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# 3-0. Energy Trade, Security and Investment in the 7th Edition

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# Energy Security

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# 7th Edition energy security focuses on the "4 As of energy security"

**The 7th Edition APEC Energy Demand and Supply Outlook developed a set of 10 indicators in order to benchmark APEC's energy security in the context of four categories that are collectively known as the "4 A's of energy security".**

## Availability

- Self-sufficiency ratio
- Reserves-to-production ratio
- Import dependency ratio
- Import source diversity

## Affordability

- Cost of energy imports as percentage of GDP
- Revenue from exports as a percentage of GDP
- Percentage of household income spent on electricity

## Acceptability

- Percentage of household income spent on electricity
- Electrification rate
- SAIDI
- Carbon dioxide emissions

## Accessibility

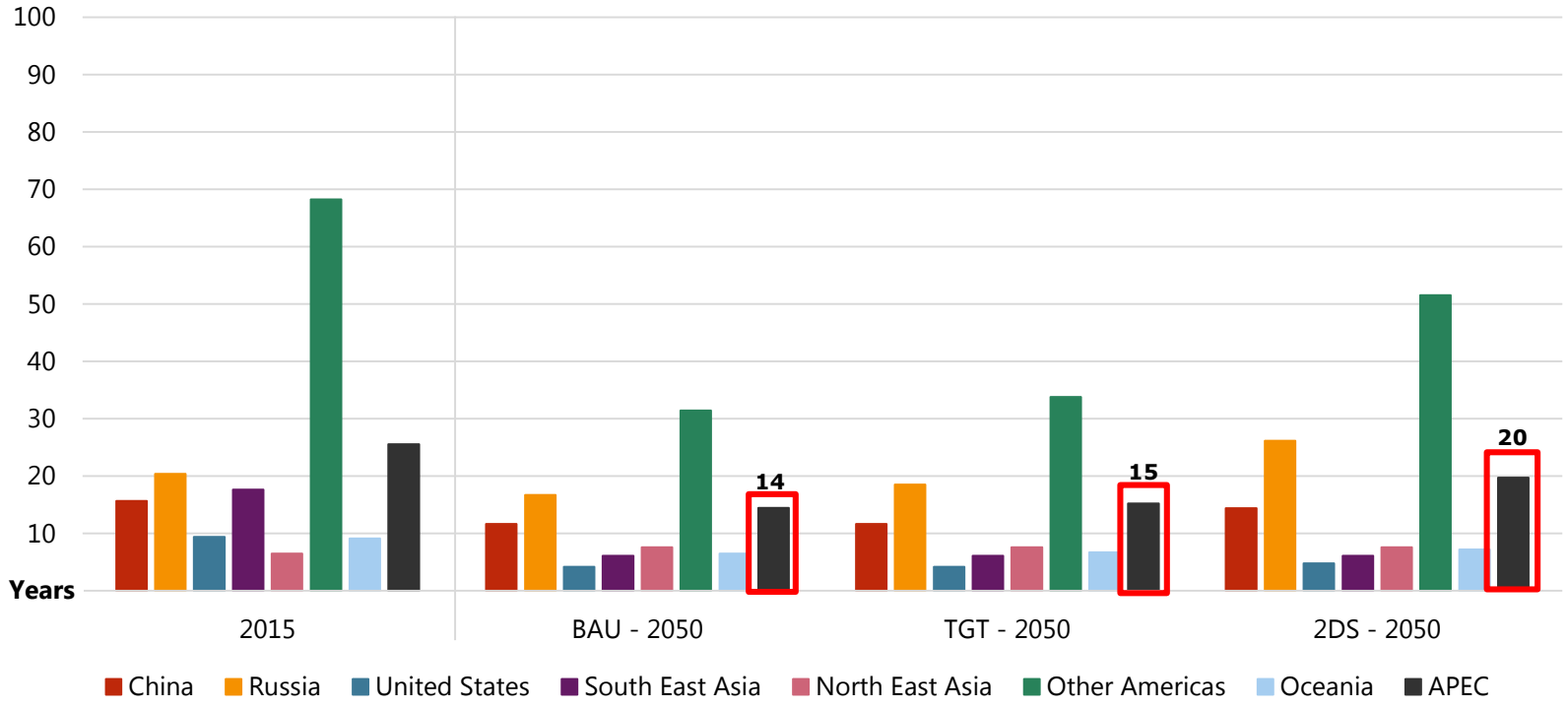
- Percentage of household income spent on electricity
- Electrification rate
- SAIDI

# APEC crude oil availability decreases in all three scenarios

## Reserves-to-production ratio for crude oil, 2015-50

### Availability

- Reserves to production ratio (RPR) is the remaining amount of fossil fuels, expressed in years.




- ***APEC availability increases in the APEC Target and 2°C scenarios because of higher use of renewables and efficiency improvements.***
- ***The largest effects of increased renewables are seen in Other Americas, where there RP ratio increases from 31 years in BAU to 52 years in 2DS.***

