Asia-Pacific
Economic Cooperation

Advancing Free Trade
for Asia-Pacific Prosperity

Energy Efficiency Policy Workshop on PREE 11: Energy Efficiency Project Financing

APEC Energy Working Group

July 2022

Asia-Pacific
Economic Cooperation

Energy Efficiency Policy Workshop on PREE 11: Energy Efficiency Project Financing

APEC Energy Working Group

July 2022

APEC Project: EWG 02 2021A

Produced by
Asia Pacific Energy Research Centre
Inui Building, Kachidoki, 1-13-1, Kachidoki, Chuo-ku, Tokyo, 104-0054, Japan
Phone: (81) 3-5144-8551
E-mail: master@aperc.or.jp Website: https://aperc.or.jp/

For
Asia-Pacific Economic Cooperation Secretariat
35 Heng Mui Keng Terrace
Singapore 119616
Tel: (65) 68919 600
Fax: (65) 68919 690
Email: info@apec.org
Website: www.apec.org

APEC#222-RE-04.4

Table of Contents

Workshop Objectives

The 58th Meeting of the APEC Expert Group on Energy Efficiency & Conservation (EGEEC 58) and Associated Workshop on 29 March to 1 April 2022 was hosted by China and conducted via Cisco WebEx. This meeting brought together APEC member economies and international experts to exchange energy efficiency and conservation policy and actions towards the APEC aspirational target of reducing aggregate energy intensity by 45 percent from 2005 levels by 2035.

The workshop is a half day event to provide a capacity building opportunity regarding energy efficiency project financing framework in designing an effective program available to economies. It will include economy's practical trends in energy efficiency project financing and best practices to simulate energy efficiency market through presentations and discussions from prominent experts in energy efficiency.

Opening Remarks

Moderator, Barbara Tyran (Senior Advisor, The Global America Business Institute) and Mr Munehisa Yamashiro (Vice President and General Manager of APERC) welcomed the participants and thanked them for joining this timely workshop.

Vice President Yamashiro gave opening remarks and expressed gratitude to the hosts in Beijing for hosting the workshop, the Global America Business Institute for organizing the event, and to the speakers for sharing their knowledge. The Asia Pacific Energy Research Center (APERC) has been implementing APEC Peer Review on Energy Efficiency (PREE). This consists of two activities: 1) peer review of energy efficiency goals, strategies, institutional setup and policy measures for a volunteer economy. The latest review was held in November 2021 for Indonesia. 2) Energy Efficiency Policy Workshop, which is being held as the sixth one today. The theme of this workshop is Energy Efficiency Project Financing. This theme was raised during the Indonesia peer review last year. APERC thought this theme would be worth exploring in a formal workshop. The hope is that the information shared will be the foundation for a capacity building opportunity about energy efficiency project financing and the workshop will become a good occasion to exchange ideas of various financial schemes.

Session 1. Project Financing: Expanding Investment in Energy Efficiency

Panel Presentation #1 – Energy Efficiency and Digital Technologies

***Akin Olumoroti**, Manager, Research and Analysis, Alliance to Save Energy*

The first speaker of the panel was Akin Olumoroti of the Alliance to Save Energy. His presentation focused on energy efficiency, energy conversation, and how deployment of energy efficiency technologies can lower costs. *Energy efficiency* is the use of technology that requires less energy to perform the same function. *Energy conservation* means using less energy by adjusting behaviors and habits.

Energy efficiency is paramount in lessening the effects of the current global energy crisis that was made worse by the Russian invasion of Ukraine. In the past, energy efficiency could be thought of as changing incandescent lightbulbs to LED lightbulbs that provide the same amount of light but required less energy. Traditional energy efficiency means utilizing low-technology features to save energy like using insulation in a house to save on heating and cooling costs. New technologies that can help with energy efficacy would be smart thermostats, new appliances, and lightbulbs can help households become more energy efficient.

