

IMPROVING ENERGY EFFICIENCY IN INDUSTRY IN ASIA

- A P o l i c y R e v i e w



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IMPROVING ENERGY EFFICIENCY IN INDUSTRY IN ASIA

**A Policy Review as part of the
*Energy Efficiency Guide for Industry in Asia***

www.energyefficiencyasia.org

**United Nations Environment Programme
Division of Technology, Industry and Economics**

March 2006

ACKNOWLEDGEMENTS

This policy review was prepared as part of the project *Greenhouse Gas Emission Reduction from Industry in Asia* (GERIAP) during an internship at UNEP/ROAP between January and March of 2006.

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Special thanks to

The Swedish International Development Cooperation Agency (Sida) for the financial contribution that made both this internship and the GERIAP project possible.

Sophie Punte for excellent supervision and feedback during the writing process of this policy review and general support throughout the entire internship.

Wei Zhao from UNEP DTIE for guidance during the course of the internship.

Wanapa Chanvirat and Patcharin Udompornwirat for their computer and administrative assistance when preparing this review.

And everyone else at the UNEP/ROAP office that made this internship an enjoyable learning experience.

Contents

1. EXECUTIVE SUMMARY AND RECOMMENDATIONS	1
1.1 OVERVIEW OF THE POLICY REVIEW	1
1.2 KEY CONCLUSIONS FROM THE REVIEW	1
1.3 RECOMMENDATIONS	2
2. INTRODUCTION	4
2.1 THE IMPORTANCE OF ENERGY EFFICIENCY IN INDUSTRY	4
2.2 BACKGROUND TO THIS REVIEW	4
2.2 OBJECTIVE, SCOPE AND OUTPUT	5
2.3 METHODOLOGY	5
3. POLICY INSTRUMENTS FOR ENERGY EFFICIENCY	6
3.1 WHAT ARE ENERGY EFFICIENCY POLICY INSTRUMENTS?	6
3.2 CLASSIFICATION OF POLICY INSTRUMENTS	6
3.2.1 <i>Legislative Instruments</i>	7
3.2.2 <i>Economic Instruments</i>	7
3.2.3 <i>Voluntary Instruments</i>	7
3.3 EVALUATION CRITERIA	8
3.3.1 <i>Environmental effectiveness</i>	8
3.3.2 <i>Economic efficiency</i>	8
3.3.3 <i>Budgetary impact</i>	8
3.3.4 <i>Ability to implement and enforce</i>	9
3.3.5 <i>Support from stakeholders</i>	9
3.4 GENERAL EVALUATION OF SELECTED POLICY INSTRUMENTS	9
3.4.1 <i>Evaluation and applicability of legislative instruments in Asia</i>	10
3.4.2 <i>Evaluation and applicability of economic instruments in Asia</i>	11
3.4.3 <i>Evaluation and applicability of voluntary instruments in Asia</i>	14
4. EXISTING POLICY INSTRUMENTS AND CASE STUDY EXAMPLES	16
4.1 INTRODUCTION	16
4.2 LEGISLATIVE INSTRUMENTS	16
4.2.1 <i>General findings and observations</i>	16
4.2.2 <i>Energy conservation laws</i>	17
4.2.3 <i>Minimum energy performance standards</i>	18
4.3 ECONOMIC INSTRUMENTS	20
4.3.1 <i>General findings and observations</i>	20
4.3.2 <i>Taxes on petrol and emissions</i>	21
4.3.3 <i>Subsidies on energy efficient technologies</i>	22
4.4 VOLUNTARY INSTRUMENTS	23
4.4.1 <i>General findings and observations</i>	23
4.4.2 <i>Energy programs and projects</i>	24
4.4.3 <i>Energy labeling schemes</i>	26
4.4.4 <i>Energy efficiency research and development</i>	28
Appendix A REFERENCES	31
Appendix B OVERVIEW TABLE OF ENERGY EFFICIENCY POLICY INSTRUMENTS IN SELECTED COUNTRIES	34
Appendix C ABBREVIATIONS AND ACRONYMS	40
Appendix D ENERGY EFFICIENCY LEGISLATION IN GERIAP COUNTRIES	41

1 EXECUTIVE SUMMARY AND CONCLUSIONS

1.1 Overview of the policy review

This policy review has been prepared to give policy makers across Asia an overview of available energy efficiency policies to reduce energy use and greenhouse gas (GHG) emissions in industry. The three month review was conducted to be included in UNEP's *Energy Efficiency Guide for Industry in Asia*, available at www.energyefficiencyasia.org.

Policy instruments can be classified into three groups: legislative (energy conservation laws and standards), economic (taxes and subsidies) and voluntary (programs, labeling and R&D).

To assist policy makers in identifying tangible policy alternatives, selected case study examples are presented of the energy efficiency policies currently used within Asia and outside. Furthermore, an overview table with a more detailed list of the policy instruments to improve energy efficiency in industry is provided. However, their suitability for each Asian country will depend upon their environmental effectiveness, economic efficiency, budget impact, ability to implement and enforce and support from stakeholders.

1.2 Key conclusions from the review

After the review of what policies exist and an assessment of existing energy efficiency policies the following four conclusions are made:

Conclusion 1. Energy laws are not focused on energy efficiency in industry and legislative enforcement is weak.

- Energy laws are not tailored/specific to energy efficiency in industry, but are mostly aimed at ensuring energy supply security in society as a whole.
- Energy conservation laws exist in a few Asian countries only, including Japan, India and Thailand. These mostly cover energy auditing and appointment of energy managers. But their impact on energy efficiency is rarely reported.
- Energy conservation laws are generally opposed by industry and the structures to enforce legislation, including energy conservation laws, are limited.

Conclusion 2. Economic instruments to improve energy efficiency in Asian industries are very limited and government fuel subsidies encourage industry to use more energy, not less.

- Economic instruments to encourage energy efficiency are rarely used in Asian countries, one exception is Thailand. The main reason is that environmental ministries are not familiar with applying economic instruments to address environmental issues.
- Of the few examples found, subsidies are most common, including grants, tax credits and tax exemptions for investments in energy efficient technologies or projects.
- Some economic instruments can actually have the opposite effect to reducing energy consumption, namely:
 - Subsidies on fuels that make it affordable for industry to continue to consume large amounts of fossil fuels.
 - Fuel taxes aimed at general revenue raising rather than investments into energy efficiency. Hence, the government budget becomes dependent on the income from

fuel taxes and therefore benefits from continued high fuel consumption.

Conclusion 3. *Voluntary instruments are popular with industries and the most commonly used of the three instruments, but real impacts on energy efficiency are rarely reported.*

- Voluntary instruments are popular with industry because they are not mandatory, involve no penalties and require little financial contributions from participating companies.
- The impact on improved energy efficiency is rarely monitored or reported. This combined with the voluntary nature of these instruments brings the risk of government and industry inaction and that real change is negligible.
- The most common voluntary instruments include: a) energy efficiency programs and projects aimed at reducing energy use at industrial sites through audits, replacement of inefficient equipment, change of practices, etc. b) voluntary labeling schemes covering industrial appliances and equipment c) R&D into energy efficiency technologies.
- Voluntary instruments have been implemented in most countries in Asia, particularly in Malaysia, Republic of Korea, Thailand, Japan and Taiwan, Republic of China.

Conclusion 4. *Governments mostly do not have a long-term vision for their countries or lack the political will to translate this into concrete and consistent policies. This is evident by:*

- Policies are focused on short-term rapid economic development backed by affordable fossil fuels through subsidies of fuel prices (most common) and subsidies for more efficient fossil fuel use.
- Governments mostly engage the existing energy providers in formulating energy policies, including oil and gas companies and power utilities. While some of these companies are already investing in renewable energy, it is in their interest to delay the transition to renewable energy until they are ready for it.
- Environmental and social policies at present are developed as ‘band aid’ policies to (partially) offset the environmental and social damage caused by economic growth. This includes most existing energy conservation laws. Asia will be particularly affected by the continuing “Get rich first and pay later” attitude, as most of the world’s population and poor live in Asia and therefore the impacts of climate change will be mostly felt here.

1.3 Recommendations

For energy efficiency policies to be fully effective, a number of policies need to be changed, developed or introduced.

Recommendation 1. *Government should improve the effectiveness of legislative instruments to improve energy efficiency by:*

- Developing policy objectives that are clear, aligned with other energy, economic and social objectives and are integrated with national policies.
- Putting more efforts and funding into implementation, enforcement and monitoring. Additionally, industry and other stakeholders, such as the public and NGO’s, should be consulted and engaged to ensure broad society support for the legislation.
- Working together and coordinating efforts amongst Government agencies (e.g. Ministries of Environment, Industry, Energy and Finance).

Recommendation 2. Government should increase the use of economic instruments to improve energy efficiency and remove barriers by:

- Developing a more balanced mix of legislative, economic and voluntary policy instruments where economic instruments are used more than at present.
- Removing fuel subsidies.
- Using income from fuel/emission taxes to financially reward good environmental, (rather than raising general revenue behavior) for example giving companies tax breaks for investing in energy efficient technologies.

Recommendation 3. Government should improve the effectiveness of voluntary instruments to improve energy efficiency by:

- Increasing the effectiveness of programs through improved commitment from industry in terms of money, time and targets.
- Increasing transparency of voluntary programs by monitoring and reporting impacts to ensure that real progress is made.

Recommendation 4. Governments should be more courageous and lead their societies to a sustainable future through:

- Developing policies aimed at long-term sustainability. For energy this means a decisive transition to renewable energy through:
 - Reshaping the tax system by posing taxes on energy and emissions combined with recycling the taxes raised through reduced income tax. As a result polluting industries are gradually pushed out and replaced by cleaner industries.
 - Promoting R&D for renewable energy technologies rather than improving fossil fuel based technologies (e.g. 'clean coal')
- Engaging new players in the energy field, in particular those at the forefront of renewable energy and energy efficient technologies who are able to accelerate the transition to renewable energy.
- Introducing integrated "development policies" that consider economic as well as social aspects within the limitations posed by the environment.

“Economists now broadly agree that improved energy efficiency and other "no regrets" strategies could bring great benefits at little or no cost. Enlightened corporate leaders are already seizing the opportunity to use and develop green technology.”

“We must stop being so economically defensive, and start being more politically courageous.”

--Kofi Annan UN Secretary General
on Climate Change & Energy Efficiency¹

¹ Kofi Annan, *Containing Climate Change: A Global Challenge*, Keynote Address Tufts University's Fletcher School of Law and

2. INTRODUCTION

2.1 Importance of energy efficiency in industry

Energy demand is growing significantly in most Asian countries due to rapid industrialization. Indeed, the five most energy intensive industrial sub-sectors including iron and steel, petroleum refining, cement production, pulp and paper and chemicals account for approximately 45 percent of all industrial energy consumption in the region.² As a result, the industrial sector is one of the major contributors to greenhouse gas (GHG) emissions and this will likely continue as Asia's energy use and related CO₂ emissions are estimated to rise by more than 50 per cent by the year 2030.³ Sadly enough, large amounts of energy consumed by industry in Asia are used inefficiently because of lack of awareness about proper energy management and weak energy policies and measures, among others. In fact, studies indicate that as much as 23 percent of industrial end-use energy is wasted because of inefficiencies.⁴ Hence, finding ways to increase energy efficiency in the industrial sector in Asia is highly important because the global climate and the region's energy security depend on it. One of the key tools to achieve this goal is through implementation of various energy efficiency polices, some of which are reviewed in this report.