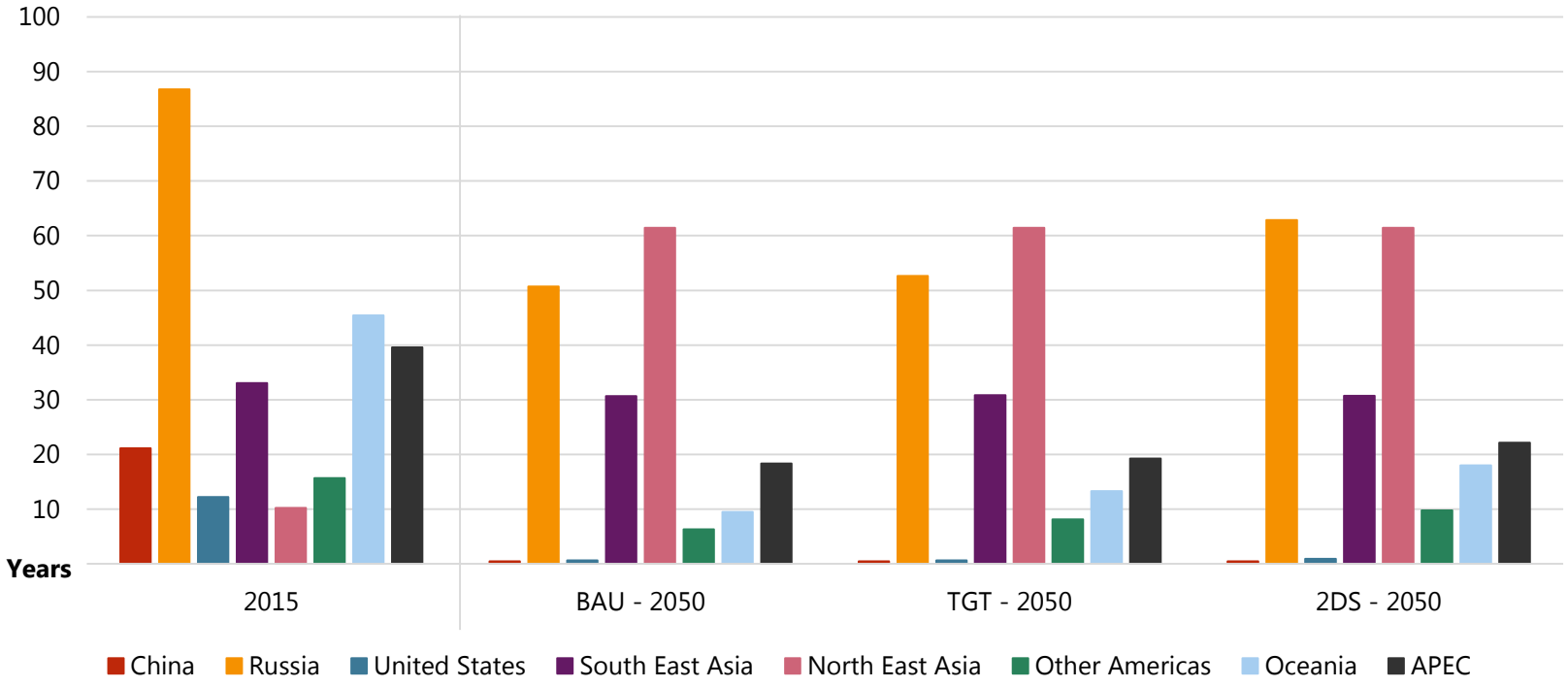
Sources: (EIA, 2017; BP World Energy Satistics, 2017)

# APEC natural gas availability is almost similar in the three scenarios

## Reserves-to-production ratio for natural gas, 2015-50

### Availability

- Reserves to production ratio (RPR) is the remaining amount of fossil fuels, expressed in years.




- ***Natural gas productions levels in APEC decreases in Target and 2°C scenarios due to a decrease in demand, but also because renewable production increase.***
- ***A question being discussed within APERC in whether or not RPR makes sense to report for projections or if it should focus on history only.***

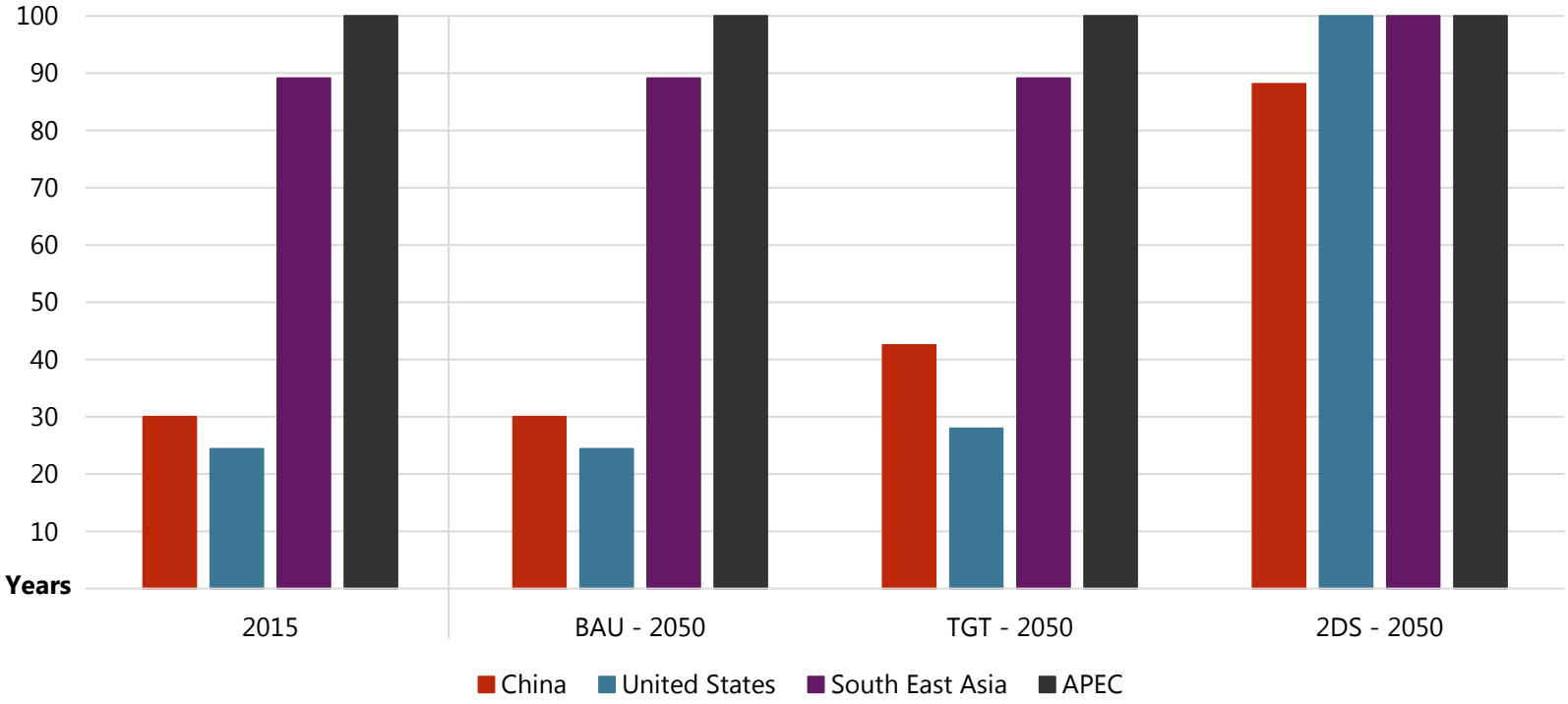
Source: (Cedigaz, 2017)

# APEC coal availability is here to stay

## Reserves-to-production ratio for coal, 2015-50

### Availability

- Reserves to production ratio (RPR) is the remaining amount of fossil fuels, expressed in years.




