



# **TECHNOLOGY RESPONSE TO CLIMATE CHANGE**

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Chairman and CEO IFP***

*Third OPEC International Seminar  
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## Long term challenges of the energy sector

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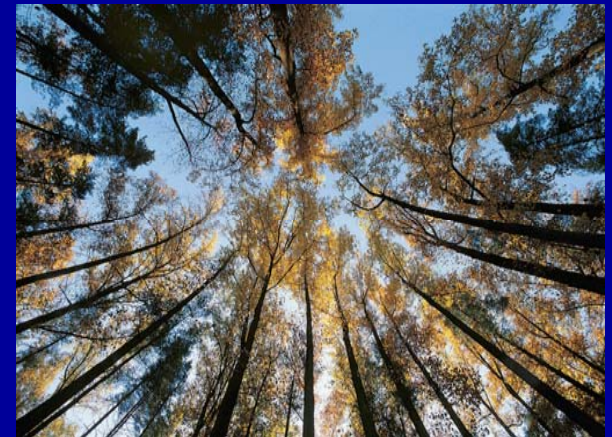
- **On going growth of energy demand**
- **Limited resources of fossil fuels**
- **Local/global environment**



# Technological responses



➔ Long term energy supply



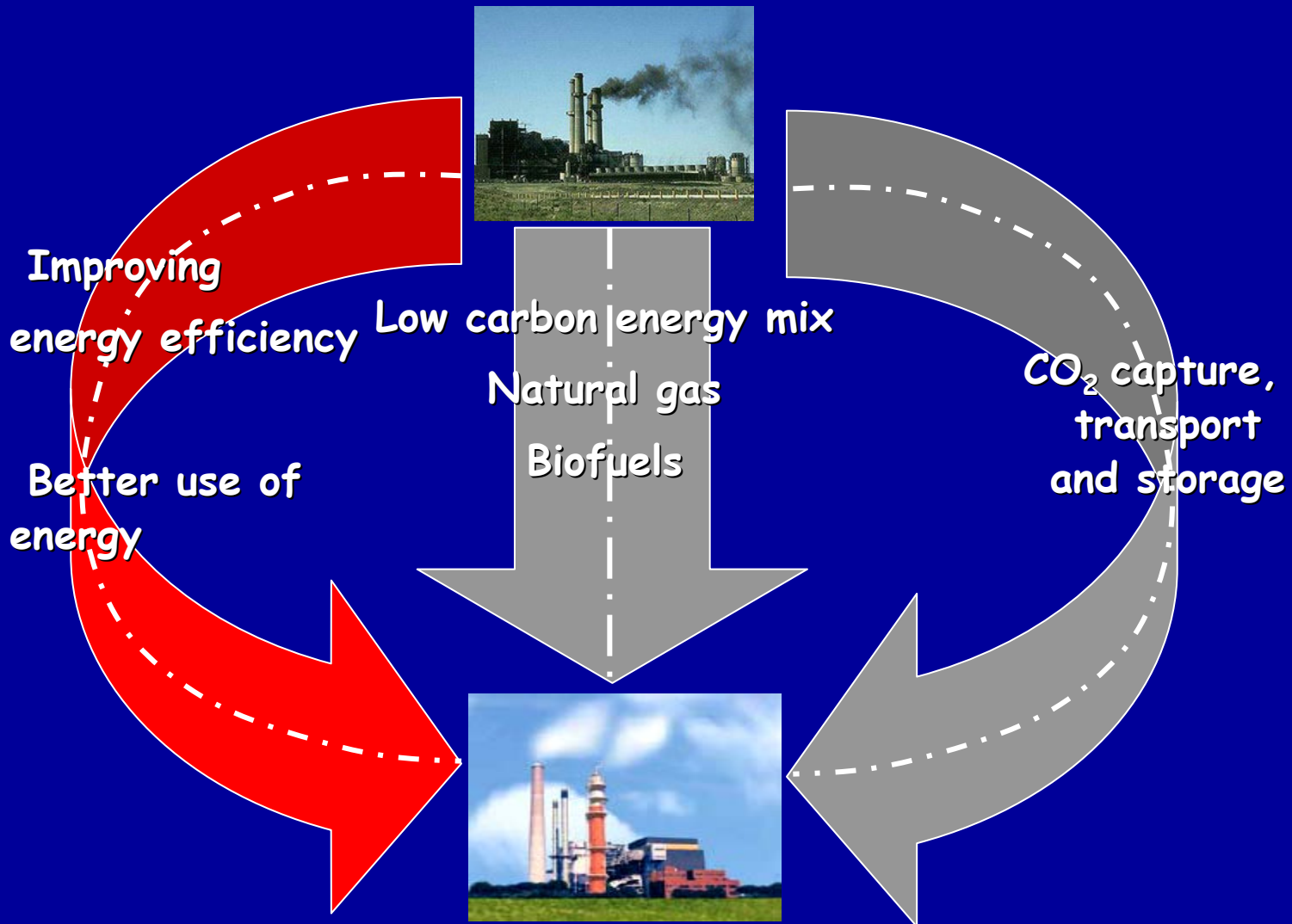
Environment protection ←



➔ Answers to global climate change



# Pathways for CO<sub>2</sub> emissions reduction





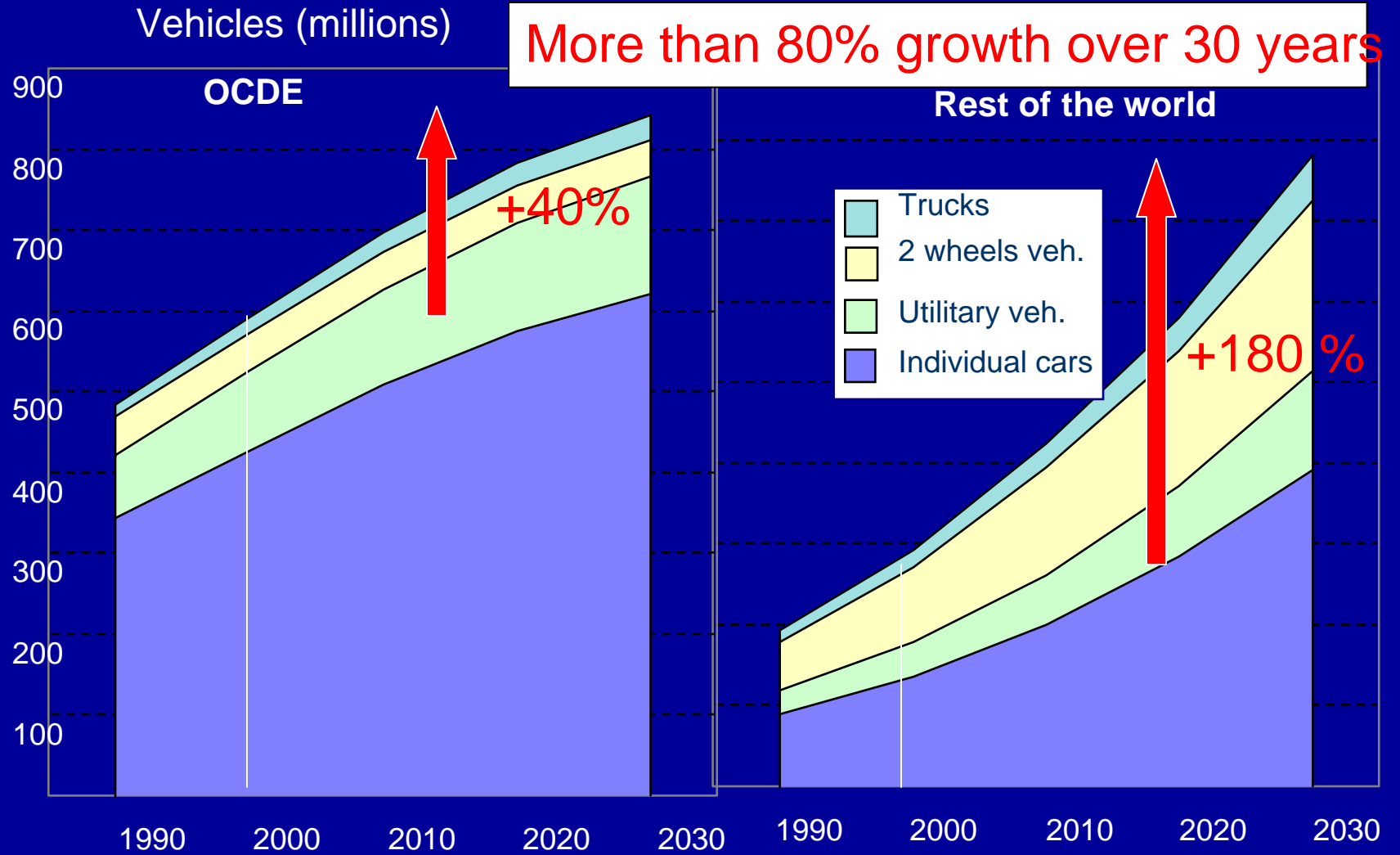
## Energy Efficiency in Building, Industry

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- **Buildings**
  - insulation
  - efficient equipments
  - new technologies
- **Industry**
  - efficient equipments
  - new processes

