Total Energy Outlook 2040
Energy Outlook 2040
Demand fundamentals

<table>
<thead>
<tr>
<th>Key drivers</th>
<th>Key outcomes for net energy demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP: + 3.3 % p.a.</td>
<td>Energy demand growth</td>
</tr>
<tr>
<td>Population: ~9 Bn in 2040</td>
<td></td>
</tr>
<tr>
<td>Access to energy: ~1 Bn people without access to electricity in 2018</td>
<td>Energy savings</td>
</tr>
<tr>
<td>Regulation and policies</td>
<td>Development of low carbon energies</td>
</tr>
<tr>
<td>Technology</td>
<td></td>
</tr>
</tbody>
</table>

Multiple pathways addressed by modeling scenarios
Energy Outlook 2040
Total presents two scenarios: Momentum and Rupture

Momentum scenario explores oil, natural gas and power demand in detail…

**Energy demand** based on

- Announced policies and regulations
- EV: **50%** of sales, **32%** of total fleet by 2040
- Adopting state of the art technologies
- Energy intensity falls by **2.2%** pa

Rupture

Anticipating *technological breakthroughs* and strong shift in **public policies**

- Mass electricity storage
- Massive switch to **renewable** power generation
- Faster electrification in all sectors
- Steeper decrease of energy intensity, ending with same energy demand level in 2040 as in 2015
Momentum scenario: oil demand
Oil demand dominated by transport and petrochemicals
Emerging markets underpinning rising demand

2015 global oil* demand
%

Global oil demand
Mb/d

* Hydrocarbon liquids, including NGLs, excluding biofuels
** Residential & Commercial Sector

Growth concentrated in transportation and petrochemicals
Oil demand stagnating for light duty vehicles
Growth offset by efficiency gains and EV penetration

Oil demand: light duty vehicles*
Mb/d

Worldwide fleet of cars doubles
from 1.1 billion to > 2 billion by 2040
• In developing regions, fleet nearly triples

Fuel efficiency gains impact demand
by ~ 30% mainly due to environmental regulations

Electric Vehicle penetration by 2040
• Aggressive penetration: 50% of sales, 32% of fleet
• EVs drive fewer km/y, mainly urban users

* 2 & 3 Wheelers + Cars + Light commercial vehicles
Oil demand growing for heavy duty vehicles
Main source of growth for road transportation despite electrification of urban buses & trucks

Oil demand: heavy duty vehicles*
Mb/d

25

2015

2040

Growth**
Efficiency gains
EVs
Biofuels & Nat gas

+3 Mb/d 2015-40

Heavy duty vehicle activity more than doubles

Efficiency gains enhanced by energy switch in an already optimized sector

Buses and urban delivery trucks switch to electricity
- Stricter air quality standards in cities
- 35% electric by 2040

Rising natural gas penetration

* Buses + Trucks
** net of improved load factors
Global cap stimulating **LNG substitution**

* net of improved load factors

**Oil demand growing for aviation and marine fuels**

Shipping sector facing product quality change

**Oil demand: marine fuels**

<table>
<thead>
<tr>
<th>Year</th>
<th>Growth*</th>
<th>Nat gas</th>
<th>Low Sulfur</th>
<th>High Sulfur</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2040</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Oil demand: aviation fuels**

<table>
<thead>
<tr>
<th>Year</th>
<th>Growth*</th>
<th>Efficiency gains</th>
<th>Biofuels</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2040</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Limited alternatives to jet fuel**

Strong traffic growth for **cargo and people**
Oil demand growing for petrochemicals
Recycling technologies developing rapidly

Oil demand: petrochemicals
Mb/d

- **Recycling & bioplastics**
- **CTO/MTO***
- **Market growth & new uses**

- **Gasoil**
- **Ethane**
- **LPG**
- **Naphtha**

**Demand for plastics** grows
- Rising global prosperity
- Increasing urban population with higher plastic consumption

~25% of feedstock displaced by rapidly expanding **plastic recycling**

Oil-based feedstock increase mostly coming from **LPG** and **ethane**

+1.2 Mb/d oil products and +2.7 Mb/d ethane and LPG in 2040

* Coal To Olefins / Methanol To Olefins
Sustained oil demand
Despite EVs, efficiency gains, and substitution

Global oil demand
Mb/d

190
130
70
2015
2040

Demand for mobility remains strong in emerging countries

Natural gas is the main alternative to oil
• > 10 Mb/d of oil displaced by natural gas