- ***APEC shows high coal availability in all three scenarios.***
- ***Increased efficiency plus efforts to lower greenhouse gas emissions further strengthen coal's availability, as production levels decline with decreasing demand.***

Source: (EIA, 2017)

# Energy Trade

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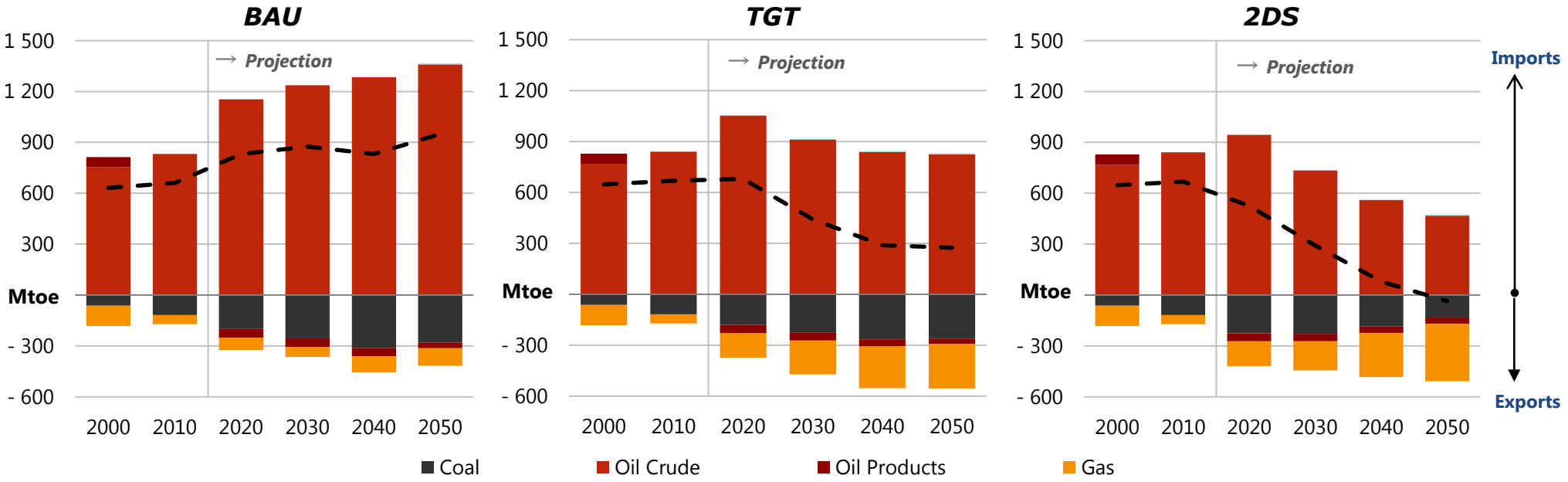
# APEC is projected to remain a net importer of energy in all scenarios

## Net imports of coal, oil, gas in APEC, 2015-50

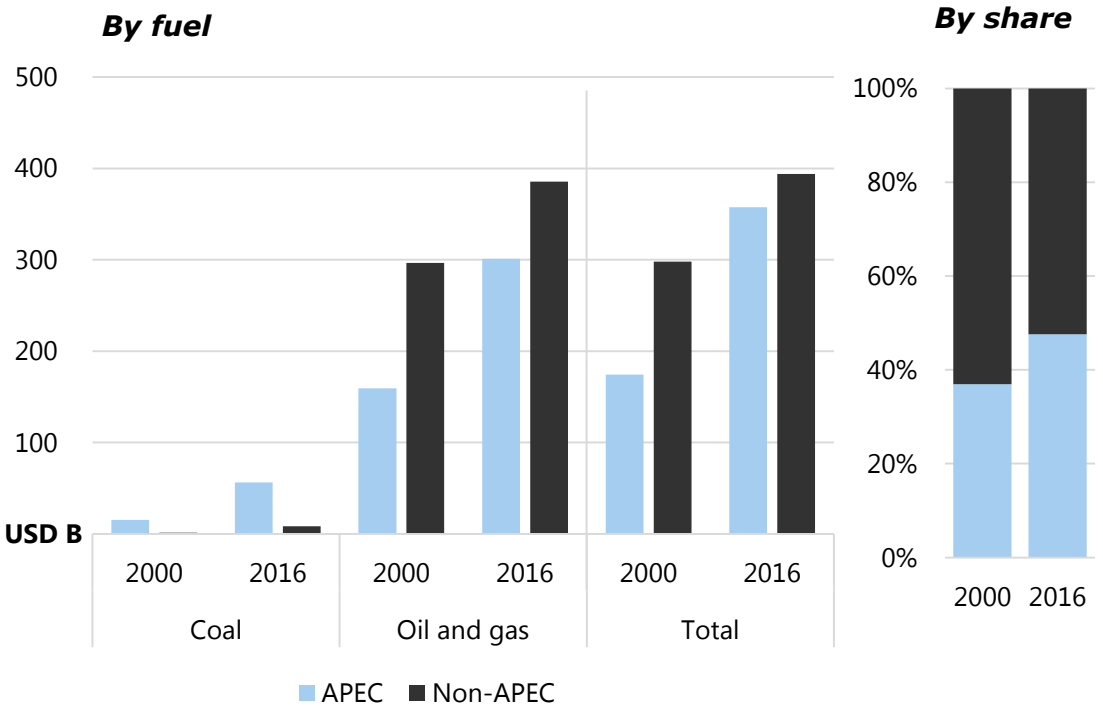



- ***Crude oil drives net imports on an energy basis.***
- ***Coal net exports are projected to decrease post 2040 in the BAU and Target Scenarios because of weak demand. In the 2DS, coal demand and production rapidly decline after 2020.***
- ***As gas demand decreases in the 2DS, there are more opportunities for producers to export gas to markets outside of APEC, leading to increased net exports.***

