

Footnotes

1. See, for example, OECD Economic Outlook, Interim Report, March 2009, and World Economic Outlook, International Monetary Fund, April 2009.
2. The low and high variants assume respectively lower and higher fertility rates of 0.5 children per woman.
3. This takes into account the assumed need to also provide a small additional amount of oil for stocks.
4. The Bali Action Plan was agreed upon at the 2007 UNFCCC Conference on the island of Bali, Indonesia, charting the negotiation process designed to adopt a decision at the Copenhagen COP meeting in December 2009 on how to implement the Framework Convention.
5. See Transportation Energy Data Book: edition 27-2008, US Department of Energy. Available at <http://cta.ornl.gov/data/Index.shtml>.
6. Source: International Organization of Motor Vehicle Manufacturers. Available at www.oica.net.
7. Ibid.
8. See 'Momentum: KPMG's Global Auto Executive Survey 2009 – Industry concerns and expectations 2009-2013', KPMG International, 2009.
9. In May 2009, US President Obama announced a proposal to introduce similar efficiency standards, but even sooner, reaching 35.5 miles per gallon by 2016. This would impact demand even more than the Reference Case assumes.
10. International Civil Aviation Organisation, submission to the third session of the Ad Hoc Working Group on Long-Term Cooperative Action under the Convention, Accra, Ghana, August 2008.
11. 'Access to Energy and Human Development', Amie Gaye, United Nations Development Programme (UNDP), Human Development Report Office, 2007. Available at http://hdr.undp.org/en/reports/global/hdr2007-2008/papers/Gaye_Amie.pdf.
12. See 'Crude Oil: Forecast, Markets and Pipeline Expansions', Canadian Association of Petroleum Producers, June 2009.
13. The current carbon tax imposed by the Alberta government on oil sands producers, as well as other producers, is around \$15 per ton of CO₂ emitted. This tax applies

to emissions above 88% of those producers' historical per-barrel average. (See 'Alberta's 2008 Climate Change Strategy', Edmonton, Alberta: Government of Alberta, 2008).

14. UN Environment Programme (UNEP), 'Global Trends in Sustainable Energy Investment 2009'.
15. See Monthly Oil Market Report, June 2009, OPEC. Available at www.opec.org.
16. OPEC Long-Term Strategy, 2006, OPEC. Available at www.opec.org.
17. 'Global Economic Policies and Prospects', note by the Staff of the International Monetary Fund prepared for the Group of Twenty Meeting of the Ministers and Central Bank Governors, 13–14 March 2009, London, UK. Available at <http://www.imf.org/external/np/g20/pdf/031909a.pdf>.
18. 'The State of Public Finances: Outlook and Medium-Term Policies After the 2008 Crisis', Fiscal Affairs Department, International Monetary Fund, 6 March 2009. Available at: <http://www.imf.org/external/np/pp/eng/2009/030609.pdf>.
19. See, for example: 'The investment challenge' Bassam Fattouh and Robert Mabro, in 'Oil in the 21st Century: Issues, Challenges and Opportunities', ed. Robert Mabro, OPEC, 2005.
20. Financial Regulatory Reform: A New Foundation, US Treasury Department. Available at http://www.financialstability.gov/docs/regs/FinalReport_web.pdf.
21. The World Oil Refining Logistic and Demand (WORLD) model is a trademark of EnSys Energy & Systems, Inc. OPEC's version of the model was developed jointly with EnSys Energy & Systems.
22. IHS CERA Special Fourth Quarter 2008 Market Update, January 2009.
23. Oil & Gas Journal, Volume 107, Issue 17, 4 May 2009.
24. International Oil Daily, 12 March 2009.
25. Hart's Refinery Tracker, January 2009.
26. Calculated as 90% of incremental distillation capacity additions.

