



# ENERGY TRANSITION: COOPERATION, RESEARCH AND INNOVATION OPPORTUNITIES FOR THE OIL & GAS SECTOR

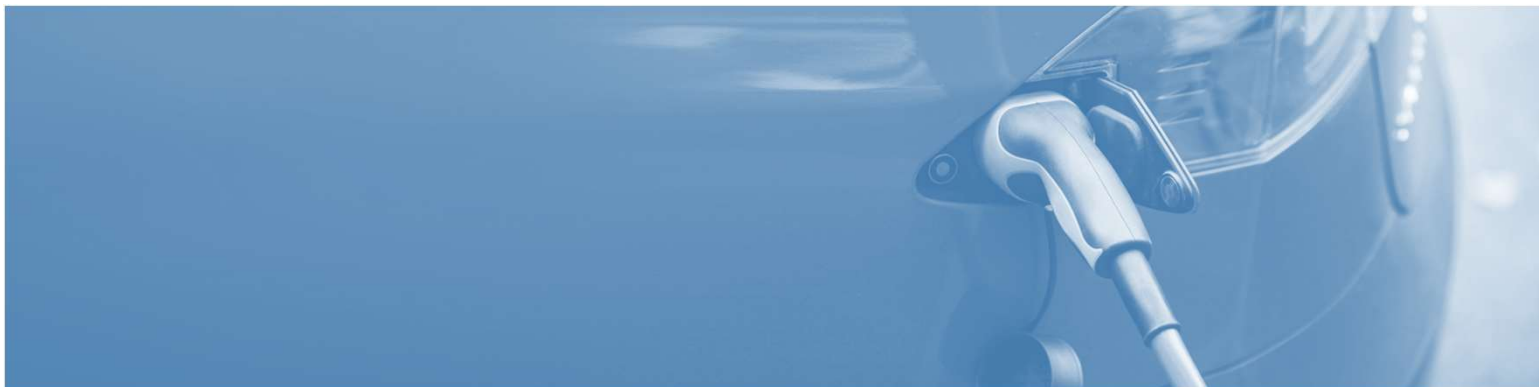
37<sup>TH</sup> JCCP INTERNATIONAL SYMPOSIUM

24<sup>th</sup> JANUARY 2019

**DIDIER HOUSSIN**

CHAIRMAN AND CEO

*IFP Energies nouvelles*



## OUTLINE

- Energy market trends
- Technology impacts on the oil & gas chain
- The role of cooperation at international level based on IFPEN experience