Sources: (APERC, 2018; IEA, 2017)

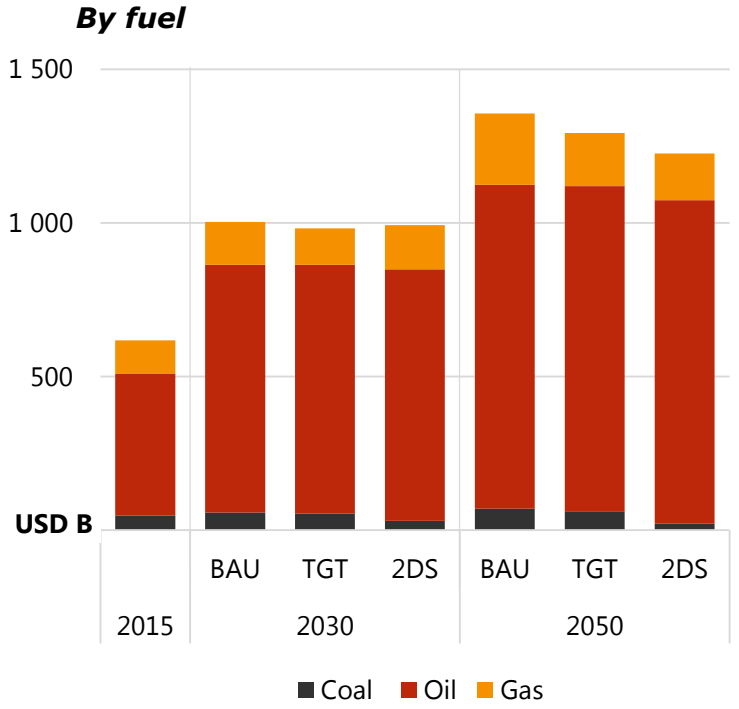
# Intra-APEC trade on fossil fuel doubled between 2000 and 2016

## Value of fossil fuel imports from APEC and non-APEC economies, 2000 and 2016




*Note: Trade value excludes services.*
*Sources: (APERC, 2018; UN Comtrade, 2018)*

## Value of energy imports, 2016-60

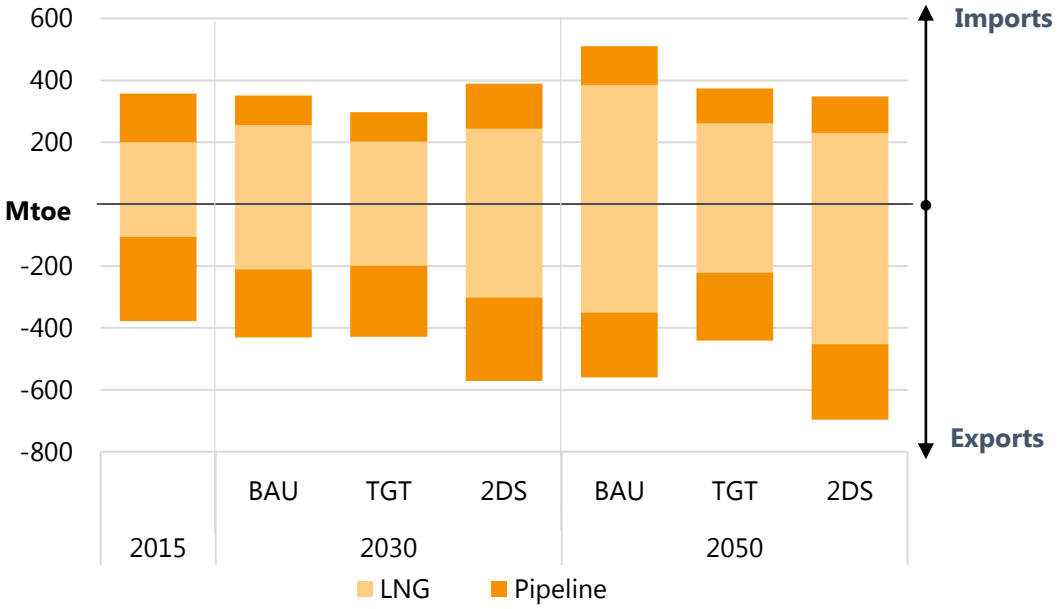



*Note: Trade value excludes oil product imports and services.*
*Sources: (APERC, 2018; IEA, 2017)*

- ***Increase in intra-APEC trade was mostly driven by natural gas and oil product imports.***
- ***Total value of fossil fuel imports is projected to reach almost USD 1.4 trillion in 2050 in the BAU, USD 1.3 trillion in the Target and USD 1.2 trillion in the 2°C Scenario.***

