

25th world gas conference
"Gas: Sustaining Future Global Growth"

Strategy for increasing advanced gas use in Japan

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1. Changes in Japan's energy strategies since 3.11
2. Addressing short-term issues
3. Addressing medium- to long-term issues
 - (1) Shift to natural gas and promotion of advanced uses
 - (2) Expanded use of distributed energy systems
 - (3) Building of next-generation energy systems
4. Expansion of natural gas use to 2030
 - (1) Stable and economical natural gas procurement
 - (2) Enhancement of the natural gas value chain

1. Changes in Japan's energy strategies since 3.11

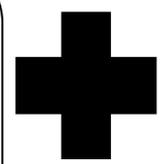
Issues that emerged in the energy field on the occasion of the 3.11 disaster

- 1. Electric power - Fukushima nuclear power plant accident
 - Major electric power supply shortages due to halting of nuclear power plant operations across Japan
- 2. Petroleum - Shortages of gasoline and kerosene, etc., in and around disaster areas
- 3. Gas - Supply stopped due to damage from tsunami to LNG receiving terminal and satellite terminals



"Three E's"

- Energy security
- Environmental friendliness
- Economic efficiency



New Issues

- (1) Greater safety and assurance
- (2) Energy system innovation
- (3) Establishment of an energy supply infrastructure toward sustainable growth

2. Addressing short-term issues

Issues immediate aftermath of the disaster

Aggressive response starting soon after the disaster, in liaison with government

(a) Stable supply of electricity

- Augment supply with wide use of **cogeneration and fuel cells**
- Reduce peak electricity by use of **gas air-conditioning and gas heating equipment**
- Use alternatives to heavy electricity-consuming devices at **restaurants and for hot water**

(b) Enhance security in disasters and power outages

- Expand introduction of **cogeneration for normal and emergency use** in important facilities
- Develop and sell residential cogeneration systems for **backup electricity supply**
- Consider energy security enhancements at the **city block level**

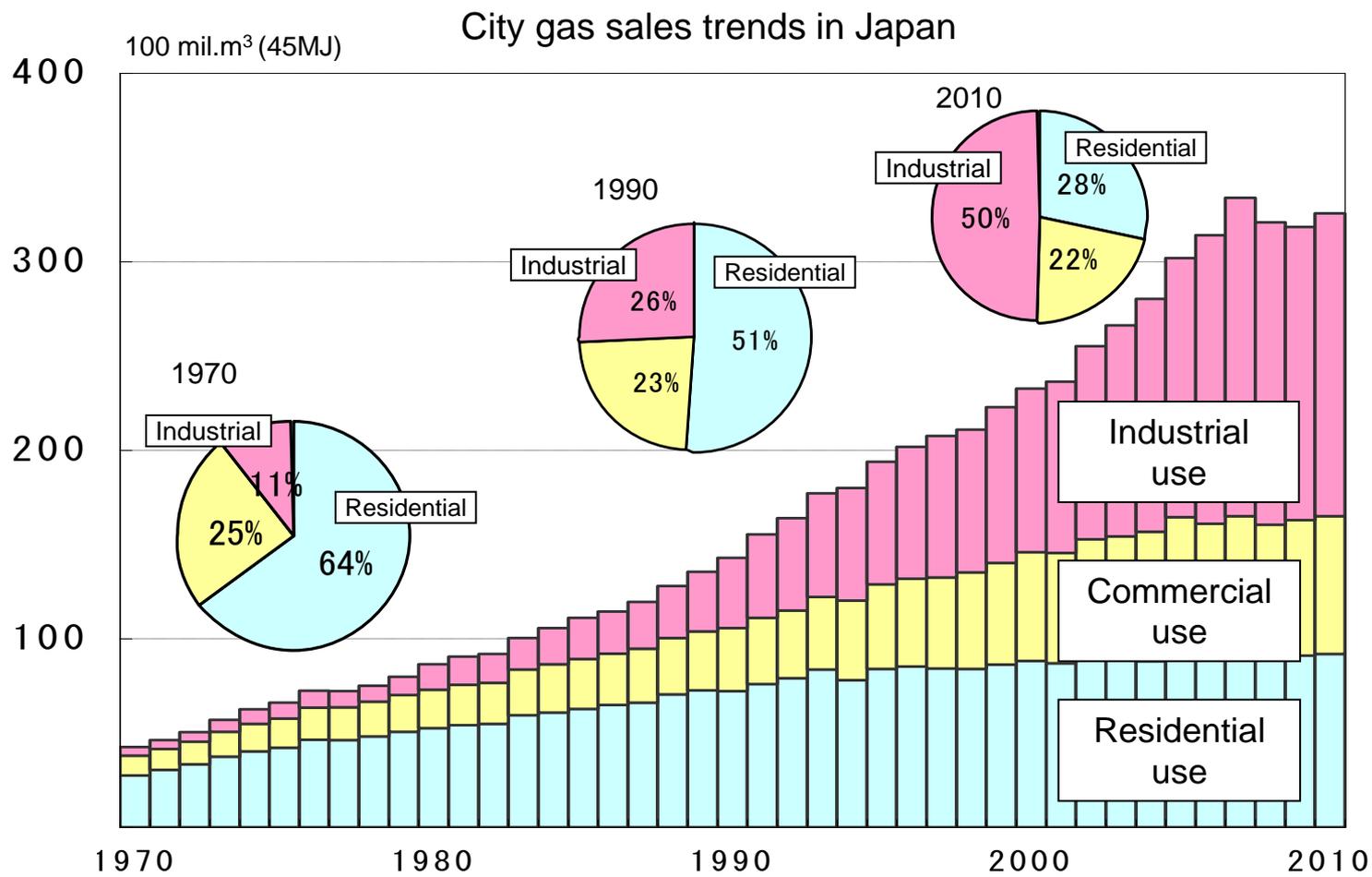
3. Addressing medium- to long-term issues

