REGULATED INDUSTRIES COMMISSION

# Energy Road Map Series

## Advancing Energy Efficiency/ Energy Conservation in Trinidad and Tobago

June 2019

RIC Staff Discussion Paper

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# LIST OF ACRONYMS AND ABBREVIATIONS

| | | |
|---|---|---|
| AMI | - | Advanced Metering Infrastructure |
| Capex | - | Capital Expenditure |
| Caricom | - | Caribbean Community |
| CFL | - | Compact Fluorescent Light |
| $CO_2$ | - | Carbon Dioxide |
| DR | - | Distributed Resources |
| DSM | - | Demand Side Management |
| EC | - | Energy Conservation |
| ECLAC | - | Economic Commission for Latin America and the Caribbean |
| EE | - | Energy Efficiency |
| EEF | - | Energy Efficiency Fund |
| ESCO | - | Energy Service Companies |
| EU | - | European Union |
| EWS | - | Efficient World Scenario |
| GCC | - | Global Climate Change |
| GDP | - | Gross Domestic Product |
| GHG | - | Green House Gas |
| GoRTT | - | Government of Trinidad and Tobago |
| GWh | - | Giga-Watt Hour |
| HDC | - | Housing Development Corporation |
| IDB | - | Inter-American Development Bank |
| IEA | - | International Energy Association |
| IPP | - | Independent Power Producer |
| LA&C | - | Latin America and the Caribbean |
| LED | - | Light Emitting Diode |
| MEEI | - | Ministry of Energy and Energy Industries |
| MEPS | - | Minimum Energy Performance Standards |
| MOE | - | Ministry of Education |
| MOF | - | Ministry of Finance |
| MPU | - | Ministry of Public Utilities |
| MT&I | - | Ministry of Trade and Industry |
| NEC | - | National Energy Corporation of Trinidad and Tobago Limited |
| NGC | - | National Gas Company of Trinidad and Tobago |
| NGO | - | Non-Governmental Organization |
| OECS | - | Organization of Eastern Caribbean States |
| PEEREA | - | Protocol on Energy Efficiency and Related Environmental Aspects |
| REEBC | - | Regional Energy Efficiency Building Code |
| RIC | - | Regulated Industries Commission |
| RPT | - | Regional Project Team |
| SE | - | Sustainable Energy |
| SEP | - | Sustainable Energy Policy |
| T&TEC | - | Trinidad and Tobago Electricity Commission |
| TTBS | - | Trinidad and Tobago Bureau of Standards |
| TTSER 2021/ 2030 | - | Trinidad and Tobago Sustainable Energy 2021/2030 Roadmap |
| TWC | - | Tradable White Certificates |
| TWh | - | Tera-Watt hour |
| UN | - | United Nations |
| UNECE | - | United Nations Economic Commission for Europe |
| USD | - | United States Dollar |
| VA | - | Voluntary Agreement |

# EXECUTIVE SUMMARY

This Staff Discussion Paper, "*Advancing Energy Efficiency/Energy Conservation in Trinidad and Tobago*", examines the current energy efficiency (EE)/energy conservation (EC) framework and initiatives in place in Trinidad and Tobago. As part of a series of papers on crucial energy issues in Trinidad and Tobago, the authors of this paper seek to stimulate the national dialogue on EE/EC matters and to sensitize key stakeholders of the opportunities and options to advance the uptake of EE/EC at the national level by presenting an approach for advancing EE/EC in Trinidad and Tobago. The paper highlights the role of EE/EC in the country's policy agenda and the major challenges hindering the uptake and roll out of EE/EC programmes and initiatives in Trinidad and Tobago.

Improving energy efficiency in homes, businesses, schools, governments, and industries is one of the most constructive, cost-effective ways to address the challenges of high energy prices, energy security and independence, air pollution, and global climate change. Despite the clear benefits and the success of energy efficiency programs globally, energy efficiency measures remains critically underutilized in Trinidad and Tobago's energy portfolio. All the core imperatives of energy policy, which include reducing energy bills, decarbonisation, air pollution control, energy security, and energy access by all, are better realized with the implementation of robust and holistic energy efficiency policies. By offering cost-effective opportunities to avoid new energy supply, energy efficiency is increasingly being recognized as the world's "first fuel". There are many no cost and low cost EE measures that can be easily implemented.

The local electricity sector has largely relied on supply-side options (new generating capacity) to meet the growing demand rather than significantly employing EE/EC options to control the rate of growth of the electricity consumption over the years. Energy efficiency/conservation is not the sole responsibility of any single entity in the provision and use of energy services in Trinidad and Tobago. There are a number of stakeholders which include: the Government of Trinidad and Tobago (GoRTT) through its executing ministries/agencies; the Regulated Industries Commission (RIC); Trinidad and Tobago Electricity Commission (T&TEC) and the consumers.

Presently, the advancement of EE/EC in Trinidad and Tobago is hampered in the following ways:

- Absence of consistent national energy and energy efficiency policies and specific targets;
- Absence of a cohesive institutional structure for the implementation and administration of said policy, inclusive of the appropriate regulatory and legislative frameworks;
- Lack of dedicated financing mechanisms;
- Low electricity pricing that does not reflect the market price of natural gas; and
- Prevailing consumer behavior marked by the high consumption of electricity, energy and natural gas relative to that of other jurisdictions.

Reform within the energy sector is necessary at this time in order to promote the efficient use of the country's natural gas resources, as well as to establish sustainable mechanisms to advance and finance the implementation of EE/EC initiatives. The following key activities are proposed in order to address the major challenges that have been identified and to advance EE/EC in Trinidad and Tobago:

- Formulation of policy and mandate;
- Establishment of governance frameworks;
- Formulation of appropriate financing mechanisms; and
- Implementing measures to significantly modify consumer behaviour.

Actions that are proposed to be undertaken by the GoRTT include:

- Establish Energy Efficiency/Energy Conservation policy. This policy should be aligned with international commitments, such as, the Paris Agreement ratified in February 2018.
- Establish national EE and Energy Intensity targets based on the estimated reduction to current electricity consumption levels of the various consumer classes modeled after successful implementation schemes in other jurisdictions. Achievement of the targets should be on a phased basis.
- Assess the current institutional structure with respect to the national EE objectives. Identify the shortcomings and successes to inform the revision of the institutional, regulatory and legislative frameworks.

- Review relevant legislation which pertain to electricity generation, such as, the T&TEC and RIC Acts to address any legislative issues and new legislation arising from the adoption of EE/EC practices.
- Consider the establishment of a government agency with combined focus on EE/EC/RE. (GoRTT). This agency could serve as an effective institution[1] with the key role of executing government policies and strategies through the coordination of EE/EC/RE policies and programmes, including programme design, administration, management, monitoring, and evaluation. Combined focus on EE/EC/RE will provide greater leverage in obtaining funding, staffing and other resources.
- Establish a "Energy Efficiency Fund (EEF)" with the objective of providing financing for the implementation of EE programmes and encouraging EE initiatives among a wide range of stakeholders, including government, equipment suppliers and the building industry. The monies for the fund can be sourced from the government (a specific RE/EE tax can be considered), in addition to grants and loans from multilateral development banks.
- Examine and institute direct (rebates) or indirect (subsidies) public benefits funding mechanisms commensurate with the achievable potential for cost-effective energy efficiency.
- Examine the ability of ESCOs to enter into EE investment transactions with clients. ESCOs may seek financing for the EE investments in the client's facilities and recoup payment through the energy savings achieved from the investments. Also consider the formulation of an agency to coordinate the investment financing and equipment procurement for local EE projects that are implemented and performance guaranteed by certified ESCOs.
- Establish EE targets for the transport, residential and business/industrial sectors based on the national targets.
- Ensure that the natural gas used in the production of electricity is priced at the prevailing market rates.
- Conduct the transition in pricing on a phased basis with a commitment to a firm timeline.

[1] The agency's role should be one that takes lead in promoting, supporting, and facilitating the creation of the enabling environment for key stakeholders to execute activities in order to have the best impacts on the local economy, society, and the environment.

- Adjust electricity tariffs in quick succession based on adjustments in the price of natural gas. Until the true cost of electricity is realized, the motivation to implement EE measures will be low and the level of incentives needed will be artificially high.
- Promote EE initiatives through import restrictions, tax deductions on energy efficient appliances and trade-in programmes.
- Establish time frames and provide the resources for the relevant agencies to develop EE standards and issue EE labels on locally distributed household, water heating, heating, ventilation, and air conditioning (HVAC) appliances and buildings.
- Implement a comprehensive public awareness campaign on energy efficiency and energy conservation practices. This will support other initiatives by providing pertinent information to customers in order to fully appreciate the impact of behavioral change with respect to the use of energy efficient technologies and energy conservation measures in reducing their electricity bills. The public awareness campaign should also target the commercial building sector by identifying and providing demonstrations and training programmes on applicable technology and design modifications, that can be used to improve the energy efficiency of newly constructed or renovated buildings.

Actions that are proposed to be undertaken by the RIC include:

- Conduct Regulatory Impact Assessments of the impact of EE/EC initiatives/targets and smart grid investments in order to balance the fundamental goals of affordability, cost recovery (for sustainable utility operations), and fairness of regulatory objectives specified in legislative frameworks.
- Examine utility-based EE initiatives to ensure that outlays are prudent and effective, and include all investments for distributed resources (DR) and EE measures as negative revenue in calculating regulated revenue.
- Review rate-making frameworks and rate design so that prices signal the value to consumers and society of efficiency in the consumption of electricity.

Actions that are proposed to be undertaken by T&TEC include:

- Apply planning frameworks that integrate demand-side efficiency measures into the assessment of overall strategic scenarios to meet electricity-related energy service needs as part of comprehensive Integrated Resource Planning.
- Adjust all electricity billing cycles from a bi-monthly to a monthly period in order to provide T&TEC's customers with a better appreciation of the cost of their monthly energy use rates. Allow for customers to access their consumption data in real-time to assist with demand management efforts.
- Explore the feasibility of a demand side-management programme, structured around the existing advanced metering infrastructure (AMI), aimed at modifying the pattern of electrical consumption across all of the consumption sectors.