# The role of LNG relative to pipeline trade increases in all scenarios

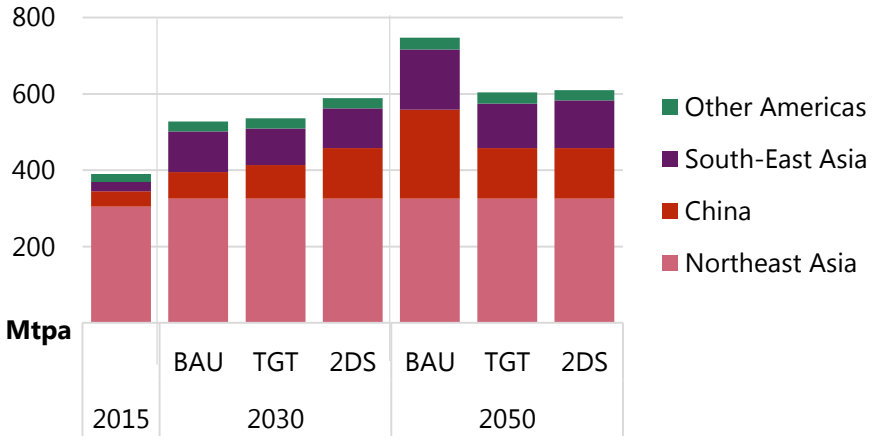
## APEC natural gas trade by mode in the BAU vs TGT vs 2DS, 2015-50



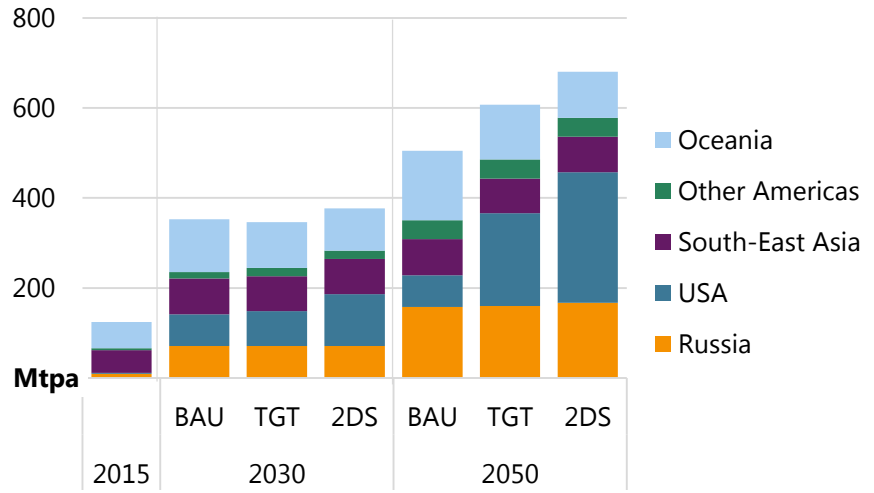

- ***LNG is projected to be the main choice of gas trade in APEC, due to its flexibility.***
- ***Infrastructure development and managing fluctuations in the supply/demand balance continue to be a challenge in the future.***

Sources: (APERC, 2018; IEA, 2017, Cedigaz, 2017)

## APEC LNG import capacity, 2015-50

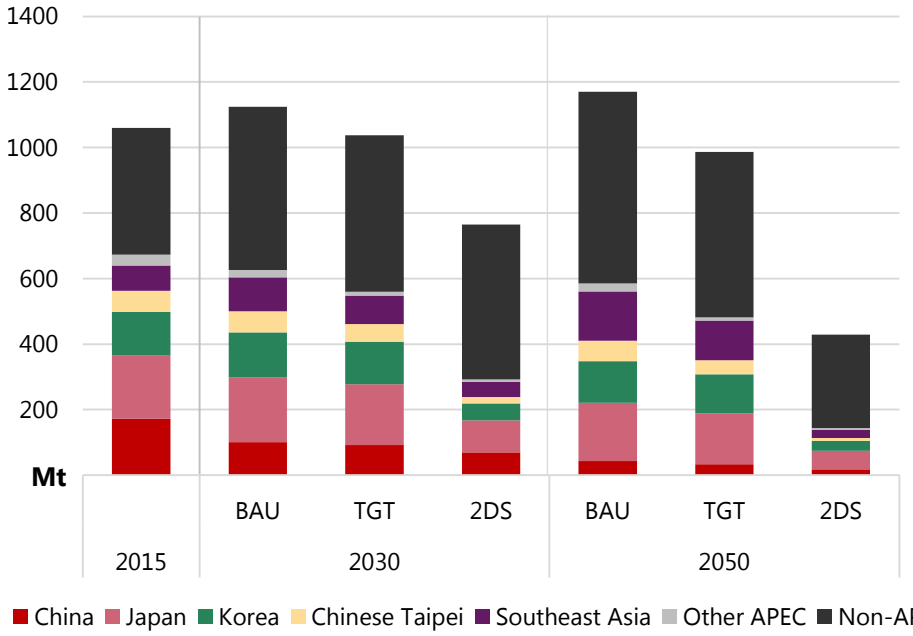



## APEC LNG export capacity, 2015-50

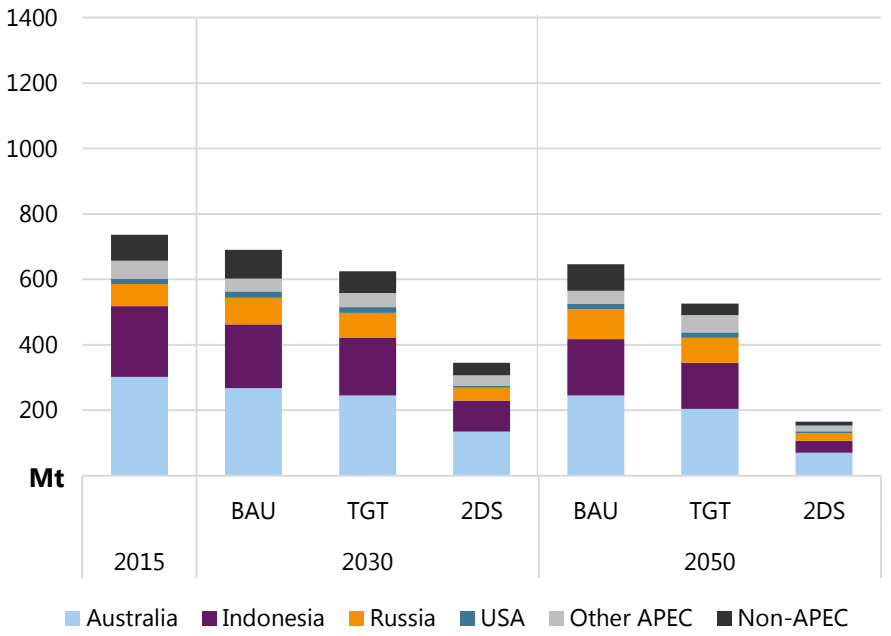


# Coal exporters look for new markets outside APEC

## Coal exports by destination in the BAU vs TGT vs 2DS, 2015-50




## Coal imports by source in the BAU vs TGT vs 2DS, 2015-50




- ***Coal exports drop significantly in the 2°C Scenario, particularly from South-East Asia.***
- ***As coal imports to China and Northeast Asia are projected to decrease, APEC coal producers may need to look to other markets (e.g. India and South-East Asia)***
- ***Despite lower projected import volumes, most coal imports continue to be sourced from APEC members in all three scenarios.***