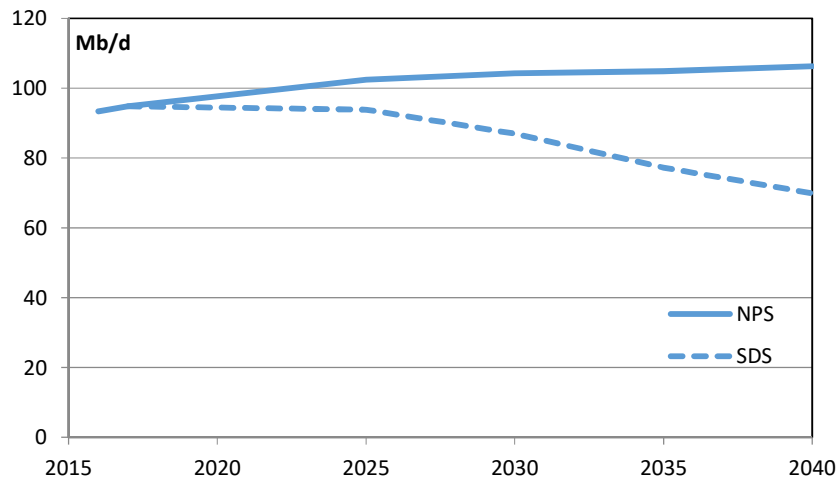
# OIL DEMAND

NPS: New Policies scenario - Reference Scenario for the IEA

SDS: Sustainable Development Scenario, 2°C target

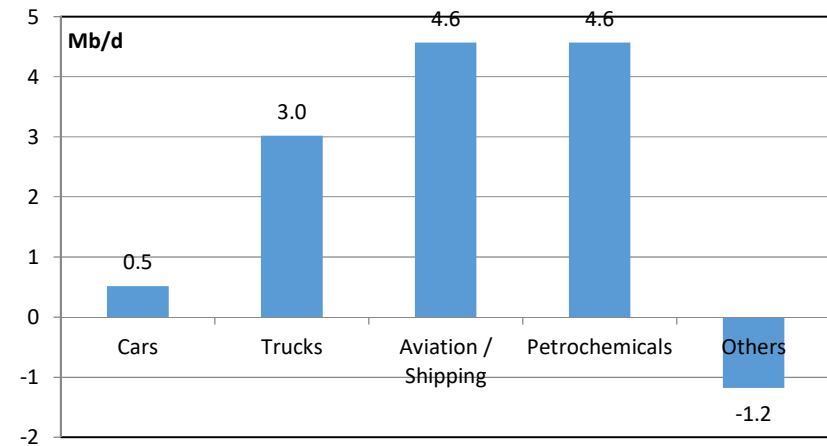
## No “peak oil demand” in the baseline scenario

World oil demand by scenario  
2016 / 2040



Source : IEA WEO 2018

World oil demand growth (NPS scenario)  
2017-2040: +0,5%/y (+ 11 Mb/d)



Source : IEA WEO 2018

## Continuous growth in the New Policies scenario

## Mainly transport (excluding personal cars) and petrochemicals

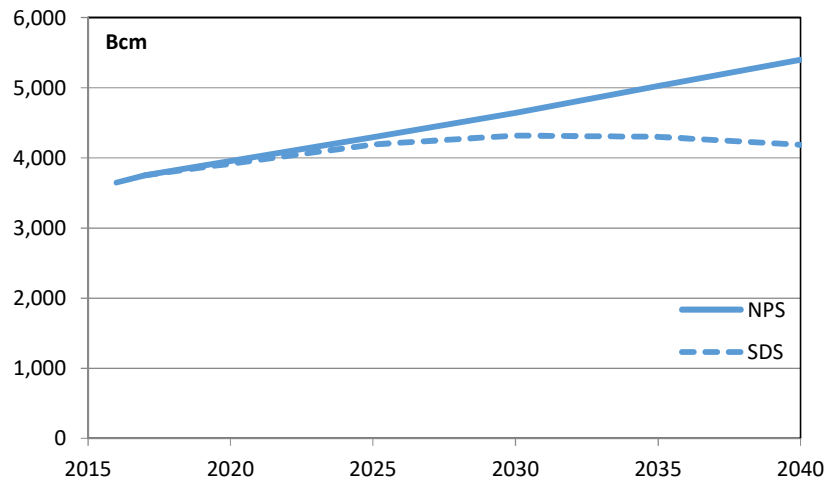
# NATURAL GAS DEMAND

NPS: New Policies scenario - Reference Scenario for the IEA

SDS: Sustainable Development Scenario, 2°C target

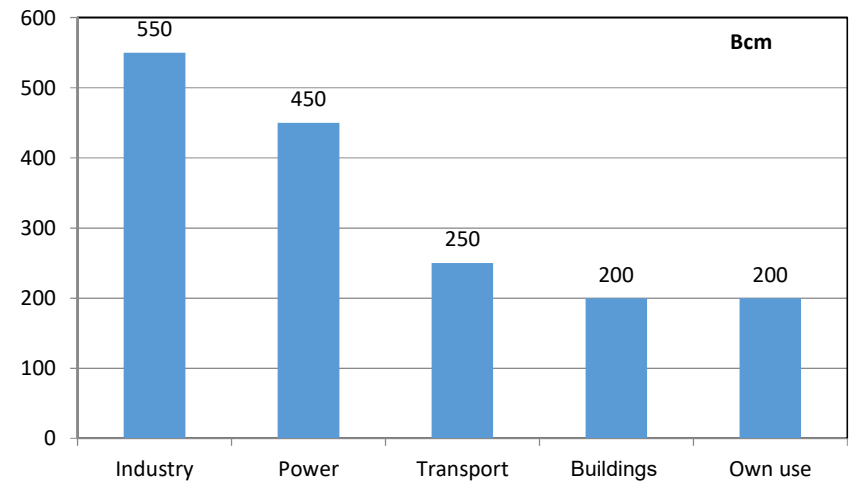
## The only fossil energy to grow even in the SDS scenario

