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**Comparative Evaluation and development of
the Carbon Credit Utilization Policies of the Japanese Government:
Japan’s Domestic Emission Trading Schemes and
Kyoto Mechanism Credit Acquisition Program**

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Summary

“Japan voluntary emission trading scheme (JVETS)”, “Credit trading scheme between the large companies and the small/medium companies”, “Kyoto mechanism credit acquisition program (KMCAP)” “Experimental Nationally-Integrated Market for Emissions Trading” and “Offset Credit Scheme (J-VER)” were evaluated and compared from the viewpoints of policy formulation process, allocation method, cost-efficiency and impacts on the achievement of the target defined in the Kyoto Protocol. The result of this comparison study indicated that: 1) robust infrastructure for the emission trading scheme is being constructed in Japan, 2) the difference of cost-efficiency between the credit acquisition from the overseas and that from the domestic GHG emission abatement projects may not be so large, 3) system design of the domestic mitigation scheme will have a big impact on the achievement of the Kyoto target both for the large companies in Japan and for Japan as a whole, and 4) considering the co-benefits, mitigation measures utilizing such domestic emission trading scheme should be supported for further development.

Keywords

Domestic emission trading scheme, domestic emissions reduction projects, Kyoto mechanism, Japan Voluntary Emission Trading Scheme (JVETS), carbon offset mechanism

1. Background and Objectives

Domestic instruments to incentivize greenhouse gas emission reduction measures include: 1) emission cap or carbon tax for corporations and other sources; and 2) project-based emissions credits to corporations, which can be traded in the market or purchased by the government (domestic offset). In the US State of Oregon, for example, the State has imposed caps greenhouse gas emissions of power plants, with the mandate to offset any non-compliance by the purchase of carbon credits from greenhouse gas emission reduction projects verified by the third party. (Davis, 2007) In Europe and Canada, discussion and proposals have been made for the utilization of credits from greenhouse gas emissions reduction projects of the businesses and corporations having no caps under the European Union Emissions Trading Scheme (EU ETS), although the number of concrete case studies is fewer in such field. (Gigler and Wytz, 2007; Environment Canada, 2008) At the same time, EU member countries, led by Dutch Government, are undertaking policies to acquire Kyoto credits from overseas, in consideration of cost-efficiency.

In Japan, on the other hand, various studies, such as Asuka (2002) and Matsuo *et al* (2002), have made independent reviews on the introduction of “domestic Joint Implementation (JI)” or “domestic Clean Development Mechanism (CDM)”, i.e. domestic offset systems to provide credits to greenhouse gas emissions reduction projects, with or without the simultaneous introduction of caps on domestic entities. However, at that time, the Government of Japan was very slow to adopt such policies, and failed to seriously review the governmental acquisition of Kyoto credits from overseas as well, despite the proposal made by Asuka (2003, a) and Asuka (2003, b).

Later, in 2005 and afterward, the Ministry of Environment and the Ministry of Economy, Trade and Industry (METI) started to launch carbon credit utilization measures, in concern of the non-compliance of Kyoto Protocol. Focused was on the domestic emissions trading system and credit acquisition from overseas. Already, some domestic credit trading and the government’s purchase of Kyoto credits have started, though they are smaller in scale.

At the same time, in Japan, the discussion on the actual designing of emissions trading system is ongoing separately at various forum including committees and study groups under the Ministry of Environment (MOE) and METI, yet there has not been sufficiently open discussion on the contents of various systems. Moreover, there have not been any studies in Japan that made quantitative comparison of cost efficiency between domestic measures and the overseas credit acquisition programs. Even internationally, a number of studies in such area are limited, except the one by CE, a think tank in Netherlands, which quantitatively compare the effects of domestic

measures of the Dutch Government, and the overseas credit acquisition measures.¹ (Faber and Wit, 2005, De Bruyn *et al.*2005)

In this study, we shall study various systems for carbon credit utilization: a voluntary domestic emission trading system under review by the Ministry of Environment; a system reviewed by the Ministry of Economy, Trade and Industry for the credit trading between small to medium companies and big companies; a Kyoto Mechanism credit acquisition system proposed by the Government of Japan; experimental introduction of domestic integrated market for emissions trading to be started from October 2008; and an offset-credit system. The study will assess and compare these systems from the viewpoints of policy-making processes, allocation and trading methods, stringency of credit certification, effectiveness, cost-efficiency, relationship with the Kyoto Target Compliance Plan, differences from various overseas systems, etc. By identifying the issues involved in the development and designing of these systems, we shall comprehensively discuss the current situation and issues of carbon credit utilization measures in Japan.

2. Methods

This study shall address the following six systems:

No. 1: Japan Voluntary Emission Trading Scheme of the Ministry of Environment (hereinafter referred to as MOE's JVETS)

No. 2: CO₂ emission reduction certification and subsidy projects for small to medium companies contemplated by the Ministry of Economy, Trade and Industry (hereinafter referred to as METI's old)

No. 3: Credit trading system for small to medium companies by the Ministry of Economy, Trade and Industry (hereinafter referred to as METI's new), which is based on the system proposal discussed at the "review meeting for CO₂ emission reduction in small to medium companies" held by the Ministry of Economy, Trade and Industry in 2007

No. 4: Kyoto Mechanism Credit Acquisition Program by the Ministry of Environment, Ministry of Economy, Trade and Industry, and NEDO (hereinafter referred to as KMCAP)

¹ De Bruyn *et al.* (2005) considered five cost items involved in governmental measures: 1) investment cost, 2) operating cost, 3) administrative cost, 4) subsidies, and 5) revenue (negative costs such as energy saving). The study identified actual cost efficiency of governmental measures in each industry sector, calculated from the sum of these costs and the emissions reduction attained by such governmental measures.

No. 5: Experimental introduction of domestic integrated market for emissions trading by the Ministry of Economy, Trade and Industry, Ministry of Environment, and the Ministry of Agriculture, Forestry and Fishery (hereinafter referred to Domestic Integrated Market)

No. 6: Off-set credit system by the Ministry of Environment (hereinafter referred to as J-VER, which stands for Japan Verified Emission Reduction)

The author conducted interview and survey of persons in charge at relevant ministries as well as the study of literature published about these systems, and identified the following points, while comparing them and contemplating on the issues involved.

