



エネルギーと環境問題の長期トレンド

エネルギー供給見通し担当部長 ティム・ゴールド

2020年以降の日本のインフラシステム輸出戦略議論に関するプレゼンテーション資料

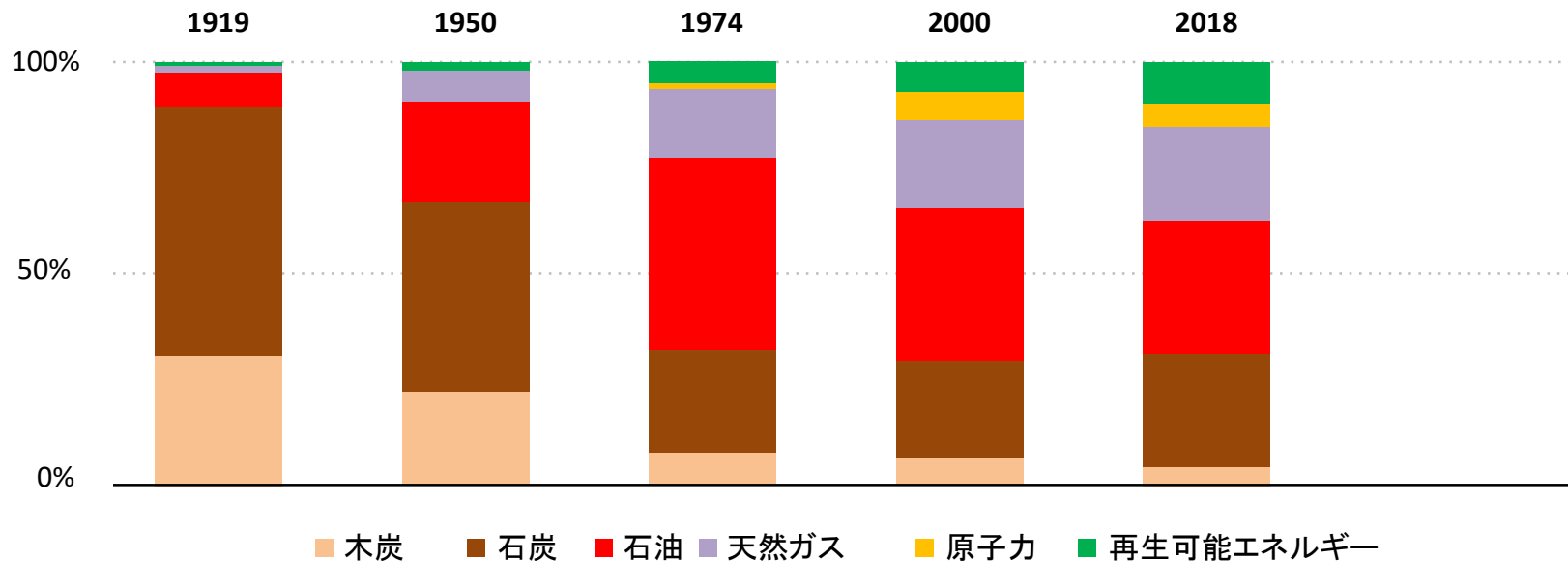
背景

COVID-19)パンデミックの影響で、世界の市場、企業、経済全体が揺らいている

- 原油価格の値崩れ等、輸送燃料の需要に影響
- その他のお燃料や技術の需要にも広く影響
- 投資計画とサプライチェーンは途絶

年のCO₂排出量は横ばい、さらに2020年には減少する見込みだが、意図していなかった理由による

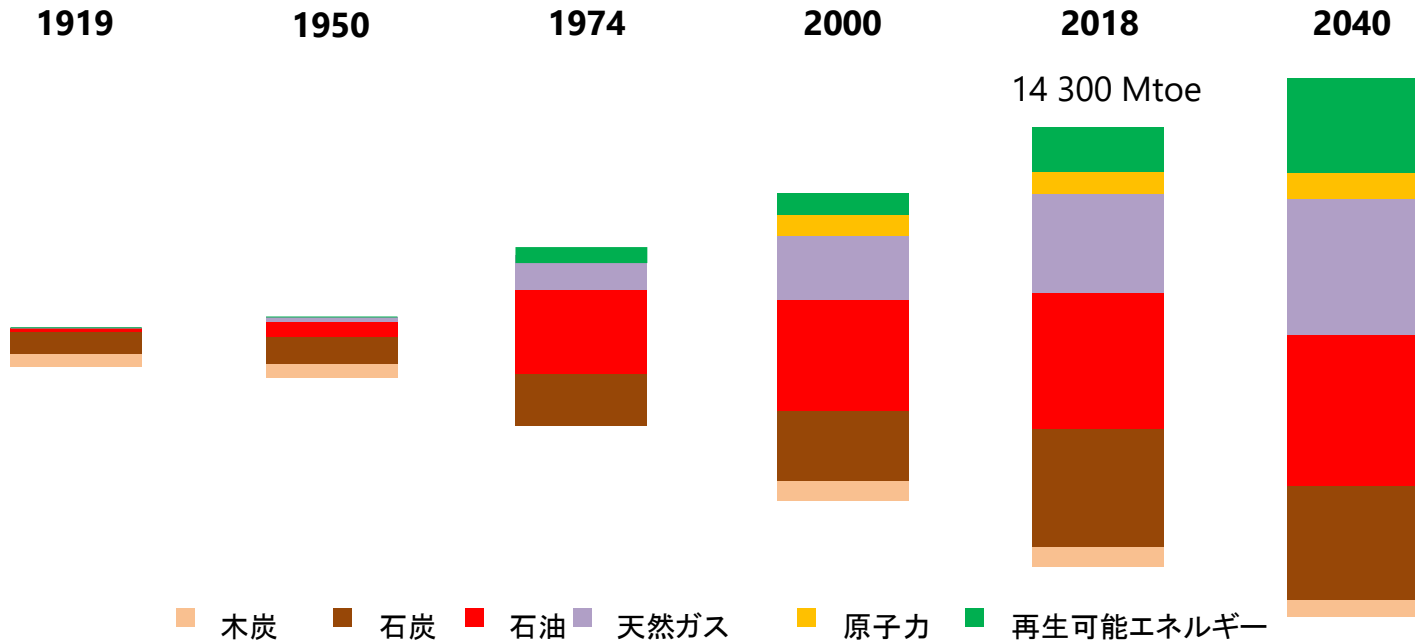
エネルギーの歴史的観点



1900年代には、燃料・技術の転換が複数回発生

エネルギーの歴史的観点

公表政策シナリオ (Stated Policies Scenario) に基づく世界のエネルギー需要