World natural gas demand by scenario  
2016 / 2040



Source : IEA WEO 2018

World natural gas demand growth  
2017-2040: +1,6%/y (+ 1630 bcm)

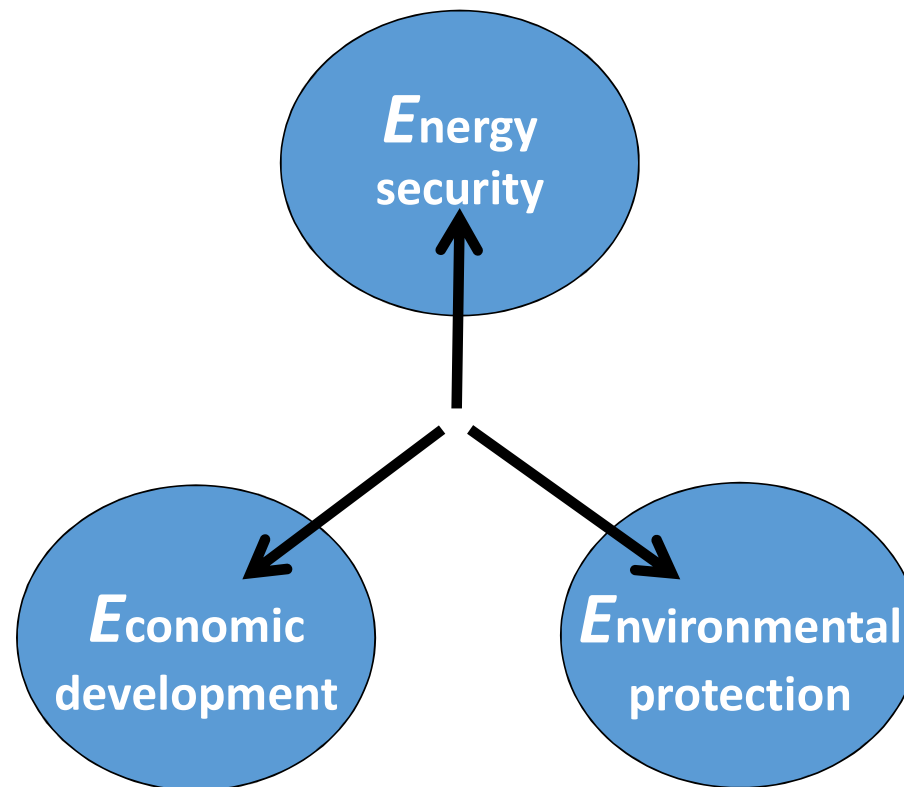


Source : IEA WEO 2018

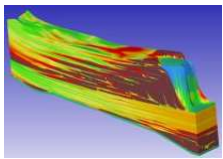
## Increase of Natural gas demand in both scenarios