- 1) Policy-making process in designing the systems
 - Changes in social environment surrounding emissions trading systems
 - Measures taken by each stakeholders and their incentives
- 2) Details of system designing
 - Allocation of emissions and trading methods
 - With or without subsidies or penalties
 - Stringency in credit certification (criteria for additionality and verification methods and verification costs)
 - Governance structure
- 3) Details of participating companies and implemented projects
 - Number of participating companies
 - Sectors of participating companies
 - Contents (types) of greenhouse gas emissions reduction projects
- 4) Cost-efficiency
 - Government budget amount
 - Emission reduction volume
 - Cost per unit emission reduction
 - Credit trading prices
 - Co-benefits (auxiliary effects such as energy-saving, air pollution prevention, job opportunities, etc.)

Note that the Domestic Integrated Market (No. 5) is based on the Japanese Government's

proposal announced on October 21, 2008, while the J-VER (No. 6) is based on the Government's proposal set forth for public comments on October 25, 2008.

3. Results

3.1 Policy—making process in designing the system

3.1.1 Domestic Emissions Trading System

Since the Third Conference of Parties of the United Nations Framework Convention on Climate Change (UNFCCC) held in 1997, the Ministry of Environment made efforts to introduce carbon tax as one of Japan's domestic measures. However, the industries and businesses along with the Ministry of Economy, Trade and Industry strongly opposed any introduction of a new tax that might lead to production cost increase. As of year 2008, no clear indication is given to the actual introduction of environment tax, although the discussion of such measures along with the reform of consumption tax and the continuation of temporary tax rate on gasoline is ongoing among multiple numbers of political parties. Emissions trading system, on the other hand, is a new system for Japan with many uncertainties. Japanese policy-makers used to observe the progress of EU ETS, and provide fewer prospects in the introduction of its Japanese version in Japan. As the EU ETS and Clean Development Mechanism (CDM) are operating smoothly since their introduction in 2005, the emissions trading is slowly and passively, in principle, winning social recognition among businesses in EU and Japan.

In view of such situation, the Ministry of Environment started the experimental introduction of emissions trading system since fiscal 2004, and, after fiscal 2005, it introduced the JVETS, which is a small scale and voluntary, but serious emissions trading system equipped with the emissions volume management system and registry system. The system design of JVETS was quickly developed as, unlike carbon tax, it was essentially the voluntary system inviting less interference from other ministries and agencies. Moreover, some of Energy Special Account budget under the jurisdiction of the Ministry of Economy, Trade and Industry was designated as the budget for greenhouse gas reduction measures and transferred to the account under the Ministry of Environment since 2003, expanding the MOE's revenues for subsidies. The revisions of "Act Concerning the Rational Use of Energy (Energy-saving Act)" and "Law Concerning the Promotion of Measures to Cope with Global Warming (Warming Measures Law)" in 2006 set the measurement and reporting of greenhouse gas emissions obligatory to emission sources, which plays an important role for the development of infrastructure necessary for the introduction of emissions trading system. This is because the standards and verification methods to measure emission quantities should be established before the introduction of emissions trading system. In turn, the progress in the development of MOE's JVETS clarified the issues involved in the emission measurement methods under the "Energy Saving Act" and "Warming Measures Law".

In 2007, the Global Environmental Sub-Committee at the Central Environment Council of MOE and the Industrial Structure Council of METI held joint council meeting on the review of Kyoto Protocol Target Achievement Plan to focus on the possible introduction of mandatory emissions trading. At their joint meeting on November 30, 2007, four advocates of emissions trading schemes and four opponents had a “debate” on the pros and cons of emissions trading scheme introduction. The Ministry of Environment itself started to move toward the expansion of voluntary type emissions trading and the possible introduction of mandatory type schemes as indicated in their decision to establish a new Office on Market Mechanisms in July 2007. In August 2008, the Prime Minister Fukuda (at that time) announced the experimental introduction of domestic emissions trading scheme to be started from October 2008. The Ministry of Environment also introduced the concept of the “carbon offset”, creating a system to offset greenhouse gas emissions from goods production and activity with credits purchased by event hosts and consumers. In February 2008, the Ministry of Environment announced the “Way of carbon off-setting in Japan (Guideline)” and continued to hold review meetings to set rules for the system.

The traditional stance of the Ministry of Economy, Trade and Industry was to oppose, in principle, to introduce stringent policy. Therefore, in stead of the introduction of cap and trading system that would set a cap on emissions of corporations and industries, promotion of the domestic global warming measures by the revision of Energy Saving Act and the expansion of emission sources subjected to this Act were proceeded.

However, the METI noted higher energy saving potentials among small to medium enterprises in Japan, and introduced subsidy systems for the greenhouse gas emission reduction projects of small to medium enterprises since fiscal 2005. The Ministry also consigned to its affiliated organization, the Global Industrial and Social Progress Research Institute, to form “Research Committee on the promotion of global warming measures among small to medium enterprises” to discuss appropriate design of such a system. This Research Committee focused on the “System under which big companies purchase credits from small to medium companies to use for their compliance with Voluntary Action Plan (Small to Medium Enterprise CDM)”, which led to the establishment of “Domestic Crediting System” in the domestic integrated market announced on October 21, 2008.

For this domestic integrated market, the Cabinet Office and the Ministry of Environment took a central role in the discussion following the announcement of Fukuda Vision in June 2008. As mentioned above, the result of their discussion culminated to the “experimental introduction of domestic integrated market for emissions trading” announced on October 21, 2008, which did not

solicit any public comments before the announcement.

According to the published document, the system allows the issuances of emission allowances and credits to be used for the achievement of the Voluntary Action Plan through four systems of: 1) Cap and Trade system for corporations under which corporations set their own target that can conform to the Voluntary Action Plan target, 2) JVETS, 3) Cap and Trade system for corporations not participating in the Voluntary Action Plan, but setting own target in reference to JVETS system, and 4) domestic crediting system developed from METI New. Adding the Kyoto credits to above-mentioned systems, they will comprise domestic integrated market. In addition to these systems of domestic integrated market, a system called J-VER will be created, which provide tradable credits that cannot be used for the compliance with Voluntary Action Plan target. (Fig.-1)

