

# Japanese Industries' Voluntary approaches: Outcomes Attained and Roles of the Government

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## Industry's action plan towards a low-carbon society

- After the announcement of the Keidanren Voluntary Action Plan on the Environment (VAP) in 1997, industrial organizations voluntarily set up emission reduction targets, prior to the Government's target setting, and promoted efforts for their achievement.
- The targets are chosen by themselves amongst CO2 emissions, CO2 intensity, energy consumption, and energy intensity, in accordance with industry-specific characteristics and potential for technology introduction.
- Action plans comprise 4 pillars: 1) emission reduction targets; 2) development/diffusion of low-carbon products; 3) contribution at the international level through contribution to other sectors through technology transfer; and 4) development/introduction of innovative technologies
- Under the VAP, 114 industries set up emission reduction targets. 86 industries have formulated action plans 2030 towards a low-carbon society.

Examples of 2030 reduction target	Target indicator	Baseline year	2030 reduction target
Japan Iron and Steel Federation	CO2 emissions	BAU	-9 Mil t-CO2
Japan Chemical Industry Association	CO2 emissions	BAU	-2 Mil t-CO2
Japan Paper Association	CO2 emissions	BAU	-2.86 Mil t-CO2
Japan Cement Association	Energy intensity	2010	Less than -49MJ/t-cem (more than -1.4%)
Liaison Group of Japanese Electrical and Electronics Industries for Global Warming Prevention	Energy intensity	2012	More than -16.55%
Japan Automobile Manufacturers Association / Japan Auto-Body Industries Association	CO2 emissions	1990	-33%
Federation of Electric Power Companies of Japan	-	-	-
Petroleum Association of Japan	Energy consumption	BAU	-1 Mil kl
The Japan Gas Association	CO2 intensity Energy intensity	1990	-89% -84%

# Emissions coverage under the VAP and action plan towards a low-carbon society

- The VAP covered over 80% of energy-related CO2 emissions from the industrial and energy conversion sectors, while the action plan 2030 towards a low-carbon society covers 75%.
- In the business/commercial sector, 20% of energy-related CO2 emissions were covered by the VAP. 10% are covered by the action plan 2030.
- The VAP covered 51% of total energy-related CO2 emissions in Japan, while the action plan 2030 covers 45%.

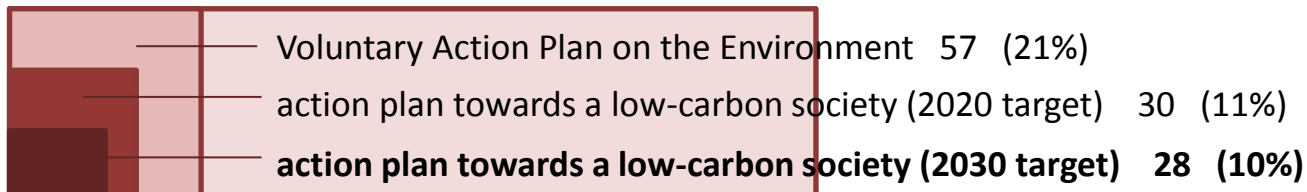
As of June 19, 2015

## Industrial and energy conversion sectors (505)

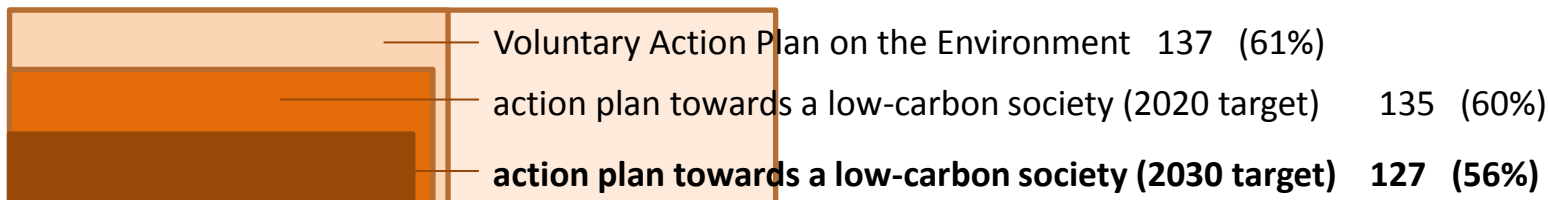
based on FY2012 emissions data (Mil t-CO2)