2.2 Background to this review

The project "Greenhouse Gas Emission Reduction from Industry in Asia and the Pacific" (GERIAP), funded by the Swedish International Development and Cooperation Agency (SIDA) and coordinated by the United Nations Environment Program (UNEP), started in 2003 and will finish in June 2006. The objective of the project is to support Asian businesses to address climate change by becoming more energy efficient, and thereby reducing greenhouse gas emissions and costs. The target group is primarily Asian industry (specifically five sectors: cement, steel, pulp/paper, chemical and ceramics in nine countries: Bangladesh, China, India, Indonesia, Mongolia, Philippines, Sri Lanka, Thailand, Vietnam) and in second place all stakeholders who can influence industry (government, associations, customers, NGOs, research institutions, banks etc). The three project components are:

- Capacity building: National Focal Points (NFPs) and participating companies received training on how to apply CP to identify energy efficiency options for main energy uses in industry
- Demonstration of CP and energy efficiency: CP assessments to find ways to improve energy efficiency were carried out at the participating companies. Options that were technically feasible, financially attractive and reduced energy and GHG emissions were implemented, resulting in sector specific case studies.
- Survey of barriers to energy efficiency: Why do some companies improve energy efficiency and others not? A survey assessed the financial, technical, cultural and other factors affecting businesses, resulting in proposed solutions to overcome the most important regional and national barriers in Asia.

Diplomacy , Sunday, May 20, 2001.

² UNESCAP, *Promotion of Energy Efficiency in Industry and Financing of Investments*, 2001, p. 5

³ UNEP, *International launch showcases Guide for Asian industry to reduce energy costs and greenhouse gas emissions*, Press release, January 18th 2006.

⁴ UNESCAP, *End-use energy efficiency and promotion of a sustainable energy future*, 2004, p. 55

The main output of the project is the “Energy Efficiency Guide for Industry in Asia” with the results from the three project components, including energy information and options for energy equipment and industrial processes. The Guide has been partly translated into eight languages: Chinese, Vietnamese, Thai, Bahasa Indonesia, Sri Lanka, Bangla, Mongolian and Tamil.

2.3 Objective, Scope and Output

While the Guide contains a lot of information and tools for industry and facilitators it has less to offer to policy makers wanting to amend or develop policies to facilitate energy efficiency in industry. For this reason, a policy review was needed for inclusion in the Guide. The objective of this research study is to review the available policy instruments for Asian governments to improve energy efficiency in industry in Asia.

The scope of the review is limited to policies related to:

- Energy efficiency and industry.
- Energy efficiency of the production processes and of the products companies make but not, for example, aimed at the customer using the product.
- All countries in the world, even though case study examples have been selected on the basis of their applicability to Asian countries in particular.

The output is this report containing a classification of various energy efficiency policy instruments, case study examples for each selected types of policy instrument and an overview table of all the policy measures found applicable to energy efficiency, industry and Asia.

2.4 Methodology

The survey was conducted between January – March 2006 and it included the following steps:

Step 1 ~ Information gathering (January – 2006)

In step 1 a number of short interviews with participating organizations and agencies to the GERIAP project was carried out to establish a general understanding of the issues involved in energy efficiency policy making and implementation in relation to industry in Asia. In addition an extensive international internet and literature review of websites and publications of governmental departments and agencies, research, energy and community bodies and businesses was conducted to identify major energy efficiency issues relevant to industry in Asia and the policy instruments used to tackle these. Building on that information a classification of policy responses and a list of criteria to assess the policy measures was then developed and scrutinized. The key documents, databases and research reports used in this review can be found in the reference section of this report.

Step 2 ~ Detailed analysis (February – 2006)

Step 2 involved a detailed review of the policy responses selected, the costs and benefits of implementing the policy measure, the cost savings (eg reduced energy costs), and environmental savings (eg. reduced CO2 emissions). A number of case studies were selected to describe what could be possible in Asia. Legislative, economic and voluntary policy measures were also assessed against a set of evaluation criteria.

Step 3 ~ Preparation and dissemination of report (March – 2006)

Step 3 entailed drafting the report, and disseminating it through the Guide’s website at: www.energyefficiencyasia.org

3 POLICY INSTRUMENTS FOR ENERGY EFFICIENCY

This chapter presents a classification of policy instruments that could be applied to improve energy efficiency in industry, a set of criteria for evaluating their applicability to Asia, and a general evaluation of energy efficiency policy instruments against these criteria. Appendix C provides an overview of selected instruments in various industrial sectors in Asia and internationally. Appendix D provides an overview of the existing legislation relating to energy efficiency in nine GRIAP covered countries.

3.1 What are energy efficiency policies?

Energy efficiency policy, according to the World Energy Council (WEC), refers to: *All public interventions (policy instruments) aiming at improving the energy efficiency of a country, through adequate pricing, institutional setting regulations and economic or fiscal incentives.*⁵

3.2 Classification of policy instruments

There are a number of means to categorize policy instruments, depending on the approach and objective of the study. The following is a fusion and simplified version of the classifications used by the World Energy Council (WEC)⁶, International Energy Agency (IEA)⁷, Asian Institute of Technology (AIT)⁸, UNESCAP⁹, KPMG¹⁰, OECD¹¹ and Panayotou¹². Table 1 gives an overview of the classification of policy instruments available for improving energy efficiency in industry, grouped into category and type.

Table 1 Classification of Policy Instruments

Policy Category	Policy Type
Legislative Instruments	Law & Regulations
	Standards
	Codes of Practice
Economic Instruments	Fiscal
	Subsidies
	Property & tradable rights
	Bonds and deposit refunds
Voluntary Instruments	Liability systems
	Voluntary agreements
	Programs & Projects
	Research and development, R&D

⁵ WEC, 2001, p. 3

⁶ WEC, 2001

⁷ IEA, 2006, *Energy Efficiency Database* <<http://www.iea.org/textbase/pamsdb/search.aspx?mode=ee>>

⁸ AIT, 2005

⁹ UNESCAP, 1999

¹⁰ KPMG, 2001

¹¹ OECD, 1997

¹² Panayotou, 1998

3.2.1 Legislative instruments

The logic of using legislative instruments is that command and control govern behavior and these are enforced by governmental institutions at national, provincial or local level. There are three types of legislative instruments:¹³

- *Laws & regulations*: law sets out the legal rules that govern a specific action, process, product etc. A regulation on the other hand supports a law by outlining how the law should be implemented.
- *Standards*: provide technical and design guidance notes. For example standards for energy equipment used by industry.
- *Codes of practice*: give practical advice and guidance on how to comply with legislation, for example a building code.

3.2.2 Economic instruments

The logic of using economic instruments is that it is economic rewards or costs that govern behavior and these come in many shapes and forms including:¹⁴

- *Fiscal instruments*: such as taxes and fees/charges which can be levied on both producers and consumers in a production process. Examples include taxes on GHG emissions, fees/charges on fuels and energy utility charges.
- *Subsidies*: to encourage less polluting behavior, such as grants (non-repayable forms of financial assistance), soft loans (loans with interest rates below market rates) and tax allowances (tax exemptions, tax rebates and accelerated depreciation).
- *Property and tradable rights*: provide secure and well-defined rights to resources, which may or may not be tradable. For instance, rights to land and water, licences that enable use within a geographic areas or access to facilities, rights to develop resources, such as a natural gas finding. Property rights can also emerge in creating a market for environmental products, e.g. tradeable emission permits.
- *Bonds and deposit refunds*: to ensure that resource companies are encouraged to minimize environmental damage, have adequate finances to undertake restorative works. The bond is returned when environmental performance requirements have been met. Deposit refund schemes are aimed at encouraging users of products with potentially polluting by-products to dispose of them in a reasonable manner by returning the deposit upon disposal, for example beverage and battery disposal.
- *Liability systems*: either they seek to (a) establish, and enable enforcement of, legal liability for damage to the environment, people or to prosecute for non-compliance with laws, regulations or the payment of taxes, fees and charges or (b) pool and share liability risks through common insurance policies.

3.2.3 Voluntary instruments

The logic of using voluntary instruments is that it is ethics that govern behavior, which is based on a will to change a behavior for the benefit of an entire community.

¹³ Modified from National Occupational Health and Safety Commission of Australia, <www.nohsc.gov.au>

¹⁴ Adapted from the report *Economic instruments for environmental management*, KPMG, 2001, pgs. 15-17

There are countless types of voluntary instruments, including:¹⁵

- *Voluntary agreements (VA)*: involves a commitment from a business to engage in energy conservation in one way or another, either through voluntary monitoring, auditing, reporting or labeling of products and equipment or meeting certain emission targets for instance. VA may also include covenants between government and private businesses or sectors, such as packaging covenants.
- *Programs and projects*: aimed at increasing both public awareness, and technical skills and know-how of workers in a particular sector. Examples include, participation in multilateral projects, the production of booklets, journals, books, web sites, demonstration projects and training programs. This may also include the development of associations and centers, focused on monitoring, benchmarking, auditing, labeling, education, data gathering, coordination and facilitation of informational services among other things.
- *R&D*: involves research and development of new technologies, such as low emitting industrial equipment and technologies to better use wasted heat.

3.3 Evaluation Criteria

The criteria used to evaluate the policy instruments used in this review are based on studies made by the OECD¹⁶ and Panayotou¹⁷. These have been modified to correspond to issues relating to energy efficiency in industry in an Asian context.

3.3.1 Environmental effectiveness

Environmental effectiveness refers to the capacity for the instrument to impact on energy efficiency, i.e reduce energy use or emissions. This criterion is important because it enables a government to gauge the likely environmental impact and performance of the instrument.

3.3.2 Economic efficiency

Economic efficiency concerns whether the instrument provides the most cost-effective means of achieving energy efficiency in absolute terms or per unit of production. The cost assessment may include establishment, compliance, monitoring and enforcement costs and any distortionary effects on the economy arising from introducing the instrument. This criterion is important because it enables a government to assess how it compares financially to other available instruments.

3.3.3 Budgetary impact

Some instruments, such as taxes, fees and charges, will provide revenue to a government that could be used to pay for the establishment, monitoring and enforcement costs of a policy instrument. Sometimes the primary purpose of the policy is to raise revenue and energy reduction is only a secondary objective. This criterion is important as it allows a government to assess the income it stands to earn from the instrument.