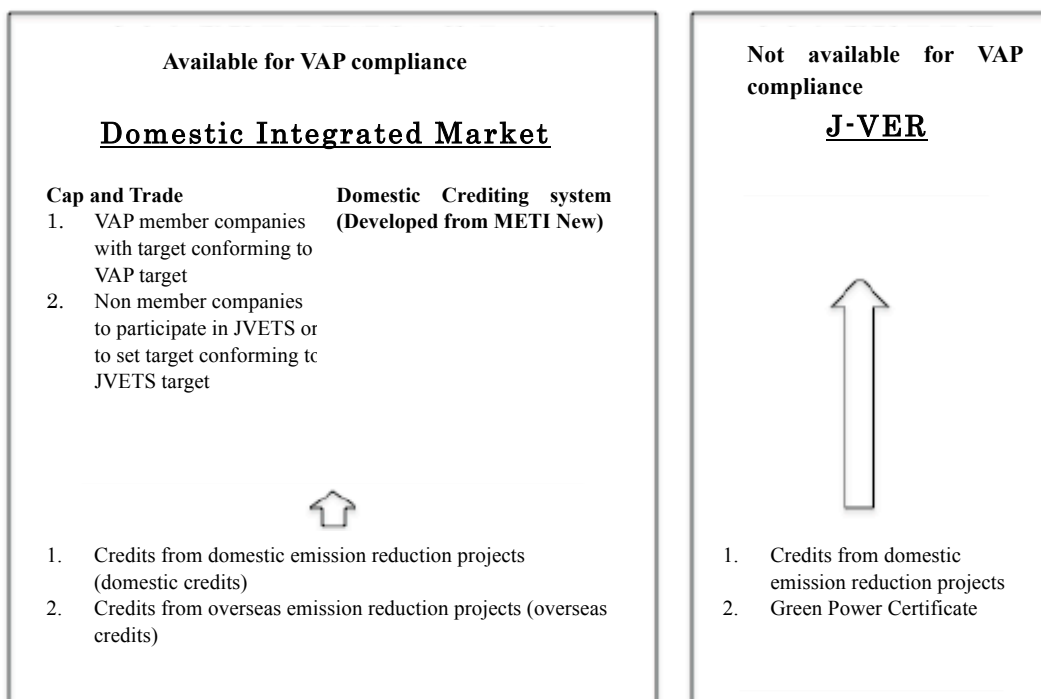


Fig. 1 Overall image of domestic emissions trading schemes in Japan

Source: above figure prepared by author

It should be noted that Operational Entity (OE) to verify the emission quantity would take an important role in the introduction of emissions trading schemes in Japan. As several Operational

Entities monopolize validation works on many CDM projects around the world, it was extremely important for Japanese Operational Entities to conduct verification works on greenhouse gas emission reduction projects in Japan, for developing experiences in such works. Therefore, many Operational Entities have been involved as secretariat and the policy proposal advocates for the designing of emission trading systems studied at the Ministry of Environment and the Ministry of Economy, Trade and Industry.

As seen here, Japan seems to have discretely but steadily advanced toward the development of key infrastructure for emissions trading schemes, especially those that would be needed to measure and verify emission quantities, and to manage and trade credits, through the reviews conducted at the Ministry of Environment and the Ministry of Economy, Trade and Industry, in addition to legislative reforms and the activities and presence of Operational Entities, as well as intense discussion on pros and cons of emissions trading introduction at Councils and Committee meetings.

3.1.2 Kyoto Credit Acquisition from Overseas

The Kyoto Mechanism Credit Acquisition Programme (KMCAP) is a system of the Government of Japan (co-sponsored by the Ministry of Environment and the Ministry of Economy, Trade and Industry) to acquire Kyoto credits from abroad. As the Government's Kyoto Protocol Target Achievement Plan called for the acquisition of overseas credits to the amount equivalent to 1.6% of Japan's base year emissions (about 100 million ton-CO₂), this KMCAP is an essential system for Japan's compliance with the Kyoto Protocol. Since 2005, the Market Mechanism Committee under the Global Environmental Sub-Committee of the Industrial Structural Council of METI continued to review the KMCAP system designs. Main issues there included how to purchase credits, credit prices and types, and the disclosure of purchase prices. Except the issue of selecting purchaser organizations (ultimately decided on the New Energy and Industrial Technology Development Corporation : NEDO), however, there were no major controversies on issues between the Ministry of Economy, Trade and Industry and the Ministry of Environment. Moreover, the Committee did not enter into in-depth discussion on actual purchase methods (for example, whether to purchase higher quality credits at the prices different from market prices). At present, there has not been any specific rule on the purchase methods, except the basic policy of not purchasing any credits from forestation CDM projects that would require supplement credits in the future. Under this KMCAP, the purchasing organization is purchasing Kyoto Credits from the market, with its own discretion in view of market situation, at the prices approved by the Ministry of Economy, Trade and Industry and the Ministry of Environment. However, it is highly likely that Japan needs to purchase more credits than originally planned amount of 1.6% of gross emissions in 1990,

anticipating the need to significantly increase the budget amount for credit purchases.

3.2 Analysis of actual scheme designs

3.2.1 Fundamental structure of various schemes

Table 1 compares the fundamental structures of aforementioned domestic schemes (No. 1, No. 2, No. 3, No. 5 and No. 6) and overseas Kyoto Credits acquisition scheme (KMCAP, No. 4).

<Analysis>

Participation and allocation and trading methods

All these schemes are for voluntary participation. In regards to allocation and trading methods, domestic crediting schemes of the METI old, METI new, domestic integrated market and J-VER determine the difference between the case with greenhouse gas emission reduction project (project scenario) and the case without them (baseline scenario) as the emission reduction quantity, as in the case of CDM.

MOE's JVETS, on the other hand, presume the implementation of greenhouse gas emission reduction projects, and the credits are given to the emission reduction quantity, which will be calculated as the difference in emission quantities within the boundary of a unit entity, which is comprised of plants and offices, between the base year² and project start-up year. This is different from EU ETS method (where boundary is the one enclosing an emission entity/installation that emits a certain scale of emissions), or CDM method (where boundary is to enclose the range affected by an emission reduction project). The reasons why MOE JVETS adopted a system to designate a boundary as the one to encompass an entity as a whole and to monitor emissions within the boundary were: 1) it is not a good warming mitigation measure, if gross emission amount of an entity increases as a whole; 2) to calculate and verify emissions of an entity as a whole is easier as it enables the monitoring at the point of raw material purchase; 3) it conforms with the Energy Saving Act and Warming Measure Law of Japan, in terms of monitoring unit; and 4) since this system is relatively smaller in scale, it is necessary to grasp power consumption at the demand end of target factories and offices as major CO₂ emission reduction volume (Ninomiya 2007, a). Therefore, the monitoring would only target the projects in case of METI old/new, and in case of MOE's JVET, the monitoring is done for the emissions from entire plant, facility, office, etc. While MOE's JVETS would control credit by registry system, METI's old had no registry as it did not presume the trading of credits.

² Basically, base year emissions are calculated by averaging emissions in the last three years before the starting year of the project.

