

SPE Webinar



The International Energy Agency's Sustainable Development Scenario

Kamel Ben Naceur
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Outline



- The current energy context
- Sustainability requirements
- The IEA's New Policies Scenario
- The IEA's Sustainable Development Scenario
- Implications for the oil and gas sector



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THE INTERNATIONAL ENERGY AGENCY (IEA)



- The International Energy Agency – IEA -(different from the AIEA, and the EIA)
 - Major Role in the 3 E's
 - Energy Security and Supply
 - Economic Growth
 - Environmental protection
 - Publishes every year the World Energy Outlook and the Energy Technology Perspectives and over 30 books related to energy
 - Collects and disseminates several energy statistics at the country, regional, and worldwide levels
 - Very large energy technology network, encompassing 45 energy systems and technologies, and over 6,000 energy experts



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OTHER INFORMATION SOURCES ON ENERGY



- The OPEC: Focus on Oil, publishes the annual World Oil Outlook
- The Energy Information Agency - EIA
- Other Agencies and Organizations
 - The World Energy Council (WEC), IRENA, REN21
 - The United Nations Development Program (UNDP) and the UNFCCC, UNECE, IPCC
 - The International Energy Forum (IEF), World Bank, Int. Mon. Fund
- Energy Companies: BP, Shell, ExxonMobil, ENI, EQUINOR, Total, DNV
- Energy Analysts: IHS, WoodMcKenzie ...
- Financial Analysts, Consulting Firms
- SPE, Energy journals (Hart, OGJ ...)
- Academia
- Think-Tanks

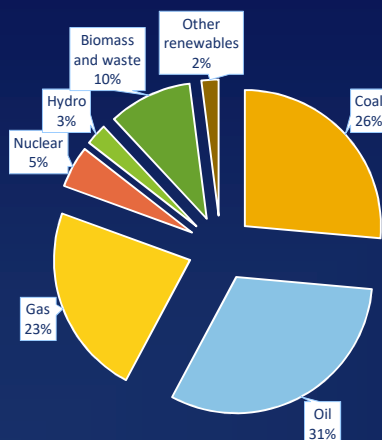


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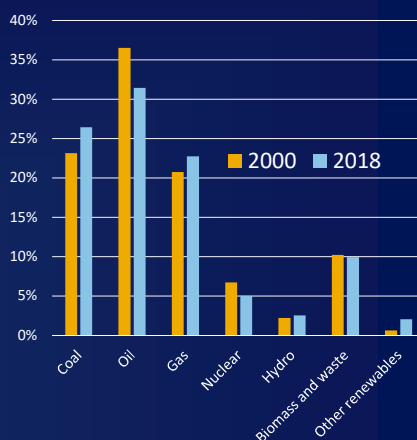
Today's Energy Context



Primary Energy in 2018



Primary Energy Share 2000-2018



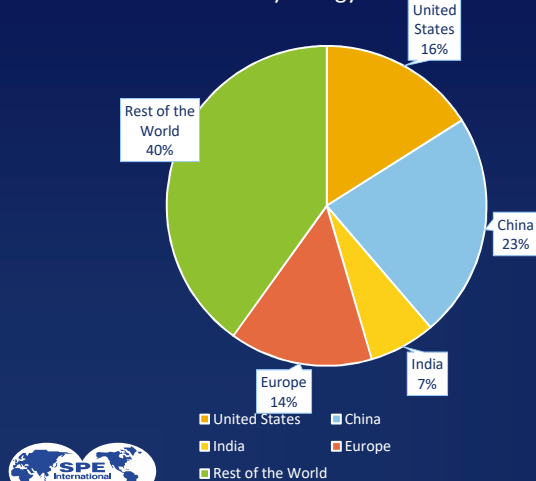
Source: IEA, bp, Nomadia

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Today's Energy Context

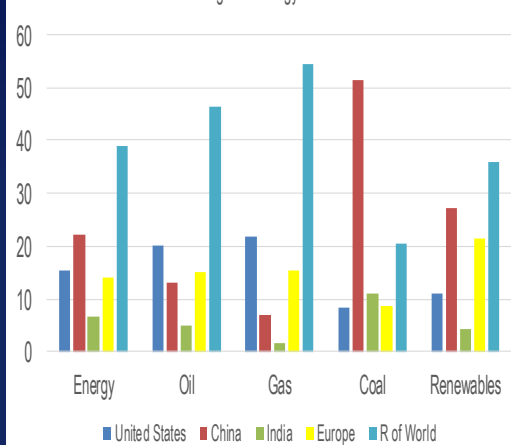


Primary Energy Demand



Source: IEA, Nomadia

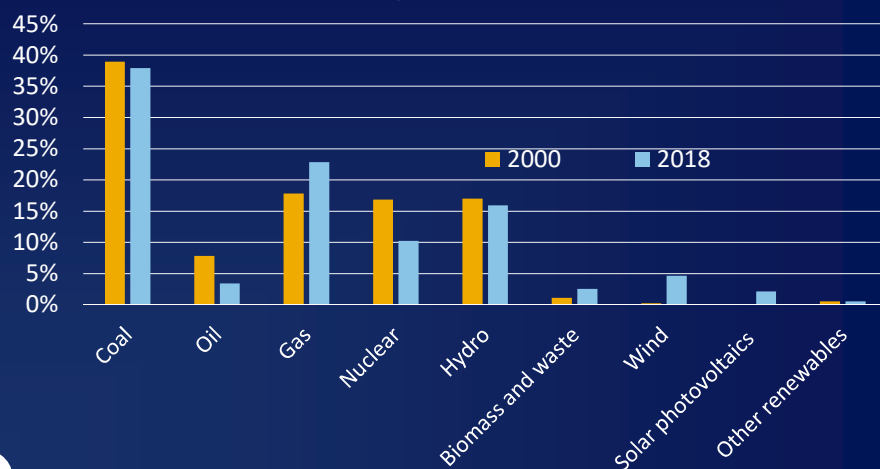
Regional Energy Share



Today's Energy Context



Electricity Share 2000-2018



Source: IEA, bp, Nomadia

Energy-related CO₂ emissions rising again !

