



"Making Energy Efficiency Work for Energy Suppliers"

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**International Cooperation on Energy Efficiency:
Working together for a Low-Carbon Economy**

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Two dimensions will be considered in this contribution:

- The **Economic dimension** - primarily from an enterprise management perspective
- The **Environmental dimension** - specifically arising from the energy needs and consumptions

The “big” question is:

May a balanced relationship between these two dimensions be found, where all human beings can flourish and develop their potential, in a planet where the effects of human activities don't exceed certain limits, in order to preserve the system's diversity & complexity which allows the *“ecological life”*?

The Economic dimension

(primarily from an enterprise management perspective)

In the interest of whom?

Yesterday's answer:

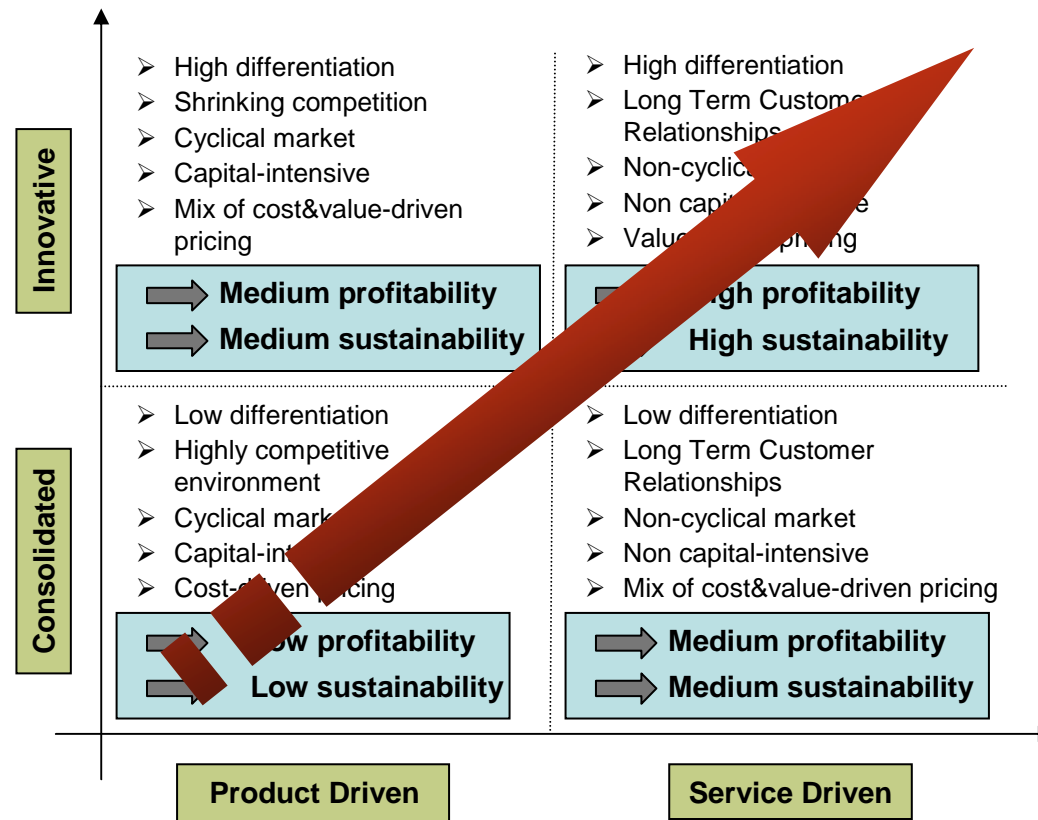
Of the shareholders

Today's answer:

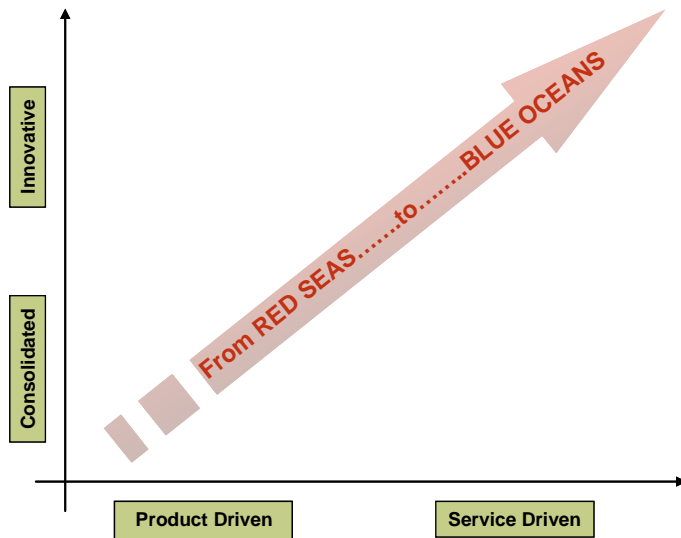
Of the stakeholders

(i.e.: customers, local communities,
suppliers, shareholders, employees,
unions, ...)