# 1. INTRODUCTION

The seventh United Nations (UN) Sustainable Development Goal (SDG7) (2015) seeks to ensure access to affordable, reliable, sustainable and modern energy. Two of the 2030 targets of this SDG relate to doubling the global rate of improvement in energy efficiency and enhancing international cooperation to facilitate access to clean energy research and technology. Thus, over the last decade, many countries have promoted and implemented energy efficiency (EE)/energy conservation (EC) efforts as a means of reducing the demand of traditional energy resources. Although energy efficient technologies have been developed and continuously improved over the years, the realization of large scale energy savings continues to be a significant challenge for most countries as they neither establish the enabling environment nor clearly define EE objectives/targets.

In assessing the efficiency of the use of energy in Trinidad and Tobago, the average electric power consumption per capita for the world in 2014 was 3,127 kWh per capita and for the Latin American and the Caribbean (LA&C) region it was 2,129 kWh per capita[2]. The consumption in Trinidad and Tobago[3], Suriname and Jamaica in 2014 was 7,134 kWh, 3,632 kWh and 1,056 kWh per capita respectively in that year[4]. It is therefore apparent that Trinidad and Tobago's consumption of electricity per capita was significantly higher than the world and LA&C averages.

Through technical assistance from the European Union (EU) the "Trinidad and Tobago Sustainable Energy 2021/2030 Roadmap (TTSER 2021/2030)" document was produced in 2017. The Roadmap indicated that EE upgrades in the generation plants of the existing Independent Power Producers (IPPs) can lead to significant fuel/energy savings and avoided $CO_2$ emissions. Also it was indicated that EE options on the demand side including demand side management (DSM)[5], have the potential of achieving at least 10% of savings (reduction in the load demand) up to the year 2022. However, the Government of Trinidad and Tobago (GoRTT) is yet to establish a Sustainable Energy Policy (SEP) for the country.

[2] World Bank Database - Electric power consumption (kWh per capita)
[3] Trinidad and Tobago is one of the most industrialized countries in the English-speaking Caribbean
[4] World Bank Database - Electric power consumption (kWh per capita)
[5] DSM includes load management, energy efficiency and electrification. Load management includes peak dipping, valley filling and load shifting. Energy efficiency involves a reduction in overall energy use. Electrification involves load building over all hours, inclusive of the development of new markets and customers.

The local electricity sector has, thus far, largely relied on supply-side options to meet the growing demand rather than significantly employing EE/EC options to control the rate of growth of the electricity consumption. Ultimately, demand reduction locally will depend on end users making informed decisions, which it is hoped will change the behavioural patterns that drive electricity consumption. This paradigm shift would require the use of a number of different mechanisms in the sector to bring about positive change. The Regulated Industries Commission (RIC), the regulator, and the Trinidad and Tobago Electricity Commission (T&TEC), the sole distributer of electricity, has each published conservation information targeting primarily residential customers[6]. More recently, RIC's pamphlets on energy conservation and usage have been included in the envelopes of T&TEC's customer bills. The general aim has been to educate this class of customers on the benefits of energy conservation practices and the use of energy efficient technologies.

## Purpose of Document

The purpose of this paper is to examine the current EE/EC framework and initiatives in place in Trinidad and Tobago. In this regard, the paper will highlight the role of EE/EC in the country's policy agenda and the major challenges hindering the uptake and roll out of EE/EC programmes and initiatives in Trinidad and Tobago. An approach for advancing EE/EC in Trinidad and Tobago will be discussed drawing on research of policies, programmes and practices in regional and international jurisdictions.

It aims to discuss:

- Fundamental aspects (legislation, licensing, pricing regime, and initiatives) of EE/EC;
- The EE/EC Sector in Trinidad and Tobago as it relates to the various stakeholders: Government; Regulator; Service Providers; and Consumers;
- Best practices and implementation frameworks in other jurisdictions; and
- The role of the various stakeholders to best advance the EE/EC Sector in Trinidad and Tobago.

[6] "Save money on your next electricity bill" - RIC.
"Appliance usage and its impact on your bill"; "Conserve Energy". – T&TEC.

## Structure of Document

The rest of this document is structured as follows:

**Section 2: The Case for Energy Efficiency/Energy Conservation**

**Section 3: State of Energy Efficiency/Energy Conservation Efforts – Trinidad & Tobago**

**Section 4: Energy Efficiency Implementation – Key Considerations**

**Section 5: Proposed Approach for Advancing Energy Efficiency/Energy Conservation in Trinidad and Tobago**

**Section 6: Appendix**

## Responding to this Document

All persons wishing to comment on this document are invited to submit their comments. Responses should be sent by post, fax or e-mail to:

Executive Director
Regulated Industries Commission
#37 Wrightson Road
Port-of-Spain, Trinidad

**Tel.** : 1(868) 625-5384; 627-7820; 627-0821; 627-0503
**Fax** : 1(868) 624-2027
**Email** : ricoffice@ric.org.tt
**Website** : www.ric.org.tt

# 2. THE CASE FOR ENERGY EFFICIENCY/ENERGY CONSERVATION

The management of energy and improving energy efficiency has long been an important issue worldwide. Energy efficiency practices initially began in the 1970's after the world's first oil crisis, and was commonly referred to as "energy conservation efforts". While the concepts of energy efficiency and energy conservation are not synonymous, they both share the common goal of reducing energy consumption. Furthermore, the techniques and approaches employed today by governments worldwide to reduce energy consumption, are largely considered to be a natural evolution of those developed more that forty years ago and EE is recognized as promoting EC.

Energy conservation essentially focuses on reducing the need for energy, often by trying to alter the mindset and behaviour of energy users (e.g. turning off lights and unplugging home appliances when not in use). Whereas, the paradigm underlying energy efficiency stresses that, if energy must be used, its consumption should at least be as productive as possible. Advances in science and technology over the years have resulted in products and services that utilize less energy (e.g. energy-saving compact florescent and led bulbs, smart appliances, and fuel-efficient cars). Energy efficiency essentially increases the 'services' derived from each unit of energy, which is particularly important given that energy demand typically rises with population growth, development and rising incomes.

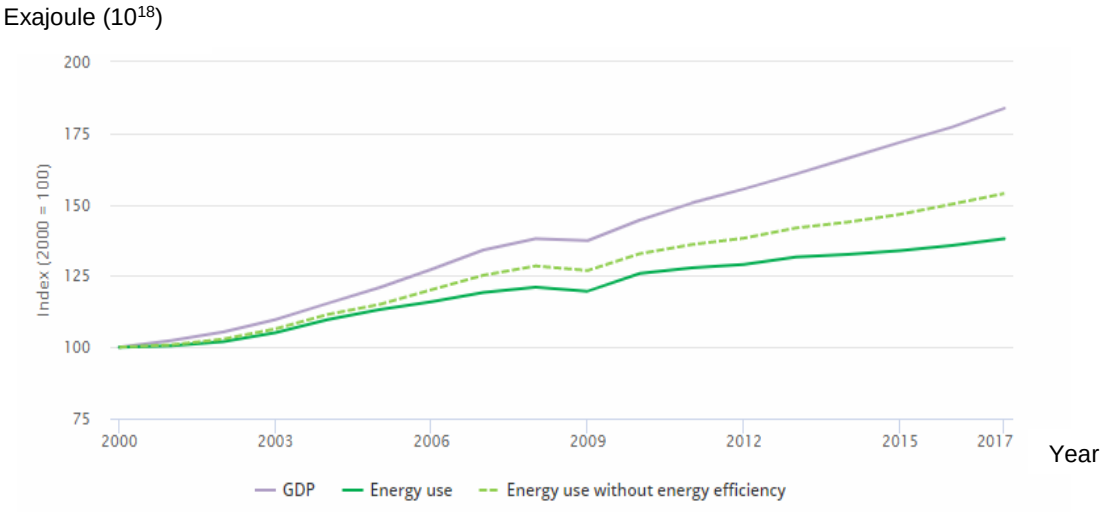
Beyond reduced energy demand and associated cost savings, energy efficiency improvements can deliver multiple benefits (i.e. economic, social and environmental) to many different stakeholders. Thus, it is becoming increasingly clear that energy efficiency has to be an important consideration when formulating energy policy. All the core imperatives of energy policy, which include reducing energy bills, decarbonisation, air pollution control, energy security, and energy access by all, are better realized with the implementation of robust and holistic energy efficiency policies. As the world transitions to clean energy, efficiency measures can make the transition cheaper, faster and more beneficial across all sectors of our economies. There can be no feasible energy development strategy that is not led by energy efficiency objectives. By offering cost-effective opportunities to avoid new energy supply, energy efficiency is increasingly being recognized as the world's "first fuel". There are many no cost and low cost EE measures that can be easily implemented.

## 2.1 Global Perspective

Energy efficiency is gaining increasing momentum as it remains at the centre of international policy discussions, including the Paris Agreement and the UN SDG7. As of 2015, 146 countries had some form of energy efficiency policy and 128 countries had at least one energy efficiency target.

The impact of efficiency policies has been significant over the last two decades. It is estimated that globally, efficiency gains since 2000 prevented 12% more energy use than would have otherwise been the case in 2017 (see figure 1). Efficiency gains also prevented both an estimated 12% more in greenhouse gas emissions and 20% more in fossil fuel imports[7]. This is an indicator that energy efficiency has been a major driver for uncoupling energy consumption from economic development.