## Industry and Power: 60% of the growth

## ENERGY TRILEMMA (OR THREE E'S): HOW TO COMBINE THEM ?



## OIL & GAS VALUE CHAIN



*Exploration*



*Drilling*



*Surface processing*



*O&G production*



*Venting/Flaring*



*Transport*



*Refinery*



*Final use*

## Research and Innovation



**Optimization of discoveries**



**Higher recovery rates**



**More efficient processes**



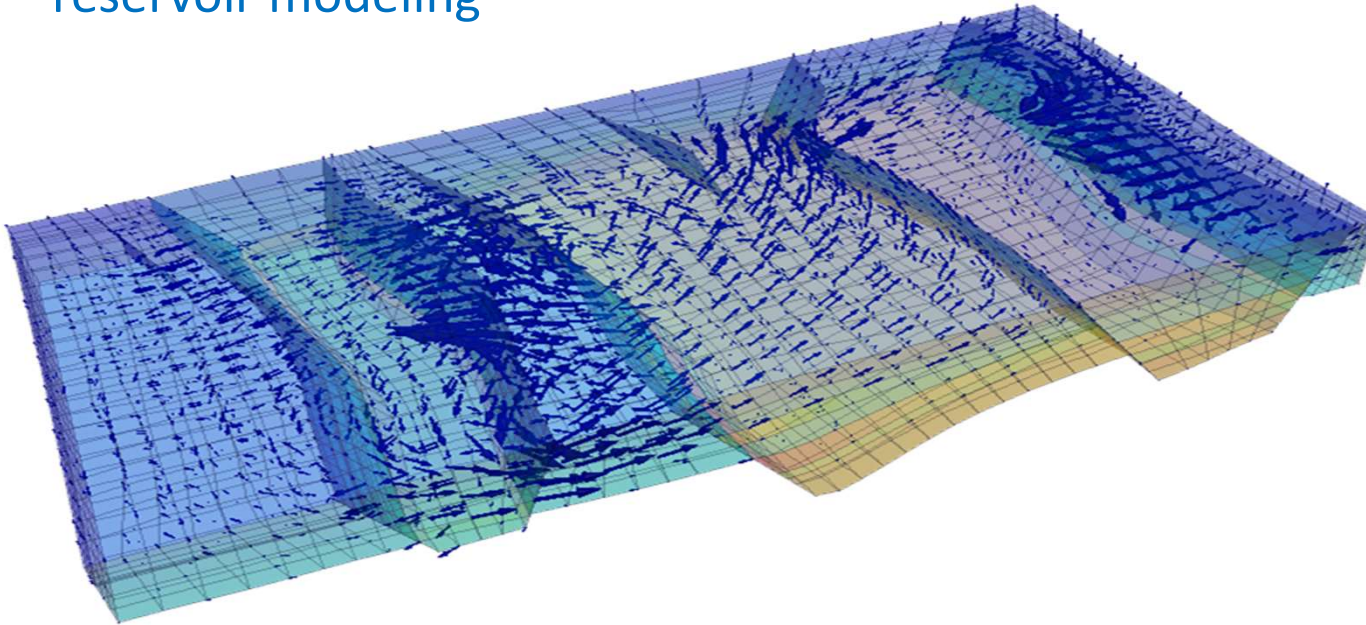
**CCUS**



**Electrification and alternative fuels**

## OPTIMIZING EXPLORATION AND PRODUCTION

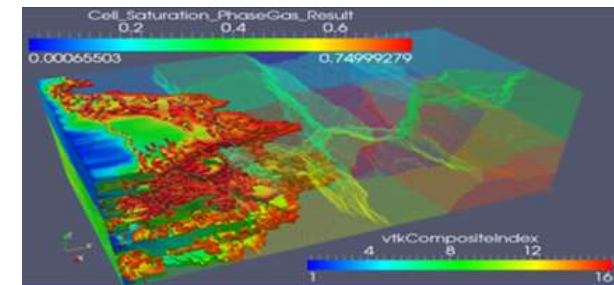
Digital technologies for basin and reservoir modeling