"Active efficiency" is a term coined by the Alliance to Save Energy that includes all the ways that we can work towards saving energy in the digital era of the 21st century. Digitization can improve energy efficiency by relying on data gathering and data analysis that can show actions that can save energy. Data gathering utilizes sensors, meters, and interfaces to see how and when energy is being used. Data analysis will use algorithms, artificial intelligence, and digital simulations to understand how energy can be saved. Actions like automation, digital controls, 3D printing, and smart interfaces can all be used to help lower costs. Digitalization focuses not just on end-users to be energy efficiency but will use demand-side end-use efficiency with demand-side flexibility to create *new energy efficient systems.*

There are some digital technologies that can enhance energy efficiency. The internet of things (IoT) is a network of physical objects embedded with sensors and software that connect and exchange data over the internet. They enable insights on user habits that can expand energy efficiency in homes and buildings, data centers, mobile devices, shops, airports, factories, and in the transportation sector. Advanced analytics and cloud-based platforms are reinforcing innovation that can expand energy efficient outcomes. Predicative and automated controls can update systems and energy efficient products.

We have the technologies, but the technologies must be compatible with existing infrastructure. This structure is broadband and good internet to enable automated response and advanced metering and controls. The energy system of the future will have distributed energy resources where people in remote areas will have their own microgrids without committing to a particular utility for their energy. Storage will also be important and will be working on getting to its apex. Storage will be at the core of energy efficiency and will be utilized when energy prices are high.

There are various policies that can be implanted that can save energy. Having vehicle fuel economy standards for cars, vans, trucks, etc. has saved 9 quads[1] since being enacted in the 1970s. Appliance and equipment efficiency standards have saved 6 quads. ENERGY STAR is a program run by the EPA and has saved about 4 quads. Utility sector energy efficiency programs and federal research, development, and deployment have saved about 2 quads. FERC Order No. 2222 will help usher in the electric grid of the future and promote competition in electric markets by removing the barriers preventing distributed energy resources (DERs) from competing on a level playing field in the organized capacity, energy and ancillary services markets run by regional grid operators. DERs are small-scale power generation or storage technologies that can provide an alternative or an enhancement of the traditional electric power system and can be located on an electric utility's distribution system, a subsystem, or behind a customer meter.

Other enabling policies include performance-based utility programs, subsides, and nudges. Utility operators do not pay attention to energy efficient programs because they are not

[1] A "quad" is 10 Btus. The US uses about 100 quads per year.

necessarily cost-effective. Those cost-effective calculations do not take into account health and environmental benefits. When cost effective-calculations begin taking these other benefits into account, energy efficient programs become more cost-competitive. By "performance," we are not just talking about lowering costs, but also about environmental and health impacts. Financial incentives like subsides and nudges can push consumers into more energy efficient programs.

Two cases studies show that deploying energy efficient programs, technology, and digitalization can reduce energy usage, avoid costs, and can show a return on investment. The first is a collaborative member from the Alliance to Save Energy. It worked with a restaurant chain to deploy Centrica Business Solutions' Panoramic Power technology across their restaurants. These sensors collected real-time data at the restaurants. They also measured actual electricity consumption in real-time that allowed restaurant managers to understand electricity consumption and the next steps to ensure they are using power in the most efficient way. In 34 months, that program saw a reduction of 11.4 GWh of energy reduction, US$1.2 million in avoided costs, and a 308% return on investment.

The second study used Ameresco's Active Efficiency Approach at the Marine Corps base at Parris Island. The US Department of Defense is the largest consumer in the economy. Utilizing Ameresco's Active Efficiency Approach, energy demand saw a 70% reduction, 37,000 metric tons of CO2 reduced, and saved US$6.9 million.

Energy efficiency programs have a gap. Energy efficiency investments should be more both from a consumer perspective and a societal perspective. Some possible explanations for these gaps include market failures, behavioral failures, and hidden costs.

