

Outlook for Alternative Scenarios

II. Middle East

The Institute of Energy Economics, Japan (IEEJ)

*Please note this outlook was finalised before the day of East Japan Great Earthquake, thus does not reflect any impacts of the event.



I. Major assumptions

Economy

GDP Growth and Population in the Maximum Impact Scenario and Strong Policies Scenario is **the same as in the BAU Scenario**.

	2008	2035
GDP (US dollars at 2000 value)	941 billion of US dollars	2,410 billion of US dollars
GDP growth rate	4.2% : from 1990 to 2008	3.5% : from 2008 to 2035
Population	2.0 million	3.0 million
GDP per capita	4,653 dollars	8,005 dollars

Energy Efficiency

Energy Efficiency in industry, transport and building and **Power Generation Efficiency** in the Maximum Impact Scenario and Strong Policies Scenario is **the same as in Asian countries' alternative Scenarios.**

	Maximum Impact Scenario	Strong Policies Scenario
Industry sector	Energy efficiency of major industries (steel, chemicals, etc.) continue to improve, to reach the level of advanced OECD countries in 2035.	The speed of improvement is assumed to be slower than MIS (70% efficiency improvement rates).
Transport sector	the clean energy vehicles will account for approximately 50% of total stocks in 2035.	the clean energy vehicles will account for approximately 35% of total stocks in 2035.
Buildings sector	All appliances meet the highest efficiency standard currently applicable in OECD countries.	70% of all appliances meet the highest efficiency standard.
Power generation Efficiency	The most efficient technologies are applied to all newly build power plants.	The most efficient technologies are applied to 70% of newly build power plants.

Nuclear

Maximum Impact Scenario

We assume nuclear development achieve the most ambitious level.

- Large numbers of Middle East Countries will install nuclear power plants and the total capacity of those will be 35.8 GW in Middle East in 2035.
- More nuclear power plants will be installed in Iran, UAE, Saudi Arabia, Kuwait, and Jordan than those in SPS assumption.

Strong Policies Scenario

We assume more moderate nuclear development to be achieved than that in the Maximum Impact Scenario.

- Besides Iran and UAE, Saudi Arabia, Kuwait, and Jordan (Other Middle East) will install nuclear power plants. The introduction of the total nuclear power plant will be 16.5 GW in Middle East in 2035.
- More nuclear power plants will be installed in Iran than those in BAU assumption.

Renewables

Maximum Impact Scenario

We assume renewables energy deployment be more strongly promoted than that in Strong Policies Scenario.

- Renewable energy generation will reach at 10% of the power generating capacity in 2020, 20% in 2035.
- Saudi Arabia will introduce 30GW of the renewable energy generation in 2030, 35GW in 2035.

Strong Policies Scenario

We assume renewable energy deployment to be achieved each countries' target by 2020.

- Renewable energy generation will reach at the level of ranging from 5 to 7 % of the power generating capacity in 2020, 15% in 2035.
- Some countries, for which a clearly stated target for renewable energy deployment is not available, are assumed to install renewable energy generation at 5% of the power generating capacity.
- Saudi Arabia, is assumed to install renewable energy generation at 10 % of the power generating capacity in 2020, 20% in 2035.

Nuclear & Renewable power generating capacity (table)

Nuclear

BAU GW	2008	2020	2030	2035
Irn	0	1	1	1
Qtr	0	0	0	0
Sar	0	0	0	0
Uae	0	1.4	5.6	5.6
Kwt	0	0	0	0
Irq	0	0	0	0
Omn	0	0	0	0
Ome(Jordan)	0	0	0	0
Middle East	0	2.4	6.6	6.6

SPS GW	2008	2020	2030	2035
Irn	0	2	2	2
Qtr	0	0	0	0
Sar	0	0	4.2	5.6
Uae	0	1.4	5.6	5.6
Kwt	0	0	1.1	2.2
Irq	0	0	0	0
Omn	0	0	0	0
Ome(Jordan)	0	0	1.1	1.1
Middle East	0	3.4	14	16.5

MIS GW	2008	2020	2030	2035
Irn	0	2	4	4
Qtr	0	0	1.4	2.8
Sar	0	0	5.6	9.8
Uae	0	2.8	7	8.4
Kwt	0	0	2.2	4.4
Irq	0	0	0	0
Omn	0	0	1.4	2.8
Ome(Jordan)	0	1.1	2.2	3.6
Middle East	0	5.9	23.8	35.8

Renewable

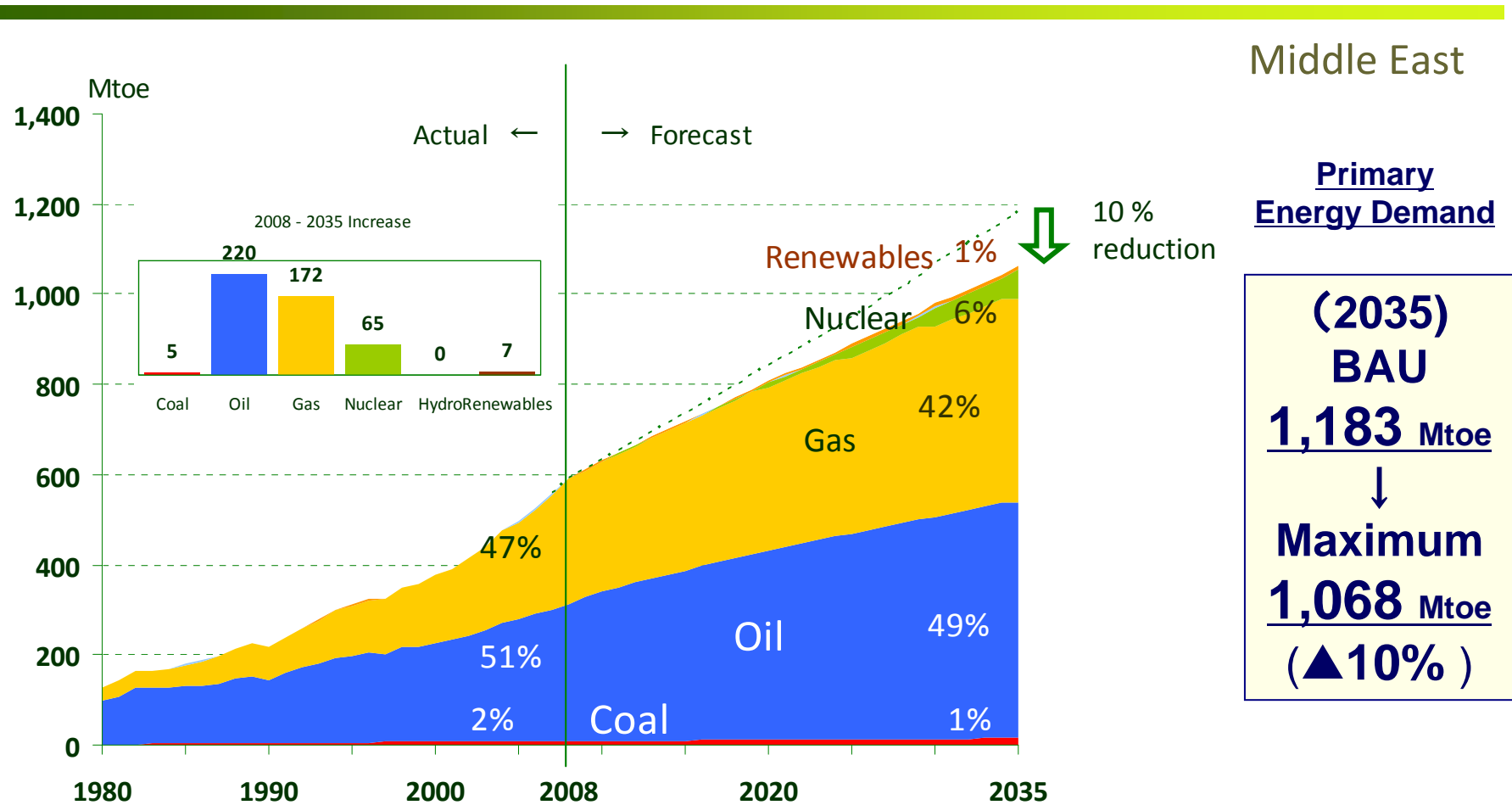
BAU GW	2008	2020	2030	2035
Irn	0.2	0.2	0.2	0.2
Qtr	0	0	0	0
Sar	0	0	0	0
Uae	0	0	0	0
Kwt	0	0	0	0
Irq	0	0	0	0
Omn	0	0	0	0
Ome	0.01	0.02	0.02	0.02
Middle East	0.2	0.2	0.2	0.2

SPS GW	2008	2020	2030	2035
Irn	0.2	4	8	14
Qtr	0	0	1	2
Sar	0	7	14	21
Uae	0	2	4	6
Kwt	0	1	2	3
Irq	0	1	2	3
Omn	0	0	1	2
Ome	0.01	2	7	12
Middle East	0.2	17	38	63

MIS GW	2008	2020	2030	2035
Irn	0.2	7	13	19
Qtr	0	1	2	3
Sar	0	7	30	35
Uae	0	3	6	9
Kwt	0	2	3	4
Irq	0	2	3	4
Omn	0	1	1	2
Ome	0.01	5	10	15
Middle East	0.2	25	67	90

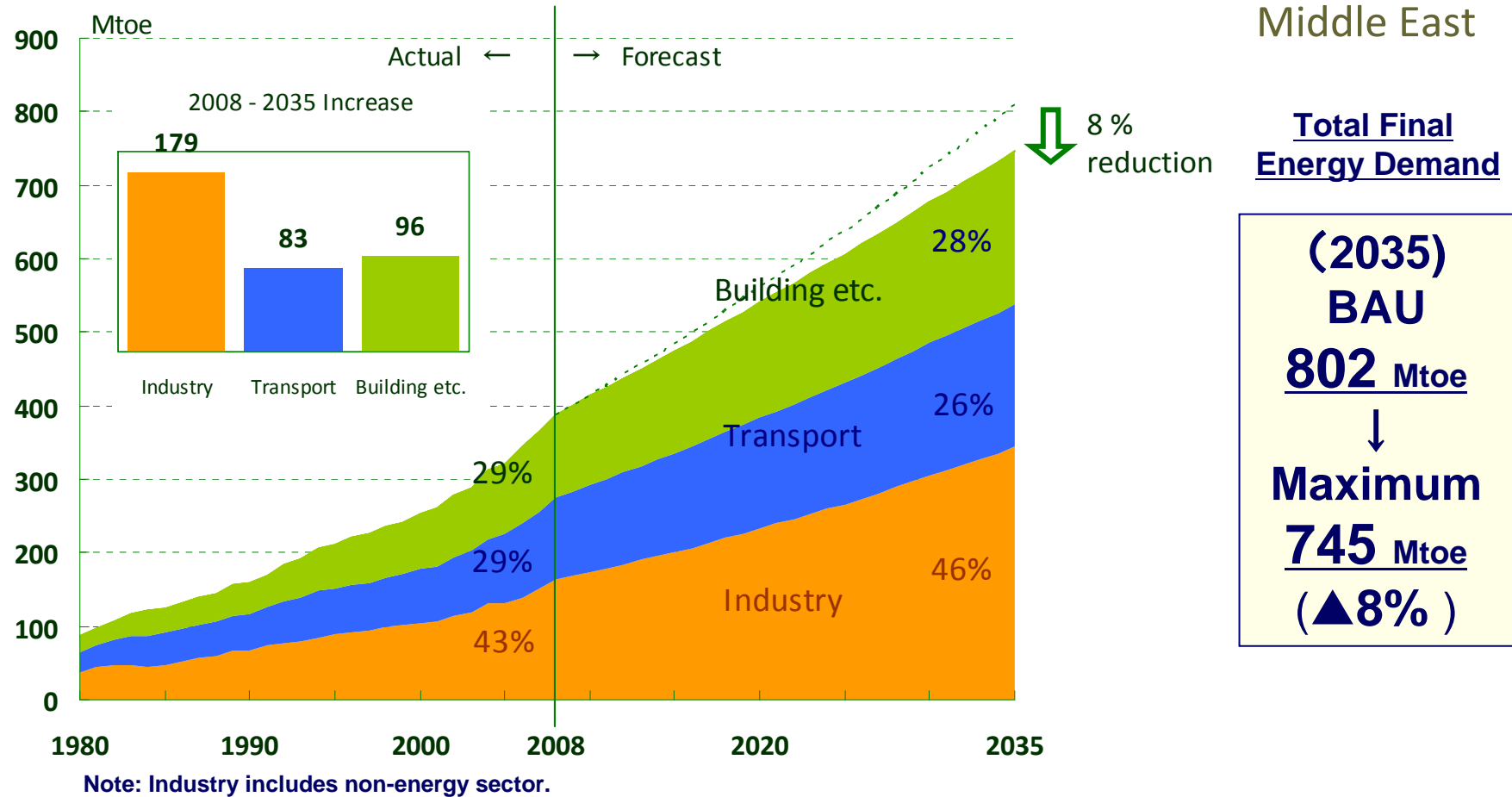
II. Energy Outlook for Middle East (Alternative Scenario)

Maximum Impact Scenario : Primary energy demand



- In 2035, TPE of Middle East in Maximum Impact Scenario will be lower by 10% compared with the BAU Scenario.
- Non-fossil fuel will account for about 7% of TPE in 2035.

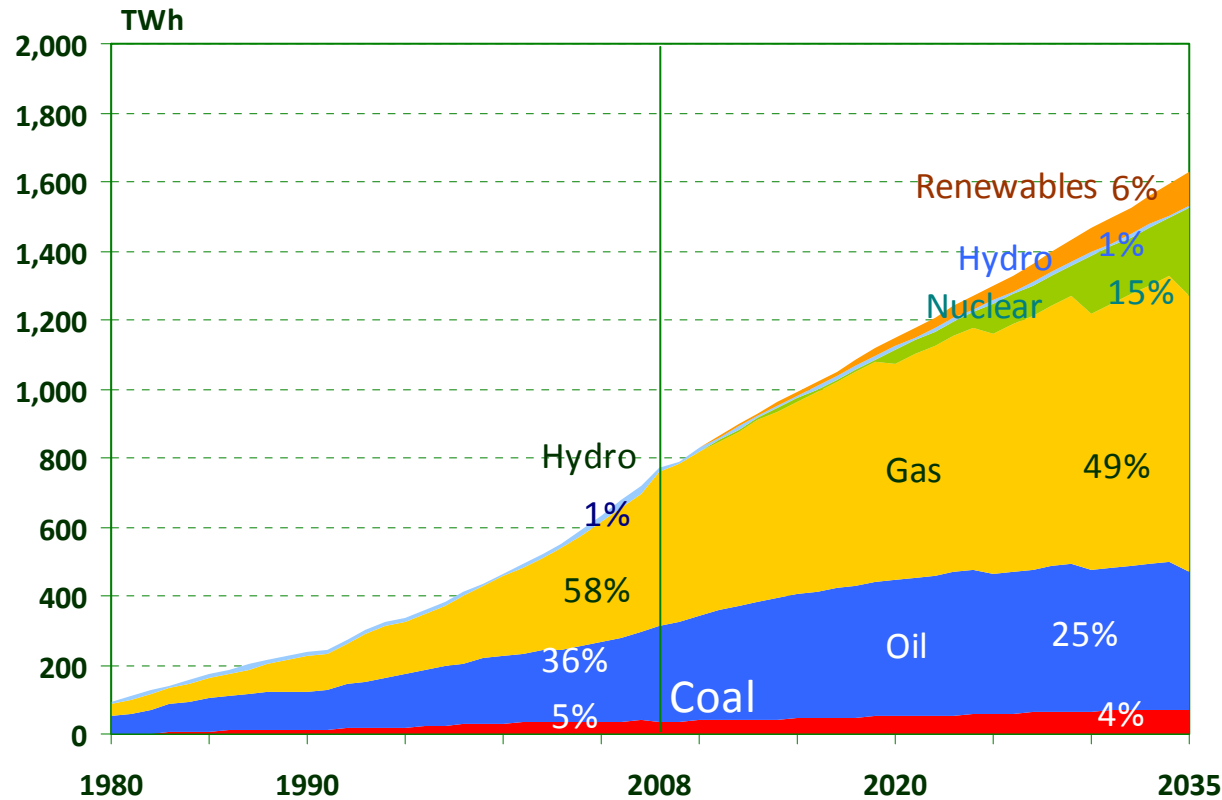
Maximum Impact Scenario : Final energy demand



- In Maximum Impact Scenario in 2035, TFED will be lower by 57 Mtoe, showing 8% reduction compared with BAU Scenario, reflecting efficiency improvement.
- Energy saving in Industry sector will be smaller than those in other sectors because demand in Petrochemical industry and Non-Energy sector, which accounts for the most part of the Industry sector demand, will be robust.

Maximum Impact Scenario : Power Generation Mix

Middle East

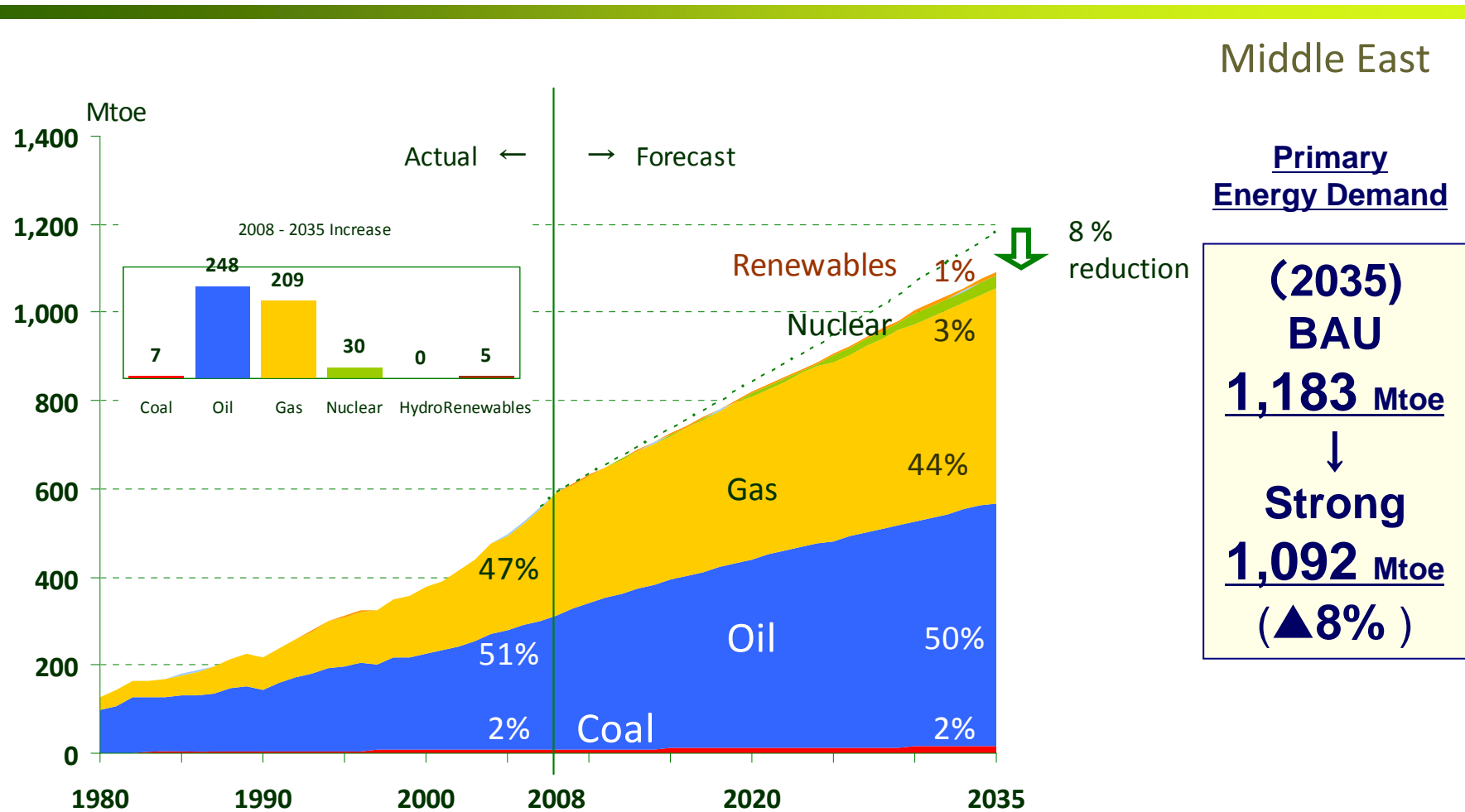


Power Generation

(2035)
BAU
1,856 TWh
 ↓
Maximum
1,626 TWh
 (▲12%)

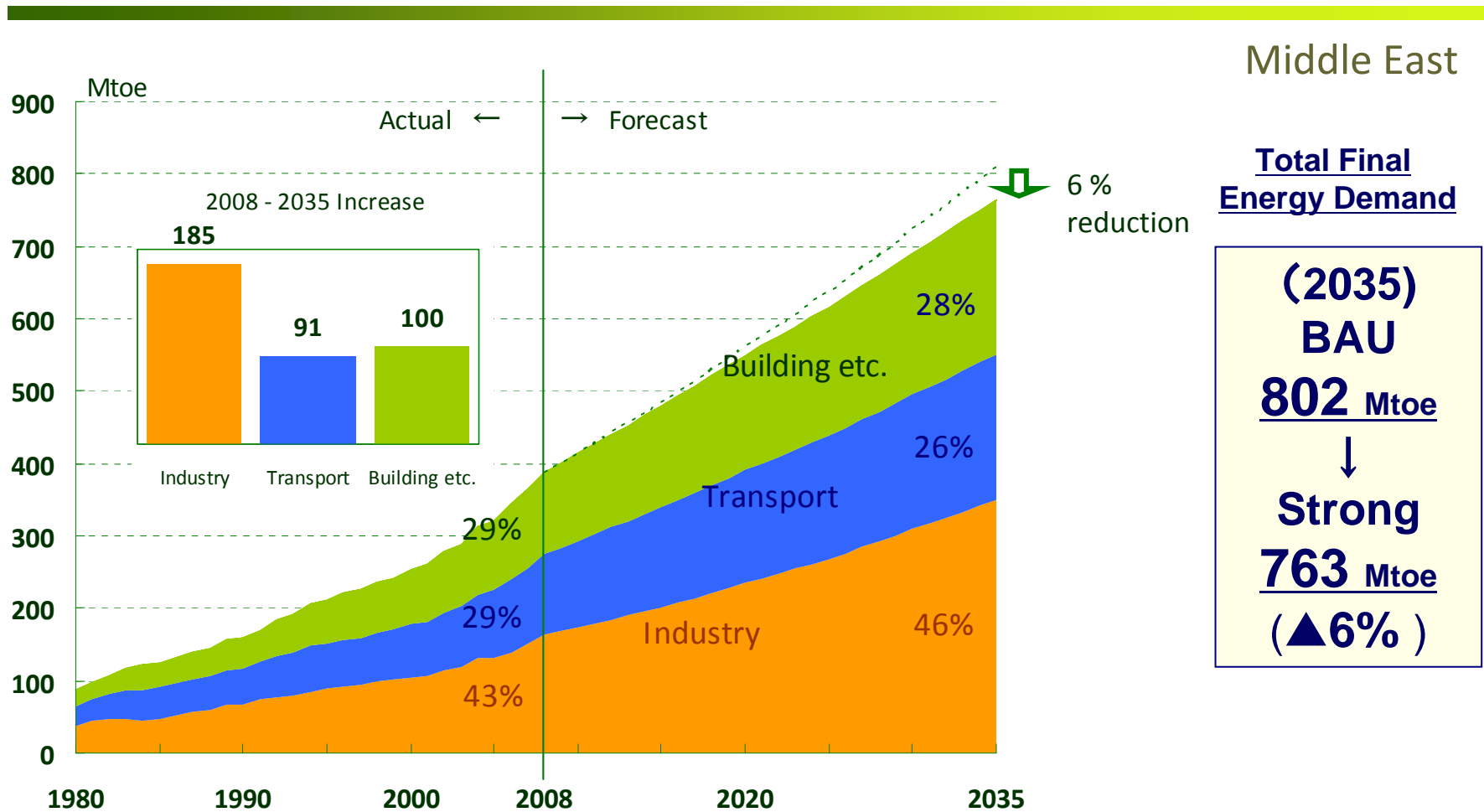
- In Maximum Impact Scenario in 2035, power generation will be lower by 230 TWh, showing 12% reduction compared with BAU Scenario.
- Nuclear power generating capacity will be 35.8GW in total in 2035, while renewable power generation will reach 95 TWh.
- Share of non-fossil fuel in power generation will reach 22% of total power generation by 2035.