Table 1 Comparison of fundamental structures of various systems

	Domestic Emissions Trading					Acquisition from abroad
Names	MOE JVETS	METI old	METI new	Domestic integrated market	MOE J-VER	KMCAP
Starting year	Fiscal 2005 (pilot phase from fiscal 2004, integrated into domestic integrated market after October 2008)	From fiscal 2005 till fiscal 2007	Since fiscal 2008 (Integrated into domestic integrated market after October 2008)	Since October 2008	Since November 2008	Since fiscal 2006
Participation	Voluntary	Voluntary	Voluntary	Voluntary	Voluntary	NA
Allocation/Trading methods	Mix of cap and trade and baseline crediting ^{Note 1} with trading	Baseline crediting, no trading	Baseline crediting, with trading	Mix of cap and trade and baseline crediting Allowances be smaller of the voluntary action target or actual emissions, with trading	Baseline crediting, with trading	Purchasing credits
Registry	Yes	None	NA	Yes	Yes	
Subsidies	Yes (1/3 of reduction project investment, or max. 200 Million Yen)	Yes (1/2 of reduction project investment)	Under review	None	None	NA
Penalty	None (May a part of subsidies to be recovered, or disclose the name of non-compliance entities)	NA	NA	None	NA	NA
Relationship with voluntary action plan	None	None	Yes (Plan used for compliance of VAP target)	Yes (Plan used for compliance of VAP target)	None	NA
Governance	CA (Competent Authority) Committee	METI and Operational Entities	METI and Operational Entities	Cabinet Office, METI, MOE, National Credit Committee	METI, J-VER Certification Committee, etc.	METI, MOE, NEDO

Source: above tables prepared by author

Note 1: Although the system mainly concerns emissions reduction by projects, this is entity-base system, different from the baseline crediting system adopted by CDM and other mechanisms.

Note 2: The METI-new system has presumed the introduction from fiscal 2008. This is based on the reviews conducted at the “Review Committee for CO₂ emission reduction at small to medium companies” held by METI since May 2007.

Note 1

Moreover, MOE JVETS prioritize projects with higher CO₂ emission reduction quantity per subsidy amount applied for by participating company (in other words projects with higher cost-efficiency) within the range of overall subsidy amount. Even in the international community, it is rare to find a system that combines subsidies to greenhouse gas emission reduction project and cap and trade scheme as in the case of MOE JVET.

MOE JVETS sets following four types of participants (corporations):

- (i) Participant with target Type A
Participants are to commit to a certain amount of emissions reduction in exchange for the issuance of emission allowances and subsidies for the installation of CO₂ emission control equipment. (Entity adopting equipment subsidies)
- (ii) Participant with target Type B
Participants are to commit to at least 1% emission reduction from base year in fiscal 2008 without any equipment subsidy
- (iii) Participant with target Type C
Participants are to commit to at least 1% emission reduction from base year in fiscal 2007, and at least 2% emission reduction in fiscal 2008, without any equipment subsidy
- (iv) Trading participant
In order to trade emission allowances, etc., participants are to open their accounts on the registry and conduct trading. Trading participants will not have any subsidies, or initial allocation of emission allowances.

Above Type B and Type C started since the 3rd period (fiscal 2007), as the first such system to promote participation without incentives such as subsidies. As a result, the number of participating companies was fewer as expected. Only 3 companies participated as Type B and 3 companies participated as Type C. However, it is valuable to know that there are companies willing to have caps without subsidies.

As mentioned above, the MOE JVETS is an entity-based cap and trade system, so that, depending on the changes of production quantity and activity volume of an entity, some emission reduction may be achieved regardless of the implementation of greenhouse gas emission reduction project. The credits issued in such case are, in a way, “windfall” credits, unfavorable in terms of the significance of subsidies. Still, MOE started this JVETS system with windfall credit possibilities, in consideration of: 1) prioritizing the early introduction of easy-to-verify and easy-to-participate system; 2) not adopting projects with smaller emission reduction ratio; and 3)

confirming the implementation of projects afterward.

On the other hand, METI's old system was so-called baseline credit method, and calculated emission estimates of project implementation scenario and baseline scenario (the difference would be the amount of credits), by evaluating and estimating production plan, specification of equipment introduced under the project, and operating conditions. In the case of METI old, amount of credit issued may not necessarily coincide with the actual emission reduction quantity as the actual emissions and estimated emission would differ. Still, METI old scheme did not adjust credit amount as it did not assume any trading of credits.

In the case of domestic integrated market started its pilot phase in October 2008, all those participants of Voluntary Action Plan can voluntarily participate in this domestic integrated market. If they are to participate, they can have allowances as a smaller of actual emissions or voluntary target. Also, they can participate in a system using intensity target. In principle, this market prohibits the participation of industry as a whole, but it may become possible.

Subsidies

JVETS and METI old/new provide subsidies to project participants up to 1/3 to 1/2 of project's investment amount (MOE JVETS sets 1/3 subsidy ratio with maximum amount of 200 million Yen, while METI sets 1/2 cap on subsidy ratio). JVETS recruits participants without subsidies from their third period, while METI new and domestic crediting scheme under domestic integrate market assume that big companies are to pay for credits from small to medium enterprises and small to medium enterprises as credit suppliers will receive such cash revenue in exchange for credits. However, credit revenues received after project implementation may not be sufficient as incentives for the promotion of emission reduction projects. (Review Committee for CO₂ emission reduction at small to medium enterprises, 2007, B)

Penalty

In case of MOE JVETS, there is no fine like the case of EU ETS (40 euro/ton-CO₂), or penalty. Still, companies not complying with their target may have their names disclosed, and be requested to return subsidies at the ratio relative to the amount of deficiency in credits.

Relationship with Voluntary Action Plan

METI new has two main purposes, 1) to identify energy saving projects among small to medium enterprises with greater energy saving potentials, and 2) trading of credits generated from small to medium enterprises with big companies. (Review Committee for CO₂ emission reduction at

small to medium enterprises, 2007, b) The latter purpose also implies that it will rescue big companies with difficulty in achieving the Voluntary Action Plan targets. As shown in Fig. 1, this leads to the establishment of domestic credit scheme in domestic integrated market (Fig. 2)

Governance System

EU ETS and other schemes have each member country set own Competent Authority (CA) throughout the emissions trading schemes as a whole, which would govern the operational management starting from the domestic allocation of emission allowances to verification and monitoring. Accordingly, MOE JVETS launched a CA Review Committee in fiscal 2006 as JVETS governance organization, which was consisted of MOE officials, experts, and researchers at think tanks. (The Committee was renamed as CA Committee from fiscal 2007.) This Committee is the organization actually operates and manages the MOE JVETS as a whole. In case of METI old, the scheme was operated and managed with Operational Entity acting as a secretariat under the guidance of Ministry of Economy, Trade and Industry, since the scheme itself was smaller scale than MOE JVETS. The governance systems for domestic integrated market and J-VER are not established yet, but the government plans to create a domestic credit management committee in case of domestic crediting scheme involved in the former, and J-VER certification and operation committee in case of the latter as operational and management organizations.