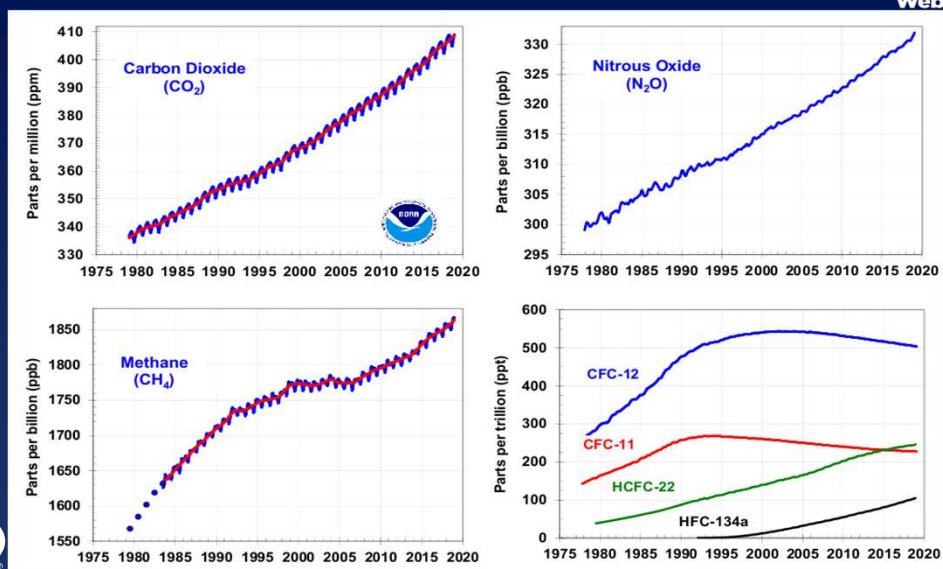


	Total CO ₂ emissions (Mt CO ₂)	Growth Rate (%)
	2018	2017-2018
United States	4 888	3.1%
China	9 481	2.5%
India	2 299	4.8%
Europe	3 956	-1.3%
Rest of the World	11 249	1.1%
WORLD	33 143	1.7%



Source: IEA, - 2019

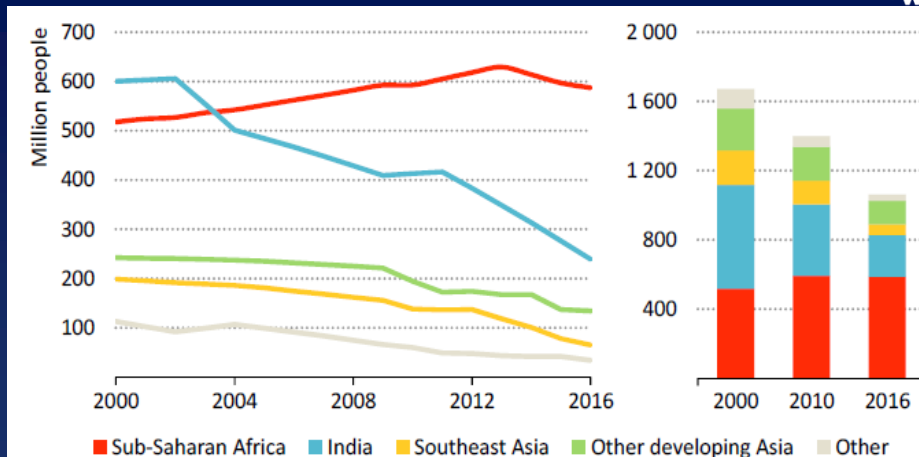
Rising Greenhouse Gas (GHG) Emissions



Source: NOAA, 2019



One Billion people without electricity access



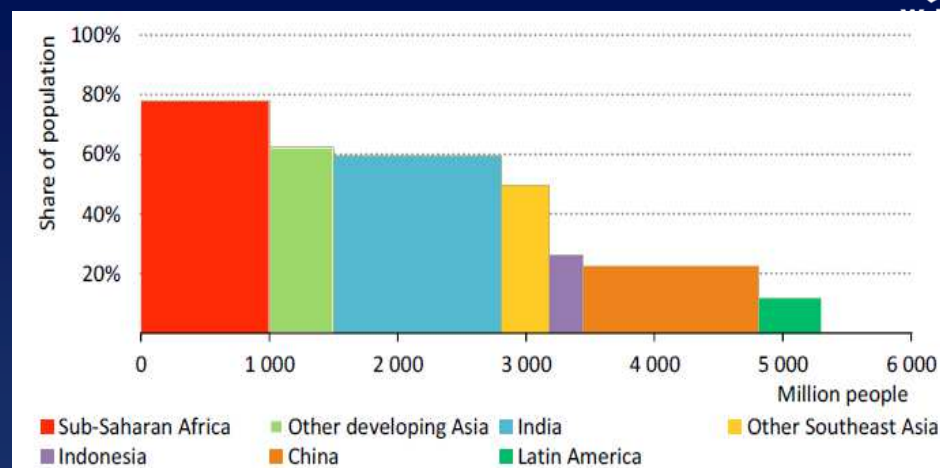
Progress on electricity access is being made in all parts of the world, led by developing countries in Asia, in particular India



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Source: WEO 2017

Nearly 3 billion people are relying on old cooking methods

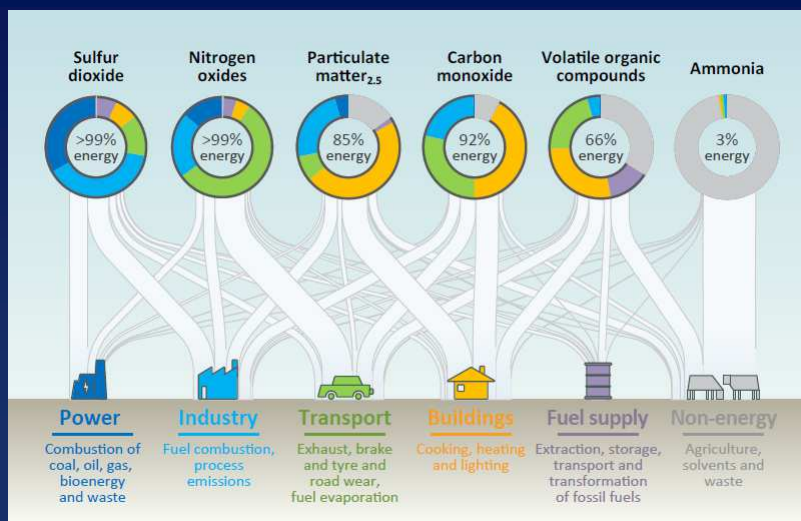


Many parts of sub-Saharan Africa and Asia rely heavily on biomass for cooking

Sources: IEA analysis; WHO Household Energy Database.



