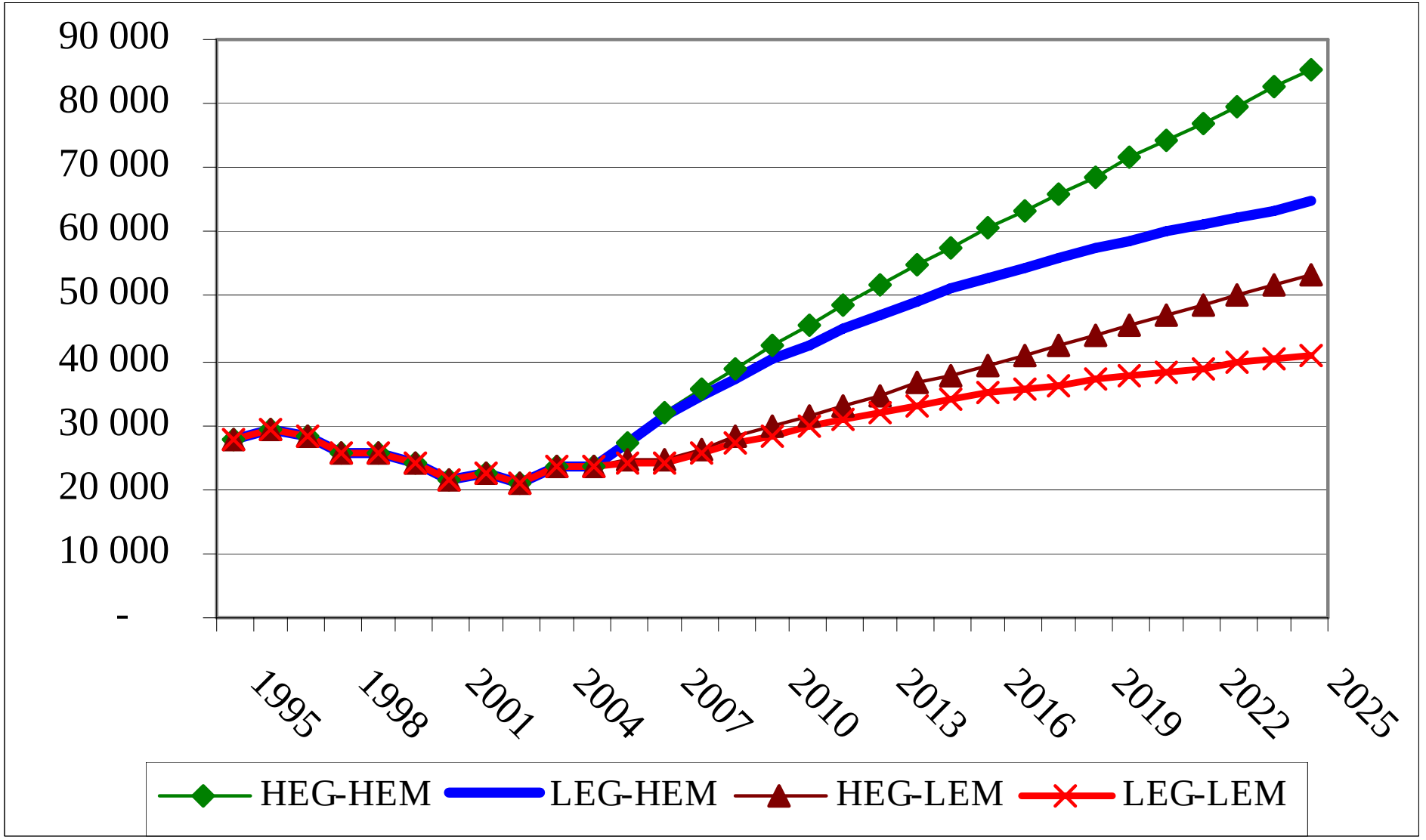
3- Extraction-condensing cycle

4- Gasification and combined cycle

# Otto cycle engine fuels consumption in Brazil (billion liters)



# Avoided $CO_2$ emissions due to Ethanol use in Brazil (Kt CO2 eq.)



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# Thank you!

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