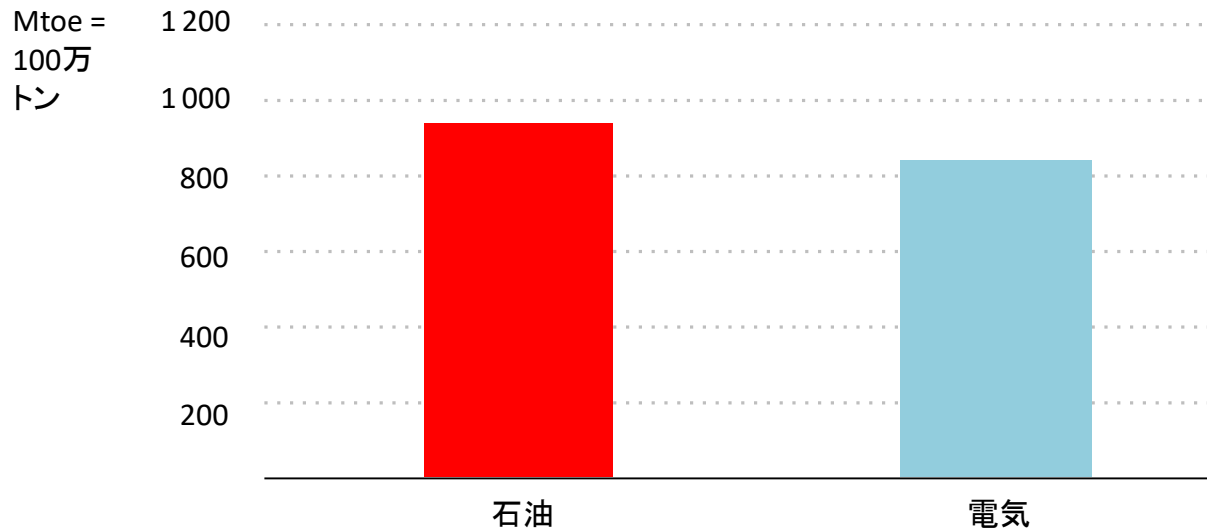


1900年代には、燃料・技術の転換が複数回発生

現在の課題はエネルギー需要の増加。世界消費は1919年以降10倍に増え、今後も増加の見込み

20年での転換

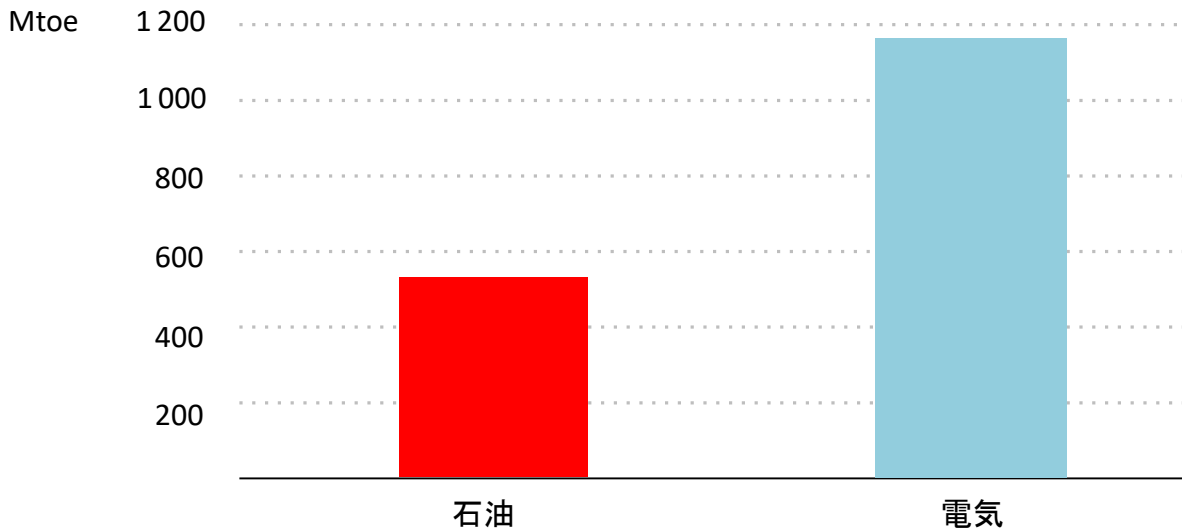
石油消費量と電力消費量の増加(2000年～2018年)



これまで、エネルギーを必要とする消費者は石油に目を向けてきた

20年での転換

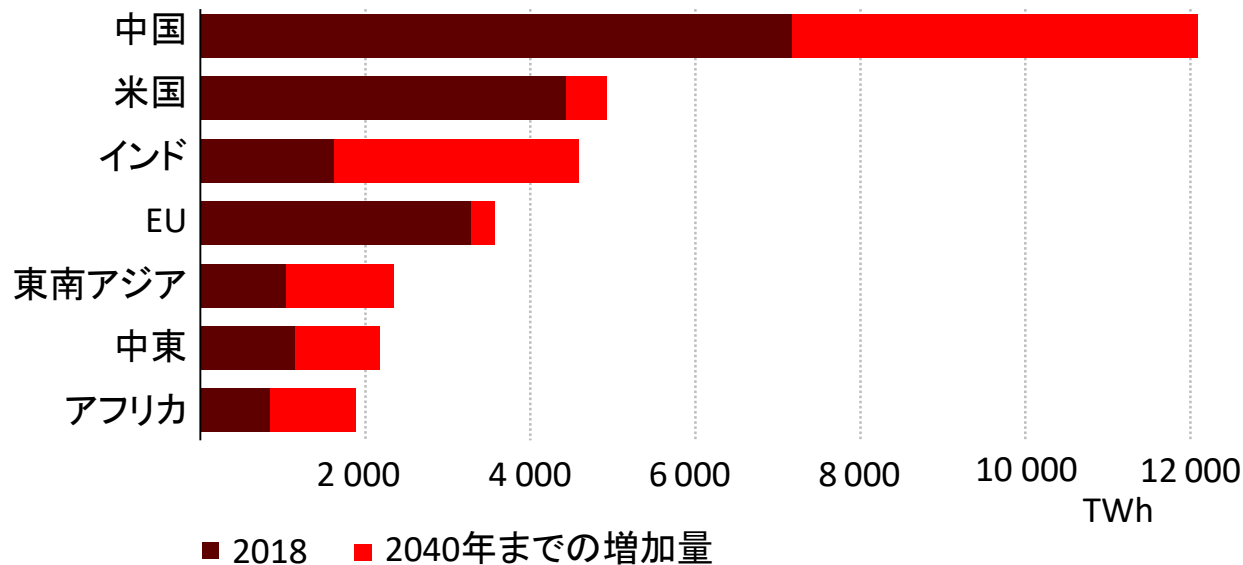
公表政策シナリオ (Stated Policies Scenario) に基づく世界の石油消費量と電力消費量の推移 (2018年～2040年)



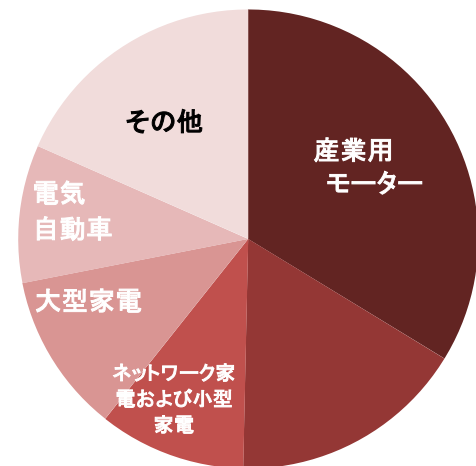
Sustainable Development Scenario) ではその傾向が強まる