Sources: (APERC, 2018; IEA, 2017, UN Comtrade, 2018)

# Energy Investment

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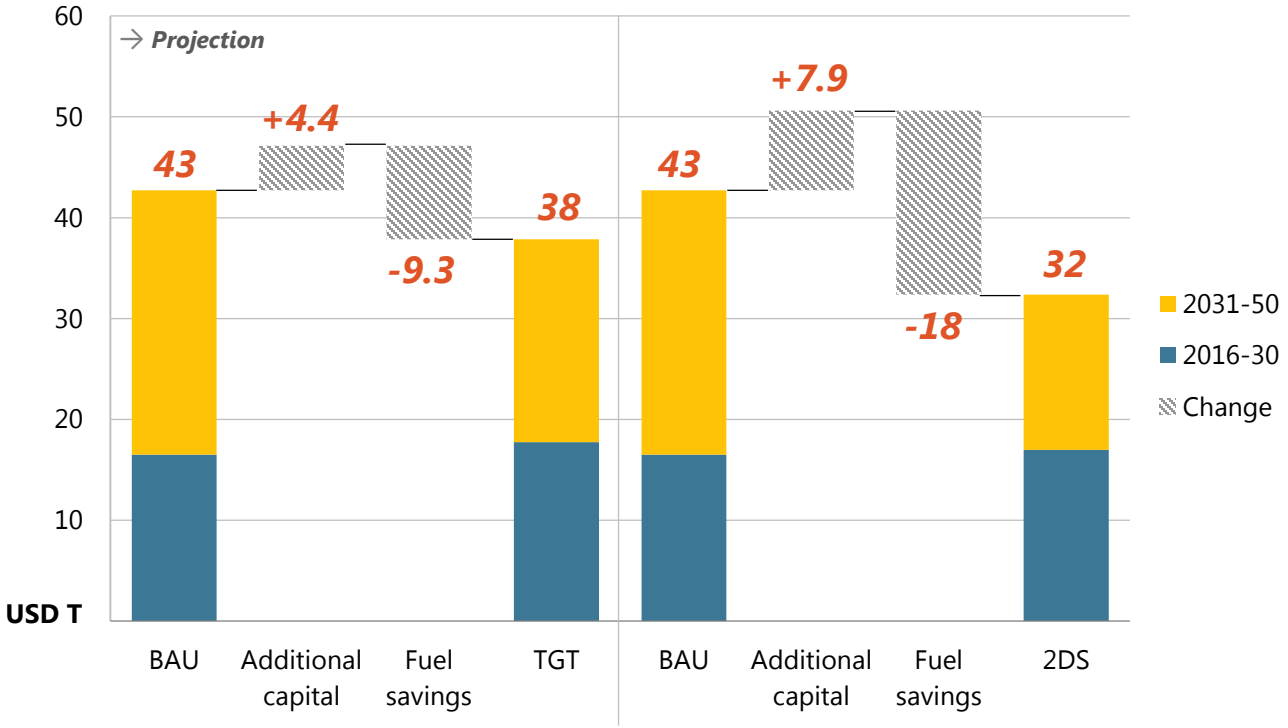
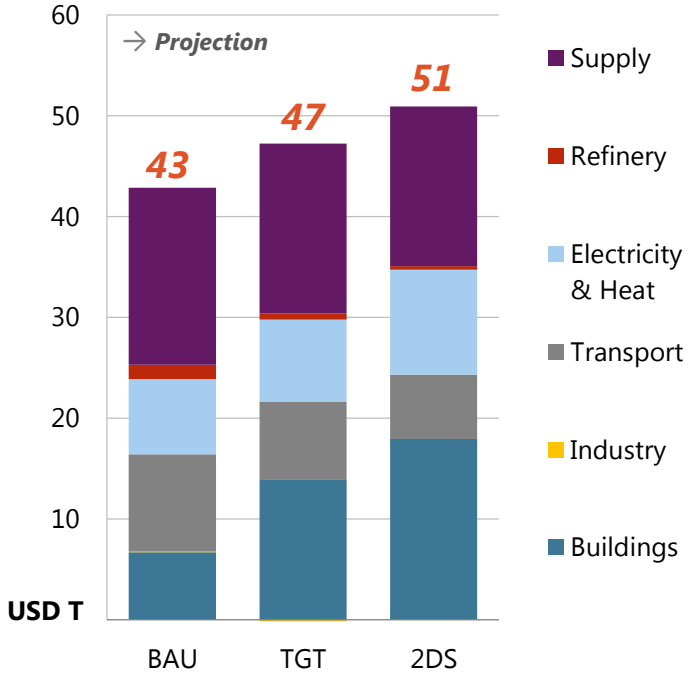
# Higher initial capital requirements are offset by fuel savings