Panel Presentation #2 – Energy Efficiency in the Midst of Energy Crisis

***Elrika Hamdi**, Energy Finance Analyst, Institute for Energy Economics and Financial Analysis*

The second panelist was Elrika Hamdi, an Energy Finance Analyst for the Institute for Energy Economics and Financial Analysis (IEEFA). The IEEFA is a global think tank with ground level comprehension across six continents. The IEEFA puts special attention to the financial and economic analysis of the energy transition issues. IEEFA has published global reports on finances, corporate pushes for renewable energy, coal market trends, and other global issues. They have also made regional reports relating to Asia, Australia, and Europe on the transition.

Hamdi's presentation was focused on Energy Efficiency in the Midst of Energy Crisis. The backdrop shows that the energy crisis increases the risks of war. Russia supplies more than 40% of the EU's gas and coal imports and a quarter of its crude oil. Europe's daily energy bill to Moscow is €800mn. Analysts have put out concerns of the current energy crisis to the 1970s oil crisis. Energy security, independency, and affordability once again become the number one topic globally. Italy and Germany currently get 15% of their natural gas as a share of gross available energy from Russia, and the Eurozone and EU27 get just under 10%.

The impact is that the global energy supply crunch means another year of high and volatile energy prices for *everyone*. In the leadup to the Russian invasion of Ukraine, coal went above US$400/ton. This is important for economies who have a lot of energy imports. In March 2022, Putin demanded that the EU's buyers of Russian oil and gas must use the Russian Ruble to pay for their imports, and this will not be accepted due to sanctions on the Russian Central Bank. The HIS Market-S&P has two scenarios. The most probable scenario is that Gazprom

starts the negotiation process with their EU counterparts which could lead to a slow burning of contract suspensions and terminations which would lead to pressure on spot prices. A possible but unlikely scenario is a full cut-off of Russian gas from Europe.

Figure 1: Oil Consumption of APEC Economies for Every US$10/bbl Increase in Oil Price

Total Oil Consumption (all source)	2020											
APEC	000 bpd	ars per barrel	$ 50.00	$ 60.00	$ 70.00	$ 80.00	$ 90.00	$ 100.00	$ 110.00	$ 120.00	$ 130.00
Australia	890		$ 16.2	$ 19.5	$ 22.7	$ 26.0	$ 29.2	$ 32.5	$ 35.7	$ 39.0	$ 42.2
China	14225		$ 259.6	$ 311.5	$ 363.4	$ 415.4	$ 467.3	$ 519.2	$ 571.1	$ 623.0	$ 675.0
Hong Kong, China	285		$ 5.2	$ 6.2	$ 7.3	$ 8.3	$ 9.4	$ 10.4	$ 11.5	$ 12.5	$ 13.5
Indonesia	1230		$ 22.5	$ 26.9	$ 31.4	$ 35.9	$ 40.4	$ 44.9	$ 49.4	$ 53.9	$ 58.4
Japan	3268		$ 59.6	$ 71.6	$ 83.5	$ 95.4	$ 107.4	$ 119.3	$ 131.2	$ 143.2	$ 155.1
Malaysia	728		$ 13.3	$ 15.9	$ 18.6	$ 21.3	$ 23.9	$ 26.6	$ 29.2	$ 31.9	$ 34.5
New Zealand	148		$ 2.7	$ 3.2	$ 3.8	$ 4.3	$ 4.9	$ 5.4	$ 5.9	$ 6.5	$ 7.0
Philippines	378		$ 6.9	$ 8.3	$ 9.6	$ 11.0	$ 12.4	$ 13.8	$ 15.2	$ 16.5	$ 17.9
Singapore	1332		$ 24.3	$ 29.2	$ 34.0	$ 38.9	$ 43.8	$ 48.6	$ 53.5	$ 58.4	$ 63.2
Korea	2560		$ 46.7	$ 56.1	$ 65.4	$ 74.8	$ 84.1	$ 93.4	$ 102.8	$ 112.1	$ 121.5
Chinese Taipei	973		$ 17.8	$ 21.3	$ 24.9	$ 28.4	$ 32.0	$ 35.5	$ 39.1	$ 42.6	$ 46.2
Thailand	1271		$ 23.2	$ 27.8	$ 32.5	$ 37.1	$ 41.8	$ 46.4	$ 51.0	$ 55.7	$ 60.3
Viet Nam	491		$ 9.0	$ 10.7	$ 12.5	$ 14.3	$ 16.1	$ 17.9	$ 19.7	$ 21.5	$ 23.3
Mexico	1312		$ 23.9	$ 28.7	$ 33.5	$ 38.3	$ 43.1	$ 47.9	$ 52.7	$ 57.5	$ 62.3
Chile	347		$ 6.3	$ 7.6	$ 8.9	$ 10.1	$ 11.4	$ 12.7	$ 13.9	$ 15.2	$ 16.5
Peru	210		$ 3.8	$ 4.6	$ 5.4	$ 6.1	$ 6.9	$ 7.7	$ 8.4	$ 9.2	$ 10.0
Canada	2282		$ 41.7	$ 50.0	$ 58.3	$ 66.6	$ 75.0	$ 83.3	$ 91.6	$ 100.0	$ 108.3
United States	17178		$ 313.5	$ 376.2	$ 438.9	$ 501.6	$ 564.3	$ 627.0	$ 689.7	$ 752.4	$ 815.1