電化する未来

公表政策シナリオ (Stated Policies Scenario) に基づく主要地域の発電量

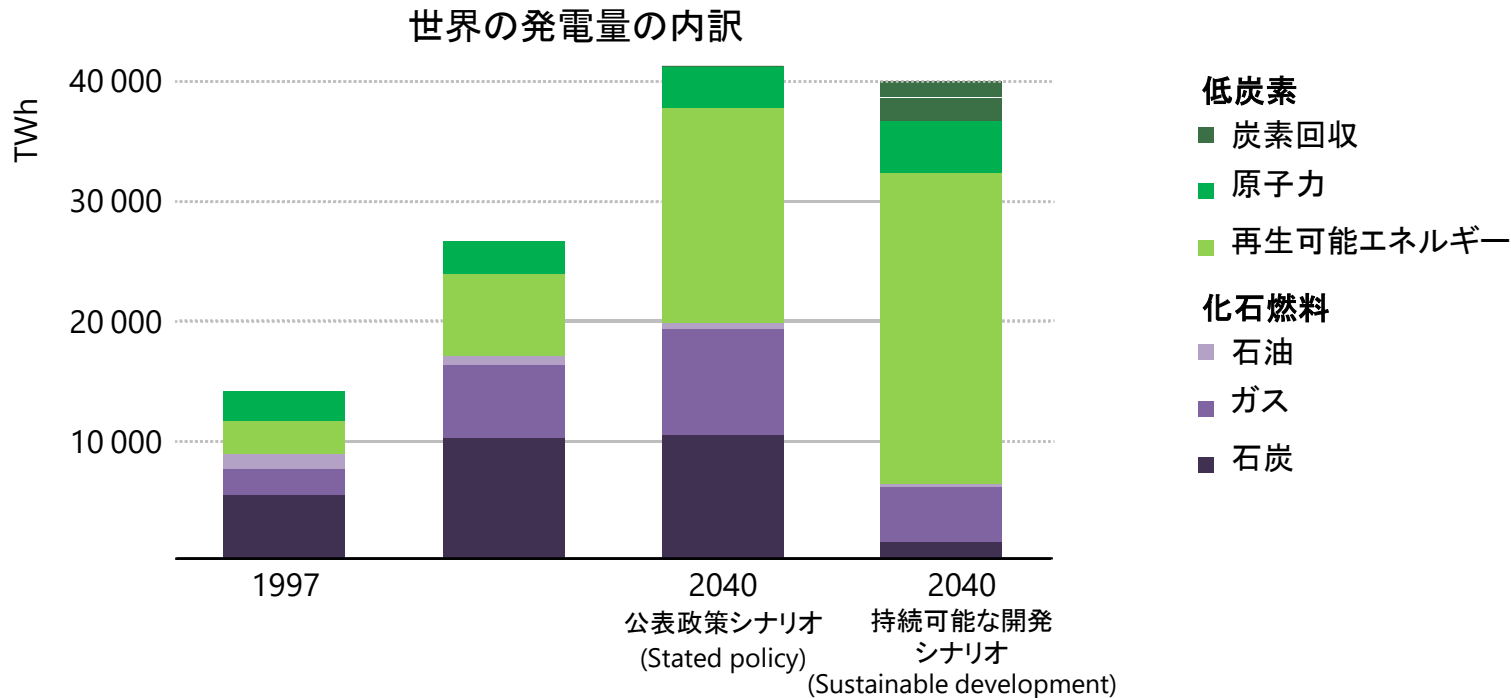


世界の電力需要増加の内訳



2040年には、インドの発電増加量は現在のEUの発電量、中国の発電増加分は現在の米国の発電量に達する

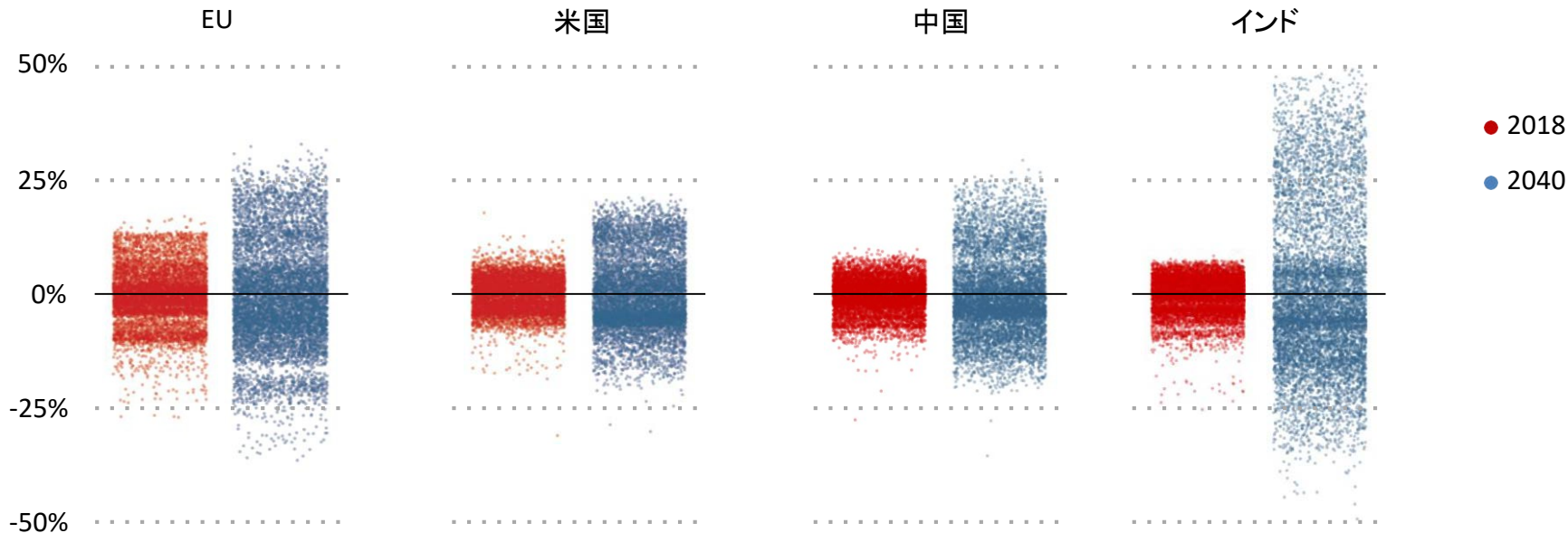
転換するエネルギーセクター



再生可能エネルギーの増加によってエネルギーミックスは変化。公表政策シナリオでは、再生可能エネルギーが2040年までの電力供給増加量の4分の3を占めるが、電力の脱炭素化には不十分

電力は現代のエネルギー安全保障の中核

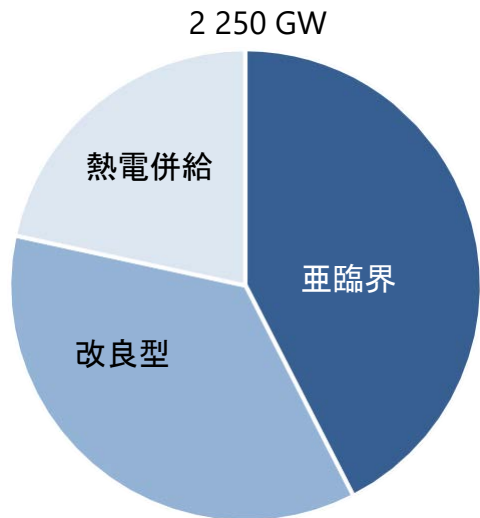
発電需要の変動で必要となる、電力システムの時間毎の調整(風力と太陽光発電)



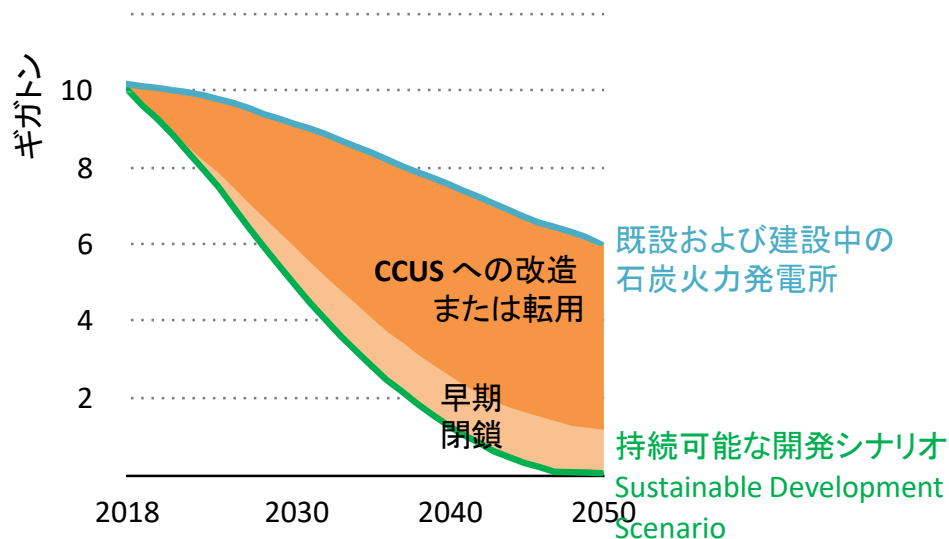
世界の電力供給に求められる柔軟性は2040年までに倍増。一方、現在の市場設計では実現するための発電所、ネットワーク、デマンドサイドレスポンス、エネルギー貯蔵(バッテリー等)などへの十分な投資は行われない可能性

現在の石炭火力発電所が残すレガシーは技術によって対処可能

石炭電源の設備容量(既設および建設中)