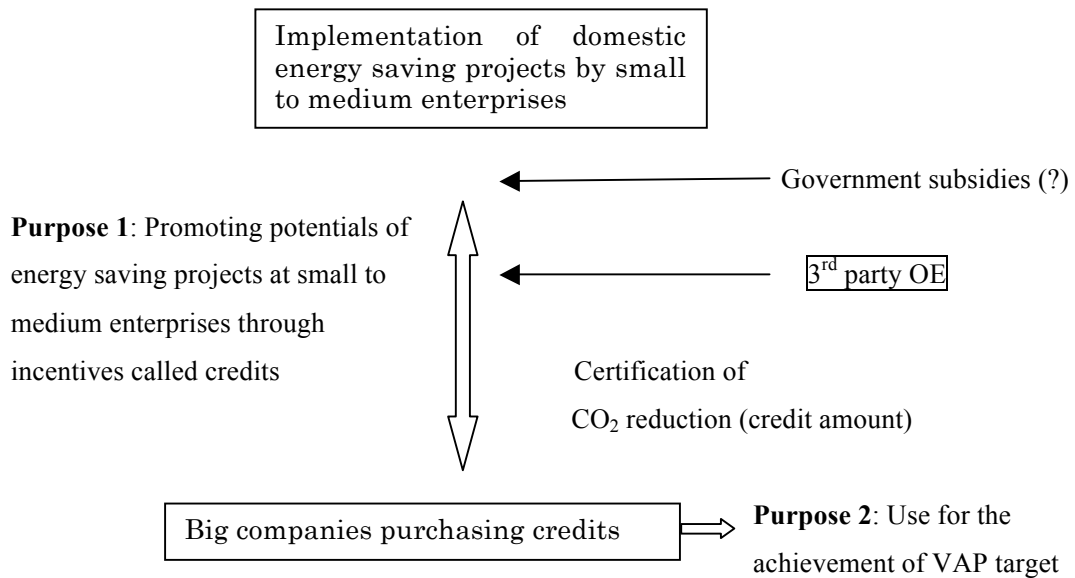


Fig. 2 Image of CO₂ domestic credit trading under METI new

Source: author prepared the above figure from Fujiwara (2007, b), Yoshida (2007), Review Committee of CO₂ emission reduction at small to medium enterprises (2007, a), and Review Committee of CO₂ emission reduction at small to medium enterprises (2007, b).

3.2.2 Stringencies of credit certification (additional criteria, double counting and verification method and cost)

Table 2 compares stringencies in credit certification among various systems.

Table 2 Comparison of stringencies in credit certification among various systems

Names	Domestic emissions trading					Acquisition from overseas
	MOE JVETS	METI old	METI new	Domestic integrated market	J-VER	KMCAP
Additionality criteria	Not so stringent (Post confirmation of project's execution, accept projects as long as they reduce gross emissions within boundary)	Not so stringent in confirming additionality	Not so stringent in confirming additionality (Ex. a project with two or more years in investment recovery is considered additional)	Not determined yet	Stringent criteria in confirming additionality (Ex. a project with less than 3 years in investment recovery is not considered additional)	NA
Verification cost	1.2 to 1.5 million Yen (Both for base year and execution year)	Less than 100,000 Yen	Not determined yet	Not determined yet	Not determined yet	Not determined yet

Source: above table prepared by author based on interviews with relevant personnel at ministries and agencies as well as operational entities, Fujiwara (2007, b), Yoshida (2007), Global Environmental Measures Promotion Headquarter (2008), and MOE (2008)

<Analysis>

Additionality criteria and double counting

Needless to say that the biggest issue in project base systems is additionality. In other words, if additionality criteria is set leniently, it will lead to the generation of credits for free riders, which were to implement the project whether the system was in place or not, resulting in the overall increase in greenhouse gas emissions. In regards to the methodology to confirm additionality, MOE's JVETS and METI's old/new cannot be described as stringent systems as they do not ask for the scale of investment profitability in greenhouse gas emission reduction projects. As mentioned above, MOE JVETS aims to reduce gross emissions within the boundary, so it may be argued that leniency in additionality criteria is acceptable as long as the implementation of the project is confirmed. In case of METI new, the "Review Committee for CO₂ emission reduction in small to medium enterprises" held by the Ministry of Economy, Trade and Industry discussed the policy to accept additionality of a project if investment recovery (pay-back periods) will take two years or

longer. (Yoshida, 2007) This may be considered more lenient than the additionality criteria of CDM, even for the smaller scale of the projects.

Furthermore, the proposal of domestic integrated market announced on October 21, 2008, had no description of any additional criteria. In case of J-VER, a fuel-switching project with payback periods in less than 3 years is considered non-additional. Moreover, if a big company uses the emission reduction of a small to medium enterprise, which is a participating company of the VAP or a subsidiary company located within the entity boundary of Voluntary Action target, as a credit, it is a double count of the same emissions reduction, so will not actually contribute to the compliance with Japan's Kyoto Protocol target. In case of Voluntary Action Plan targets participated by industries as a whole, their entity boundaries are quite oblique, raising the likelihood of double counting.

Nevertheless, if a big company is allowed to claim the achievement of Voluntary Action Plan target through the trading of non-additional credits or double-counting of credits, it will not contribute to the achievement of Japan's Kyoto target, but adversely affect the target achievement, as it will actually increase emissions.

Verification method and cost

The cost associated with the verification of greenhouse gas emission reduction projects performed by operational entities may correlate with the stringency of verification. The more stringent the verification work, the higher the cost of verification. In order to expand and develop a system, however, it is necessary to lower the verification cost. In other words, it is necessary to balance the costs and quality of verification.

In case of MOE JVETS, a Monitoring Reporting Guideline (MRG) has been developed based on the study of precedents among other countries. Since July 2007, they started the use of emission control system (called "Kaiketsu-Shiotts"), which incorporates this MRG. The adoption of this system has improved efficiencies in application, calculation, monitoring and verification from the fiscal 2007 (3rd period) compared with the year before. However, due to the almost mandatory regulations to have operational entity personnel visit the site of target facilities, upon the verification of base year and implementation year emissions, the verification under MOE JVETS can cost from 1.2 to 1.5 million yen (the cost to be paid to operational entities, for base year and implementation year, and verification fee to be borne by MOE.)