Profitability vs. Sustainability



From Red Seas to Blue Oceans



Service-driven enterprises, heavily investing in R&D and with strong product and process development capabilities, are more likely to maximize stakeholders value, i.e.:

- Higher financial returns
- Long term sustainable growth
- More adaptive to new laws & regulations
- More aware and respectful of local & diverse environments

Key Processes:

- Design for maintainability
- Total life cycle management
- Product life extension
- Supply Chain redesign
- Environmental, Health & Safety procedures

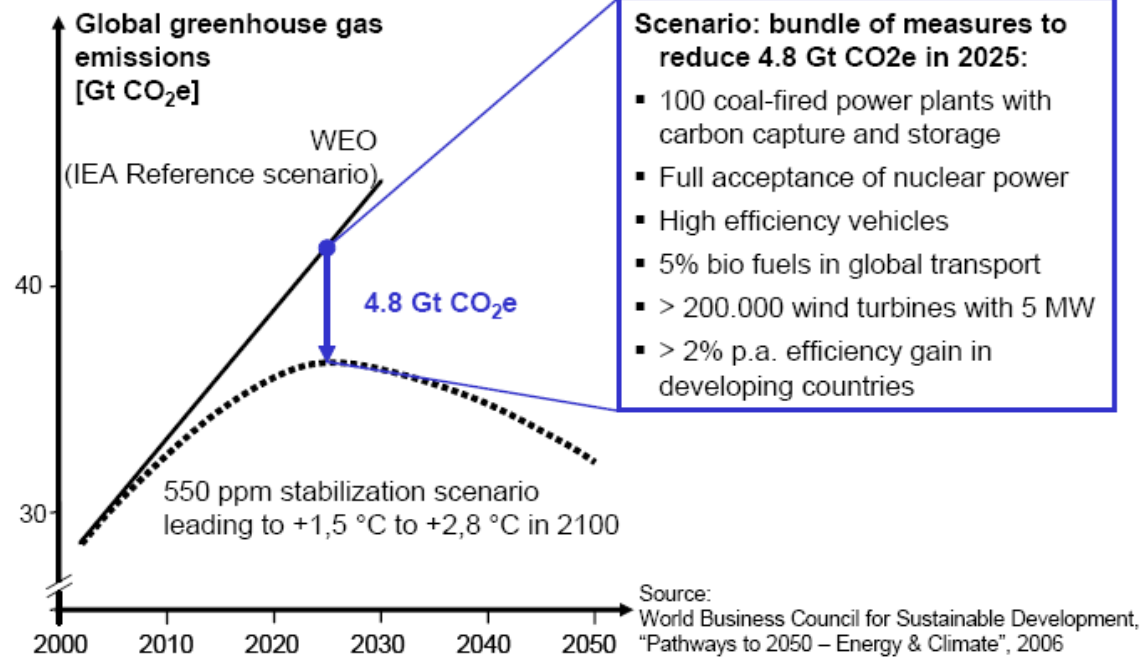
Key Products & Services (examples) :

- Low NOx gas turbine burners
- Low BTU gas combustors (e.g.: syngas from industrial processes)
- Blades and vanes refurbishment

Achieving sustainability goalswhile pursuing
economic goals

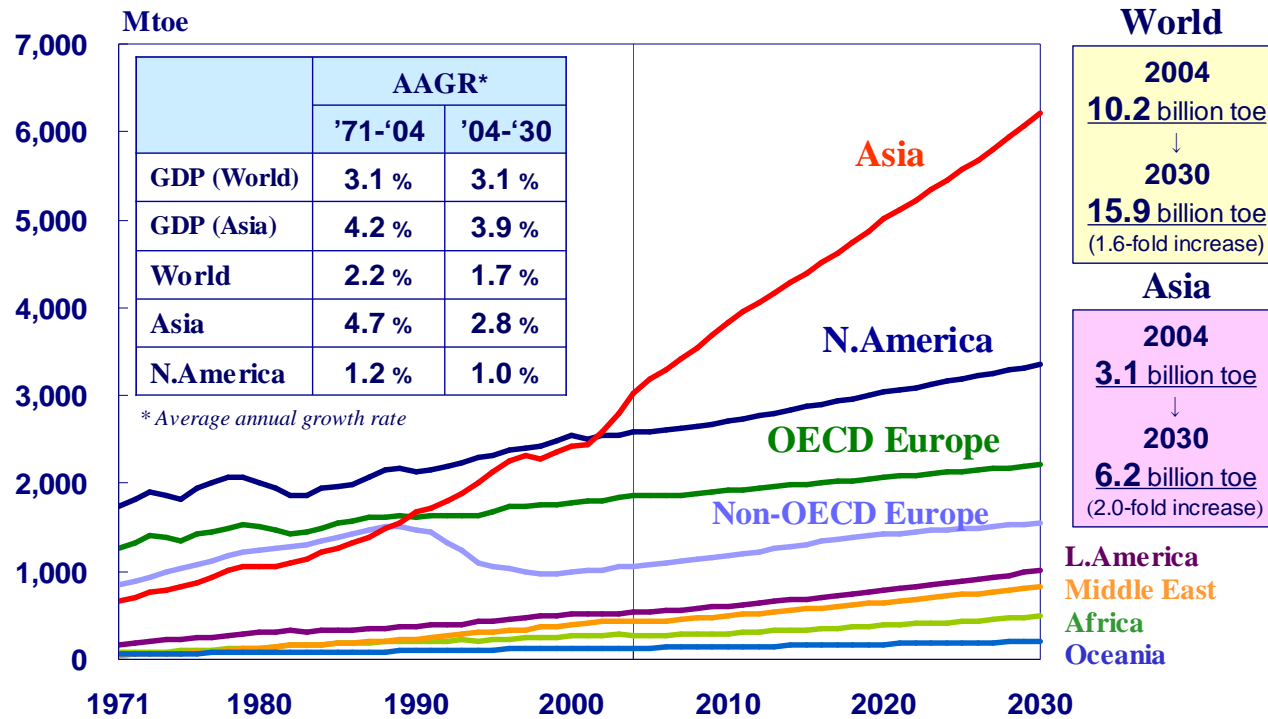
The Environmental dimension
(specifically arising from the energy
needs and consumptions)