Aggressive case for EV penetration

Stronger disruptions needed to meet the IEA 450 ppm scenario

* net of improved load factors in transports
** Including plastic recycling
Oil demand sensitivities

2040 oil demand
Mb/d

-9

+/- 0.5% per year economic growth

Passenger vehicles

Freight

Marine

Aviation

New vehicle efficiency gains

+/- 33%

70% of sales in 2040

EV penetration

30% of sales in 2040

-2

-1

-1

-3

-6

3

3

1

1

6

2

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Regional oil demand is shifting rapidly
North America, Europe, & Asia OECD shares decreasing

Oil demand: evolution by region*
%, Mb/d

<table>
<thead>
<tr>
<th>Region</th>
<th>2015</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>25%</td>
<td>19%</td>
</tr>
<tr>
<td>Europe</td>
<td>20%</td>
<td>18%</td>
</tr>
<tr>
<td>Asia OECD</td>
<td>9%</td>
<td>7%</td>
</tr>
<tr>
<td>Asia Non-OECD</td>
<td>26%</td>
<td>33%</td>
</tr>
<tr>
<td>Middle East</td>
<td>9%</td>
<td>8%</td>
</tr>
<tr>
<td>Africa</td>
<td>4%</td>
<td>8%</td>
</tr>
<tr>
<td>Latin America</td>
<td>7%</td>
<td>7%</td>
</tr>
</tbody>
</table>

* Excluding International Marine Bunkers

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Momentum scenario: natural gas demand
Natural gas demand growing in all sectors
Power generation and industry pulling-up global natural gas demand

2015 global natural gas demand %, Bcm/yr

- Residential & Commercial: 21%
- Industry: 24%
- Power & Heat generation: 41%
- Transport: 13%
- Other*: 13%

3,400 Bcm/yr

Global natural gas demand Bcm/yr

- 2015: 6,000 Bcm/yr (including autoconsumption)
- 2040: 1.8% per year growth

All sectors growing, dominated by power generation and industry
Power generation
Remains #1 driver for natural gas demand through 2040

Natural gas demand: power generation
Bcm/yr

Growth spurred by the increase of power demand

Fuel switching mainly from coal
• More from coal and oil products to natural gas than from natural gas to renewables

Efficiency gains driven by the improvement of gas-fired power plants
Strong industrial natural gas demand
Natural gas use as an energy source and feedstock

Natural gas demand: industry
Bcm/yr

Growth driven by economic activity

Switch from coal & oil driven by
• Regulation (Blue Sky in China)
• Natural gas availability and affordability

Two key factors for significant natural gas savings
• Improvements of existing processes
• Structural switch towards less-energy intensive industries
Slower demand growth in Residential & Commercial

Natural gas demand: Res & Com*
Bcm/yr

Growth mainly driven by economic activity and increased comfort in households, partially offset by efficiency gains.

Switching away from oil & coal
Two-thirds of the switch in China

Efficiency gains mainly in commercial sector

* Residential & Commercial Sector
Strong LNG demand growth driven by Asia
Supportive government policies for natural gas

Emerging markets driving growth

LNG expected to surpass pipelines in international gas trade

* Including Bunkers
Natural gas demand sensitivities

2040 natural gas demand
Bcm/yr

**Macro drivers**
- Change in economic growth: +/- 0.5% per year GDP growth

**Efficiency drivers**
- Change in energy efficiency: +/- 0.1% per year Energy efficiency

**Sectoral drivers**
- Boost gas in transport (trucks and marine bunkers)
- Coal-to-gas switch in power generation
- Competition with renewables in power generation

- Impact on global CO2 emissions: -1.3%

2019 Investor Day – Total Energy Outlook 2040
Momentum scenario: power demand
Power demand growing in all sectors
Growing twice as fast as global energy demand

2015 global power demand
\% TWh/yr

- Residential & Commercial: 35\%
- Industry: 44\%
- Transport: 19\%
- Other*: 19\%

24,200 TWh/yr

Global power demand
TWh/yr

- 2015: 20,000 TWh/yr
- 2040: 45,000 TWh/yr

\(+2.2%\) per year

All sectors growing, dominated by residential & commercial and industry

* Including losses
Residential & Commercial Accounts for nearly half the growth

More people, increased wealth per capita and service growth

Electrification of energy use
- Switching from biomass (access to electricity) and hydrocarbon fuels

Efficiency gains
- Technical improvements: appliance efficiency, building insulation and LEDs
- Partially offset by increasing power demand per capita in developing countries
Electrification will transform industry