In case of METI old, the verification cost was less than 100,000 Yen, as it adopted

simplified method in verification, such as no monitoring after the implementation of the project. In this case, however, the lowering of verification cost might invite excess-issuance of credits exceeding the actual amount of emission reduction, since METI old issued credits, in principle, based on the verification of CO₂ emission reduction calculation sheet submitted upon the application, and would not require monitoring after the implementation of the project, for simplification purpose.

In case of MOE JVETS, on the other hand, the scheme is designed in a way so that the project development document (PDD) for equipment subsidies, which is related to voluntary reduction target, and to be submitted upon application, will be used only for assessing the cost-efficiency of a project, while actual emission allowances will be issued based on the certified calculation report for emissions in the base year and the year of implementing reduction measures (= actual value). So, it will prevent the excess issuance of credits.

The MRG and emission control system of MOE JVETS were created by MOE under the cooperation of CA Committee through intensive discussion of one and a half year among think tanks and Operational entities. They refer to various systems adopted in EU member countries, while taking due attention to Japanese laws and acts (for example, Measurement Act, Fire Prevention Law, High Pressure Gas Safety Act, etc.). Especially the emission control system is an IT system linking project participants, Ministry of Environment, Operational Entities, and CA Committee through Internet, not only contributing to the efficiency improvement in registration and verification, but also preparing for the future prospects of increase in project participants.³

Domestic crediting system adopts relatively simplified rules on calculation, verification and control, as it is, in principle, a negotiated transaction a big company and a small to medium enterprise, and does not assume the distribution of credits in the market.

3.2.3 Participating companies and their projects

Table 3 indicates the number of participating companies and the description (type) of projects for various schemes (except domestic integrated market and J-VER)

³ URL for Japan's emission control system "Kaiketsu-Shiotti" is: <https://www.ems.registry.go.jp/imart/ems.portal>

Table 3 Comparison of various systems in terms of participating companies

Names	Domestic emissions trading			Acquisition from abroad
	MOE JVETS	METI old	METI new	KMCAP
Number of participating companies (note)	Fiscal 2005: 31 Fiscal 2006: 58 Fiscal 2007: 61	Fiscal 2005: 40 Fiscal 2006: 17 Fiscal 2007: NA	NA	Fiscal 2006: 5
Types of participating companies	Big companies and small to medium companies	Small to medium companies	Big companies and small to medium companies	2 Japanese, 2 Chinese, and 1 British
Project description	Boiler renewal/fuel switching, co-generation, AC efficiency improvement, efficient lighting, better insulation, operational improvement, efficient equipment, etc.	Boiler renewal/fuel switching, co-generation, AC efficiency improvement, efficient lighting, better insulation, operational improvement, efficient equipment, etc.	NA	Power generation using wastes, hydro, N ₂ O thermal decomposition, power generation using blast furnace gas, biomass power generation

Source: author prepared above table in reference to Fujiwara (2007, a), Yoshida (2007), Ministry of Environment (2005), Ministry of Environment (2006, a), Ministry of Environment (2006, b), Ministry of Environment (2007, a), Ministry of Environment (2007, b), and NEDO (2007)

Note: KMCAP participating companies are providers of credits (sellers).

Note: Number of actually participating companies may differ from planned (number of companies accepted into the system), due to their withdrawal from the system. Also, the multiple numbers of companies may jointly participate in a project as a group, so the number of participating companies actually means the number of participating groups.

<Analysis>

MOE JVETS and METI old had 222 facilities (sum of 4 terms, i.e. fiscal 2005, fiscal 2006, fiscal 2007 and fiscal 2008) and 57 facilities (sum of fiscal 2005 and fiscal 2006) participated, respectively. MOE JVETS has several member companies of Voluntary Action Plan participating, but in case of METI old, participating companies are mostly small to medium enterprises. When classified by their sectors, total 189 companies participating MOE JVETS for fiscal 2005 and 2006 were foods (31%), businesses (20%), textile and fiber (13%), pulp and paper (10%), chemicals (10%), metal (8%), and ceramics (8%). (Ninomiya, 2007) In terms of the types of projects, 40 companies participating METI old in fiscal 2005 can be divided into boiler renewal/fuel switching (28%), co-generation (12%), air conditioner efficiency improvement (20%), efficient lighting (10%), insulation improvement (8%), operational improvement (10%), and efficient equipment, etc. (12%)

(Global Industrial Social Progress Research Institute, 2007) The composition of project types may reflect the strong influence of oil price increase in recent years.

3.3 Cost-efficiency

Table-4 indicates the values related to cost efficiency of various systems (excluding domestic integrated market and J-VER).

<Analysis>

Government budget

Government budget for all these systems was from the Special Energy-related Account. Total budget amount for MOE JVETS and KMCAP shows tendency to either maintain or somewhat increase, while that of METI new is almost ten times as much as that of METI old.

Reduction quantities

Both MOE JVETS and METI old indicate that their emission reduction quantities are relatively smaller than the average CDM projects, as a whole or in average. The fact that these schemes are mainly for CO₂ reduction projects and for small to medium enterprises could be the reason. In case of JVETS, however, the reduction ratio of base year in some projects were higher than the average ratio of EU ETS projects, indicating that these participating companies accepted relatively higher reduction targets. In case of KMCAP for the purchase of CDM credits, the acquired reduction quantity was less than the target amount. The reason could be the rise in purchasing prices over the prices assumed when MOE made budget request to the Ministry of Finance.

Cost-efficiency

Table 5 shows the cost-efficiency of MOE JVETS and METI old in details. Here, the cost efficiency is considered as “subsidy amount divided by the sum of estimated emission reduction quantities for legal service life of the project”. Table-6 shows the result of credit trading performed by the participating companies of MOE JVETS in its first and second periods, in details. During the first period, most credit transactions were done immediately before the credit depreciation time limit of the first period, i.e. August 31, 2007, according to the transaction log.