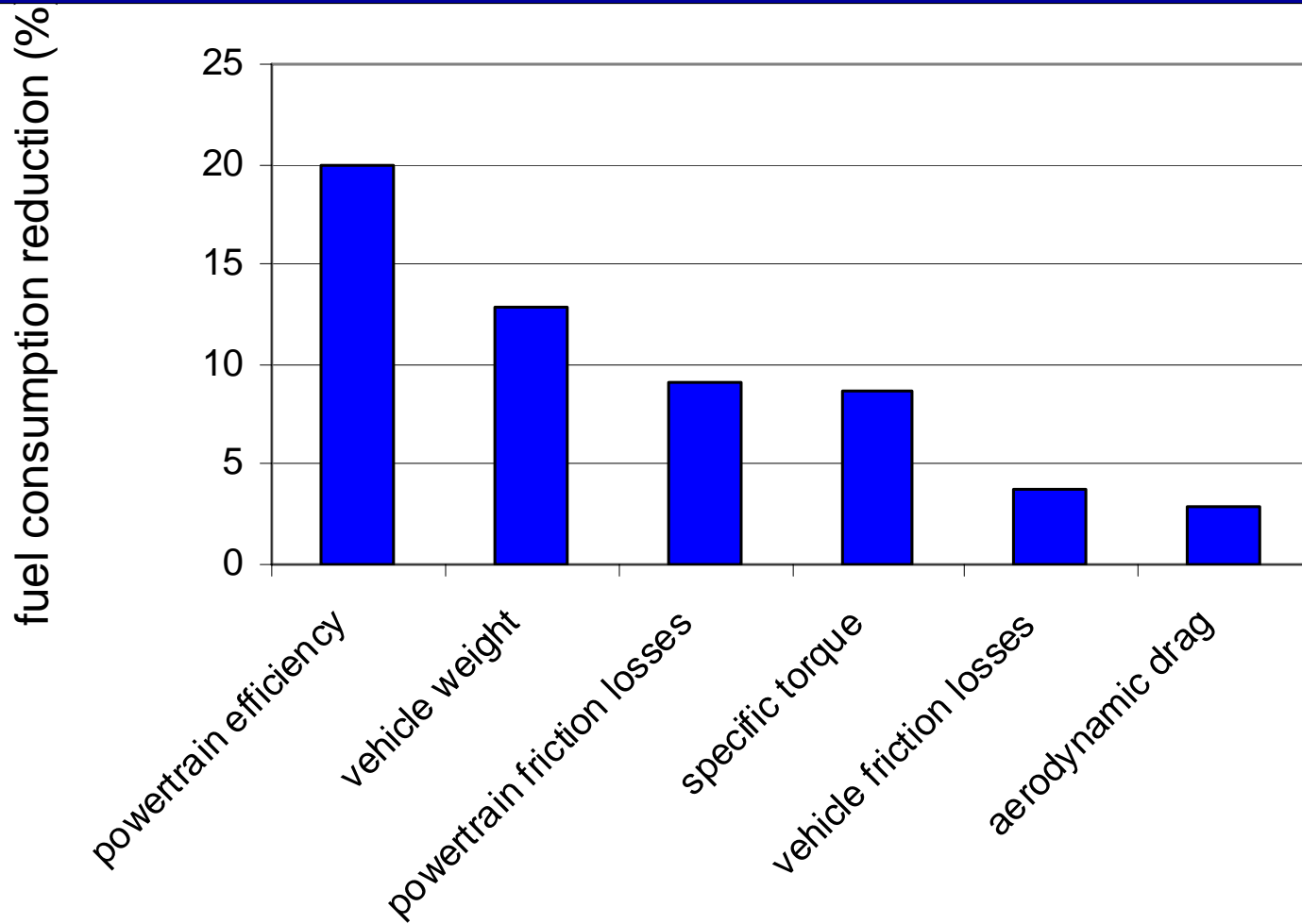


# Growth of road transportation





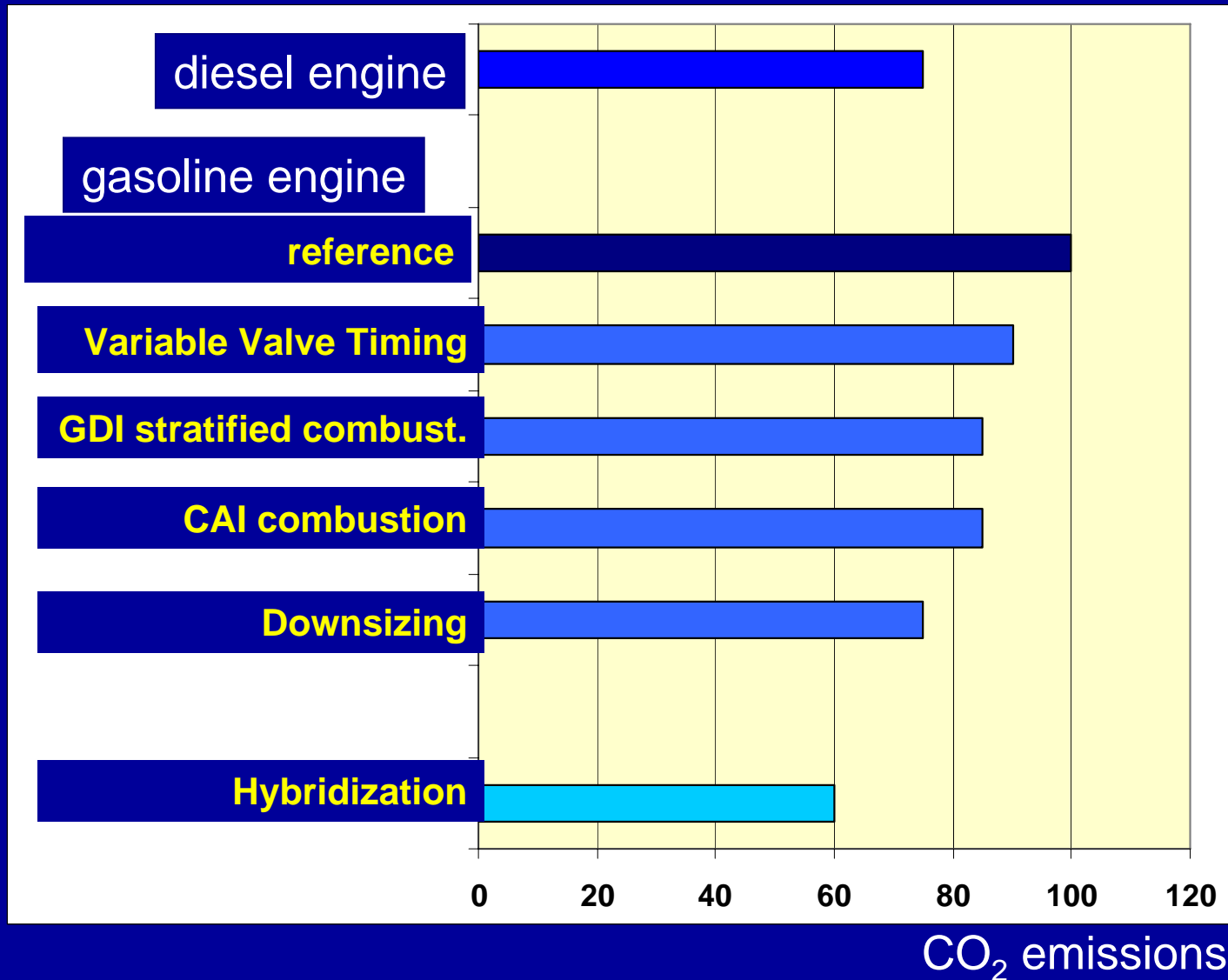
# Key parameters for vehicle fuel consumption reduction



