



Balancing sustainability & investment: Natural Gas & Renewable Energy

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PGCA Chairman
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Agenda

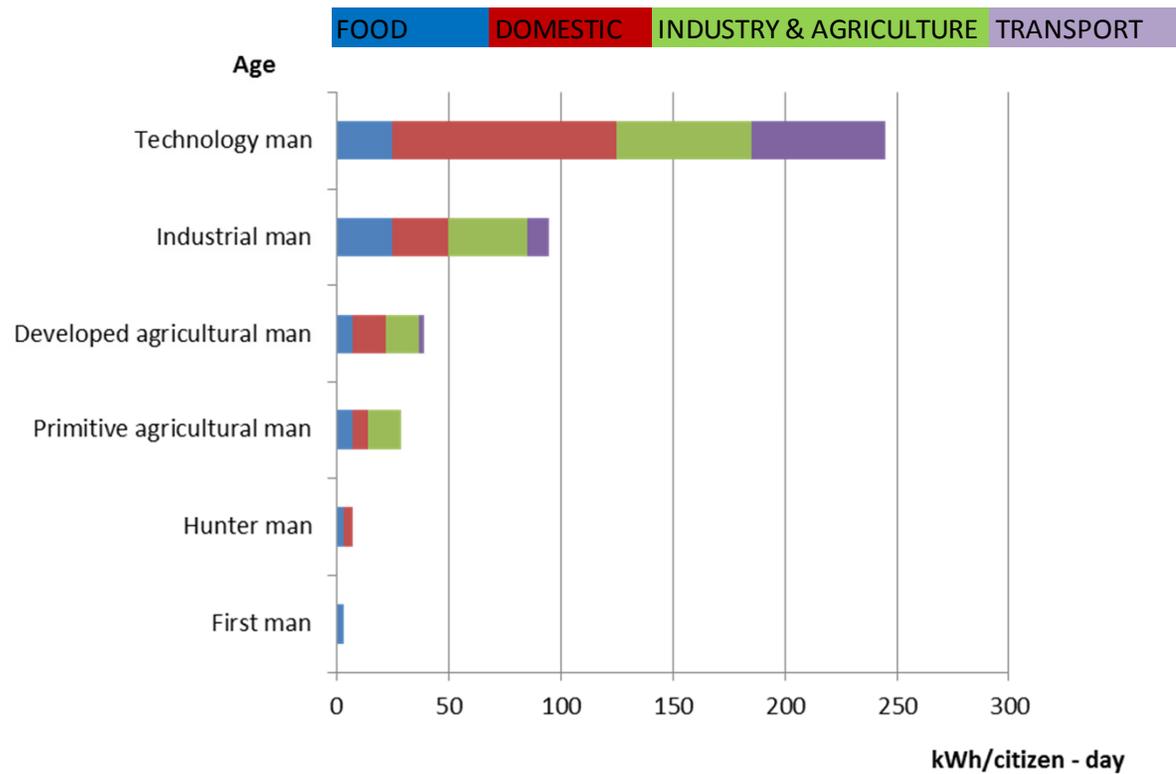
1. Energy problem
2. Consequences of the problem
3. Analysis of the problem
4. Energy & Human Development
5. Influence of Renewable energies
6. Future energy model
7. Conclusions





