Creating a Vision – Cutting Emissions 30% by 2020

A Reduction Scenario and Policy Proposals for Japan's Residential and Commercial Sectors

【Summary】

September 2006

KIKO Network

KIKO Network has been carrying out a project aimed at achieving by 2020 carbon dioxide emissions from Japan's residential and commercial sectors that are 30% lower than 1990 levels. A report on the results of this project was published in September 2006: a summary follows.

1. Project aims

Climate Change is already having a significant impact on humankind and natural ecosystems, but to prevent even more disastrous damage in the future, the net rise in global temperatures must be kept to below 2 degrees Celsius compared to pre-industrial levels. To achieve this, industrialized countries need to reduce their greenhouse gas (GHG) emissions to levels about 60%-80% lower than 1990 levels by 2050. A society that can achieve the transitional goal of a "30% reduction" needs to be realized as soon as possible. This is the rationale for our choice of 2020 as the target year.

This project aims to realize 30% reduction of GHGs emissions from 1990 levels by 2020 in Japan, particularly focusing on the residential and commercial sectors greatly increasing emissions of CO2 since 1990, which emissions reflect our life style or the way of working. To realize it we offer a portrait of a society that could actually achieve a 30% reduction, describing a scenario and suggesting policies and measures appropriate for creating such a society.

2. Emission trends in Japan's residential and commercial sectors

CO2 emissions from Japan's residential sector in fiscal 2004 were 31.5% greater than in 1990, amounting to over 168 Million t-CO2. To a certain extent, trends in the CO2 emissions intensity of electricity can be considered a contributing factor to this increase, but the major factor has been the increase in the number of households – a 20.5% increase over 1990. Also, electricity's share of total energy consumption has grown consistently, as a result of increasing acquisition of electronic devices and equipment. As for housing, 40% - 50% of existing detached houses were built prior to 1980, and it is unlikely that new housing construction will grow significantly in future, meaning that housing stock replacement rates may weaken.

CO2 emissions from commercial sector in fiscal 2004 were 227 million t-CO2, 37.9% greater than in 1990. The area of occupied building space and energy consumed by this sector have both increased greatly since 1990; with growth rates for department stores, supermarkets, theaters and other places of amusement have been especially high. In the retail sector, specialty supermarkets and other supermarkets located in the suburbs have grown remarkably in terms of both the number of stores and amount of floor space. Energy consumption for electricity equipment per unit area of floor space is also on an upward trend. This is thought to be a result of the introduction of IT technology.

Table 1 Rates of CO2 Emission Increase for Japan's Residential and Commercial Sectors

	FY 1990 (Mt-CO2)	FY 2004 (Mt-CO2)	Rate of Increase
Residential	127	168	31.5%
Commercial, etc.	164	227	37.9%

3. The "Baseline Case" - a business-as-usual scenario for 2020

We calculated a business-as-usual "Baseline Case" scenario for 2020 as a standard to compare with the alternative "Minus 30% Case." The model used is based on figures from 2000. After breaking down each energy source by use, energy consumptions per unit were drawn up for all the housing elements relevant to energy consumption, and for each type of business and each type of house or building. In drawing up the Baseline Case, the assumption is of an absence of any remarkable change consistent with present norms through to 2020. Quantitative changes in the number of households, in floor space occupied by businesses, etc., are based on estimates found in the literature, while also assuming the implementation of energy conservation and other measures found in the Japanese government's Kyoto Protocol Targets Achievement Plan.

Estimate results show the residential sector consuming 28% more energy than in 1990, and emitting 21% more CO2, and the commercial sector consuming 60% more

energy and emitting 42% more CO2. Combining the two sectors yields significant increases, with energy consumption 54% higher and CO2 emissions 32% higher than in 1990.