Now is the tipping point for renewable energy and energy efficiency. Energy efficiency should be put back at the forefront of the energy transition policy. The IEA recommends:

1. enacting short-term measures to shelter vulnerable electricity consumers from high prices. This will bring down energy bills for consumers even when natural gas prices remain high making available up to €200 billion to cushion impacts on vulnerable groups.

2. Speed up the replacement of gas boilers with electric heat pumps. This will reduce gas use for heating by an additional 2 bcm in one year.

3. Accelerate energy efficiency improvements in buildings and industry. This will reduce gas consumption for heat by close to an additional 2 bcm within a year and will lower energy bills, enhance comfort, and boost industrial competitiveness.

4. Encourage a temporary thermostat adjustment by consumers. Turning down the thermostat for buildings' heating by 1° C would reduce gas demand by some 10 bcm a year.

Global investment in energy efficiency reached record levels in 2021 but will still need to triple by 2030. Buildings receive the most amount of global investment in energy efficiency by a 2:1 margin. Transport is the second largest sector followed by industry. There are some barriers to energy
efficiency funding. Lack of similar projects for comparing expected savings, unclear metrics for analyzing performance, unattractive small ticket size projects for lenders, lack of understanding of project risks, and no real policy incentives all contribute to the funding of new projects.

There are potential game changing policies in energy efficiency, but it could start from as simple as changing a design logic to incorporate "a whole-system design." Promising new policies include the EU "Fit for 55" directive. Italy's 'Super Ecobonus' scheme home

renovations offers a 110% tax credit incentive to customers who are renovating their homes. India's Energy Efficiency Services Ltd 'Super-efficient Air Conditioning' program put bulk procurement to provide cheaper air-conditioning. Some economies like China have mandatory audits and energy management systems. Increasing energy efficiency could be as simple as changing design. Walmart's energy savings from changing its operation design logic improved its energy efficiency by 40%. Redesigning or designing an integrative system in buildings, factories, houses, equipment, and vehicles could save 97% of pumping energy. Redesigning insulation systems or installing solar rooftops could also help with energy efficiency programs. In a new energy crisis era, the largest, safest, cheapest, cleanest, and fastest way to address it is through energy efficiency and conservation.