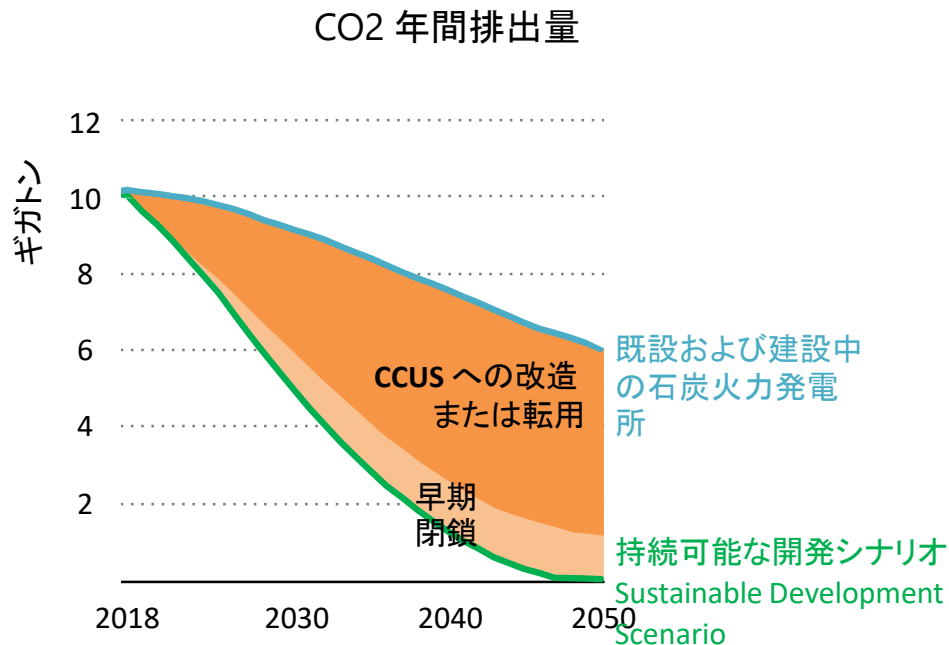
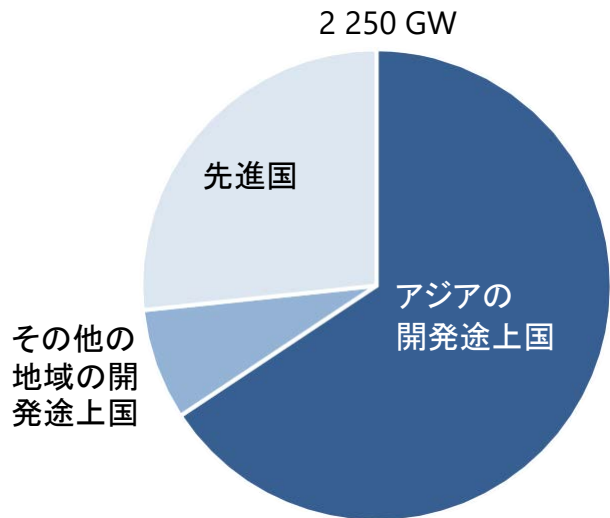


石炭火力発電所のCO₂年間排出量



新しい石炭火力発電所が気候変動対策目標に対応するためにはCCUSへの投資が不可欠。同時に、柔軟性を提供できるように転用することでCO₂と汚染物質の排出を削減し、再生可能エネルギーの統合を促進することが可能

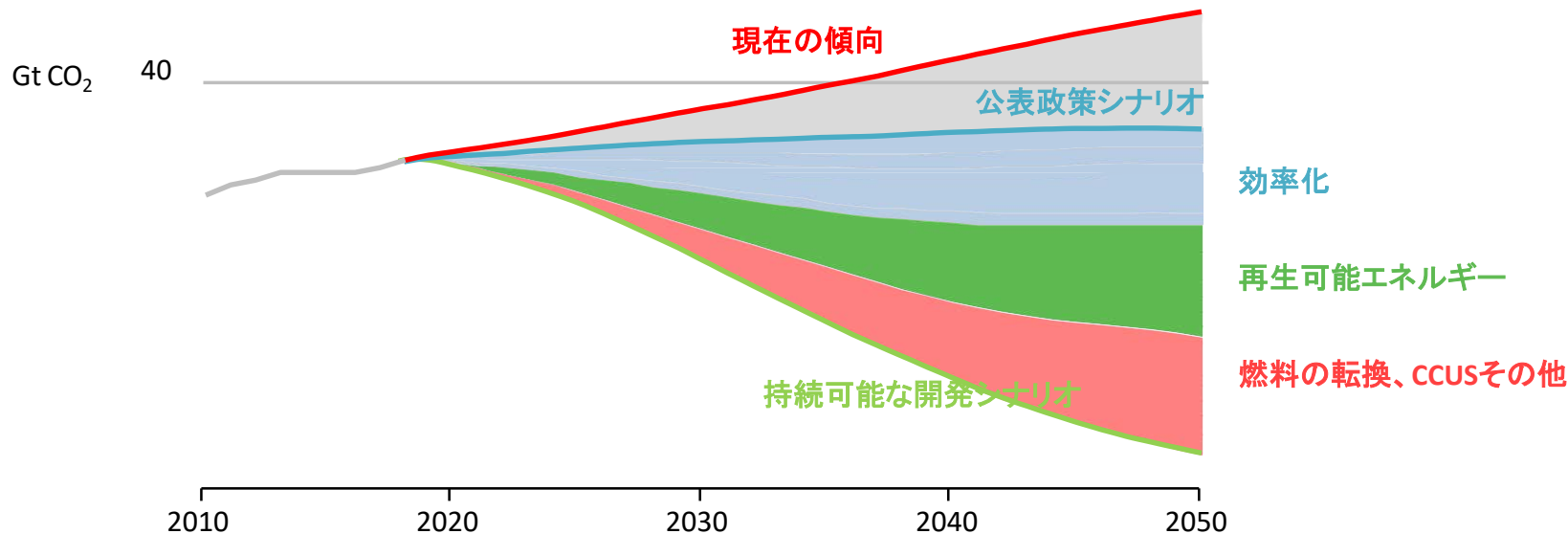
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持続可能なエネルギー目標を達成するための単一または単純な解決策はない

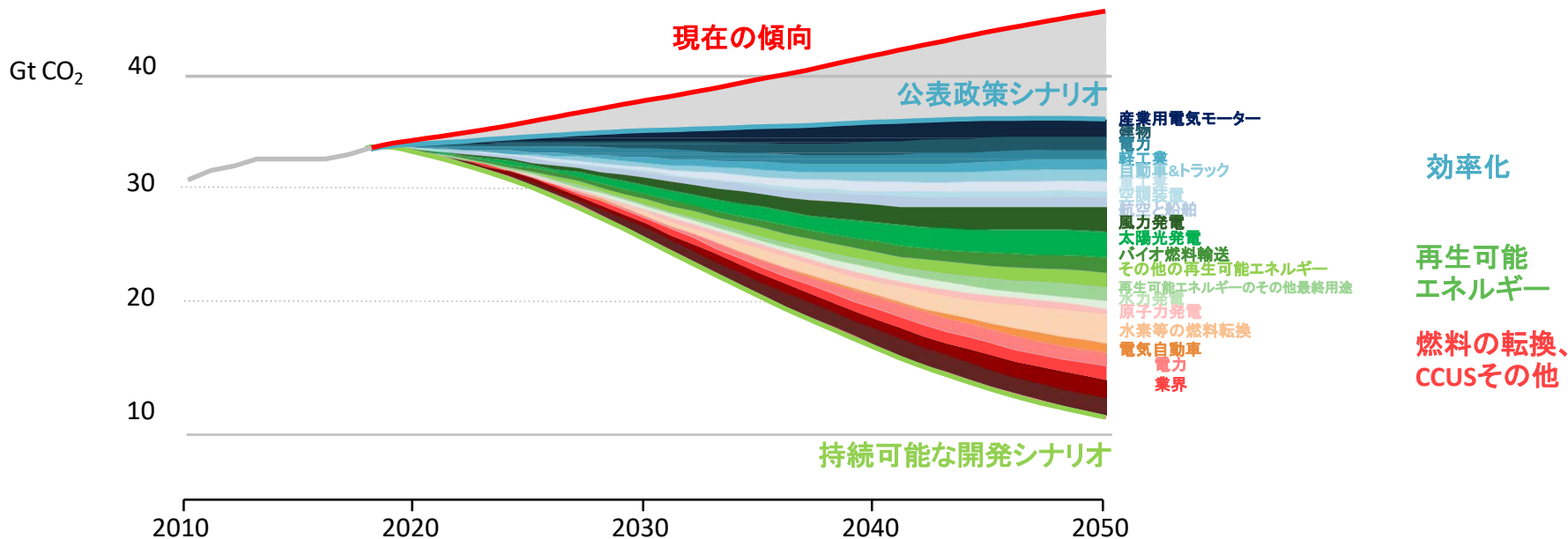
持続可能な開発シナリオ(Sustainable Development Scenario)に基づくエネルギー関連のCO₂ 排出量と削減量の内訳



気候変動対策目標の達成圏内に入るには、全セクターにわたる多くの政策と技術が必要になる。
加えて、1.5°C目標の達成を促進するには、さらなる技術革新が不可欠である。

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持続可能な開発シナリオ(Sustainable Development Scenario)に基づくエネルギー関連のCO₂ 排出量と削減量の内訳



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結論

CO₂ 排出量のカーブを下降させることも引き続き極めて重要である。政策立案者はCO₂排出量を減らしながらも、経済の活性化、雇用の創出、インフラ強化を実施できる

2000年に欧州・北米が世界全体の40%超、アジアの開発途上国20%程度だったが、2040年までに完全に逆転する見込み

排出量を減らすための単一の解決策は存在しない。再生可能エネルギー、エネルギー効率化、そして、CCUSや水素をはじめとすあらゆる技術が必要となる。

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Long-term energy and environmental trends