4. Vision of a society able to achieve a 30% reduction

A more hopeful portrait of society in 2020 would be one where working styles would be more diverse, e.g. “work sharing,” and where increased leisure time and the maturing of civil society would help foster more gentle, undemanding behavior in a wide diversity of family and local community contexts. In this connection, society would need to achieve a smooth transition to work activities that conform to environmental constraints and still provide a stable economy, allowing lifestyles that place greater emphasis on non-work interests, leisure and finding meaning in life. Such a society would encourage a re-awakening to our connections with nature and the desire to protect the global environment. Building this kind of society would also allow us to achieve a 30% reduction.

Possible approaches to the specifics of achieving a 30% reduction in greenhouse gas emissions will need to include the following: efforts to suppress resource waste and achieve a transition from a mass-consumption society to one that can be satisfied with utilizing existing stocks; concentrated application of know-how and creativity to the task of eliminating present energy wastage and losses; maximum utilization of the abundant benefits of renewable energy sources to secure supplies of safe, low-risk, non-fossil fuel and non-nuclear energy; conversion to lifestyles that seek a quality of life that is compatible with environmental protection; development of communities that are molded to fit the particularities of their location; and development of new manufacturing and service businesses that meet the needs of the times.

5. The “Minus 30% Case” – a significant reduction scenario for 2020

In order to create a portrait of a society that could achieve a 30% reduction, the KIKO project calculated estimates for its proposed “Minus 30% Case” scenario. In contrast to the assumptions made regarding the overall continuation of trends in emissions growth in the Baseline Case, assumptions made for the Minus 30% Case posited the most vigorous possible introduction of measures that would be both appropriate and effective in ensuring emission reductions within the time available up to 2020, and assuming that society adopts the goal of becoming capable of a 30% reduction. The assumptions were based on measures that would bring about improvements in the residential and commercial sectors, such as significant improvements in the equipment capacity and efficiency of homes and other buildings, appropriate controls on energy demand and maximum use of renewable energy, as well

as measures such as encouraging people to choose living quarters that match their lifestyles, regulation of commercial activity, and curtailing working and business hours to levels appropriate to society's future evolution. Estimates were also based on the assumption that measures would be taken to reduce CO2 intensity of electric power supplied (see Table 2).

Table 2　Measures Assumed in the Minus 30% Case

Type of Measure	Assumption
Equipment efficiency improvement	Definitive prevalence of highest-efficiency models
Home & building capacity increase	Prevalence of buildings that meet or exceed next-generation energy conservation standards
Energy demand management systems	Prevalence of HEMS, BEMS, etc.
Maximum use of renewable source	Use of photovoltaics, solar heating, biomass heating
Reconsideration of activity levels appropriate to the social vision	Reconsideration of lifestyle-appropriate housing, regulation/curtailment of commercial floor space & working hours
Electric power supply	Activation of power generation sources in order of higher-efficiency & lower CO2 emission; phasing-out of nuclear power within 30 years

Estimates showed that the combined emission reduction effects of all these measures would result in the residential sector consuming 28% less energy and emitting 43% less CO2 than in 1990, and the commercial sector consuming 4% more energy but emitting 20% less CO2 than in 1990. Taken together, the residential and commercial sectors would consume 10.7% less energy and emit 30.5% less CO2 than in 1990, thus realizing the goal of a 30% reduction in greenhouse gas emissions by 2020.