hypothesis : 20% improvement on each parameter

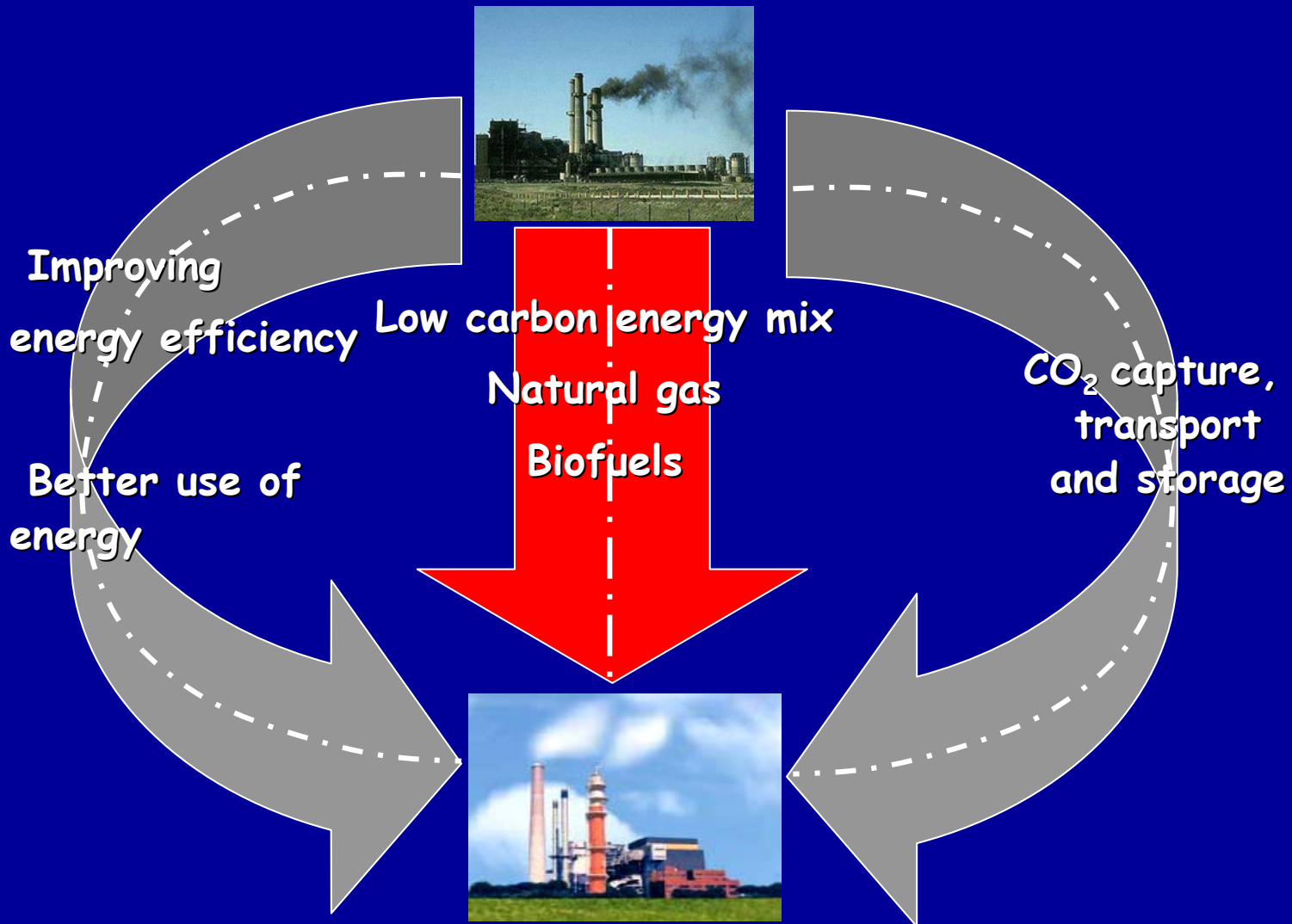


# Reducing CO<sub>2</sub> emissions of the gasoline engine





# Pathways for CO<sub>2</sub> emissions reduction





## Reducing energy carbon content in power generation

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- **Natural gas**