CO₂ "inertial" scenario is catastrophic



Cross sector mitigation scenario for 2025

Energy Consumption reflects GDP's



World primary energy consumption to 2030 by region

Source: EIA Energy Outlook 2006

Technological innovation, industry competitiveness and sustainable development should walk hand in hand in the next decades to come. As long as everyone realizes that *time* is the scarcest resource we have on the planet, rather than oil or natural gas.

When it comes to the environmental concerns, decoupling emissions from economic growth is a long term goal, which even the more optimistic scenarios cannot predict to happen before 2050.

By that time, the world demand for energy will be double than today, but even more importantly the mix of power generation technologies and their impact on the environment will have to be dramatically changed in order to preserve a living earth.

What measures & policies are needed on the supply side?

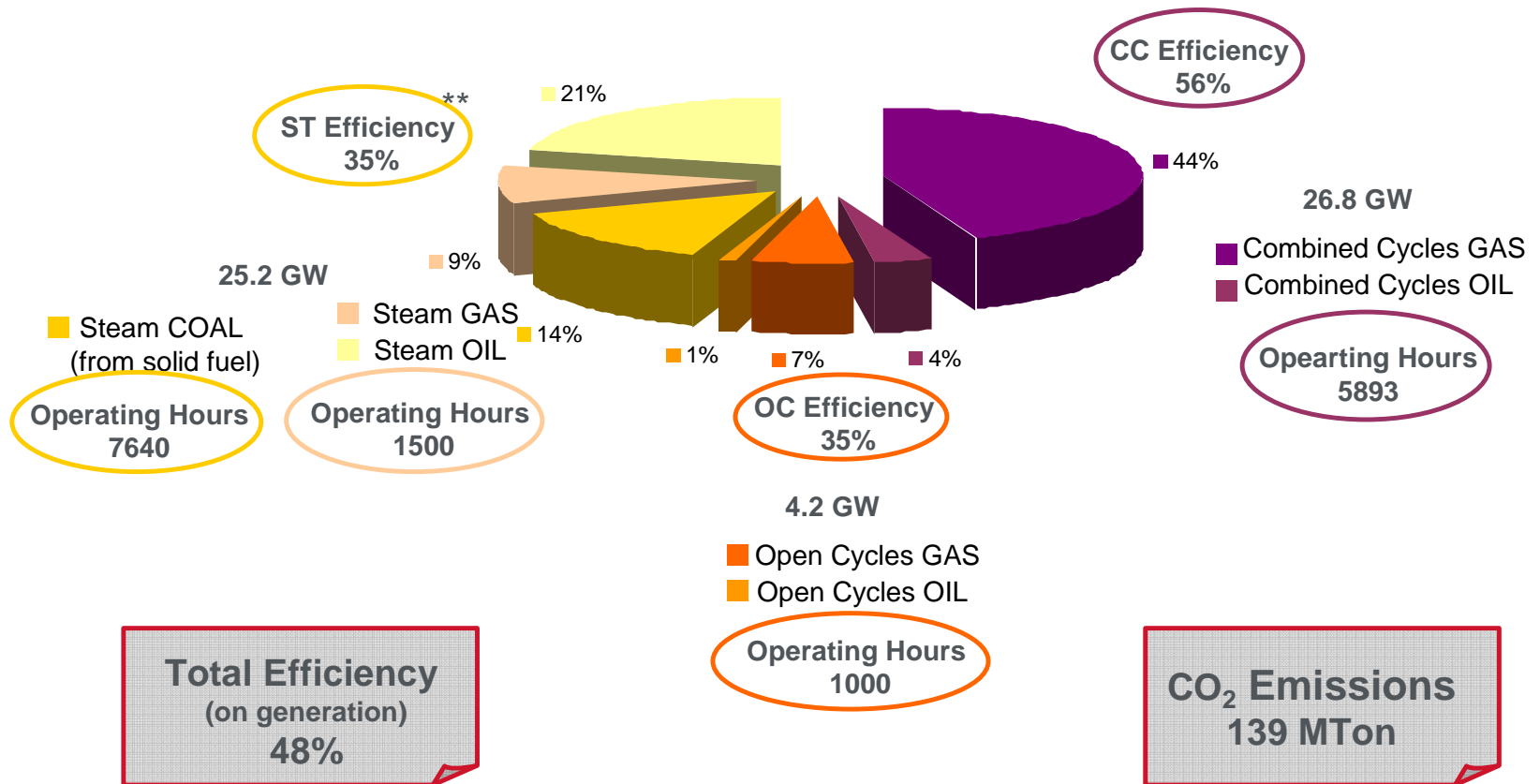
Improving Energy Efficiency
With Best Available Technologies, to
significantly reduce CO₂ emissions