Issues to be addressed by Japan's energy strategies

- Promoting a shift to natural gas and advanced uses
 - Saving energy and reducing carbon through **fuel switching and advanced use**
 - Saving energy and reducing carbon through **energy management**
- Expanding use of distributed energy systems
 - Accelerated introduction of **renewable energy**
- Building next-generation energy systems
 - Realization of **smart energy networks** around natural gas cogeneration as core

3-(1) Shift to natural gas and promotion of advanced uses

Since 1990, promotion of switch to natural gas for industrial and commercial uses



3-(1) Shift to natural gas and promotion of advanced uses

(a) Industrial use sector

**Acceleration of fuel switching to natural gas for heating use
(promotion of advanced use engineering)**

(b) Residential and commercial use sector

**Spread of high-performance, advanced-function gas systems
Use of renewable energy and unused energy**

(c) Transport sector

Achieving wider use of natural gas vehicles (CNG heavy-duty trucks)

Readying hydrogen supply infrastructure enabling use of fuel cell vehicles

(a) Industrial use sector

Shift to natural gas enabled by carrying out advanced use engineering

Sales and marketing
Thermal measurement and
energy diagnosis at user sites



Maintenance
Maintenance and regular
inspections
Response to failure and trouble



Technology development
Burner device prototype
Combustion simulation

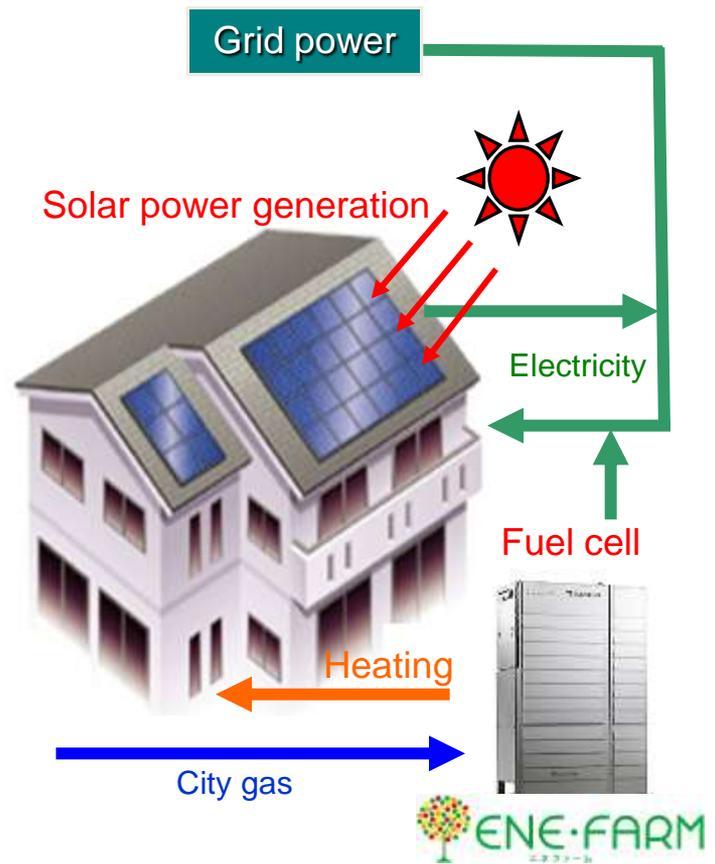


(b) Residential and commercial use sector

Use of renewable energy at the consumption stage

1. Dual-mode generation with solar

Cogeneration/fuel cell use + solar power

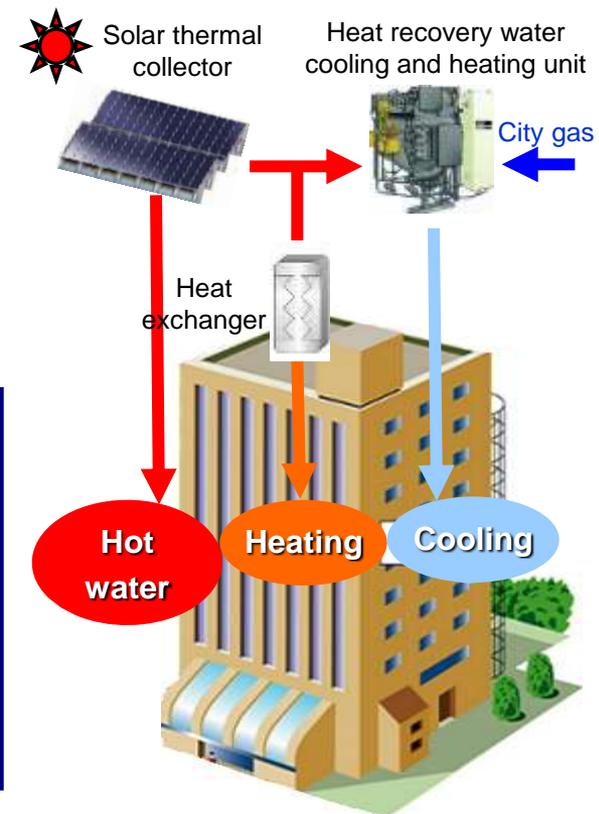


2. Use of solar heat for hot water and air conditioning

Home Solar heat + gas water heater



Buildings Solar heat + gas air-conditioning



Use of new renewable and unused energy

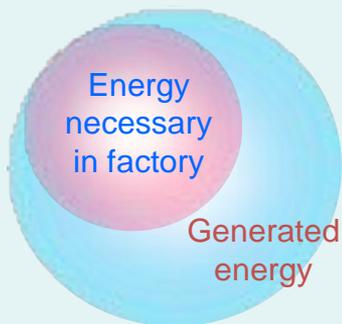
Combining the region's renewable and unused energy with natural gas

Urban waste heat (industrial waste heat)

- Use of industrial waste heat for hot water and heating



Urban waste treatment plant, etc.



