TOTAL

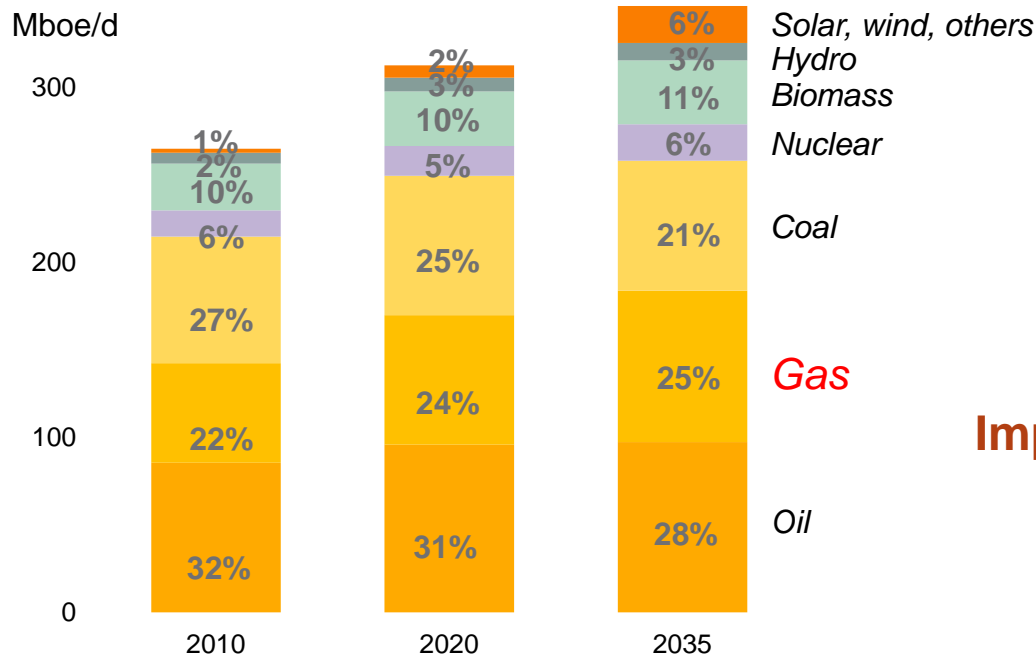# GAS-BASED POWER GENERATION CONTRIBUTING TO RELIABLE, EFFICIENT, COMPETITIVE AND CLEAN ENERGY FUELING ECONOMIC GROWTH.
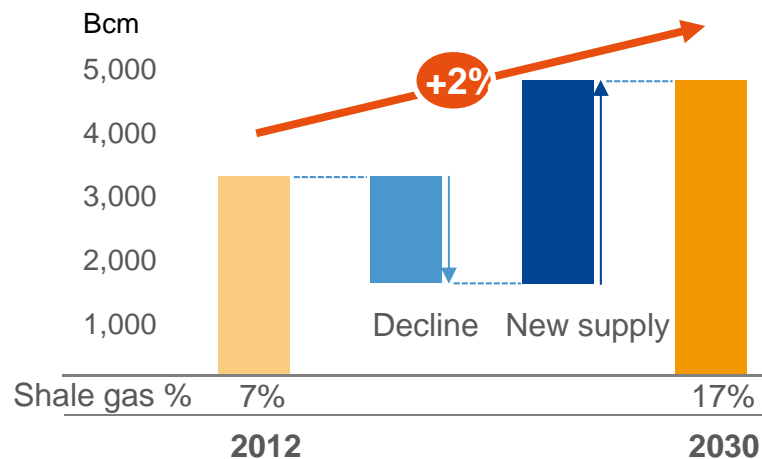
IGU, Warsaw, November 17th, 2013
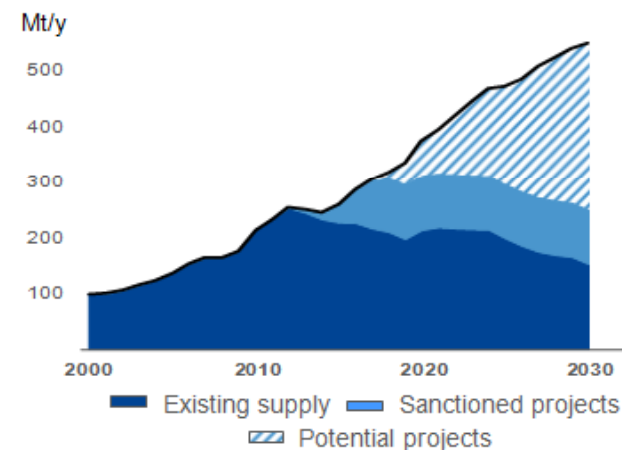
Gerard Moutet, Vice-president Climate - Energy