Strong Policies Scenario : Primary energy demand



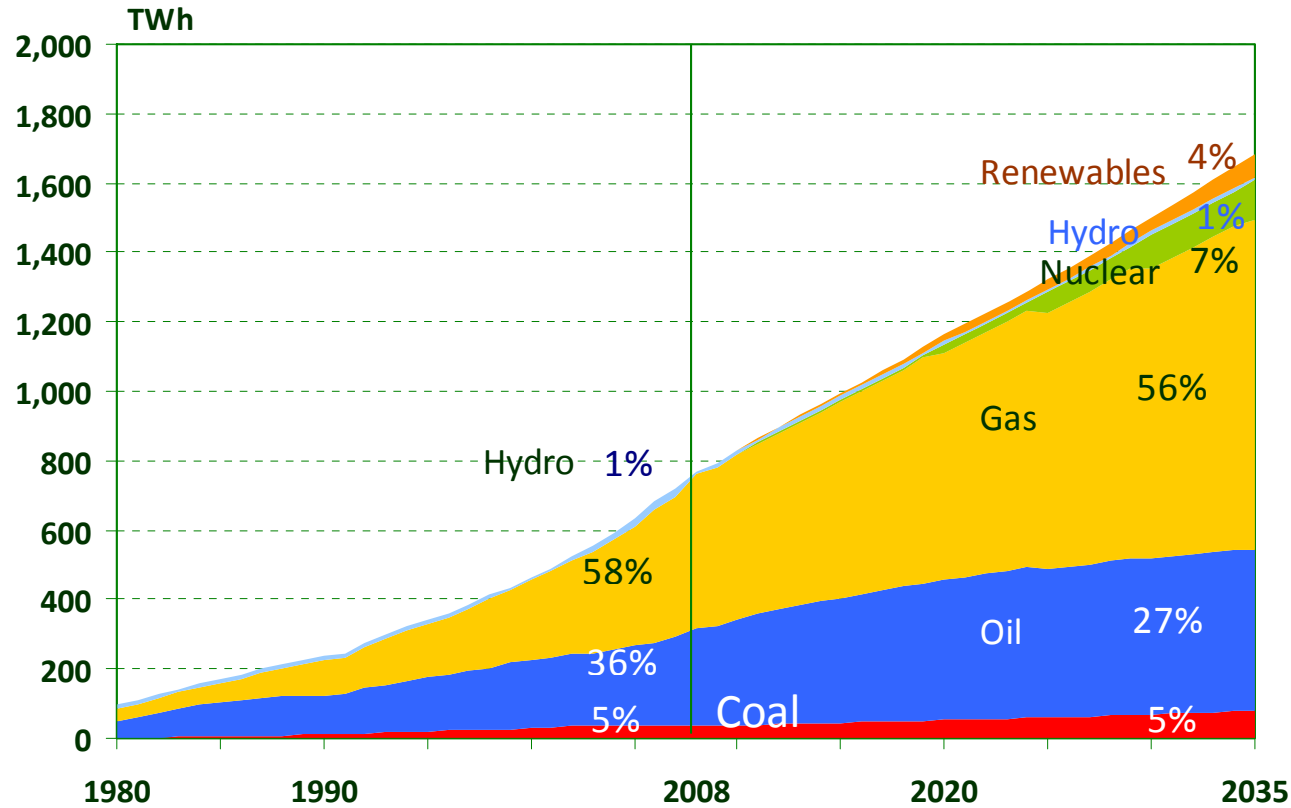
- In 2035, TPE of Middle East in Strong Policies Scenario will be lower by 8% compared with the BAU Scenario.
- Even at 2035 in Strong Policies Scenario, fossil fuel will account for more than 96% of TPE.

Strong Policies Scenario : Final energy demand



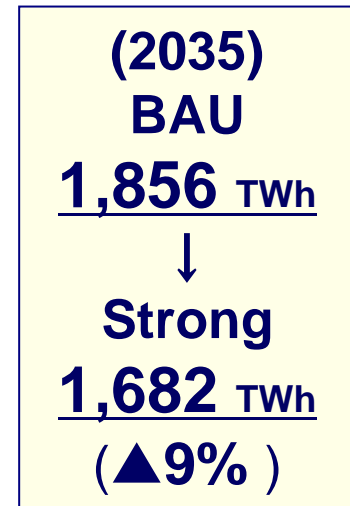
- In Strong Policies Scenario in 2035, TFED will be lower by 39 Mtoe, showing 6% reduction compared with BAU Scenario.
- Final Energy Demand in the transport sector will decrease by 8% in 2035 compared with the BAU Scenario.

Strong Policies Scenario : Power Generation Mix



Middle East

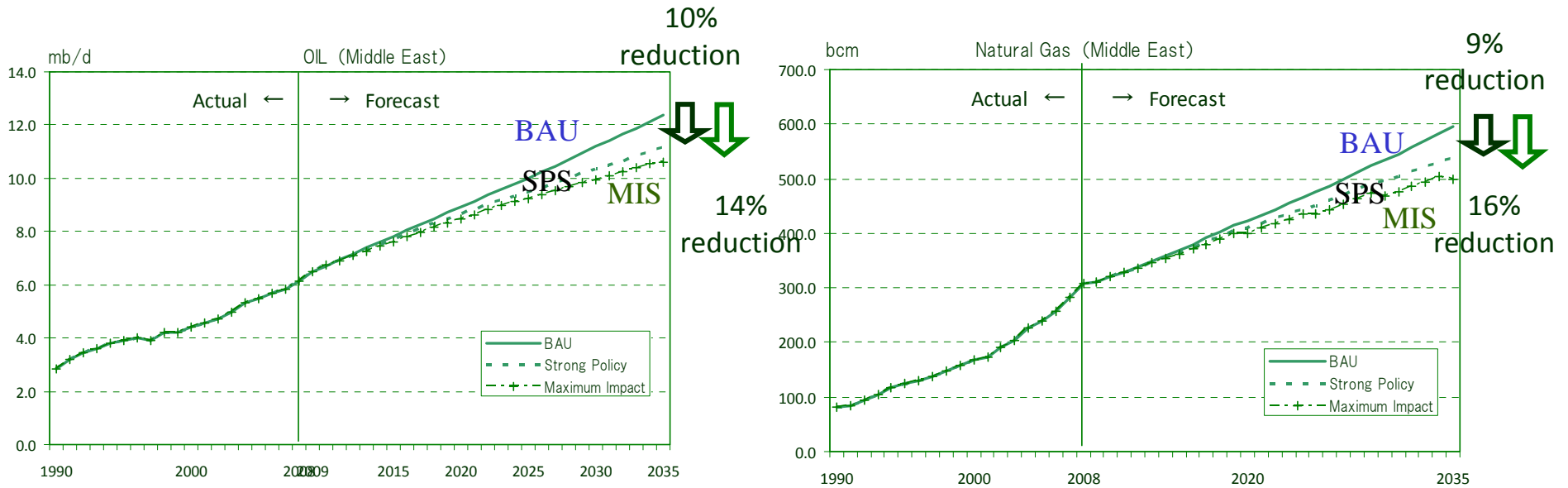
Power Generation



- In Strong Policies Scenario in 2035, power generation will be lower by 174 TWh, showing 9% reduction compared with BAU Scenario.
- Gas-fired power generation will remain as dominant source for the total power generation.

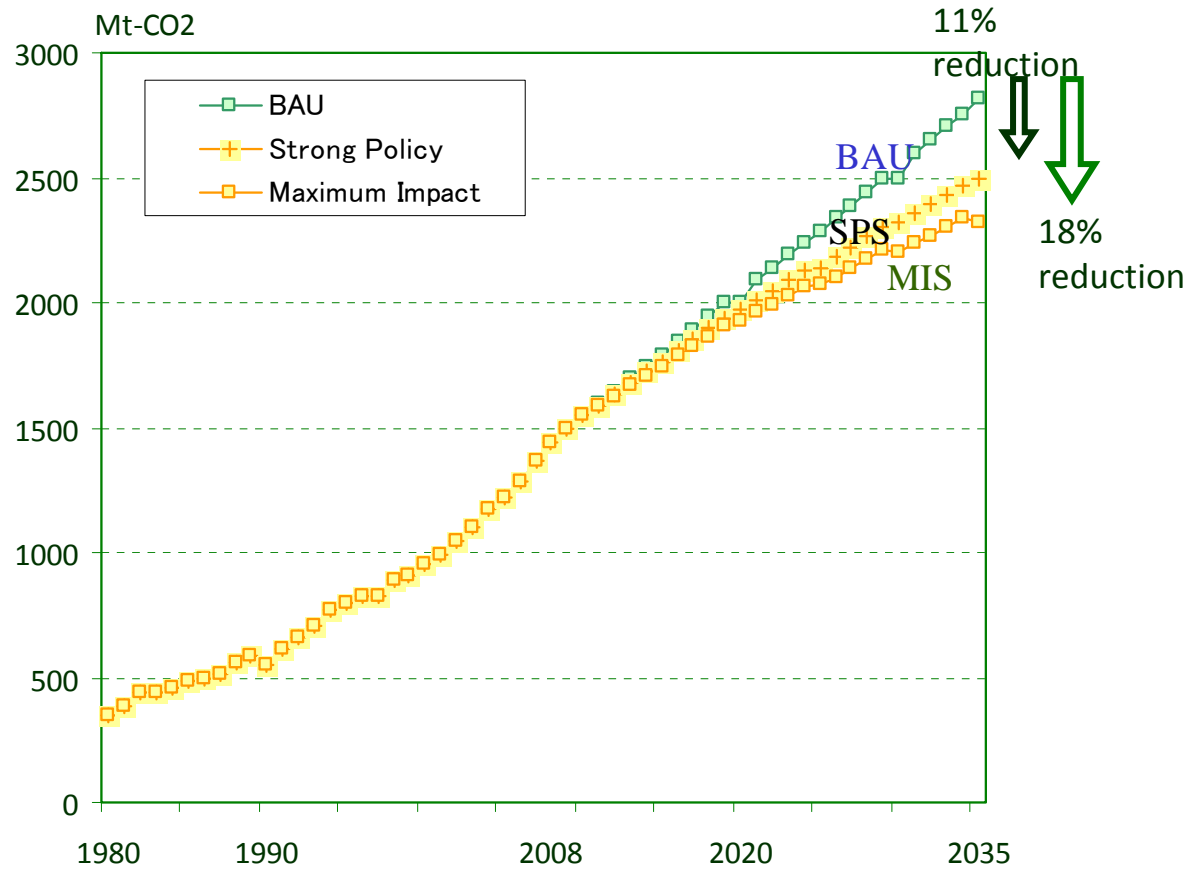
Oil demand and Natural gas demand

Middle East



- Oil demand in Maximum Impact Scenario will be lower by 14% in 2035 compared with the BAU Scenario, while that in Strong Policies Scenario will be lower by 10% in 2035.
- Transport sector demand will account for 36% of oil demand growth in 2035 in MIS.
- Natural gas demand in MIS will be lower by 16% in 2035 compared with the BAU Scenario, while that in SPS will be lower by 9% in 2035.
- Power sector demand will account for 33% of gas demand growth in 2035 in MIS.

CO2 Mitigation by Alternative Scenarios



Middle East

CO2 Mitigation

(2035)
BAU
2,813 Mt-CO2

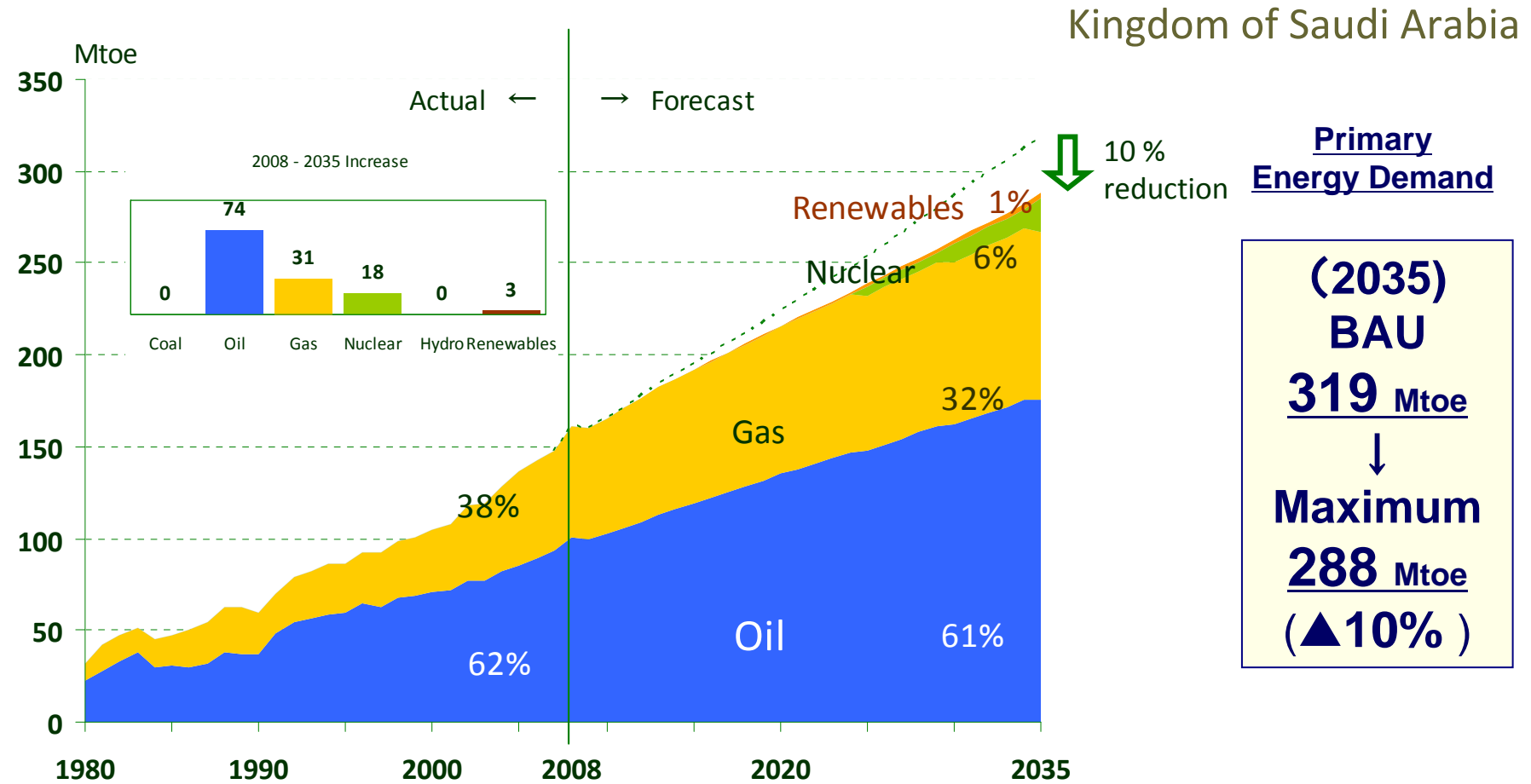
Strong
2,498 Mt-CO2
(▲ 11%)

Maximum
2,320 Mt-CO2
(▲ 18%)

- In Maximum Impact Scenario, CO2 emissions will be reduced by 18% compared with the BAU Scenario due to the introduction of nuclear and renewable energy and energy efficiency improvement.
- In Strong Policies Scenario, CO2 emissions will be reduced by 11% compared with the BAU Scenario.

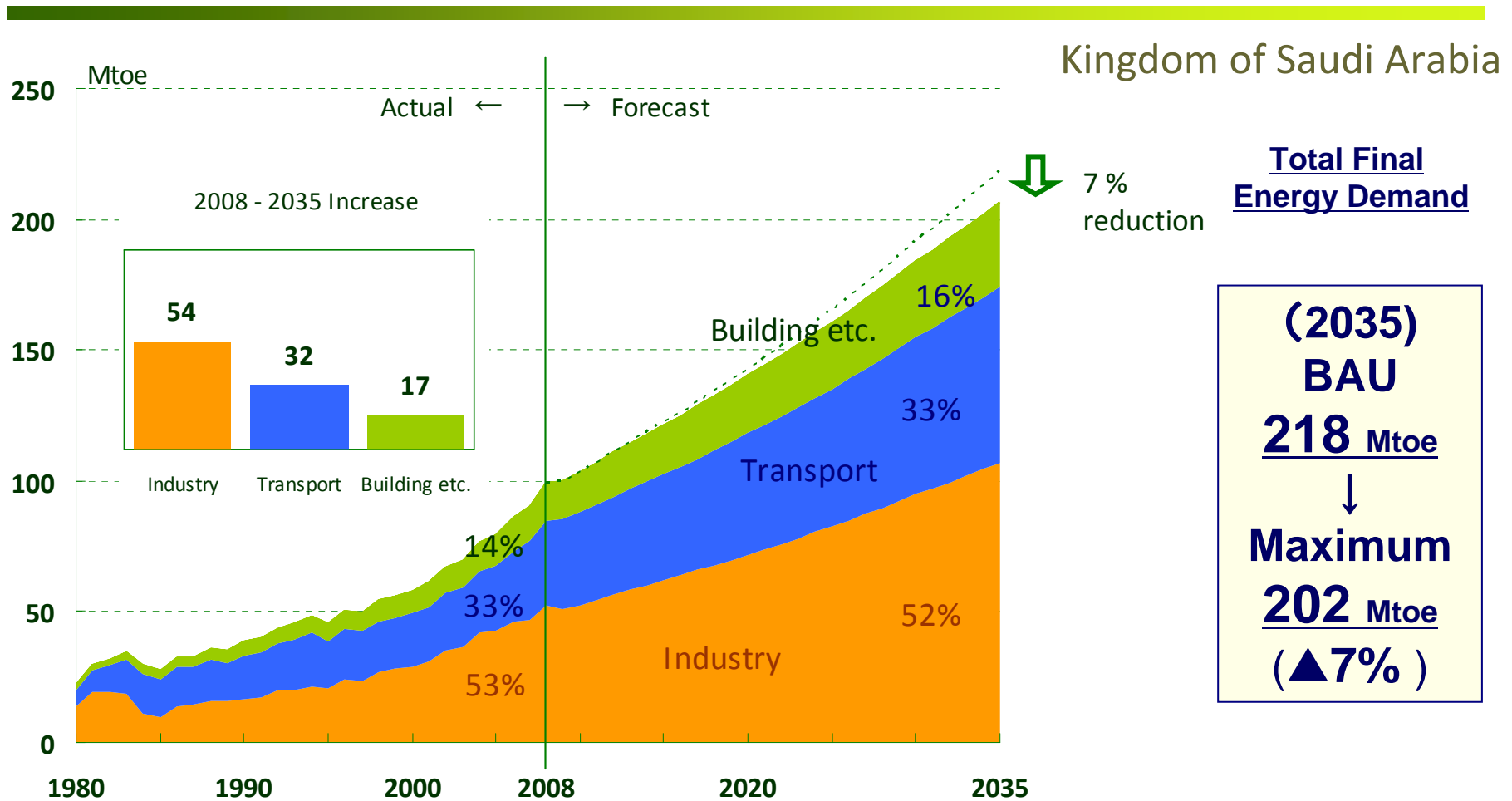
III. Energy Outlook for the Kingdom of Saudi Arabia (Alternative Scenario)

Maximum Impact Scenario : Primary energy demand



- In 2035, TPE of Saudi Arabia in Maximum Impact Scenario will be lower by 10% compared with the BAU Scenario.
- Non-fossil fuel will account for 7% of TPE.
- Nuclear power generation is expected to gradually replace oil-fired and gas-fired generation towards 2035.

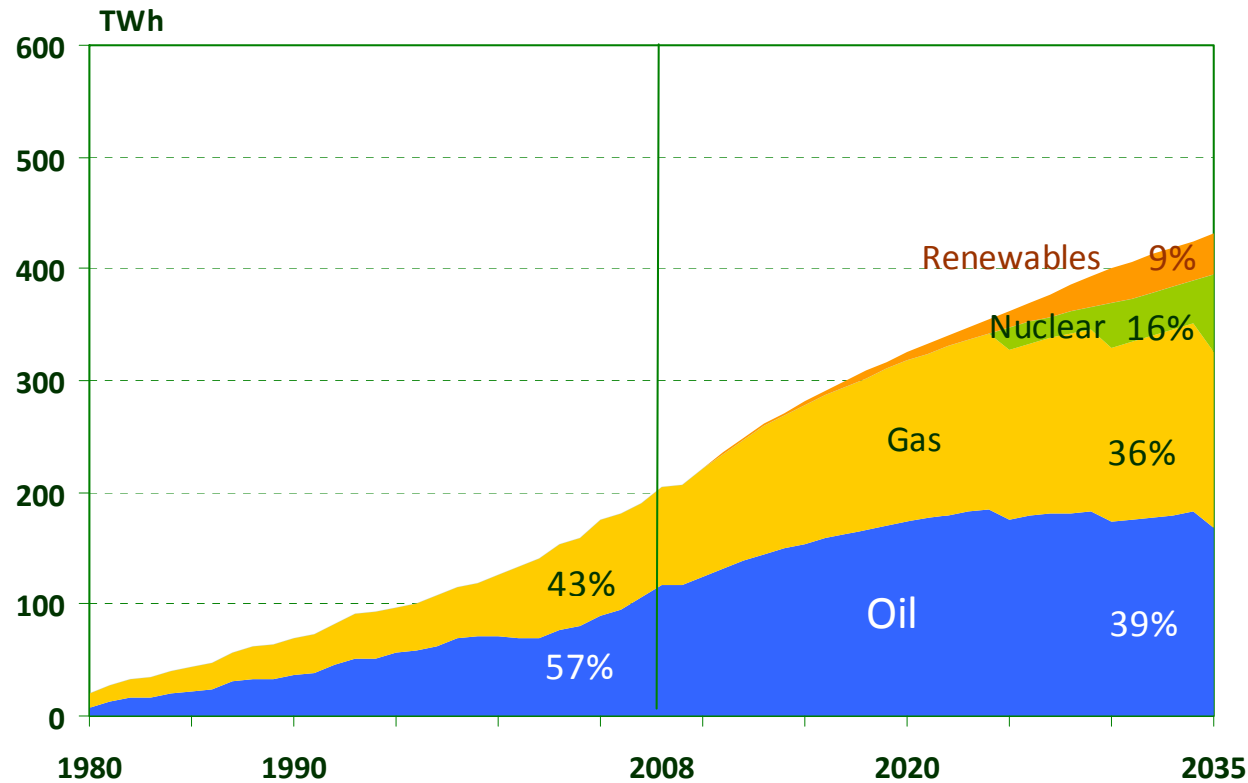
Maximum Impact Scenario : Final energy demand



- In Maximum Impact Scenario in 2035, TFED will be lower by 16 Mtoe, showing 7% reduction compared with BAU Scenario.
- Energy saving in Industry sector will be smaller than that in other sectors because of steady growth in demand in Petrochemical industry and Non-Energy sector.

Maximum Impact Scenario : Power Generation Mix

Kingdom of Saudi Arabia



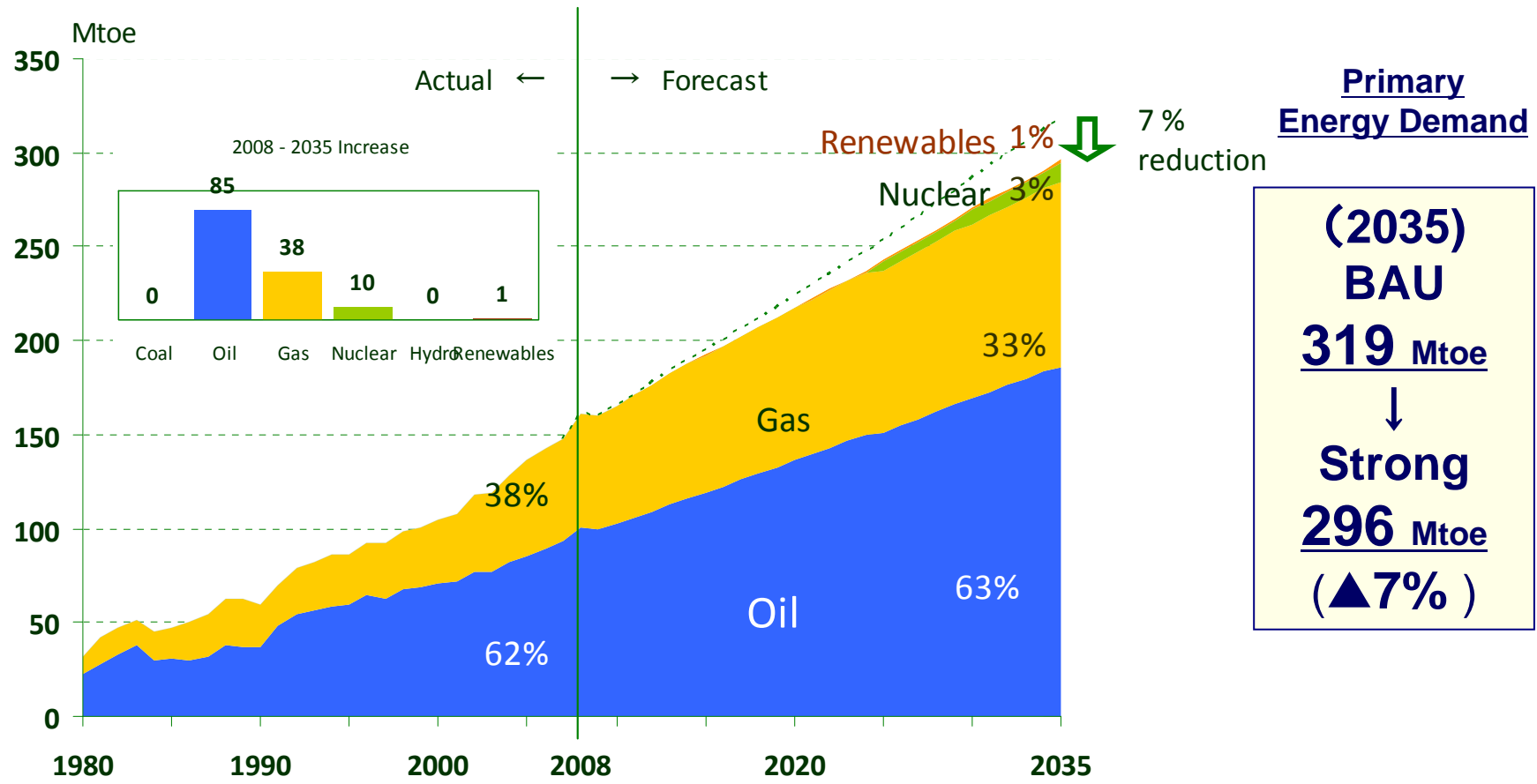
Power Generation

(2035)
BAU
495 TWh
 ↓
Maximum
432 TWh
(▲13%)

- In Maximum Impact Scenario in 2035, power generation will be lower by 63 TWh, showing 13% reduction compared with BAU Scenario.
- Nuclear power will be introduced from 2025 and its capacity will increase to reach at about 10 GW in 2035, while renewables power generation will reach 37 TWh.
- Non-fossil fuel power generation will increase in 2035, to reach at 21% to total electric power20 generation.