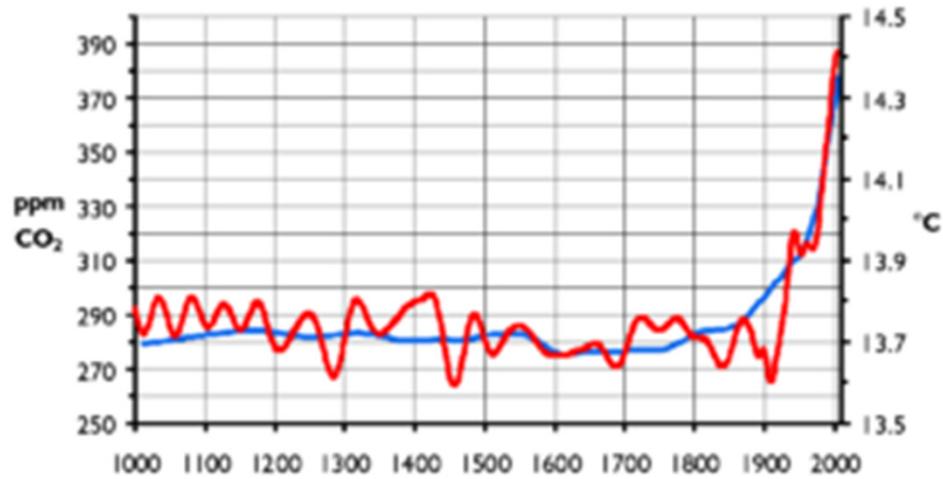
Energy problem

Evolution of energy consumption

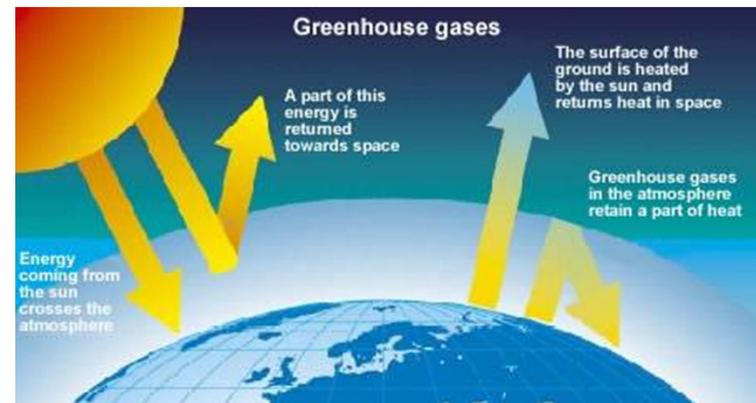




Consequences of the problem



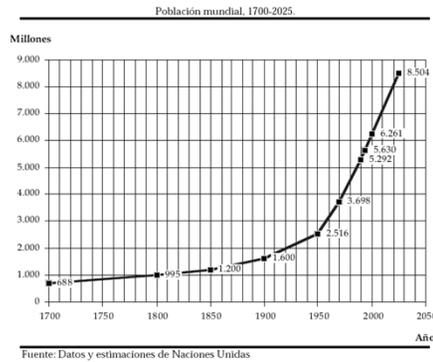
- \uparrow GHG \rightarrow \uparrow CO₂ \rightarrow \uparrow Temperature





Analysis of the Problem. Kaya Identity

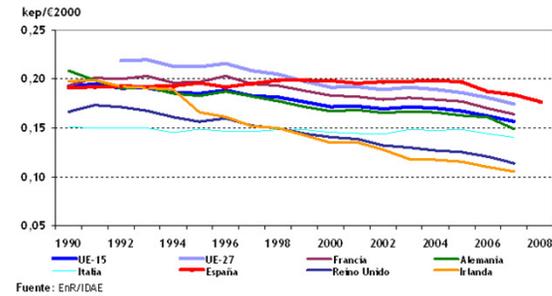
$$\text{CO}_2 \text{ emissions} = \text{Population} * \text{GDP/Population (rpc)} * \text{Primary Energy /GDP (energy intensity)} * \text{CO}_2 \text{ emissions/primary energy (carbon intensity)}$$



The world population has doubled in the last fifty years and the rent per capita, in average, income has grown by seven.

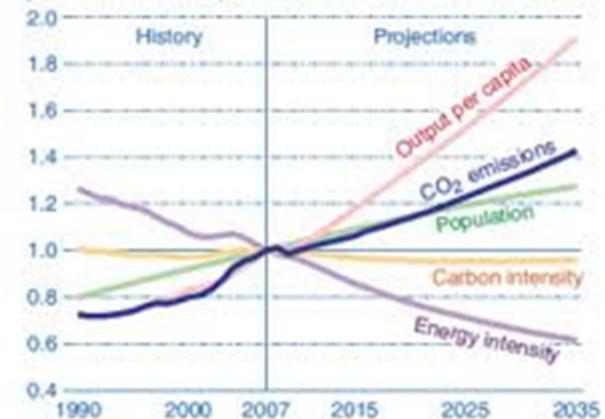


Next efforts should focus on increasing the reduction of energy intensity (*energy efficiency and savings*) and to reduce carbon intensity (*increase of renewable energies and improvement of existing technologies*)