Selected primary air pollutants and their sources (2015)



Source: WEO

Air Pollution: The fourth largest human health risk



- Air pollution
 - 3.5 million premature deaths are linked to energy poverty due to the use of biomass for cooking and kerosene for lighting
 - 3 million premature deaths are linked to outdoor air pollution, mostly in cities
- Many of its root causes – and cures – are in the energy sector
 - The majority of air pollutant emissions comes from the energy sector, mainly from fuel combustion
 - Currently only 8% of global energy production is combustion free: more than half of the rest has no effective technology in place to control emissions
 - No country in the world has solved the air pollution problem completely, but many are taking important policy steps



Source: WEO, WHO

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Defining sustainable development



- **Sustainable development** has been **defined** in many ways, but the most frequently quoted **definition** is from Our Common Future, also known as the **Brundtland Report**:

"**Sustainable development** is **development** that meets the needs of the present without compromising the ability of future generations to meet their own needs."



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The 17 United Nations Sustainable Development Goals (UN-SDG)



The 17 Sustainable Development Goals are the blueprint to achieve a better and more sustainable future for all. They address the global challenges we face, including those related to poverty, inequality, climate, environmental degradation, prosperity, and peace and justice. The Goals interconnect and in order to leave no one behind, it is important that we achieve each Goal and target by 2030.



Source: UN

The 17 United Nations Sustainable Development Goals (UN-SDG)



Source: UN

The UN SDG#7: Affordable and Clean Energy



- SDG 7.1: By 2030, ensure **universal access** to affordable, reliable and modern energy services
- SDG 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix
- SDG 7.3: By 2030, double the global rate of improvement in energy efficiency



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SDG status related to energy



- Over 1 billion people w/out electricity
- 3 billion without modern energy
- 6.5 million deaths annually due to air quality
- Little progress in recycling



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Source: UN

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Many long-term energy projections: Plausible scenarios, Outlooks, Normative



Organization/Report	Plausible scenarios	Outlooks	Normative scenarios
Shell	Mountain, Ocean		Sky
Equinor	Reform, Rivalry		Renewal
BP		Evolving Transition	
Exxon		Reference	
DNV-GL		Reference	
IEA: World Energy Outlook, Energy Tech. Perspectives		CPS, SDS	SDS, WB2DS
World Energy Council	Modern Jazz, Unfinished Symphony, Hard Rock		



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Source: WEC

The IEA's long-term energy scenarios



The IEA has two types of long-term energy scenarios:

- Outlooks
 - Current Policies Scenario (CPS) considers the impact of only those policies and measures that are firmly enshrined in legislation as of mid-2018.
 - New Policies Scenario (NPS) is the central scenario of this *Outlook*, and aims to provide a sense of the direction in which the most recent policy ambitions could take the energy sector. In addition to incorporating policies and measures that governments around the world have already put in place, it also takes into account the effects of announced policies, as expressed in official targets and plans (e.g. the Nationally Determined Contributions of the Paris Agreement)



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The IEA's long-term energy scenarios

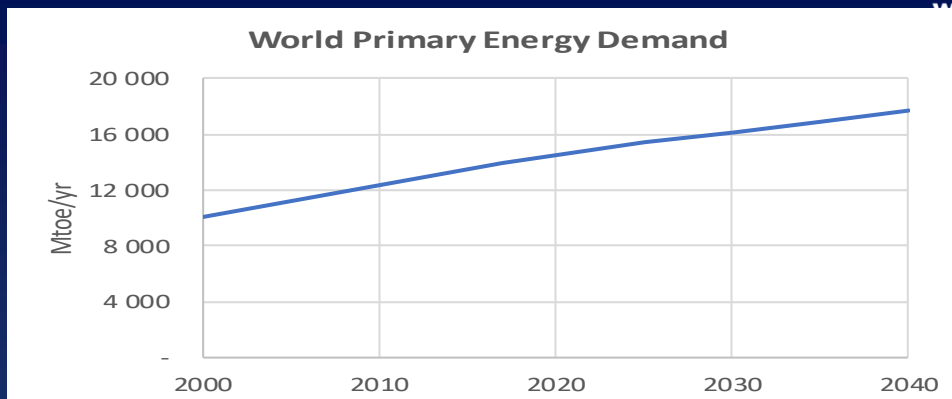


- Outlooks
 - Current Policies Scenario (CPS)
 - New Policies Scenario (NPS)
- Normative scenarios
 - **450 Scenario** assumes a set of policies with the objective of limiting the average global temperature increase in 2100 to 2 degrees Celsius (2 °C) above pre-industrial levels.
 - **Sustainable Development Scenario (SDS)**
 - **Well Beyond 2 °C (towards 1.5 °C)**



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The IEA's New Policies Scenario

