Today’s energy context

- Mixed signals about the pace & direction of change in global energy:
  - Oil markets are entering a period of renewed uncertainty & volatility.
  - Natural gas is on the rise: China’s rapid demand growth is erasing talk of a ‘gas glut’.
  - Solar PV has the momentum while other key technologies & efficiency policies need a push.
  - Growing disconnect between climate goals and energy-market trends.
  - For the first time, the global population without access to electricity fell below 1 billion.

- **Electricity** is carrying great expectations, but questions remain over the extent of its reach in meeting demand & how the power systems of the future will operate.

- Policy makers need well-grounded insights about different possible futures & how they come about.
Global CO₂ emissions are on the rise in 2018; Even in advanced economies – where they had been flat for 5 years – emissions are set to increase in 2018.
In 2000, more than 40% of global demand was in Europe & North America and some 20% in developing economies in Asia. By 2040, this situation is completely reversed.
The increase in demand would be twice as large without continued improvements in energy efficiency, a powerful tool to address energy security & sustainability concerns.
Can US shale alone avoid a turbulent oil market?

Global oil outlook

Oil demand looks robust in the near term; if approvals of new conventional projects remain low, market stability would require continuous exceptional growth in US shale.
China – the emerging giant of gas demand

Developing countries in Asia – led by China – dominate the rise in long-distance gas trade; more than 80% of the growth to 2040 comes in the form of LNG.
India and southeast Asia will lead coal demand growth while it will continue to decline in Europe and United States.
Our energy destiny rests with governments

Total investment in energy supply to 2040:
$42.3 trillion

More than 70% of the $2 trillion required each year in energy supply investment either comes from state-directed entities or receives a full or partial revenue guarantee.
### Phases of Integration with Variable Renewables Share, 2030

- **Integration phase**

<table>
<thead>
<tr>
<th>Integration phase</th>
<th>Wind and solar PV share of generation</th>
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<tbody>
<tr>
<td>1</td>
<td>0%</td>
</tr>
<tr>
<td>2</td>
<td>10%</td>
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<tr>
<td>3</td>
<td>20%</td>
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<td>4</td>
<td>30%</td>
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<tr>
<td>5</td>
<td>40%</td>
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<tr>
<td>6</td>
<td>50%</td>
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**All sources of flexibility needed**

**Targeted investment in flexibility needed**

**Mobilise existing power system flexibility**

*Higher shares of variable renewables raise flexibility needs and call for reforms to deliver investment in power plants, grids & energy storage, and unlock demand-side response.*
Two directions for nuclear power

The contribution of nuclear power could decline substantially in leading markets, while large growth is coming, as China takes first position within a decade.
What if the future is electric?

Increased electrification leads to a peak in oil demand, avoids 2 million air pollution-related premature deaths, but does not necessarily lead to large CO₂ emissions reductions.
Can we unlock a different energy future?

Coal plants make up one-third of CO₂ emissions today and half are less than 15 years old; policies are needed to support CCUS, efficient operations and technology innovation.
Conclusions

- The links between energy & geopolitics are strengthening & becoming more complex, a major factor in the outlook for energy security.
- New dynamics in the oil demand and supply balance lead to unprecedented volatility in oil markets.
- The rapid growth of electricity brings huge opportunities; but market designs need to deliver both electricity and flexibility to keep the lights on.
- There is no single solution to turn emissions around: renewables, efficiency & a host of innovative technologies, including storage, CCUS & hydrogen, are all required.
- The future pathway for energy is open: governments will determine where our energy destiny lies.