Table 4 Budget, reduction quantity, cost-efficiency, transaction prices, co-benefits, etc. of various schemes

Name	Domestic emissions trading			Acquired from abroad
	MOE JVETS	METI old	METI new	KMCAP
Government budget amount (Note-1)	Fiscal 2005: about 2.6 billion Yen FY 2006: 3.5 BY FY 2007: 3.1 BY FY 2008: 3.0 BY	FY 2005: 0.6 BY FY 2006: 0.3 BY FY 2007: 0.4 BY	FY 2008: 0.45 BY (budget request)	FY 2006: 4.9 BY (excluding administrative expense) Limit on national budget allowance: 12.24 BY (FY2006 – FY2013) FY 2007: 12.2 BY (w/o Adm. Expense) National budget allowance: 40.7 BY (FY2007 – FY2013) FY 2008: 31.5 BY (Budget request)
Reduction Qty (each year, t-CO ₂ /yr.) (Note-2)	FY 2005: 276,380 (21% reduction from base year) FY 2006: 229,405 (20% reduction) FY 2007: 280,192 (25% reduction)	FY 2005: 15,832 FY 2006: 4,185		Acquisition target for fiscal 2006: 17.8 million Actual acquisition in FY 2006: 6.38 million Acquisition target for FY 2007: 44.49 million Actual acquisition for FY 2007: 16.66 million
Reduction Qty (Scheme as a whole, t-CO ₂)	6.6 million (Total reduction in the projects of FY 2005 participants and FY 2006 participants)	20,017 (total of FY 2005 and FY 2006)	NA	NA
Reduction Qty (average per project, t-CO ₂)	5,883/yr (average per project of FY 2005 and FY 2006)	328/yr (average per project of FY 2005 and FY 2006)	NA	NA
Cost-efficiency	About 1,000 Yen/t-CO ₂ (Considering the cost born by participants, about 3,000 to 6,000 Yen/t-CO ₂) (Note-3)	About 4,500 Yen/t-CO ₂ (Considering the cost born by participants, about 6,000 to 12,000 Yen/t-CO ₂) (Note-5)	NA	1,911 Yen/t-CO ₂ (Note-6)
Transaction cost (Note-4)	1,212 Yen/t-CO ₂ (FY 2005) 1,250 Yen/t-CO ₂ (FY 2006)	NA	NA	NA
Co-benefits (domestic)	Yes	Yes	Yes	No

Source: author prepared the above table in reference to: Fujiwara (2007, a), Fujiwara (2007, b), Yoshida (2007), Ninomiya (2007, b), MOE (2005), MOE (2006, a), MOE (2006, b), MOE (2007, a), MOE (2007, b), MOE (2008, b), NEDO (2007), NEDO (2008), Denki Shimbun August 24, 2007.

Note-1: Due to participant's withdrawal and for other reasons, the budget amount and actual expense (actual expenditure from government budget) may differ in many cases. In this paper, however, we did not find any vast difference in amounts between the

budget and actual expenditure.

Note 2: For FY 2005 participants, actual emission reduction year will be FY 2006.

Note 3: The values of cost efficiency for MOE JVETS when considering the cost born by participants (3,000 Yen to 6,000 Yen) are the values when the MOE's subsidy ratio (1/3) was taken into account (according to the values published by MOE). They differ depending on the year (refer to Table-5 below).

Note 4: Value for fiscal 2005 is the average price of transactions through emission trading system of Mitsubishi Research Institute only. (Refer to the Table 6 below).

Note 5: Cost efficiency of METI old was calculated by the author on the assumption that the legal service life of equipment introduced is 12 years for MOE JVETS participants. They are not the government published values (Refer to Table-5 below).

Note 6: The value of 1,911 Yen as cost efficiency of KMCAP is the National budget allowance for fiscal 2006 to 2013 (12.24 billion yen) divided by actual credit acquisition amount (6.38 million ton). It is author's calculation and not a government published value.)

Table 5 Cost-efficiency of MOE JVETS and METI old

Fiscal Year	MOE JVETS			METI old	
	2005	2006	2007	2005	2006
Total subsidies (1000 Yen)	2,596,340	3,511,477	3,063,405	600,000	300,000
Total emission reductions in legal service life (t-CO ₂)	3,75,0,311	2,848,358	1,728,611	1,894,984	50,220
Cost-efficiency (Yen/t-CO ₂)	692	1,233	1,772	3,158	5,973

Source: above table was prepared by the author in reference to: MOE (2005), MOE (2006, a), MOE (2006, b), MOE (2007, a), MOE (2007, b), Fujiwara (2007m b), and Yoshida (2007)

Note: Emission reduction amount for legal service life is calculated by multiplying emission reduction estimates per year with the number of years in the legal service life of installed equipment. In case of MOE JVETS, the numbers are published upon the announcement of participants accepted. (It may differ from actual reduction due to participants' withdrawal from the program.) In case of METI old, the value was calculated by the author with the assumption that legal service life of equipment installed under the project would be 12 years, in reference to the values indicated in MOE JVETS. Note that the costs shown in this table are initial costs and do not include operating and management expenses. Also note that the values shown for MOE JVETS are the estimates given when MOE announced the names of participants accepted in the program.

Table 6 Credit transaction amount and transaction prices of MOE JVETS

	Gross transaction amount (Yen) (GHG-Trade)	Gross transaction volume (t-CO₂)	Average transaction price (GHG-trade)	Maximum transaction price (GHG-trade) (Yen/t-CO₂)	Minimum transaction price (GHG-trade) (Yen/t-CO₂)
FY 2005: 24 transactions	21,796,050	82,624	1,212	2,500	900
FY 2006: 51 transactions	NA	54,643	1,250	NA	NA

Source: MOE (2007, c), MOE (2008, b), Mitsubishi Research Institute GHG-trade website (www.ghg-trade.com, September 5, 2007)

Note: Number of transactions and gross transaction quantities are MOE's data (for fiscal 2006, average transaction price is also MOE's data). In case of fiscal 2005, on the other hand, gross amount, average transaction price, maximum price and minimum price are those only for transactions through GHG-trade, which was created by the Mitsubishi Research Institute for MOE JVETS (number of transaction: 13, and total transaction quantity: 17,987 t-CO₂). Other transactions were those mediated by transaction participants, and over-the-counter transaction among project participants.

In case of MOE JVETS, cost efficiency including the cost born by participating companies was in the range of 3,000 - 6,000 Yen/t-CO₂. In case of METI old, the cost efficiency can be 6,000 – 12,000 Yen/t-CO₂, if calculated as in the case of MOE JCETS.