Effective use of waste heat in district



Waste heat recovery boiler

Spa (hot water and air heating)



Biogas use

- Use of biogas from sewage and waste treatment plants for cogeneration, boilers, and air conditioning



Kyoto bio-cycle project

- Use as fuel for natural gas vehicles



(c) Transport sector

Our Response to GHG Protocol Scope 3 and Carbon Footprint Movements

1. Natural gas vehicles used mainly for cargo transport

- Introducing heavy-duty natural gas trucks for long-haul transport (powered by highly efficient natural gas engine)
- Provision of natural gas stations



2. Fuel cell vehicles for long-haul transport

- Providing hydrogen stations for fuel cell vehicles



Fuel cell vehicle



Hydrogen station

3. Use of LNG fuel to power ships

- Using LNG to fuel coastal ships



(illustration)

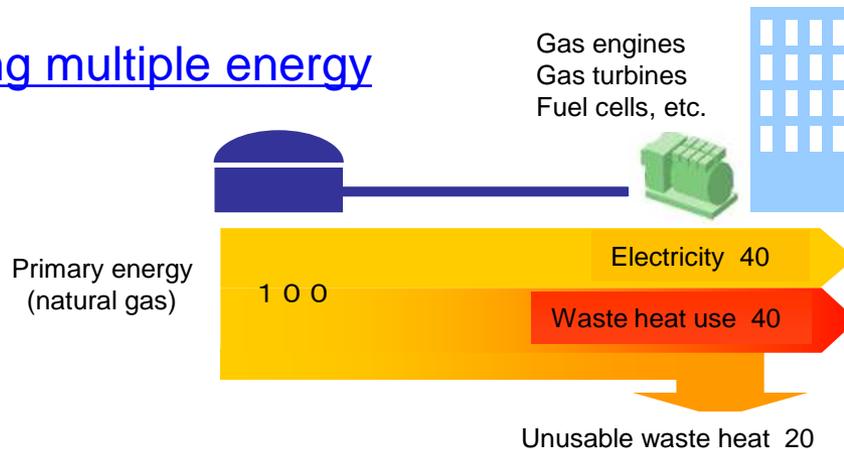
3-(2) Expanded use of distributed energy systems

Advantages of natural gas cogeneration and fuel cells

(a) Greater energy security from having multiple energy sources

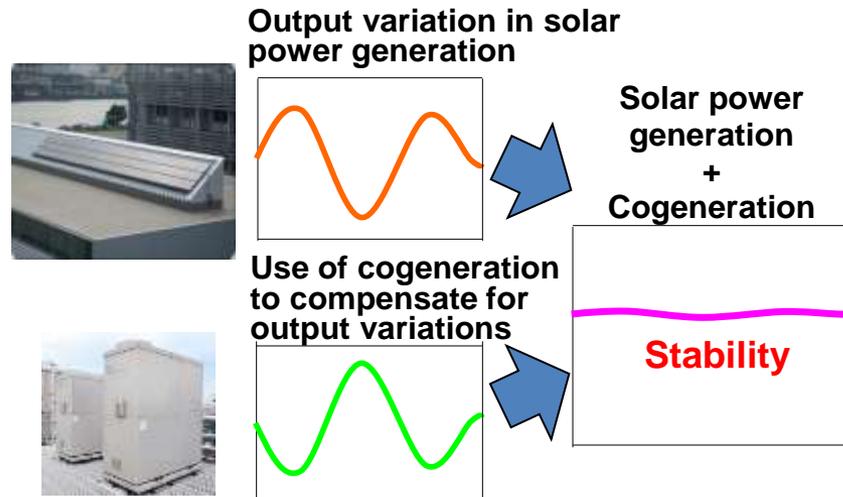
(b) Outstanding energy efficiency

- High supply efficiency achieved by making effective use of waste heat
- Help to lower peak of grid power demand and reduce fluctuations