## Business/commercial sector (272)



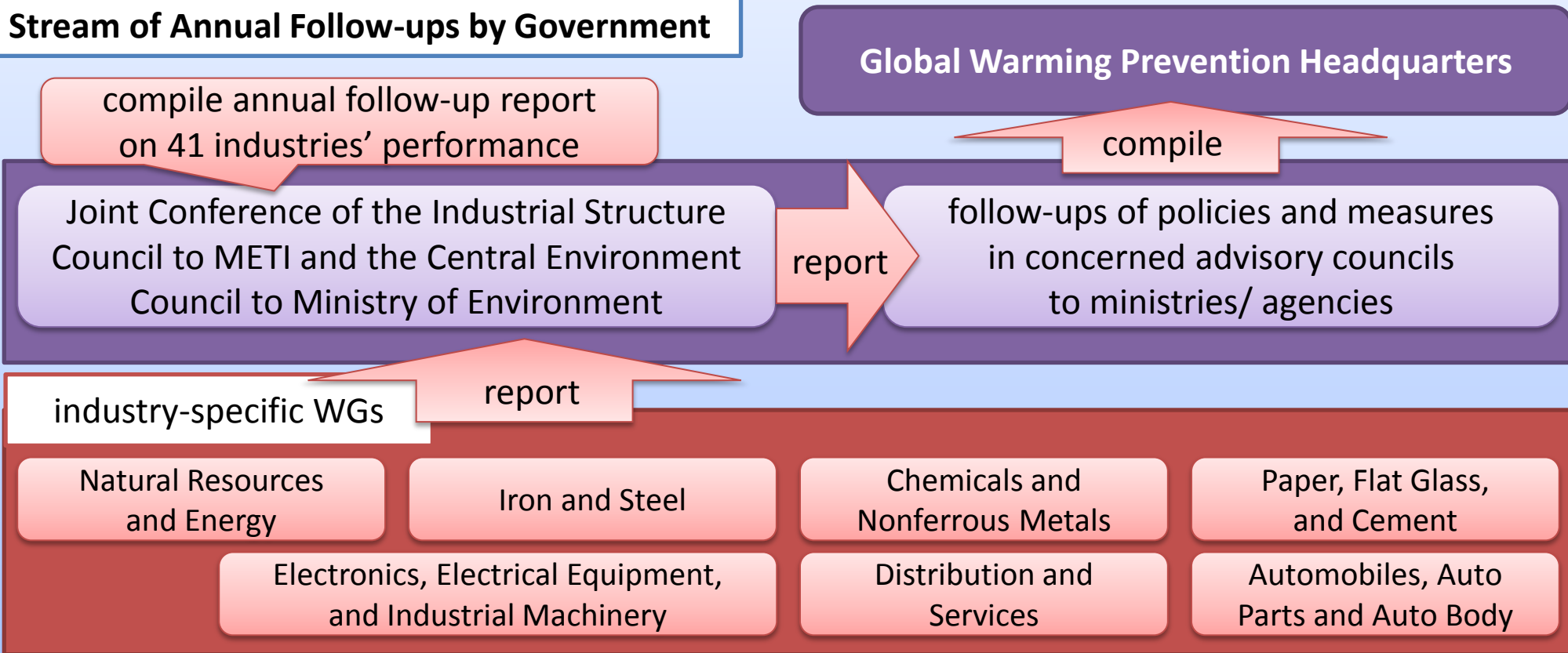
## Transportation Sector (226)



## Follow-ups by the Government

- The action plans of the 41 industries under the jurisdiction of METI are evaluated and verified in 7 industry-specific WGs under an advisory council to METI, which consist of experts from universities/ research institutes. The outcomes of deliberations conducted in each WG are reported at the Joint Conference of advisory councils to METI and Ministry of Environment, where an annual follow-up report on 41 industries' performance and future challenges is compiled.
- The Global Warming Prevention Headquarters, led by the prime minister, annually conducts government-wide follow-ups to policies and measures on climate change, including the industry's voluntary approach.

### Stream of Annual Follow-ups by Government



compile annual follow-up report on 41 industries' performance

Global Warming Prevention Headquarters

compile

Joint Conference of the Industrial Structure Council to METI and the Central Environment Council to Ministry of Environment

report

follow-ups of policies and measures in concerned advisory councils to ministries/ agencies

industry-specific WGs

report

Natural Resources and Energy

Iron and Steel

Chemicals and Nonferrous Metals

Paper, Flat Glass, and Cement

Electronics, Electrical Equipment, and Industrial Machinery

Distribution and Services

Automobiles, Auto Parts and Auto Body

# Committee for the Comprehensive Review of the VAP

- Experts reviewed the VAP in a committee to identify unresolved challenges embraced by it and enhance the effectiveness of the action plan towards a low-carbon society to be implemented in the business community from 2013, as well as to conduct a comprehensive review of the accomplishments of the Plan and to contribute to future domestic and overseas studies and analyses on it.
- Welcoming Yoichi Kaya, President of RITE (former Chairman, Global Environmental Subcommittee, Environmental Committee, Industrial Structure Council) as Chair, the committee comprised current and former Chairs of industry-specific WGs under the Industrial Structure Council and the Chairman of the Expert Committee for Follow-Up to the Voluntary Action Plan on the Environment, Global Environment Committee, Central Environment Council. Research institutions with insight on the VAP, the Ministry of the Environment and the Keidanren secretariat also joined discussions.