**Figure 1: Global Final Energy Use with and Without Energy Efficiency (2000-2017)**



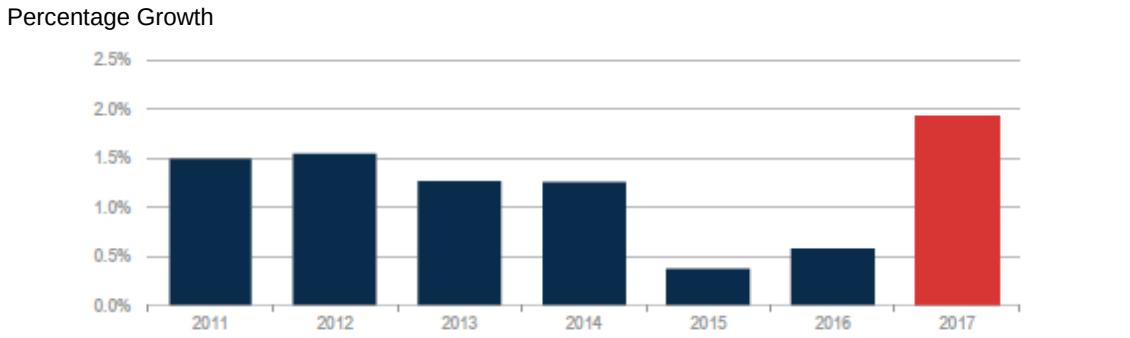

**Source: International Energy Agency, Energy Efficiency 2018: Analysis and outlooks to 2040**

Since 2000, energy efficiency improvements in the world's major economies have offset more than a third of the rise in the demand for energy due to energy-intensive activities[8]. However, the positive impact of energy efficiency policies has been overwhelmed in emerging countries by fast-growing economic activities that boost energy demand. As a result, the percentage growth in

[7] International Energy Agency Energy Efficiency Report (2018)
[8] Ibid., pp 13.

energy use has been accelerating, with global energy demand rising by nearly 2% in 2017[9] (see figure 2). This rise, which is the fastest of this decade, was largely driven by economic growth and changes in consumer behaviour.

**Figure 2: Percentage Change in Global Primary Energy Demand (2011-2017)**




**Source: International Energy Agency, Energy Efficiency 2018: Analysis and outlooks**

According to the IEA, the world is missing opportunities to improve energy efficiency and today's policies are not delivering the full potential gains that are cost-effective with current technology. Delayed action in implementing energy efficiency measures ends up locking in inefficiencies that will result in much stronger action to be taken in the future. The IEA has projected that if stronger energy efficiency policies were in place in 2017, the world could have saved for that year more than[10]:

- 2.2 million barrels of oil per day, if all countries had adopted the best passenger fuel economy standards;
- 16% of industry electricity use, if all countries had adopted the strongest electric standards, and
- USD 20 billion on electricity bills, if everyone had purchased the top 10% most efficient refrigerators.

## 2.2 Regional Perspective (Latin America and the Caribbean)

The countries in the LA&C region have made progress in energy efficiency over the last two decades, resulting in savings albeit to varying degrees. The pioneers of energy efficiency within

[9] International Energy Agency Energy Efficiency Report (2018)
[10] International Energy Agency (2019). Energy efficiency 2018. Analysis and outlooks to 2040. Retrieved from https://www.iea.org/efficiency2018/

LA&C, such as, Argentina, Brazil, Chile and Mexico, have made important advances. However, these advances seem insignificant considering the levels of emission reductions needed in the fight against climate change, to which the region is highly vulnerable. Thus, the potential to realise further energy efficiency gains within the region is high.

The Economic Commission for Latin America and the Caribbean (ECLAC) has shown that a number of countries – e.g. Panama, Peru, Uruguay and Venezuela – have implemented specific energy efficiency laws, while others have more general energy transition laws, such as Mexico and some Central American countries. Within the Caribbean Community (CARICOM), the scale of energy efficiency progress has arguably been smaller. Notwithstanding this, Caricom member countries continue to benefit from regional collaborations with various institutions, such as ECLAC, the Organization of Eastern Caribbean States (OECS) Commission and the EU, among others in developing new energy efficient tools, improving energy efficiency in buildings, and establishing a common regional energy efficient strategy respectively.

There has been a greater dependence on fossil fuel imports in the LA&C region due to economic growth that is closely linked to energy consumption. This is of particular concern for many countries in the Caribbean, where electricity prices are generally high as a result of the high cost of the imported fossil fuel used for electricity generation. The energy efficiency performance of the LA&C region in 2012, across key economic sectors is summarized below:[11]

- *Buildings* – this sector accounted for 16% of the total final energy consumption in the LAC in 2012, and is likely to increase with the expansion of urban areas and with further economic growth and improvement in the standard of living.
- *Light appliances and Equipment* - many countries already have mandatory energy labelling schemes for some appliances and equipment, particularly for refrigerators. However, the number of countries with minimum energy performance standards (MEPS) was much lower. The introduction of standards and a transition to more energy efficient refrigerators, air conditioners and electric fans in households in the region could result in annual energy savings of 138 TWh.

[11] IEA Energy Efficiency Report (2015).

- *Transport* - this sector represented approximately 36% of the total final energy consumption in the region in 2012. Increasing demand for mobility in the region has been causing a number of challenges for transport system planning and infrastructure, especially in Latin American cities. The percentage of freight movement through road transport has been very high compared to other freight transport modes and the purchase of light and heavy duty vehicles is expected to continue to rise, resulting in greater congestion, air pollution and fossil fuel consumption which will affect economic productivity, health and energy security.
- *Industry* - this sector, which is a key driver of economic growth, represented 32% of the total final energy consumption in the region in 2012. The most common energy-intensive industries present in the region are agro industry, mining, chemicals, pulp and paper, iron and steel and cement.

## 2.3 Opportunities for Efficiency Improvements Globally

The IEA has developed an Efficient World Scenario (EWS) which is essentially a model of what the world could look like if, between 2019 and 2040, all countries achieved all the economically viable energy efficiency potential that is available. The model projects a world with 20% more people, 60% more building space and double the GDP, all with a **marginal rise** in energy demand. The model further shows that the energy efficiency target of SDG7 would be met. All of the measures implemented in the EWS are cost-effective, based on energy savings alone, and use technologies that are readily available today.

Despite several highly cost-effective investment opportunities in energy efficiency, the global investment in energy efficiency is not on track to achieve the results projected under the EWS[12]. The IEA has, therefore, established a strategy which maps out the priority sectors, technologies and policy actions for achieving the full potential benefits of energy efficiency. The opportunities summarized in table 1 represent substantial energy savings that could be unlocked through targeted policy measures, combining regulation, incentives, market-based instruments, information and capacity building measures and other tools.

[12] International Energy Agency Energy Efficiency Report (2018)

**Table 1: Summary of the IEA's Strategy**

| Sector | Opportunity | Key governmental policy actions |
|---|---|---|
| **Transport** | • Energy demand could stay flat, despite doubling activity levels.<br>• Passenger cars and trucks offer two-thirds of potential savings. | • Improve coverage and strength of transport policies for cars and trucks and non-road modes.<br>• Provide incentives to support uptake and sustainable use of efficient vehicles. |
| **Buildings** | • Building space could increase by 60% for no additional energy use.<br>• Space heating, cooling and water heating offers 60% of potential savings. | • Put in place comprehensive efficiency policies, targeting both new and existing building stock and appliances.<br>• Incentives to encourage consumers to adopt high efficiency appliances and undertake deep energy retrofits. |
| **Industry** | • Value-added per unit of energy could double.<br>• Less energy-intensive industry offers 70% of potential savings. | • Expanded and strengthened standards for key industrial equipment, including electric heat pumps and motors.<br>• Incentives to encourage the adoption of energy management systems. |
| **Investment** | • Investment must immediately double, and double again after 2025.<br>• The returns from investment in the Transport sector presents the largest potential. | • Build scale and momentum in financing using programmes and incentives to increase activity.<br>• Market-based instruments to encourage investment. |

**Source: IEA Energy Efficiency 2018. Analysis and Outlooks to 2040**

For implementation of the IEA's strategy to be effective, government policies need to be tailored, dynamic and supported. Governments can maximize the effectiveness of energy efficiency policy by enacting ambitious measures, with appropriate follow-up and enforcement. It cannot be stressed enough that governments also have a role in ensuring market readiness to deliver efficiency improvements, and in evolving programmes, using monitoring and evaluation, in order to increase up-take as technology develops and costs fall.

# 3. STATE OF ENERGY EFFICIENCY/ENERGY CONSERVATION EFFORTS – TRINIDAD & TOBAGO

In Trinidad and Tobago, supply and demand-side energy efficiency options have the potential to reduce energy costs to consumers, by reducing both the quantity and cost of electricity used. The key to reducing the costs of electricity is achieving better utilization of existing assets, deferring the need for new capital expenditure on additional capacity and promoting EE while concurrently replacing assets that are no longer economical to keep in service. Energy efficiency/conservation is not the sole responsibility of any single entity in the provision and use of energy services in Trinidad and Tobago. There are a number of stakeholders which include: the GORTT through its executing ministries/agencies; the RIC; T&TEC and the consumers.

Presently, the advancement of EE/EC in Trinidad and Tobago is hampered in the following ways:

- Absence of consistent national energy and energy efficiency policies and specific targets;
- Absence of a cohesive institutional structure for the implementation and administration of said policy, inclusive of the appropriate regulatory and legislative frameworks;
- Lack of dedicated financing mechanisms;
- Low electricity pricing that does not reflect the market price of natural gas; and
- Prevailing consumer behavior marked by the high consumption of electricity, energy and natural gas relative to that of other jurisdictions.

Reform within the energy sector is necessary at this time in order to promote the efficient use of the country's natural gas resources, as well as to establish sustainable mechanisms to advance and finance the implementation of EE/EC initiatives. The GORTT has instituted a few incentives designed to encourage the implementation of EE practices in the residential, commercial and industrial sectors. However, the impact of these incentives has not been far reaching due to a number of reasons. While there has also been dissemination of public awareness tips on how to conserve energy through the print and digital media, uptake has been marginal, mainly due to the relatively low price of electricity. Another important factor to consider with respect to the uptake of EE practices is the significance of consumer behaviour. Different studies have been conducted examining the potential impact of behavioural change on the outcome of EE programmes. It has been shown that when more frequent and specific feedback on electricity usage is provided to

consumers, there is a greater level of application of EE practices[13]. On a positive note, it may be anticipated that the impact of the rebound effect [14] for the residential class of customers in Trinidad and Tobago could possibly be lower than what has been observed in other jurisdictions due to the fact that electricity consumption levels are already high.