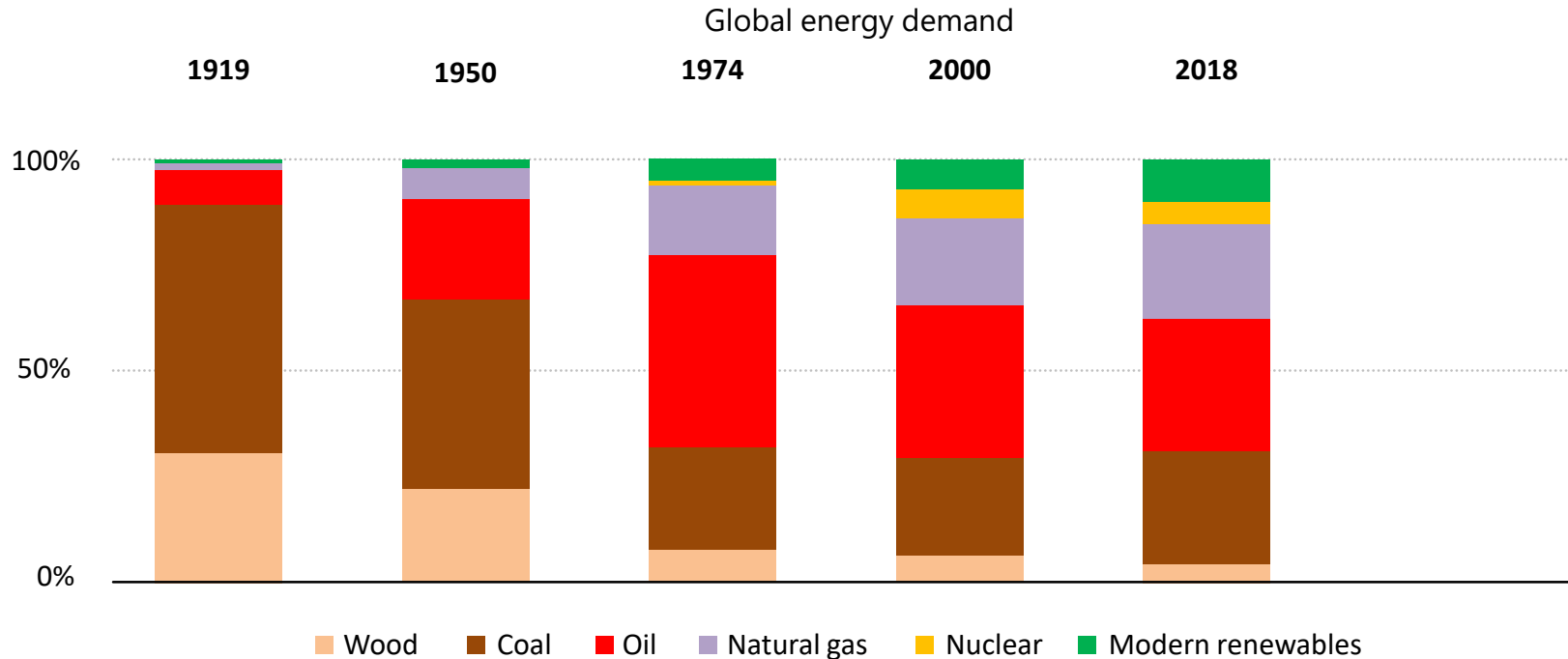
Tim Gould, Head of Division, Energy Supply Outlooks & Investment, IEA

Presentation to the Round-table Panel for the Post 2020 Infrastructure Systems Export Strategy in Japan, organized by the Ministry of Economy, Trade and Industry (METI)

Context

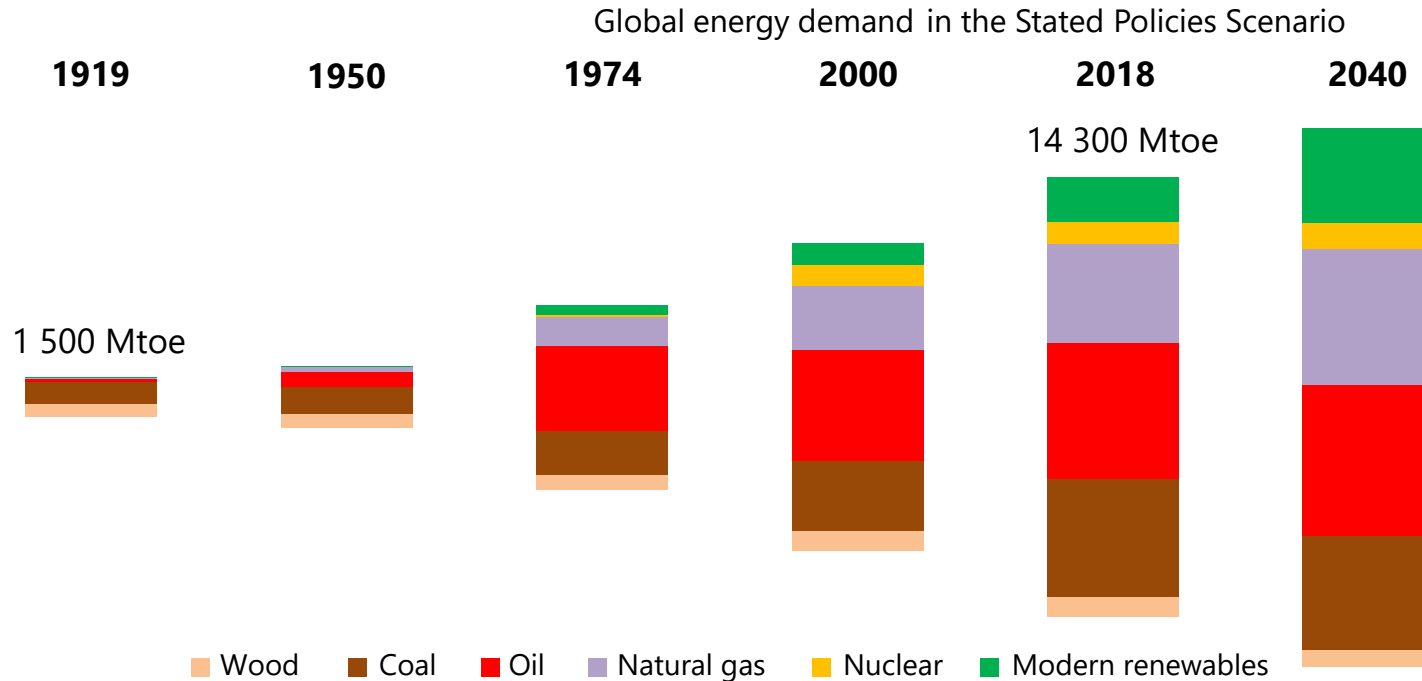
- Global markets, companies and entire economies are reeling from the effects of the global crisis caused by the coronavirus (COVID-19) pandemic
- This is having very profound implications for the energy sector:
 - Transport fuel demand has been hit particularly hard and oil prices have crumbled
 - Demand for other fuels and technologies widely affected
 - Disruption to investment plans and supply chains
- The current crisis has underlined that electricity is more indispensable than ever
- CO₂ emissions flattened in 2019 and are set to decline in 2020, but for the 'wrong' reasons
- Policymakers are focused on short-term imperatives, but need to think too of long-term trends & risks

Perspectives from energy history



The last century has witnessed multiple transitions to and from different fuels and technologies

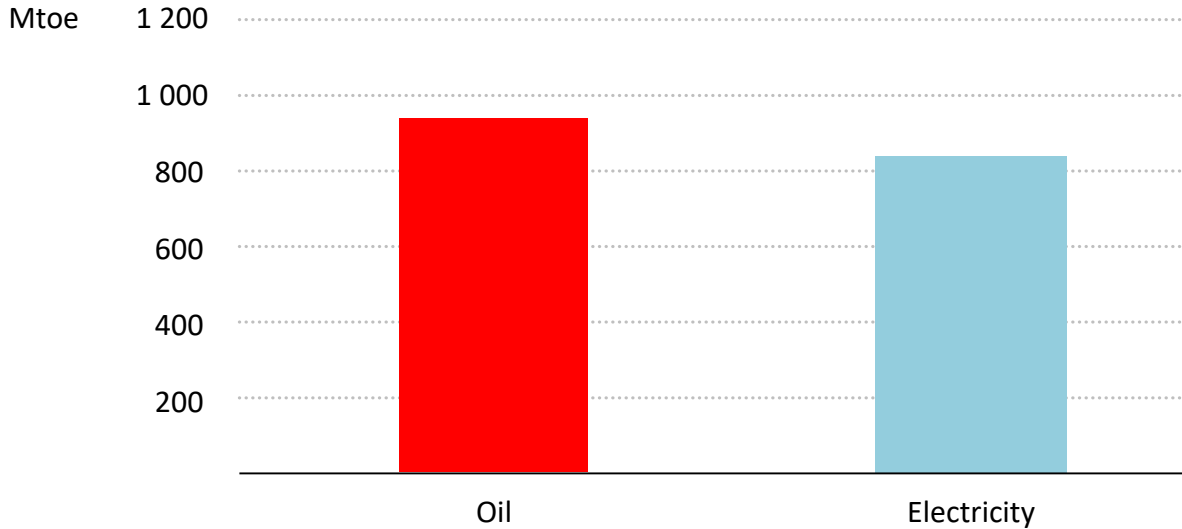
Perspectives from energy history



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 The challenge today is one of scale: global energy use is ten times higher than in 1919.... and growing