¹⁵ Adapted from IEA *EE Policy database*, <www.iea.org/textbase/pamsdb/search.aspx?mode=ee>

¹⁶ OECD, 1997, pgs. 32-33

¹⁷ Panayotou, 1998, chapter 7

3.3.4 Ability to implement and enforce

This criterion is particularly important because it assesses the feasibility and flexibility of the instrument, whether or not a certain policy instrument is capable of being implemented and enforced. Specifically, it evaluates if:

- A government has the means (people, funds) to implement and enforce the policy instrument
- The policy instrument conflicts with or complements other government policy objectives
- The policy instrument is capable of adjusting to changing circumstances and conditions.

3.3.5 Support from stakeholders

This criterion refers to the support from the government, public, industry and other key stakeholders for the instrument. This is important because it allows a government to assess the level of acceptance of the instrument in a community and give valuable insights into the potential concerns it may create before it receives widespread acceptance and adoption.

3.3 General evaluation of selected policy instruments

This section presents a general evaluation of legislative, economic and voluntary policy instruments against the evaluation criteria described previously. The evaluation specifically has industry in Asia in mind and aims to provide policy makers with an insight into advantages and disadvantages of each instrument type.

The evaluation is based on information provided in studies by the OECD, WEC, IEA, AIT, UNESCAP, KPMG and Panayotou.¹⁸

However, the evaluation does not go into detail on specific policy instruments but provides general insights on what to take into account during the evaluation of policy instrument. Section 4 provides case study examples of specific legislative, economic and voluntary policy instruments.

Table 2 Summary of Policy Evaluation

	Legislative	Economic		Voluntary
		Taxes	Subsidies	
Environmental effectiveness	+	+	+	+ / - (+ if commitment, - if high uncertainty)
Economic efficiency	-	-	+ / -	+ / - (depending on gov. functionality)
Budget impact	+ / -	+	-	Zero

¹⁸ OECD 1999, WEC 2001, IEA 2003 & 2006, AIT 2005, UNESCAP 1999, KPMG 2001, and Panayotou 1998

	Legislative	Economic		Voluntary
		Taxes	Subsidies	
Ability to implement & enforce	+ / - (depending on gov. functionality)	+ / - (depending on gov. functionality)	+	-
Support from:				
▪ Government	+	+	+	+
▪ Industry	-	-	+	+
▪ Env. NGOs	+	+	+ / - (+ If they are environmentally effective, - if it benefits polluters)	+
		(If they are env. effective)		(If they are env. effective)
▪ Public	+ / - (+ for a greater cause, - if it costs \$ or jobs)	+ / - (+ if benefits are known, - if costs are passed on)	+ / - (+ for a greater cause, - if it benefits polluters)	+

3.4.1 Evaluation and applicability of legislative instruments in Asia

In assessing legislative instruments against the evaluation criteria the following was reported in the literature reviewed:

Environmental effectiveness

- In principle legislation can lead to significant energy reductions because it is the law, i.e. industry must comply.
- However in practice the energy reduction target may not be achieved because:
 - Requirements are vague, i.e. energy conservation targets or goals are not specified and methodologies not clearly defined.
 - Requirements are unrealistic i.e. several countries adopt legislation based on existing legislation in the EU or other developed countries. These reduction levels may be desirable but often are not achievable in a developing country.
 - The governance structures needed to implement and enforce the legislation in most Asian countries are weak.
 - Funds are often insufficient to implement and enforce legislation and monitor impact.
 - Performance standards are the exception because they are very specific (e.g. minimum energy performance standards for boilers) and therefore less costly and easier to implement and measure results.

Economic efficiency

- The economic cost per unit of energy reduced is generally higher for legislation than for economic instruments. This is because money is needed for authorities implementing, regulating and monitoring the legislation.

- The penalty for non-compliance should be higher than the costs of complying. However, in Asia bribing of government officials is for most industries the cheapest option.
- Many governments allocate insufficient funds for enforcement of legislation. As a result the total costs of the legislation are lower, but the energy reduction is also low. Therefore the economic efficiency is further reduced.

Budgetary impact

- The budgetary impact from legislative instruments is zero, except from revenue from penalties for non-compliance.

Ability to implement and enforce

- In most Asian countries legislation is often difficult to enforce in practice because of vague and unrealistic requirements, weak governance structures and insufficient funds as described earlier.
- Energy efficiency legislation may conflict with economic/social policies, e.g. fuel subsidies.
- Due to technological developments there is a risk that legislation becomes outdated and thereby loses its effectiveness. In addition, the process of amending existing or developing new legislation is often very slow.

Support from stakeholders

- *Government* generally supports legislative instruments because it is what they are used to. But financial and industrial ministries are more likely to oppose legislation if it has a negative impact on the economic viability of industry or the country.
- *Industry* opposes legislation that costs them money or time.
- *Environmental NGOs* are supportive of legislative instruments if properly enforced.
- *The public* supports legislation if they are not adversely affected by it or if they also benefit from it, i.e. the legislation addresses issues of public concern e.g. climate change. However, they may oppose legislation if industry passes on the cost of compliance onto the consumers through their production or services or if it could lead to economic slowdown or unemployment.

3.4.1 Evaluation and applicability of economic instruments in Asia

In assessing economic instruments against the evaluation criteria described before the following was reported in the literature reviewed. Here the focus is specifically on taxes and subsidies because these are most relevant to energy efficiency.

Environmental effectiveness

- Taxes have a high environmental effectiveness because they provide an economic incentive for industry to reduce their energy use and thereby reduce emissions. But since companies have the choice of paying the taxes or reducing energy consumption the taxes have to be set high enough for them to reduce energy use.
- Subsidies can be environmentally effective because subsidies provide a positive economic incentive to change industrial behavior. For example, a subsidy that makes normally expensive gas boilers comparable in price to fuel oil boilers. However, the environmental

effectiveness is uncertain and lower compared to taxes because:

- Industry must be actively informed about it (whereas with a tax they will find out fast!).
- Those who decide not to make the desired change are not penalized.
- Subsidies can attract new businesses (rather than just persuading old ones to adopt new practices) to enter the industry, which in extreme cases would increase total emissions.

Economic efficiency

- Taxes can provide an incentive for cheaper energy reduction compared with legislation and a compensation for economic “costs” of greenhouse gases and other emissions. This may lead to greater alignment of economic and environmental incentives rather than traditional legislative instruments, because improvements are more likely to be made by those that can achieve this at lower costs.
- Subsidies are more economic efficient than legislation but less than taxes.
- In principle, however, subsidies are economically inefficient because they are distorting market forces by:
 - Giving an unfair economic advantage to polluting companies that use the subsidies to change compared to environmentally responsible companies that have already changed their industrial practices.
 - Passing the costs of subsidies to other parties, i.e. some of the providers of the subsidy (government, tax payers) may not be the beneficiaries.
- However, subsidies can also be used to, for example, encourage new energy resources (e.g. wind energy) where the price of old energy sources (e.g. oil, coal) does not include the external costs of pollution.
- In addition, subsidies can be seen as a form of community service obligation, a payment by government for the provision of an activity that is in the interest of the community (i.e. reduction or avoidance of greenhouse gas emissions), but would not otherwise be economic to provide.
- To avoid economic inefficiencies subsidies thus have to be carefully priced, preferably the subsidies should be the same as pollution mitigation costs.

Budgetary impact

- Taxes:
 - Raise revenue and therefore are economically attractive to governments. A condition for this in a developing country context is that collection systems for taxes, fees or charges are fully functioning.
 - In several Asian countries where corruption is a real issue, there is a risk of tax evasion through double bookkeeping and bribing of government officials.
 - Often government use environmental taxes for instance, to raise money rather than serve the environment and taxes could be criticized for this.
 - If the primary purpose is to raise general revenue, to for example, fund an energy program, then there is a risk of low revenue if industry significantly reduces energy use.

- Subsidies:
 - Budgetary costs from subsidies are high because generally it is government, hence the community, who finances it.

Ability to implement and enforce

- Taxes can be collected through an already existing collection system. A good working system is essential for a successful energy tax scheme but the following must be considered for Asia:
 - In general, monitoring and administrative requirements are lower for inputs (fuel tax etc.) and outputs (for example final products, like steel) than for pollutants (greenhouse gas emissions), because data on inputs and outputs are more readily available whereas emissions are more difficult to measure and quantify.
 - Several companies avoid taxes by submitting different data on production, energy use etc. to the government than their real figures.
- Subsidies:
 - Subsidies generally require more administration plus monetary changes compared to taxes. This is less the case if subsidies come in the form of tax deductions than for grants.
 - The advantage of subsidies is that it is generally easier to detect and avoid fraud compared to taxes. This is because there are fewer users of subsidies and because industry has to show proof to deserve the subsidy.
- Taxes and subsidies:
 - Both policy measures are flexible because they can be adjusted as conditions change, also making them easier to predict.
 - A drawback in Asia is that energy related taxes and subsidies often conflict with the economic policies aimed at rapid economic growth, which most governments find to be the most important.

Support from stakeholders

- Taxes:
 - *Governments* support taxes because it generates revenue, but on the other hand they may oppose them due to the risk of losing voters and upsetting the industry lobby.
 - *Industry* opposes taxes, simply because they cost them money, unless the taxes are offset by tax deductions elsewhere, e.g. instituting an energy tax but in return also lower profit taxes for companies.
 - *Environmental NGOs* are generally in favor of taxes provided they are environmentally effective, i.e. not used as general revenue or that does not result in industry cutting its energy use and emissions (e.g. tax is too low). However they are opposed to taxes where levies are the same for everyone, independent of quantity used or emissions i.e. low and high entities are punished equally and when it is mostly used as a measure by government “seen to be doing something”.
 - *The public* generally opposes industrial taxes when the costs are passed on to the consumer or in cases where an energy tax is imposed both on consumers and industry.

But they are in favor of taxes when the social and environmental benefits are clearly known.

- Subsidies:
 - *Governments* support subsidies, provided that the actual cost is not too high for them.
 - *Industry* also favors subsidies, because they benefit financially and are not penalized if they decide not to make the desired change.
 - *Environmental NGOs* support subsidies when they are environmentally effective but oppose them for the same reasons as with taxes. In addition, they are opposed in cases where the subsidy is benefiting polluters and not rewarding already environmentally responsible companies.
 - *The public* favors subsidies when they have wider social and environmental benefits but they are opposed when they benefit polluters rather than environmentally responsible industries.

3.4.3 Evaluation and applicability of voluntary instruments in Asia

In assessing voluntary instruments against the evaluation criteria described before the following was reported in the literature reviewed:

Environmental effectiveness

- Environmental effectiveness is highly uncertain because it is up to industry to decide if they want to participate in, for example a program, and there are no legal or financial consequences of inaction.
- Environmental effectiveness is higher if there is/are:
 - a signed agreement, e.g. covenant especially because industry has agreed to its objectives and targets;
 - financial contributions by industry themselves, e.g. to program or R&D;
 - targets to measure progress, e.g. program;
 - mandatory requirements, e.g. mandatory public reporting under a voluntary program;
 - industry is convinced about the benefits to them;
 - threat of legislation if voluntary mechanisms do not achieve the desired reductions;
 - public exposure, e.g. labeling, R&D certifications.
- Partnership programs between government/industry that requires financial contributions from companies may put environmental effectiveness at risk if companies with the biggest environmental gains do not participate due to inefficient funding.