Gas to become the second largest worldwide energy source before 2030
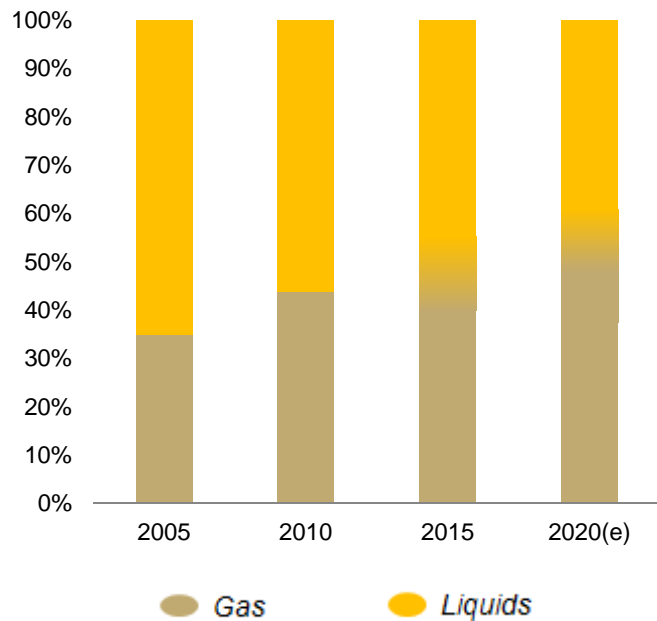
Improvement in producing techniques

Mboe/d

Energy source	2010	2020	2035
Solar, wind, others	1%	2%	6%
Hydro	2%	3%	3%
Biomass	10%	10%	11%
Nuclear	6%	5%	6%
Coal	27%	25%	21%
Gas	22%	24%	25%
Oil	32%	31%	28%

Gas demand increasing 2%/year

Bcm

+2%

Decline   New supply

Shale gas %	7%	17%
	2012	**2030**

LNG demand increasing 5%/year

Mt/y

Existing supply   Sanctioned projects   Potential projects

TOTAL

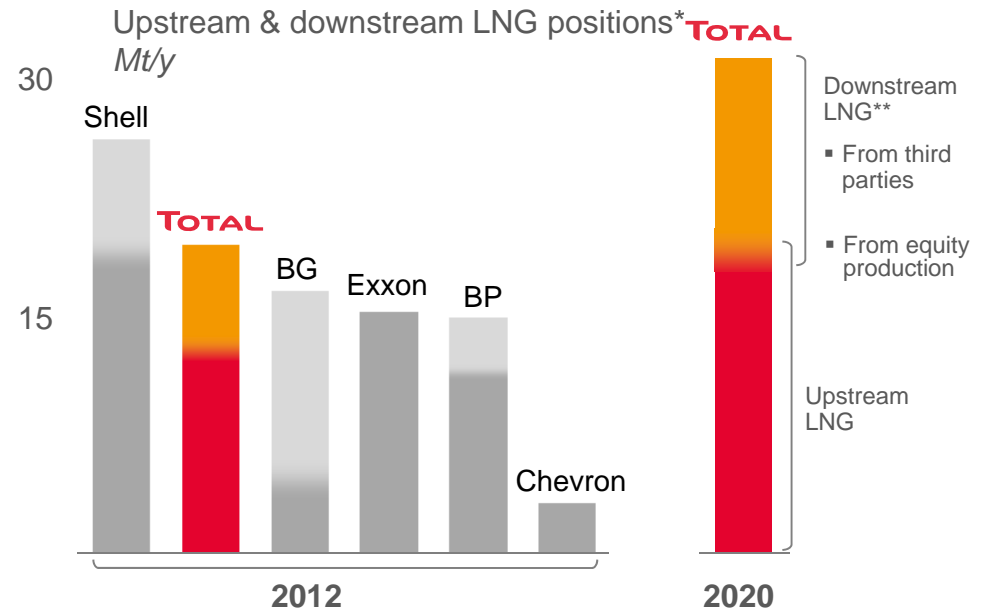# Gas has an increasing weight in TOTAL productions