The 20-year switch

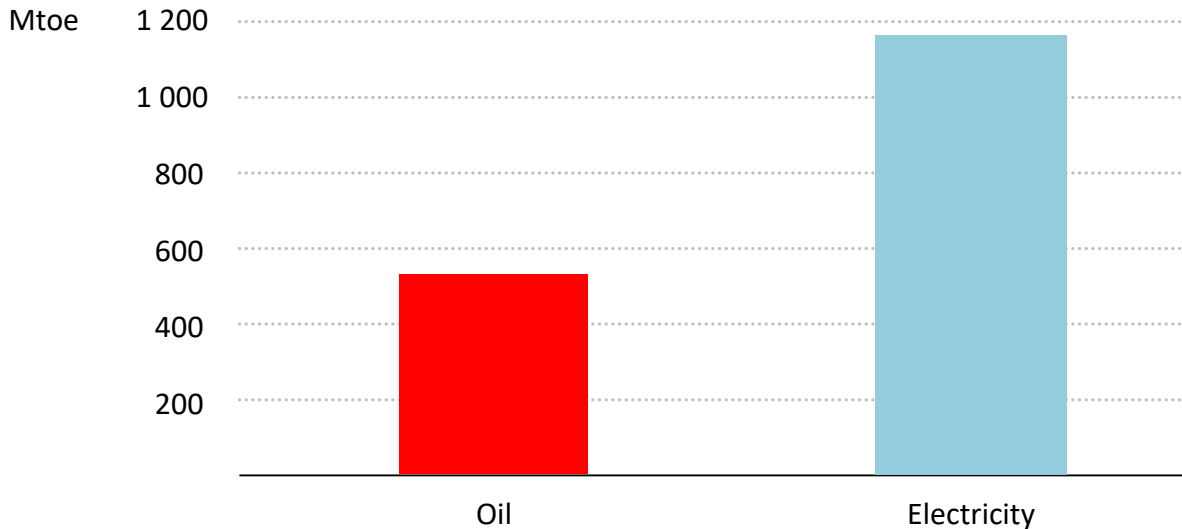
Change in global oil and electricity consumption, 2000 - 2018



When consumers needed more energy in the past, they traditionally turned to oil

The 20-year switch

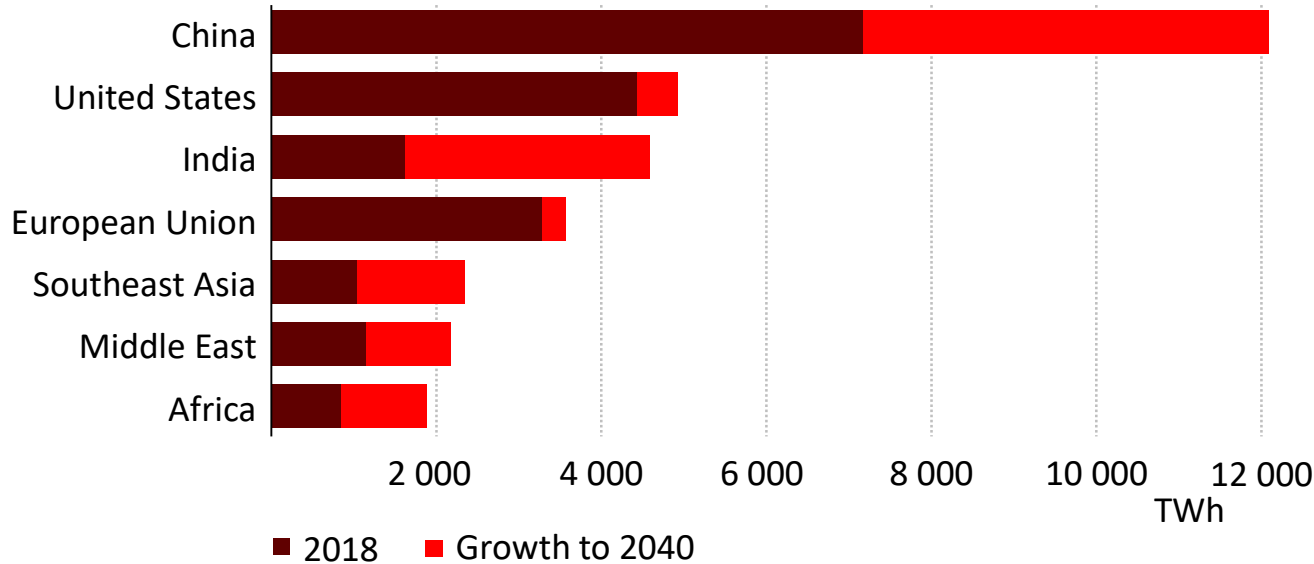
Change in global oil and electricity consumption in the Stated Policies Scenario, 2018 - 2040



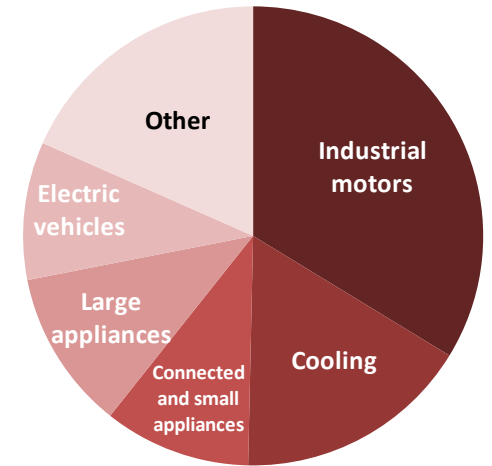
When consumers needed more energy in the past, they traditionally turned to oil
In the future, they turn first to electricity – even more so in the Sustainable Development Scenario