Growth driven by economic activity

**Fuel switching** driven by electrification of processes and automation

**Energy efficiency** expected from
- Technology adoption
- Structural switch toward less electricity-intensive industries
Power generation: more low carbon electricity
Hydrocarbon share of generation falls to half in 2040

2015 global power generation
% TWh/yr

- Coal: 39%
- Oil: 4%
- Gas: 23%
- Bio: 2%
- Solar: 4%
- Wind: 16%
- Hydro: 11%
- Nuclear: 11%
- Other: 4%

24,200 TWh/yr

Global power generation
TWh/yr

- 2015:
  - Coal: 20,000 TWh
  - Renewables: 2,200 TWh

- 2040:
  - Coal: 13,300 TWh
  - Renewables: 11,700 TWh

2040 global power generation
% TWh/yr

- Coal: 27%
- Oil: 6%
- Gas: 23%
- Bio: 3%
- Solar: 11%
- Wind: 8%
- Hydro: 27%
- Nuclear: 11%
- Other: 4%

45,000 TWh per year

Renewables and natural gas dominating growth
Decrease of carbon intensity by one third
Power demand sensitivities

2040 power demand
TWh/yr

Macro drivers
- Change in economic growth
  +/− 0.5% per year GDP growth

Efficiency drivers
- Change in energy efficiency
  +/− 0.1% per year Energy efficiency

Sectoral drivers
- Boost electric cars
  Extra 10% market share for EVs in LDV fleet
- Convergence of per capita electricity demand in Res. & Com.
  China fills 1/3 of the gap vs. OECD per capita average
  India fills 1/3 of the gap vs. China’s per capita average

Total Energy Outlook 2040
Regional weights in power demand shift massively
Non-OECD Asia will use more than North America, Europe, & OECD Asia

Power demand: evolution by region
%, TWh/y

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>22%</td>
<td>15%</td>
</tr>
<tr>
<td>Europe</td>
<td>22%</td>
<td>16%</td>
</tr>
<tr>
<td>Asia OECD</td>
<td>8%</td>
<td>5%</td>
</tr>
<tr>
<td>Asia Non-OECD</td>
<td>36%</td>
<td>48%</td>
</tr>
<tr>
<td>Middle East</td>
<td>4%</td>
<td>6%</td>
</tr>
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<td>5%</td>
<td>5%</td>
</tr>
</tbody>
</table>

2019 Investor Day – Total Energy Outlook 2040
Primary energy demand and CO2 emissions
Momentum scenario: global primary energy demand
Gas and renewables outperform global energy demand growth

CO₂ emissions in line with IEA New Policy Scenario (NPS)
Optimized Momentum scenario
Adding efficiency and sectorial sensitivities insufficient for a 2°C pathway

Global primary energy demand
Mboe/d

CO2 emissions
GtCO2/yr

Need for a Rupture scenario

2019 Investor Day – Total Energy Outlook 2040
Rupture scenario
Technological breakthroughs and strong shift in public policies

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Huge <strong>energy intensity improvements</strong> (&gt; 3%/yr) or • <strong>Reduced economic growth</strong></td>
<td>• <strong>2040 energy consumption</strong> similar to 2015</td>
</tr>
<tr>
<td>• Industry, transport and buildings: <strong>faster electrification</strong> with mass electricity storage</td>
<td>• <strong>Power demand to double</strong> by 2040 • <strong>EV share in light vehicle fleet &gt; 60%</strong> in 2040</td>
</tr>
<tr>
<td>• Power generation: massive switch to <strong>renewables</strong></td>
<td>• <strong>Coal demand divided by &gt; 3</strong> by 2040 substituted by renewables</td>
</tr>
<tr>
<td>• <strong>Carbon storage</strong> large scale development</td>
<td>• <strong>2.5 GtCO₂/yr</strong> stored in 2040</td>
</tr>
</tbody>
</table>
A rupture required for a 2°C pathway

Global primary energy demand
Mboe/d

CO2 emissions
GtCO2/yr

2015 2040 Momentum 2040 Rupture

Renewables Nuclear Coal Oil Natural Gas

Momentum Rupture

15 2015 2040

IEA CPS IEA NPS IEA SDS

2019 Investor Day – Total Energy Outlook 2040
Integrating climate into strategy
Integrating climate into strategy
Taking into account anticipated market trends

Global energy demand
Mboe/d

IEA 2°C scenario*

<table>
<thead>
<tr>
<th>Year</th>
<th>Renewables</th>
<th>Nuclear</th>
<th>Coal</th>
<th>Oil</th>
<th>Natural gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2040</td>
<td></td>
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</tbody>
</table>