27. Volumes of acidic 'high TAN' (total acid number) crudes are growing. These require additional pre-treating and/or processing in crude units with either the metallurgy or the additives to counter the acid's corrosive effects.
28. Projections on fuel product specifications are mainly based on the HART World Refining & Fuel Services and International Fuel Quality Center (IFQC).
29. Renewable Fuel Standard Requirements for 2006: Direct Final Rule and Notice of Proposed Rulemaking, published by EPA on 30 December 2005, adopting the default standard for renewable fuel as set forth in the Energy Policy Act of 2005.
30. See also EU-OPEC joint study on refining: EU Petroleum Market Study prepared for European Commission by Purvin & Gertz, November 2007.
31. Excise duties on gas oil, IP/07/316, Brussels, 13 March 2007.
32. Oil here includes crude oil, refined products, intermediates and non-crude based products.
33. All projections presented in this section are indicative only and they represent the minimum required capacity for a given time horizon as they are the result of an optimization process.
34. MR1 movements are not captured by the model since these tankers are mainly used for intra-regional trade. Therefore, they are assumed to grow proportionally to the capacity expansion of smaller MR2 and LR1 tankers.
35. For instance, new steam cracker projects in the Middle East are understood to use ethane and butane as feedstocks rather than naphtha.

Annex A

Abbreviations

ANWR	Arctic National Wildlife Reserve
AOSP	Athabasca Oil Sands Project
API	American Petroleum Institute
AR4	(IPCC) Fourth Assessment Report
AWG-LCA	Ad Hoc Working Group on Long-Term Cooperative Action
b/d	Barrels per day
BEV	Battery electric vehicle
boe	Barrels of oil equivalent
CAFE	Corporate Automobile Fuel Efficiency
CARB	California Air Resources Board
CBOT	Chicago Board of Trade
CCS	Carbon capture and storage
CD	Charge depleting
CO ₂	Carbon dioxide
CO ₂ -eq	Carbon dioxide equivalent
CTLs	Coal-to-liquids
DCs	Developing countries
DOE/EIA	(US) Department of Energy/Energy Information Administration
dwt	Deadweight tonnes
ECA	Emission control areas
EISA	(US) Energy Independence and Security Act
EOR	Enhanced Oil Recovery
EU	European Union
EU ETS	EU Emissions Trading Scheme
E&P	Exploration and production
FCC	Fluid catalytic cracking
FSU	Former Soviet Union
GDP	Gross domestic product
GHG	Greenhouse gas
GTLs	Gas-to-liquids
GW	Gigawatt
HEV	Hybrid electric vehicle
IEA	International Energy Agency

IEFS	International Energy Forum Secretariat
IFO	Intermediate fuel oil
IFQC	International Fuel Quality Centre
IMF	International Monetary Fund
IMO	International Maritime Organization
IOC	International Oil Company
IPCC	Intergovernmental Panel on Climate Change
IRF	International Road Federation
Li-on	Lithium-ion
Li ₂ CO ₃	Lithium carbonate
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
LR1	Large Range 1 (50,000–79,999 dwt)
LR2	Large Range 2 (80,000–159,999 dwt)
LTS	(OPEC's) Long-Term Strategy
mb/d	Million barrels per day
MEPC	Marine Environmental Protection Committee
MOMR	Monthly Oil Market Report
mpg	Miles per gallon
MR1	General Purpose Vessels (16,500–24,999 dwt)
MR2	Medium Range Vessels (25,000–49,999 dwt)
MTBE	Methyl tetra-butyl ether
mtoe	Million tonnes of oil equivalent
NGLs	Natural gas liquids
NiMH	Nickel-metal hydride
NOC	National Oil Company
OECD	Organisation for Economic Co-operation and Development
OFID	OPEC Fund for International Development
OPEC	Organization of the Petroleum Exporting Countries
ORB	OPEC Reference Basket (of crudes)
OTC	Over-the-counter
OWEM	OPEC's World Energy Model
p.a.	Per annum
PHEV	Plug-in hybrid electric vehicle
ppm	Parts per million
PPP	Purchasing power parity

QELROs	Quantitative emissions limitations or reductions objectives
R&D	Research and development
RFS	Renewable Fuels Standard
R/P	Reserves-to-production (ratio)
SUV	Sports utility vehicle
TAN	Total acid number
TAR	(IPCC) Third Assessment Report
toe	Tons of oil equivalent
UHBR	Ultra-high by-pass ratio
UN	United Nations
UNDESA	United Nations Department of Economic and Social Affairs
UNFCCC	United Nations Framework Convention on Climate Change
URR	Ultimately recoverable reserves
USABC	United States Advanced Battery Consortium
USGS	United States Geological Survey
VGO	Vacuum gasoil
VLCC	Very large crude carrier (160,000 dwt and above)
WCBS	Western Canadian Sedimentary Basin
WOO	World Oil Outlook
WORLD	World Oil Refining Logistics Demand Model
WTI	West Texas Intermediate