The future is electrifying

Electricity generation by selected region in the Stated Policies Scenario

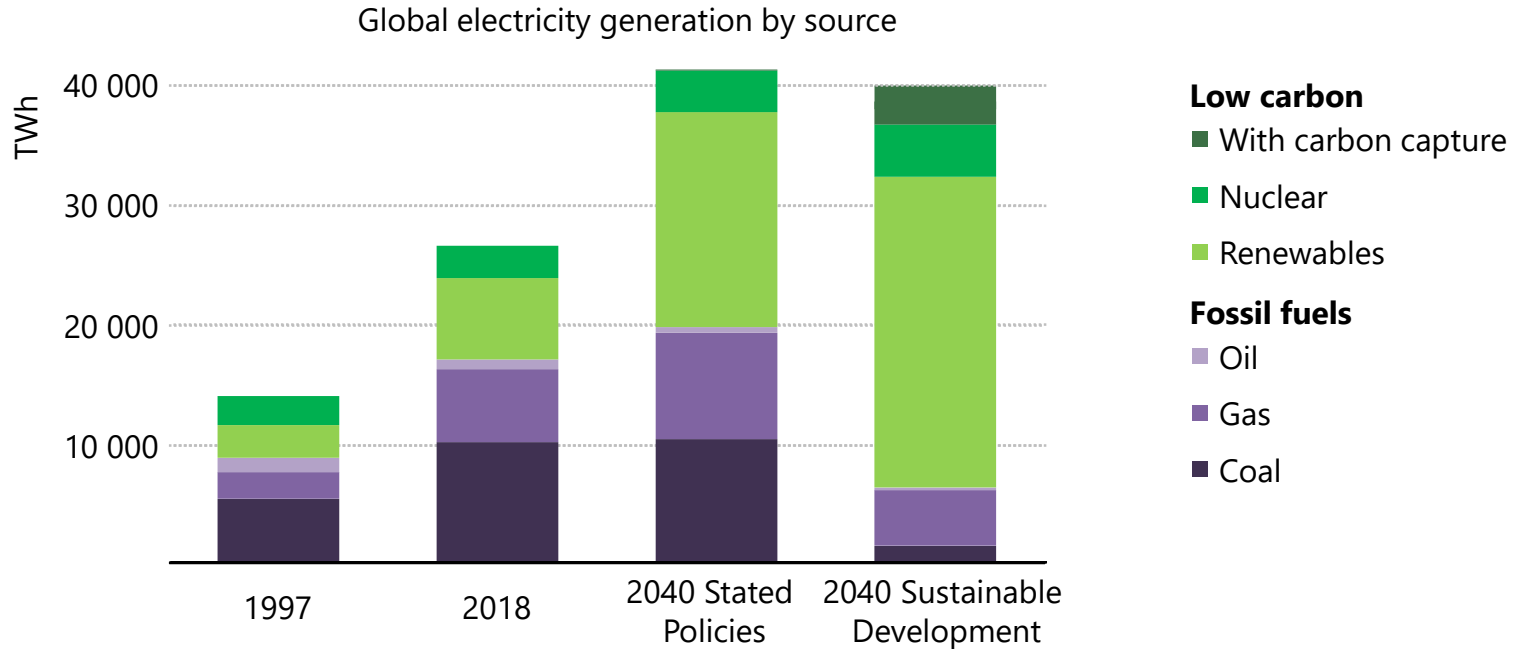


Sources of global electricity demand growth



India adds the equivalent of today's European Union to its electricity generation by 2040, while China adds the equivalent of today's United States

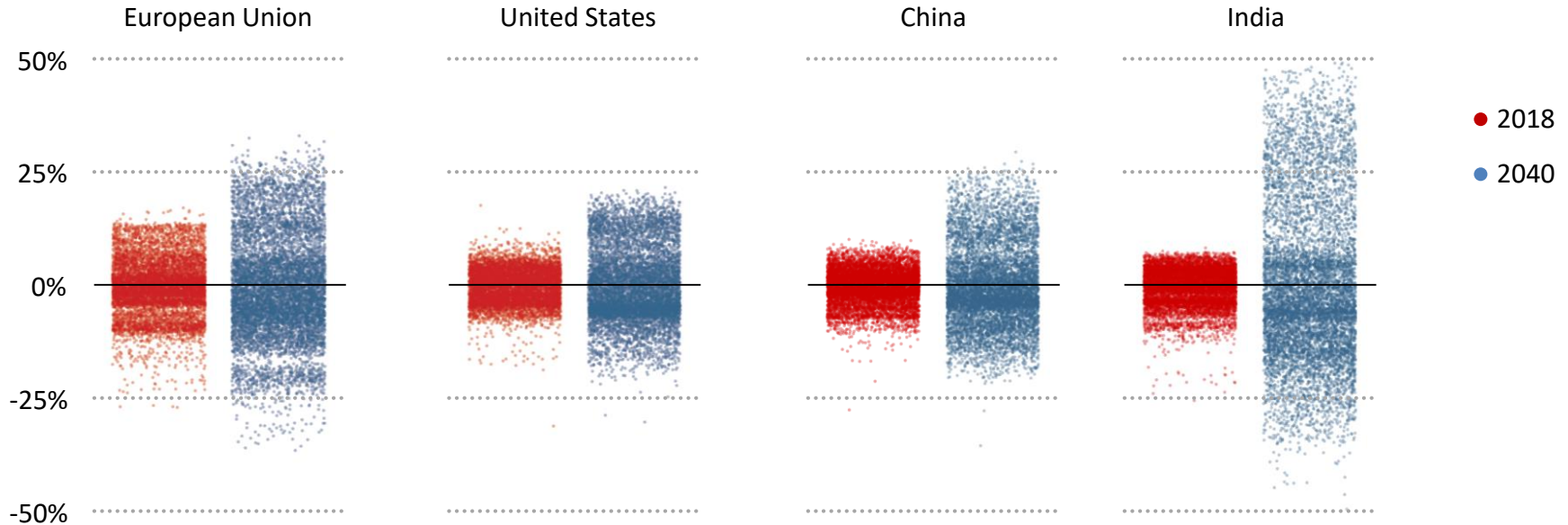
Power sector in transition



The power mix is being re-shaped by the rise of renewables, which provide three-quarters of the growth in electricity supply to 2040 under stated policies, though much more is needed to decarbonise electricity

Electricity moves to the heart of modern energy security

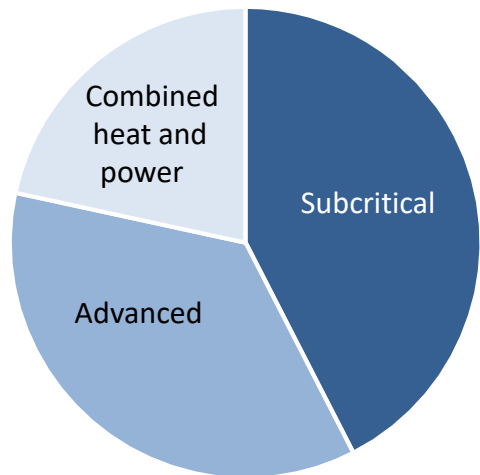
Hour-to-hour adjustments required in power systems due to variability in demand, wind and solar



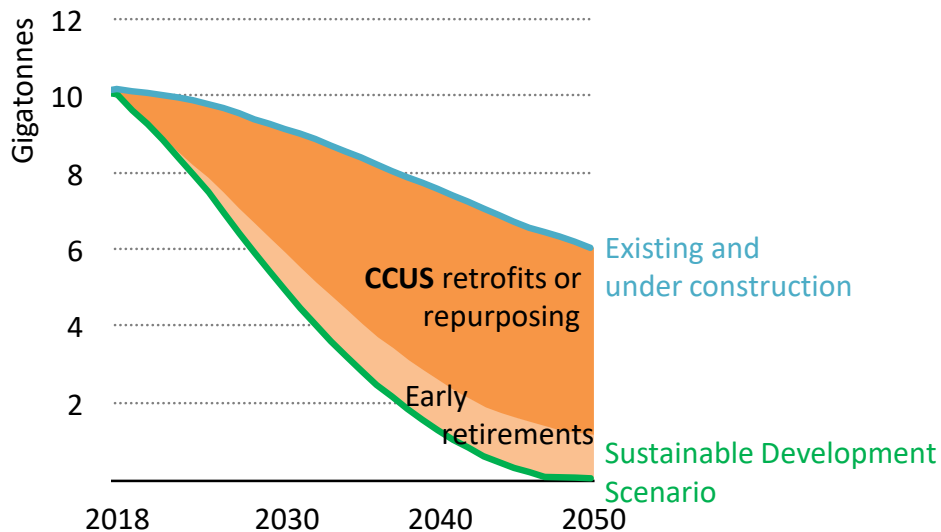
Global needs for flexibility double to 2040, but today's market designs may not bring sufficient investment to deliver it, e.g. in power plants, networks, demand-side response and energy storage, including batteries

Today's coal plants leave a legacy that technology can address

Coal-fired capacity, existing and under construction:
2 250 GW



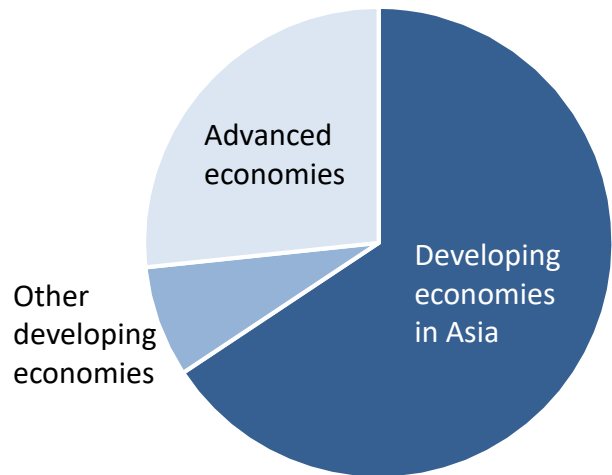
Annual CO₂ emissions from coal-fired power plants