## Members

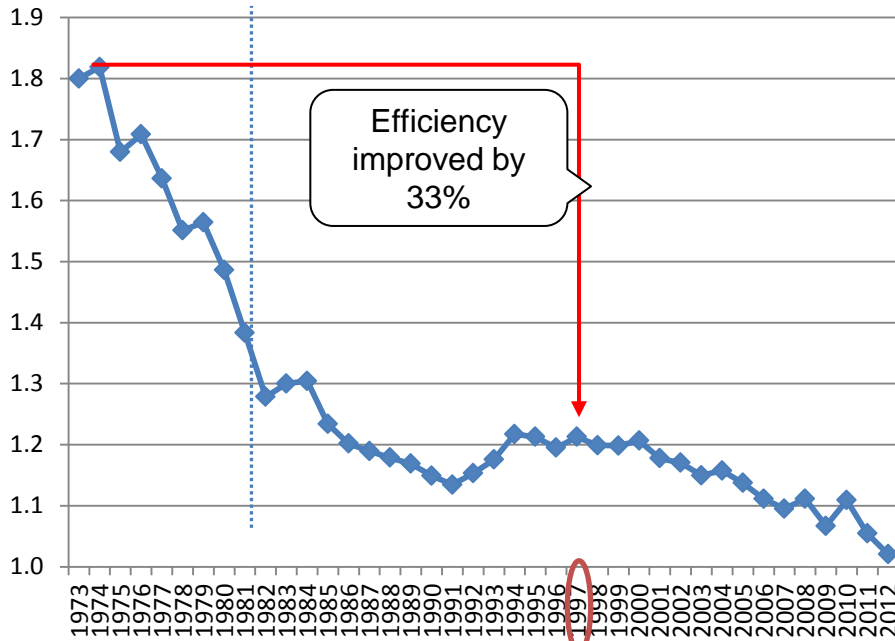
Chair	Yoichi Kaya	President, Research Institute of Innovative Technology for the Earth
Members	Hisashi Ishitani	Professor emeritus, University of Tokyo
	Tadashi Otsuka	Professor, School of Law, Waseda University
	Takeo Kikkawa	Professor, Graduate School of Commerce and Management, Hitotsubashi University
	Taketo Sakuma	Vice President, Kochi University of Technology
	Hidetoshi Nakagami	President, Jukankyo Research Institute
	Ryuji Matsuhashi	Professor, Department of Electrical Engineering and Information Systems, Graduate School of Engineering, University of Tokyo
	Kenji Yamaji	Director-General, Research Institute of Innovative Technology for the Earth
Observers	Keigo Akimoto	Group Leader, System Research, Research Institute of Innovative Technology for the Earth
	Hiroki Kudo	Senior Research Fellow, Global Environment & Sustainable Development Unit, Institute of Energy Economics, Japan
	Taishi Sugiyama	Senior Researcher, Central Research Institute of Electric Power Industry
	Junichi Fujino	Senior Researcher, Social and Environmental Systems Division, National Institute for Environmental Studies
		Climate Change Policy Division, Global Environment Bureau, Ministry of the Environment Environmental Policy Bureau, Keidanren

# Achievements of the VAP

- In 1997, Japan had improved efficiency levels by more than 30% as a result of energy-saving efforts since the oil crises, thus achieving the world's highest efficiency levels.
- Targets set under the VAP by the 34 Keidanren member industries from the industrial and energy conversion sectors represented, on average, a ratio of 0.90 (-10%) to actual energy intensity and CO2 intensity levels in 1997 (=1.0). In comparison, actual values in the target year were, on average, 0.83 (-17%) against 1997 levels, thereby indicating industrial efforts to overachieve targets which had been set at even more stringent levels compared to the world's highest efficiency levels.

## Primary energy consumption per real GDP in Japan

(tonne of oil equivalent/trillion yen)



Source: Comprehensive Energy Statistics, Annual Report on National Accounts

Upper row: [Target level]  
 Middle row: Actual performance, without credits  
 Lower row: (actual performance, credits reflected)













	Energy intensity	Energy consumption	CO2 intensity	CO2 emission
Federation of Electric Power Companies of Japan	0.96	0.96	[0.91] 1.05 (1.04)	1.05 (1.04)
Petroleum Association of Japan	[0.95] 0.92	0.92	0.92 (0.92)	0.92 (0.92)
The Japan Gas Association	0.21	0.21	[0.20] 0.21 (0.19)	[0.20] 0.21 (0.19)
Japan Iron and Steel Federation	0.84	[0.85] 0.84	0.85 (0.84)	0.85 (0.84)
Japan Chemical Industry Association	[0.93] 0.90	0.90	0.92 (0.87)	0.92 (0.87)
Japan Paper Association	[0.84] 0.79	0.79	0.83 (0.81)	0.83 (0.81)
4 Electrical & Electronics Associations	0.71	0.71	[0.83] 0.86 (0.76)	0.86 (0.76)
Japan Automobile Manufacturers Association / Japan Auto-Body Industries Association	0.66	0.66	0.72 (0.67)	[0.84] 0.72 (0.67)
<b>Average for 34 Keidanren member industrial and energy-conversion sectors</b>			[0.90] 0.83	

# Energy-related CO2 emission trends by sector in Japan

○ In the result, energy-related CO2 emissions in Japan have decreased in the industrial sector.