Panel Presentation #3–Financing Options for EV Charging Infrastructure: A US Case Study

***Vijeta Jangra**, Managing Consultant, Guidehouse's Energy, Sustainability, and Infrastructure Practice*

The final speaker of Session 1 was Vijeta Jangra of Guidehouse. Jangra talked about Financing Options for Electric Vehicle (EV) Charging Infrastructure: US Case Study. Her presentation began with an explanation of why electric vehicles are important which fit into four categories, geopolitics, the environment, technology, and the consumer. For geopolitics, EVs can help an economy become energy secure, reduce dependence on oil, and reduce the impact of oil price volatility. In the United States, transportation accounts for 77% of the petroleum sector and is the largest emitter of greenhouse gasses in the United States. Transportation contributed 36% of all emissions in 2020. Oil prices are volatile, but electricity prices are more stable.
For environmental reasons for shifting to EVs, EVs help policy makers change their climate change policy and can improve local air quality. When accounting for NOx emissions, switching to EVs instead of internal combustion engines can reduce emissions by 100% by 2050.

Advances in battery technology, charging technology, and economies of scale are pushing battery prices down which are pushing the price of EVs down. There have been advances in charging technology which signals to consumers that they will have places to charge their vehicles. EVs also now offer longer driving ranges which help consumers. When looking at lifetime savings from EVs vs the best-selling internal combustion vehicles, customers can save between US$3,000 to over US$17,000 depending on the comparison.
EV charging infrastructure is critical. The federal government has a goal to have 50% of all new passenger cars and light trucks sold in 2030 to be zero-emission vehicles. A problem for this goal is that there is a limited network of EV charging stations. Consumers need assurances that there will be charging stations if they buy an EV, and the industry needs to ensure there is a market for installed charging stations. The government then has a goal of 500,000 new chargers. The government has also allocated US$7.5 billion over five years to states for more EV charging stations.
Financing options for EV charging infrastructure in the United States can be at the federal level, state level, from utility companies, and from private investments.

- *Federal programs* provide a key source of money. The government can offer grants such as Low or No Emission Vehicle Grants, Alternative Fuel Corridor Grants, or the Surface Transportation Block grant. The government has offered loans such as the Improved Energy Technology Loan. Tax credits such as the Alternative Fuel Vehicle

Refueling Property Credit or tax exemptions such as the Plug-in Electric Vehicle Weight Exemption. These dollars can directly flow to installers or they can go to intermediator programs.

- *State and local programs* in the form of grants, low programs, tax credits and tax exemptions exist in many states including California, Colorado, Arkansas, Georgia, Oklahoma, the District of Columbia, and New Mexico. These programs are generally funded by the federal government, but sometimes they are funded through state and local budgets.

- *Utility incentives* have a strong interest in electrification because they increase loads on the grid. Some utilities offer EVSE rebates like Dominion Energy, LADWP, PG&E, SDG&E, TEP, CEA, PWP, NHEC, Consumers Energy, and Hawaii Energy. Some schools offer EVSE rebates like PG&E, NV Energy, and Duke Energy. There is also EVSE leasing programs by OUC in Florida and MGE in Wisconsin.

- *Private Investments* There are also *private investments* by automakers like Tesla, Nissan, Ford, and BMW. There are investments by EV charging companies such as EVGo, Blink Charging, and Electrify America, and by oil companies like Shell, BP, and Chevron.

In 2020, Guidehouse and Dominion Energy Virginia partnered to develop and launch a new Smart Charging Infrastructure Pilot (SCIP) Program. The program was approved by the Virginia State Corporation Commission as part of Dominion's 10-year Grid Transformation Plan. The program offers rebates to incent EV charging stations for multi-family communities, workplaces, transit bus depots, and fast-charging locations. Rebates cover infrastructure, chargers, and network fees and range from US$2,000 to US$50,000 per project. The data driven insights will help shape future EV customer offerings including the design of potential managed charging programs. The program had four objectives and expected outcomes:

1. The program wanted to meet its target installations and have a positive customer experience. Dominion and Guidehouse wanted to achieve their installation goals for each targeted segment through focused and effective marketing channels. They also wanted to maximize customer engagement and satisfaction and quantify positive impacts;
2. The program wanted to accelerate beneficial electrification. Acceleration of EV adoption will drive down greenhouse gas emissions and prove it. The program was going to collect data and report for continuous improvement, tracking, and regulatory purposes. Dominion and Guidehouse wanted to accurately quantify reductions in emissions for site installments;

3. The program wanted to shape future customer programs. This would leverage data to better understand customers and develop programs that address future EV charging opportunities. This would also bolster innovation for new technologies, programs, and network applications and services; and

4. The program wanted to shape future rate designs by shaping regulatory outcomes with a fact-based account of program success. The program would establish the groundwork for managed charging programs in other segments and minimize the impact that new EVSEs have on the distribution grid.