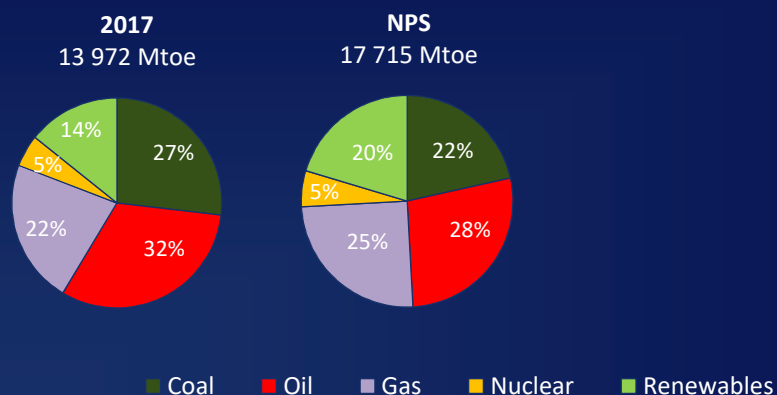


- In the New Policies Scenario, primary energy demand will increase by 27% between 2017 and 2040
- The increase is required to meet rises in GDP, population and urbanization rate



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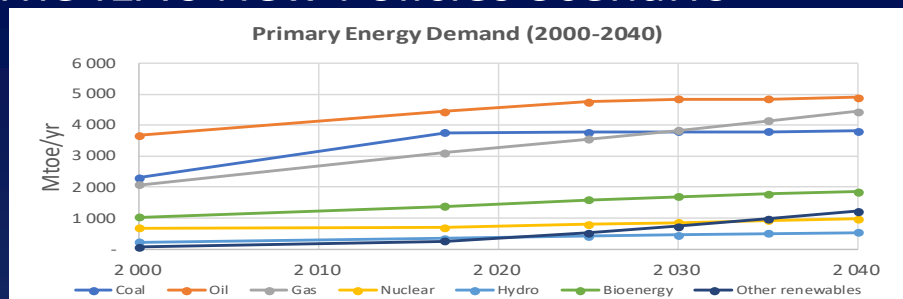
Shares of fuels in world primary energy demand today and in 2040 by scenario