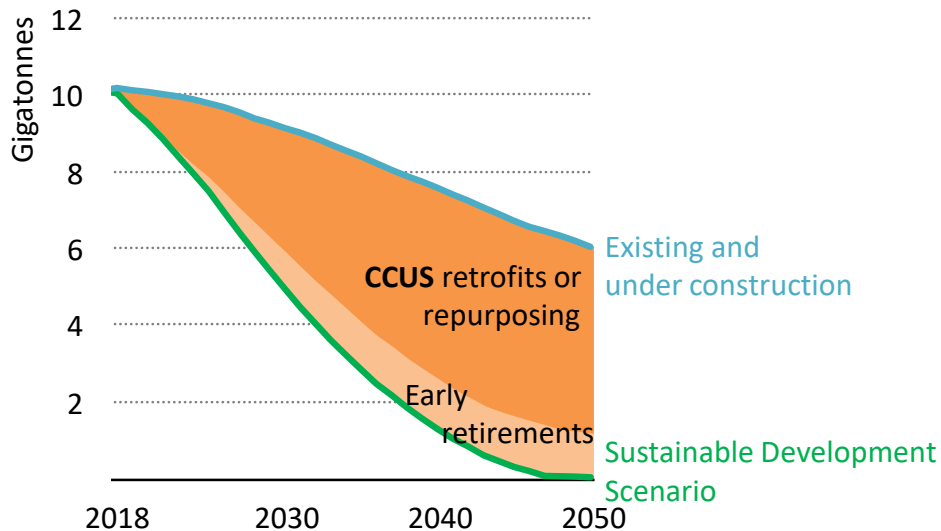
Investment in CCUS will be critical to ensure that the young coal fleet is compatible with climate targets, while repurposing them to provide flexibility can reduce CO₂ and pollutant emissions, and help integrate renewables

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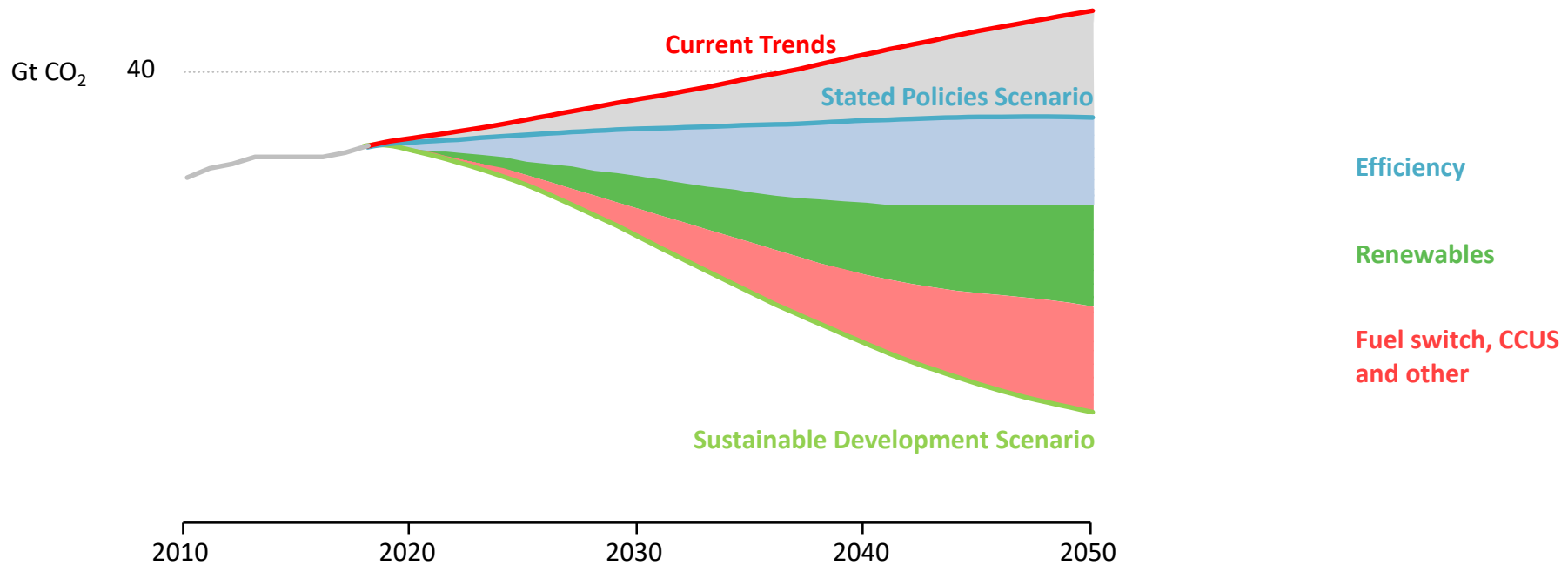
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No single or simple solutions to reach sustainable energy goals

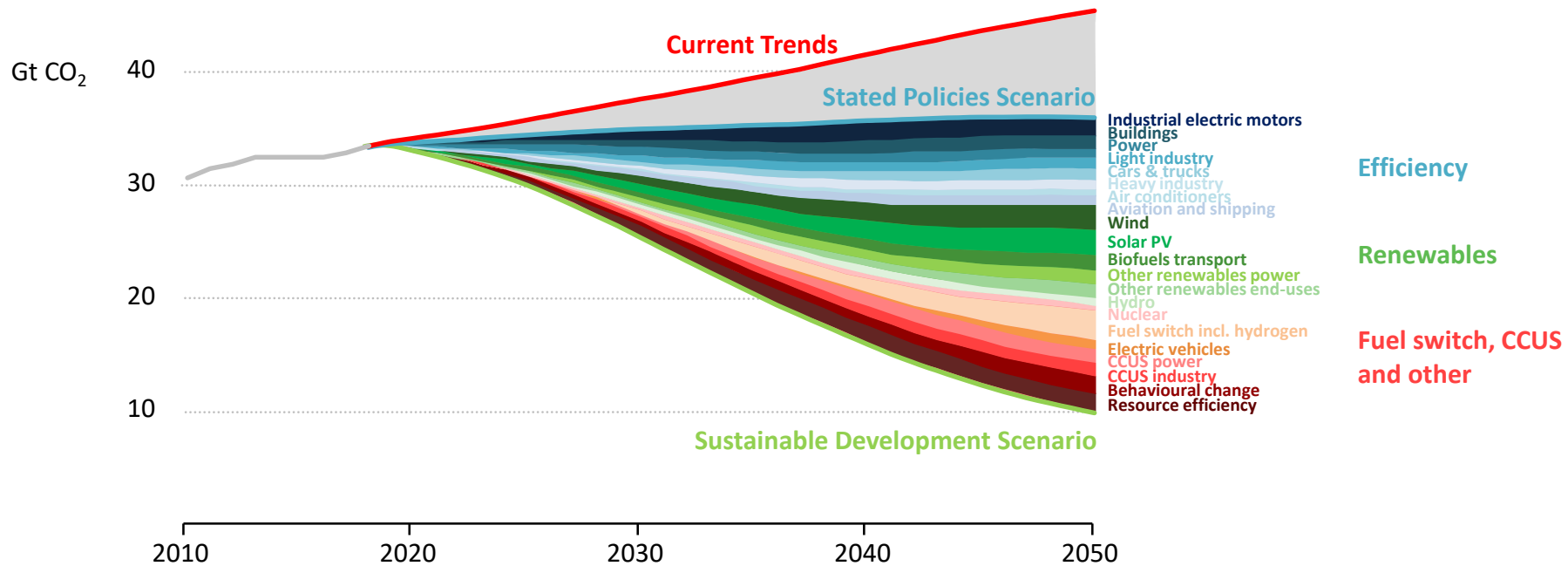
Energy-related CO₂ emissions and reductions in the Sustainable Development Scenario by source



A host of policies and technologies will be needed across every sector to keep climate targets within reach, and further technology innovation will be essential to aid the pursuit of a 1.5°C stabilisation

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Energy-related CO₂ emissions and reductions in the Sustainable Development Scenario by source



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Conclusions

- Countries are focused on flattening the COVID-19 curve but it remains vital to bend the CO₂ curve too; policy makers can stimulate the economy, create jobs & strengthen infrastructure while reducing emissions
- The geography of energy use is changing fast: in 2000, more than 40% of global demand was in Europe & North America and some 20% in developing countries in Asia. By 2040, this situation is completely reversed
- Solar, wind, storage & digital technologies are transforming the electricity sector, but an inclusive and deep transition also means tackling legacy issues from existing infrastructure
- There is no single solution to turn emissions around; renewables, efficiency and a host of innovative technologies, including CCUS & hydrogen, are all required
- All have a part to play, but governments must take the lead in writing the next chapter in energy history and steering us onto a more secure and sustainable course

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