## Energy-related CO2 emissions trends by sector

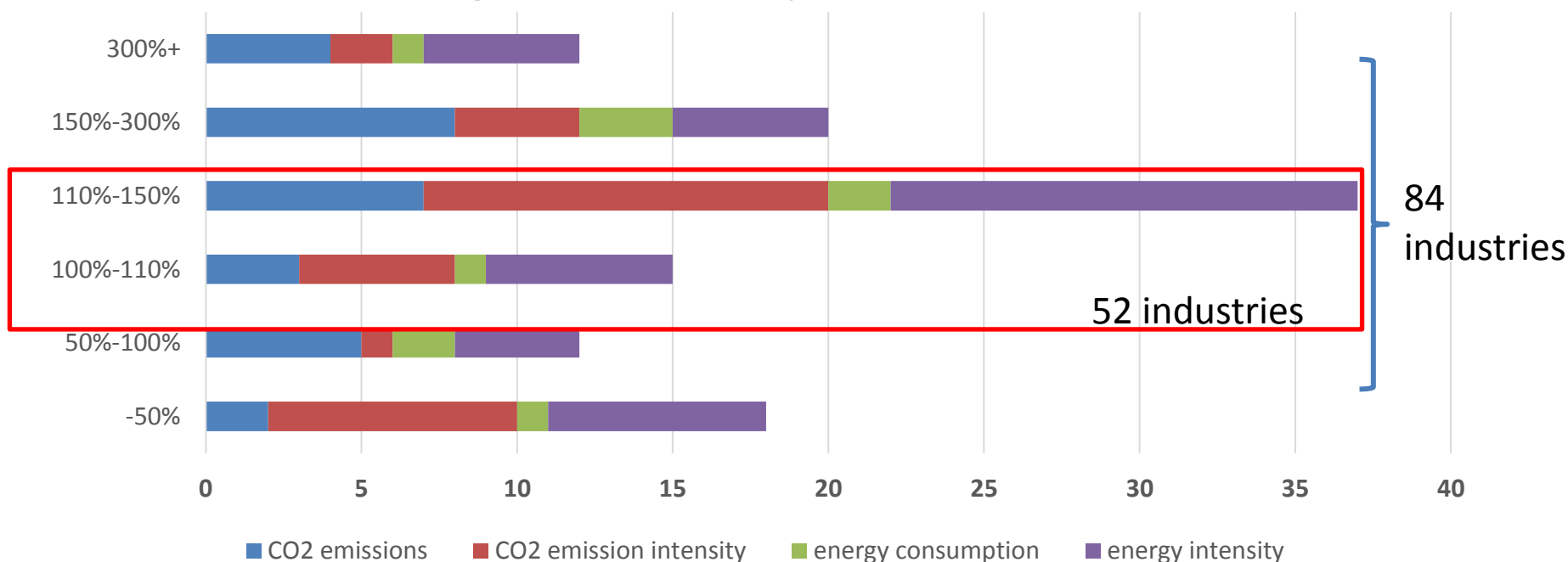
Unit: Mil t-CO<sub>2</sub>

	FY1990 (baseline year)	FY2001	FY2012	Average of FY2008~2012	
Industry	482	 450	 418	413 (36.1%)	( -14.3% relative to 1990 )
Transportation	217	 267	 226	231 (20.2%)	( +6.5% relative to 1990 )
Business/ commercial	164	 214	 272	238 (20.8%)	( +45.1% relative to 1990 )
Household	127	 154	 203	179 (15.6%)	( +40.9% relative to 1990 )
Energy conversion	68	 68.9	 88	83 (7.3%)	( +22.1% relative to 1990 )
Total	1059	 1153	 1208	1144	( +8.0% relative to 1990 )

# Status of target achievement under the VAP (114 industries)

- Targets were achieved by 84 industries of the 114 industries that formulated VAPs.
- One-third of participating industries (38 industries) enhanced their targets, responding to encouragement in follow-ups.
- Targets were slightly overachieved (achievement rate of 100-150%) in 52/114 industries, 26 industries of which had enhanced their targets in the follow-up process.

Status of target achievement by indicator (114 industries)



Source: Compiled by IEEJ based on responses from industrial organizations to FY2012 questionnaire survey, FY2013 Government follow-up material

- Notes: 1) Achievement rates were calculated using the following formula (100% = achievement of pledged reductions in no more or no less than target level):  $Achievement\ rate = \frac{1 - actual\ performance\ level}{1 - target\ level}$
- 2) For industries adopting more than one indicator, the indicator with a lower achievement rate was counted.
- 3) For industries which have achieved targets which sought to maintain baseline levels ( $\pm 0$ ) are counted among industries with achievement rates of 300+, as their achievement rates would be infinite.