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Source: WEO

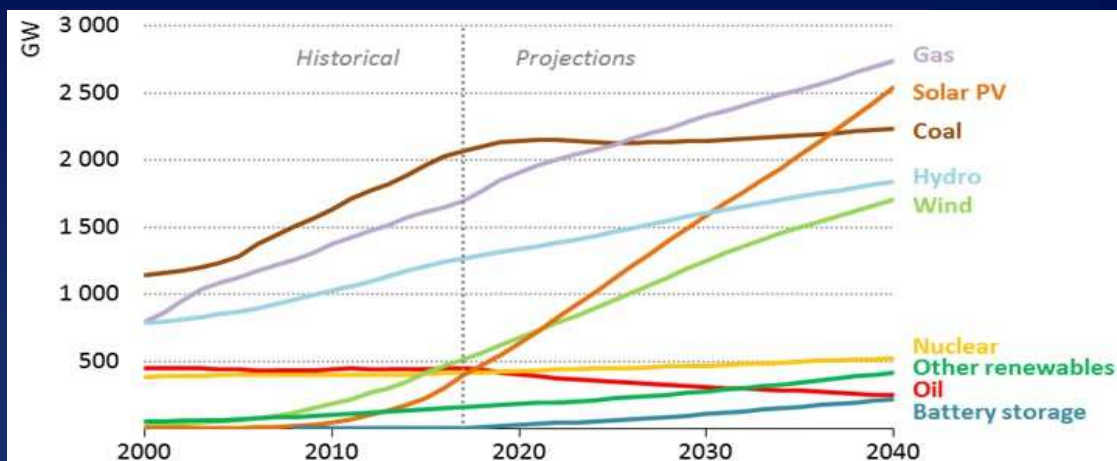
The IEA's New Policies Scenario



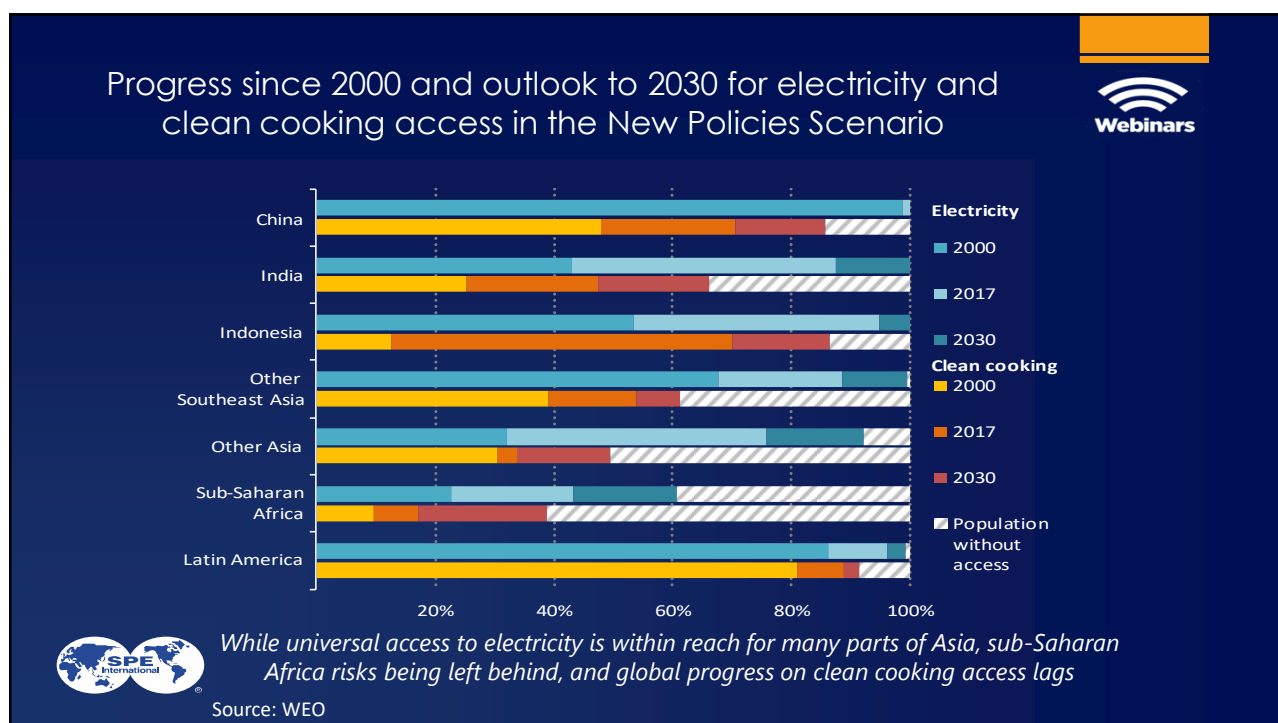
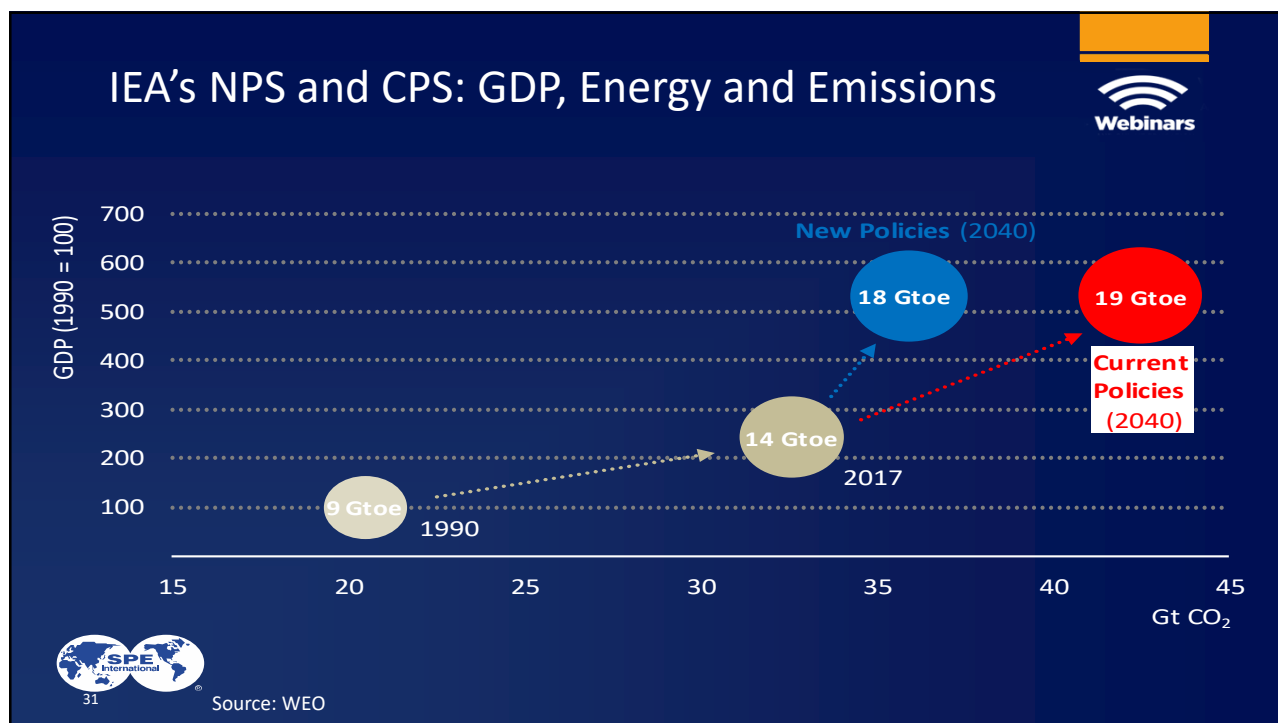
	2000 Share	2040 Share	Ann. Growth→2040
Coal	23.0	21.5	0.1
Oil	36.6	27.6	0.4
Gas	20.7	25.0	1.6
Nuclear	6.7	5.5	1.5
Hydro	2.2	3.0	1.8
Bioenergy	10.2	10.4	1.3
Other renewables	0.6	6.9	7.1



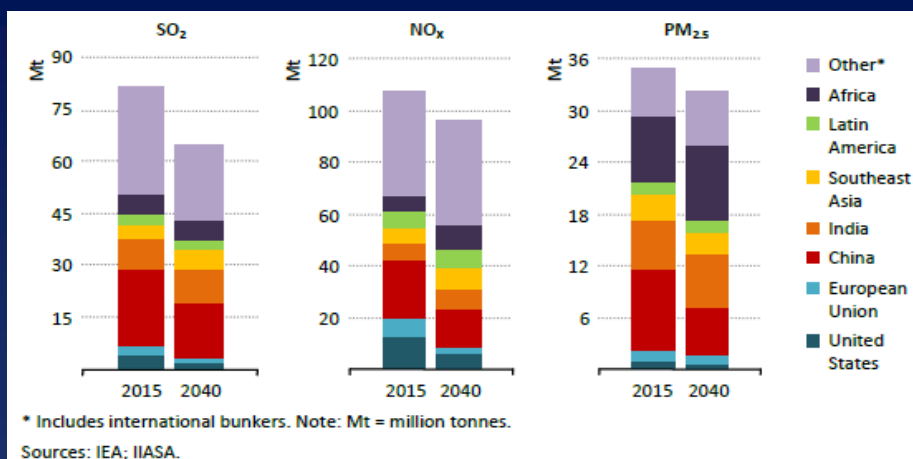
Rise of Solar PV and Wind in the Electricity Mix Gas Remains 1st source in 2040