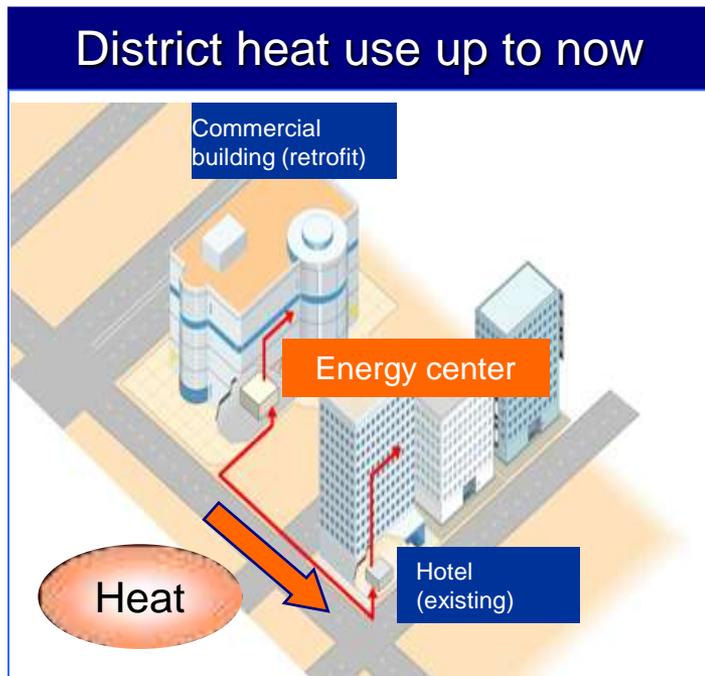
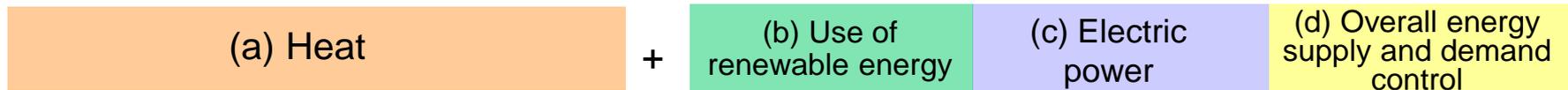
(c) Affinity with renewable energy

- Expansion of renewable energy use made possible by stabilization of output
(adjust for output variation in renewable energy by controlling cogeneration operation)



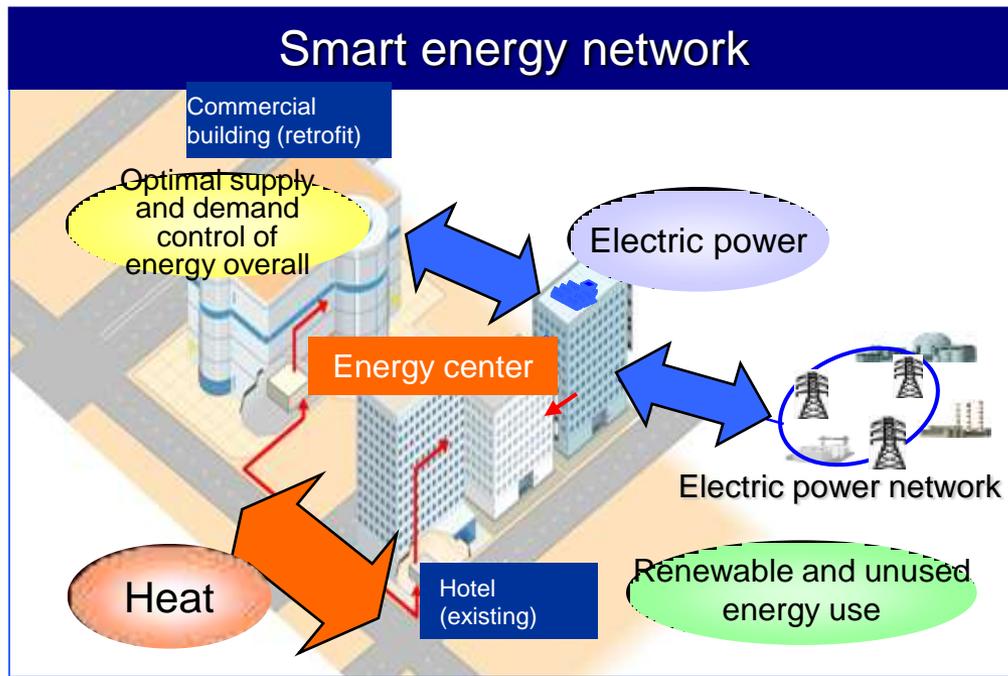
3-(3) Building of next-generation energy systems