Annex B

OPEC World Energy Model (OWEM) definitions of regions

OECD

North America

Canada

Guam

Mexico

Puerto Rico

United States of America

United States Virgin Islands

Western Europe

Austria

Belgium

Czech Republic

Denmark

Finland

France

Germany

Greece

Hungary

Iceland

Ireland

Italy

Luxembourg

Netherlands

Norway

Poland

Portugal

Slovak Republic

Spain

Sweden

Switzerland

Turkey

United Kingdom

OECD Pacific

Australia

Japan

New Zealand

Republic of Korea

Developing countries

Latin America

Anguilla

Antigua and Barbuda

Argentina

Aruba

Grenada

Guadeloupe

Guatemala

Guyana

Bahamas
Barbados
Belize
Bermuda
Bolivia
Brazil
British Virgin Islands
Cayman Islands
Chile
Colombia
Costa Rica
Cuba
Dominica
Dominican Republic
El Salvador
Falkland Islands (Malvinas)
French Guiana

Middle East & Africa

Bahrain
Benin
Botswana
Burkina Faso
Burundi
Cameroon
Cape Verde
Central African Republic
Chad
Comoros
Congo
Congo, Democratic Republic
Djibouti
Egypt

Haiti
Honduras
Jamaica
Martinique
Montserrat
Netherlands Antilles
Nicaragua
Panama
Paraguay
Peru
St. Kitts and Nevis
St. Lucia
St. Vincent and the Grenadines
Suriname
Trinidad and Tobago
Turks and Caicos Islands
Uruguay

Malawi
Mali
Mauritania
Mauritius
Mayotte
Middle East, Other
Morocco
Mozambique
Namibia
Niger
Oman
Réunion
Sao Tome and Principe
Senegal

Equatorial Guinea
Eritrea
Ethiopia
Gabon
Gambia
Ghana
Guinea
Guinea-Bissau
Ivory Coast
Jordan
Kenya
Lebanon
Lesotho
Liberia
Madagascar
Rwanda

South Asia

Afghanistan
Bangladesh
Bhutan
India

Southeast Asia

American Samoa
Brunei Darussalam
Cambodia
Chinese Taipei
Cook Islands
Democratic People's Republic of Korea
Fiji
French Polynesia
Hong Kong, China

Seychelles
Sierra Leone
Somalia
South Africa
Sudan
Swaziland
Syrian Arab Republic
Togo
Tunisia
Uganda
United Republic of Tanzania
Western Sahara
Yemen
Zambia
Zimbabwe

Maldives
Nepal
Pakistan
Sri Lanka

Myanmar
Nauru
New Caledonia
Niue
Papua New Guinea
Philippines
Samoa
Mongolia
Singapore

Indonesia
Kiribati
Lao People's Democratic Republic
Macao
Malaysia

Solomon Islands
Thailand
Tonga
Vanuatu (New Hebrides)
Vietnam

China

OPEC

Algeria
Angola
Ecuador
I.R. Iran
Iraq
Kuwait

S.P. Libyan A.J.
Nigeria
Qatar
Saudi Arabia
United Arab Emirates
Venezuela

Transition economies

Russia

Other transition economies

Albania
Armenia
Azerbaijan
Belarus
Bosnia and Herzegovina
Bulgaria
Croatia
Cyprus
Estonia
Serbia
Slovenia

Georgia
Kazakhstan
Kyrgyzstan
Latvia
Lithuania
Malta
Moldova
Montenegro
Romania
Turkmenistan
Ukraine

Tajikistan

The Former Yugoslav Republic of Macedonia

Uzbekistan

Annex C

**World Oil Refining Logistics and Demand
(WORLD) model
definitions of regions**

US & Canada

United States of America

Canada

Latin America

Greater Caribbean

Antigua and Barbuda

Bahamas

Barbados

Belize

Bermuda

British Virgin Islands

Cayman Islands

Colombia

Costa Rica

Dominica

Dominican Republic

Ecuador

El Salvador

Falkland Islands (Malvinas)

French Guiana

Grenada

Grenadines

Guadeloupe

Guatemala

Guyana

Haiti

Honduras

Jamaica

Martinique

Mexico

Montserrat

Netherlands Antilles

Nicaragua

Panama

St. Kitts & Anguilla

St. Lucia

St. Pierre et Miquelon

St. Vincent

Suriname

Trinidad & Tobago

Turks and Caicos Islands

Venezuela

Rest of South America

Argentina

Bolivia

Paraguay

Peru

Brazil
Chile

Uruguay

Africa

North Africa/Eastern Mediterranean

Algeria
Egypt
Lebanon
S.P. Libyan A.J.