Source: WEO

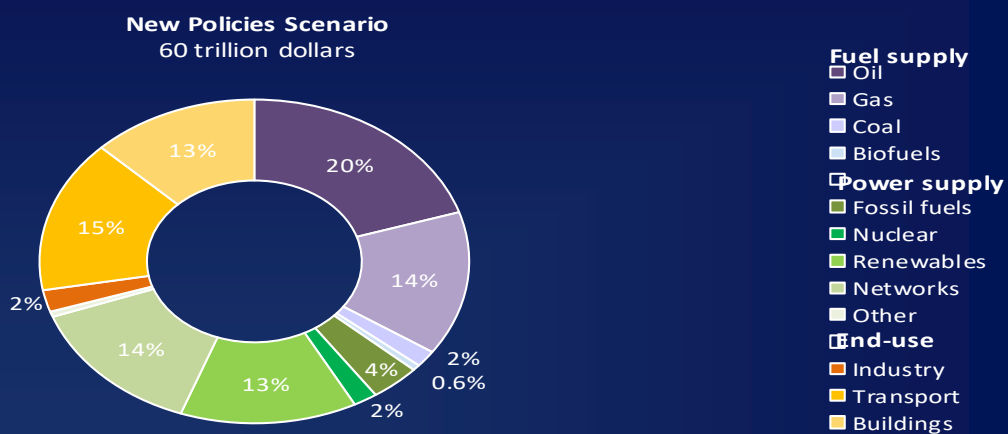


The New Policies Scenario: Impact on air pollution and premature deaths



*Pollutant emissions generally fall in the New Policies Scenario
But number of deaths from outdoor pollution increases from 3 to 4.5 millions, while
Number of deaths from indoor pollution declines from 3.5 to 2.9 millions*

Energy Investment Required between 2018 and 2040 (NPS)



An average 1 trillion dollars per year is required for oil and gas between 2018 and 2040

Source: WEO

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The IEA's Sustainable Development Scenario



The IEA Sustainable Development Scenario starts from the objectives to be achieved and then assesses what combination of actions would deliver them.

These objectives are derived from the Sustainable Development Goals (SDGs) of the UN providing an energy sector pathway that achieves:

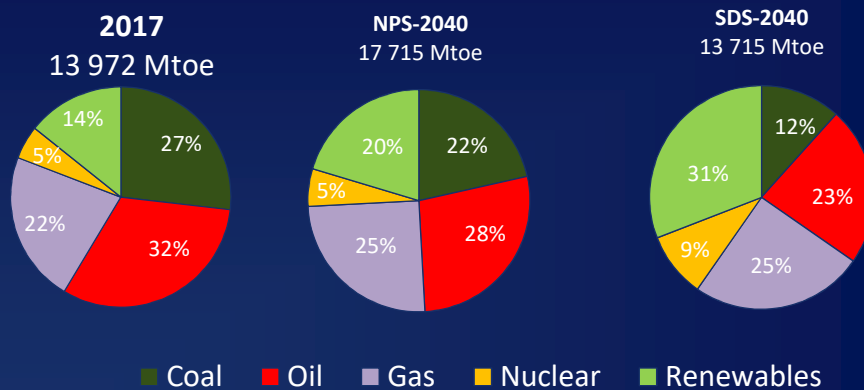
- Universal access to affordable, reliable and modern energy services by 2030 (SDG 7.1);
- A substantial reduction in air pollution (SDG 3.9);
- And effective action to combat climate change (SDG 13).

On the latter point, the Sustainable Development Scenario is fully aligned with the goal of the Paris Agreement to hold the increase in the global average temperature to **well below 2 °C** above pre-industrial levels.



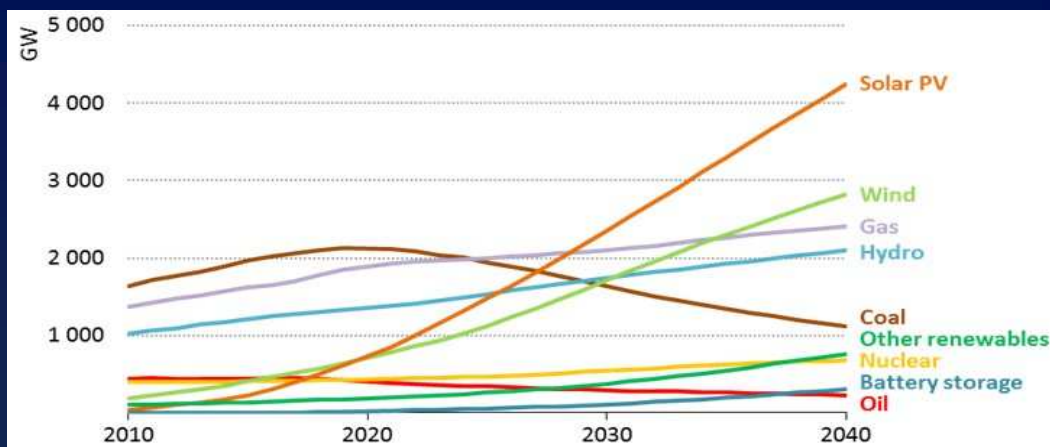
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Shares of fuels in world primary energy demand today and in 2040 by scenario



Source: WEO

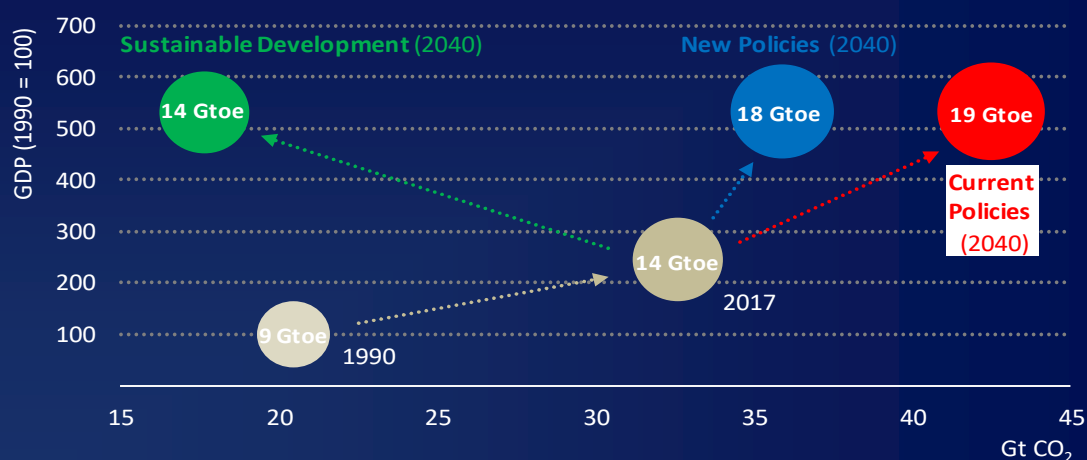
Total power generation capacity in the Sustainable Development Scenario