- **Nuclear power**
- **Renewables**



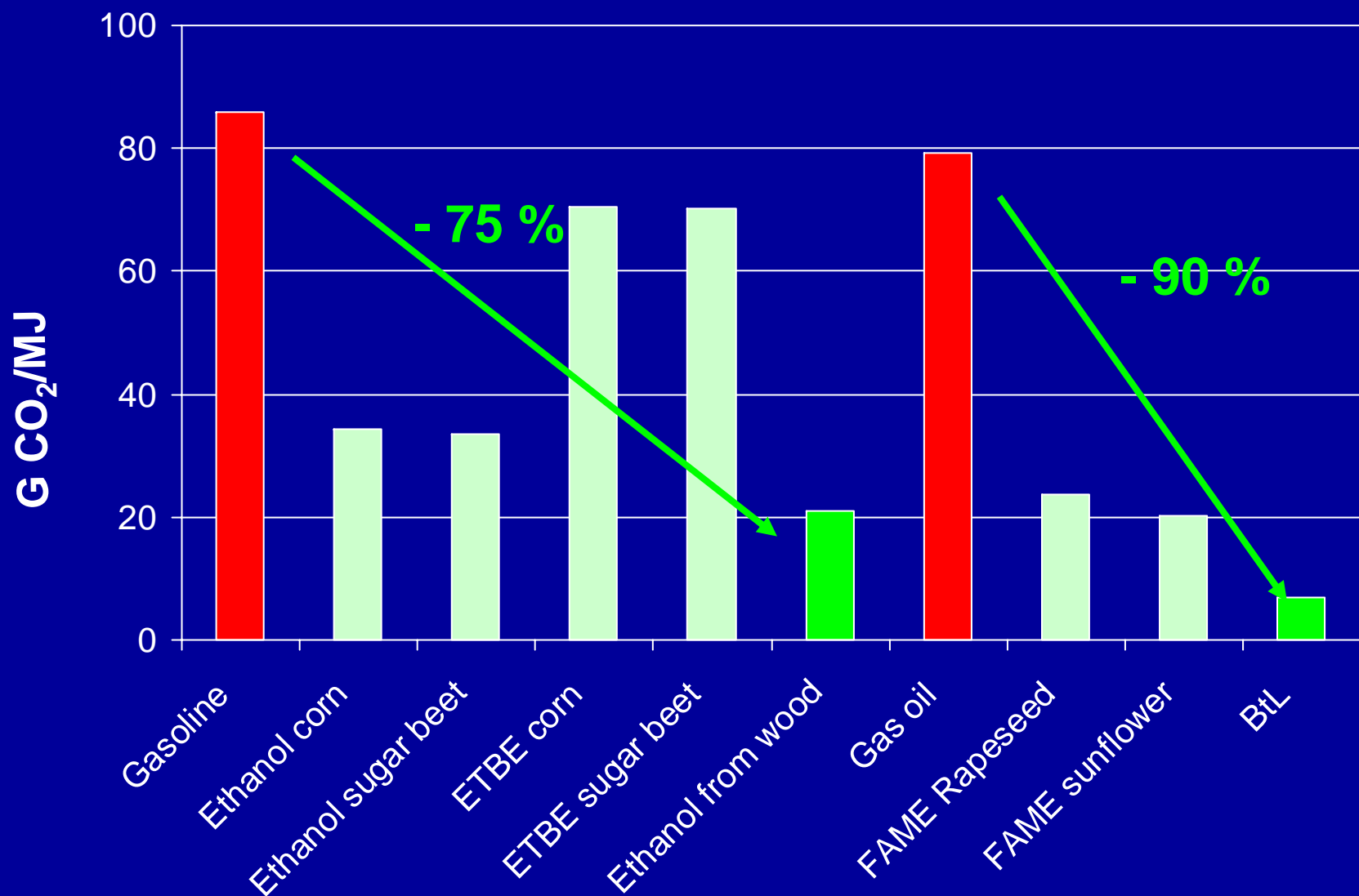
## Biofuels: Anticipated deployment

- Improving present processes  
EtOH, ETBE, FAME, FAEE («**1st generation**»)
- EtOH, Syn Diesel, DME  
from lignocellulosic biomass («**2nd generation**»)
- Integrated biorefining complexes