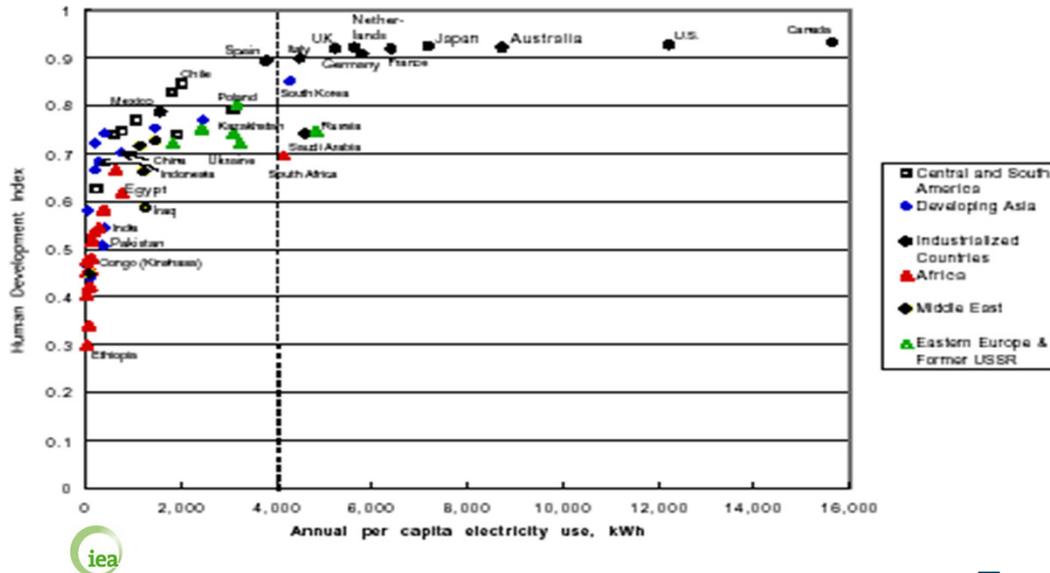
Nota: Los datos de *Intensidad Primaria* para España se han calculado a partir de las cifras de Producto Interior Bruto publicadas por el INE a precios constantes de 2000 y de acuerdo con el nuevo Sistema Europeo de Cuentas. Según esto,

Figure 11. Impacts of four Kaya factors on world carbon dioxide emissions, 1990-2035 (index: 2007 = 1.0)





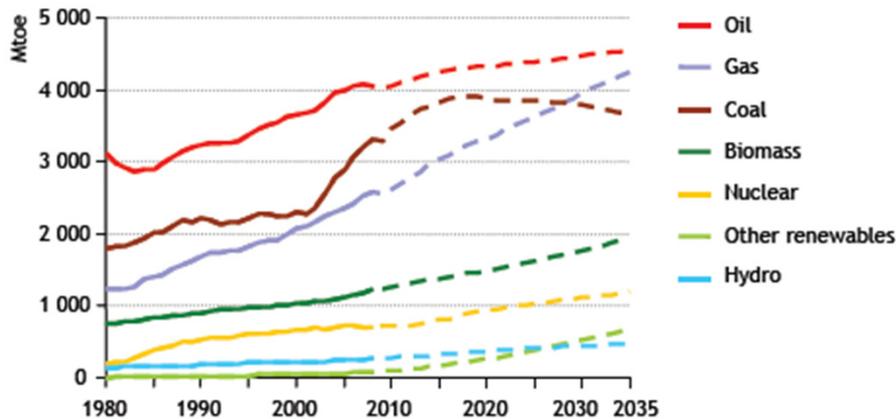
Energy & Human Development



- Energy is a key factor in the human development.
- Average consumption of electricity per capita: 4,000 kWh / year.
- Many areas of the planet lower levels: necessary new production systems.



Influence of renewable energies



Source: IEA, The Golden Age of Gas, 2011 (GAS scenario)