Source: WEO

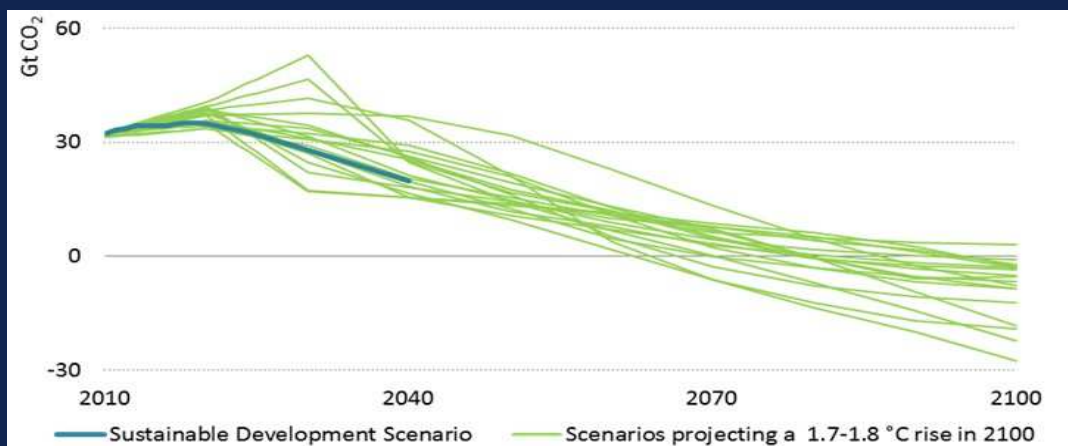
*Solar PV takes the lead in installed capacity before 2030;
unabated coal capacity declines from 2020*

IEA's SDS vs NPS and CPS: GDP, Energy and Emissions



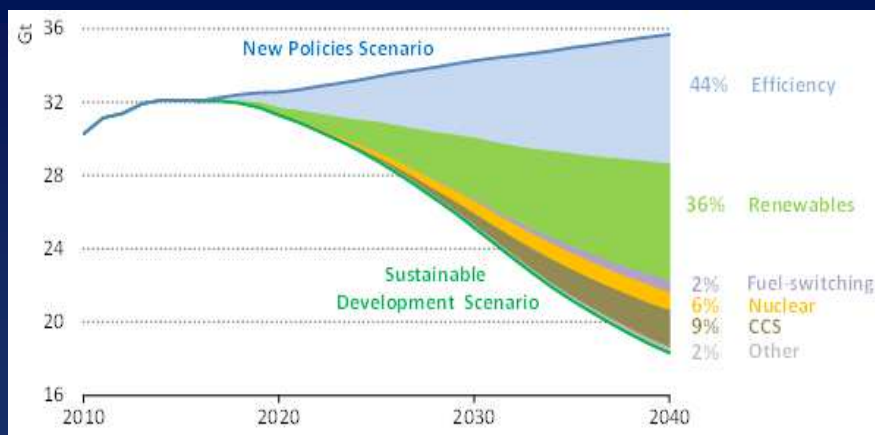
Source: WEO

CO₂ emissions in the Sustainable Development Scenario and other "well below 2°C" scenarios (1.7-1.8 °C)



The CO₂ emissions trajectory to 2040 in the SDS is at the lower end of a range of scenarios projecting a global temperature rise of 1.7-1.8 °C in 2100

Decarbonization requirements for a sustainable scenario

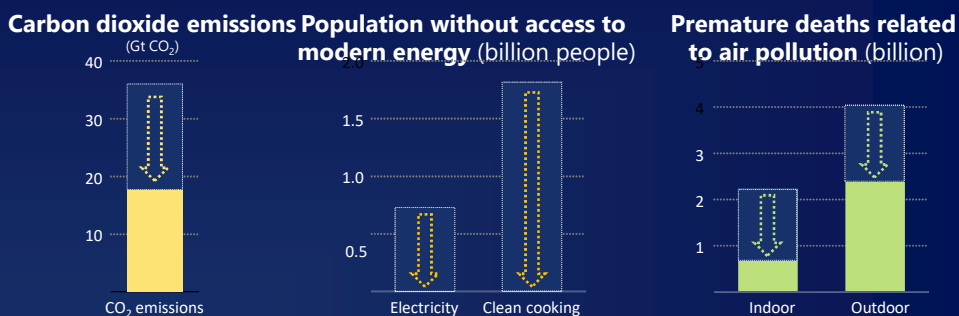


- An average abatement 9 Gt of CO₂ per year is required between now and 2040
- The main 3 decarbonization wedges represent nearly 90% of the requirement



Source: IEA-WEO 2018

Outcomes of the Sustainable Development Scenario vs. New Policies Scenario, 2040



In an integrated approach, universal energy access can be reached while also achieving climate goals and reducing air pollutant emissions, at little extra cost



Source: WEO

Policy Enablers: Carbon Pricing Mechanisms



- Carbon taxes
 - Explicit systems
 - Implicit systems (transportation)
- Emissions trading schemes
 - Cap and trade systems
 - Performance standard / Baseline and credit systems
- Carbon pricing has the potential to radically decarbonize global economic activity by changing the behavior of consumers, businesses, and investors while unleashing technological innovation and generating revenues that can be put to productive use (World Bank)
- Triple benefits: Environment, Drive investments, Raise revenues



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Status of Carbon Pricing Mechanisms



- 2018: 45 national and 28 subnational jurisdictions are putting a price on carbon
- Carbon prices varies from less than \$1 to \$140 /tCO₂
- An annual 50% increase in Government revenues from \$22 in 2016 to \$33 billion in 2017
- ETS + Carbon taxes amounted to \$82 billion
- The Chinese government launched its development plan for a national emissions trading system in late 2017 with the potential to be the world's largest carbon market
- United States: The Energy Innovation and Carbon Dividend Act (H.R. 763)