**U.E. : 25% in 2030?  
Biofrac Vision Report**

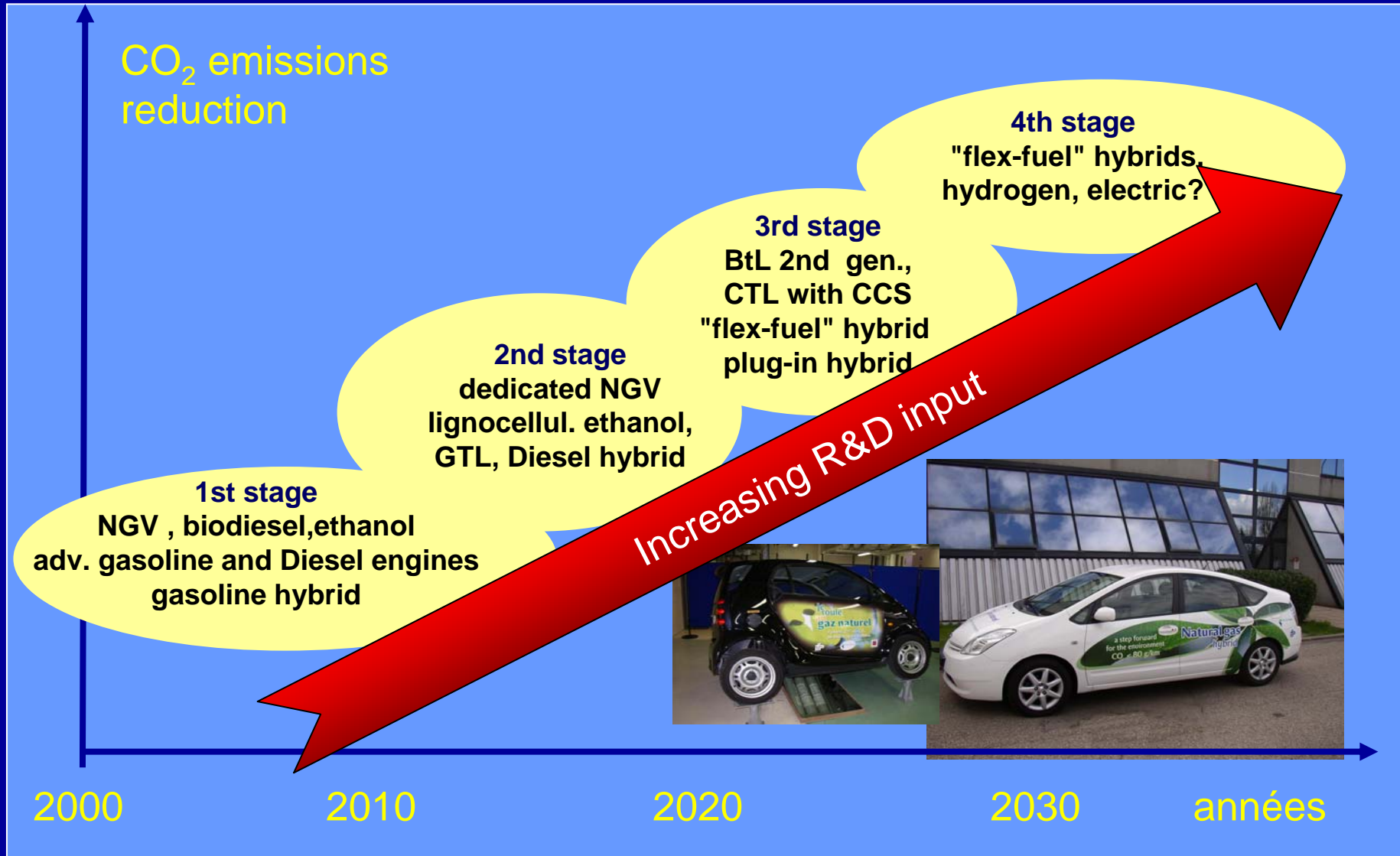


## Biofuels : CO<sub>2</sub> balance



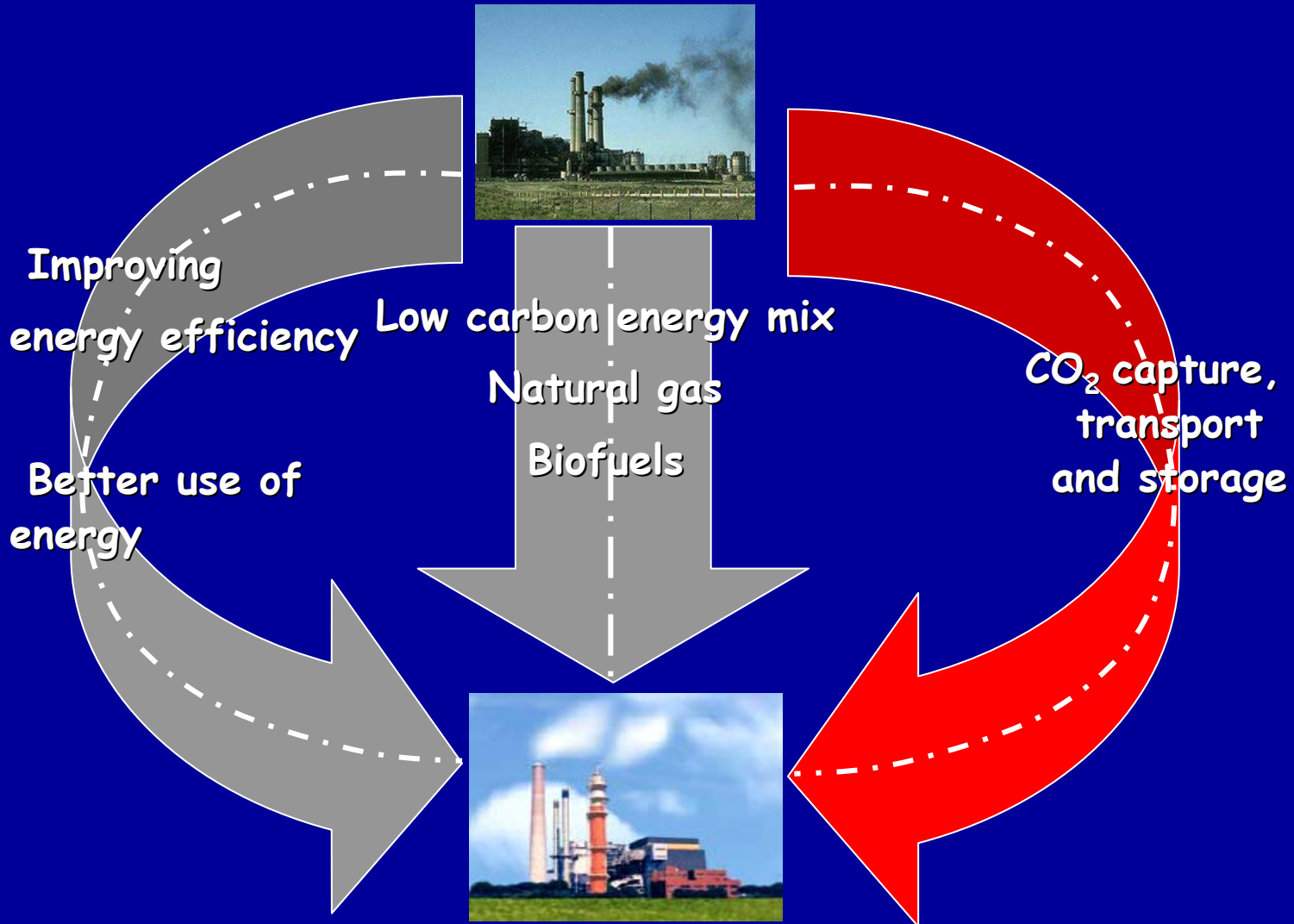


# Passenger Cars Powertrain roadmap





# Pathways for CO<sub>2</sub> emissions reduction





## CO<sub>2</sub> Capture and Storage

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- **An industrial reality already now**
- **An integrated approach needed : capture, transport and storage**
- **Large initiatives at the European and international level : ZETP, CSLF, AIE GHG etc.**