In the Trinidad and Tobago Sustainable Energy 2021/2030 Roadmap (TTSER 2021/2030) it was quoted that a 2008 IDB study had indicated that Trinidad and Tobago could save the equivalent of 980 GWh of electricity over the period 2008 – 2018, if EE across all sectors was improved by 10% during that time frame. It was estimated that the cost of implementation of EE measures would be approximately USD 115 million as opposed to an estimated capital expenditure (Capex) cost of USD 365 million to set up additional gas fired open cycle generation plants to meet that demand. However, without the enabling environment in place for the coordinated and large scale implementation of EE/EC measures, this projection in energy saving was not achieved.

## 3.1 Policy Framework

Over the years, the GoRTT has formulated environmental policies, such as, the "National Environmental Policy" (2018) and the "National Climate Change Policy" (2011). These policies have articulated the need for the conservation and efficient use of the country's resources. Subsequently, the "Framework for Development of a Renewable Energy Policy for Trinidad and Tobago" (2011) identified that EE and EC considerations are essential elements of RE policy implementation while the "Medium Term Policy Framework 2011-2014" (2011) outlined, in greater detail, specific EE/EC measures that should be employed in different sub-sectors of the Energy sector. More recently, the "Strategy for Reduction of Carbon Emissions in Trinidad and Tobago, 2040" (2015) also outlined a number of EE/EC measures that should be implemented. However, the lack of an explicit EE policy framework certainly hinders the country's progress in seeking the most efficient use of existing resources to support economic growth along with a possible reduction in energy costs.

[13] Carrie Armel "Behavior & Energy" 2008. Standford University's Precourt Institute of Energy Efficiency.
[14] A behavioral response to the reduction in energy costs caused by an improvement in technical efficiency: as the cost of using energy is reduced due to efficiency improvements, there is the tendency for longer periods of utilization of energy efficient appliances, thereby offsetting the energy savings made possible by the efficiency improvements.

## 3.2 Institutional Structure

The Ministry of Energy and Energy Industries (MEEI) is the principal ministry responsible for coordinating energy, EE and renewable energy (RE) activities in Trinidad and Tobago. It has formed a number of committees to address various issues/matters related to EE and has encouraged the participation of various stakeholders, such as, other government agencies, regulator, utility, private sector companies and non-governmental organizations (NGOs) on these committees. However, the research presented in section four will show that the formation of a dedicated agency to champion energy efficiency and/or renewable energy rather than having an energy ministry undertake this responsibility as part of its portfolio has been a more successful way for advancing the EE/EC agenda in other jurisdictions.

As the economic regulator for the water and electricity sectors, the RIC regulates tariffs and charges. The Regulated Industries Commission Act, 1998 (the Act), requires the RIC to consider regulatory principles and objectives, relevant to efficiency, in the course of its duties, including:

- financial viability and sustainability of the service providers;
- maximum efficiency in the use and allocation of resources to ensure as far as is reasonably practicable, that services are reliable and provided at the lowest possible cost;
- the impact on customers and the public interest; and
- the national environmental policy.

The above objectives broadly point to the need to consider the most efficient means of consuming electricity and the benefit of delaying the need for additional electricity generation, least cost planning and pricing policies that protect the environment. The RIC has focused on mechanisms aimed at incentivising the service provider to undertake specific activities to improve efficiency. In making its Final Determination (Rates and Miscellaneous Charges) for the Electricity Transmission and Distribution Sector in 2006, the RIC required that T&TEC consider price related DSM techniques, such as, rate restructuring and load shifting and non-price related DSM techniques, such as, promoting EE appliance usage and consumer education programmes.

T&TEC is the sole transmitter and distributor of electricity in Trinidad and Tobago. Due to the extent of its responsibilities and the authority granted under legislation it also purchases the natural gas used by the independent power producers (IPPs) to generate electricity.

## 3.3 Legislation and Regulations

There is currently no tangible enabling environment for the uptake of EE/EC in Trinidad and Tobago. The potential benefit of EE/EC can only be realized with the establishment of an overarching legislative framework in conjunction with mandatory EE standards formulated from the directives of an EE policy. The Trinidad and Tobago Bureau of Standards (TTBS) is presently developing national EE standards for lighting and appliances. The completion of this exercise combined with the labeling of the EE ratings of household appliances and equipment is an important step towards the successful implementation of EE initiatives. The TTBS is a member of the Regional Project Team (RPT) established to develop a Regional Energy Efficiency Building Code (REEBC). The REEBC is expected to address all of the aspects of energy use in buildings which comprise of, but are not limited to: thermal performance requirements for walls, roofs and windows; day lighting, lamps and luminaire performance; energy performance of chillers and air distribution systems; the electrical wiring system; solar water heating; appliances; renewable energy; zoning of buildings, climate classification and building energy management systems. The adoption and enforcement of a ratified REEBC will be a major driver for the integration of EE design in newly constructed and renovated buildings.

## 3.4 Financial and Fiscal Incentives

The current financial and fiscal incentive framework is limited and has not been fully implemented. At present, the fiscal incentive for residential customers is a 25% tax credit that can be claimed on the cost of acquiring solar water heating installations with the maximum limit set at TTD 10,000. In the case of commercial, light and heavy industrial companies there is a 150% Tax Allowance incentive for the cost of their EE investments once the company achieves at least a 15% reduction in their energy consumption after implementation of an EE programme. The commercial consumers are required to engage Energy Service Companies (ESCOs) to identify their energy savings potential and implement energy savings projects on their behalf. However, the drawback with this incentive mechanism is the fact that the framework to certify and administrate ESCOs has not been established by the GoRTT. The ESCOs present cannot make any recommendation for the award of the tax incentives. A Sustainable Energy Policy (SEP) has to be implemented and will have to treat with broader incentives and regulations in order to better incentivize the

implementation of EE initiatives for both the supply and demand of electricity sectors in Trinidad and Tobago.

## 3.5 Potential for the uptake of EE/EC with respect to Customer Class

The local electricity sector has, thus far, largely relied on supply-side options to meet growing demand rather than engaging in EE options to control the rate of growth. Part of the growth in demand can be attributed to the wasteful consumption of electricity arising from relatively low electricity rates. Ultimately, demand reduction would depend on end users making informed decisions and thus changing their behavioural patterns. To bring about such a change, it may become necessary to employ a number of different mechanisms to encourage or stimulate demand reduction, such as:

- establishing mandatory performance codes and minimum standards applied to appliances and equipment and the specification of a minimum level of energy performance. Equipment and appliances not meeting minimum standards should not be sold;
- rewarding energy efficiency practices through economically efficient pricing (pricing energy to reflect the costs of supply makes the opportunity costs and reward for energy efficiency clear to all);
- promoting public awareness through extensive public education campaigns and programmes; and
- providing incentives to support the development and use of innovative technologies.

Energy efficiency practices can be undertaken by all classes of consumers, such as, residential, non-residential and industrial. The non-residential class of customers can be broken down into two groups with distinct outlooks with respect to energy efficiency; private business enterprises inclusive of the service industries (**Commercial**), and public and (**State Enterprises**). Industrial customers can also be distinctly classified as either small or large industrial customers. Therefore, the different consumer groupings in Trinidad and Tobago to be discussed within the context of this paper will be:

- Residential
- Commercial/ Tourism/ Small Industrial
- State Enterprises
- Large Industrial

On the basis of the analysis presented in the TTSER 2021/2030, the residential sector stands to amass the highest amount in aggregate energy savings from the use of the energy efficient technologies in the areas of lighting, air-conditioning and household appliance use. Energy savings could amount to 930 GWh compared to 10 GWh for hotels and 33 GWh for industrial consumers. The Commercial/State Enterprises sectors have the potential to achieve higher levels of energy efficiency in the areas of lighting, air-conditioning, motors, and cooling/heating. The Small Industrial sector should benefit by upgrading their lighting and motor equipment.

**Residential Consumers**

EE in the residential sector can include a range of options such as the replacement of incandescent lamps with compact fluorescent lamps and leds, replacement of less efficient appliances with more efficient models, use of efficient electrical water heaters showerhead/ tank, etc. Despite the benefits of reduced energy costs as a result of investing in EE technologies, there are many impediments/barriers for success, such as, the upfront costs and the lack of public awareness/information on the benefits of EE/EC. In the TTSER 2021/2030 it was projected that USD 413 million in Capex could result in an aggregate energy savings of 930 GWh. The following are some EE measures that could have a fair chance of success among the residential class of customers:

- efficient lighting
- efficient appliances
- efficient water heating
- efficient cooling of buildings

**Commercial/Tourism and Small Industrial Consumers**

In these sectors, the main load arises from the use of lighting, and heating, ventilation, and air conditioning (HVAC) systems. The types of EE measures that redound in savings include the use of high efficiency motors and fans, lighting upgrades and upgrades of electrical office equipment. The engagement of ESCOs by these consumer groups to identify savings potentials and implement energy saving projects should materialize once tangible incentives, such as, the 150% tax allowance proposed by the GoRTT, can be accessed by those consumers that implement EE measures.