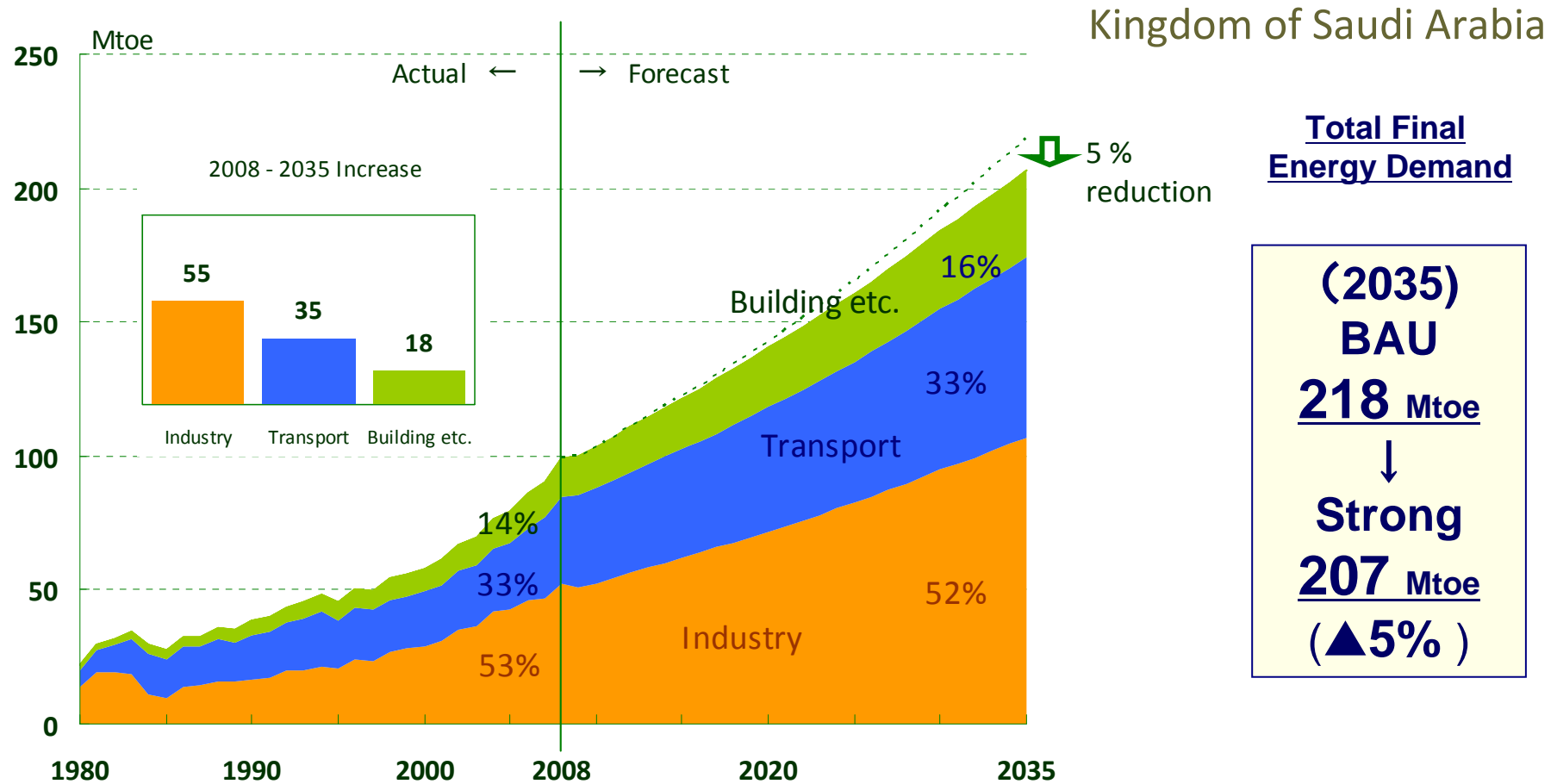
Strong Policies Scenario : Primary energy demand

Kingdom of Saudi Arabia



- In 2035, TPE of Saudi Arabia in Strong Policies Scenario will be lower by 7% compared with the BAU Scenario.
- Non-fossil fuel will account for 4% of TPE.

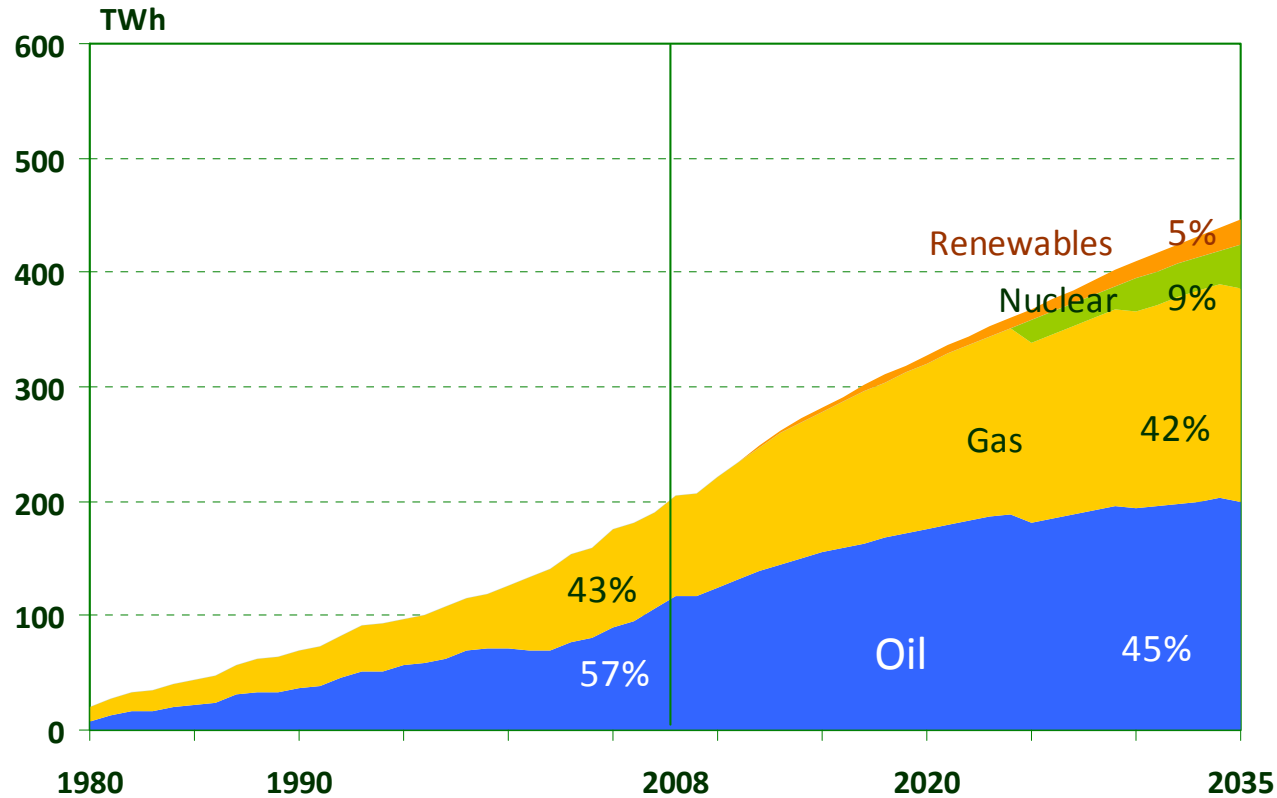
Strong Policies Scenario : Final energy demand



- In Strong Policies Scenario in 2035, TFED will be lower by 11 Mtoe, showing 5% reduction compared with BAU Scenario
- Demand in Residential and commercial sector will be lower by about 11% in 2035 compared with the BAU Scenario.

Strong Policies Scenario : Power Generation Mix

Kingdom of Saudi Arabia



Power Generation

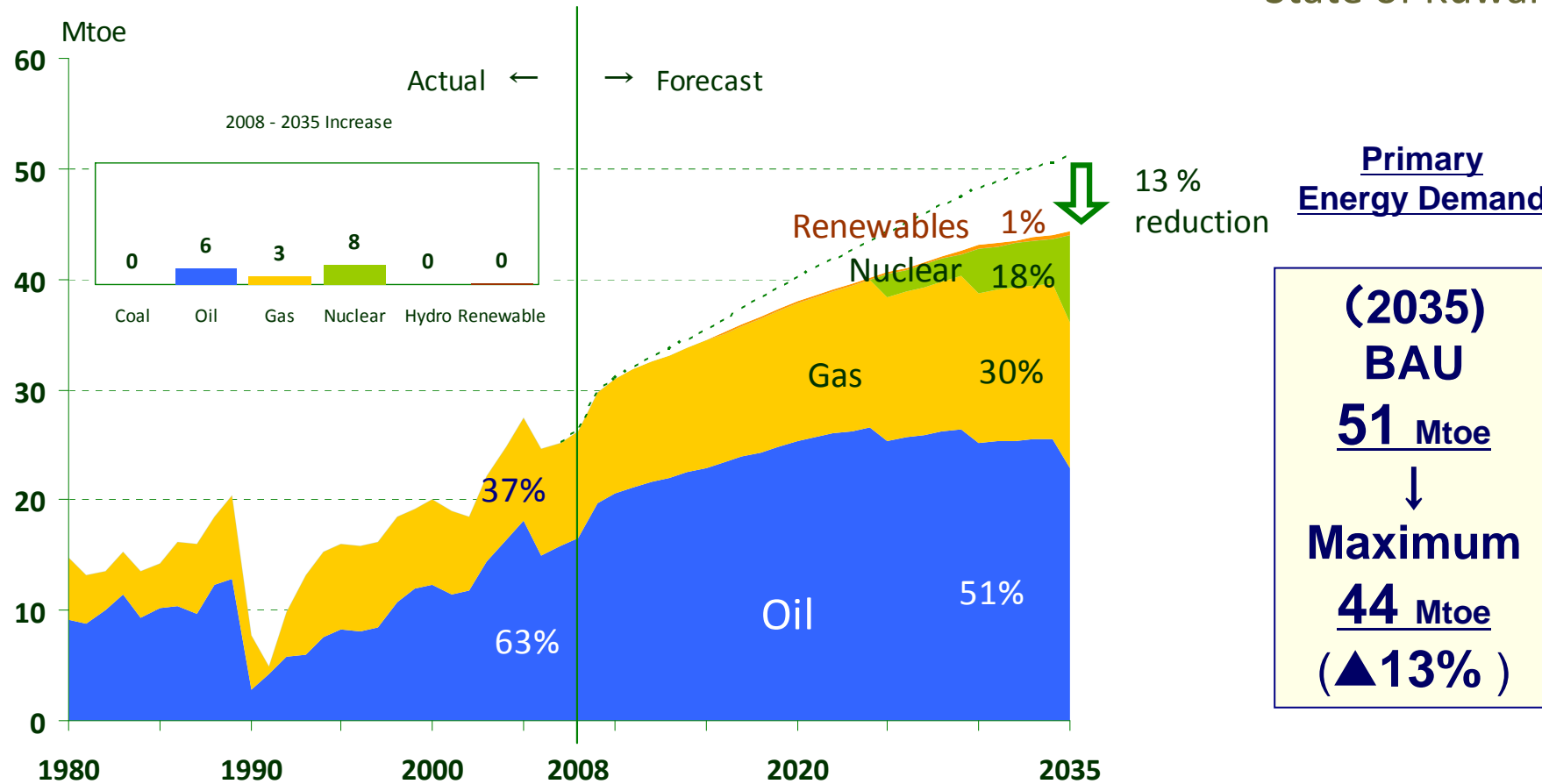
(2035)
BAU
495 TWh
 ↓
Strong
447 TWh
(▲10%)

- In Strong Policies Scenario in 2035, power generation will be lower by 48 TWh, showing 10% reduction compared with BAU Scenario.
- Nuclear power will be introduced from 2025 and its capacity will reach at 5.6 GW in 2035, while renewables power generation will reach 22 TWh.

IV. Energy Outlook for the State of Kuwait (Alternative Scenario)

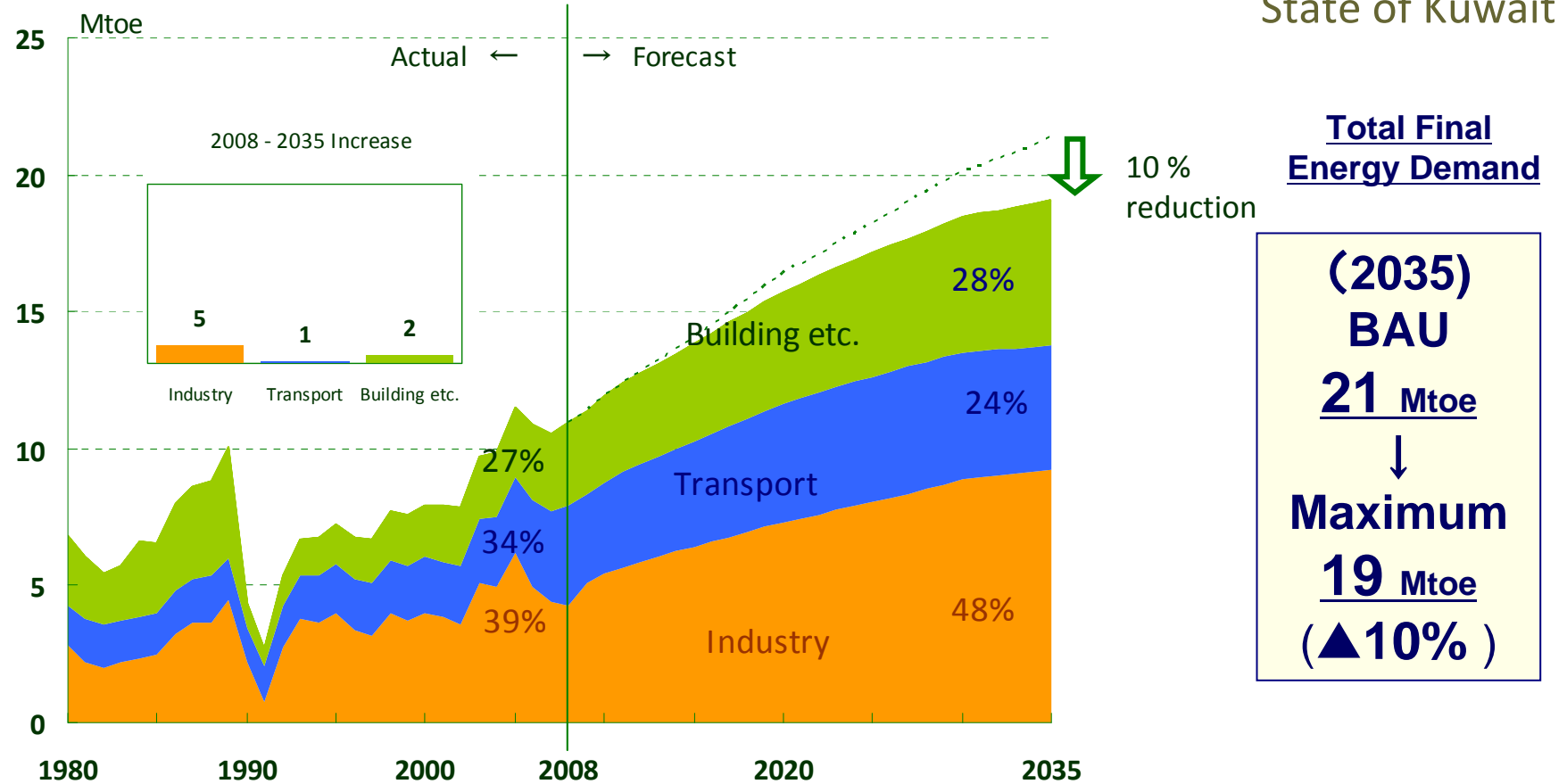
Maximum Impact Scenario : Primary energy demand

State of Kuwait



- In 2035, TPE of Kuwait in Maximum Impact Scenario will be lower by 13% compared with the BAU Scenario.
- Non-fossil fuel will account for 19% of TPE.
- The increase in nuclear power as primary energy source will be significant.

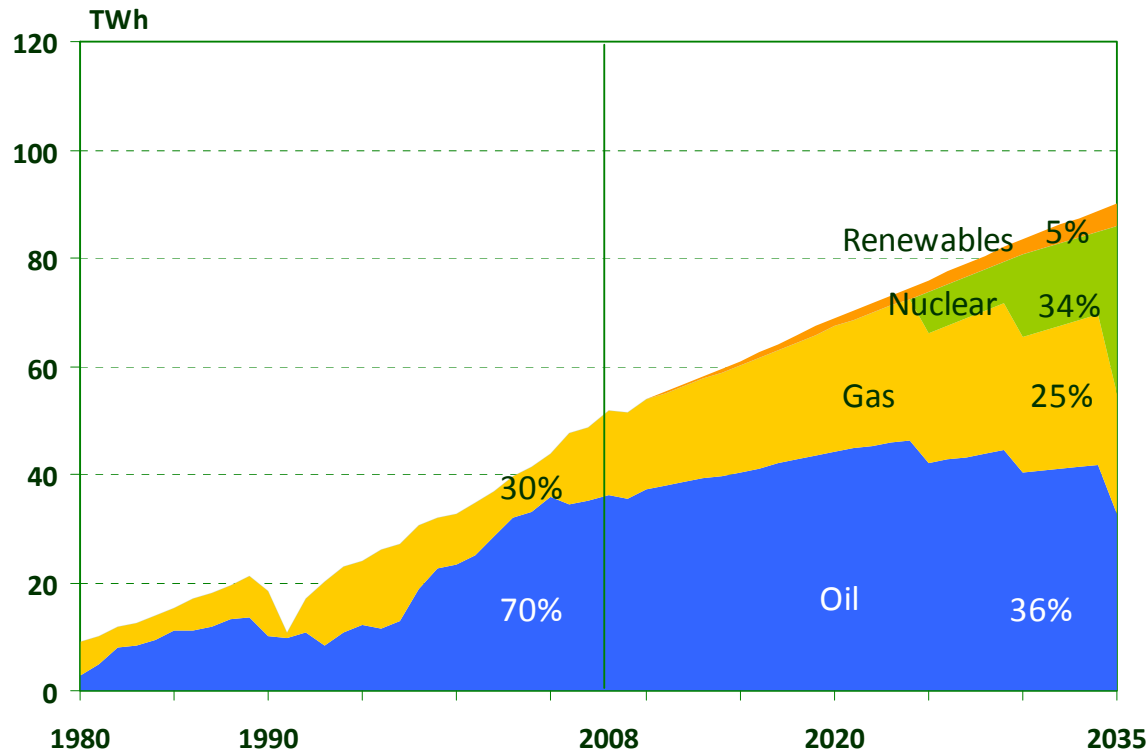
Maximum Impact Scenario : Final energy demand



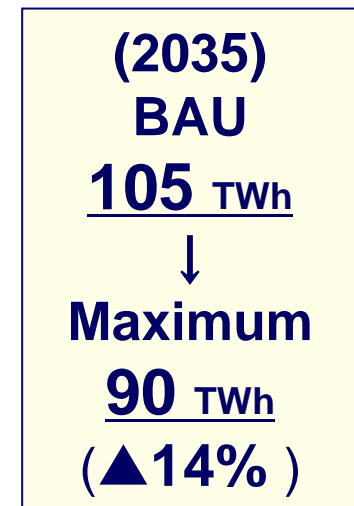
- In Maximum Impact Scenario in 2035, TFED will be lower by 10% compared with BAU Scenario.
- Demand in Residential and commercial sector will be lower by 15% in 2035 compared with the BAU Scenario.

Maximum Impact Scenario : Power Generation Mix

State of Kuwait



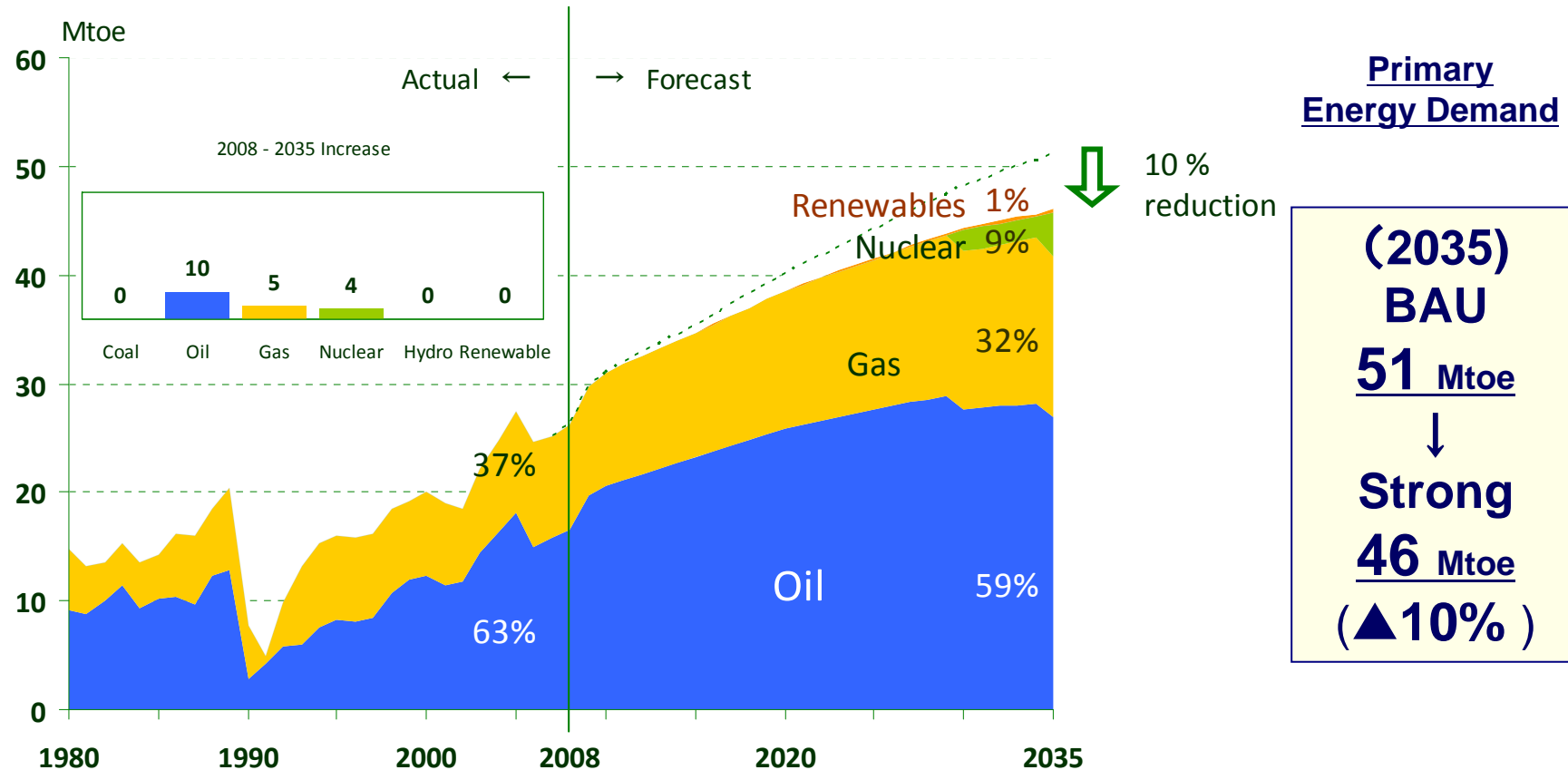
Power Generation



- In Maximum Impact Scenario in 2035, power generation will be lower by 14% compared with BAU Scenario.
- Nuclear power will be introduced from 2025 and its capacity will reach 4.4 GW in 2035, while renewables power generation will reach 4 TWh.
- Nuclear power generation will be the same level as the Oil-fired power generation in 2035.