- The VAP is not subject to challenges faced by the ETS: 1) lack of flexibility in addressing changes in business environment due to economic downturn, etc.; 2) difficulties in determining emission allocations; 3) “windfall profits”; 4) concerns regarding carbon leakage; and 5) impacts on investment in technological development due to carbon price instability

### **Precedent studies on the EUETS**

- Grandfathering of excessive emission allocations in 2008 due to economic recession caused a sharp fall in emission permit prices, which have remained stagnant.
  - EC (2012) “Report from the commission to the European parliament and the council: The state of the European carbon market 2012”, European Commission, Brussels.
- Governments grandfathered excessive emission allocations based on concerns for asymmetry of information and international competitiveness of domestic companies.
  - M. Grubb et al. (2005) “Allowance allocation in the European emissions trading system: a commentary”, *Climate Policy*, 5:127-136.
- Some businesses have enjoyed profits by adding costs associated with grandfathered emission allocations on prices (“windfall profits”)
  - J. Sijm et al. (2006) “CO2 cost pass-through and windfall profits in the power sector”, *Climate Policy*, 6(1): 49-72.
  - W. Lise et al. (2011) “The Impact of the EU ETS on Prices, Profits and Emissions in the Power Sector: Simulation Results with the COMPETES EU20 Model”, *Environmental and Resource Economics*, 47:23–44.

- The VAP, however, embraces issues such as that the implementation of action plans are not always guaranteed.

### **Precedent studies on the EUETS**

- There are concerns regarding carbon leakage, or companies shifting economic activities to countries free of carbon-related costs
  - S. Droege (2009) “Tackling Leakage in a World of Unequal Carbon Prices”, Climate Strategies Report, London.
  - DECC (2010) “Assessment of the degree of carbon leakage, following an international agreement on climate change”, Department of Energy & Climate Change, UK.
- Corporate efforts were focused on investments with short amortization times and EUETS had little impact on long-term investment in technological innovation.
  - K. S. Rogge et al. (2011) "The innovation impact of the EU Emission Trading System - Findings of company case studies in the German Power Sector“, Ecological Economics, 70:513–523.
  - V. Hoffman (2007) “EU ETS and Investment Decisions: The Case of the German Electricity Industry”, European Management Journal, 25(6):464-474.

### **Challenges faced by the VAP**

- Has yet to ensure the implementation of targets, which are not legally binding nor subject to a transparent monitoring process.
  - OECD (1999) “Voluntary Approaches for Environment Policy An Assessment”.

# Evaluation of the VAP in Government documents

- “The Status of Progress in Implementing the Kyoto Protocol Target Achievement Plan,” compiled by the Global Warming Prevention Headquarters based on the outcome of deliberations by the Comprehensive Review Committee states that the VAP “has been sufficiently successful.”
- The VAP has similarly gained high acclaim in other Government documents including the environment white paper (Annual Report on the Environment, the Sound Material-Cycle Society and the Biodiversity in Japan.)

## **excerpts from the Annual Report on the Environment, the Sound Material-Cycle Society and the Biodiversity in Japan (2014)** **(adopted by Cabinet decision on June 6, 2014)**

Japan's business community, led by Keidanren, has proactively addressed global warming issues by formulating the Voluntary Action Plan on the Environment in 1997. Consequently, the Voluntary Action Plan has thus far produced sufficiently high results, including the following:

[1] The Voluntary Action Plan was effective on the whole, as many industries set up challenging targets, which were achieved through consistent energy-saving efforts and Government-led follow-ups, best practices were shared among different industries and a steadily increasing number of industries formulated action plans.

[2] Investment was made not only in measures with short payback periods but also in middle- to long-term strategies for enhanced competitiveness.

[3] The world's highest energy efficiency levels were maintained through persistent technological development and introduction.

## **excerpts from The Status of Progress in Implementing the Kyoto Protocol Target Achievement Plan** **(compiled by the Global Warming Prevention Headquarters on July 1, 2014)**

Despite significant changes in Japan's energy context in both domestic and international terms after the Great East Japan Earthquake and the accident at TEPCO's Fukushima Daiichi Nuclear Power Plant in March 2011, Japan was able to achieve its target of reducing emissions by 6% by the first commitment period under the Kyoto Protocol, because all circles and levels of the Japanese public have made maximum efforts to address global warming. These include the sufficient success achieved by the Voluntary Action Plan on the Environment, which has played a central role in implementing global warming countermeasures in the business community, thus maintaining the world's highest energy efficiency levels, the tireless efforts to implement energy-saving measures, such as enhancing the efficiency of equipment in accordance with Top Runner standards, and the consistent implementation of emissions control of HFCs, PFCs, SF6 and forest sink measures, etc.

# Advancement and strengthening of industries' action plan towards a low-carbon society

- It is declared that, through specific polices and measures listed in the attached documents, such as “the advancement and strengthening of Japanese industries’ action plan towards a low-carbon society”, further improvements in energy efficiency will be sought, in the Government’s draft of Japan’s Intended Nationally Determined Contribution (approved by the Global Warming Prevention Headquarters on June 2, 2015).
- In addition to 1) improving the effectiveness of the action plan through enhancement of the follow-ups, it is also important 2) to ensure fairness among businesses through expanding the number of participating industries and engaging more member companies of each participating industry, and 3) to enhance the target level of industry which target have been already achieved.