Diagram 1　Estimates for CO2 emissions from Japan's residential sector

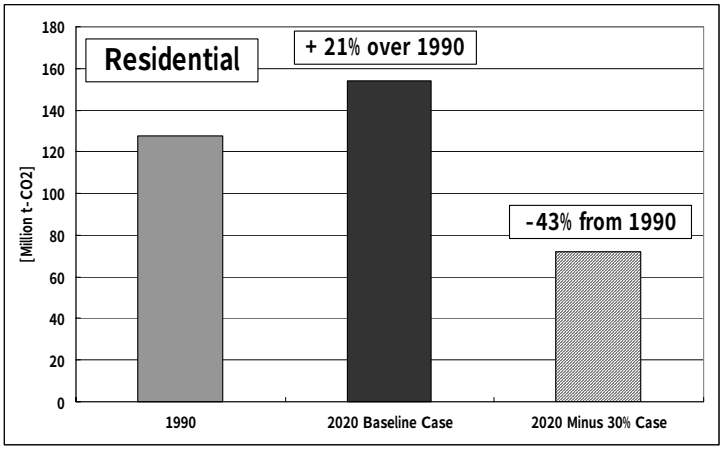


Diagram 2　Estimates for CO2 emissions from Japan's commercial sector

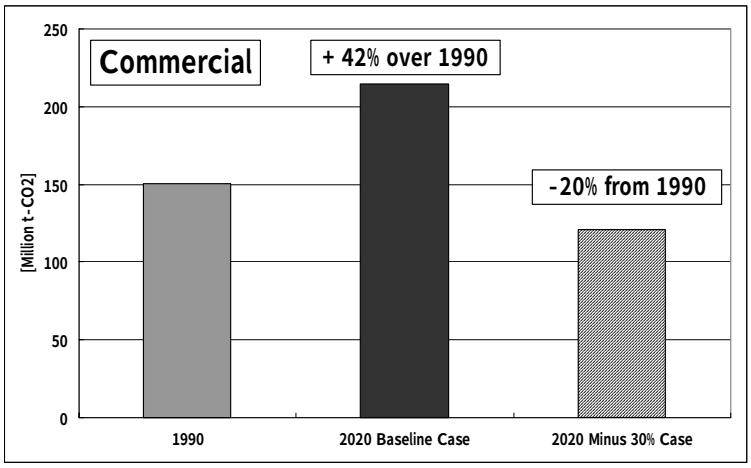


Diagram 3　Estimates for CO2 emissions from Japan's residential and commercial sectors

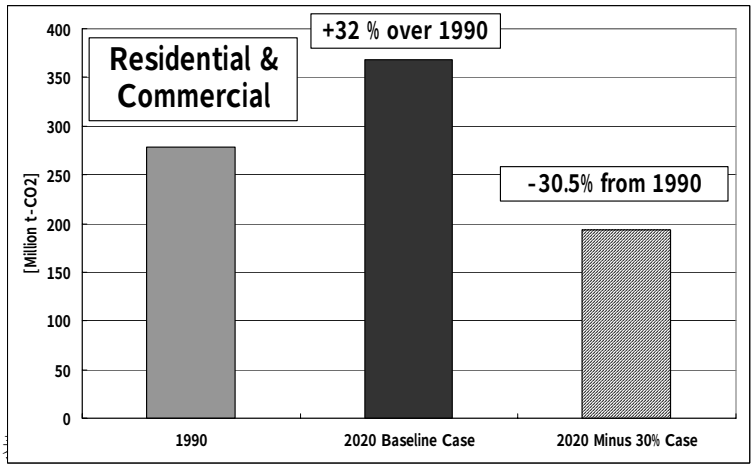
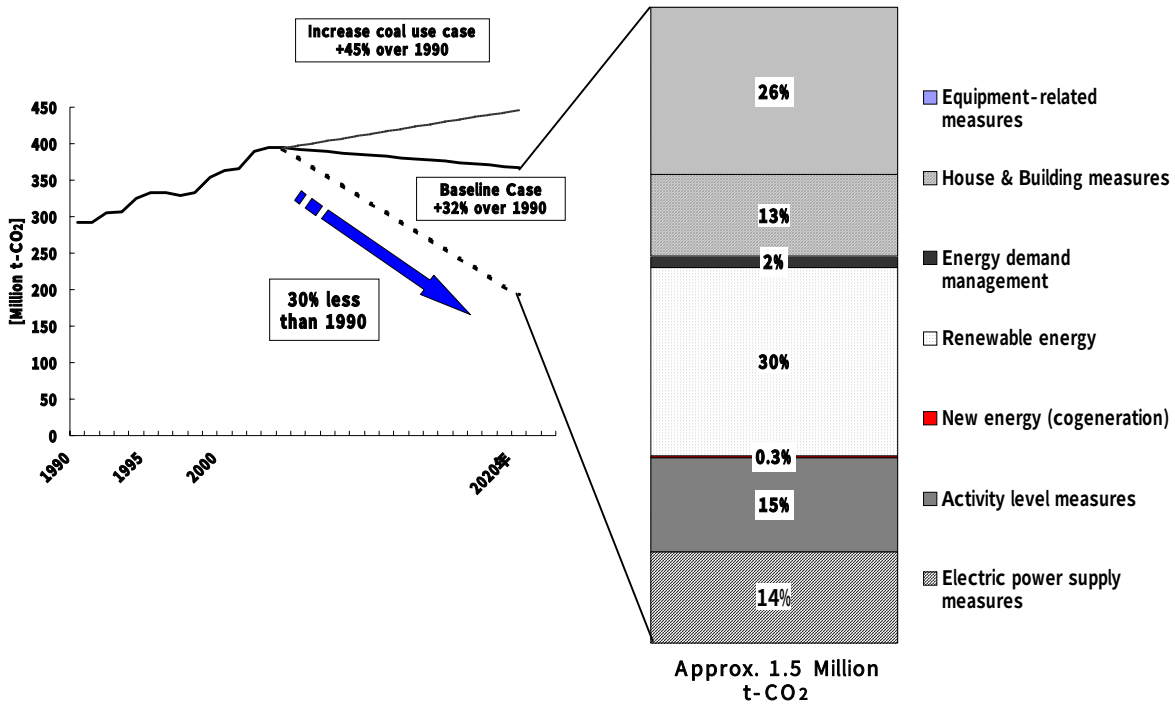