The 2006 Scenario

(Power Plants operational as of end 2006)

Technological Mix

56.3 GW – 250 TWh



Transitioning to 2011.....

Steam Turbines

- Coal Fueled
- 6 generation units
- Large Utilities



- Thermal cycle upgrade to **USC**
- Major efficiency improvement (e.g., low pressure section modification)

Δ Efficiency: ~8%

Δ Efficiency: ~1%

Steam Turbines

- Oil&Gas Fueled
- 5 generation units
- Large Utilities



- Repowering of the plants into Combined Cycles

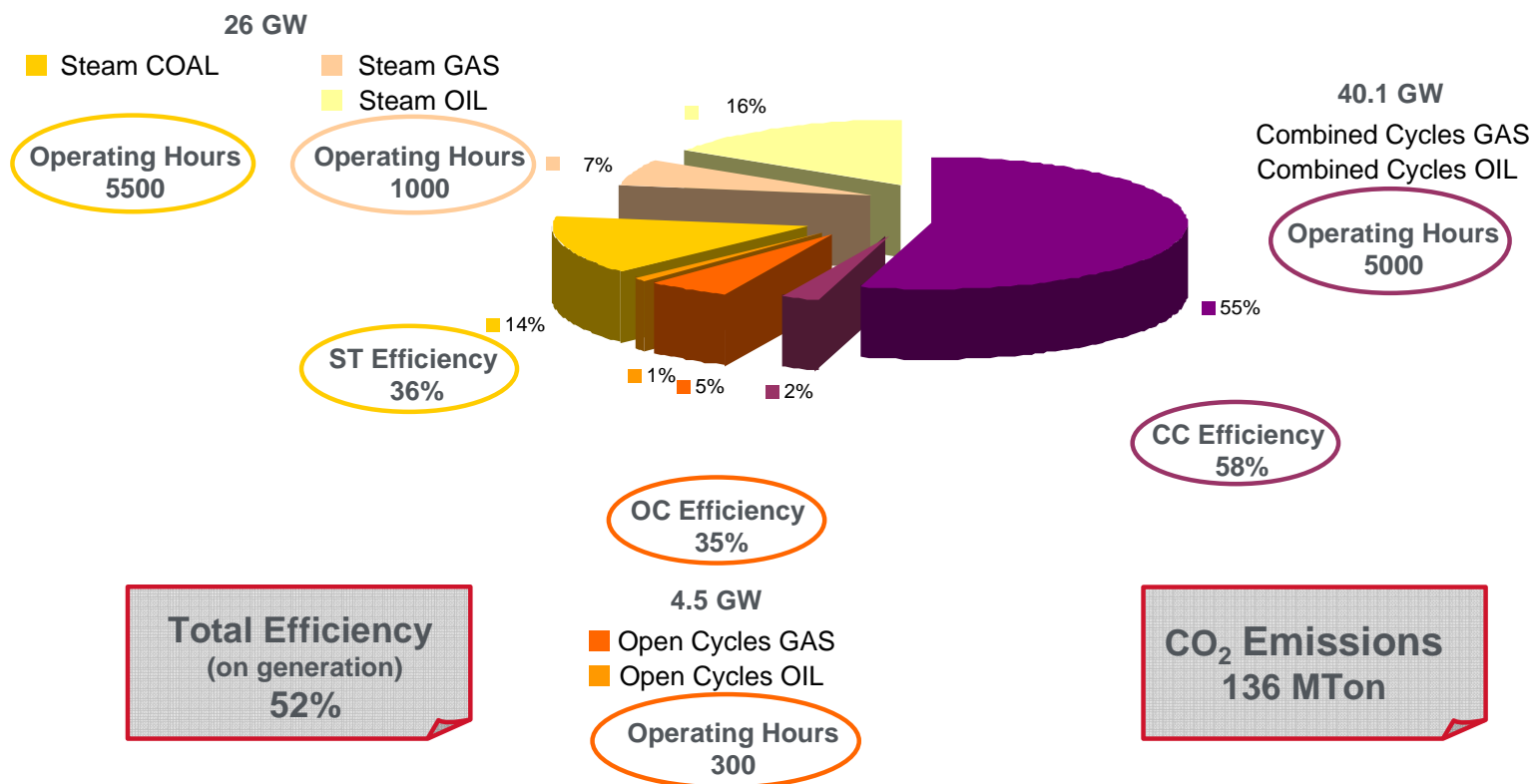
Δ Efficiency: up to 20%

The "as determined" 2011 Scenario

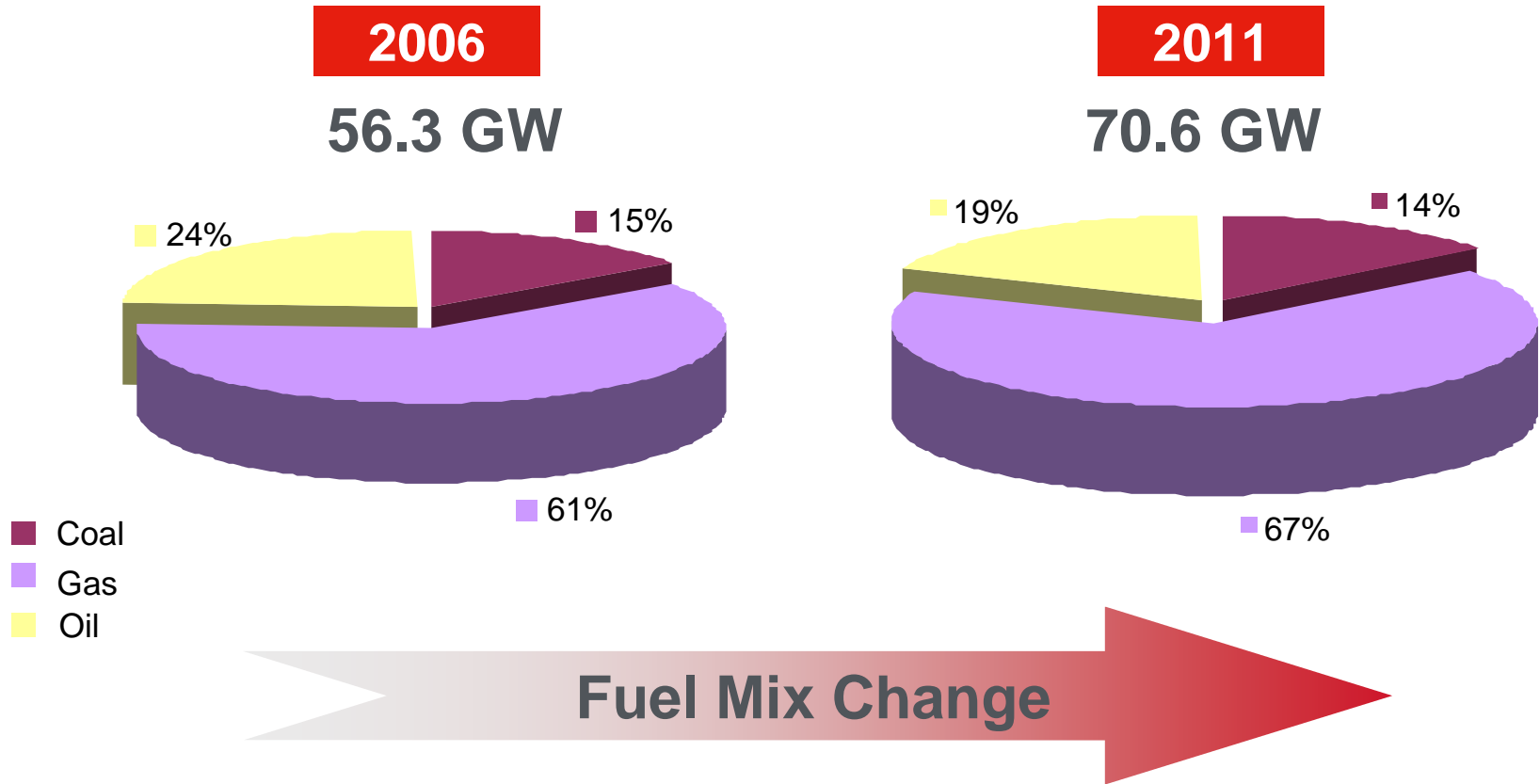
(Power Plants operational as of end 2011)