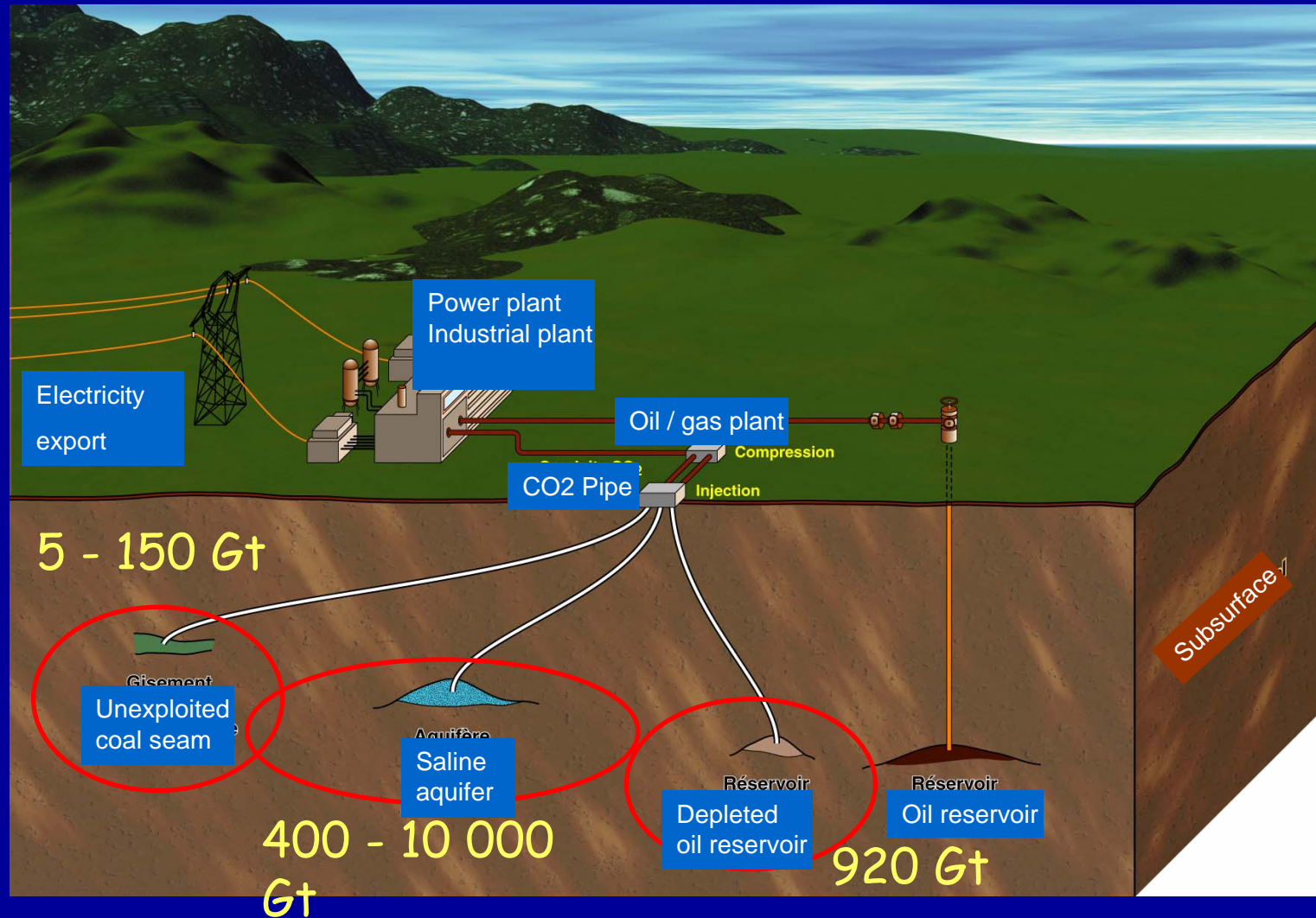
## Key Technological Challenges

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- **Capture : reduce the costs**
  - Solvent scrubbing
  - CO<sub>2</sub> capture by concentration
  - Oxy/pre combustion power plants
- **Underground storage : increase safety and reliability**
  - Controlling CO<sub>2</sub> injection
  - Predicting long term behaviour of the reservoir
  - Monitoring CO<sub>2</sub> in place



# Underground storage potential

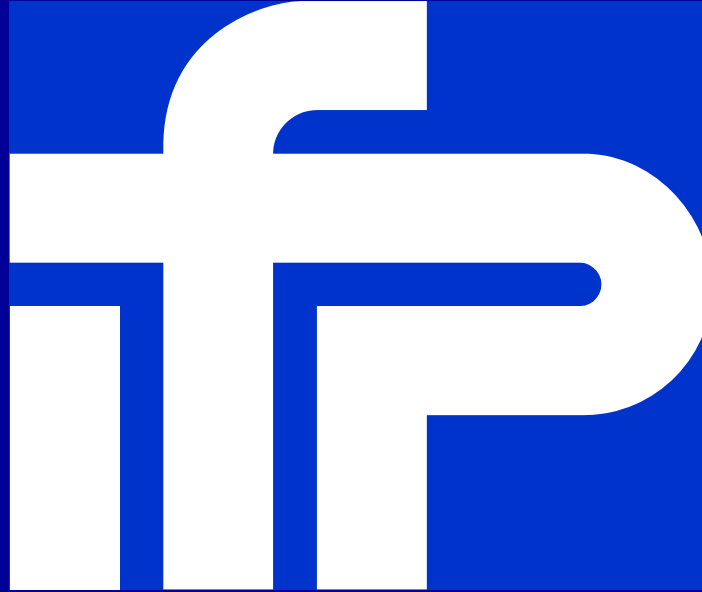




## Conclusion

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- **No panacea, but a bunch of solutions**
- **Well focused R&D programmes**
- **International collaboration**



<http://www.ifp.fr>