Table 3　Breakdown of CO2 reductions (Residential – L, Commercial – R)

	CO2 reduction vol. 1000t-CO2	Share
Better equipment efficiency		
Air conditioner (heating & cooling)	4586	5.6%
Air conditioner (cooling only)	51	0.1%
Space heater (gas)	16	0.0%
Space heater (oil)	142	0.2%
Water heater (gas)	465	0.6%
Water heater (oil)	102	0.1%
Gas cook stove	125	0.2%
Refrigerator	6,764	8.3%
Television	2,143	2.6%
VCR	257	0.3%
Heated toilet seat	269	0.3%
Fluorescent light	597	0.7%
Other electronic devices	2,219	2.7%
Incandescent light	591	0.7%
High-efficiency water heater	8,073	9.8%
Home energy conservation	7,502	9.2%
Energy demand management	764	0.9%
Natural energy		
Photovoltaic	24,127	29.4%
Solar heating	11,100	13.5%
Biomass	1,028	1.3%
Activity level measures	4,716	5.8%
Lower CO2 emission per unit of electricit	6,346	7.7%
Total	81,983	100.0%

	CO2 reduction vol. 1000t-CO2	Share
Better eqipment efficiency		
Heating/cooling equipment	4,263	6.3%
Copy machine	44	0.1%
Fluorescent light	2,831	4.2%
Transformer	770	1.1%
Vending machine	277	0.4%
Freezer, refrigerator, showcase	1,105	1.6%
Incandescent light	3,687	5.4%
Building energy conservation	11,837	17.5%
BEMS	471	0.7%
Energy demand management	1,434	2.1%
Natural energy		
Photovoltaic	5,571	8.2%
Solar heating	395	0.6%
Biomass	2,102	3.1%
Cogeneration	395	0.6%
Activity level measures	17,604	26.0%
Lower CO2 emissions per unit	15,044	22.2%
Total	67,829	100%

Diagram 4　Breakdown of CO2 reductions in the Minus 30% Case



6. Policies and measures for achieving a 30% reduction

The Japanese government's existing policies and measures lack a comprehensive conceptual foundation and its policy planning process is less than rational. Because the policies needed to back up successful measures are presently weak, they will prove incapable of inducing major reductions in the residential and commercial sectors unless there are significantly improved. To achieve a 30% reduction, policies and measures that encourage maximal deployment of existing technology that improve stock efficiency will certainly be necessary. Policies and measures that encourage the release of specific, practical information and the significantly wide-ranging adoption of renewable energy sources will also be essential.