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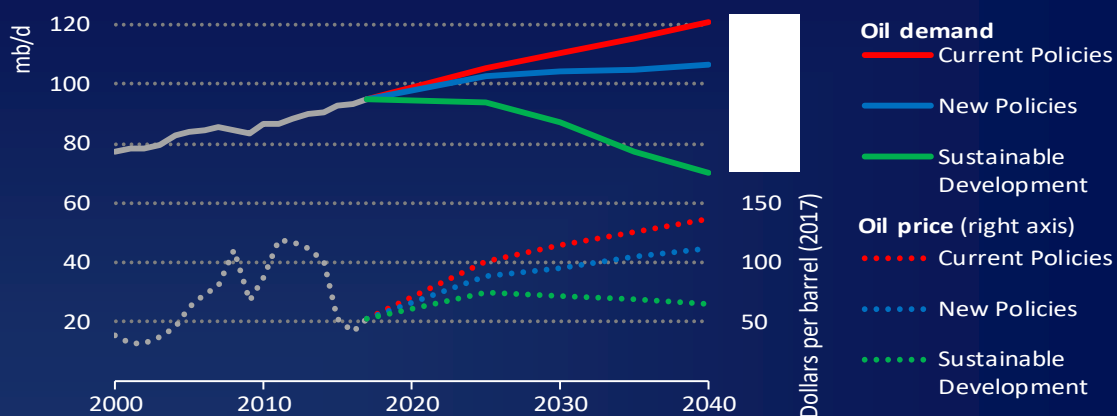


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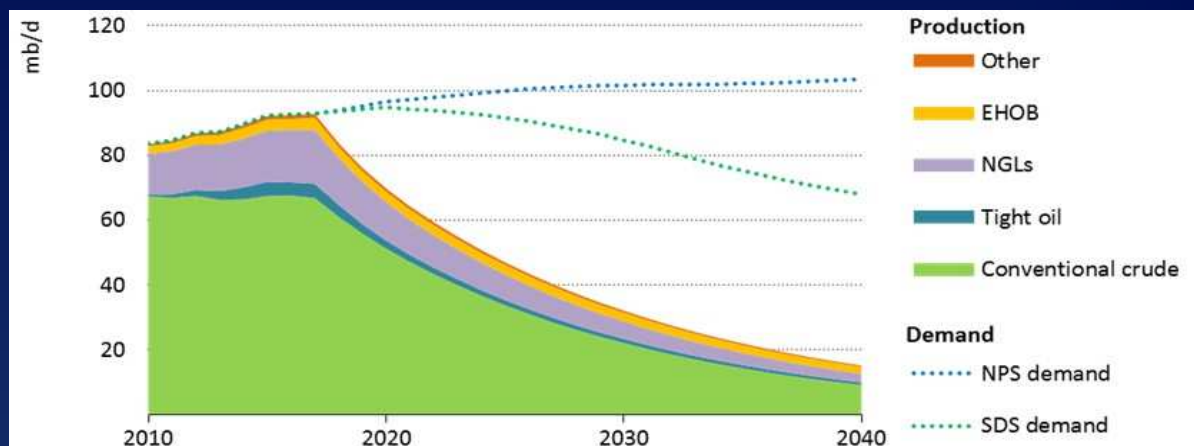
Global oil demand and prices by scenario



In 2040, oil demand in the Current Policies Scenario is 51 mb/d higher than in the Sustainable Development Scenario

Source: WEO

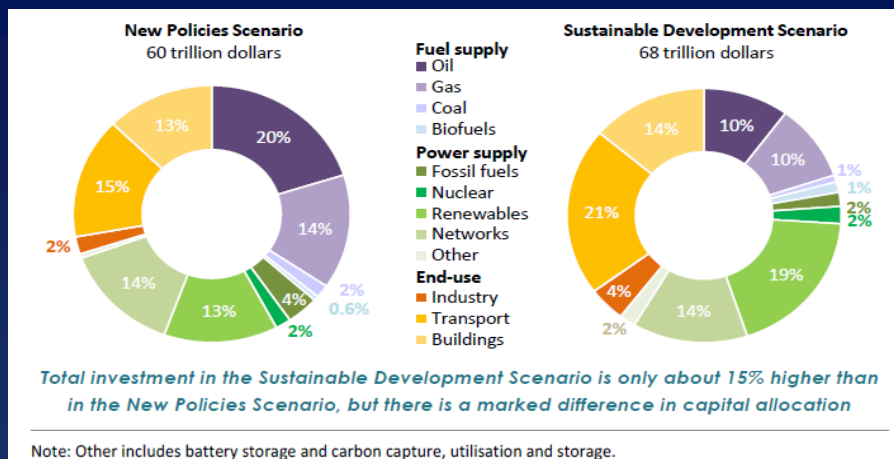
Oil production with no new investment from 2018 and demand in the New Policies and Sustainable Development Scenarios



investment, global oil production would halve by 2025: an average loss of nearly 6 mb/d every year

Source: WEO

An additional \$8 trillion is required in energy investment (~13% more than NPS)



- An average \$ 400 billion per year additional investment
- Average 50\$/t CO₂

Source: IEA-WEO 2018

The Sustainable Development Scenario in numbers



The Sustainable Development Scenario in 2040

875

million electric
vehicles

2

times
more efficient
than today

3 250_{GW}

global solar PV capacity

580_{bcm}

additional gas demand

Only 13% additional investment is required to 2040 to achieve the Sustainable Development Scenario, with two-thirds of energy supply investment going to electricity generation & networks



Source: WEO

Summary



- The current energy context continues to be dominated by fossil fuels, rising GHG emissions, energy poverty, and air quality issues
- Sustainability requirements: The United Nations SDG7, Paris Agreement
- The IEA's New Policies Scenario leads to rising GHG emissions, continuing energy poverty and deteriorating air quality
- The IEA's Sustainable Development Scenario provides a sustainable pathway with limited cost implications, while leading to a transformation of the energy sector



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