An increasing gas share in Total's productions

A top-tier position in LNG

Upstream & downstream LNG positions* *Mt/y*

Gas   Liquids

2005 2010 2015 2020(e)

Shell
TOTAL
BG
Exxon
BP
Chevron
2012

2020

Downstream LNG**
▪ From third parties
▪ From equity production

Upstream LNG
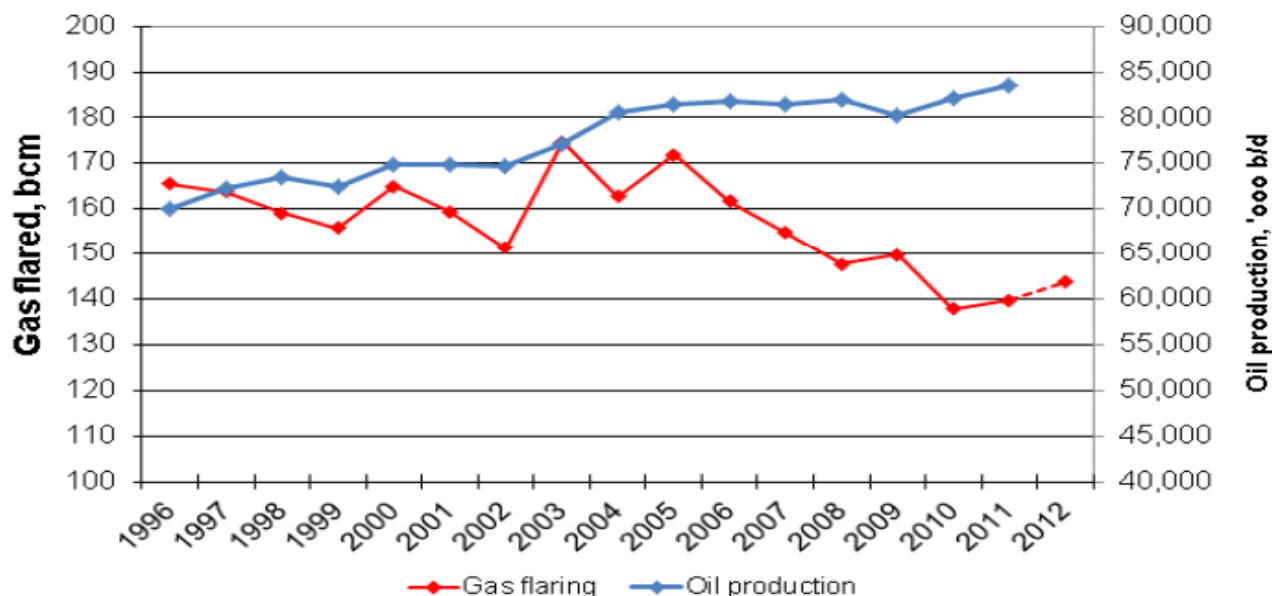
* Estimates based on public data

** LNG purchases by the Group, including those from subsidiaries and participations that are part of the Upstream LNG portfolio
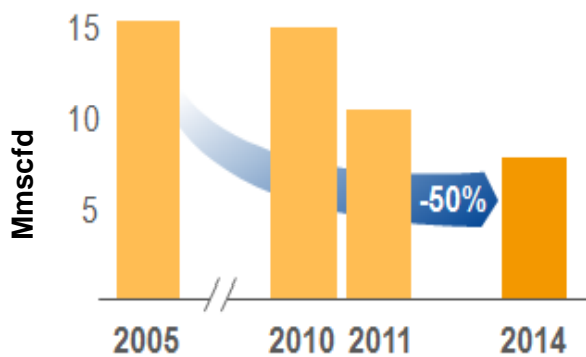
Technology challenges and opportunities
Worldwide gas flaring still to be further decreased