As detailed in Table 4, progress is needed towards the establishment and mandatory enforcement of new home and other building standards that aim at an overall level of efficiency achieved through better insulation and improved equipment and comprehensive energy conservation measures should be incorporated in all new construction. For existing home buildings, mandatory insulation retrofitting should be introduced based on comprehensive information about the efficiency of the existing building stock. To encourage the introduction and promotion of energy-conservation technology in the residential and commercial sectors, equipment and appliance

efficiency should be further upgraded and an “energy efficiency commitment (EEC)” with mandatory energy saving goals should be required of energy suppliers. To encourage the widespread adoption of renewable energy sources, stable purchase prices should be guaranteed by establishing a purchasing system of fixed prices for power produced by renewable energy sources (feed-in-tariff system), and also regulations on the CO2 emissions per unit of hot water supply and per unit of floor space are required. To encourage the use of renewable energy heat sources (solar heating, biomass heating), a “green heat certificate” system should be introduced.

In addition, to provide economic incentives for the development and adoption of all kinds of products, activities, energy sources, etc. that produce relatively less CO2, a carbon tax will be essential. This will need to be integrated into all aspects of society in order to achieve results in the residential and commercial sectors.

Table 4 The major policies and measures needed

Housing & building measures (new construction)	Adoption of new, mandatory standards that aim for an overall level of efficiency achieved through both insulating capacity and equipment efficiency
Housing & building measures (existing stock)	Mandatory insulation refitting based on a housing/building stock efficiency information
Introducing and upgrading energy conservation technology	Reinforcement of Law concerning the Rational Use of Energy (Upgrading equipment and appliance efficiency) Introduction of an “energy efficiency commitment (EEC)” with mandatory energy saving goals required of energy suppliers
More widespread adoption of natural energy sources	- Introduction of a feed-in-tariff system for electricity produced by photovoltaic and other renewable energy sources - Regulation of CO2 emissions per unit of hot water supply and per unit area of floor space - Popularization of renewable heating sources (solar heating, biomass heating) through a “green heat certificate” system
Economic incentives that give relative advantage to products, activities and energy sources, etc. that produce less CO2	Introduction of a carbon tax

7. Conclusion

The prediction is that if we stay on our present course, by 2020 Japan's residential and commercial sectors will end up producing 30% more CO2 emissions than they did in 1990. In this context, setting up the goal of a 30% reduction by 2020 might seem absurd and impossible.

However, this idea shares many features with the course towards long-term, major emission reductions, and if the appropriate policies and measures are adopted and all concerned entities act on a conscious commitment to achieving this goal, a 30% reduction by the transitional year of 2020 can be considered entirely possible. In fact, realization of the KIKO project's Minus 30% Case does not depend on any fantastical measures or as-yet-unknown technology – everything proposed could be implemented right now, should we start following a clearly defined course of action.

However, to achieve this, the Japanese government must take stronger measures and adopt more effective policies. In particular, stronger measures are needed to deal with homes and other buildings, which play an important part in the proposed Minus 30% Case. Effective national government measures will also be an indispensable prerequisite to the popularization of energy conservation technology and the widespread adoption of renewable energy sources. Responsible action by all concerned entities and independent action by citizens will also be needed.

KIKO Network hopes this proposal will act as a foundation on which as many people as possible can build a shared vision for society in 2020. We look forward to undertaking practical activities in cooperation with a great many other people, and call for the speedy adoption of bold government policies in pursuit of achievement of the Kyoto Protocol and further emissions reductions under post-2012 framework.

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