Technological Mix

70.6 GW – 273.6 TWh



Fuel Mix Change between 2006 and 2011



Performance of the analysed fleet

	<u>2006</u>	<u>2011</u>
– Fleet Subset:	56.3 GW	70.6 GW
– Energy generated:	250 TWh	273.6 TWh
– Average efficiency: (on generation)	48%	52%
– CO ₂ Emissions:	139 MTon	136 MTon
– MTonCO ₂ /TWh ratio:	0.56	0.50

While the 2011 scenario depends completely on decisions already taken, and little can be done to improve its environmental footprint, today is the time to make the strategic decisions that can lower the impact of the Italian thermal fleet on the country's overall GHG emissions and help reach the target

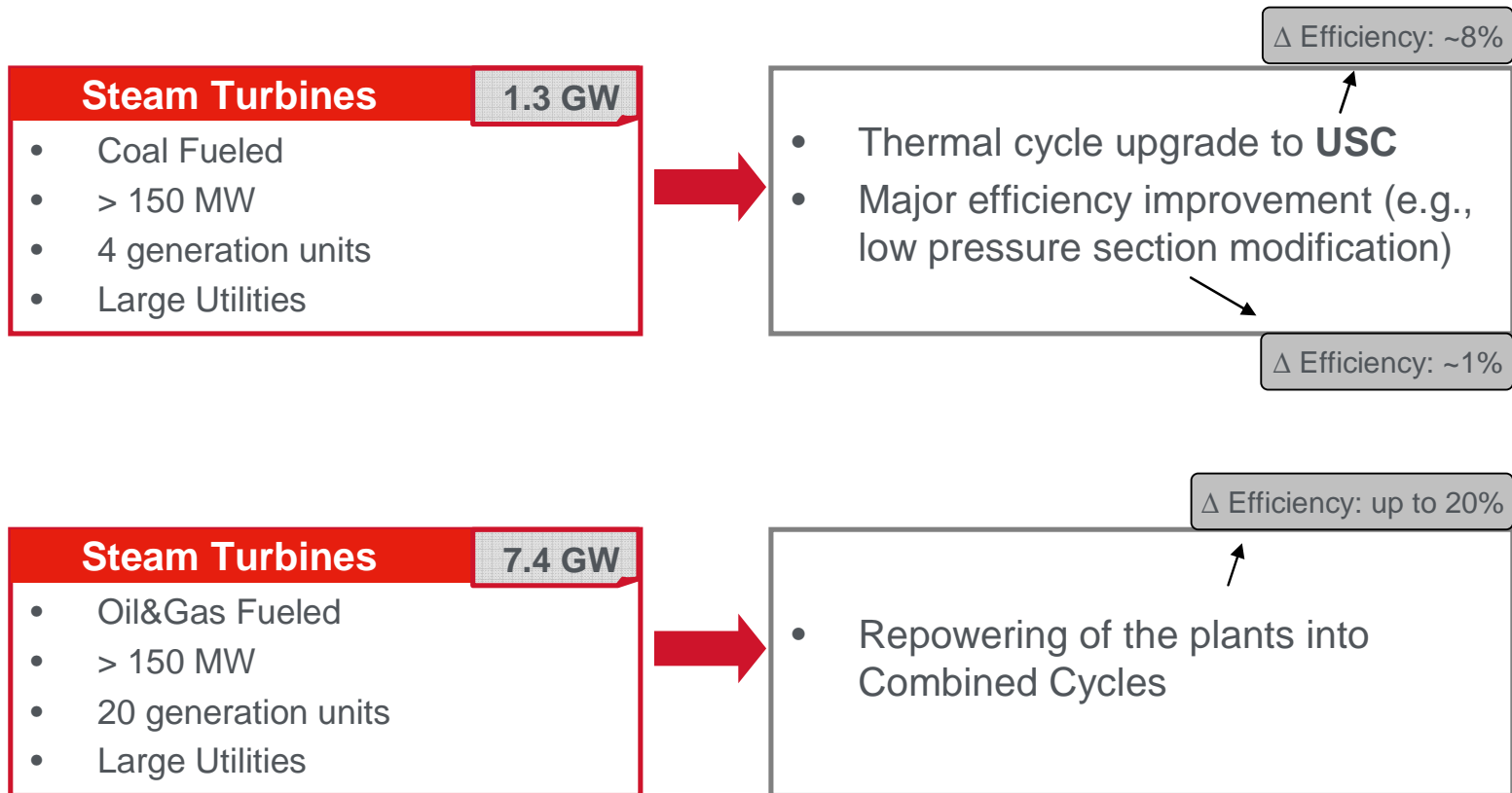
from 136 MTON CO₂ to 100 MTON CO₂ by 2020

Major interventions have to be deployed, and they will only in the case that appropriate new

**REFURBISHMENTS - UPGRADES – SERVICES
policies & regulations**

are swiftly put in action!

Broader application of BAT.....