HPC - Parallel computing

Fine-scale simulation

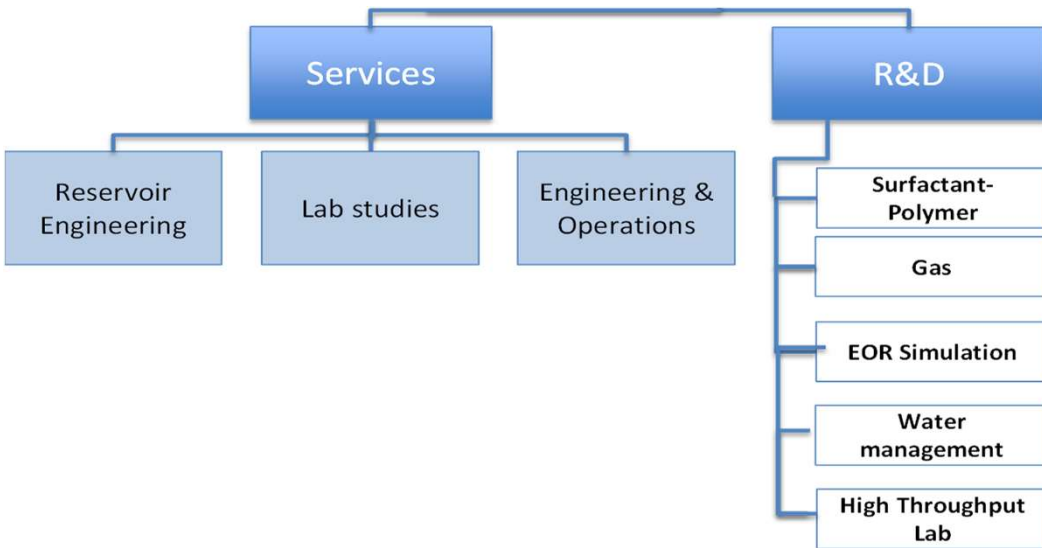
Automatic dynamic gridding



# THE EOR™ ALLIANCE



Integrated offer covering enhanced oil recovery (EOR), from **formulation** to **field application and monitoring**

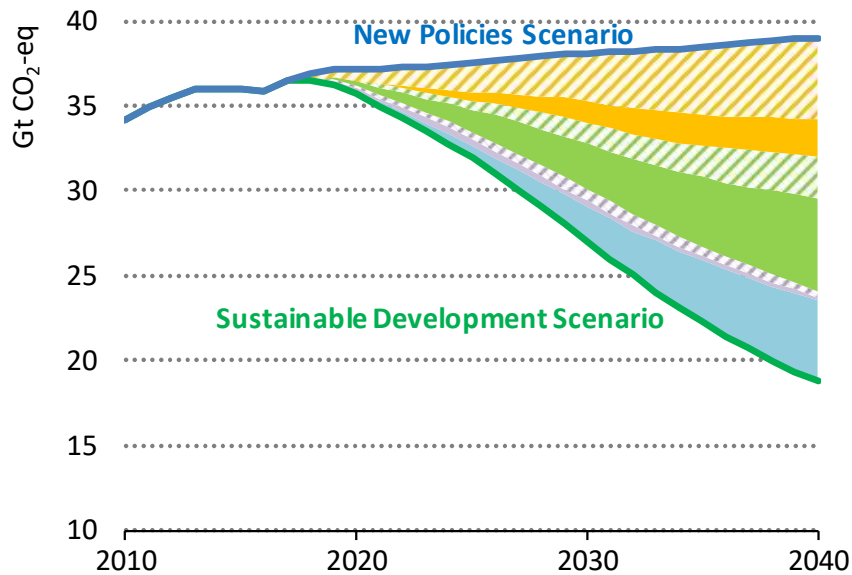




## REDUCING THE CO<sub>2</sub> EMISSIONS WITH CCUS

NPS: New Policies scenario - Reference Scenario for the IEA

SDS: Sustainable Development Scenario, 2°C target



Source : IEA WEO 2018

37% Efficiency and fossil fuel subsidy reform

36% Renewables and reducing least-efficient coal power

8% Reducing upstream oil and gas methane

20% Other: nuclear, CCUS, fuel-switching

**CCUS needed to reach the objective of the Paris Agreement**

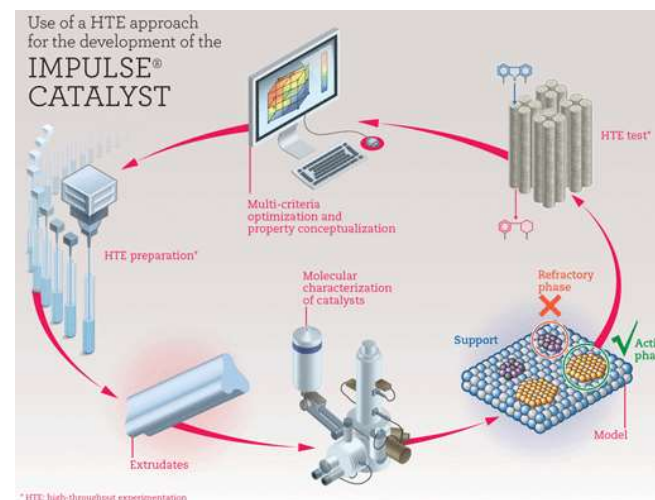
CCUS : 13% of total CO<sub>2</sub> reduction