If all final energy from renewable sources → GHG emissions = zero

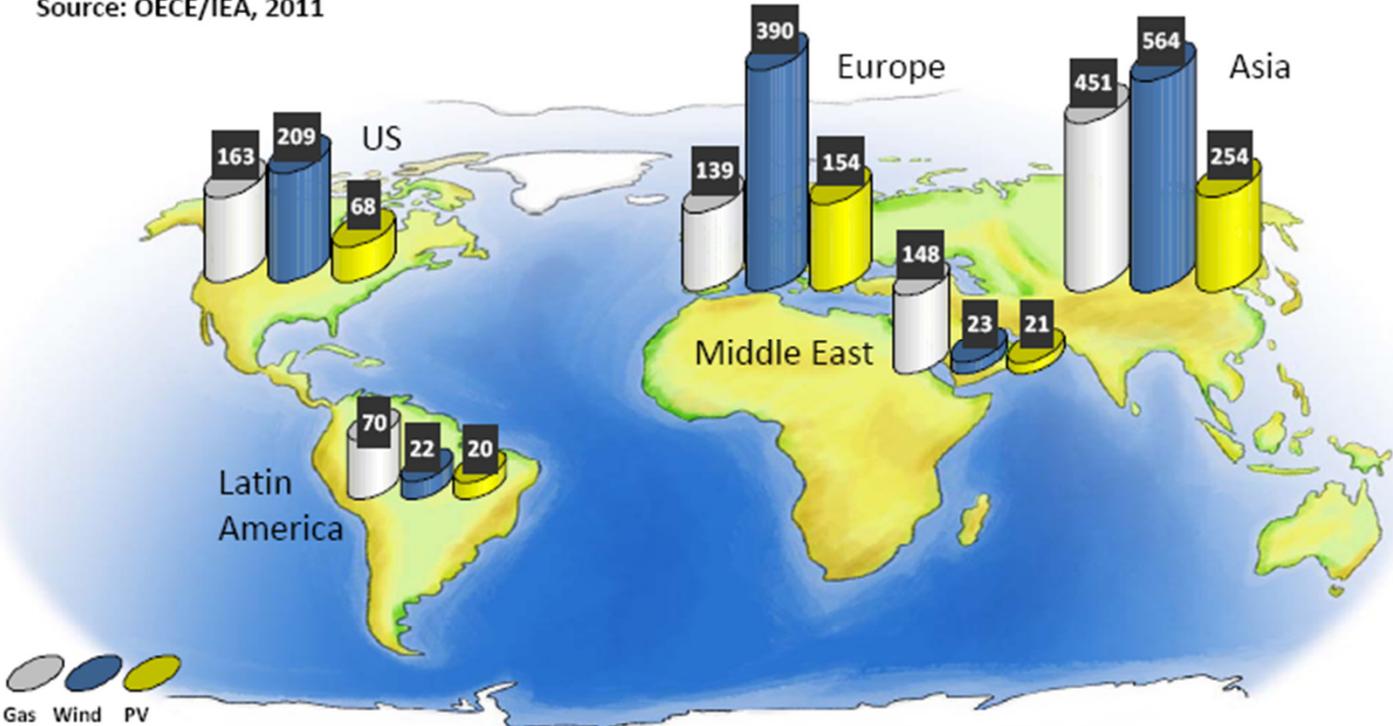
Is it possible to produce final energy only from renewable sources?



Influence of renewable energies

Cumulative gross power generation capacity additions by regions and sources in the New Policies Scenario, 2011-2035 (GW)

Source: OECDE/IEA, 2011



Source: IEA

Future energy model



The future model proposed by some government agencies will be produce electricity and hydrogen by renewable energy that we will us as final energy.

This model needs a partner which guarantee the security of supply.

Do you think natural gas will be the best partner? Why?



Conclusions

Now it is your time to think about the conclusions of this presentation.





Thanks for your attention



Possible questions

- *How long do you consider that the solar energy will need to produce energy as the same prize as the fossil fuels?*
- *How is going to be the photovoltaic energy in the future?*
- *In these places in where the solar irradiation is acceptable, do you think that it should be compulsory to implant solar technologies in the new construction buildings?*
- *Which are the best policy instruments for supporting the renewable gases industry?*
- *Do natural gas grid companies consider renewable gases rather as a necessary evil or as a necessary positive image driver?*
- *Is the injection of hydrogen into the natural gas grid a preferable option compared to the injection of synthetic methane?*
- *Experts predict a convergence of power and gas systems for the future. Is Power-to-gas the “missing link” or will it be “distributed generation”?*
- *Why μ CHP devices are still so expensive? Is it due to relatively small-scale production? What decreases in prices may we expect with more common usage, due to scale effect?*
- *What is the future of individual transportation – is it electricity, hydrogen (based on FC) or CNG cars?*
- *Small cogeneration units generate power energy and heat. Only usage of 100% of both devices are economically efficient. How to fulfill this?*