Economic efficiency

- Economic efficiency varies enormously from case to case, but is influenced by:
 - Governmental, organizational or administrative structures to establish or run e.g. a program or labeling scheme;

- The factors described under environmental effectiveness;
- The direct impact on energy reduction by the voluntary instrument. For example, the impact of an R&D or training program on energy reduction is mostly visible in the long term, whereas direct benefits can be seen from cleaner production projects;
- Financial contributions by industry themselves.

Budgetary impact

- Potential revenues for the government can be found in the transition from voluntary to mandatory, which is becoming more common in some developed countries. In Australia for example, one energy efficiency program is now going into a new phase where some of the components, including labeling is becoming mandatory.

Ability to implement and enforce

- The feasibility of voluntary instruments varies significantly and therefore must be reviewed on a case by case basis.
- Voluntary instruments can never be enforced due to their voluntary nature, however industry can be put under pressure to participate or comply depending on the commitment made by them. Lack of obligation may deter some companies from e.g. signing a voluntary agreement or complying with the agreement because they know that they cannot be financially or legally penalized.
- Voluntary instruments generally do not conflict with other policies (as opposed to legislative, taxes and subsidies) because there is no legal requirement.
- Generally, there is great flexibility in voluntary instruments. Companies can voice their concerns and needs for what they want out of a program, voluntary agreement or R&D scheme, and therefore they can influence their development.

Support from stakeholders

- *Government* supports voluntary instruments because they can avoid confrontation with industry, and as long as government costs are manageable. Projects financed by multilaterals, like the WB, UNDP, GEF or through partnerships with corporations are therefore popular with governments from developing Asian countries.
- *Industry* favors voluntary instruments, such as programs, covenants because they consider these as a way to avoid or delay legislation. The influence of voluntary instruments on industry's ability to minimize costs and/or maximize profits will determine the extent of their support. In addition, they are supported because voluntary instruments are flexible and can be shaped and adapted to industry's changing needs.
- *Environmental NGOs* in principle, welcome any voluntary initiative as long as changes are real, fast and long term and are not only used as a measure by government "seen to be doing something".
- *The public* favor voluntary initiatives but may push for legal, economic instruments if the environmental improvement is modest and too slow.

4 EXISTING POLICY INSTRUMENTS AND CASE STUDY EXAMPLES

4.1 Introduction

This section provides a more detailed description of a number of policy types utilized in Asia and overseas to improve energy efficiency in industry. The case studies presented here were selected on the basis of how well they meet the evaluation criteria and if they are applicable to Asia.

The selected policy instruments include:

- Legislative
 - Laws and regulations: conservation law and act
 - Standards: minimum energy performance standards
- Economic
 - Fiscal: resource tax and emission tax
 - Subsidies: credits and loans.
- Voluntary
 - Programs and projects: GERIAP, MIEEP etc.
 - Labeling schemes: Energy labeling savings program and ENERGY STAR
 - Research & Development: research fund and venture capital.

For each case study example presented, the following information is provided:

- Policy objective
- Instrument description
- Incentive provided to improve energy efficiency
- Examples from Asia and overseas and
- Reported energy efficiency outcomes, in particular energy emission reductions and cost savings.

Difficulties encountered in finding case study examples from within Asia include:

- Few policies on energy are specifically aimed at energy efficiency.
- Information is generally lacking in the area of reported outcomes, simply because monitoring, evaluation and reporting is not regularly done
- Great language barriers exist because only a few of the governmental and industrial organizational websites in Asia are available in English.

4.2 Legislative instruments

4.2.1 General findings and observations

Nowadays most countries of Asia have an energy law.¹⁹ These laws are broad in scope and any mention of energy efficiency/conservation is generally vague and with rather non-specific objectives. However, a handful of countries, among them Japan, India, and Thailand have adopted legislation focusing specifically on energy efficiency/conservation. These laws are generally comprehensive in scope, involving many sectors, but still specific in addressing energy efficiency.

¹⁹ See Appendix D for an overview of energy legislation in a selected number of Asian countries

4.2.2 Energy conservation laws

The features of energy conservation laws are described below.²⁰

Policy objective

The general policy objective of most energy conservation laws reviewed is to reduce the use of energy in factories, buildings, machinery and/or equipment.

Instrument description

These laws differ in their scope, with some being more focused on residential rather than the industrial sector. All reviewed laws have mandatory components, for instance, mandatory energy audits or the appointment of energy managers in every industrial facility.

Incentive provided to improve energy efficiency

Energy efficiency is improved on the basis that anyone violating regulations is penalized according to the law. In many instances these penalties involve high financial fines, and in the worst cases even prison time.

Examples from Asia

- In India the Energy Conservation Act (ECA) from 2001 includes among other things the establishment of a *Bureau of Energy Efficiency*, which carries out the majority of the mandates included in the Act, such as establishing systems and procedures to measure, monitor and verify energy efficiency results in individual sectors and at a macro level; influence multi/bilateral and private sector support in the implementation of ECA; and demonstrate delivery of EE services through publications and reports. For industry specifically, the Act mandates:²¹
 - Commitment to national energy conservation and efficiency efforts and programs.
 - Adhering to energy standards and equipment labels, when they apply.
 - Appointment of energy managers at every industrial facility, and
 - Carrying out of mandatory energy audits on an annual basis.
- In Japan the Energy Conservation Law from 1979 stipulates that industries shall:²²
 - Appoint a licensed energy manager and a trained energy officer if it is a high-intensive industry such as iron & steel, pulp & paper, petrochemical, cement, sheet glass, textile and automobile industry.
 - Use and buy products that have mandatory energy efficiency labeling, when they apply.

The law was last amended in 2005 to also include the 13,000 factories across Japan that belong to the large or medium size energy consumers of the industry sector as well as the product manufacturers, transportation businesses and buildings consuming a lot of energy. A set of guidelines for achieving energy efficiency was also added to the law which involves:

- Rationalization of fuel burning
- Rationalization of heating

²⁰UNESCAP, *Compendium on Energy Conservation Legislation in Countries of the Asia Pacific Region*, pgs. 3-19

²¹Bureau of Energy Efficiency (BEE), <<http://www.bee-india.nic.in/sidelinks/Downloads.html>>

²²The Energy Conservation Center (ECCJ), <http://www.eccj.or.jp/law/rational_use_of_energy.html#6>

- Cooling and heat conduction
 - Recovery and re-use of waste heat
 - Rationalization of converting heat to power
 - Prevention of energy loss via radiation
 - Rationalization of converting electricity to power and heat.²³
- In Thailand the Energy Conservation and Promotion Act from 1992 stipulates that companies who have over 1 MW peak energy demand or consume more than 20 TJ of energy annually are required to abide by the conditions set up in the Energy Conservation Program (ECP). Currently this applies to more than 4000 large buildings and factories (so called Designated Facilities) across the country. Mandatory tasks for these Designated Facilities include:
 - Assignment of energy managers
 - Monthly reporting on energy use
 - Development of energy efficiency plan and targets
 - Compilation of all energy codes.²⁴

Reported outcomes

- The Bureau of Energy Efficiency in India reports that specific data about performance and energy consumption of designated consumers under the Energy Conservation Act is difficult to obtain. Data integrity is questionable and comprehensive data is not available. Therefore it is not possible to find any specific data on the total number of energy audits performed in the country or the energy savings these have achieved. Nevertheless, regarding the mandatory energy efficiency standards and labels BEE estimates that these activities alone is expected to save 11,689 million kWh/year of energy in a five year period.²⁵
- Since the enactment of the Energy Conservation Law in Japan CO₂ emissions from industries have been reduced from 52,423 tons in 1997 to 49,851 tons in 2002 and energy consumption in the same time period has decreased from 17,619kl to 16,566kl in crude oil equivalent, despite the fact that Japans industry has continued to grow. It is expected that the amendments to the law in 2005 will improve these numbers even more, since additional energy consumers are now also covered by the law.²⁶
- No data is currently available on the energy savings/emissions avoided by abiding to the requirements stipulated in the ECP in Thailand.

4.2.3 Minimum energy performance standards (MEPS)

The features of minimum performance standards are described below.²⁷

Policy objective

The policy objective of minimum energy performance standards (MEPS) is to increase the average efficiency of a product/equipment class that industry uses and in doing so decrease and

²³ The Institute of Energy Economics, Japan , <<http://eneken.ieej.or.jp/en/data/pdf/314.pdf>>

²⁴ Prasert Sinsukprasert, Dep't of Alternative Energy Development and Efficiency, *Government Roles: regulation and incentives for EE promotion in Thailand*, UNIDO's Bangkok Industrial Development Club Discussion, Electrical and Electronic Institute, 16th March 2006.

²⁵ BEE, <<http://www.bee-india.nic.in/Implementation/Standards%20&%20Labellings.html>>

²⁶ The Energy Conservation Center (ECCJ), <http://www.eccj.or.jp/law/rational_use_of_energy.html#6>

²⁷ Energy Efficiency Regulations, <<http://www.eeca.govt.nz/eeca-library/products/standards/report/energy-efficiency-energy-using-products-regulations-04.pdf>>

eventually phase out inefficient products/equipment used in a country.

Instrument description

Minimum energy-efficiency standards are procedures and regulations that prescribe the energy performance of manufactured products, sometimes prohibiting the sale of products that are less efficient than a minimum level. The main components of MEPS include performance criteria, test protocol, effective dates (which allow for manufacturer lead-time), and possibly a mechanism to review or adjust the performance criteria for future levels. Typically MEPS are used on consumer products such as home appliances (e.g. refrigerators, air-conditioners, freezers, fluorescent lights, water heaters) but only a few MEPS target industrial equipment (e.g. boilers, motors, transformers). In many instances MEPS come in a package with mandatory labeling as a requirement to inform consumers. A regulatory agency sets the MEPS (usually a standards organization) and importers, manufacturers as well as retailers of MEPS targeted products are responsible for ensuring that their products comply with the standards. Monitoring and testing of manufactured and imported products are also carried out to ensure that standards are fully met. The biggest benefit of MEPS is that because they are so specific, it is easy to meet monitor and enforce them, thereby meeting the desired policy objectives.

Incentive provided to improve energy efficiency

Failure to comply with the stipulated MEPS will result in substantial monetary fines for the offender. In addition a key advantage of a MEPS program is that once a level becomes effective, all future sales must meet or exceed that level. Eventually an entire stock of a particular product is replaced, increasing the company's competitiveness in the global market for that particular product.