## **excerpts from Japan’s Intended Nationally Determined Contribution (draft by the Government)** **(approved by the Global Warming Prevention Headquarters on June 2, 2015)**

Japan’s INDC has been prepared on a bottom-up basis taking into account specific polices and measures in major sectors, with the contents made clear, which makes it highly transparent and concrete. Parties’ provision and sharing of information on each sector in this manner will improve transparency, ensure fairness, and also aid effective reviews. Through this, sector-specific measures will be encouraged, which will lead to fair and efficient global emissions reductions.

In Japan’s industry sector, energy efficiency for producing iron and steel (converter steel) and cement (clinker) are both at top levels globally, but through specific polices and measures listed in the attached documents, such as the advancement and strengthening of Japanese industries’ action plan towards a low-carbon society, further improvements will be sought.

# Improvements in follow-ups by the Government

- Facilitate substantive discussion at follow-up advisory council meetings by presenting critical points of discussion for WG meetings, conducting further discussions in each WG following a round of Q&A on paper, and enhancing the disclosure of performance data.

## Improvements made in the follow-up process

### <Present critical points of discussion for WG meetings>

- To facilitate more active deliberation at WG meetings, the Secretariat will present major issues for discussion, such as bases for target-setting, BATs to be introduced, factors of intensity level changes, comparison of performance with international benchmarks, the rate of progress toward FY2020, and the participation rate, before meetings based on industrial organizations' reports and committee members' questions. Meeting agendas will comprise such major issues.

### <Conduct a round of Q&A on paper before meetings>

- Regarding issues other than those on the meeting agenda, members will be granted the opportunity to ask questions on paper before WG meetings and industrial organizations will document answers. Questions and answers will be distributed at WG meetings.

### <Disclose advisory council meeting material as Excel files>

- Performance data for each industry that have been presented at advisory council meetings are provided in Excel and CSV format on the METI website to enable third-party ex-post analysis.

## Image of follow-up survey sheets

(2) Outline of performance . . .

A. Summary table of performance . . .

- ‡ Please provide the performance value for the baseline year and the previous year, an outlook and the performance value for the follow-up year, an outlook for the following year, the 2020 target and 2030 target for five indicators: economic activity, energy consumption, CO2 emissions, energy intensity and CO2 intensity. Please provide actual values to the maximum extent possible.
- ‡ Outlook for the follow-up year and the following year are reference values to increase the probability of target achievement through the annual PDCA cycle and are not meant to require commitment. Therefore, industries are asked to provide outlooks to the extent possible.
- ‡ Organizations that have adopted CO2 emission and/or CO2 intensity targets should provide CO2 emissions or CO2 intensity values calculated by using the electricity emission factor used in determining the target level(s) to calculate CO2 emissions and/or CO2 intensity. Organizations that have adopted energy consumption or energy intensity targets should provide CO2 emissions and CO2 intensity values calculated by using an adjusted emission factor (net output).
- ‡ Organizations that have adopted electric power consumption (e.g. electric power consumption per unit floor area per business hour) as target indicators should provide both energy consumption in terms of oil equivalent and electric power consumption (or energy consumption in terms of electricity equivalent).
- ‡ The values provided in this summary table shall be considered accurate and should be consistent with all other values reported in [Attachment 4] and other section (see below). On [Attachment 4], please outline boxes containing data from this summary table with bold lines. . .

[Summary table] (refer to Attachment 4 for details) . . .

	Baseline year (FY**)	FY2013 Performance	FY2014 Outlook	FY2014 Performance	FY2015 Outlook	FY2020 Target	FY2030 Target
Economic activity (Unit)							
Energy consumption (10,000ki-hoil equivalent)							
Electric power consumption (100Mll kWh)							
CO2 emissions (10,000t-CO2)	*1	*2	*3	*4	*5	*6	*7
Energy Intensity (Unit)							
CO2 Intensity (Unit)							

[Electricity emission factor] . . .

- ‡ Regarding the electricity emission factor used to calculate CO2 emissions in the previous subsection, please indicate the value of the emission factor and whether it is an actual emission factor, an adjusted emission factor or a fixed factor. If the emission factor is based on actual performance, please provide the

# Opening of a portal site on voluntary approaches

- In September 2014, a portal site on voluntary approaches taken by the business community was opened.
- The portal site enables users to have one-stop access to various information (in both Japanese and English) on voluntary approaches taken by the business community, including industry-specific action plans and performance data. It promises to encourage ex post evaluation and analysis by third parties including academic studies by domestic and overseas researchers, as well as facilitate the international and inter-industry sharing of information, such as that on best practices.
- Accumulating more information on the English version of the portal site will serve to enhance international communication of what have been achieved by Japan's business community through voluntary approaches.

## Information available on the portal site

- Action plans compiled by each industry
- Introduction of best practices (information-sharing, standardization, international cooperation, etc.)
- Performance data (production, energy consumption, CO2 emissions, investments, etc.)
- Status of follow-ups conducted by Keidanren and concerned ministries and agencies
- Evaluation and analysis of the VAP, etc.