## Cumulative total capital investment and fuel savings in APEC, 2016-50




## Cumulative total capital investment in APEC, 2016-50



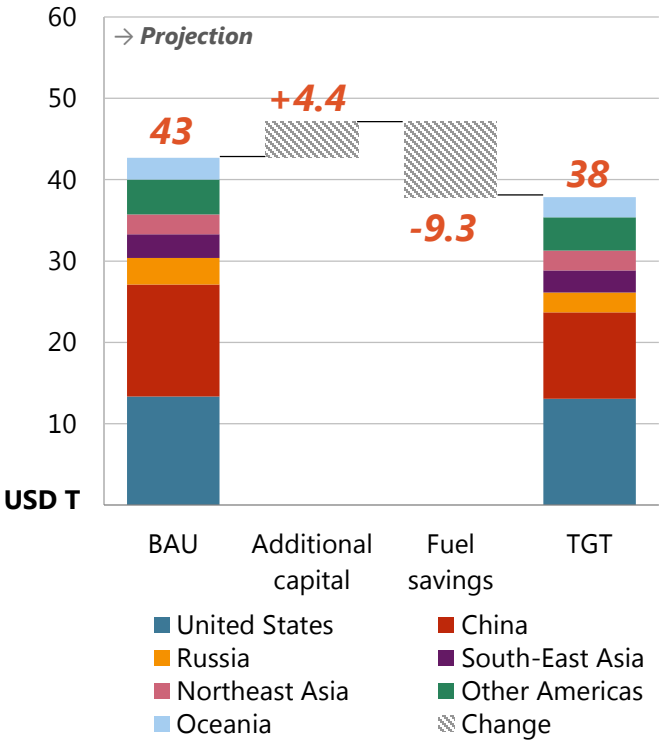

- ***Capital investment is 10% higher in the Target Scenario and 19% higher in the 2°C Scenario, relative to Business-As-Usual.***
- ***Fuel cost savings offset 22% of initial capital investments in the Target Scenario and 43% in the 2°C Scenario.***

Sources: (APERC, 2018; IEA, 2017)

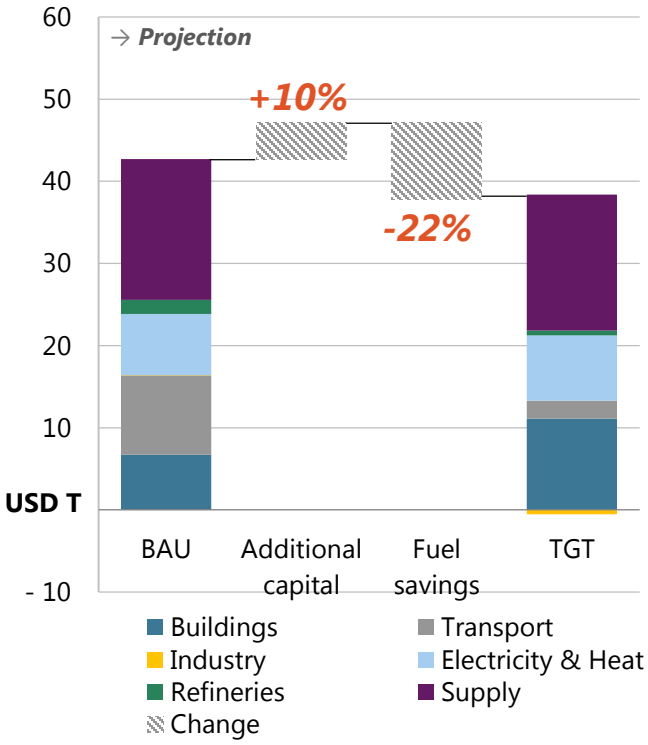
# Total investment requirements are 11% lower in the Target Scenario