Example from Asia

- In Taiwan, Republic of China, mandatory energy efficiency standards have been established as part of the last amendment to the National Energy Policy in 1996. Applicable to the industrial sector are:
 - Motors
 - Boilers
 - Transformers
 - Water chillers and
 - Heating, ventilation and air-conditioning (HVAC) systems.

An authorized agency or technician must test each piece of equipment to ensure that the standards are met before they are sold or imported. Typically the standards call for energy efficiency of 5 percent to 25 percent greater than that of average products in service.²⁸

Example from outside Asia

- In New Zealand the application of mandatory MEPS are provided for under the Energy Efficiency and Conservation Act 2000. The MEPS together with mandatory labeling provides one of the more important components of New Zealand's *National Energy Efficiency and Conservation Strategy* (NEECS) adopted in 2001 with at target of at least a 20% improvement in economy-wide energy efficiency by 2012. Due to this MEPS for selected appliances and products were introduced progressively between July 2002 and February

²⁸Asia Pacific Energy Research Centre, *EE programs in developing and transitional APEC economies*, 2003, pg. 69.

2003 and cover both manufactured and imported products. The standards of course vary depending on the product and appliance. For instance new energy efficiency requirement coming into force in New Zealand and Australia in October 2007 stipulates that External Power Supplies with a nameplate output power rating up to 250 Watts are required to have a minimum energy efficiency level of between 0.49 to 0.84 AND meet or be less than the no-load requirements of between 0.5 to 0.75 depending on the power rating.²⁹ These new requirements are being enforced to harmonize with MEPS in other countries and states, such as the US, China and California. One of the stated benefits of the policy is that it will make New Zealand's manufacturers and products globally competitive, because it ensures that New Zealand's manufacturers offer energy efficient products comparable to the best in the world to domestic consumers. Equipment and products covered by MEPS applicable to the industrial sector include:³⁰

- Distribution transformers
- Three phase electric motors
- Heat pumps
- Air-conditioners and fluorescent lamps.

Reported outcomes

- No data is currently available on the outcomes of the introduced MEPS in Taiwan, Republic of China.
- By the end of 2003 MEPS had together with the other components in NEECS contributed to a 1 percent improvement in the country's overall energy efficiency and to the avoidance of 335,000 tons of CO₂ emissions. Since then government has suggested adding yet another 17 product classes to the standards and mandatory labeling scheme.³¹

4.3 Economic instruments

4.3.1 General findings and observations

The use of economic instruments for improving energy efficiency in developed countries is quite common, especially fiscal instruments like taxes on emissions and fuels. Also various types of subsidies are common, especially those related to tax credits, loans and grants for investments into energy efficient technologies. Asian governments have not been as active in the use of economic policy instruments to achieve energy efficiency, despite their potential economic and environmental benefits, particularly raising revenues for poor governments. Still, countries like Thailand, the Republic of Korea and India have incorporated some economic instruments into their national energy policies. Others are now also drafting energy policy proposals related to economic instruments because of its successes in their neighboring countries and outside of Asia. However, many Asian countries are still plagued by the fact that energy prices are heavily subsidized and most energy efficiency experts believe that until these unrealistic subsidies are significantly reduced or even removed, other policy instruments used to improve energy efficiency will not fully work.³²

²⁹Energy Efficiency and Conservation Authority, *New Australian and New Zealand Energy Performance Requirements for External Power Supplies, MEPS*, Fact Sheet, February 2006

³⁰Energy Efficiency and Conservation Authority <<http://www.eeca.govt.nz/labelling-and-standards/meps.html>>

³¹EECA and the year three report on the national energy efficiency strategy, <<http://www.eeca.govt.nz/eeca-library/eeca-reports/neeecs/report/neeecs-three-year-on-report-05.pdf>>

³²UNESCAP, 1999, pg. 20

4.3.2 Taxes on petrol and emissions

The features of petrol and emission taxes are described below.³³

Policy objective

In most cases, the dual purpose of petrol taxes and emission taxes are to raise government revenues and at the same time reduce the use of petrol and production of emissions respectively.

Instrument description

Taxes can be levied on the use of petrol directly, based on the amount used. And when it comes to emissions, taxes levied are usually based on how much pollutants the resource contain and is being released when it is burned.

Incentive provided to improve energy efficiency

An economic incentive is provided to reduce fuel use or use fuels that generate less emission.

Example from Asia

- In Thailand a 0.07 bath (about \$ 0.002 US) per liter tax on petrol is used to fund the Energy Conservation Promotion Program and the Energy Conservation Promotion Fund, which provides financial assistance for energy conservation efforts by public and private sectors.³⁴

Example from outside Asia

- In Denmark the Carbon Dioxide Act of 1993 provides the economic incentive for industries to reduce CO₂ emissions. The overall purpose of the Carbon tax in Denmark has been to achieve several environmental goals through internalization of external costs in energy usage. Denmark has the objective of reducing CO₂ emission by 20% of the 1988 levels by 2005. Furthermore, in order to reduce pollution and the dependence on fossil fuels the aim is that 35% of Denmark's gross energy consumption can be supplied by renewable energy sources by the year 2030. The CO₂ rates are fixed according to the CO₂ content of fossil fuels and amounts to 100 DKK (approximately US \$14.5) per tonne CO₂.³⁵

Reported outcomes

- The fuel tax in Thailand has helped fund many energy efficiency projects, among them costs for energy audits in industries. Subsequently, between 1995 and 2003 a total of 6,075 facilities were audited, mainly in the industrial sector. The result showed annual energy savings of 5,294 GWh and demand savings of 1,062 MW.³⁶
- In 1996 the total revenue from the combined taxes from CO₂, energy, and sulphur was DKK 24.3 billion (approximately US \$ 3.9 billion) equivalent to 7% of the country's total fiscal revenue.³⁷ By 2002, despite a constant growth in gross energy consumption and an increase in the gross national product of 29%, CO₂ emissions had decreased by 13% since 1990.

³³ WEC, Thailand Report, <<http://www.worldenergy.org/wec-geis/edc/countries/Thailand.asp>>

³⁴ WEC- Thailand Report, <<http://www.worldenergy.org/wec-geis/edc/countries/Thailand.asp>>

³⁵ Skatteministeriet,

<<http://www.skm.dk/foreign/english/taxindenmark2006/section10vatpayrolltaxandenvironmentaltaxes/#103>>

³⁶ WEC- Thailand Report, <<http://www.worldenergy.org/wec-geis/edc/countries/Thailand.asp>>

³⁷ AKF Institute <http://www.akf.dk/udgivelser_en/97/afgifter/>

Subsequently, actual CO₂ emission in 2002 was almost the same as the emission in 1990.³⁸

4.3.3 Subsidies on energy efficient technologies

The features of subsidies on energy efficient technologies are described below.³⁹

Policy objective

Economic subsidies are provided to encourage investments in energy efficient technologies to reduce costs as well as energy use.

Instrument description

The subsidies can come in many shapes and forms, typically they either involve: tax credits, tax depreciation, tax exemption, loans or grants. Tax credits, depreciation and exemption are given in return for investments in EE technologies for a certain (sometimes specified) period. While grants and loans are direct payments for such investments with the only difference that loans are paid back with low interest over time.

Incentive provided to improve energy efficiency

An economic incentive in the form of a subsidy is provided to refrain from investments in other energy related technology in favor of energy efficient technologies. The use of these instruments also helps to demonstrate that governments are serious about changing energy use practices and it provides the economic support to industries to change.

Example from Asia

- In the Republic of Korea industries qualify for a 5 per cent income tax deduction both for domestic and foreign products if they invest in energy efficient technologies, including:
 - Replacing inefficient industrial furnaces and kilns
 - Installing cogeneration facilities, alternative fuel-using facilities
 - Reducing energy consumption by more than 10 percent.⁴⁰
- In Thailand a number of economic subsidies are used to encourage energy efficiency including:⁴¹
 - Favorable *loans* allocated by the Energy Conservation and Promotion Fund (ECPF) and various Thai Banks of up to US \$1.2 million per project, with fixed interest rates of less than 4% and repayment in a defined timeframe of 7 years.
 - Cost based tax incentives giving companies a 25% *tax break* for investing in projects that result in efficiency improvement. These tax breaks are applicable to the first 50 million Baht investment (approximately US \$1.25 million) and spread over 5 years.
 - Performance based tax incentives, meaning that 100% of achieved energy savings are *tax deductible*, i.e. all energy savings achieved are tax free. The max incentive is 2 million Baht (approximately US \$50,000). Pre and post auditing is also required for it to be

³⁸ Ministry of Environment, *Denmarks National Inventory Report 2004 to the UNFCCC*, 2004, pg. 32

³⁹ IEA, 1997

⁴⁰ UNESCAP, 1999

⁴¹ Prasert Sinsukprasert, Dep't of Alternative Energy Development and Efficiency, *Government Roles: regulation and incentives for EE promotion in Thailand*, UNIDO's Bangkok Industrial Development Club Discussion, Electrical and Electronic Institute, 16th March 2006.

approved. As of now this is still only a pilot project.

- Incentive through Board of Investment (BOI), meaning *import duty and cooperate tax exemption* on new investments in: Energy conservation business such as high efficiency machine or equipment and renewable energy equipment manufacturing, solar PV manufacturing, Energy Service Companies AND Renewable energy production business such as the use of alcohol or fuels from agricultural products and electricity or steam generation.

Example from outside Asia

- In the United Kingdom, the Carbon Trust, an independent non-profit company funded by the UK government, gives loans to SMEs that want to replace or upgrade existing equipment to be more energy efficient. Loans range from \$8000-\$180,000 and can be borrowed unsecured and interest free to fund projects incorporating energy efficient lighting, boilers and insulation for example. Export related activities are exempted from the loan program.⁴²

Reported Outcomes

- No comprehensive data on the outcomes of tax deductions in industry in Korea are available at this time.
- Out of the 4 subsidy mechanisms to promote energy efficiency in industry in Thailand only the ECPF provides any comprehensive results. Currently 82 project loans have been approved or are under construction with leverages of US \$80 million in energy conservation investment. The average investment for each project is US \$1 million and the average payback period is 2.3 years. The estimated annual energy savings are more than 250 GWh and 91 million liter of fuel oil.⁴³
- In the United Kingdom such comprehensive data is not readily available either, instead outcomes are reported on a case by case basis but with emphasis on the financial savings rather than the energy saved or emission avoided. Nevertheless, one example given reports how an interest free loan from the Carbon Trust made it possible for Breiby Business Park to invest £355,000 (approximately US \$ 620,000) in new boilers, which reduced their annual energy bill from £400,000 (approximately US \$ 700,000) to £220,000 (approximately US \$380,000). The company also managed to pay the loan back in just over three and half years from the money saved on energy bills.⁴⁴

4.4 Voluntary instruments

4.4.1 General findings and observations

Of all the policy instruments available for improving energy efficiency, voluntary instruments seem to be the most popular outside of Asia and in Asia. Common voluntary instruments include energy efficiency projects and programs, and energy efficiency labeling. But there are exceptions. Voluntary agreements are almost non-existent in Asian countries, even though they are quite common in other regions, especially Europe and North America.