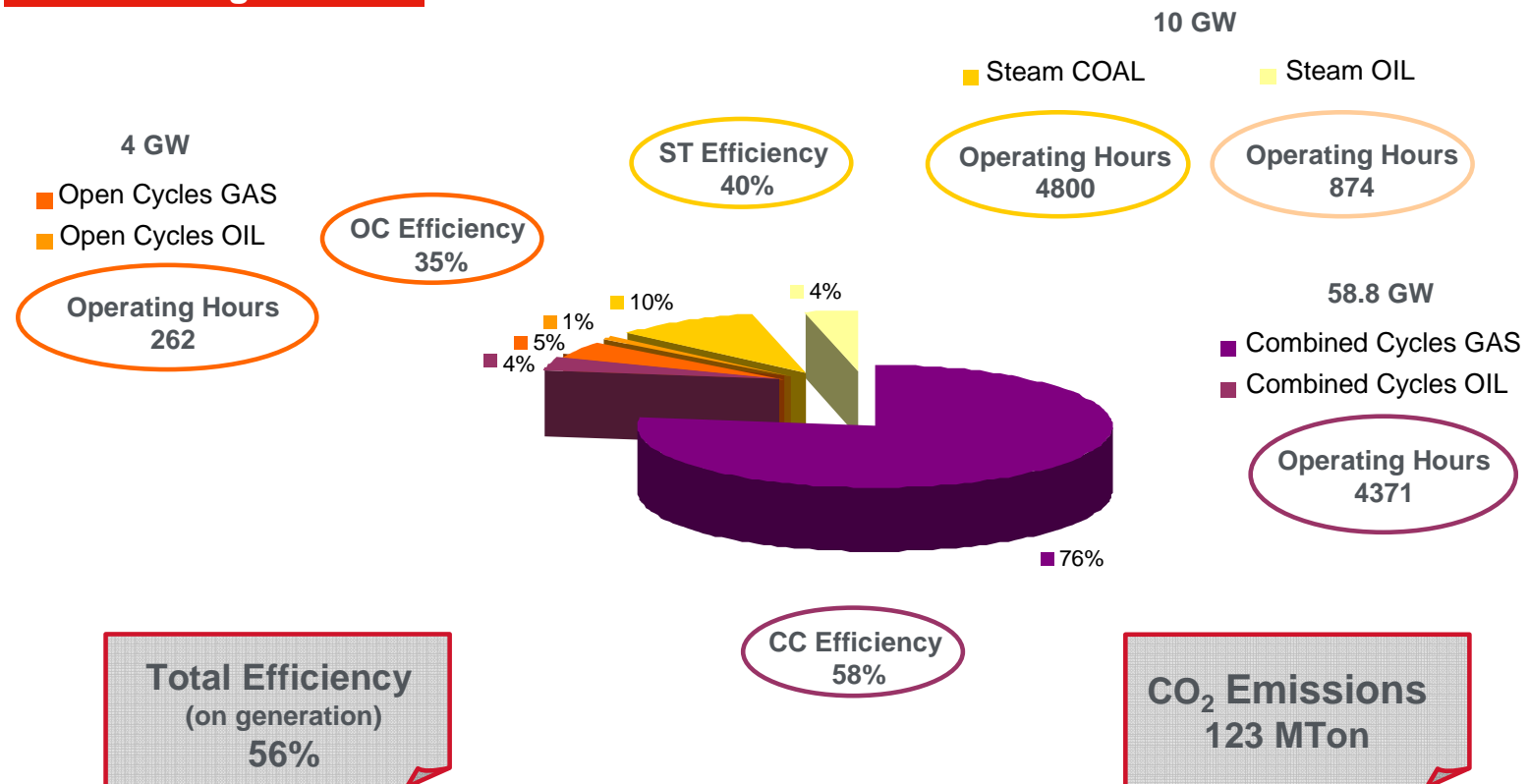
All such technologies are 100% available today!

The "improved" 2011 scenario

(Scenario at 2017-2020, all proposed interventions operational)

Technological Mix

72.8 GW – 296 TWh



Performance of the analysed fleet

	<u>2006</u>	<u>2011</u>	<u>2017-2020</u>
– Fleet Subset:	56.3 GW	70.6 GW	72.8 GW
– Energy generated:	250 TWh	273.6 TWh	296 TWh
– Average efficiency: (on generation)	48%	52%	56%
– CO ₂ Emissions:	139 MTon	136 MTon	123 MTon
– MTonCO ₂ /TWh ratio:	0.56	0.50	0.42

Great Improvement....not enough though!

Multiple generation technologies (I)

- **BAT Thermal Generation**

- Increased Efficiency
- Flexible Operations
- Multiple Fuels
- Syngas
- Biomass
- Capture Ready
- Waste-to-Energy

- **Hydrogenerators & Geothermal**



Multiple generation technologies (II)



Future Thermal Generation

- CO₂ Capture
- Gasification



Fuel Cells & Micro Turbines




Advanced Nuclear

Distributed Generation



- None of them can be excluded from the game....solution comes from a combination
- More funding has to be deployed for energy R&D
- In the short and medium term (2020 vision), funding has to be addressed to clean energy technologies....e.g. those who help reaching the Kyoto and the new EU targets (i.e.: the "20-20-20" target)
- In the medium to long term (2050 vision), a new generation of technologies (implying major breakthrough's) need to be commercially viable, in order to head to a complete decarbonization (e.g. hydrogen economy, fuel cells, zero-emission fossil fuel plants with 100% carbon sequestration, 4th generation nuclear from fission, nuclear fusion,...)