**State Enterprises**

The public sector's energy demand in most countries is usually a significant percentage of the commercial demand. Thus, the potential for the integration of EE initiatives is higher within this sector due to the government's capacity and capability to implement the necessary measures. Publicizing any positive outcomes of EE practices in the public sector may have a motivating effect in stimulating consumers in other sectors to implement proven measures. The potential for energy savings varies among different public sector activities. Available cost savings measures include both simple, low cost actions, such as installing efficient lighting, turning off lights when spaces are not in use and more complex and time-consuming improvements in building retrofits, and other infrastructure systems. No position has been articulated with respect to implementing EE initiatives within the office spaces utilized by governmental agencies or the large scale housing developments constructed under the GoRTT's housing initiative. The link between water and energy presents the climate change community with a valuable opportunity to better manage two of the world's most valuable resources. Hence the production and distribution efficiencies of the state run water utility should be optimized to ensure that minimal energy is used for portable water that does not reach consumers.

**Large Industrial Consumers**

Energy efficiency has been an area of concern for these consumers. This sector can further benefit from the accurate monitoring and reporting of the EE efforts being undertaken. The greatest gains that can be achieved through improved EE in the industrial sector will arise from the use of:

- high efficiency motors and variable speed drive systems;
- improved process heating controls; and
- energy efficient lamps and ballasts.

# 4. ENERGY EFFICIENCY IMPLEMENTATION – KEY CONSIDERATIONS

The circumstances which hinder the implementation of a comprehensive strategy for the effective roll-out of EE/EC are not unique to Trinidad and Tobago. In many countries, the implementation of EE faces a number of challenges/barriers, the most crucial of which include: no formal EE policies or the establishment of poorly drafted EE policy; weak institutional structure to determine the best suite of EE programmes and activities; inadequate support and financing for programmes and low technical capacity at many levels. In order to fully benefit from the implementation of a national EE strategy, countries like Trinidad and Tobago must address their deficiencies in the areas highlighted above. Within this context it is perhaps useful to discuss the various approaches adopted worldwide to address deficiencies in policy and implementation before proposing an approach that is appropriate for Trinidad and Tobago.

Broadly, countries can harness the tremendous opportunity that exists for the uptake of EE measures and technologies. This can be achieved by committing to good governance arrangements supported by an enabling policy framework which is data driven. This type of environment will facilitate efficient investment decisions which can positively impact EE/EC initiatives. It is also useful for countries to adopt EE policy to sufficiently address their respective development needs, inclusive of the vision for the local energy sector and relevant sustainability considerations. In addition, cross-sectoral EE policies usually lay the foundation for the energy utility policies and operational policies for the residential, transport and business sectors. Key EE measures are then designed for each sector. The implementation of a sound institutional structure will ensure proper collaboration/coordination between important stakeholders, independence and flexibility in decision-making and the provision of adequate technical and financial resources. The following steps are critical when designing or modifying institutional frameworks to meet a country's overarching EE policy goals and enable its policy framework[15]:

- Define the country context and the need for institutional structure for EE implementation;
- Define the specific objectives and or goals for the EE agency;
- Define the major consuming sectors to be addressed by the agency;

[15] World Bank Institutional Frameworks and Policies for Energy Efficiency Implementation (2006)

- Define the major barriers;
- Assess the existing institutional structure(s);
- Define the types of "mechanism" needed;
- Determine the potential funding sources;
- Define the need for a new or modified institutional framework;
- Assess the legislative or other mechanisms needed;
- Learn from the experience of other countries; and
- Develop the strategy and plan for establishing the new or modified institutional framework.

## 4.1 Best Policy Practices

A number of agencies have reviewed and collated information on the progress made with respect to EE policies, and have developed a number of EE policy recommendations to provide a useful portfolio of cost effective options for countries to consider in the context of their economies. In identifying best policy practices for promoting EE, policy evaluations should focus on the following four (4) key attributes:[16]

i. **Significant outcomes**. An ability to contribute to a large energy demand reduction and significant multiple benefits. Best practices are those policies that have demonstrated that they produce or are essential to delivering significant quantifiable results;

ii. **Complementarity**, synergies and integration attributes enable an easy fit with other national, regional and international efforts, ensuring ease of implementation and a supportive complementarity with other policies;

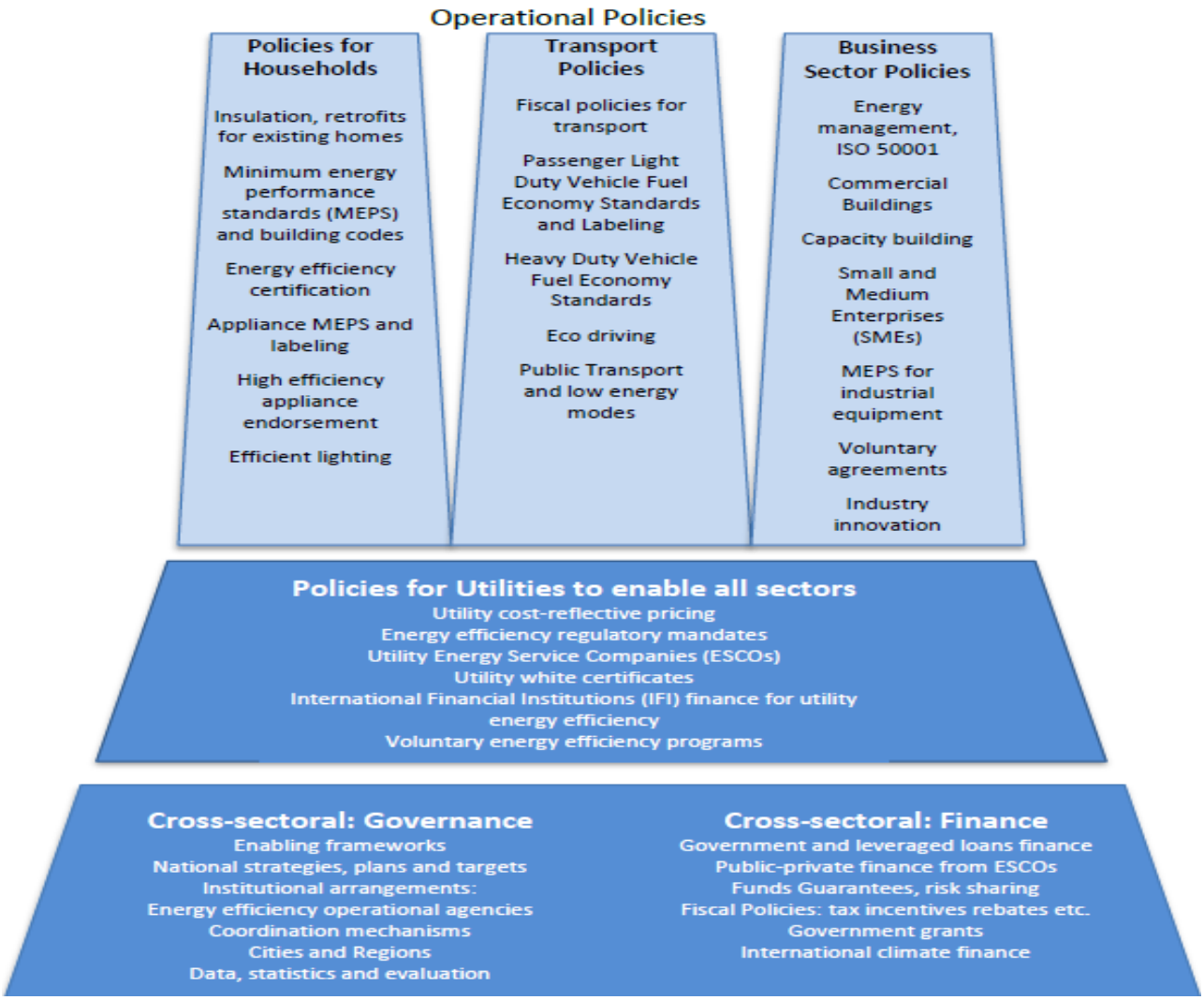
iii. **Political alignment**, governance and accountability attributes help ensure policies are politically palatable and are likely to work and persist in multi-layer governance frameworks where national, regional and local governance influence effectiveness of policies and enable outcomes; and

iv. **Marketability** and market impact ensure polices can and will work in the global and local markets that supply energy efficient technologies, are attractive to decision makers, and are likely to attract investment finance.

[16] Best Policy Practices for Promoting Energy Efficiency (2015). United Nations Economic Commission for Europe.

Figure 3 presents a policy mix[17] of best practice policies for promoting energy efficiency. The design of this policy mix is hierarchal, with cross-sectoral policies as the foundations for energy utility policies and operational policies in the residential, transport and business sectors. Governments implementing these best policy practices have been rewarded with high rates of return from lower energy costs, reduced health costs due to better living conditions, improved productivity for businesses, and improved access to energy, over the past two decades. However, an enabling framework of governance and financial policies remains the key challenge in most countries.

**Figure 3: Best Practice Policies for Promoting Energy Efficiency**




**Source: United Nations Economic Commission for Europe. Best Policy Practices for Promoting Energy Efficiency (2015).**

[17] A combination of policy instruments aimed at the achievement of a national target.

## 4.2 Institutional Frameworks

Institutional frameworks should broadly include enabling mechanisms (e.g. laws or decrees), oversight of government policy strategies, EE implementation, for example, program design and administration, goods and services delivery, and results monitoring. With respect to EE implementation, developing an institutional structure that is capable of helping achieve desired EE goals or targets, well suited to the market and prevailing economic conditions, and acceptable to stakeholders is an important input to a successful outcome[18]. While the institutional framework provides the basis for interventions designed to overcome market, economic, and technical barriers, it should also reflect the unique economic, technical, governmental, and political characteristics and capacities of a particular country. The framework can also comprise of either new or existing organizations in either the public or private sector or involving public–private partnerships.

The main elements of institutional models and practices that have proved to be effective in promoting EE investments, particularly in the end-use (industry, buildings, residential) consuming sectors are summarized in table 2. [19] Seven distinct institutional models, ranging from government agencies to privately owned entities have been distiguished. Notably, governments have been moving away from the broad-based national energy agencies (Model 1) to the more specialized agencies focused on EE and related clean energy investments (Models 2 and 3). However, adequate dedicated funding needs to be assured. Independent statutory authorities (Model 4) or government owned corporations (Model 5) have been formed more recently. To a smaller extent, there have also been a few public-private partnerships (Model 6) and non-governmental implementation frameworks (Model 7). It is noted that the range of policies and programs does not vary much for the different institutional models.