Due to smaller number of samples, and early stage of introduction, the comparison of MOE JVETS and METI old is difficult, considering the significant differences in the scale of participating companies, types of projects, and budget amount. Still, one reason why MOE JVETS tends to show better cost-efficiency can be because MOE JVETS specifically request higher cost efficiency as a condition of project acceptance, so participating entities may add emission reductions from greenhouse gas emission reduction projects that are not the subject of subsidies.⁴

In case of small to medium enterprises, lack of information and fund procurement for capital investment may act as obstacles against energy saving investment. (Review Committee on CO₂ emissions reduction at the small to medium enterprises, c) Therefore, if a scheme provides greater scale of subsidies and credits, and government and businesses communicate more information on energy saving equipment and devices, more cost-effective projects may be developed

⁴ Other reductions are those from the projects without subsidies. MOE publishes the emission reduction costs (1,298 Yen/t-CO₂) of projects subjected to subsidy provision for fiscal 2005 participants only. (MOE, 2005)

among small to medium enterprises.

Nevertheless, there were some studies analyzing the selection of global warming measures among small to medium enterprises (such as Okamura, 2006), but advance studies that focus on small to medium enterprises and analyze actual global warming measures taken by such enterprises from economic viewpoint are fewer, except the survey METI conducted in their processes of developing METI old/new schemes (Global Industrial and Social Progress Research Institute, 2007). Therefore, further development of case studies in this field is anticipated.

The transaction prices shown in Table-6 are from the data of only those transactions that went through MOE prepared trading system. In consideration of limited number of transactions, the prices shown here could be described cheaper than those of less risk CERs in the market, as of August, 2007.⁵

In case of KMCAP, it is difficult to determine whether the purchasing price of 1,911 Yen/t-CO₂ is higher or lower than general market price of CER, considering the uncertainty in the scale risks involved in each credit, and the fact that Japanese Government has provided significant amount of funds for CDM related capacity building in other Asian countries. Nonetheless, the purchase price is likely being higher than original estimates.

Co-benefits

The disadvantage of importing Kyoto Credits from abroad is that they provide less co-benefit to an importing nation. For example, energy saving project implemented in Japan can generate positive cash revenue after the recovery of investment, resulting in the creation of employment and the sustenance of technology among Japanese companies. Fuel switching project may provide the co-benefits of air pollution measures. It is difficult to quantify such co-benefits, but in case of Netherlands, the air pollution prevention effects of domestic global warming measures were monetized. According to such study, (avoided) costs of regional air pollution measures and acidification measures were about 100 million Euro in total for 5 years from 1990 to 2004, equivalent to about 12.5 % of global warming measure cost (De Bruyn et al., 2005)

⁵ Transaction prices are greatly influenced by CER prices and the request for the return of subsidies in case of non-compliance (= amount of cost efficiency). Since there are over-the-counter transactions without going through trading system, the overall picture of transaction is not known.

3.4 Summary of comparison study

Although generalization is difficult due to limited number of cases, the comparison study conducted here can be summarized as follows:

First of all, there are relatively less cost reduction potentials in Japan. Secondly, the types of emission reduction projects implemented by participating companies seem to reflect the recent oil price increase as fuel switching and other projects increase their share. Thirdly, when comparing the credits acquired from abroad and generated from the implementation of emission reduction projects in Japan, the costs are higher in case of domestic measures. However, in comparing costs, it is necessary to take into account other factors such as co-benefits. Fourthly, in designing the systems for issuing credits from domestic projects, there can be many differences, especially for the criteria on additionality and double counts. Fifthly, the construction of robust infrastructures for emissions trading schemes is ongoing in Japan.

4. Conclusion – Future issues and prospects

Finally, let us discuss the future issues and prospects of carbon crediting systems in Japan, especially domestic integrated market (including JVETS), J-VER and KMCAP from the three aspects of: credit demand/supply, reduction effects and efficiency (achieving target at minimum cost), and infrastructure development including verification system. The author shall also discuss briefly about the issues to be addressed in future studies.

For the supply of domestic credits and J-VER, the learning of METI old/new indicates that large supply of credits cannot be expected from these systems at least for the first and second year of the start-up, due to fewer numbers of credits per project and higher transaction costs. However, the industries and corporations, which are participating in Voluntary Action Plan and have achieved their VAP target already, may be able to provide considerable amount of credits, although VAP provide banking system.

In case of KMCAP, AAU credits from Russia and Central and East European countries, with a mandate on environmental investment, and credits purchase under so-called GIS (Green Investment Scheme) may largely influence the prices and supply volume of CERs. A call for prioritizing the use of cheaper GIS may increase in the future. In this term, focus will be on future discussion in Japan and international negotiation by Japanese government. Considering the reduction effects and efficiencies, the domestic integrated market is not likely to provide significant reduction over the reduction achievable under the current Voluntary Action Plan, as the market is

basically conform to the VAP targets. If domestic crediting system provides more lenient criteria to allow the generation of non-additional credits and double counting of credits, it leads to further increase in emission quantity, making it more difficult for Japan to achieve the target. Considering the efficiency, participants of domestic systems may find perverse incentives to increase production and emission quantities in order to raise the allowances allocated for the next period, in expectation of imminent review of allocation methods, as indicated in Oka (2008) and Neuhoff (2008). Moreover, the current rules of domestic integrated market for free allowance allocation and acceptance of intensity-base targets may reduce efficiency in comparison to the combination of allowance auctioning and absolute targets. (Neuhoff, 2007)

In terms of infrastructure including verification system, operational entities may face the deficiency in capacity, in case of domestic integrated market, as the number of participating companies will drastically increase and multiply from JVET's 100 or less. If participating companies of domestic integrated market adopt intensity targets, it will not conform to the JVETS which targets are based on absolute quantities, so that infrastructure built for JVETS based on international standards may not be utilized fully. In case of domestic integrated market, the guideline for monitoring and reporting will be based on the one created for JVETS, but the presence of multiple numbers of systems may make them extremely difficult to understand by project developers and trading participants.

Future research subjects may include not only the study of individual projects, but also the analysis of costs of governmental measures, how they are related to sectors as a whole or a part, as in the case of researches in Netherlands discussed in the section 1 of this paper (Faber and Wit, 2005; De Bruyn et al., 2005), which may include the detailed analysis of cost efficiency for concrete government measures in each industrial sector, considering five cost items of: 1) investment cost, 2) operation costs, 3) management costs, 4) subsidies, and 5) revenue (negative costs, such as energy saving). In pursuing such studies, if it is possible to identify the relationship with the marginal reduction cost curve for each sector provided by National Environmental Research Institute, it may lead to the analysis of reduction costs and reduction potentials in Japan. Moreover, interesting studies can be made in the detailed analysis of policy-making processes among actors of MOE, METI and industries and possibilities of links with emissions trading systems of other countries, through quantitative analysis of co-benefits such as air pollution mitigation associated with global warming measures.

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