⁴² The Carbon Trust, <http://www.thecarbontrust.co.uk/energy/pages/page_72.asp>

⁴³ Prasert Sinsukprasert, Dep't of Alternative Energy Development and Efficiency, *Government Roles: regulation and incentives for EE promotion in Thailand*, UNIDO's Bangkok Industrial Development Club Discussion, Electrical and Electronic Institute, 16th March 2006.

⁴⁴ The Carbon Trust, <http://www.thecarbontrust.co.uk/energy/pages/page_375.asp>

Generally most voluntary instruments are funded through partnerships between governments and the private sector. But in some cases, particularly capital intensive projects in developing countries, multilateral donors or international organizations, like the World Bank or the UN are the major financial contributors. The timeframe for these instruments ranges from a few weeks to many years. A trend observed in the literature indicates that some voluntary instruments are now becoming mandatory policies. This applies specifically to energy efficient equipment labeling, standards and various emission targets. In Asia however, this shift has less impact because these voluntary instruments are not yet widespread.

4.4.2 Energy programs and projects

The features of voluntary energy efficiency programs and projects are described below.⁴⁵

Policy objective

The policy objective of most voluntary energy efficiency programs is to encourage industries to voluntarily improve energy efficiency and reduce greenhouse gas emissions through participation in a project or program that intends to do just that.

Instrument description

There is a great variation in energy efficiency programs and projects. Programs/projects can involve:

- Capacity building through information/education/workshops that increase industries technical and managerial knowledge about energy use, energy efficient technologies
- Energy auditing, labeling, standards and benchmarking of industrial equipment and practices.
- Research and development of energy efficient technologies used by industries.

Incentive provided to improve energy efficiency

The incentives for a company to participate in a voluntary program/project can include:

- Increased employee awareness and skills
- Reduced energy use and costs, thereby increasing competitiveness
- Financial means for replacing old inefficient technology with new ones
- Enhanced public image
- Improved relationship with Government

Examples from Asia

- The Greenhouse Gas Emission Reduction from Industry in Asia and the Pacific (GERIAP) is a three-year project (2003-2006) assisting Asian companies to become more energy and cost efficient through Cleaner Production (CP). CP is a strategy that prevents wastes and emissions and can assist companies to improve energy efficiency, reduce greenhouse gas emissions and reduce costs. More than 40 companies from the cement, chemicals, ceramics, iron & steel and pulp & paper sectors participate in the project in nine Asian countries: Bangladesh, China, India, Indonesia, Mongolia, Philippines, Sri Lanka, Thailand and Vietnam. The main output of the project is the “Energy Efficiency Guide for Industry in

⁴⁵ IEA, 1997

Asia” with the results from the three project components, including energy information, options for energy equipment and industrial processes.⁴⁶

The project components included:

- Capacity building: National Focal Points (NFPs) and participating companies received training on how to apply CP to identify energy efficiency options for main energy uses in industry.
 - Demonstration of CP and energy efficiency: CP assessments to find ways to improve energy efficiency were carried out at the participating companies. Options that were technically feasible, financially attractive and reduced energy and GHG emissions were implemented, resulting in sector specific case studies.
 - Survey of barriers to energy efficiency: Why do some companies improve energy efficiency and others not? A survey assessed the financial, technical, cultural and other factors affecting businesses, resulting in proposed solutions to overcome the most important regional and national barriers in Asia.
- In Malaysia a similar project called the “Malaysian Industrial Energy Efficiency Improvement project” (MIEEIP) targeting over 700 industrial sites in eight industrial sectors including: iron & steel, paper, wood, food, glass, cement, rubber and ceramic. The program focuses on a wide range of activities including :
 - Benchmarking
 - Energy Auditing
 - Energy rating
 - Energy efficiency promotion through the publication of a newsletter and the establishment of an association of energy professionals
 - Development of an energy services companies (ESCOs) support program
 - EE technology demonstration project
 - Local EE equipment manufacturing project
 - EE financing program⁴⁷
 - In the Republic of Korea a program called the “Five-year Plan for Energy Efficiency” involves special management of 194 energy-intensive factories, including energy efficiency targets for the major equipment at the factories. The Plan is mandatory for energy-intensive industries and voluntary other companies. The government performs energy audits for free on a selected number of sites with specific manufacturing equipment.⁴⁸

Examples from outside Asia

- In the Czech Republic, a non-profit, non-governmental energy efficiency consultancy center called “SEVEN” was set up in 1990. The center provides facilitation, information and educational tools on energy efficiency to the residential, industrial and commercial sector. Start up funding for the center was provided by the Global Environment Facility (GEF) but SEVEN have since the year 2000 become financially independent. Today revenues come from consultancy fees and workshop charges including the “Low Cost, Low-Energy Buildings” project administered by the UNDP.⁴⁹

⁴⁶ UNEP/ROAP, 2006, *Energy Efficiency Guide for Industry in Asia*

⁴⁷ MIEEIP, <<http://www.ptm.org.my/mieeip/about.html>>

⁴⁸ Amternes og kommunernes forskningsinstitut (AKF) *Energy Policy Documents - South Korea* <www.akf.dk/eng/udland10.htm>

⁴⁹ SEVEN <<http://www.svn.cz>>

- In the United States the “Industrial Technologies Program” started as early as 1976 and involves free energy audits for SMEs conducted by Energy Analysis and Diagnostic Centers at a number of universities around the country. In 1993, the Department of Energy teamed with the Environmental Protection Agency and expanded the program with “industrial assessments” to identify productivity improvements, waste reduction and energy savings. The goal of the program is to :
 - Increase the adoption of energy-efficient equipment and practices at SMEs
 - Build and broaden energy management
 - Make American engineering students more aware of energy issues.⁵⁰

Reported outcomes

- At the end of UNEPs GERIAP project the forty Asian companies covered were each able to reduce greenhouse gas emissions by several tons to more than 85,000 tons of CO₂ per year by taking energy efficiency measures. In the process, each company saved between several hundred dollars to more than US\$ 4 million per year.⁵¹
- There are no comprehensive data to be found on the combined energy savings or emission avoided from the MIEEIP project as a whole. However the energy audit component of the project has presented some outcomes. According to the MIEEIP project team the energy audits conducted in 43 out of the 48 most energy intensive factories, electricity usage will be reduced by 5.6 percent and fuel demand by 26.7 percent annually if all measures recommended are implemented by each factory. This will result in total energy savings of 22.3 percent per annum for all 43 factories.⁵²
- The report card on the utility of the Czech energy efficiency consultancy center SEVEN is not easily defined by numbers. But the fact that the center now is financially independent and still exists after 16 years says a lot about the success and need for its services.⁵³
- Comprehensive data on the combined outcomes from the implementation of the Industrial Technologies Program in the US has not been reported, only a few case studies, for example Spartech Plastics’ Richmond, in Indiana. Here an energy audit performed by students from Bradley University helped the company cut energy consumption by more than 7,200 MMBtu, which led to cost savings of nearly \$57,000 annually.⁵⁴

4.4.3 Energy labeling schemes

The features of energy labeling schemes are described below:⁵⁵

Policy objective

The goal of energy labeling is to remove cost-ineffective, energy-wasting products from the marketplace and stimulate the development of cost-effective, energy-efficient technology.

⁵⁰ US Department of Energy – Energy Efficiency and Renewable Energy
<<http://www.eere.energy.gov/industry/>>

⁵¹ UNEP, *International launch showcases Guide for Asian industry to reduce energy costs and greenhouse gas emissions*, Press release, January 18th 2006.

⁵² MIEEIP Energy Audits, <<http://www.ptm.org.my/mieeip/audit.html>>

⁵³ WEEA, *Occasional Paper Series (electronic)*, 2000, <<http://www.weea.org/Occasional%20Papers/Documents/SEVEN.pdf>>

⁵⁴ Industrial Technologies Program, <<http://www.nrel.gov/docs/fy05osti/38532.pdf>>

⁵⁵ CLASP, <<http://www.clasponline.org/resource.php?nrx=2&no=21>>

Instrument description

Energy-efficiency labels are informative labels affixed to manufactured products to describe the product's energy performance (usually in the form of energy use, efficiency, or energy cost). These labels give consumers the data necessary to make informed purchases. Energy labels can stand alone or complement MEPS. Labels also provide a common energy-efficiency benchmark that makes it easier for utility companies and government energy-conservation agencies to offer consumers incentives to buy energy-efficient products.

Two types of labels can be distinguished:

- Endorsement labels, which are essentially seals of approval given according to specified criteria. These are inherently voluntary labels.
- Comparative labels, which allow consumers to compare performance among similar products using categories of performance or a continuous scale.

If the program includes a comparison label, the program can be either voluntary or mandatory or could start as voluntary and evolve to being mandatory later.

Incentive provided to improve energy efficiency

The major incentive for industries is that participation in voluntary labeling can produce large energy savings and at the same time be cost-effective. These incentives together with a threat of public disclosure of non-compliance are usually enough for companies to comply, even though they are not mandatory.

Example from Asia

- In Japan the voluntary energy saving Top Runner Labeling Program was launched in 2000. The program allows consumers to compare energy efficiency between products so that they can select products with a higher energy efficiency percent when making a purchase.
 - As of August 2004, 13 products were targeted of them 6 are applicable to industry namely: air conditioners, florescent lights, space heaters, gas burning heaters, oil burning water heaters and transformers.
 - The energy conservation label consists of the energy conservation logo in combination with information on target year, achievement rate of energy efficiency standards, and energy consumption efficiency. The logo is colored in orange for a product which does not achieve the target standards of energy efficiency, and green if a product achieves over 100% of the target standards.
 - The "achievement rate of energy efficiency standards" is given to show the rate of efficiency relative to the future standard. So for example, a highly efficient product may be 120 percent more efficient than the future standard level, three or four years before the standard will take effect. At the same time, an inefficient product may be 80 percent of the level only one year before the standard takes effect. The Minister of Economy, Trade and Industry (METI) designates and disseminate the criteria to serve as judgment guidelines for each product.⁵⁶

Example from Outside Asia

⁵⁶ The Energy Saving Center <http://www.eccj.or.jp/eng/e3202energy_saving.html>

- In the United States, the ENERGY STAR, established in 1992, is a government-backed labeling scheme program (DoE, EPA) helping businesses and individuals improve EE through the introduction of voluntary labeling of products. Through its partnerships with more than 8,000 private and public sector organizations, ENERGY STAR delivers the technical information and tools that organizations and consumers need to choose energy-efficient solutions and best management practices. To date the label is used on over 40 product categories (and thousands of models) for homes and companies. Applicable products to industries are: heat pumps, lighting, office-equipment, ceiling fans, boilers, air-conditioners and furnaces.⁵⁷



Figure 1. Energy Saving Labels in Japan and United States

Source: Energy Saving Center, Japan <http://www.eccj.or.jp/index_e.html>, ENERGY STAR <<http://www.energystar.gov/>>

Reported outcomes

- Because voluntary labeling was introduced rather recently in Japan, no official data is available on the energy savings of the labeling scheme so far.
- The American ENERGY STAR labeling scheme on the other hand has been around for more than 10 years therefore data is more readily available. According to the 2002 annual report, savings from the labeling of the 34 products that were at that time covered by the U.S. ENERGY STAR program showed annual savings in 2001 of 560 trillion EJ and \$4.1 billion. The peak demand reduction resulting from the ENERGY STAR labeling program was 5.7 GWh in 2001 and was expected to increase to 7.0 GWh in 2002. This report also includes a prospective analysis of the cumulative savings under target market penetrations for the periods 2002– 2010 and 2002–2020, respectively, showing that all the products together were expected to save 11 quadrillion Btu (quads) by 2010, growing to 31 quads by 2020.⁵⁸

4.4.4 Energy efficiency research and development

The features of energy efficiency R&D are described below.⁵⁹

Policy objective

The purpose of EE R&D is to develop technologies that improve energy efficiency, while at the same time being cost-effective.