Mediterranean, Other
Morocco
Syrian Arab Republic
Tunisia

West Africa

Angola
Benin
Cameroon
Congo, Democratic Republic
Equatorial Guinea
Gabon
Ghana
Guinea
Guinea-Bissau

Ivory Coast
Liberia
Mali
Mauritania
Niger
Senegal
Sierra Leone
Togo

East/South Africa

Botswana
Burkina Faso
Burundi
Cape Verde
Central African Republic
Chad
Comoros

Namibia
Réunion
Rwanda
Sao Tome and Principe
Seychelles
Somalia
South Africa

Djibouti
Ethiopia
Gambia
Kenya
Lesotho
Madagascar
Malawi
Mauritius
Mozambique

St. Helena
Sudan
Swaziland
United Republic of Tanzania
Uganda
Western Sahara
Zambia
Zimbabwe

Europe

North Europe

Austria
Belgium
Denmark
Finland
Germany
Iceland
Ireland

Luxembourg
Netherlands
Norway
Sweden
Switzerland
United Kingdom

South Europe

France
Greece
Italy

Portugal
Spain
Turkey

Eastern Europe

Albania
Bosnia and Herzegovina
Bulgaria

Poland
Romania
Serbia

Croatia
Czech Republic
Hungary
Montenegro

Slovakia
Slovenia
The Former Yugoslav Republic of Macedonia

FSU

Caspian Region

Armenia	Kyrgyzstan
Azerbaijan	Tajikistan
Georgia	Turkmenistan
Kazakhstan	Uzbekistan

Russia & Other FSU (excluding Caspian region)

Belarus	Moldova
Estonia	Russia
Latvia	Ukraine
Lithuania	

Middle East

Bahrain	Oman
I.R. Iran	Qatar
Iraq	Saudi Arabia
Jordan	United Arab Emirates
Kuwait	Yemen

Asia-Pacific

OECD Pacific

Australia

New Zealand

Japan

Republic of Korea

Pacific High Growth – non OECD Industrializing

Brunei Darussalam

Hong Kong, China

Indonesia

Malaysia

Philippines

Singapore

Chinese Taipei

Thailand

China

Rest of Asia

Afghanistan

Bangladesh

Bhutan

Cambodia

Christmas Island

Cook Island

Fiji

French Polynesia

Guam

India

Democratic People's Republic of Korea

Lao People's Democratic Republic

Macao

Maldives

Mongolia

Myanmar

Nauru

Nepal

New Caledonia

Pakistan

Papua New Guinea

Solomon Islands

Sri Lanka

Timor

Tonga

Vietnam

Wake Islands

Annex D

Major data sources

BP Statistical Review of World Energy

Cedigaz

Direct Communications to the Secretariat

Economist Intelligence Unit online database

ENI, World Oil and Gas Review

Energy Intelligence Research, The Almanac of Russian and Caspian Petroleum

EnSys Energy & Systems, Inc

Hart Downstream Energy Services, World Refining and Fuels Service

Hart Downstream Energy Services, Refinery Tracker

IEA, Quarterly Energy Prices & Taxes

IHS/Cambridge Energy Research Associates

IHS Global Insight

IMF, Direction of Trade Statistics

IMF, International Financial Statistics

IMF, World Economic Outlook

Intergovernmental Panel on Climate Change

International Civil Aviation Organization (ICAO), ICAO's data set, <http://www.icao-data.com>

International Fuel Quality Center, Worldwide Automotive Fuel Specifications

International Oil Companies, Annual Reports

International Road Federation, World Road Statistics

National Oceanic & Atmospheric Administration, 'Monthly Climatic Data for the World'

National Sources

OECD Trade by Commodities

OECD/IEA, Energy Balances of non-OECD countries

OECD/IEA, Energy Balances of OECD countries

OECD/IEA, Energy Statistics of non-OECD countries

OECD/IEA, Energy Statistics of OECD countries

OECD, International Trade by Commodities Statistics

OECD, National Accounts of OECD Countries

OECD, OECD Economic Outlook

OPEC Annual Statistical Bulletin

OPEC Monthly Oil Market Report

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UN, Department of Economic and Social Affairs, online database

UN, Energy Statistics

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