

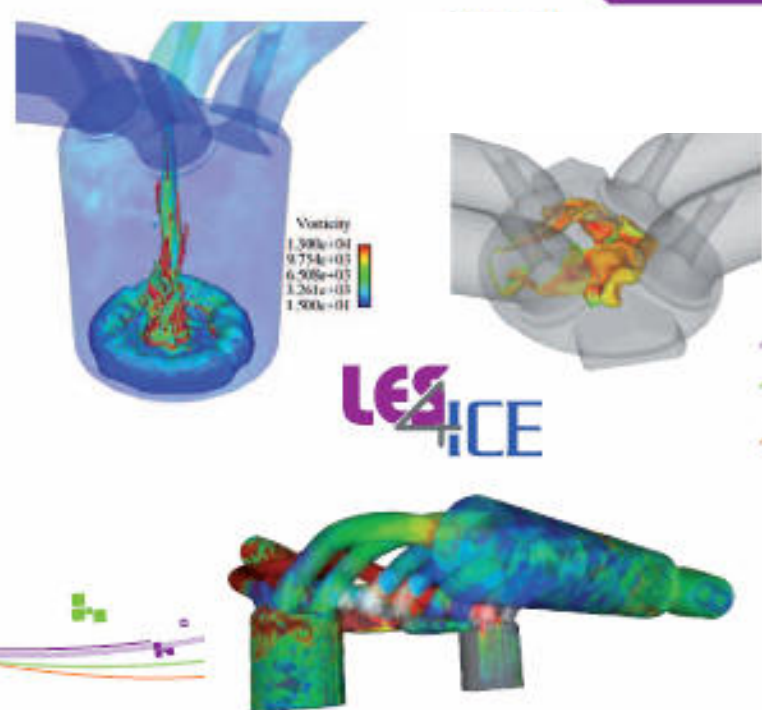
Welcome Address

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Les Rencontres Scientifiques de l'IFP

IFP, Rueil-Malmaison, France ■ 18-19 November 2010

International Conference on
LES for Internal Combustion Engine Flows



Under the auspices of the French Academy of Sciences
Sous les auspices de l'Académie des sciences



INSTITUT DE FRANCE
Académie des sciences





IFP Energies nouvelles

A public-sector research, innovation and training center

**Mission : provide public players and industry with efficient,
economical, clean and sustainable technologies
to take up the three major challenges facing society in the 21st century:
climate change, energy diversification and water resource management**



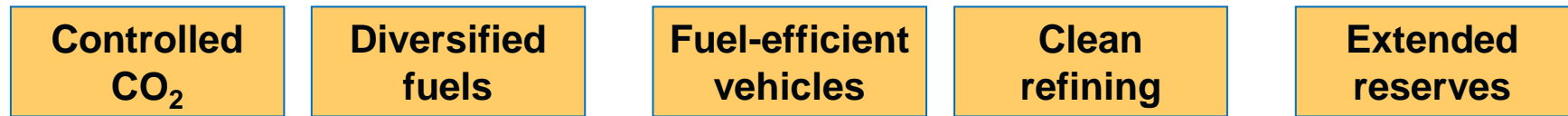
IFP Energies nouvelles provides innovative industrial solutions in its focal areas:
energy, transport, the environment

As an applied research center, it ensures transfer between fundamental research
and industrial development



IFP Energies nouvelles

Five complementary strategic priorities



Capture, storage and transport of CO₂

Production of biofuels, synfuels – natural gas, coal –, hydrogen

Innovative engine technologies, including hybridization and electrification and use of alternative fuels

- Energy efficiency of production units
- Protection of the environment (waste treatment)

- Increasing the success rate in exploration
- Improving the recovery ratio in reservoirs
- Bringing fields in extreme environments into production

The role of Modelling & Simulation for developing fuel-efficient vehicles

- **A strong political and societal urge on cleaner and more efficient vehicles**

- **Strong reduction of CO₂ emissions**

- ICE, HEV *and* EV

- **Limitation of pollutant & noise emissions**

➔ Need for green propulsion concepts for road transport

- **A hard competitive environment with strong requirements on cost, delay and quality**

➔ Modelling & Simulation is an essential element



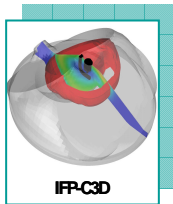
IFP- ENGINE



IFP-DRIVE



IFP-EXHAUST



IFP-C3D



■ System simulation

- libraries integrated into LMS Imagine.Lab
- design and optimisation of complex systems
 - engine, after-treatment, vehicle
- development of control strategies (RT, HiL)
- pre-calibration

■ 3D RANS

- CFD code into LMS Imagine.Lab-Engine
- optimisation of engine component
 - combustion chamber, ducts, after-treatment
- ensemble averaged flow

■ 3D LES

- AVBP is co-owned and co-developed with CERFACS
- non-cyclic flow phenomena, advanced studies

Large-Eddy Simulation: Potentials and open issues

- **LES has unique potentials**
 - "high-fidelity" simulations: resolving more, modelling less
 - gives detailed access to instantaneous flow features
 - unique ability for studying non cyclic phenomena
 - allows discriminating phenomena at different scales

- **Yet many issues remain to be tackled**
 - LES = less modelling, but how much?
 - turbulence, liquid spray, combustion, pollutants
 - LES = more resolution, but what practical compromise between numerical accuracy and CPU time?
 - validation through confrontation with experiments: need for dedicated methods and data?
 - is there an industrial vs. a scientific LES?



Innovating for energy

www.ifpenergiesnouvelles.com