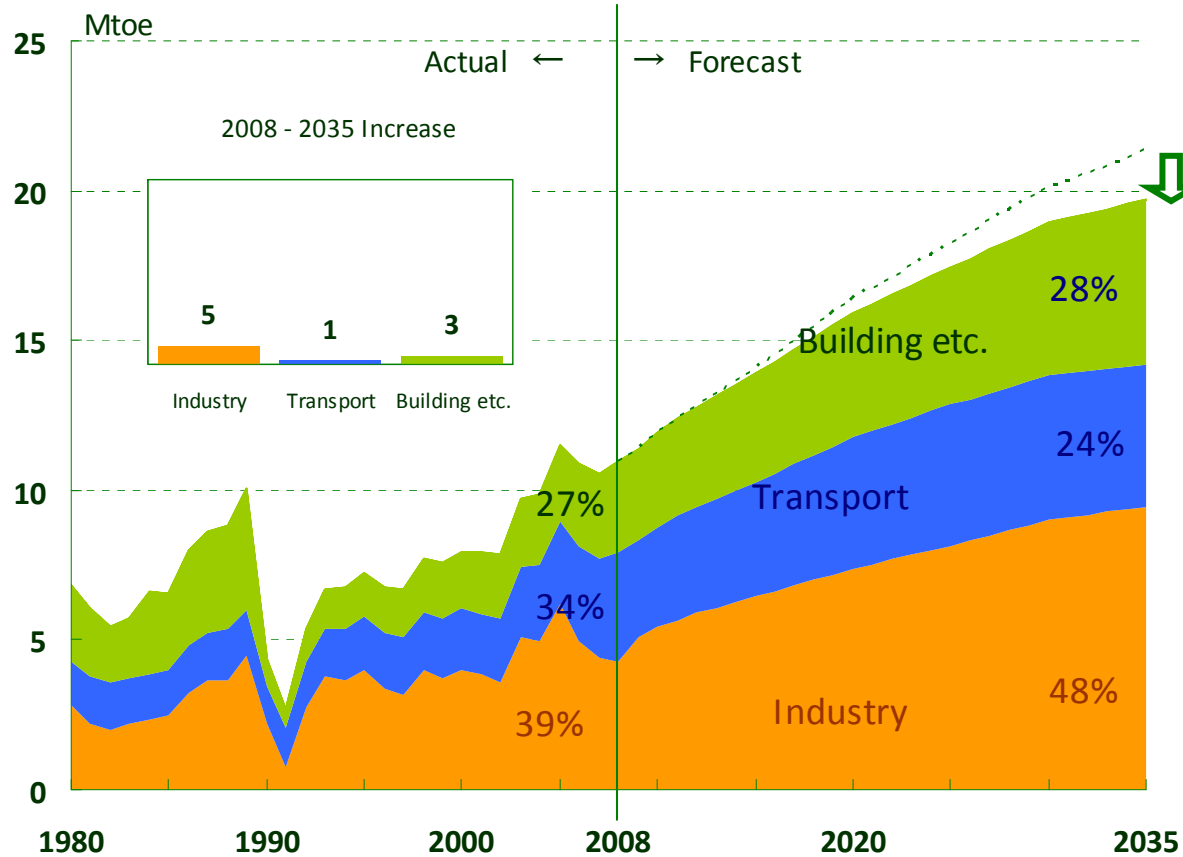
Strong Policies Scenario : Primary energy demand

State of Kuwait



- In 2035, TPE of Kuwait in Strong Policies Scenario will be lower by 10% compared with the BAU Scenario.
- Non-fossil fuel will account for 10% of TPE.

Strong Policies Scenario : Final energy demand



State of Kuwait

Total Final Energy Demand

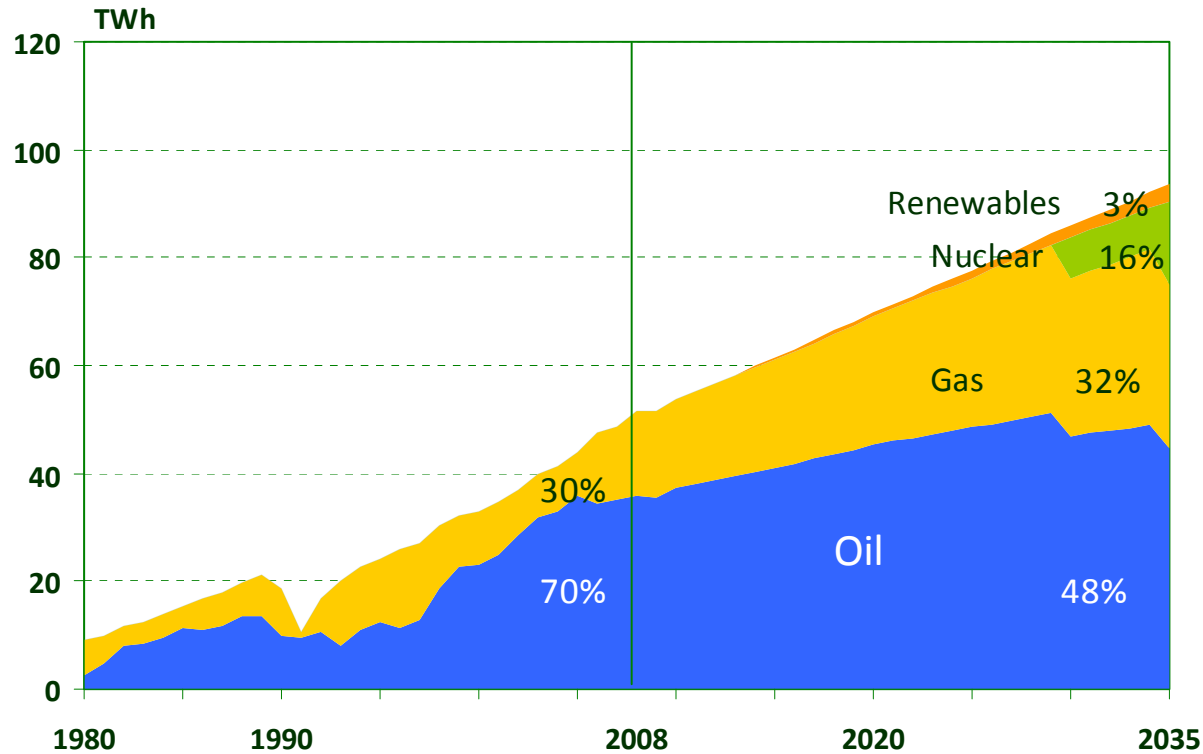
(2035)
BAU
21 Mtoe
 ↓
Strong
20 Mtoe
(▲8%)

8 %
reduction

- In Strong Policies Scenario in 2035, TFED will be lower by 8% compared with BAU Scenario.
- Demand in Residential and commercial sector will be lower by 12% in 2035 compared with the BAU Scenario.

Strong Policies Scenario : Power Generation Mix

State of Kuwait



Power Generation

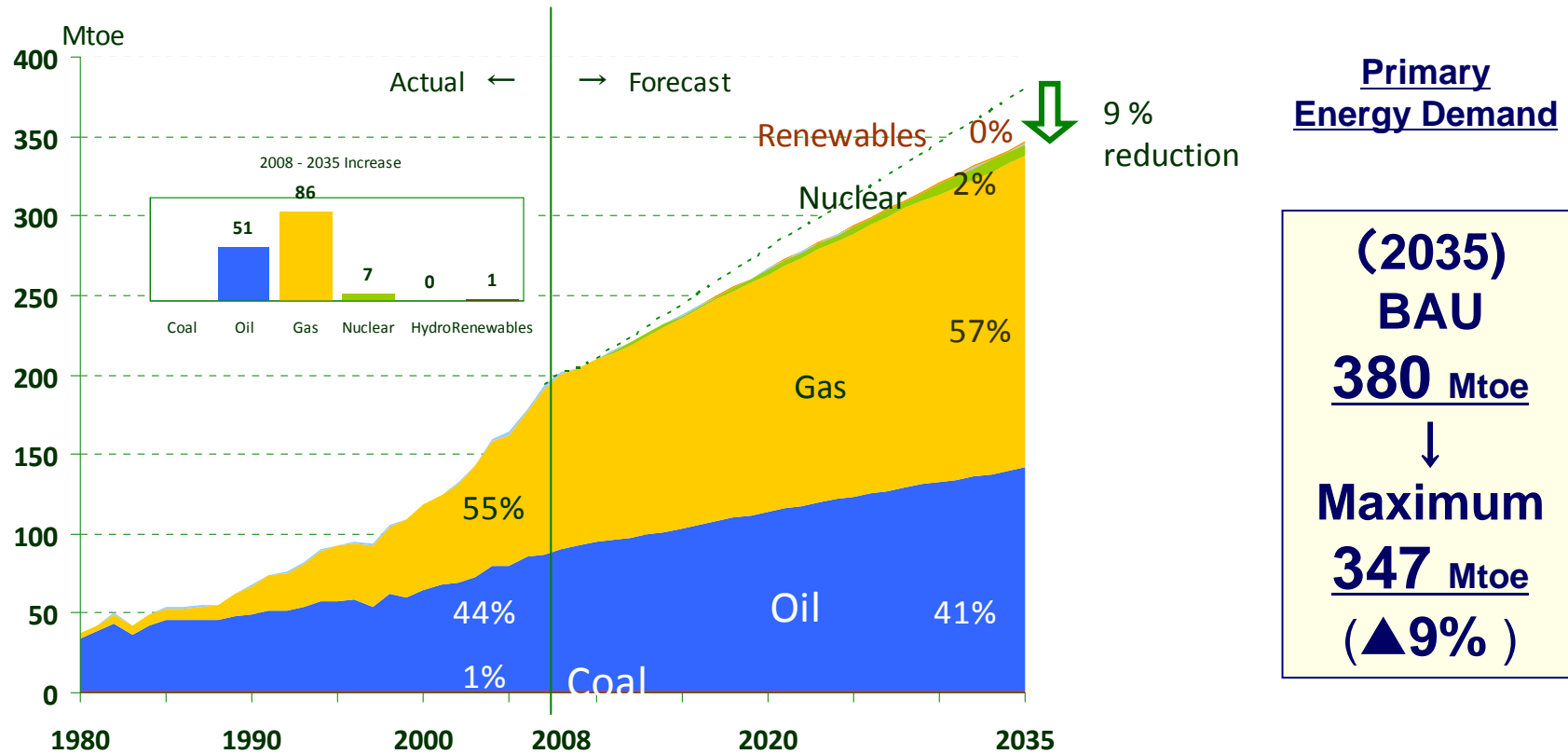
(2035)
BAU
105 TWh
 ↓
Strong
94 TWh
(▲10%)

- In Strong Policies Scenario in 2035, power generation will be lower by 10% compared with BAU Scenario.
- Nuclear power will be introduced from 2030 and its capacity will reach 2.2 GW in 2035, while renewables power generation will reach 3 TWh.
- Non-fossil fuel supply will increase in 2035, to reach 19% to total electric power generation.

V. Energy Outlook for the Islamic Republic of Iran (Alternative Scenario)

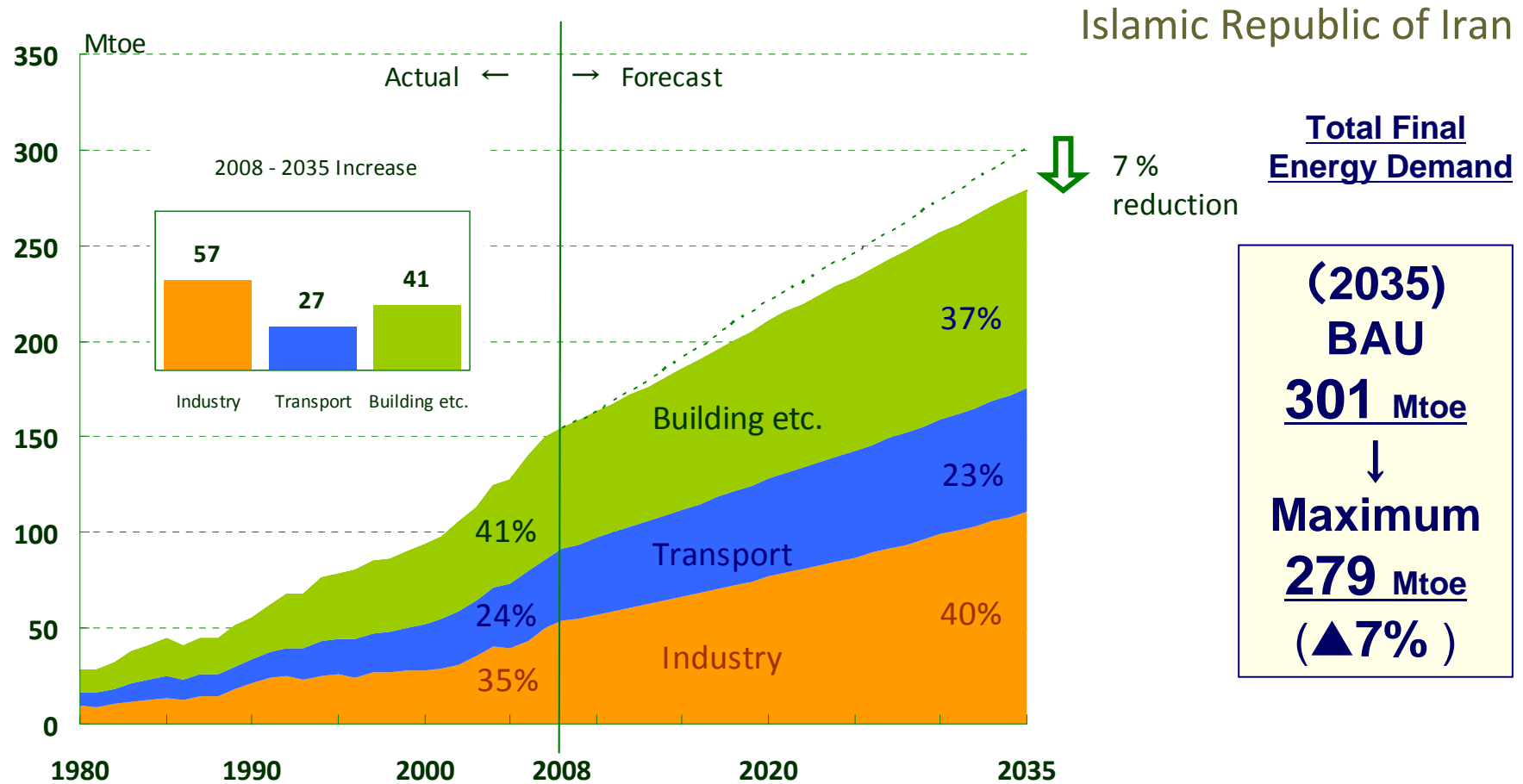
Maximum Impact Scenario : Primary energy demand

Islamic Republic of Iran



- In 2035, TPE of Iran in Maximum Impact Scenario will be lower by 9% compared with the BAU Scenario.
- Non-fossil fuel will account for 2% of TPE, while Iran will implement large scale renewable energy introduction.

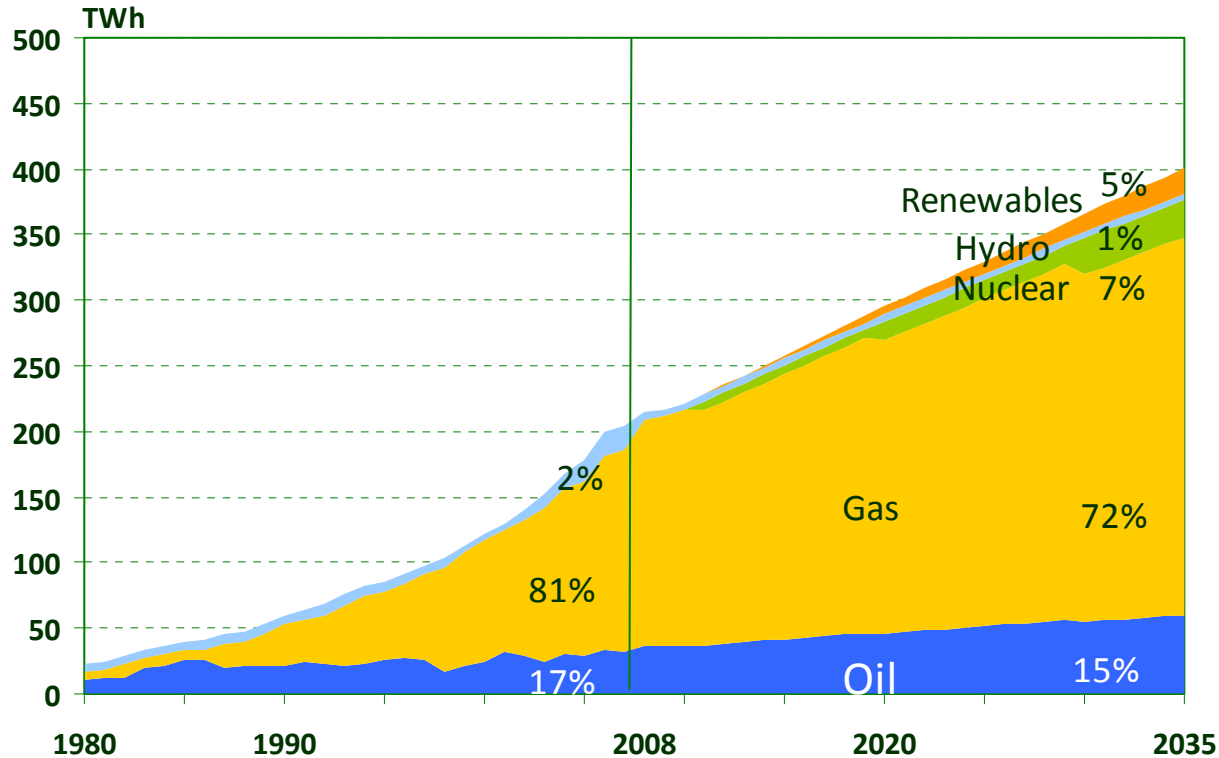
Maximum Impact Scenario : Final energy demand



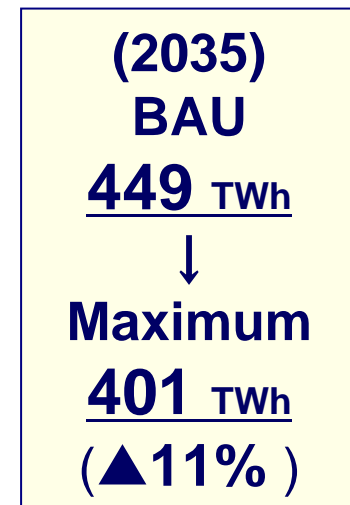
- In Maximum Impact Scenario in 2035, TFED will be lower by 22 Mtoe, showing 7% reduction compared with BAU Scenario
- Demand in Transport will be lower by 12% in 2035 compared with the BAU Scenario

Maximum Impact Scenario : Power Generation Mix

Islamic Republic of Iran



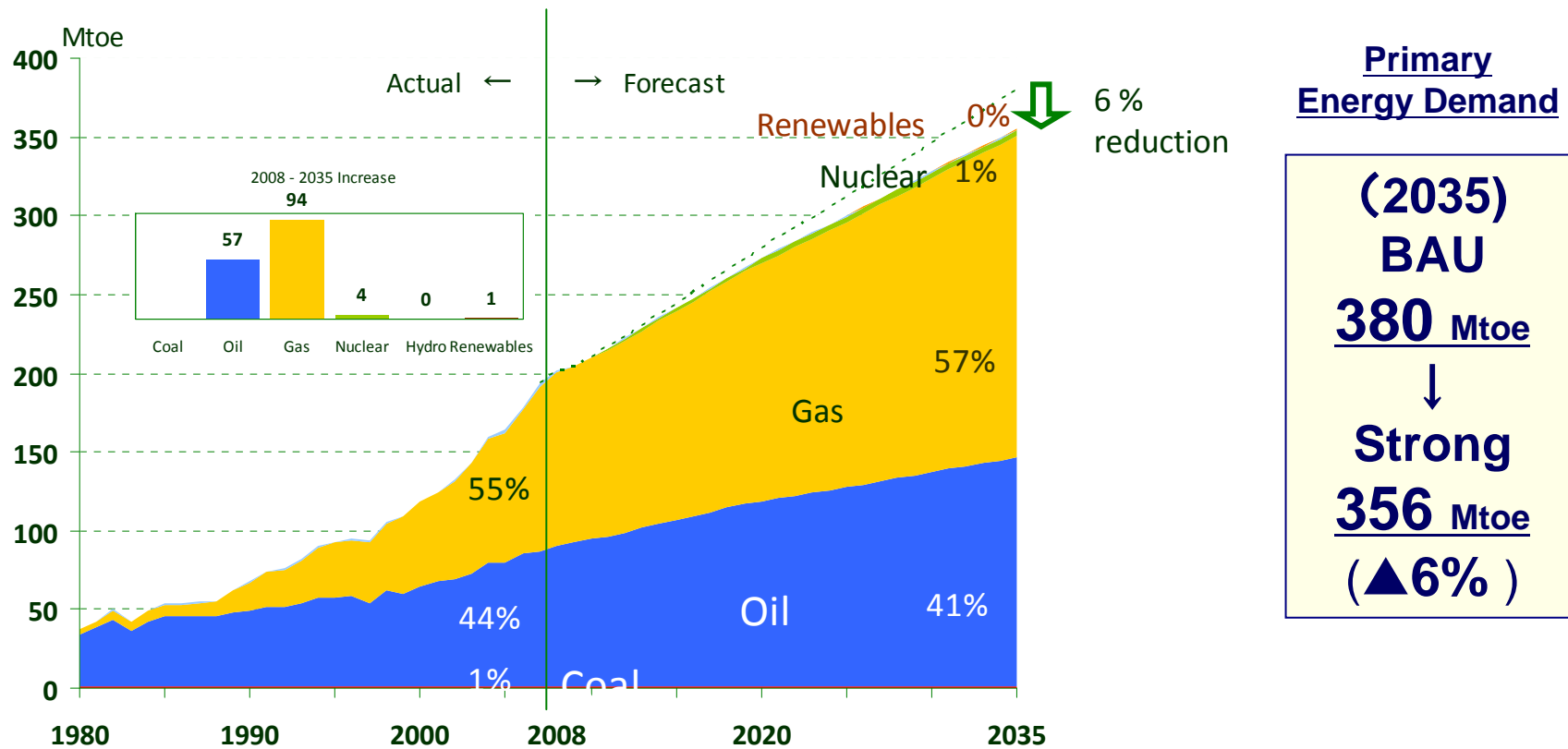
Power Generation



- In Maximum Impact Scenario in 2035, power generation will be lower by 48 TWh, showing 11% reduction compared with BAU Scenario.
- Nuclear power will be introduced from 2011 and its capacity will reach 4 GW in 2035, while renewables power generation will reach 20 TWh.
- Non-fossil fuel supply will increase in 2035, to reach 13% to total electric power generation.