## Portal site URL

[http://www.meti.go.jp/english/policy/energy\\_environment/global\\_warming/voluntary\\_approach/index.html](http://www.meti.go.jp/english/policy/energy_environment/global_warming/voluntary_approach/index.html)

The screenshot displays the METI (Ministry of Economy, Trade and Industry) website. The header includes the METI logo and navigation tabs for Home, About METI, Information, Policies, Statistics, Contact Us, and Japanese. A search bar is located in the top right corner. The main content area is titled 'Voluntary approaches on the environment' and includes a breadcrumb trail: Policies > Policy Index > Energy and Environment Policy > Global Warming Countermeasures > Voluntary approaches on the environment. Below the title, there is a 'Press Releases' section with two entries: 'International Symposium entitled "Evaluating Industry-led Voluntary Approach and Discussing the Future of Climate Change Policy" was Held (September 5, 2014)' and 'Opening of a Portal Site on Voluntary Approaches Taken by the Industrial Community (September 2, 2014)'. An 'Outline' section follows, providing a brief overview of the Keidanren Voluntary Action Plan on the Environment. The 'Summary documents' section at the bottom lists two documents: 'Voluntary approaches taken by the business community: the Voluntary Action Plan on the Environment /Commitment to a Low Carbon Society (PDF:595KB)' and '114 participation industries of the Voluntary Action Plan (PDF:182KB)'. The page also features a 'Japanese' language selector and a 'Print' button.

# Establishment of a database on the performance of voluntary approaches

- Performance data on economic activity and energy consumption under the VAP will be compiled in a database (with English data) in order to enable multidimensional evaluation and enhanced effectiveness.
- Data for FY2013 and onwards on performance under the action plan toward a low-carbon society will be included in the future.

## Available data

Name of industrial organization, ministry/agency of jurisdiction, target indicator, baseline year, economic activity, CO2 emissions, energy intensity, CO2 intensity, etc.

## Image of database

### Sources

“Progress Status of the Kyoto Protocol Target Achievement Plan” (\*Japanese only)

<http://www.kantei.go.jp/jp/singi/ondanka/>

Reports submitted by industrial organizations to advisory councils under relevant ministries and agencies (\*Japanese only)

[http://www.meti.go.jp/policy/energy\\_environment/kankyoku\\_keizai/va/](http://www.meti.go.jp/policy/energy_environment/kankyoku_keizai/va/)

### Database URL

[http://www.meti.go.jp/policy/energy\\_environment/kankyoku\\_keizai/va/database/data/jisyukoudou\\_DB.xlsx](http://www.meti.go.jp/policy/energy_environment/kankyoku_keizai/va/database/data/jisyukoudou_DB.xlsx)