Worldwide gas flaring and oil production (Ref. : GGFR)

Very significant progress done, to be pursued

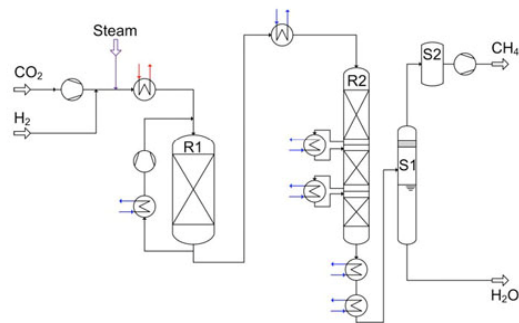**TOTAL objective is to decrease by a factor 2 gas flaring in its operated fields between 2005 and 2014**

Technology challenges and opportunities:
High synergies with renewable energies

As a back up generation

Integrated in power plant

As energy storage through methanation process

Technology challenges and opportunities:
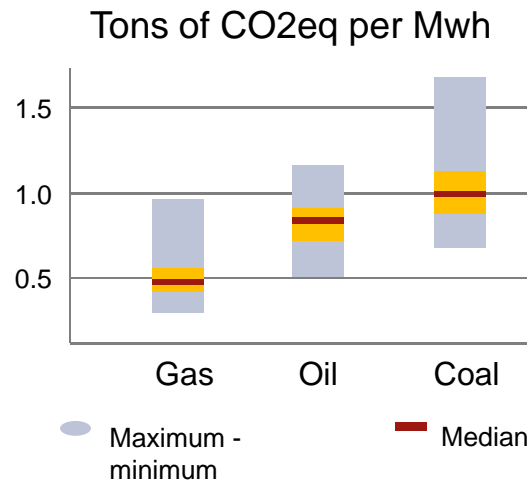## Increasing use in mobility

For road transportation

For marine transportation

Technology challenges and opportunities
Power generation

Tons of CO2eq per Mwh

Ref.: IPCC, Special report on Renewable Energy, 2011

Less CO2 emitted per kwh than other fossil fuels

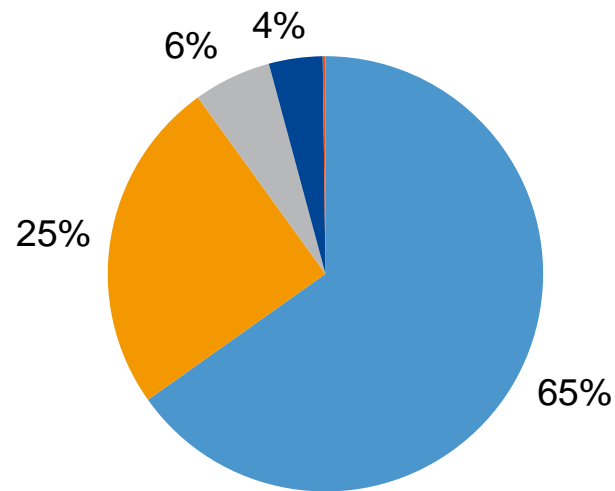**New turbine technologies allow efficiency superior to 60 % in combined cycles**

Specific interest of gas in Carbon Capture and Storage

Technology challenges and opportunities
Gas power generation and Carbon Capture and Storage

Concentrated CO_2 emissions represent more than half of world energy related CO_2

2/3 come from power generation

Concentrated emissions > 0.1 MtCO2/year
(around 16 GtCO2/year)

■ Power Generation ■ Oil & Gas industry ■ Cement ■ Steel ■ Others

Sources Petroleum Economist, BP 2007

Cost of capture per kwh with gas generation is not higher than for coal generation

Twice less transport and storage needs with gas power generation

Technology improvements will still enhance gas advantages in

supplying energy while limiting CO2 emissions

Thank you for your attention

TOTAL