## Cumulative total investment in the BAU vs TGT, 2016-50

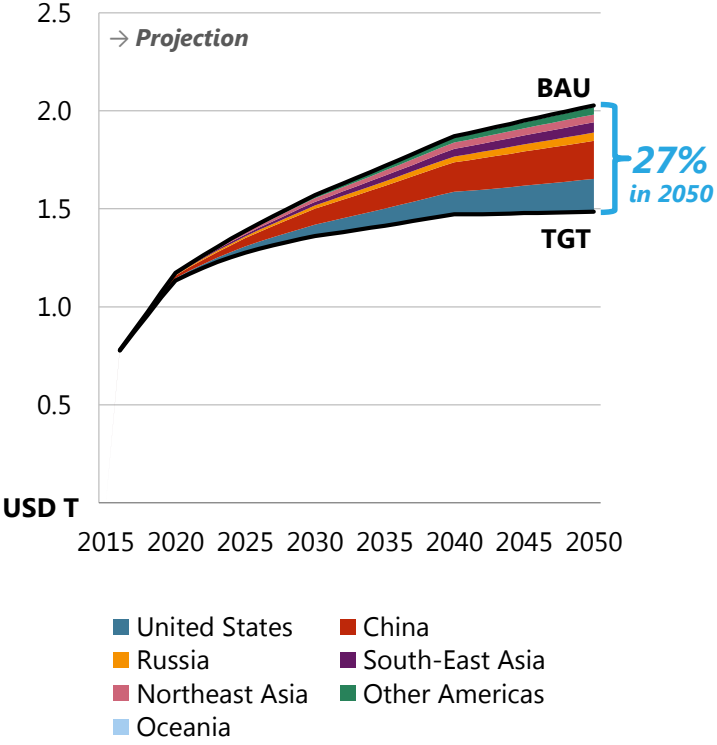
***By region***




***By sector***




## Fuel savings in the TGT, 2016-50



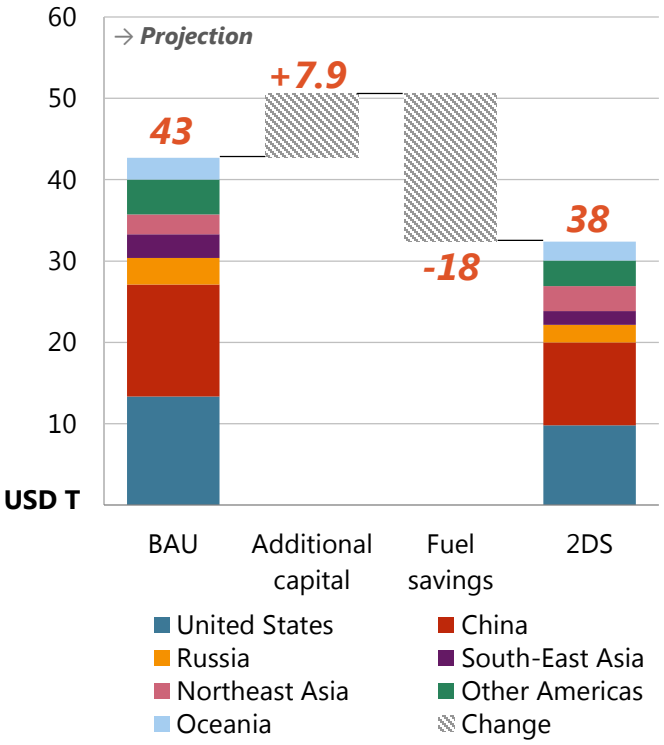

- ***Investment in transport is 7.5T lower overall in the Target Scenario relative to Business-As-Usual (-1.9T in capital and -5.6T in fuel savings) while buildings increases by 4.4T overall (+7.1T capital and -2.8T in fuel savings).***

Sources: (APERC, 2018; IEA, 2017)

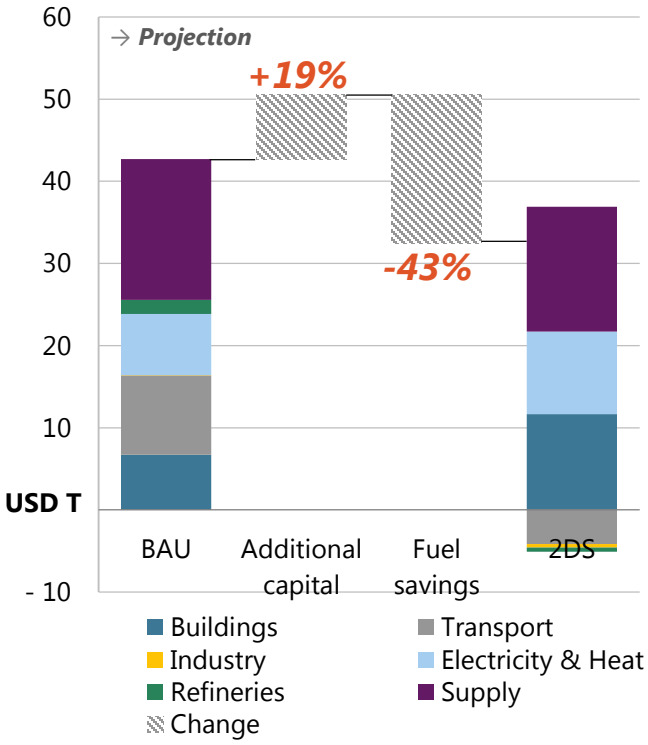
# Total investment requirements are 24% lower in the 2°C Scenario

## Cumulative total investment in the BAU vs 2DS, 2016-50

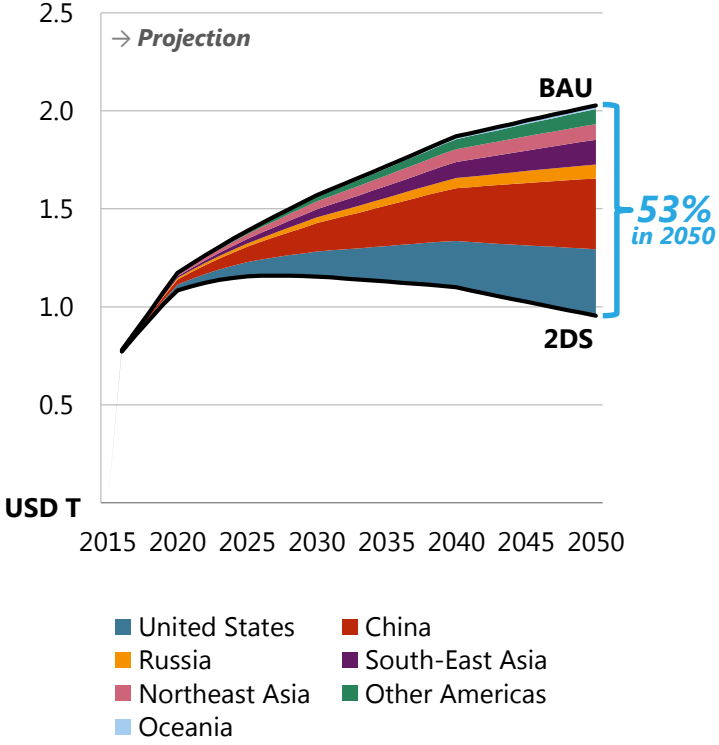
***By region***




***By sector***




## Fuel savings in the 2DS, 2016-50




- ***Demand-side total investment requirements are 9.3T lower in the 2°C Scenario relative to Business-As-Usual.***
- ***Electricity and heat investment increase by 2.6T, while refineries (-2.2T) and supply (-2.0T) decrease by 4.2T in total.***

Sources: (APERC, 2018; IEA, 2017)

# Scenario Implications

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# Scenario Implications

- **Magnitude of investment requirements**: capital investment requirements are slightly higher in the Target and 2°C Scenarios, but this initial capital is more than offset by fuel savings accumulated later in the projection period.
- **Stranded assets:**
  - Transport capital requirements in the BAU Scenario are primarily in regions that require more new conventional refuelling infrastructure (e.g. China).
  - Slightly higher investment in transport earlier (2016-30) pays off with significant fuel savings later on (2031-50), and reduces the risk of stranded assets from a delayed transition.
- **Decarbonising electricity:**
  - Coal demand declines in all scenarios in APEC. Imports and exports of coal drop significantly as the APEC region moves away from coal-fired generation for electricity.
  - There is an opportunity to get in front of investment decisions to meet the massive growth in electricity generating capacity projected in APEC over the next 15 years with clean technologies. Only 7.0% of electricity investment requirements in the 2°C Scenario are from adopting CCS.

# Thank you for your kind attention

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