* IEA Sustainable Development Scenario

- Focusing on oil projects with low breakeven
- Expanding along the gas value chain
- Developing profitable & sizeable low carbon electricity business
Further improving efficiency of our operations
Over 10% improvement of energy efficiency since 2010

Objectives

- **Energy efficiency:** \(-1\% /\text{year}\)
  > 10% reduction achieved*

- **Zero routine flaring by 2030,**
  > 80% reduction achieved*

Actions

- **300 M$ capital investment plan in energy efficiency** over 5 years in downstream facilities

- **GHG intensity reduction for new facilities:**
  process electrification, no routine flaring, fuel switch to low-carbon energies

- **30 $/t CO_2 price** embedded in investment decisions

* Over 2010-2018
Growing in natural gas
Key to fast climate action

2015-30 LNG demand
Mt/y

Integrating along the gas value chain
• 2nd LNG player, 10% market share
• Developing B2B and B2C gas marketing

Creating new LNG markets
• Developing LNG-to-Power through FSRU in emerging countries
• Pioneer in LNG for transportation

Reducing upstream methane emissions
• 2018 upstream level below 0.3%
• Emissions sustainably below 0.2% by 2025 or earlier

+10% in 2018 (China +41%)
Developing a profitable low carbon electricity business

2015-40 electricity generation
TWh

---

**Low carbon power generation**
- ~3 GW current capacity (gas, solar & onshore wind)
- Offshore wind and hydro ambitions
- 10 GW within 5 years

**Batteries** to leverage renewables, developing Saft in energy storage systems

**Marketing electricity**
- Targeting 15% market share B2C in France and Belgium by 2022 (vs. 6% and 9% in 2017)

---

Solar, wind and gas: x2.5 over 2015-40

* Gas and renewables
Source: IEA scenarios - SDS, NPS, CPS
Promoting sustainable biofuels

Biofuels world consumption
Mboe/d

2010  2017  2040

Source: IEA scenarios - SDS, NPS (in millions of barrels equivalent)

Leading European biofuel distributor in 2018 with 2.4 Mt/y

Entering M&S business in Brazil, a major biofuel market

Starting-up HVO production in La Mède based on sustainable vegetable oil

Early biogas positions (France, Netherlands, US)
Investing in carbon sink businesses

**CO₂ volume capture as per IEA SDS scenario Gt/y**

<table>
<thead>
<tr>
<th>Year</th>
<th>2017</th>
<th>2030</th>
<th>2040</th>
<th>2050*</th>
</tr>
</thead>
</table>

* Scenario 2DS - IEA Energy Technology Perspective 2017

**Carbon sinks mandatory** to reach zero net emissions by second half of the century

**Natural sinks**
- Investing in preservation of forests, mangrove and degraded lands
- Creating a dedicated business unit with agro-environmental experts and 100 M$/y investments budget from 2020

**CCUS**: looking for profitable business models
- 10% of R&D program
- Successful pilot in Lacq
- Projects in Norway (Northern Lights) and UK (Clean Gas Project)
GHG emissions: from our operations to our sales

Our accountability:
Emissions from our operations
Scopes 1 & 2

Emissions from our products sold to customers
Scope 3
Our accountability: reducing emissions from our operations
15% reduction of our GHG emissions (scope 1+2) between 2015 and 2025

2015-25 Scope 1 & 2 emissions from operated facilities by E&P + RC + M&S Mt/y

-15% 2015-2025

2015

< 40

2025

Scope 1 & 2 emission reduction targets to be included in Total executives compensation

- Flaring reduction
- Methane Control
- Energy Efficiency
- Process electrification

2019 Investor Day – Integrating climate into strategy
Our ambition: strategy contributing to tackle climate change
Reducing the carbon intensity of our energy sales

Carbon intensity: weighted average of lifecycle* emissions of energy products sold
Base 100 in 2015 (75 gCO₂/kbtu)

Further improving efficiency of our operations

Growing in natural gas

Developing a profitable low carbon electricity business

Promoting sustainable biofuels

Investing in carbon sink businesses (natural sinks & CCUS)

NPS: New Policy Scenario ~2.7°C by 2100
SDS: Sustainable Development Scenario ~2°C by 2100
* Scopes 1, 2 & 3
Total, the Responsible Energy Major
International Leadership on ESG & climate actions

- Integrating Climate into Our Strategy
  - Annually reporting since 2016
  - Integrating climate into our strategy

- TCFD
  - Supports TCFD and recommendations
  - implemented in our reporting

- Climate Leadership Council
  - Founding Member.
  - Advocating a Carbon Dividends plan

- Oil & Gas Climate Initiative
  - and Climate Investments fund

- UN Global Compact
  - Total recognized as Global compact Lead Company on Sept 2018

- Alliance to end plastic waste
  - Founding member of Alliance to end plastic waste
  - in the environment, especially in the ocean

2019 Investor Day – Integrating climate into strategy
This document may contain forward-looking information on the Group (including objectives and trends), as well as forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995, notably with respect to the financial condition, results of operations, business, strategy and plans of TOTAL. These data do not represent forecasts within the meaning of European Regulation No. 809/2004.