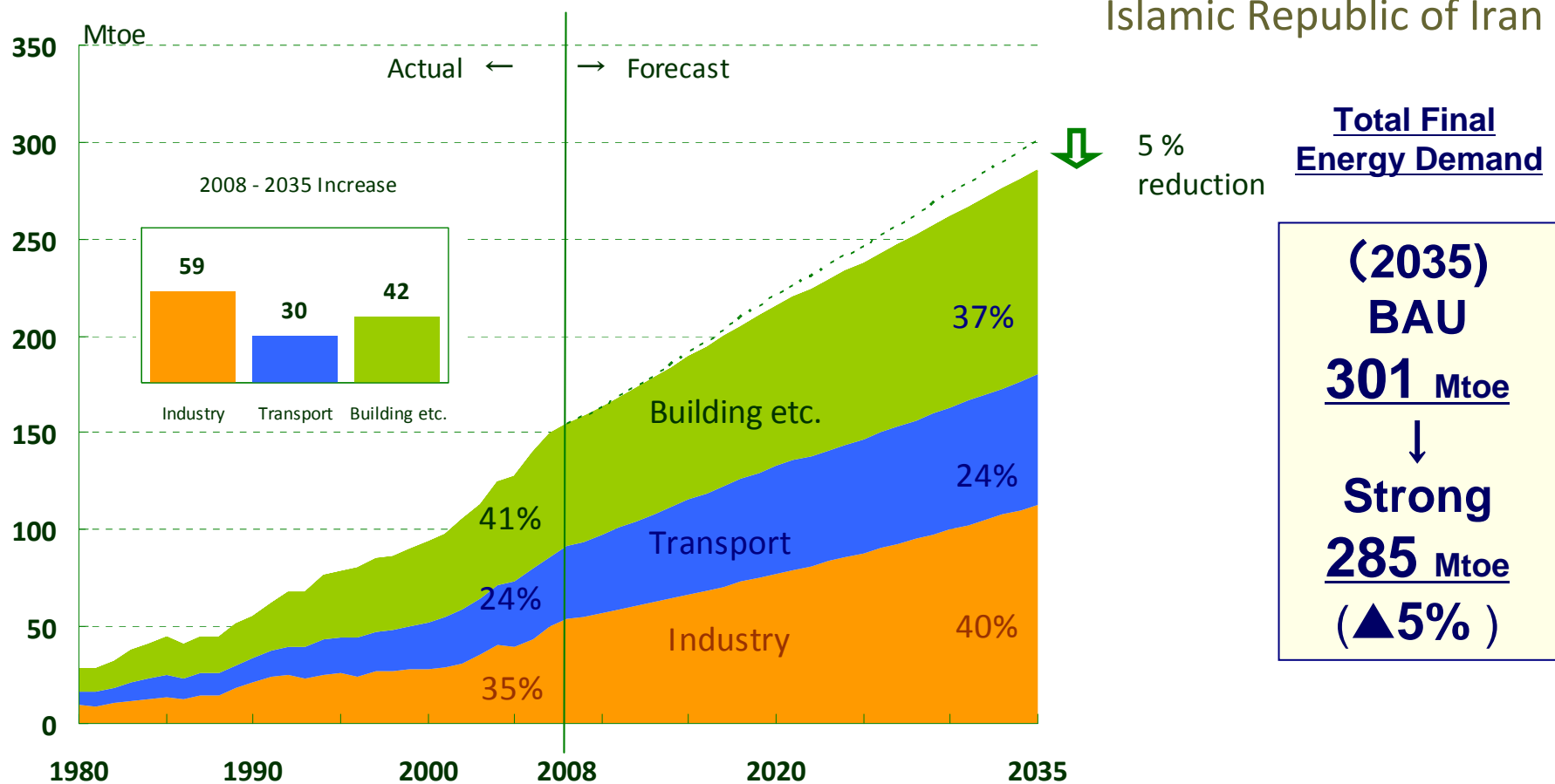
Strong Policies Scenario : Primary energy demand

Islamic Republic of Iran



- In 2035, TPES of Iran in Strong Policies Scenario will be lower by 6% compared with the BAU Scenario.
- In Strong Policies Scenario, fossil fuel will continue to dominate in TPE.

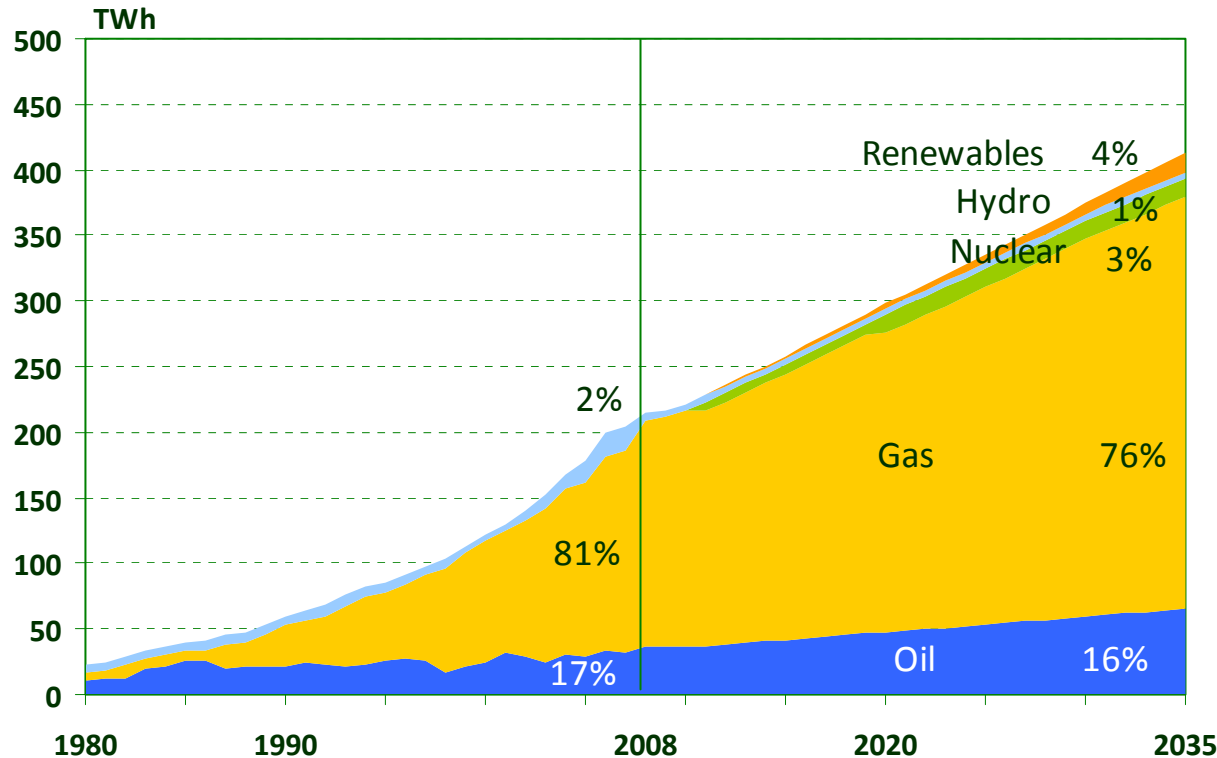
Strong Policies Scenario : Final energy demand



- In Strong Policies Scenario in 2035, TFED will be lower by 16 Mtoe, showing 5% reduction compared with BAU Scenario.
- Demand in Transport will be lower by 8% in 2035 compared with the BAU Scenario.

Strong Policies Scenario : Power Generation Mix

Islamic Republic of Iran



Power Generation

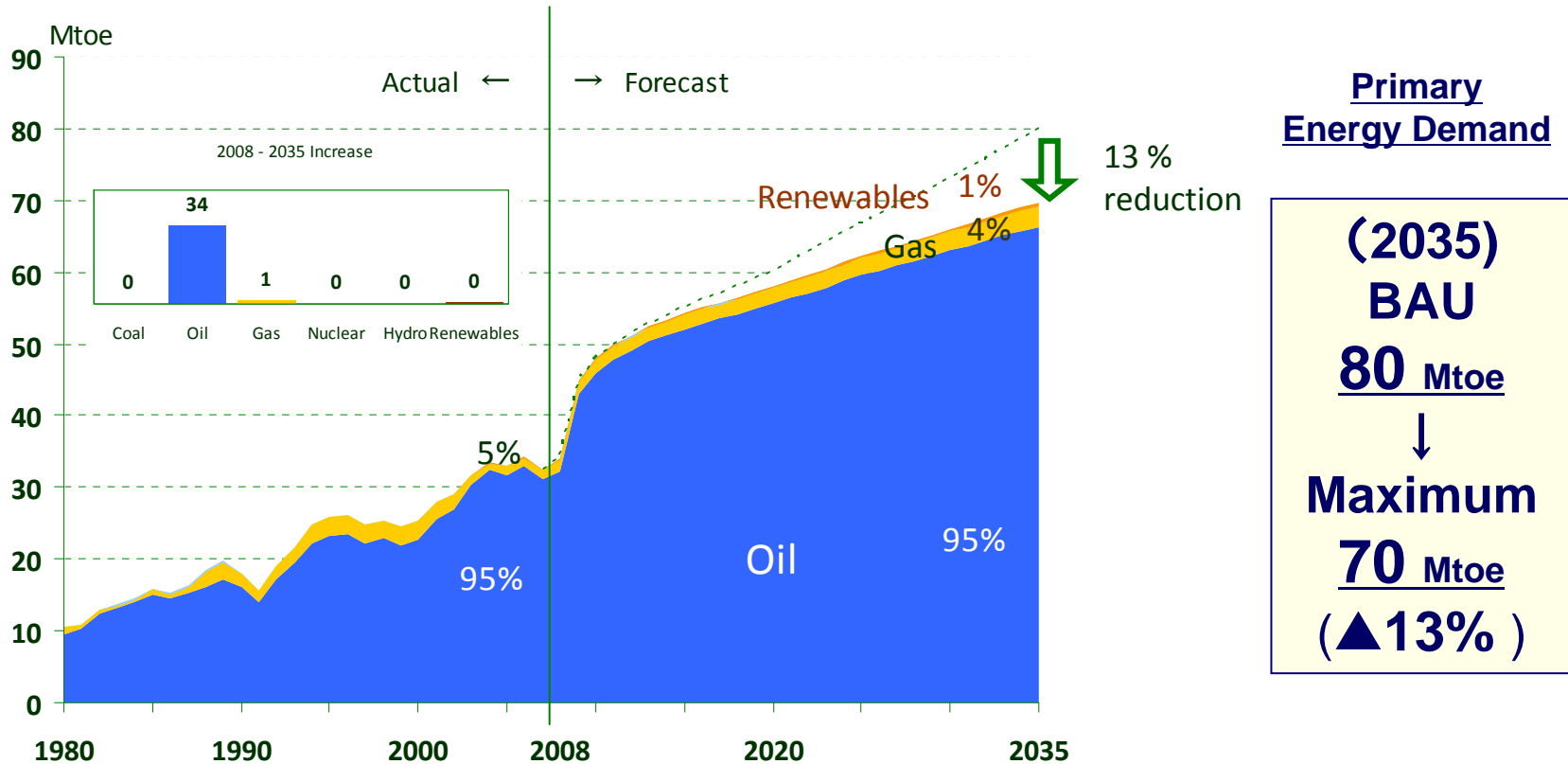
(2035)
BAU
449 TWh
 ↓
Strong
413 TWh
(▲8%)

- In Strong Policies Scenario in 2035, power generation will be lower by 36 TWh, showing 8% reduction compared with BAU Scenario.
- Nuclear power will be introduced from 2011 and its capacity will reach 2 GW in 2035, while renewables power generation will reach 15 TWh.
- Non-fossil fuel supply will increase in 2035, to reach 8% of total electric power generation.

VI. Energy Outlook for the Republic of Iraq (Alternative Scenario)

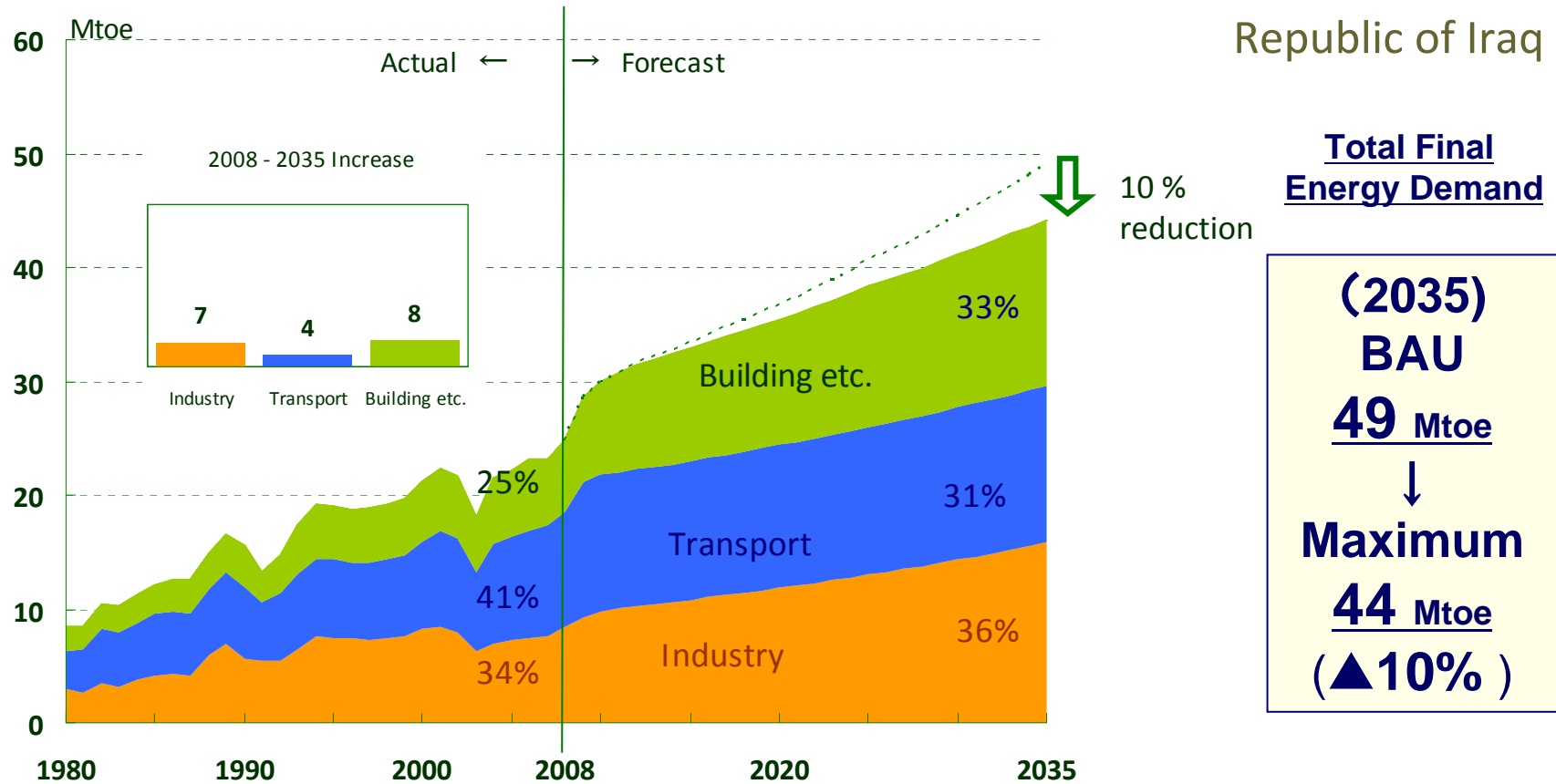
Maximum Impact Scenario : Primary energy demand

Republic of Iraq



- In 2035, TPES of Iraq in Maximum Impact Scenario will be lower by 13% compared with the BAU Scenario.
- Even at 2035 in Maximum Impact Scenario, Oil will be a dominate source in TPE.
- .

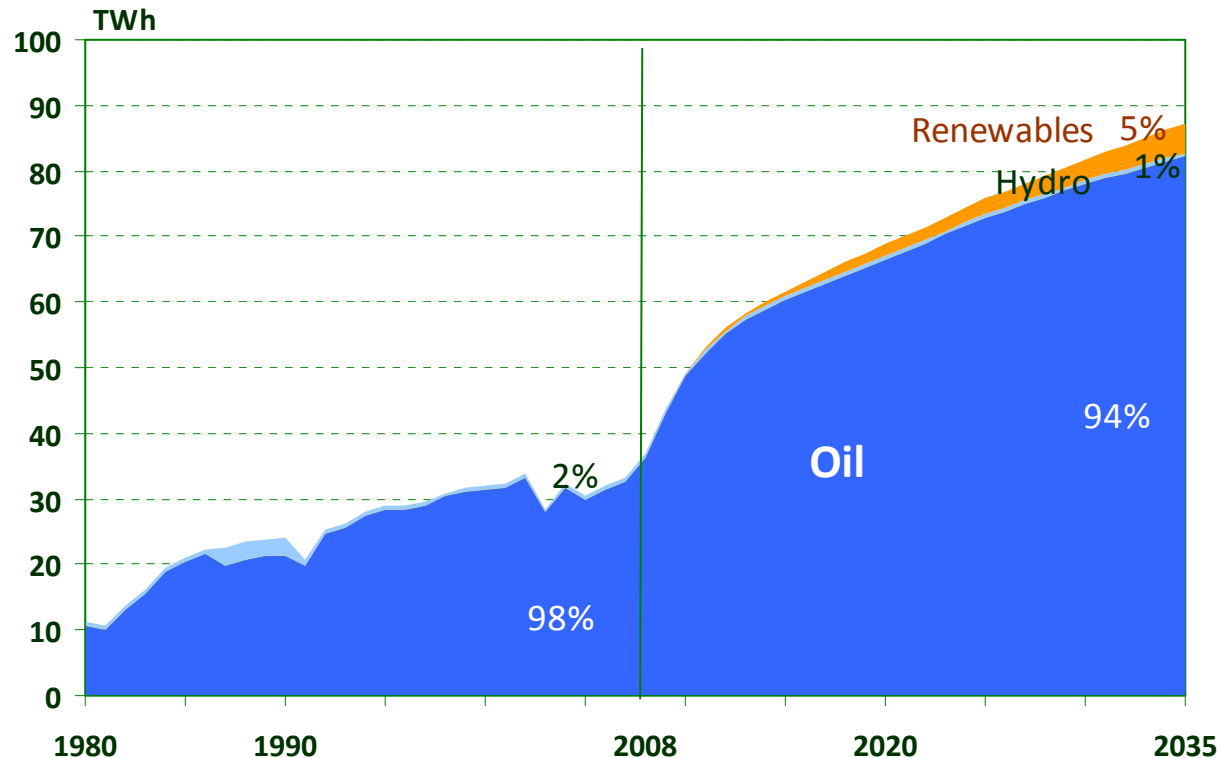
Maximum Impact Scenario : Final energy demand



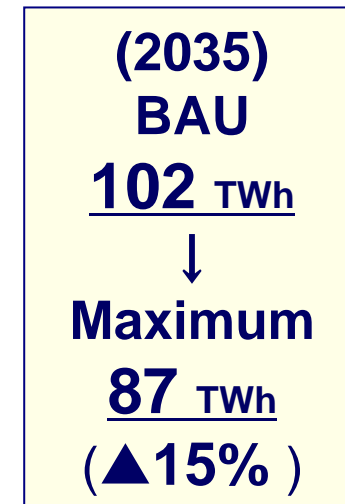
- In Maximum Impact Scenario in 2035, TFED will be lower, showing 10% reduction compared with BAU Scenario.
- Demand in Transport will be lower by 12% in 2035 compared with the BAU Scenario.

Maximum Impact Scenario : Power Generation Mix

Republic of Iraq



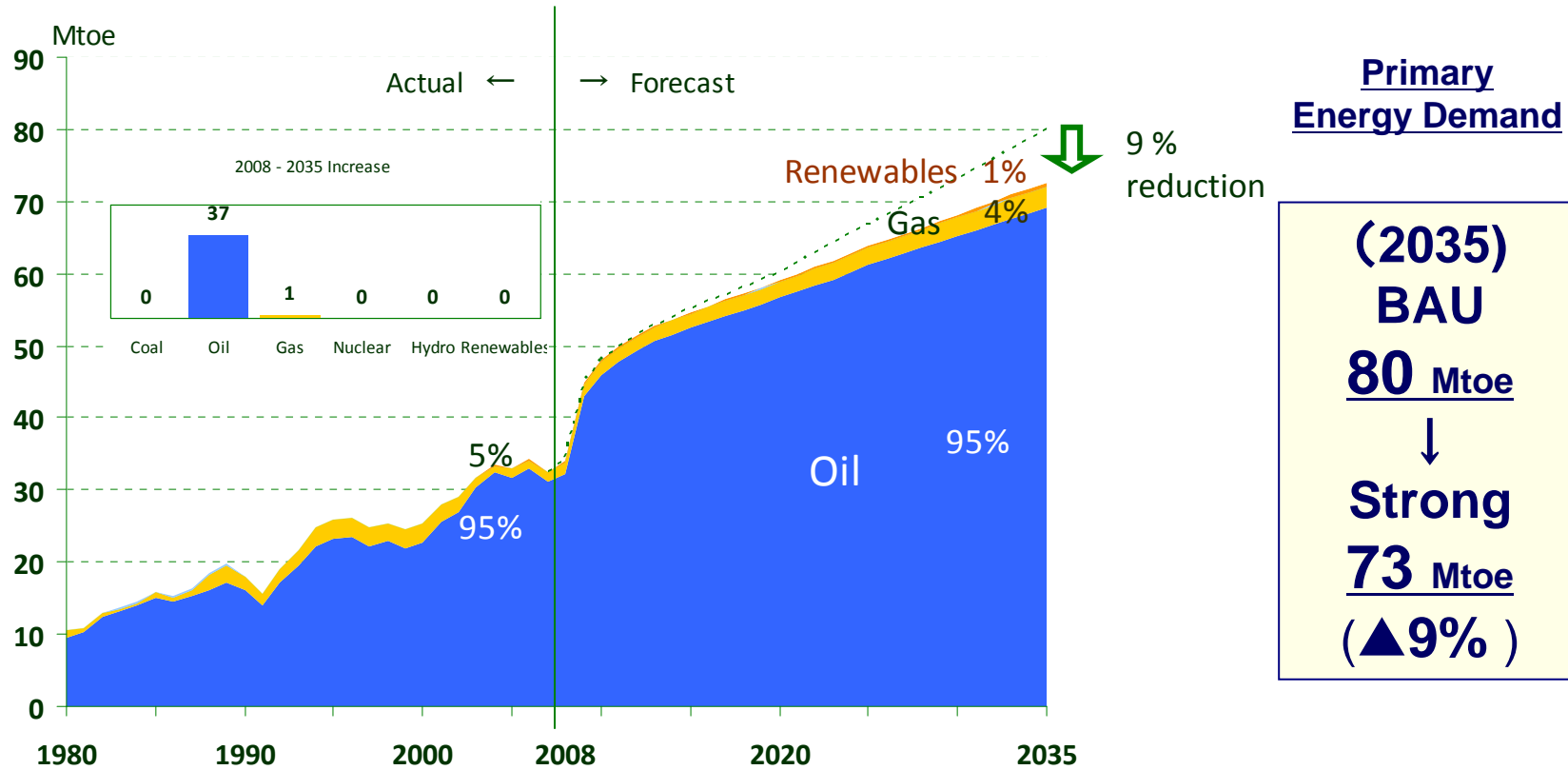
Power Generation



- In Maximum Impact Scenario in 2035, power generation will be lower, showing 15% reduction compared with BAU Scenario.
- Nuclear power plant will not be introduced during the outlook period, while renewables power generation will reach 5 TWh in 2035.
- Non-fossil fuel supply will increase slightly in 2035, to reach 6% of total electric power generation.