業界名	年度	活動量1	活動量1 (単位)	エネルギー 消費量1	エネルギー 消費量1 (単位)	CO2 排出量1	CO2 排出量1 (単位)	エネルギー 消費量1 原単位	エネルギー 消費量1 原単位 (単位)	CO2 原単位	CO2 原単位 (単位)
石油連盟	2010	1925.0	生産活動量	16506.0	原油換算(千)	3963.0	万t-CO2	8.580	原油換算kg	20.590	kg-CO2/生産活動量k
石油連盟	2011	1818.0	生産活動量	15558.0	原油換算(千)	3750.0	万t-CO2	8.560	原油換算kg	20.630	kg-CO2/生産活動量k
石油連盟	2012	1824.0	生産活動量	15751.0	原油換算(千)	3770.0	万t-CO2	8.640	原油換算kg	20.670	kg-CO2/生産活動量k
特定規模電	1990	-	販売電気量	-	-	-	億kg-CO2	-	-	-	kg-CO2/kWh
特定規模電	2007	148.8	販売電気量	-	-	69.2	億kg-CO2	-	-	0.460	kg-CO2/kWh
特定規模電	2008	141.3	販売電気量	-	-	65.9	億kg-CO2	-	-	0.470	kg-CO2/kWh
特定規模電	2009	146.4	販売電気量	-	-	68.5	億kg-CO2	-	-	0.470	kg-CO2/kWh
特定規模電	2010	175.1	販売電気量	-	-	77.7	億kg-CO2	-	-	0.440	kg-CO2/kWh
特定規模電	2011	166.5	販売電気量	-	-	67.7	億kg-CO2	-	-	0.407	kg-CO2/kWh
特定規模電	2012	164.2	販売電気量	-	-	71.2	億kg-CO2	-	-	0.434	kg-CO2/kWh
日本ガス協	1990	665.0	都市ガス製	26.0	PJ	132.8	万t-CO2	0.039	PJ/PJ	83.600	g-CO2/m3
日本ガス協	2007	1551.0	都市ガス製	8.0	PJ	39.0	万t-CO2	0.006	PJ/PJ	10.500	g-CO2/m3
日本ガス協	2008	1495.0	都市ガス製	8.0	PJ	32.2	万t-CO2	0.006	PJ/PJ	9.000	g-CO2/m3
日本ガス協	2009	1472.0	都市ガス製	7.0	PJ	29.5	万t-CO2	0.006	PJ/PJ	8.400	g-CO2/m3
日本ガス協	2010	1547.0	都市ガス製	7.0	PJ	29.4	万t-CO2	0.006	PJ/PJ	8.000	g-CO2/m3
日本ガス協	2011	1581.0	都市ガス製	7.0	PJ	35.1	万t-CO2	0.006	PJ/PJ	9.300	g-CO2/m3
日本ガス協	2012	1587.0	都市ガス製	7.0	PJ	34.8	万t-CO2	0.004	PJ/PJ	9.200	g-CO2/m3
日本鉄鋼連	1990	10470.0	粗鋼生産量	2439.0	PJ	20061.0	万t-CO2	100.000	進捗率(基準)	100.000	進捗率(基準年度=100)
日本鉄鋼連	1995	-	粗鋼生産量	-	PJ	-	万t-CO2	-	進捗率(基準)	-	進捗率(基準年度=100)
日本鉄鋼連	2008	10133.0	粗鋼生産量	2158.0	PJ	17619.0	万t-CO2	91.400	進捗率(基準)	90.700	進捗率(基準年度=100)
日本鉄鋼連	2009	9372.0	粗鋼生産量	2019.0	PJ	16545.0	万t-CO2	92.500	進捗率(基準)	92.100	進捗率(基準年度=100)
日本鉄鋼連	2010	10751.0	粗鋼生産量	2275.0	PJ	18618.0	万t-CO2	90.800	進捗率(基準)	90.400	進捗率(基準年度=100)
日本鉄鋼連	2011	10273.0	粗鋼生産量	2212.0	PJ	18377.0	万t-CO2	92.400	進捗率(基準)	93.400	進捗率(基準年度=100)
日本鉄鋼連	2012	10394.0	粗鋼生産量	2227.0	PJ	18577.0	万t-CO2	92.000	進捗率(基準)	94.300	進捗率(基準年度=100)
日本化学工	1990	100.0	生産指数付	2674.0	万K	61.720	万t-CO2	100.000	進捗率(基準)	100.000	進捗率(基準年度=100)
日本化学工	2006	127.0	生産指数付	2857.0	万K	65.480	万t-CO2	84.000	進捗率(基準)	83.000	進捗率(基準年度=100)
日本化学工	2007	129.0	生産指数付	2901.0	万K	6724.0	万t-CO2	84.000	進捗率(基準)	85.000	進捗率(基準年度=100)
日本化学工	2008	112.0	生産指数付	2639.0	万K	591.00	万t-CO2	88.000	進捗率(基準)	85.000	進捗率(基準年度=100)
日本化学工	2009	115.0	生産指数付	2620.0	万K	5789.0	万t-CO2	85.000	進捗率(基準)	82.000	進捗率(基準年度=100)
日本化学工	2010	123.0	生産指数付	2717.0	万K	5985.0	万t-CO2	83.000	進捗率(基準)	79.000	進捗率(基準年度=100)
日本化学工	2011	115.0	生産指数付	2584.0	万K	6034.0	万t-CO2	84.000	進捗率(基準)	85.000	進捗率(基準年度=100)
日本化学工	2012	111.0	生産指数付	2485.0	万K	5761.0	万t-CO2	84.000	進捗率(基準)	84.000	進捗率(基準年度=100)
日本製紙連	1990	2515.0	生産量(万t)	366965.0	TJ	2547.0	万t-CO2	14589.000	MJ/t	1.013	t-CO2/t
日本製紙連	2006	2739.0	生産量(万t)	323066.0	TJ	2321.0	万t-CO2	11797.000	MJ/t	0.848	t-CO2/t
日本製紙連	2007	2781.0	生産量(万t)	329988.0	TJ	2312.0	万t-CO2	11544.000	MJ/t	0.829	t-CO2/t

- In the IPCC WGIII Fifth Assessment Report published in April 2014, it has been stated that:
  - Voluntary approaches have been found to be effective and cost-efficient
  - Government involvement in implementation review is crucial for the success of voluntary approaches.
  - Voluntary approaches provide an opportunity for “learning by doing” and sharing experiences.

## The Working Group III Contribution to the IPCC Fifth Assessment Report (excerpts)

- Negotiated, or **voluntary agreements (VAs)**, have been found in various assessments to be effective and **cost-efficient** (Rezessy and Bertoldi, 2011). [10.11.1]
- **Successful voluntary agreements are characterized by a proper institutional framework.** This framework consists of, first, capable and influential industrial associations that serve as an arena for information exchange and development of common expectation among industries. Second, **governmental involvement in implementation review is crucial.** Third, accompanying measures such as technical assistance and subsidies for energy audits and equipment can also be instrumental. Finally, regulatory threats, even if they are not explicitly articulated, are an important motivating factor for firms to be active in the voluntary agreements. [15.5.7.4]
- The **key benefits of voluntary agreements are:** 1) quick planning and actions when technological solutions are largely known but still face uncertainties; 2) flexibility in phasing technical measures; 3) facilitating coordination and information exchange among key stakeholders that are crucial to removing barriers to energy efficiency and CO2 reductions; and 4) **providing an opportunity for ‘learning by doing’ and sharing experiences.** [15.5.7.4]