**Table 2: Comparison of Institutional Models for Energy Efficiency Implementation**

| Model | Description | Advantages | Limitations |
|---|---|---|---|
| 1 | Government Agency with broad-based energy responsibilities | - Greater credibility with stakeholders<br>- Larger resource availability<br>- Greater leverage in obtaining government funds | - EE may get low priority in funding and activities<br>- EE function may become secondary to broader energy priorities |

[18] An Analytical Compendium of Institutional Frameworks for Energy Efficiency Implementation (2008). World Bank Energy Sector Management Assistance Program.
[19] World Bank Institutional Frameworks and Policies for Energy Efficiency Implementation (2006)

| Model | Description | Advantages | Limitations |
|---|---|---|---|
| | **Examples present in USA, Denmark, Thailand, China.** | - Ability to obtain funds for EE programs | - Slower & cumbersome decision-making<br>- Difficulty in retaining staff |
| 2 | Government Agency focusing on EE/RE/SE/GCC<br><br>**Examples present in France, Sweden, Mexico, Brazil.** | - Agency focus consistent with EE<br>- Commonality of goals, functions, etc. within agency<br>- Easier to attract dedicated staff<br>- Combining EE & RE provides greater leverage in obtaining funding, staff & other resources | - Smaller size provides less leverage<br>- Potentially decreased emphasis on EE because RE is preferred due to its more tangible and high capital intensity<br>- EE may not get adequate attention from top management |
| 3 | Government Agency focusing entirely on EE<br><br>**Examples present in New Zealand, India, Japan, South Africa.** | - Focus entirely on EE; staff dedicated to EE<br>- Ability to design an EE program better<br>- With dynamic management, agency can leverage funds<br>- Possible leveraging of other resources | - Agency likely to be located in a larger organization, with a focus other than EE<br>- Without an aggressive and dedicated top management, agency may not be successful in obtaining resources |
| 4 | Independent Statutory Authority focusing on EE and RE/SE<br><br>**Examples present in U.K., Ireland, Greece, Nova Scotia in Canada.** | - Independence facilitates operation<br>- Can obtain external advice (and possibly funding)<br>- More rapid and flexible decision-making | - Agency may not be viewed as "mainstream" by stakeholders<br>- May not have sufficient leverage for obtaining increased funding<br>- May be difficult to change scope of activities and budget |
| 5 | Independent Corporation owned by the Government<br><br>**Examples present in Korea, Finland, Norway.** | - Focus on EE leads to better program design<br>- Independence allows greater freedom and flexibility in decisions<br>- Flexibility to obtain external inputs and funds | - May be more difficult to obtain government funding (unless allocated in the official budget)<br>- Board is generally appointed by Government and needs to be carefully selected to represent the relevant stakeholders |
| 6 | Public/Private Partnership<br><br>**Examples present in Poland, Germany.** | - Flexibility in obtaining private sector inputs (and possibly funding)<br>- Independence allows greater freedom and flexibility in decisions | - Potential conflicts between public and private perspectives<br>- May be more difficult to obtain government. funding (unless allocated in the official budget) |
| 7 | Non-Governmental Organization (NGO) | - Greater credibility with some stakeholders<br>- EE focus allows better program design | - More difficult to obtain government funding<br>- Difficult to take on a greater role in implementation<br>- Some stakeholders may find the NGO not credible |

| Model | Description | Advantages | Limitations |
|---|---|---|---|
| | **Examples present in Austria, Croatia.** | - Independence allows greater freedom and flexibility in decisions<br>- Flexibility to obtain external inputs and funding | |

**Source: World Bank Institutional Frameworks and Policies for Energy Efficiency Implementation (2006)**

## 4.3 Energy Efficiency Policy Setting

Governments can choose from a range of policy instruments to foster EE improvements and reduce energy consumption, including market-based instruments, financial incentives, regulatory measures, information and feedback, and non-regulatory measures as shown in table 3. These policy instruments are commonly implemented in a policy mix, i.e. a combination of instruments aimed at the achievement of a national target. The development of a given policy mix is based on different rationales specific to the prevailing environment a country faces with respect to issues, such as, economic development, energy availability, resource planning and energy security. The policy implementation framework should ensure:

- effective governance (define the institutional structure), accountabilities and resourcing;
- complementarity with other infrastructure and energy policies;
- that utilities support and complement energy efficiency policies;
- an active process of performance evaluation; and
- timely review and refinement of policies.

**Table 3: Policy Instruments Promoting Energy Efficiency and Savings at End-Use Level**

| Policy Instrument | Examples | Strengths & Weaknesses |
|---|---|---|
| **Market-based Instruments**<br>When the energy price does not correspond to its real marginal costs, i.e. external costs are not internalised, the adoption of energy efficiency and saving measures is disincentivized[20]. Market-based instruments address this problem by adding the external costs to the energy price and thereby incentivising energy | Energy taxes<br>Tradable emission permits[21] | Environmental taxes and tradable permits enable external costs to be internalised and the energy price effect can give a direct incentive for cost effective energy savings, efficiency improvements and technological change. Furthermore, taxes and auctioned permits create a governmental revenue, and thereby the possibility for a double dividend. However, low price elasticities and the regressive nature of environmental taxes may negatively impact effectiveness and feasibility respectively. Finally, taxes are politically unpopular because of the visible effect on income distribution. |

[20] Where electricity prices are subsidized, cost reflective pricing and energy price subsidy reform would also be a key policy measure.
[21] Tradable emission permits target emission reductions and are defined as an indirect energy efficiency policy.

| Policy Instrument | Examples | Strengths & Weaknesses |
|---|---|---|
| efficiency and savings based on market mechanisms. | Energy efficiency obligations/(Tradable) White Certificate (TWC) schemes[22] | Address multiple market failures through a combination of market-based, regulatory, financial and information measures. Administrative costs, especially with tradable certificates, are high and to date a burden for implementation of the scheme. |
| **Financial incentives**<br>These address the issue of high investment costs that pose a potential barrier for energy efficiency improvements, and are intended to motivate energy efficiency investment through subsidies and access to capital measures | Subsidies (including direct subsidies, tax rebates, grants)<br>Access to capital measures (e.g. grants and loans) | By reducing initial investment costs financial barriers to energy efficiency are addressed. Subsidies are socially and politically popular as long as the financing issue is factored out. Their potential to stimulate energy efficiency investment seems to be larger compared to an equivalent price increase through taxes or tradable permits, a behavioural economics issue.<br>However, the free-rider problem and a potential rebound effect may reduce the instrument's effectiveness. |
| **Regulatory Measures**<br>Within energy efficiency policy, these translate into codes and standards. Thus, they typically incentivize producers to supply energy efficient options and encourage consumers to reduce their energy consumption by installing or purchasing a particular product. Having this impact on decision making regulatory measures address information failures, bounded by rationality and principal agent problems. | Codes and standards, e.g. building codes or energy performance standards. | Regulatory measures address information failures, principal agent problems and bounded rationality, and accelerate technology diffusion. They are typically translated into legally binding energy efficiency requirements and have a high potential to improve energy efficiency. Due to their relatively easy implementation, codes and standards are popular instruments.<br>However, the instruments' rigidity may lead to high implementation costs. When technology advances fast, standards may deter rather than promote technological progress. |
| **Information and Feedback**<br>Suboptimal investments in energy efficiency can occur due to information problems and behavioural failures. This can be addressed using information, certificates, labels and audits, or feedback measures[23]. | Information (Certificates/labels and audits)<br>Feedback (e.g. smart metering, informative billing) | Information and feedback measures address incomplete or asymmetric information as well as behavioural failures, such as bounded rationality. Information is not intrusive and therefore socially and politically popular.<br>However, the effectiveness of information is uncertain. |
| **Non-regulatory Measures**<br>These refer to voluntary (or negotiated) agreements (VA), which are tailor-made negotiated | Voluntary (or negotiated) agreements (VA) | VAs may allow the regulator to set requirements that would have been infeasible with regulation, because VAs are more acceptable by industry. When |

[22] Energy efficiency obligations or white certificate schemes exist in various ways; thus, there is no consistent definition on the instrument's incentive mechanism. In general, efficiency obligations set an energy savings target on energy companies (e.g. suppliers or distributors), who get a certificate for energy saving achievements, which can potentially be traded among the obliged.

[23] Certificates and labels indicate a product's/ building's level of energy efficiency; energy audits indicate cost-effective energy efficiency measures and the saving potential; whereas feedback measures reveal consumers' energy use, e.g. through smart meters that provide detailed and frequent information on energy consumption or bills with comparative data.

| Policy Instrument | Examples | Strengths & Weaknesses |
|---|---|---|
| covenants between the public authorities and individual firms or groups of firms which include targets and timetables for action aimed at improving energy efficiency or reducing GHG emissions and define rewards and penalties. VAs primarily target industries as an end-use sector. | | these requirements are beyond business as usual, the agreement is potentially effective.<br>However, this demands negotiations between the agreement parties and a well-functioning institutional framework which is demanding for both parties. |

**Source: Information Compiled from Energy Efficiency Policy: A Review of Instruments and Potential Interaction Effects (2017)**

When multiple instruments all aiming at a reduction in energy consumption are implemented simultaneously, interactions between them are inevitable. As the number of implemented instruments increase, so does the incidence of interactions between them. Such interactions may be complementary and mutually reinforcing or there may be a risk of overlapping policies and mitigating effects between combinations of policy instruments. Instruments that enforce a certain target of energy efficiency or savings, as performance standards and energy efficiency obligations, are more likely to cause a mitigating interaction with other instruments, as they do not increase effectiveness when implemented in combination. Conversely, instruments that provide flexibility regarding how a sector or target group responds to a certain instrument, e.g. energy taxes or information measures, are more likely to have a reinforcing effect in combination (see table 4).