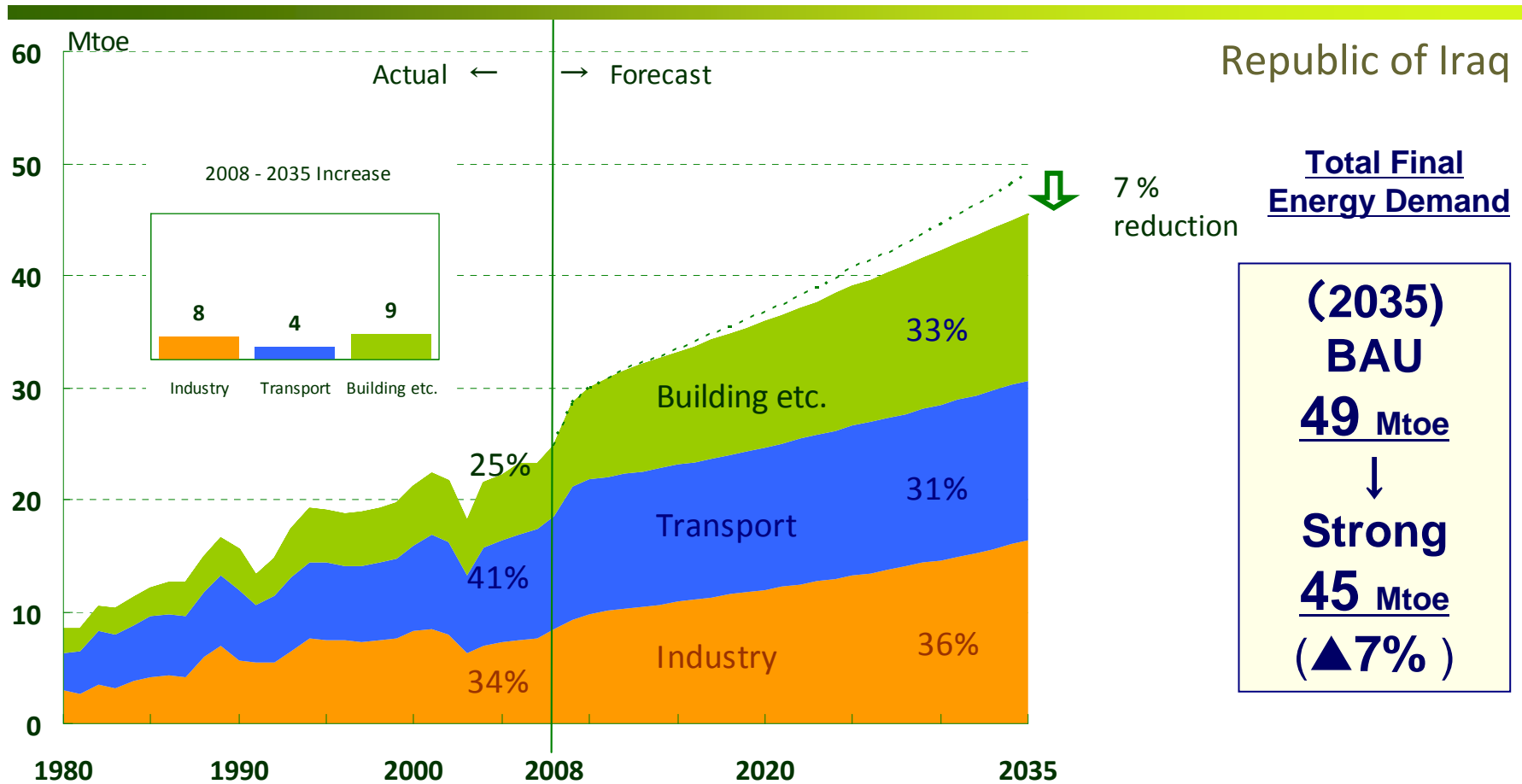
Strong Policies Scenario : Primary energy demand

Republic of Iraq



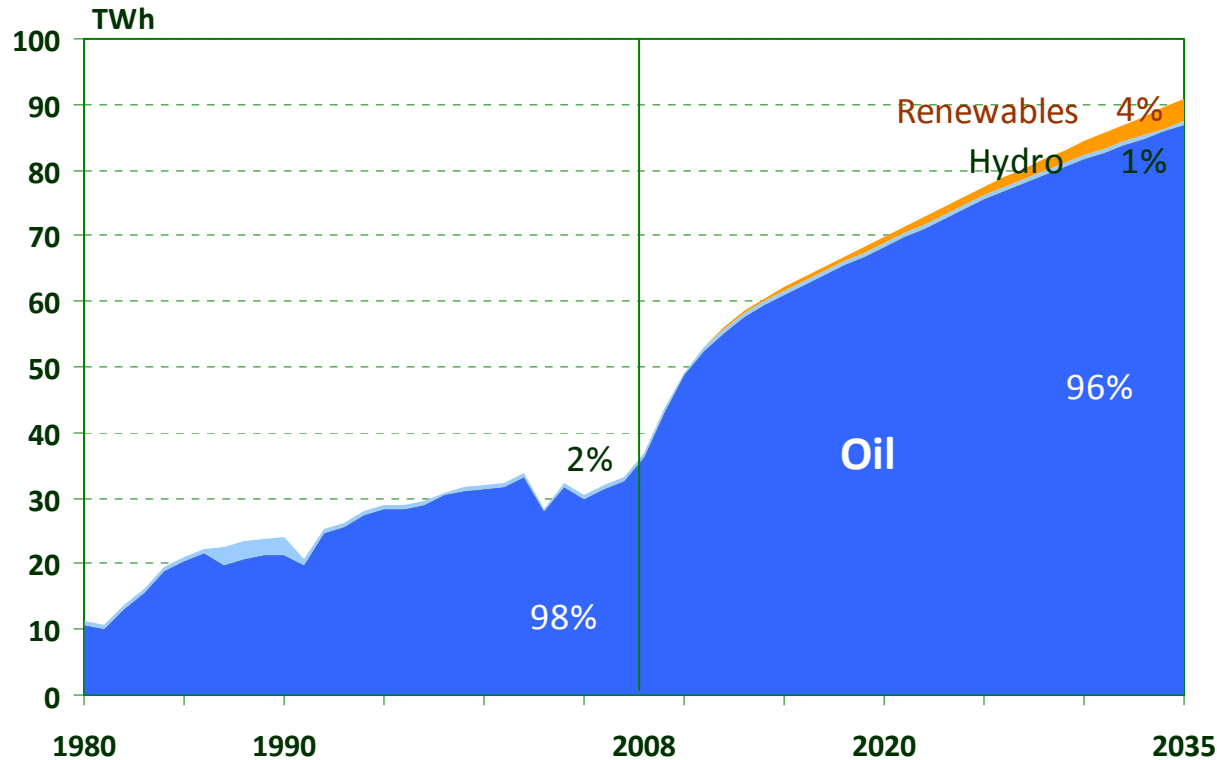
- In 2035, TPE of Iraq in Strong Policies Scenario will be lower by 9% compared with the BAU Scenario.
- Oil will continue to account for almost all of part of TPE.

Strong Policies Scenario : Final energy demand



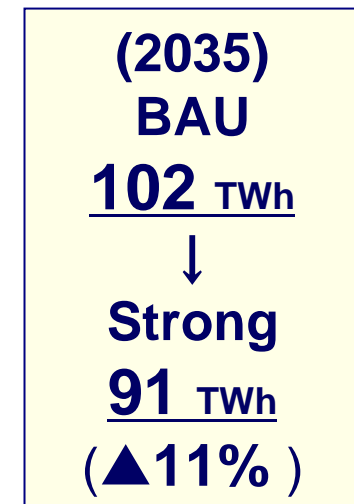
- In Strong Policies Scenario in 2035, TFED will be lower, showing 7% reduction compared with BAU Scenario.
- Demand in Transport will be lower by 8% in 2035 compared with the BAU Scenario.

Strong Policies Scenario : Power Generation Mix



Republic of Iraq

Power Generation

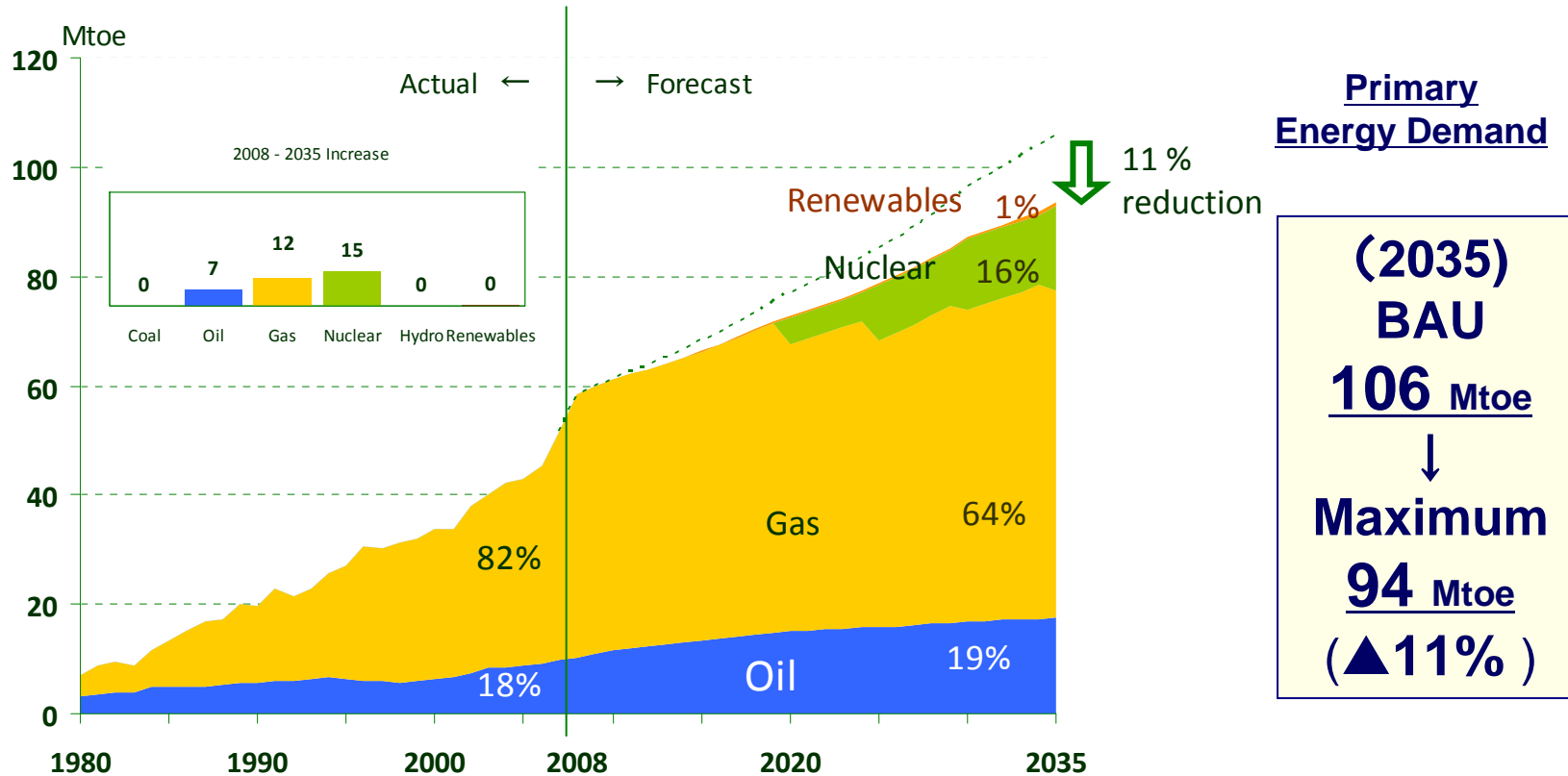


- In Strong Policies Scenario in 2035, power generation will be lower, showing 11% reduction compared with BAU Scenario.
- Nuclear power plant will not be introduced in the outlook period, while renewables power generation will reach 3 TWh in 2035.
- Oil will remain as the single largest fuel in primary energy mix by 2035.

VII. Energy Outlook for the United Arab Emirates (Alternative Scenario)

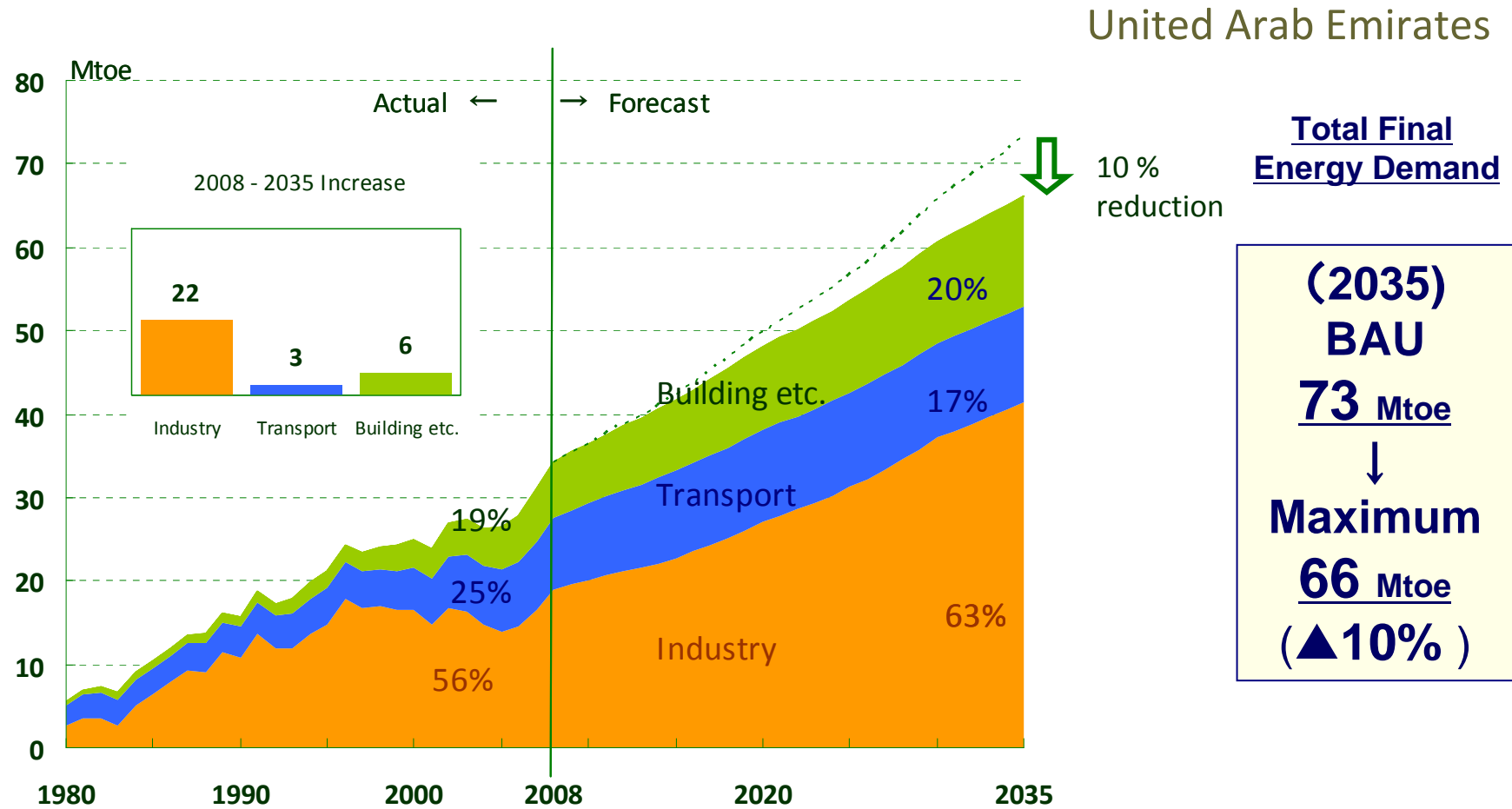
Maximum Impact Scenario : Primary energy demand

United Arab Emirates



- In 2035, TPE of United Arab Emirates in Maximum Impact Scenario will be lower by 11% compared with the BAU Scenario.
- Non-fossil fuel will account for 17% of TPE in 2035.
- Growth in nuclear power is the largest in those in primary energy demand.

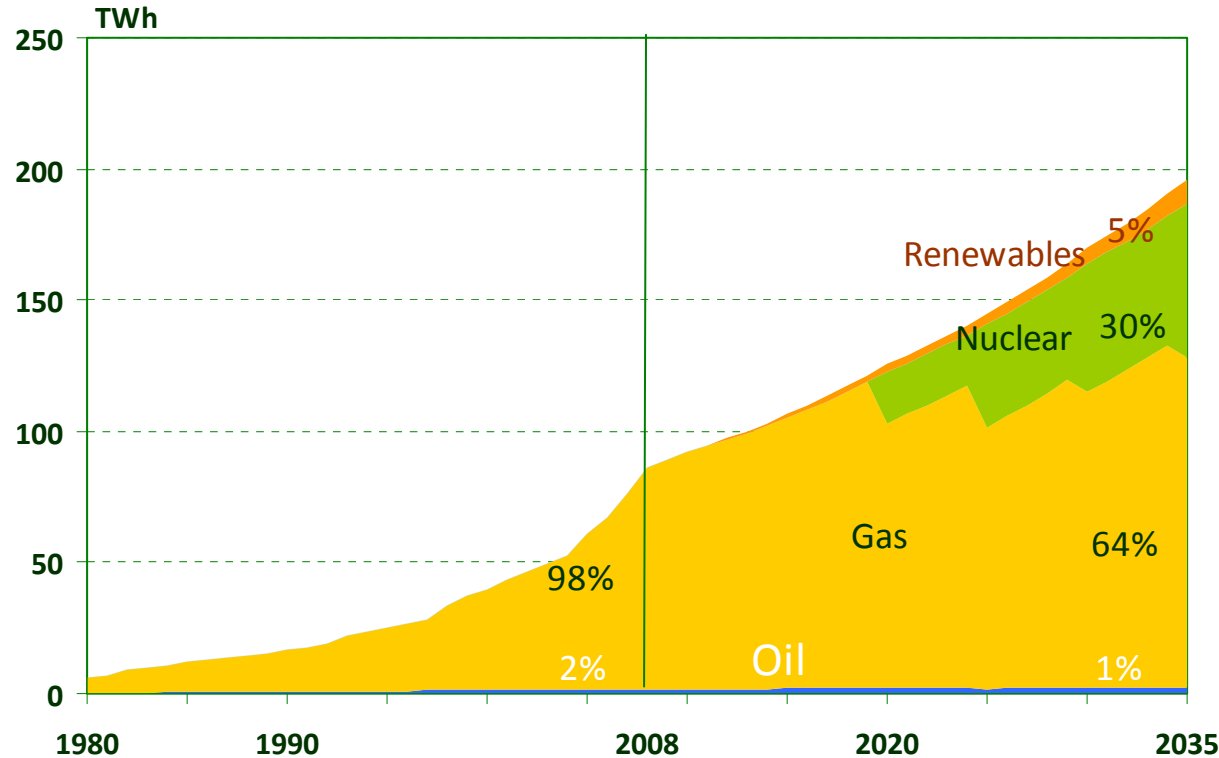
Maximum Impact Scenario : Final energy demand



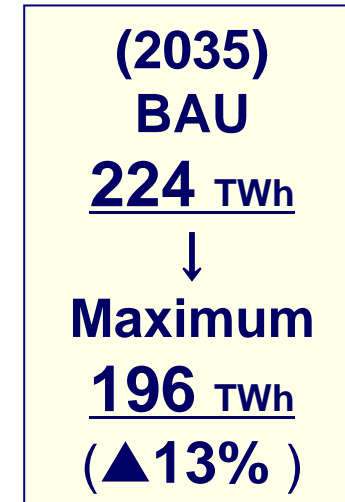
- In Maximum Impact Scenario in 2035, TFED will be lower by 10% compared with BAU Scenario.
- Demand in Residential and commercial sector will be lower by 12% in 2035 compared with the BAU Scenario.

Maximum Impact Scenario : Power Generation Mix

United Arab Emirates



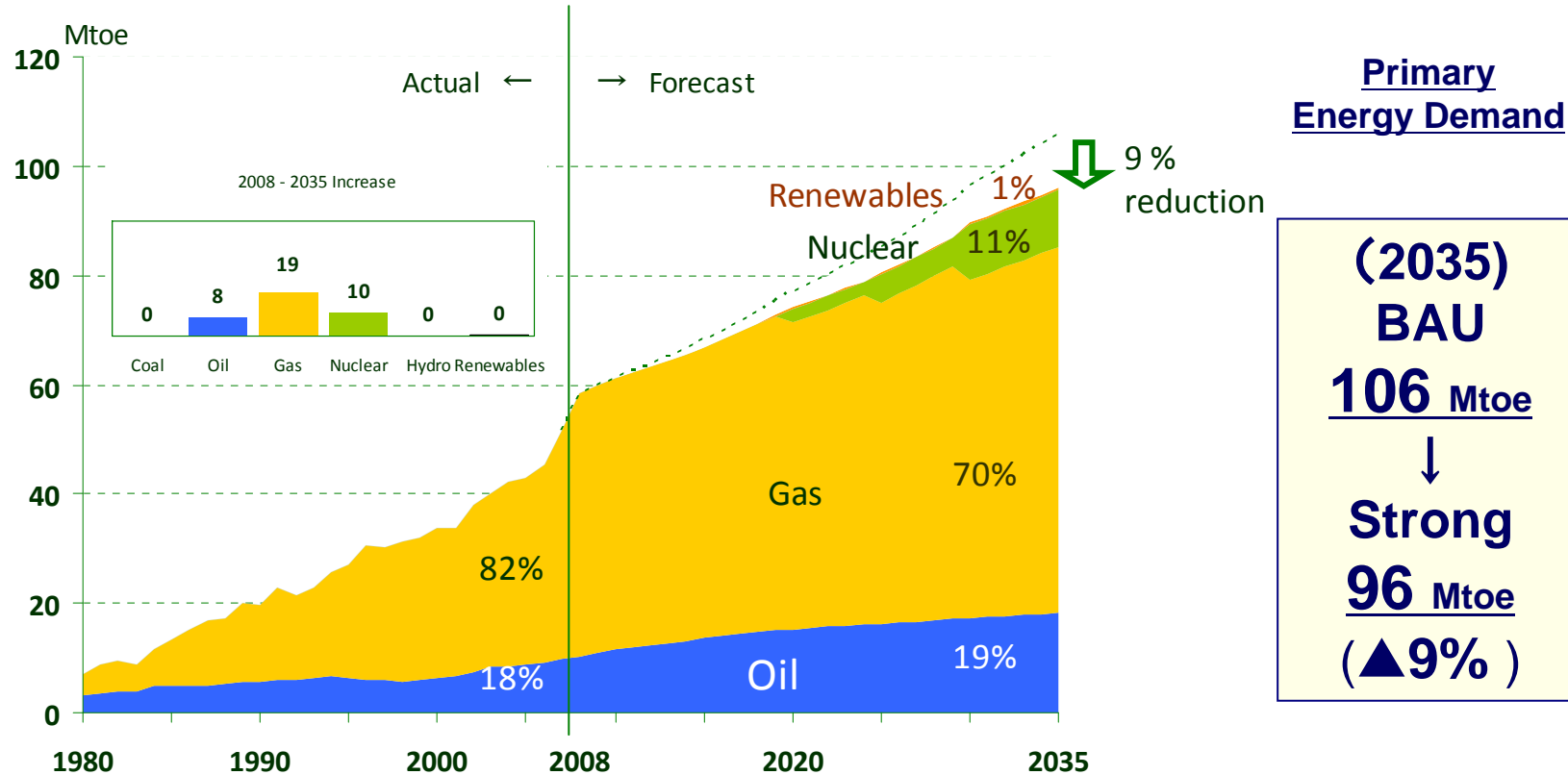
Power Generation



- In Maximum Impact Scenario in 2035, power generation will be lower by 28 TWh, showing 13 % reduction compared with BAU Scenario.
- Nuclear power will be introduced from 2020 and its capacity will continue to rise to reach 8.4 GW in 2035, while renewables power generation will reach 9 TWh.
- Nuclear power generation is expected to replace mainly gas-fired generation towards 2035.

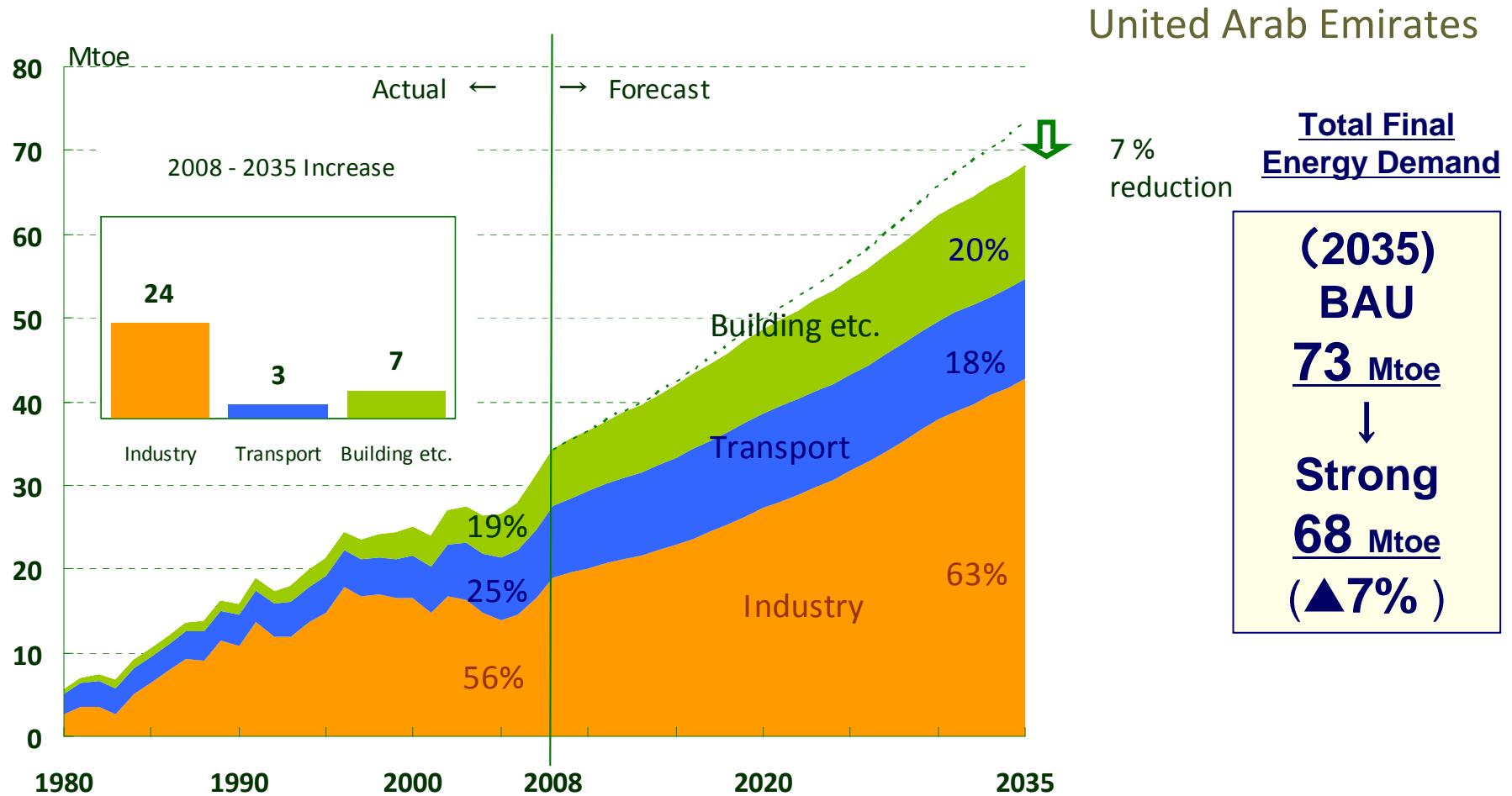
Strong Policies Scenario : Primary energy demand

United Arab Emirates



- In 2035, TPE of United Arab Emirates in Strong Policies Scenario will be lower by 9 % compared with the BAU Scenario.
- Non-fossil fuel will account for 12% of TPE.