Instrument description

⁵⁷ The ENERGY STAR <http://www.energystar.gov/index.cfm?c=about.ab_index>

⁵⁸ CLASP <<http://www.clasponline.org/resource.php?nnx=5&no=13>>

⁵⁹ UNESCAP, *End-use of Energy Efficiency and Promotion of a Sustainable Energy Future*, 2004, pgs. 51-68.

Typically R&D of EE technology is not as common in Asia as in Europe and North America, due to lack of funding. In those cases R&D involves technology transfer or technology procurement instead of local R&D. In most cases this involves transfers of technology to Asia from outside the region.

But in those cases where R&D does exist, the focus is usually on small scale projects and equipments, with some exceptions of course. The biggest difference however is that Asian EE R&D have to take local conditions into account, such as; quality of raw materials, existing labor costs, power quality, environmental loads, temperature and humidity when developing viable energy efficiency solutions.

Incentive provided to improve energy efficiency

Investments in EE R&D may provide huge energy and cost savings for country. If the technology is successful it may also be manufactured and sold to other countries, generating even more revenues that can be used for more R&D. In the Asian context locally developed and produced EE technology may also be cheaper to produce and sell in the long run rather than importing such technology. In addition sales of locally developed technology may be easier to promote to other Asian countries, as it furthers the growth of the regional economy and improves trade within Asian countries.

Example from Asia

- Taiwan, Republic of China has an energy research and development fund financed from 0.5 percent of operating revenues from the sale of petroleum products and electricity. Uses for the fund, as specified in the Energy Management Law from 2002, include; developing energy, researching energy conservation technology, and training of energy conservation personnel. The fund aims to achieve a target of 28 percent in total energy savings by 2020. Means for achieving this target include among other things; research and development of energy technology and information exchange on energy efficient technology. R&D focus for the industrial area involves:⁶⁰
 - Cogeneration technology
 - Heat recovery
 - Electric heating energy conservation technology
 - Industrial energy conservation management
 - High-efficiency equipment production
 - Industrial energy-efficiency-enhancing technology
 - Innovative energy-saving product technology.

Example from Outside Asia

- In the United Kingdom new R&D projects can be partly funded through the Carbon Trust, which invests in early stage technologies in the low carbon energy field. For all venture capital deals the Trust works with other venture capital and private equity firms as co-investors. Typically the Trust invests between \$440,000 and \$2.6 million per deal as a minority stakeholder, alongside private sector investors on the same terms. The Trust also provides the companies with expertise and assists in coordinating R&D plans.⁶¹

⁶⁰ Asia Pacific Energy Research Centre, *Energy efficiency programs in developing and transitional APEC economies*, 2003, p 71.

⁶¹ The Carbon Trust <http://www.thecarbontrust.co.uk/carbontrust/low_carbon_tech/dlct2_4.html>

Reported outcomes

- The Carbon Trust's Venture Capital program together with their R&D program has resulted in the completion and success of about 100 projects, including one on "Heat pumps with integral expansion turbines" and one on "Energy saving potential of boiler controls" to name a few. Unfortunately however no comprehensive data on the energy savings or emissions avoided are to be found.⁶²
- In Taiwan, Republic of China promotion and implementation of energy conservation and technical services resulted in an annual saving of 140 GWh of electricity and 17,000 kiloliters of fuel oil, and an average peak load power saving of 68 MW in 2005. In addition, promotion and use of cogeneration systems; up to the end of 2005, has increased the country's' installed energy capacity to 7,050 MW.⁶³

⁶² The Carbon Trust <http://www.thecarbontrust.co.uk/carbontrust/low_carbon_tech/dlct2_1_4.aspx>

⁶³ The Energy Commission of the Ministry of Economic Affairs,
<http://www.moeaec.gov.tw/ePublication/energy%20situation_94/e12.html>

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Appendix B Overview table of selected policy instruments for energy efficiency in industry in Asia

Note: This table only give an overview of the main examples of policy instruments for energy efficiency, it does not intend to be complete.

Policy Category	Policy Type	Title	Country	Target Group	Description	Date Started	Source
Legislative Instruments	Law & Regulations	The Energy Conservation and Promotion Act	Thailand	Energy intensive industries	Implementation of an Energy Conservation Program and an Energy Conservation Promotion Fund, with requirements to conduct energy audits on; industries and designated buildings.	1992	Department of Energy Promotion and Development (DEPD) www.berc.dedp.go.th
	Law & Regulations	Energy Conservation Law	Japan	Energy intensive industries	Legal measures for energy reduction in factories, buildings, machinery and equipment. The law stipulates appointment of a licensed energy manager and a trained energy officer in certain industries.	1979, last revised 2002	The Energy Conservation Center (ECCJ) www.eccj.or.jp/law/rational_use_of_energy.html#6
	Law & Regulations	The Energy Conservation Act (ECA)	India	Energy intensive industries	Includes: Establishment of a Bureau of Energy Efficiency, who will coordinate, implement and enforce the act. The Act also includes: appointment of energy managers, mandatory auditing, standards and labeling.	2001-2002	Bureau of Energy Efficiency (BEE) www.bee-india.nic.in/sidelinks/Downloads.html
	Standards	Minimum Energy Performance Standards (MEPS)	New Zealand	Selected industrial equipment	Mandatory MEPS of certain products, both manufactured and imported, industry specific includes: Distribution transformers, three phase electric motors, heat pumps, air-conditioners and fluorescent lamps.	2002	Energy Efficiency Conservation Authority www.eeca.govt.nz/labelling-and-standards/meps.html
	Standards	Minimum Energy Performance Standards (MEPS)	Taiwan, Republic of China	Selected industrial equipment	Mandatory energy efficiency standards have been established for: motors, boilers, transformers, water chillers, heating, ventilation and HVAC systems. The standards call for energy efficiency of 5 percent to 25 percent greater than that of average products in service.	2002	Asia Pacific Energy Research Centre, <i>Energy efficiency programs in developing and transitional APEC economies</i> , 2003
Economic Instruments	Fiscal	Petrol tax	Thailand	All fuel users	A 0.07 bath (about 0.002 US\$)/liter tax on petrol is used to fund the Energy Conservation Promotion (ENCON) Program and the Energy Conservation Promotion Fund (ECPF), which provides financial assistance for energy conservation efforts by both the public and private sectors.	1995	World Energy Council www.worldenergy.org/wec-geis/edc/countries/Thailand.asp Department of Energy Promotion and Development (DEPD) < http://berc.dedp.go.th >

Policy Category	Policy Type	Title	Country	Target Group	Description	Date Started	Source
Economic Instruments	Fiscal	CO ₂ tax	Denmark	All ind. but varying rates	CO ₂ rates are fixed according to the CO ₂ content of the fuels and amounts to what corresponds to c.a \$14.5 per tonne CO ₂ .	1993	Skatteministeriet www.skm.dk/foreign/english/taxindenmark2006/section10vatpayrolltaxandenvironmentaltaxes
	Subsidies	Tax exemption	Vietnam	All industries	New EE projects to receive a complete exemption from tax on profits during first two years of operation and 50 % exemption during the next two years.	2003	<i>Overview of Policy Instruments for the Promotion of Renewable Energy and Energy Efficiency in Vietnam</i> , Background Report AIT, Bangkok, Thailand, 2005
	Subsidies	Tax exemption	Thailand	All industries	Board of Investment incentive, meaning import duty and cooperate tax exemption on new investments in: EE business and RE production business.	NA	Prasert Sinsukprasert, UNIDOS Bangkok Industrial Development Club Discussion, Electrical and Electronic Institute, 16 th March.
	Subsidies	Tax break	Thailand	All industries	Cost based tax incentives giving companies a 25% tax break for investing in projects that result in efficiency improvement. These tax breaks are applicable to the first 50 million Baht investment (approximately US \$1.25 million) and spread over 5 years.	NA	Prasert Sinsukprasert, UNIDOS Bangkok Industrial Development Club Discussion, Electrical and Electronic Institute, 16 th March.
	Bonds	Energy efficiency and Renewable Energy Bond Program	New Mexico (USA)	Selected buildings	Energy Efficiency and Renewable Energy Bonding Act (HB 32), establishes up to \$20 million in bonds to finance EE and renewable energy improvements in state government and school district buildings. Bonds are exempted from state tax and are paid back to the bond authority from savings on energy bills.	2005	Database of State Incentives for Renewable Energy www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=NM07F&state=NM&CurrentPageID=1
	Subsidies	Tax Credits	Republic of Korea	All industries	Investments in EE technology by industry qualify for a 5 per cent income tax deduction both for domestic and foreign products.	1992	<i>Compendium on Energy Conservation Legislation in Countries of the Asia Pacific Region</i> , www.unescap.org/esd/energy/publications/compend/ceccpart2chapter3.htm#4%20Financial