**Table 4: Interaction Effects Between Combinations of Energy Efficiency Policies**

| Instrument Combination | Mitigating[24] | Reinforcing[25] |
|---|---|---|
| Energy tax and performance standard | ✓ | |
| Energy tax and subsidies | ✓ | ✓ |
| Energy tax and energy efficiency obligation/TWC, financial incentives, regulation, voluntary agreements, energy labelling schemes | | ✓ |
| Energy efficiency obligation/TWC and financial incentive | ✓ | ✓ |
| Energy efficiency obligation/TWC and voluntary agreement | ✓ | |
| Financial incentives and performance standard | ✓ | |
| Subsidies and access to capital measures | ✓ | |
| Information measures and all other instruments | | ✓ |

**Source: Energy Efficiency Policy: A Review of Instruments and Potential Interaction Effects (2017)**

[24] An instrument combination is mitigating or overlapping when the instruments' combined saving effect is less than the sum of the saving effects these measures would achieve stand-alone.
[25] When the combined effect is larger, the combination is reinforcing or complementary.

# 5. PROPOSED APPROACH FOR ADVANCING ENERGY EFFICIENCY/ENERGY CONSERVATION IN TRINIDAD AND TOBAGO

Any proposal for the widespread rollout of EE throughout Trinidad and Tobago will clearly face several challenges. These challenges can be fundamentally addressed by improving the institutional framework as it relates to EE. This will entail the development and enactment of legislation and regulations addressing energy efficiency and building the technical and resource capacities of key institutions and other stakeholders. A focused and holistic approach to advancing EE is needed, with the full involvement of all stakeholders and significantly improved coordination across the relevant sectors. In this regard, the proposed approach is to address the following major challenges which were identified in section 3, which will require the recommended actions to be undertaken by the GoRTT, the RIC and T&TEC.

| | |
|---|---|
| **Challenge:** | **Absence of consistent energy and energy efficiency policies and specific targets**. |
| **Approach:** | **Formulation of Policy and Mandate by the GoRTT to create the required enabling environment.** |

**Actions by GoRTT:**

1. Establish Energy Efficiency/Energy Conservation policy. [This policy should be aligned with international commitments, such as, the Paris Agreement ratified in February 2018.]
2. Establish national EE and Energy Intensity targets based on the estimated reduction to current electricity consumption levels of the various consumer classes modeled after successful implementation schemes in other jurisdictions.
3. Establish EE targets for the transport, residential and business/industrial sectors based on the national targets. [Achievement of the targets should be on a phased basis.]

| | |
|---|---|
| **Challenge:** | **Absence of a cohesive institutional structure for the implementation and administration of EE policy, inclusive of the appropriate regulatory and legislative frameworks**. |
| **Approach:** | **Establishment of Governance Frameworks by the GoRTT along with supporting activities on the part of the RIC and T&TEC.** |

**Actions by GoRTT:**

1. Assess the current institutional structure with respect to the national EE objectives. Identify the shortcomings and successes to inform the revision of the institutional, legislative and regulatory frameworks. [Figure 4 shows the current institutional structure that will benefit by the creation of a RE/EE Agency.]
2. Review relevant legislation which pertain to electricity generation, such as, the T&TEC and RIC Acts to address any legislative issues and new legislation arising from the adoption of EE/EC practices.
3. Consider the establishment of a government agency with combined focus on EE/EC/RE. This agency could serve as an effective institution[26] with the key role of executing government policies and strategies through the coordination of EE/EC/RE policies and programmes, including programme design, administration, management, monitoring, and evaluation. It can also serve as the repository for EE information, statistics and data. The combined focus on EE/EC/RE will provide greater leverage in obtaining funding, staffing and other resources.

**Actions by RIC:**

1. Conduct Regulatory Impact Assessments of the impact of proposed EE/EC initiatives/targets and smart grid investments in order to balance the fundamental goals of affordability, cost recovery (for sustainable utility operations), and fairness of regulatory objectives specified in legislative frameworks.
2. Examine proposed utility-based EE initiatives to ensure that financial outlays are prudent and effective, and include all investments for distributed resources (DR) and EE measures as negative revenue in calculating the regulated revenue of the utility.

**Actions by T&TEC:**

1. Conduct comprehensive Integrated Resource Planning by applying planning frameworks that integrate demand-side efficiency measures into the assessment of overall strategic scenarios to meet electricity-related energy service needs for Trinidad and Tobago.

[26] The agency's role should be one that takes lead in promoting, supporting, and facilitating the creation of the enabling environment for key stakeholders to execute activities in order to have the best impacts on the local economy, society, and the environment.

**Challenge:** **Lack of dedicated financing mechanisms**.

**Approach:** **Formulation of Appropriate Financing Mechanisms by the GoRTT.**

**Actions by GoRTT:**

1. Establish a "Energy Efficiency Fund (EEF)" with the objective of providing financing for the implementation of EE programmes and encouraging EE initiatives among a wide range of stakeholders, including government, equipment suppliers and the building industry. The monies for the fund can be sourced from the government (a specific RE/EE tax can be considered), in addition to grants and loans from multilateral development banks.
2. Examine and institute direct (rebates) or indirect (subsidies) public benefits funding mechanisms commensurate with the achievable potential for cost-effective energy efficiency.
3. Examine the ability of ESCOs to enter into EE investment transactions with clients. ESCOs may seek financing for the EE investments in the client's facilities and recoup payment through the energy savings achieved from the investments. Also consider the formulation of an agency to coordinate the investment financing and equipment procurement for local EE projects that are implemented and performance guaranteed by certified ESCOs.

**Challenge:** **Prevailing consumer behavior marked by the high consumption of electricity, energy and natural gas relative to that of other jurisdictions**.

**Approach:** **Modification of consumer behaviour through the coordinated efforts of the GoRTT, the RIC and T&TEC.**

**Actions by GoRTT:**

1. Ensure that the natural gas used in the production of electricity is priced at the prevailing market rates.
2. Conduct the transition in pricing on a phased basis with a commitment to a firm timeline.
3. Adjust electricity tariffs in quick succession based on adjustments in the price of natural gas. Until the true cost of electricity is realized, the motivation to implement EE measures will be low and the level of incentives needed will be artificially high.
4. Promote EE initiatives through import restrictions, tax deductions on energy efficient appliances and trade-in programmes.
5. Establish time frames and provide the resources for the relevant agencies to develop EE standards and issue EE labels on locally distributed household, water heating, heating, ventilation, and air conditioning (HVAC) appliances and buildings.

6. Implement a comprehensive public awareness campaign on energy efficiency and energy conservation practices. This will support other initiatives by providing pertinent information to customers in order to fully appreciate the impact of behavioral change with respect to the use of energy efficient technologies and energy conservation measures in reducing their electricity bills. The public awareness campaign should also target the commercial building sector by identifying and providing demonstrations and training programmes on applicable technology and design modifications, that can be used to improve the energy efficiency of newly constructed or renovated buildings.

**Actions by RIC:**

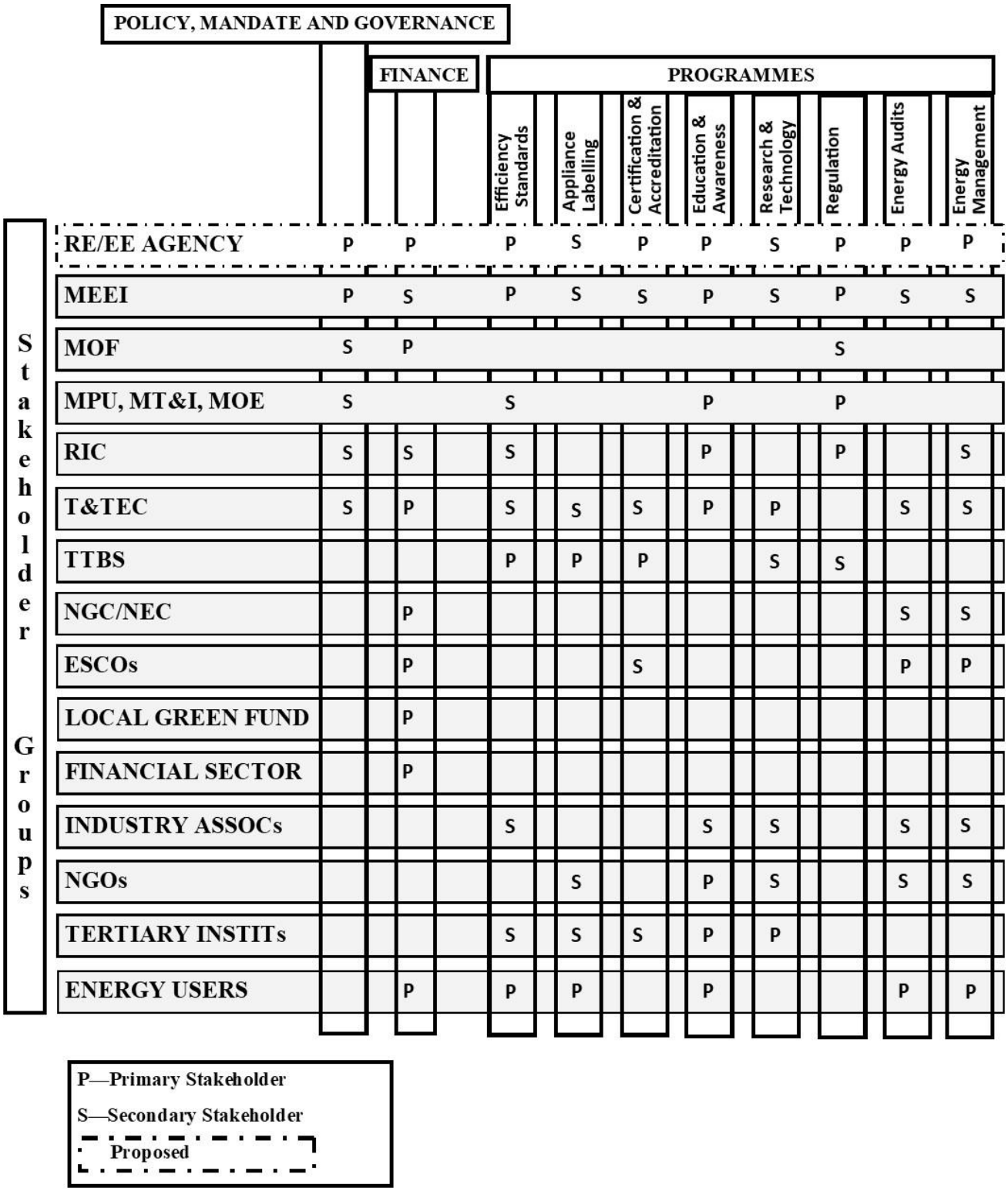
1. Review rate-making frameworks and rate design so that prices signal the value to consumers and society of efficiency in the consumption of electricity.