Objective:

2.5 Gt of CO<sub>2</sub> stored in 2040

## REFINERY OPTIMIZATION MORE EFFICIENT PROCESSES

Innovative solutions, catalysts, processes and other cutting-edge technology  
to reduce environmental impacts



### AXENS GROUP

Technologies and catalysts for the refining and petrochemicals sectors for the production of clean fuels and major intermediates

42% of the world's refineries equipped with technology developed by Axens

Source : IFPEN



## ALTERNATIVE FUELS FOR TRUCKS / AVIATION / MARITIME / ...

### Second-generation biofuels



### Natural gas / Biogas



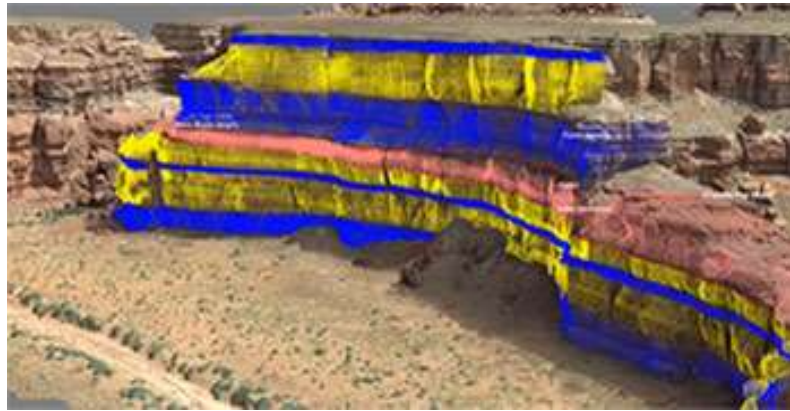
### Hydrogen



## DIGITAL

- Web services
- Software as a service
- AI interpretation
- Cloud computing

### Digital outcrop models



### Connected vehicles



### Web and smartphone services for mobility





A public-sector  
R&I body

A training center

An industrial group

RESEARCH & INNOVATION AREAS

SUSTAINABLE MOBILITY

Developing effective,  
environmentally friendly  
solutions for the  
transport sector

NEW ENERGIES

Producing  
fuels, chemical  
intermediates  
and energy  
from renewable sources

RESPONSIBLE  
OIL AND GAS

Proposing technologies  
that meet  
the demand for energy  
and chemical products  
while improving energy  
efficiency and reducing  
environmental impact



## A PARTNERSHIP-DRIVEN INNOVATION STRATEGY IN FRANCE AND ON THE INTERNATIONAL SCENE

IFPEN has developed **industrial partnerships** in order to:

- Be in line with market requirements and speed up the innovation process
- Develop and disseminate innovations
- Create innovative products and services

				Sustainable mobility
				New energies
				Responsible oil and gas

## ACADEMIC PARTNERSHIPS REGIONAL, NATIONAL, EUROPEAN AND INTERNATIONAL

Accessing skills, knowledge, project finance

French Research and  
Innovation System

French National Research  
Agency



- European Technology Platforms
- European Energy Research Alliance
- European Association of Research and Technology Organisations
- European Green Vehicles Initiative



International  
cooperation



POLITECNICO  
MILANO 1863



Universität Stuttgart



BRITISH  
COLUMBIA



## TRAINING & EDUCATION



### Training: A major challenge for the future of oil & gas

- Forecast for strong demand for training in the O&G sector
- Industry/university collaboration is needed to improve the attractiveness of the sector
- Multicultural strategies must be a priority

### IFP School

- **17** master's level programs
- More than **500** graduates per year from all around the world (50% non-French)
- **80%** of students sponsored by industry





*Innovating for energy*

Find us on:

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