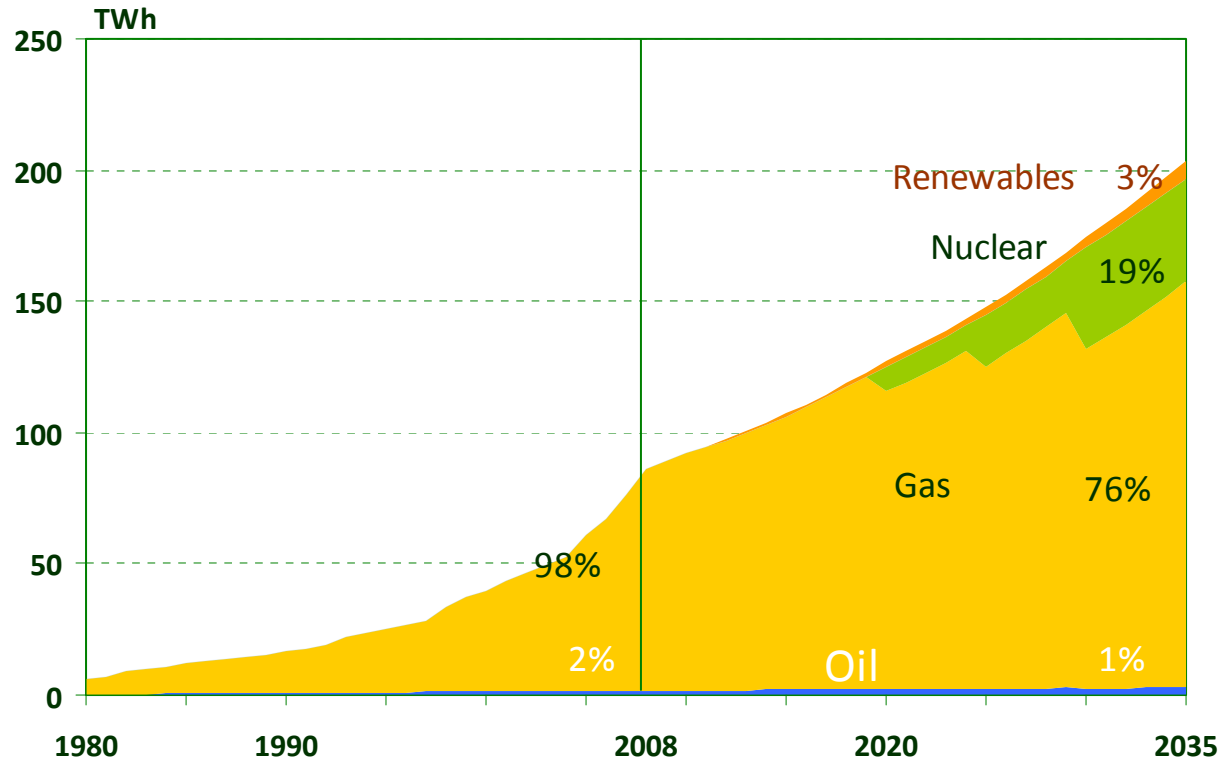
Strong Policies Scenario : Final energy demand



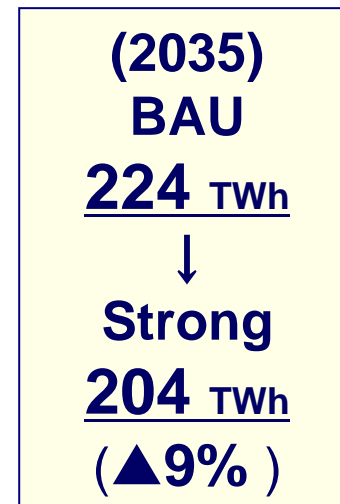
- In Strong Policies Scenario in 2035, TFED will be lower by 7% compared with BAU Scenario
- Demand in Residential and commercial sector will be lower by 9% in 2035 compared with the BAU Scenario.

Strong Policies Scenario : Power Generation Mix

United Arab Emirates



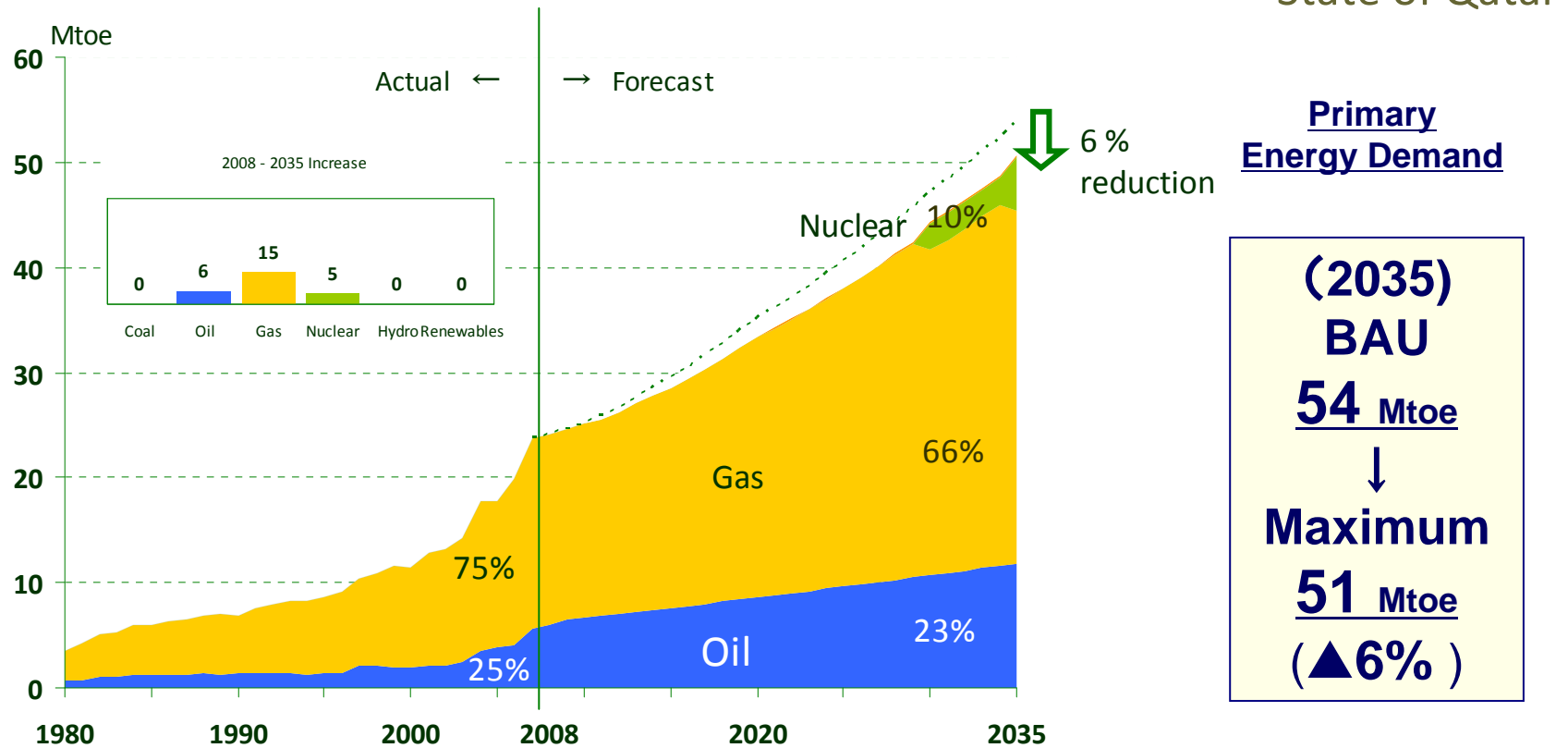
Power Generation



- In Strong Policies Scenario in 2035, power generation will be lower by 9% compared with BAU Scenario.
- Nuclear power will be introduced from 2020 and its capacity will be 5.6 GW in 2035, while renewables power generation will reach 7 TWh.
- Non-fossil fuel supply will increase in 2035, to reach 22 % in total electric power generation.

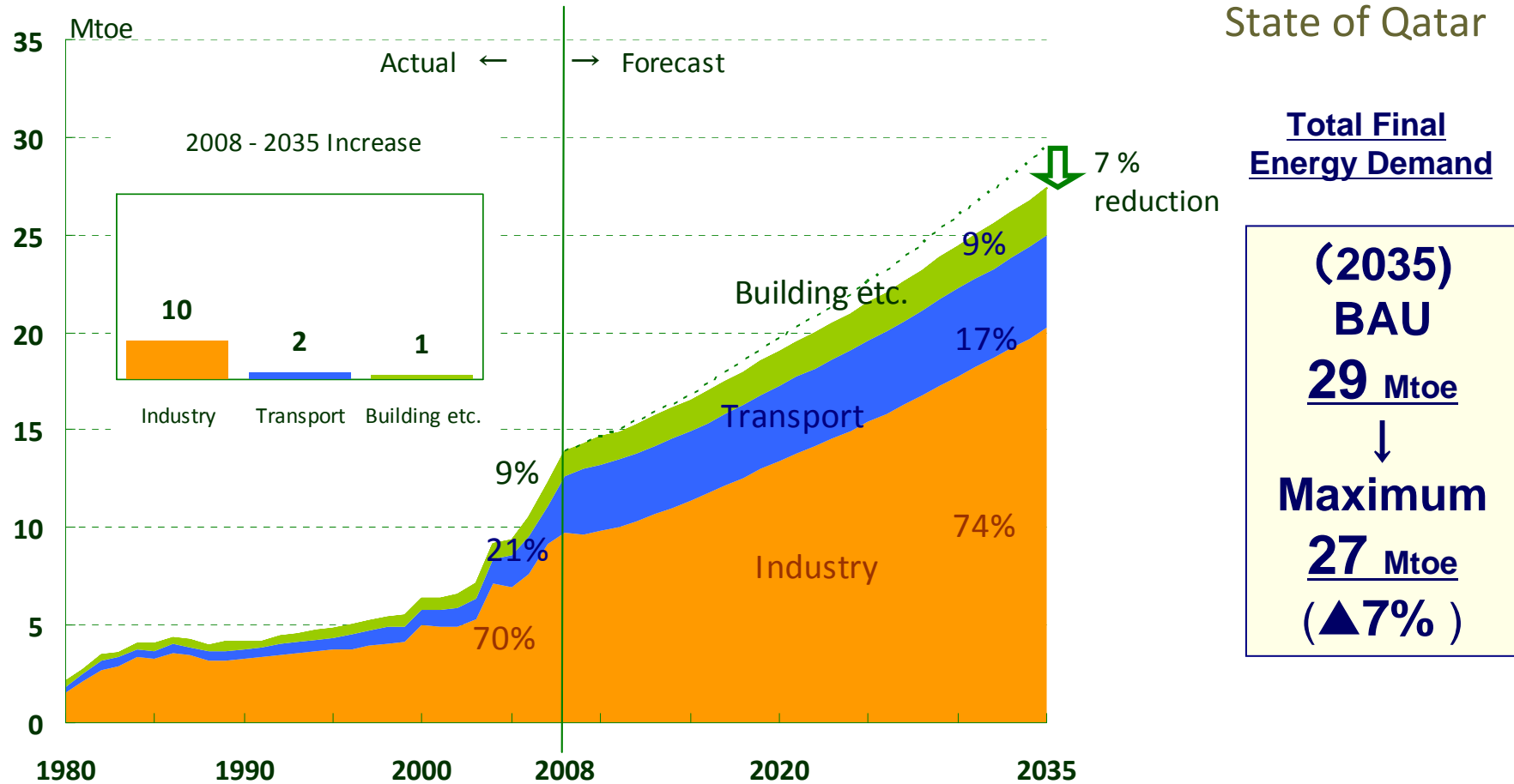
VIII. Energy Outlook for the state of Qatar (Alternative Scenario)

Maximum Impact Scenario : Primary energy demand



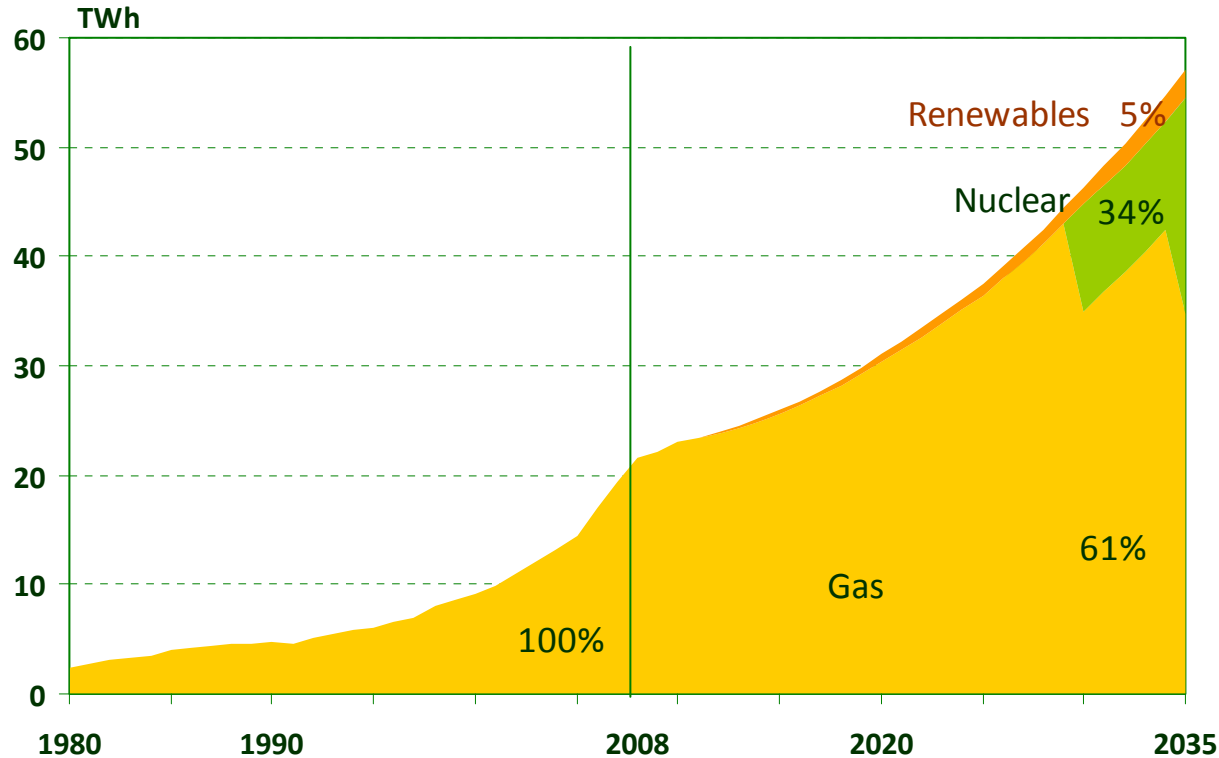
- In 2035, TPE of Qatar in Maximum Impact Scenario will be lower by 6% compared with the BAU Scenario.
- Non-fossil fuel will account for 10% of TPE.
- Nuclear power generation is expected to replace mainly gas-fired generation towards 2035.

Maximum Impact Scenario : Final energy demand



- In Maximum Impact Scenario in 2035, TFED will be lower by 7% compared with BAU Scenario.
- Energy saving in Industry sector will be smaller than those in other sectors because demand for Petrochemical industry, which account for most part of the Industry sector demand, will be robust.

Maximum Impact Scenario : Power Generation Mix



State of Qatar

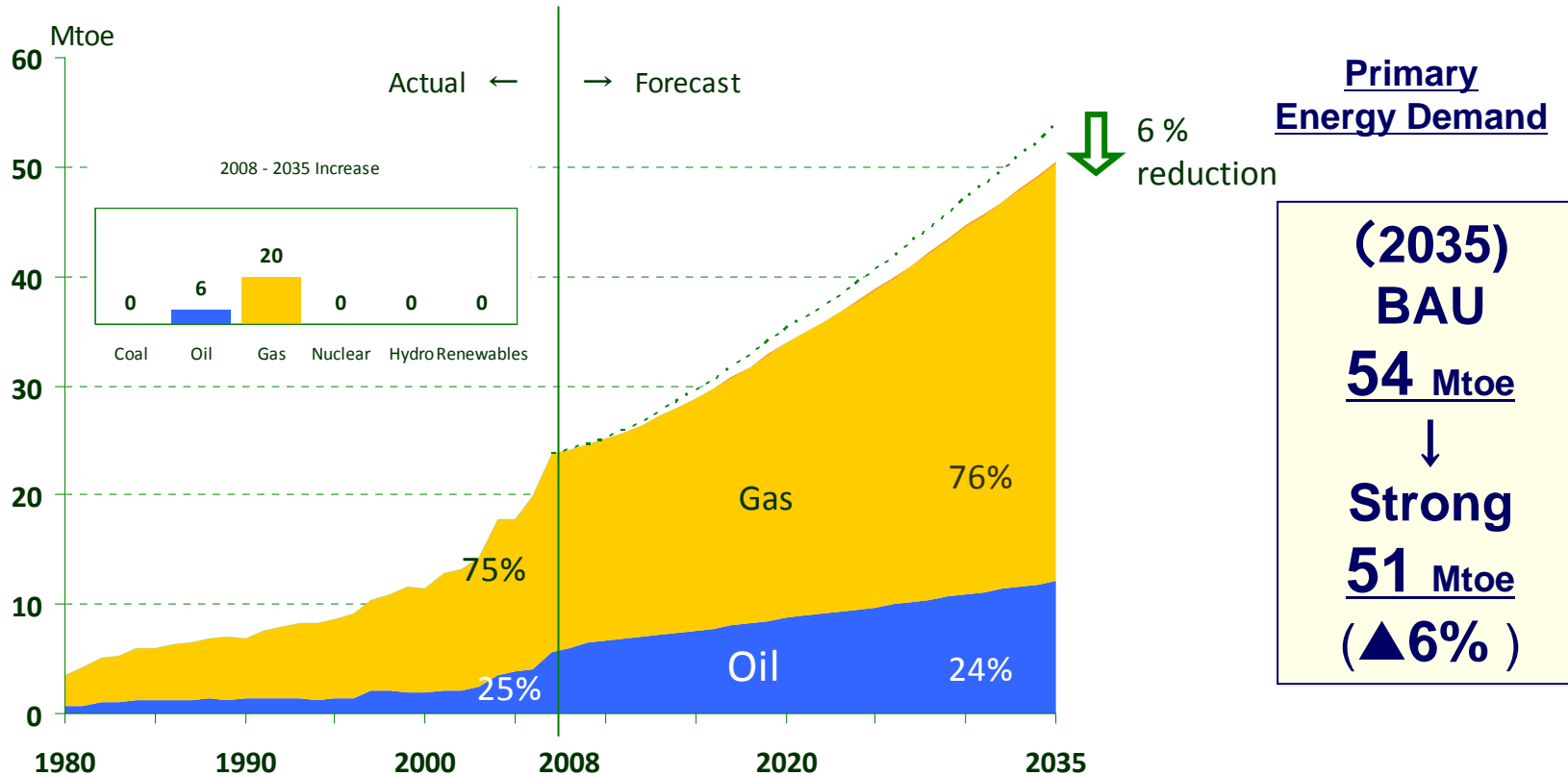
Power Generation

(2035)
BAU
65 TWh
 ↓
Maximum
57 TWh
(▲12%)

- In Maximum Impact Scenario in 2035, power generation will be lower by 8TWh, showing 12% reduction compared with BAU Scenario.
- Nuclear power will be introduced from 2030 and its capacity will reach 2.8 GW in 2035, while renewables power generation will reach 3 TWh.
- Non-fossil fuel supply will increase in 2035, to reach 39 % of total electric power generation.

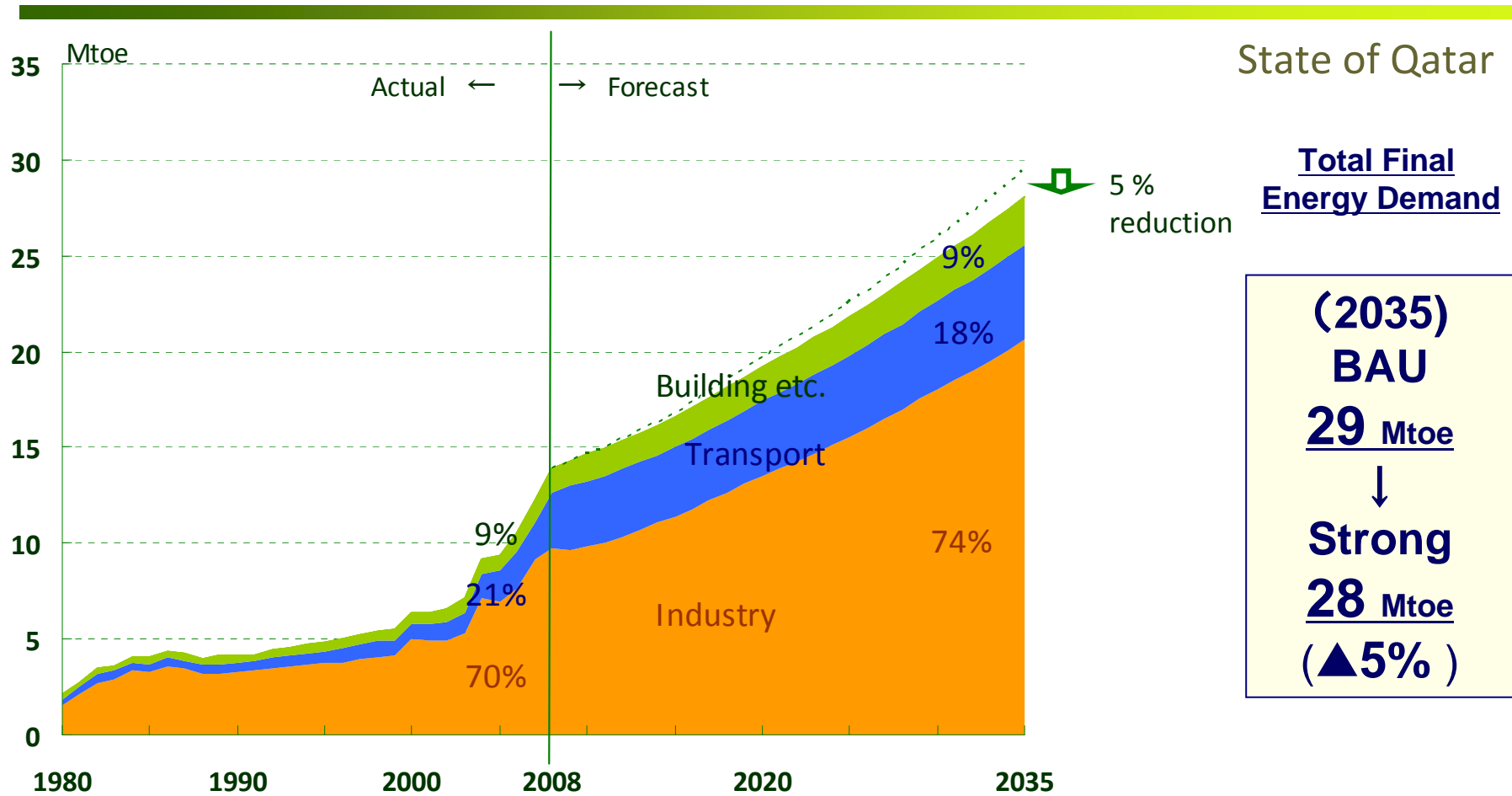
Strong Policies Scenario : Primary energy demand

State of Qatar



- In 2035, TPE of Qatar in Strong Policies Scenario will be lower by 6 % compared with the BAU Scenario.
- Gas will continue to play central role in its energy supply and its demand will increase in industry and power generation sectors.

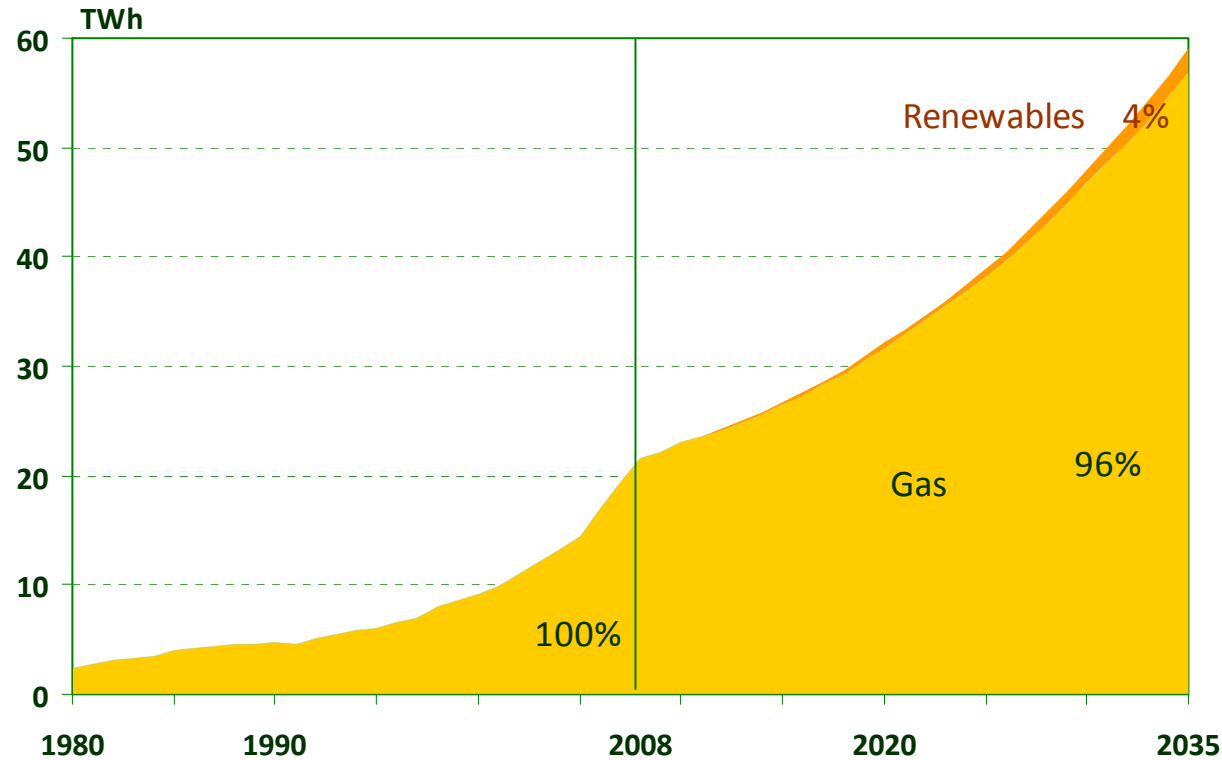
Strong Policies Scenario : Final energy demand



- In Strong Policies Scenario in 2035, TFED will be lower by 5% compared with BAU Scenario
- Demand in Transport will be lower by 8% in 2035 compared with the BAU Scenario.