Policy Category	Policy Type	Title	Country	Target Group	Description	Date Started	Source
Economic Instruments	Subsidies	Tax Credits	Thailand	Selected industries	Performance based tax incentives, where 100% of achieved energy savings are tax deductible. The max incentive is 2 million Baht (approximately US \$50,000). Pre and post auditing is also required for it to be approved. As of now this is still only a pilot project.	Pilot 2005-06	Prasert Sinsukprasert, UNIDO's Bangkok Industrial Development Club Discussion, Electrical and Electronic Institute, 16 th March.
	Subsidies	Energy Conservation Loan	Thailand	All industries	Loans allocated by the Energy Conservation and Promotion Fund (ECPF) and various Thai Banks of up to US \$1.2 million per EE project, with fixed interest rates of less than 4% and repayment in a defined timeframe of 7 years	NA	Prasert Sinsukprasert, UNIDO's Bangkok Industrial Development Club Discussion, Electrical and Electronic Institute, 16 th March.
	Subsidies	Energy - Efficiency Loan	England & Wales	All industries	The Carbon Trust, an independent non-profit company funded by the UK government, gives loans to SME's wanting to replace or upgrade equipment to be more EE. Loans can be borrowed unsecured and interest free to fund projects such as lighting, boilers and insulation.	NA	The Carbon Trust www.thecarbontrust.co.uk/energy/pages/page_72.asp
Voluntary Instruments	Voluntary Agreement (VA)	The Green Challenge Plus - Enhanced Industry Partnerships	Australia	Agreed industries	Integration of greenhouse issues into business decision making, including: Generator efficiency standards, access to emissions offsets; data reporting and verification through on-line reporting to ensure integrity and to minimize and standardize greenhouse data collection requirements.	2004	Department of the Environment and Heritage, Australian Greenhouse Office www.greenhouse.gov.au/challenge/ www.greenhouse.gov.au/challenge/about/pubs/programmeframework.pdf
	Voluntary Agreement (VA)	CIPEC-Canadian Industry Program for Energy Conservation	Canada	Agreed industries	VA under auspices of the Industrial Efficiency Initiative and Natural Resources Canada. A task force working group target more than 3000 companies. Commitment included to voluntarily stabilize CO2 emissions at 1990 level by 2000. Energy consumption has fallen but CO2 targets not yet fully met.	1994	International Energy Agency, (1997) <i>Energy Efficiency Initiative-Country Profiles and Case Studies</i> , Paris: OECD/IEA.
	Voluntary Agreement (VA)	VA with Energy-Intensive Industries (SVE)	Germany	Agreed industries	VA between government and 19 industry and trade association, representing 71 % of all energy consumption in Germany. Commitment include	1996	International Energy Agency, (1997) <i>Energy Efficiency Initiative-Country Profiles and Case Studies</i> ,

Policy Category	Policy Type	Title	Country	Target Group	Description	Date Started	Source
Voluntary Instruments					reduction targets for energy consumption and targets in absolute tons (CO ₂) or specific (per unit output) terms.		Paris: OECD/IEA.
	Voluntary Agreement (VA)	VA for energy conservation and GHG reduction	Republic of Korea	Agreed industries	Partnership between government and industry. A company conservation action plan is set up and supported by: low interest loans, tax incentives, technological support, public relations promotion, monitoring and achievement index to measure the level of implementation.	1995	Ministry of Commerce, Industry and Energy (MOCIE) http://english.mocie.go.kr/index.jsp
	Voluntary Agreement (VA)	Keidaren Environmental Voluntary Action Plan	Japan	Agreed industries	EE in 5 industrial sectors with EE targets for each sector. Incl: Diss. of existing EE tech, improvement of equipment performance, prevention of heat loss and utilization of recovered wasted heat, emission trading, CDM, tech development of CO ₂ recovery & disposal.	2000	Japan Federation of Economic Organizations (Keidanren) < http://www.keidanren.or.jp/english/policy/pol058/outline.html > The Energy Conservation Center (ECCJ) < http://www.eccj.or.jp >
	Programs & Projects	GERIAP Greenhouse gas Reduction in Industry in Asia Project	Th, Indo, In, Ch, , Mon, Sri-L, Bangla, Vn, Phi	Part. companies from 5 energy intensive industrial sectors	A UNEP/ROAP administered project funded by SIDA, focusing on EE in 5 industrial sectors in 9 countries. Project components include: capacity building, EE methodology facilitation and workshop on barriers to EE implementation.	2003-06	www.energyefficiencyasia.org
	Programs & Projects	The ECOPROFIT Program	Austria	Partner industries	Involves a three-way partnership between companies, a consulting group and the Graz local authorities. Focus: Integrated Environmental Technology through pollution prevention and EE. Program incl: information & motivation, cleaner production & waste minimization, setting up of env. team at companies, material flow analysis, waste mgmt & EE .	1994-95	International Energy Agency, (1997) <i>Energy Efficiency Initiative-Country Profiles and Case Studies</i> , Paris: OECD/IEA.
	Programs & Projects	SEVEN The Center for Energy Efficiency	Czech Republic	All businesses	A non-profit, NGO Energy Efficiency consultancy center providing facilitation, info and educational tools on energy efficiency to the residential, industrial and commercial sector.	1990	WEEA www.weea.org/ Occasional%20Papers/ Documents/SEVEN.pdf SEVEN www.svn.cz

Policy Category	Policy Type	Title	Country	Target Group	Description	Date Started	Source
Voluntary Instruments	Programs & Projects	Malaysian Industrial Energy Efficiency Improvement Project (MIEEIP)	Malaysia	Selected industries from energy intensive sector	4 yr project with: Benchmarking, Auditing, Energy rating, EE promotion, establishment of an association of energy professionals, ESCO support program, EE technology demonstration project, Local EE equipment manufacturing project, EE financing.	2000	MIEEIP www.ptm.org.my/mieeip/about.html
	Programs & Projects	Five-year plans for Energy Efficiency	Republic of Korea	Energy intensive industries	The Plan involves management of 194 energy -intensive factories, including: EE targets major equipments, selected energy audits for free. The Plan is mandatory for energy -intensive industries and voluntary for the rest of the industrial sector.	1992	AKF, <i>Energy Policy Documents - South Korea</i> www.akf.dk/eng/udland10.htm
	Programs & Projects	Industrial Technologies Program	USA	All industries	Free energy audits for SME's conducted by engineering students from energy centers at specific universities. Goal of the program: increase adoption of energy -efficient equipment and practices, build and broaden energy management, and increase energy awareness among students.	1976, extended 1993	US Department of Energy – Energy Efficiency and Renewable Energy, Industrial Technologies Program www.eere.energy.gov/industry/ www.nrel.gov/docs/fy05osti/38532.pdf
	Programs & Projects	CLASP- Collaborative Labeling & Standards Prg.	World	Selected appliances and equipment	A Global S&L initiative focusing on EE of appliances, equipment and lighting products, specifically in developing countries. Program funded predominately from UNDP, GEF, UNF	1999	CLASP ONline www.clasponline.org/about.php
	Programs & Projects	ENERGY STAR	USA	Selected appliances and equipment	Government-backed labeling scheme program (DoE, EPA) helping businesses and individuals improve EE by introducing voluntary labeling of products, applicable to industries are: heat pumps, lighting, office equipment, ceiling fans, boilers, AC, furnaces.	1992	ENERGY STAR www.energystar.gov US Department of Energy www.doe.gov/energyefficiency/energystar.htm
	Programs & Projects	Energy Labeling Savings Program	Japan	Selected appliances and equipment	Government-backed labeling scheme program that allows customers to compare EE in products. As of 2004, 13 products targeted, 6 of them applicable to industry: ACs, space heaters, gas burning heaters, oil burning water heaters, fluorescent lights, and transformers.	2000	The Energy Saving Center www.eccj.or.jp/eng/e3202energy_saving.html

Policy Category	Policy Type	Title	Country	Target Group	Description	Date Started	Source
Voluntary Instruments	R&D	Research Grants	United Kingdom	All types of industries and businesses	The Carbon Trust gives grants to support Applied Research projects which have the potential to reduce carbon emissions and become a commercial success. Grants are open to R&D projects that demonstrate: genuine innovation, clear need or demand for the outputs of the project and benefits the UK.	NA	The Carbon Trust www.thecarbontrust.co.uk/carbontrust/low_carbon_tech/dlct2_1.html
	R&D	Energy & Research Fund	Taiwan, Republic of China	All industries	The fund financed from 0.5 percent of operating revenues from the sale of petroleum products and electricity is used to conduct R&D on energy efficient technology including: Cogeneration, Heat recovery, Electric heating energy conservation.	NA	Asia Pacific Energy Research Centre, <i>Energy efficiency programs in developing and transitional APEC economies</i> , 2003
	R&D	Venture Capital	United Kingdom	All industries	The Carbon Trust invests in early stage technologies in the low carbon energy field. For all venture capital deals the Trust works with other venture capital and private equity firms as co-investors.	NA	The Carbon Trust www.thecarbontrust.co.uk/carbontrust/low_carbon_tech/dlct2_4.html

Appendix C Abbreviations and acronyms

AIT	Asian Institute of Technology
Btu	British thermal unit (unit of energy in the US defined as the amount of heat required to raise the temperature of one pound avoirdupois of water by one degree Fahrenheit)
CO ₂	Carbon dioxide
DoE	Department of Energy
EE	Energy efficiency
EPA	Environmental Protection Agency (US)
ESCOs	Energy Service Companies
GEF	Global Environment Facility
GHG	Greenhouse gas
GWh	Gigawatt hour
IEA	International Energy Agency
kWh	Kilowatt hour
MEPS	Minimum energy performance standards
MW	Megawatt
NGOs	Non-governmental organizations
RE	Renewable energy
R&D	Research and development
SMEs	Small and Medium Enterprises
S&L	Standards and Labeling
VA	Voluntary Agreement
WEA	World Energy Agency
WEC	World Energy Council
UNESCAP	United Nations Economic & Social Commission for Asia and the Pacific
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNF	United Nations Foundation
WB	World Bank

Appendix D Energy efficiency legislation in GERIAP countries

Year	Country	Law / Regulation / Plan	Focus Area
1986	China	Provisional Regulations on the Administration of Energy Resources Saving	National energy conservation, promotion of productivity in industry
1992	Thailand	Energy Conservation Promotion Act B.E 2535	Energy efficiency
1995	Thailand	Royal Decree on Designated Building & Ministerial Regulations Nos. 1, 2 and 3	Promotion of Energy Efficiency in (commercial & industrial) buildings, mostly voluntary labeling
1995	Indonesia	Master Plan for Energy Conservation for Indonesia	Voluntary labeling
1997	China	Energy Conservation Law of China	Promotion of energy conservation and efficiency, promotion of productivity in industry, mandatory MEPS, voluntary labeling
1997	Sri Lanka	Draft Energy Policy	Optimization of the use of available energy sources to promote socio-economic development
1997	Thailand	Royal Decree on Designated Factories & related Ministerial Regulations	Promotion of energy efficiency in industrial establishments
2001	India	Energy Conservation Act	Energy efficiency, auditing, labeling & standards
2002	Mongolia	Governmental Resolution # 140 Mongolia Sustainable Energy Sector Development Strategy Plan (2002-10)	Financial sustainability, restructuring, capacity building, energy access and affordability, energy conservation
2002	Bangladesh	Draft National Energy Conservation Act	Promote energy conservation
2003	Viet Nam	Decree on Energy Conservation and Energy Efficiency	Encourage efficient usage of energy for living and commercial requirements, control energy use for manufacturing, establish a policy framework and measures for promoting energy efficiency and conservation
2003	Indonesia	The Renewable Energy and Energy Conservation (Green Energy) Policy	Promoting renewable energy investments through economic incentive instruments.