**Actions by T&TEC:**

1. Adjust all electricity billing cycles from a bi-monthly to a monthly period in order to provide T&TEC's customers with a better appreciation of the cost of their monthly energy use rates. Allow for customers to access their consumption data in real-time to assist with demand management efforts.
2. Explore the feasibility of a demand side-management programme, structured around the existing AMI, aimed at modifying the pattern of electrical consumption across all of the consumption sectors.

Figure 4 depicts a cohesive institutional structure for the implementation and administration of EE/EC policy, which entails the coordinated efforts of various stakeholders in the energy sector. The level of involvement of all identified stakeholders can be distinguished as primary or secondary, with respect to the execution of the principal requirements of an EE implementation strategy. In figure 4, it is also shown that the GoRTT through the relevant ministries will have primary responsibility for developing policy with significant input from the regulator and the utility. The proposed addition/inclusion of a government agency that focuses on EE/EC/RE to the institutional structure offers clear benefits – as this agency would serve as the primary stakeholder in many areas in the implementation of a comprehensive EE strategy for the country.

**Figure 4: Proposed Stakeholder responsibilities under a coordinated approach to EE Implementation.**



# 6. APPENDIX

**Table 5: Best Practice Policies for Energy Efficiency**

| Policy types | Best Practice Policies | Exemplars |
|---|---|---|
| **Cross-sectoral: Governance** | Enabling frameworks | - EU Energy Efficiency Directive (2012).<br>- Belarus. The Law of the Republic of Belarus on Energy Conservation July 15 1998 No. 190-3. |
| | National strategies, plans and targets | - EU NEEAP. The EU Energy Efficiency Directive<br>- Belarus (b). The Republican Programme on Energy Conservation for 2011-2015<br>- Estonia NEEAP |
| | Institutional arrangements: Energy efficiency operational agencies | - Natural Resources Canada Energy Efficiency Office.<br>- Korea KEMCO. Korean Energy Management Corporation (KEMCO) |
| | Coordination mechanisms | - United States DoE – State Energy Program (SEP)<br>- Switzerland Swiss Energy |
| | Public sector energy efficiency: Cities and Regions | - PEEREA. Energy Efficiency in the Public Sector<br>- ESMAP Tool for Rapid Assessment of City Energy (TRACE) |
| | Data, statistics and evaluation | - Energy Management Information System (EMIS)<br>- Canada Office of Energy Efficiency. Statistics and Analysis.<br>- New Zealand's Domain Plan for Energy Statistics<br>- IEA Energy Statistics Manuals and data resources. |
| **Cross-sectoral: Finance** | Government and international financial institutions (IFI) leveraged loans finance: Dedicated credit lines | - Germany KfW. The German "KfW programme"<br>- EBRD Sustainable Energy Financing Facilities (SEFF)<br>- China Energy Efficiency Financing Programme (CHEEF)<br>- Thailand. Energy Efficiency Revolving Fund (EERF) scheme (2002)<br>- Green for Growth Fund (GGF) |
| | Public-private finance including ESCOs | - United States. Utility and public sector programmes for educational, health and government facilities<br>- Czech Republic. Energy performance contracting |
| | Funds Guarantees, risk sharing | - Commercializing Energy Efficiency finance (CEEF) |
| | Fiscal Policies: tax incentives, rebates | - Italy. Energy Efficiency Tax Rebate Programme (2007-2013) |
| | Government grants | - UK Warm Front. United Kingdom government grants (2002-2013) |
| | International climate finance and carbon finance | - Climate Investment Funds (2008)<br>- Estonia has "earmarked" revenues of the sales of "unspent" Joint Implementation (JI) quotas of Assigned Amount Units (AAUs) for energy efficiency |
| **Policies for Utilities** | Utility cost-reflective pricing and energy price subsidy reform | - Germany. Domestic hard coal producer support of EUR 5 billion was 0.3% of GDP in 1999.<br>- Indonesia. fuel subsidies (2014) |
| | Energy efficiency regulatory Mandates | - United States. United States investment in ratepayer funded energy efficiency Projects in 2011.<br>- United States. The California Public Utilities Commission policy rules and related reference documents energy efficiency programmes funded by ratepayers in California.<br>- Vermont, United States. Recent analysis of Efficiency Vermont,<br>- China. Issuance of an "Electricity Demand-side Management (DSM) Implementation Measures" regulation in 2010. |

| Policy types | Best Practice Policies | Exemplars |
|---|---|---|
| | Utility ESCOs | - China's establishment of a number of subsidiary ESCOs.<br>- APERC CEEDS' analysis of best practices in ESCOs China |
| | Utility white certificates | - PEEREA. Trading Mechanisms for Delivering Energy Efficiency<br>- Italy. White certificate scheme (2005)<br>- France. The French white certificate scheme CEE (Certificats d'economie d'energie, Energy Saving Certificate) |
| | Utility IFI finance for utility energy efficiency | - China Utility based Energy Efficiency Programme (CHUEE).<br>- Switzerland pro-kilowatt tender. China. |
| | Utility voluntary energy efficiency programmes, including reductions in Transmission and distribution losses | - Portugal Demand Side Energy Efficiency Plan (PPEC).<br>- South Africa ESKOM.<br>- EU District Heating - Article 14 of the EU Energy Efficiency Directive 2012/27/EU |
| **Policies for Households** Homes and Appliances | Existing homes insulation/weatherization | - Netherland's revolving fund.<br>- New Zealand Warm Up Heat Smart.<br>- China Heat Reform and Building Energy Efficiency Project.<br>- PEEREA. Cogeneration and District Heating – Best Practices in Municipalities. |
| | New and existing homes and buildings – minimum energy Performance standards (MEPS) via Building Codes | - EU Directive on Energy Performance of Buildings.<br>- APERC CEEDS. Building codes and Labelling. |
| | Energy Efficiency certification of buildings | - Ireland. The Energy Performance Certificates scheme (2009) |
| | MEPS, Standards and labelling for household appliances | - EU Eco-design Directive.<br>- Korea. Manufacturing of many types of appliances, and operation of an extensive product efficiency programme.<br>- APERC CEEDS. Appliance Energy Efficiency Standards and Labelling |
| | Endorsement of highest efficiency appliances | - ENERGY STAR. This United States Environmental Protection Agency (EPA) - DoE programme |
| | Efficient lighting | - UNEP-GEF en.lighten Initiative. |
| **Transport** Passenger and Freight | Fiscal policies (taxation and user charges) for transport | - France. 'Bonus–malus' scheme. |
| | Passenger Light Duty Vehicle (LDV) Fuel Economy Standards (VFES) and Labelling | |
| | Heavy Duty Vehicle (HDV) Fuel Economy Standards (VFES) and Labelling | - HDV VFES enacted in Canada and the United States in 2013. |
| | Eco driving | - Canada Eco Driver programme |
| | Public Transport and low energy Modes | - Poland EBRD-EIB public-private funding of efficiency upgrades to Warsaw metro and tram companies in 2011.<br>- Nigeria Lagos State Transport Master Plan (2005).<br>- APERC CEEDS best practices in Energy Efficient Urban Passenger Transportation. |
| **Business Sector** Industry | Energy management, including ISO50001 | - Ireland. Achievement of ISO 50001 certification by the Sustainable Energy Authority.<br>- Clean Energy Solutions Centre (CESC). |
| | Commercial Buildings | - China. The Top 10,000 Energy-using Enterprise |

| Policy types | Best Practice Policies | Exemplars |
|---|---|---|
| and Commerce | | - Sweden. The Swedish industrial efficiency programme successfully<br>- European Energy Manager (EUREM) standardized training |
| | Energy management capacity Building | - Australia. The Commercial Building Disclosure (CBD) Program<br>- Sweden. Requirement for building owners are to provide an energy performance certificate for their buildings. |
| | Small and medium enterprises (SME): Industry networks | - Germany. Learning Energy Efficiency Networks (LEEN) support innovative<br>- Ireland. Irish Sustainable Energy Authority SME programme (2007-2011)<br>- Switzerland / Germany. Energy Efficiency Networks (EEN)<br>- China. The Institute for Industrial Productivity (IIP) Supply Chain Initiatives Database |
| | MEPS for industrial equipment | - EU Eco-design Directive |
| | Voluntary agreements | - Netherlands. Long tradition of voluntary agreements (VA)<br>- Canada. The Canadian Industry Program for Energy Conservation (CIPEC)<br>- Finland voluntary agreement programme 2009 -2016 |
| | Industry innovation and exports | - Japan. Replacing incandescent lamps to LED<br>- Netherlands. The energy-saving technology manufacturing and services industry<br>- Ireland. Sales of energy efficiency related products (mostly insulation and efficient lighting) |

**Source: Compiled from data presented in "Best Policy Practices for Promoting Energy Efficiency (2015). United Nations Economic Commission for Europe.**