Strong Policies Scenario : Power Generation Mix

State of Qatar



Power Generation

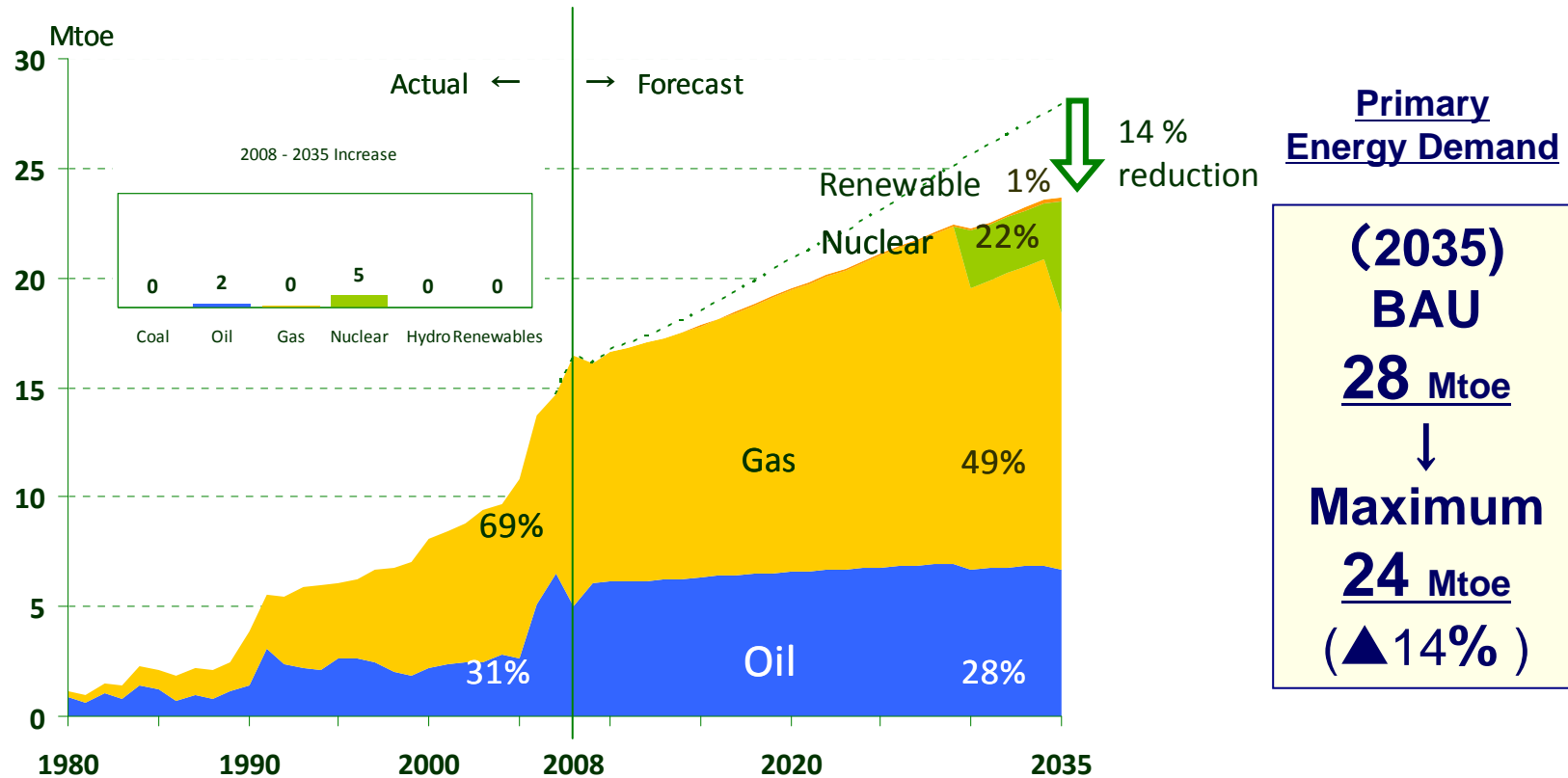
(2035)
BAU
65 TWh
 ↓
Strong
59 TWh
(▲9%)

- In Strong Policies Scenario in 2035, power generation will be lower by 9% compared with BAU Scenario.
- Nuclear power will not be introduced in outlook period, while renewables power generation will reach 2 TWh.

IX. Energy Outlook for the Sultanate of Oman (Alternative Scenario)

Maximum Impact Scenario : Primary energy demand

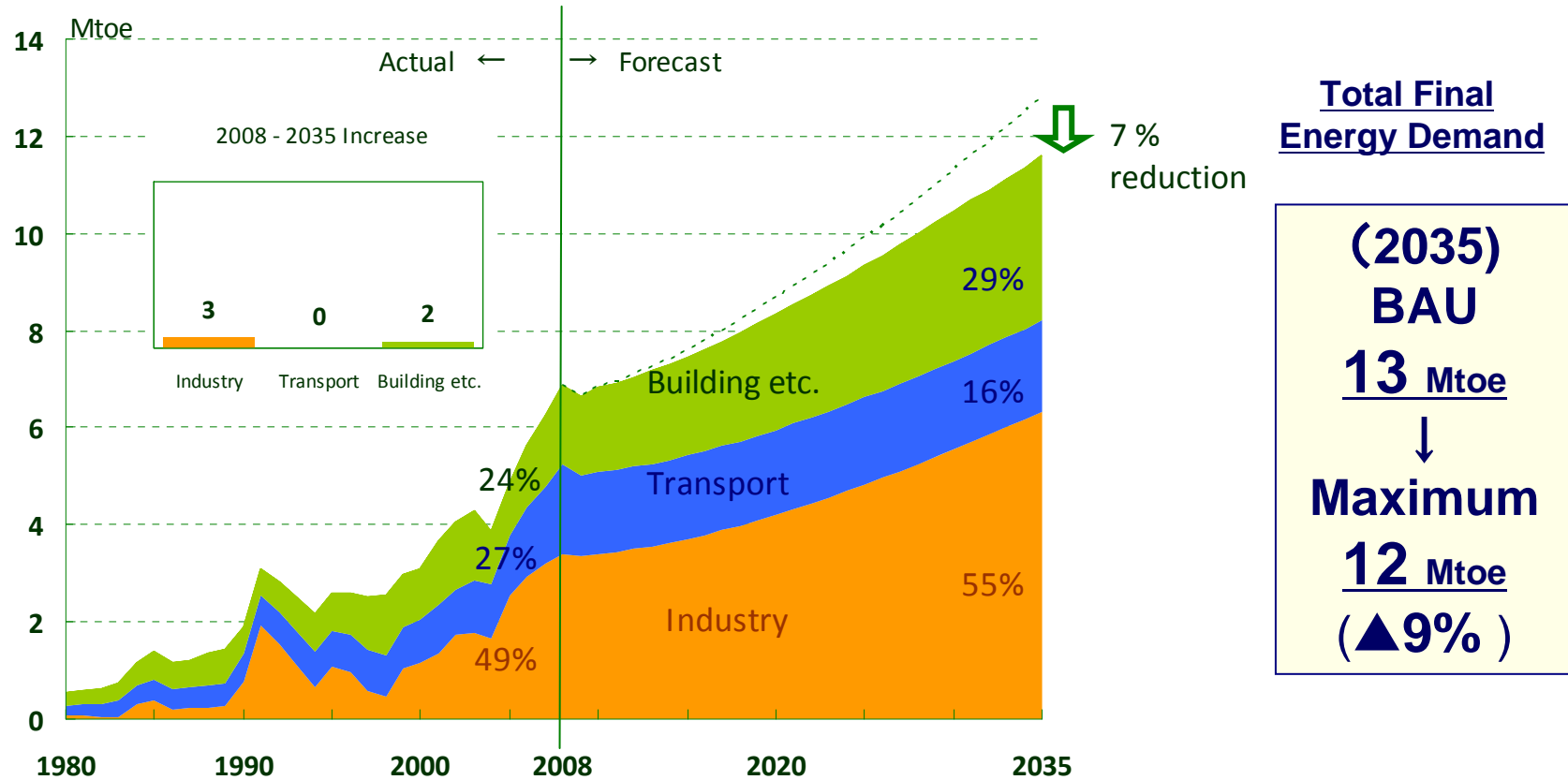
Sultanate of Oman



- In 2035, TPE of Oman in Maximum Impact Scenario will be lower by 14% compared with the BAU Scenario.
- Nuclear power generation will account for about 22% of TPE.
- Growth in nuclear power is the largest source in TPE.

Maximum Impact Scenario : Final energy demand

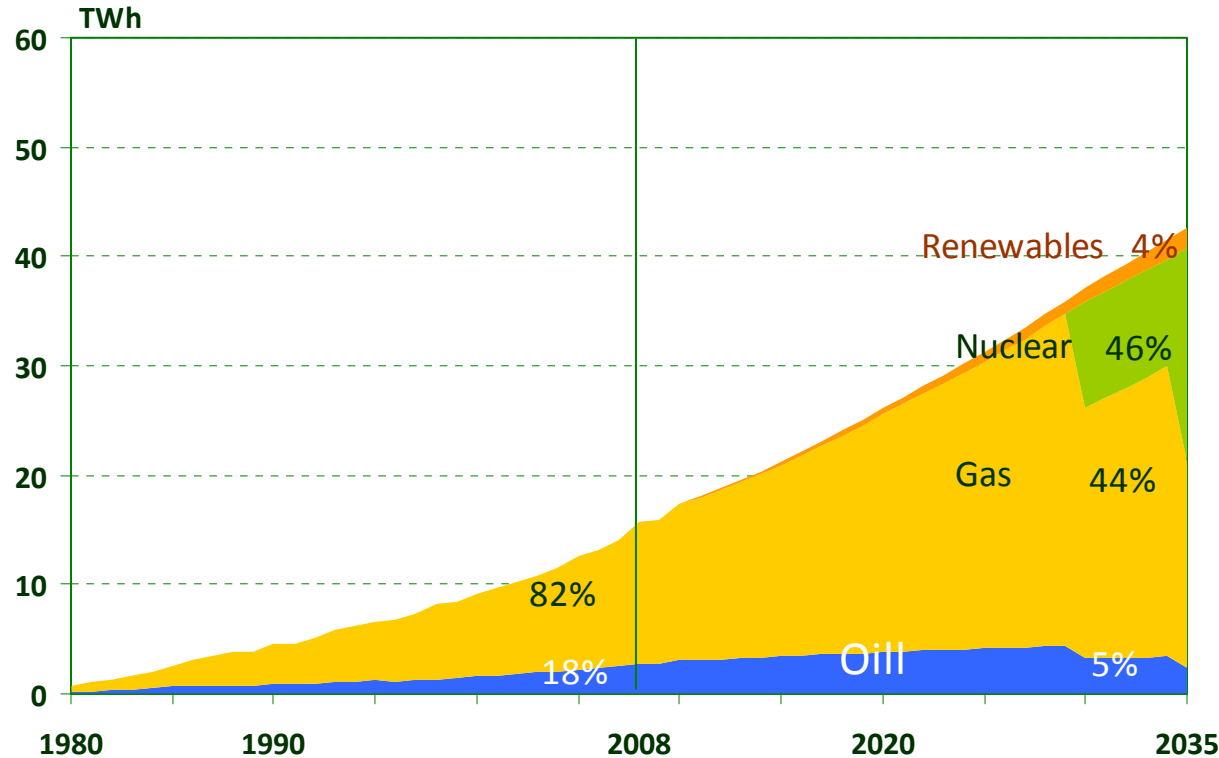
Sultanate of Oman



- In Maximum Impact Scenario in 2035, TFED will be lower by 9% compared with BAU Scenario.
- Demand in Residential and commercial sector will be lower by 13% in 2035 compared with the BAU Scenario.

Maximum Impact Scenario : Power Generation Mix

Sultanate of Oman



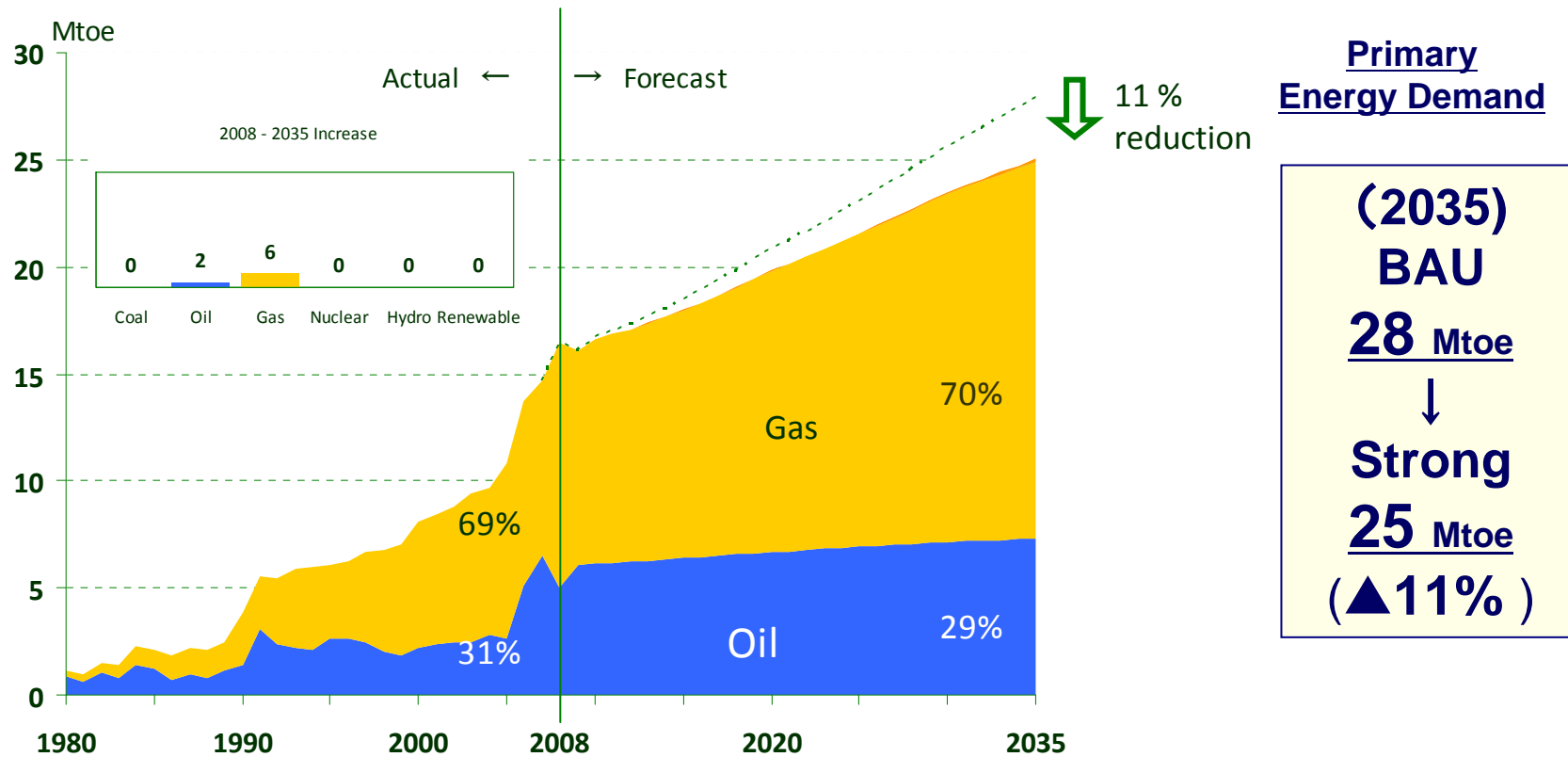
Power Generation

(2035)
BAU
49 TWh
 ↓
Maximum
43 TWh
(▲12%)

- In Maximum Impact Scenario in 2035, power generation will be lower by 12% compared with BAU Scenario.
- Nuclear power will be introduced from 2030 and its capacity will reach 2.8 GW in 2035, while renewables power generation will reach 2 TWh.
- Nuclear power generation is expected to gradually replace gas-fired and oil-fired generation towards 2035.

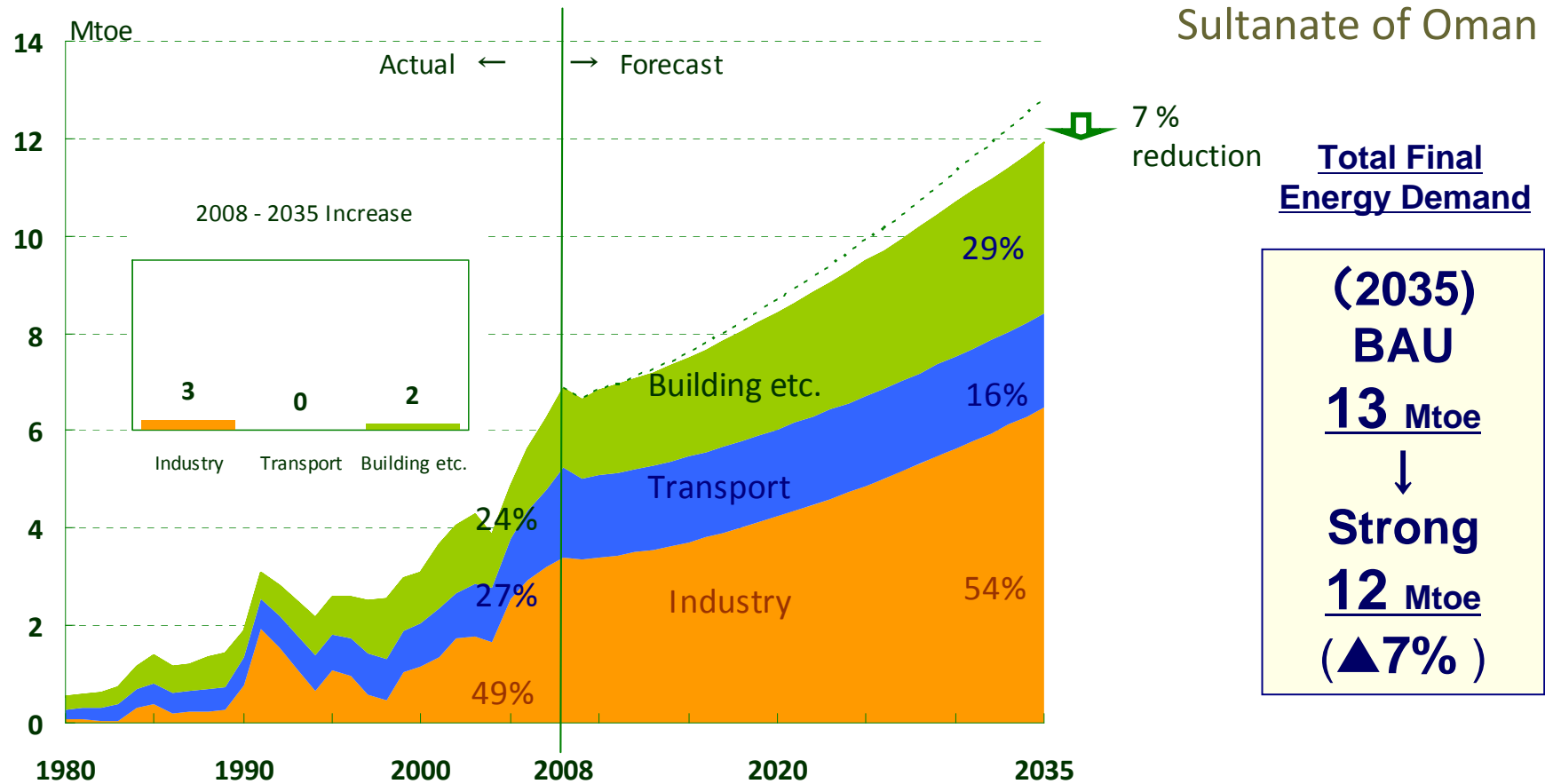
Strong Policies Scenario : Primary energy demand

Sultanate of Oman



- In 2035, TPE of Oman in Strong Policies Scenario will be lower by 11% compared with the BAU Scenario.

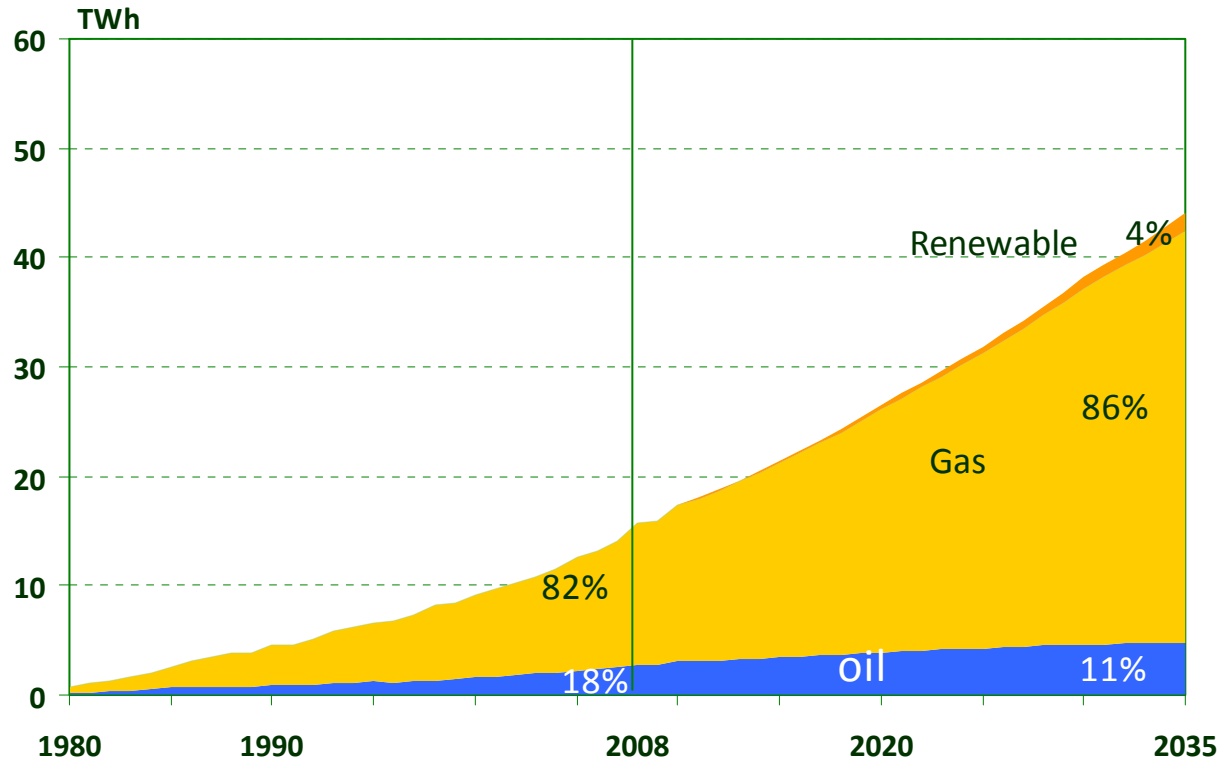
Strong Policies Scenario : Final energy demand



- In Strong Policies Scenario in 2035, TFED will be lower by 7% compared with BAU Scenario.
- Demand in Residential and commercial sector will be lower by 10% in 2035 compared with the BAU Scenario.

Strong Policies Scenario : Power Generation Mix

Sultanate of Oman



Power Generation

(2035)
BAU
49 TWh
 ↓
Strong
44 TWh
 (▲10%)

- In Strong Policies Scenario in 2035, power generation will be lower by 10% compared with BAU Scenario.
- Nuclear power will not be introduced during outlook period.
- Gas-fired power generation will be responsible for almost all additional growth of electricity demand to 2035.