Such forward-looking information and statements included in this document are based on a number of economic data and assumptions made in a given economic, competitive and regulatory environment. They may prove to be inaccurate in the future, and are subject to a number of risk factors that could lead to a significant difference between actual results and those anticipated, including the price of petroleum products, the ability to realize cost reductions and operating efficiencies without unduly disrupting business operations, changes in regulations including environmental and climate, currency fluctuations, as well as economic and political developments and changes in business conditions. Certain financial information is based on estimates particularly in the assessment of the recoverable value of assets and potential impairments of assets relating thereto.

Neither TOTAL nor any of its subsidiaries assumes any obligation to update publicly any forward-looking information or statement, objectives or trends contained in this document whether as a result of new information, future events or otherwise. Further information on factors, risks and uncertainties that could affect the Group’s business, financial condition, including its operating income and cash flow, reputation or outlook is provided in the most recent Registration Document filed by the Company with the FrenchAutorité des Marchés Financiers and annual report on Form 20-F filed with the United States Securities and Exchange Commission (“SEC”).

Financial information by business segment is reported in accordance with the internal reporting system and shows internal segment information that is used to manage and measure the performance of TOTAL. In addition to IFRS measures, certain alternative performance indicators are presented, such as performance indicators excluding the adjustment items described below (adjusted operating income, adjusted net operating income, adjusted net income), return on equity (ROE), return on average capital employed (ROACE) and gearing ratio. These indicators are meant to facilitate the analysis of the financial performance of TOTAL and the comparison of income between periods. They allow investors to track the measures used internally to manage and measure the performance of the Group. These adjustment items include:

(i) Special items

 Due to their unusual nature or particular significance, certain transactions qualified as “special items” are excluded from the business segment figures. In general, special items relate to transactions that are significant, infrequent or unusual. However, in certain instances, transactions such as restructuring costs or asset disposals, which are not considered to be representative of the normal course of business, may be qualified as special items although they may have occurred within prior years or are likely to occur again within the coming years.

(ii) Inventory valuation effect

The adjusted results of the Refining & Chemicals and Marketing & Services segments are presented according to the replacement cost method. This method is used to assess the segments’ performance and facilitate the comparability of the segments’ performance with those of its competitors.

In the replacement cost method, which approximates the LIFO (Last-In, First-Out) method, the variation of inventory values in the statement of income is, depending on the nature of the inventory, determined using either the month-end price differentials between one period and another or the average prices of the period rather than the historical value.

The inventory valuation effect is the difference between the results according to the FIFO (First-In, First-Out) and the replacement cost.

(iii) Effect of changes in fair value

The effect of changes in fair value presented as an adjustment item reflects for some transactions differences between internal measures of performance used by TOTAL’s management and the accounting for these transactions under IFRS.

IFRS requires that trading inventories be recorded at their fair value using period-end spot prices. In order to best reflect the management of economic exposure through derivative transactions, internal indicators used to measure performance include valuations of trading inventories based on forward prices.

Furthermore, TOTAL, in its trading activities, enters into storage contracts, which future effects are recorded at fair value in Group’s internal economic performance. IFRS precludes recognition of this fair value effect.

The adjusted results (adjusted operating income, adjusted net operating income, adjusted net income) are defined as replacement cost results, adjusted for special items, excluding the effect of changes in fair value.

Euro amounts presented herein represent dollar amounts converted at the average euro-dollar (€/$) exchange rate for the applicable period and are not the result of financial statements prepared in euros.

This document also contains extra-financial performance indicators, including a carbon intensity indicator for TOTAL energy sales that measures the weighted average greenhouse gas emissions of energy products sold by TOTAL, from their production in TOTAL facilities to their end use by TOTAL customers. This carbon intensity indicator covers, besides direct GHG emissions of TOTAL (scope 1), indirect GHG emissions (scopes 2 and 3) that TOTAL does not control (for the definitions of scopes 1, 2 and 3, refer to Total’s Registration Document).

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