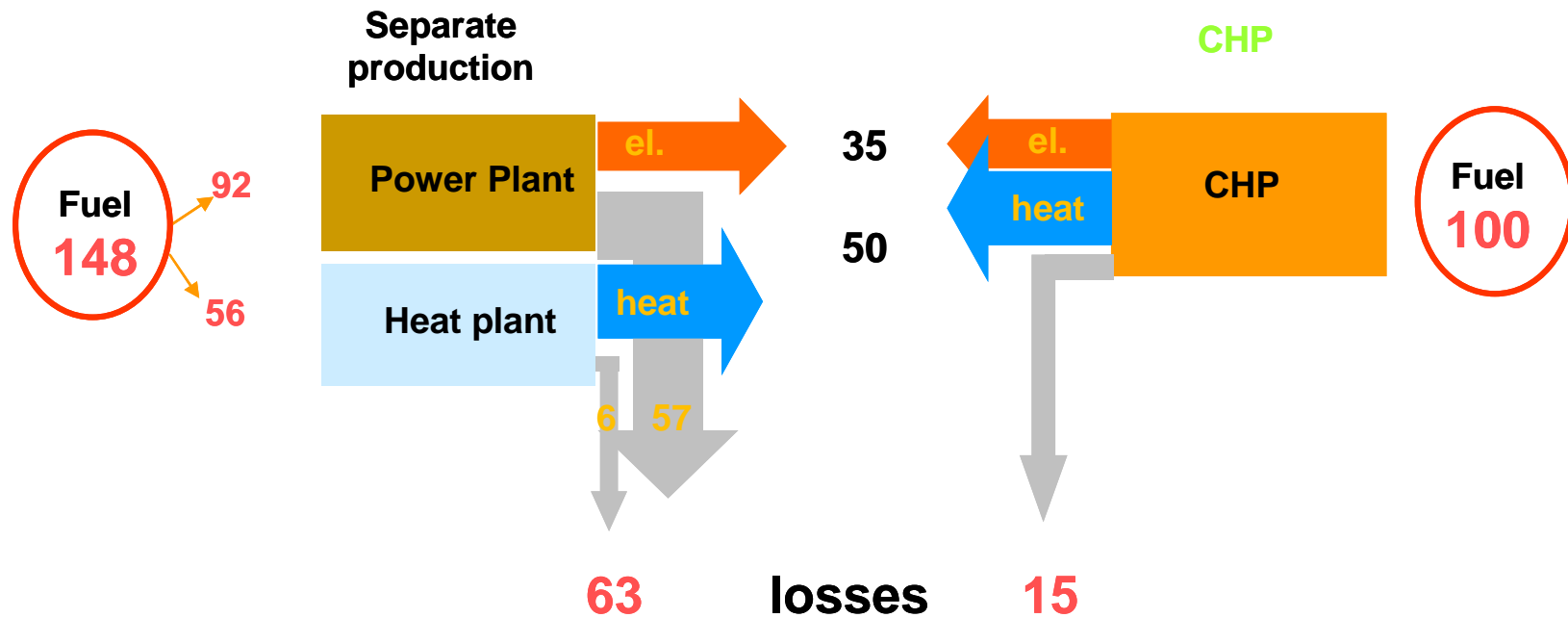
Energy Policies have to help boosting....

- Renewable sources (e.g. wind, photovoltaic, biofuels from wastes)
- Cogeneration 
- Distributed energy
- Energy Efficiency
- Clean fossil fuel technologies

While infrastructures need to support the cleaner and more efficient generation through:

- Smart grids (without which renewables and distributed cannot be fully exploited)
- Fuels transportation infrastructures (e.g.: pipelines, LNG, etc..)
- Waste treatment and disposal facilities
- Energy Efficiency
- Energy Storage Technologies

Cogeneration (I)



Source: Vattenfall, 2007

In Conclusion....

- We are facing an unprecedented challenge, on a global scale
- Oversimplifications & slogans do not lead anywhere
- Energy-producing and energy-consuming countries have to embark in a constant dialogue on energy options
- Best Available Technologies will have to make the biggest contribution to the CO₂ reduction in the 2020 scenario
- Technology & Innovation will make the difference, especially in a clear political, economical and legal framework
- In such scenario, typical business' metrics & goals do not conflict with environmental goals and targets, actually they get along hand in hand

Words of Wisdom.....

**The significant
problems we have
cannot be solved at
the same level of
thinking with which
we created them.**