Building comprehensive systems for effective use of energy, from local area heat use to renewable and unused energy use



Energy saving rate 14.6%,
CO₂ reduction rate 19.2%

(Planned values at model project introducing district energy networks [model project implemented at six locations])



Energy saving rate 16.4%, CO₂ reduction rate 30.2%

(Planned values for distributed energy optimization demonstration project)

4. Expansion of natural gas use to 2030

Assumes maximum penetration of various gas systems by 2030
(Japan Gas Association trial calculations)

| | Current state | 2030 |
|---------------------------------------|----------------------|-----------------------------------|
| (a) Cogeneration | 4.6 million kW | 30 million kW |
| (b) Gas air-conditioning | 13 million RT | 26 million RT |
| (c) Industrial heat demand (%) | 10.7% | 25.0% |
| (d) Residential fuel cells | 20,000 units | 5 million units (includes LPG) |
| (e) Natural gas vehicles (NGV) | 40,000 units | 500,000 units |

Expected benefits (compared to today)

CO₂ reduction

Approx. 62 million tons CO₂/year

Electric power supply stability

Cogeneration/fuel cells

25-30 million kW

(in terms of electric power, around 15% of total domestic demand)

Electric power peak demand reduction from gas air-conditioning use

13 million kW

Domestic demand growth (as of 2030)

Capital Investment in gas systems on the left

1.2-1.5 trillion yen/year

4-(1) Stable and economical natural gas procurement

Initiatives in the resources area

(a) Diversification of procured natural gas resources

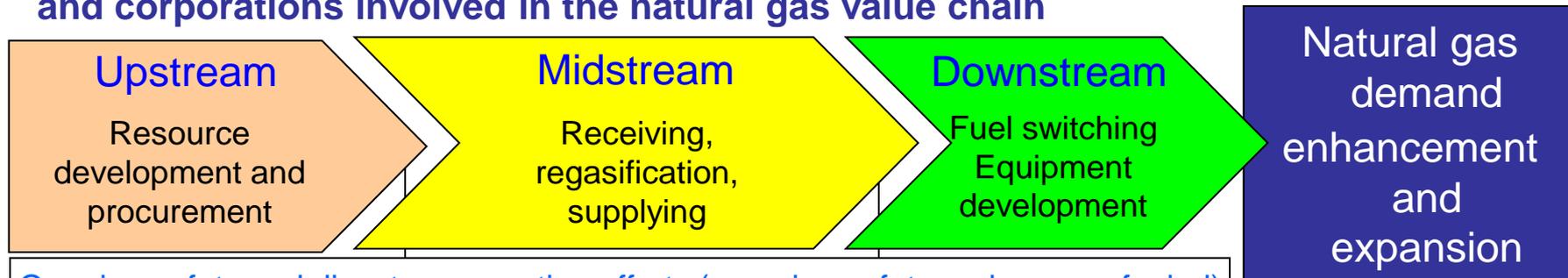
- **Procurement of unconventional gas LNG**
- **Diverse LNG procurement in Asia-Pacific region**
- **Utilization of LNG projects employing new technology such as floating liquefied natural gas (FLNG)**
- **Future use of methane hydrates and coal gasification**

(b) Diversification of natural gas procurement methods

- **Increased participation in upstream projects and transport projects**
- **Expansion in scale through joint procurement**
- **Greater government support on diplomatic and financing fronts, etc.**
- **Diversification of import means, keeping open pipeline possibilities**

4-(2) Enhancement of the natural gas value chain

Promoting long-term ties and cooperation with various industries and corporations involved in the natural gas value chain



Ongoing safety and disaster prevention efforts (ensuring safety and peace of mind)

- Stable procurement (obtaining resources)
- Obtaining inexpensive resources

- Building up domestic supply network

- Measures to obtain power sources and deal with demand peaks
- Switching to natural gas for heat demand
- Introduction of highly efficient systems with advanced performance and functions
- Energy diversification in the transport sector

- Provision of district heat networks

- Studying international pipeline networks

- Provision of hydrogen supply networks

Terima kasih banyak

Thank you for your attention.