The program was divided into four categories for rebates including multi-family, workplace, direct current fast chargers (DCFC), and transit:

- Multi-family customer rebates were offered US$9,000 for customer infrastructure, US$2,000 network fee (per charger), US$4,000 for equipment, and could have between one and four chargers per site.

- Workplace customer rebates were offered US$9,000 for customer infrastructure, US$2,000 for network fee (per charger), US$2,700 for equipment and had to have between one and ten chargers per site. The program had a limit of 400 workplace stations.

- DCFC were offered US$35,000 for utility infrastructure (per site) and US$33,000 for customer infrastructure. DCFC sites were offered US$5,000 for network fees and US$36,000 for equipment (per charger). These sites had to have a minimum of two chargers per site and a maximum of four and the program allowed for 30 stations.

- Transit stations were offered US$35,000 for utility infrastructure per site and US$33,000 for customer infrastructure per site. Transit stations were offered US$5,000 for network fees per charger and US$53,000 for equipment per charger. Transit sites had to have a minimum of one charger per site with a maximum of six chargers and the program offered sixty stations.

The Dominion Energy program began its design phase kickoff in June 2020, and SCIP publicly launched in October 2020. The first application was received in November 2020, and the first rebate payment was sent in February of 2021. The program was concluded in December 2022. The end-to-end program was stood up within five months and rebated were paid within eight months. Marketing and outreach campaign drove program interest, and end-to-end customer service and support existed for program information with a dedicated call center. DCFC and multi-family rebate segments are now fully subscribed as of March of 2021. Data collection and reporting was implanted to support program evaluation and regulatory reporting.

Question and Answer

Q: *What would you say is more cost effective? Incentivizing electrical vehicles, or incentivizing electrical vehicle charging stations?*
Vijeta Jangra: Customers are hesitant to buy EVs because they're concerned about the number of charging stations, and industries and other organizations are hesitant about investing in charging stations unless there is a demand. Clearly there are up-front costs barriers for charging stations. The World Bank conducted a study and found that it is more cost-effective to incentivize charging stations because charging stations are utilized by many consumers, so it has more wide-spread benefit.

Q: *In the US, we have a lot of congressional activity around energy including the Infrastructure Investment and Jobs Act. In your opinion, how are energy efficiency programs faring in this environment?*
Akin Olumoroti: In light of the way our Congress is structured, energy efficiency programs have fared well, but we could've done better. We've seen investment in broadband. In the future where EE is taking advantage of digitization and new technologies, that future is

dependent on broadband. With the US government investing in broadband, and with disadvantaged communities not being left behind, that is a big and significant win, and also in small business grants and programs.

Q: *Can you tell me how fast you think EE measures are being implanted, and can they be implanted faster?*
Akin Olumoroti: When we talk about digitalization and EE, we're not saying the traditional mediums of EE are unimportant. In fact, they're critical. If you put an EE appliance in a leaky house, it not good. We need to talk about redesign and insulation and how air moves. When we layer on top of that, we layer data analytics from digitalization. Then we can make really large gains. It's important we do the first things first.

Q: *Could you tell us about the Active Efficiency Collaborative?*
Akin Olumoroti: The collaborative is a community of industry leaders, NGOs, public sector institutions working to accelerate the deployment of "active efficiency." Active efficiency is essentially energy efficiency meeting digital technologies. We're working to accelerate the adoption of this approach. We have manufacturers, governments, utilities, and those new to the topic of EE, but they recognize the criticality of EE and want to learn more about it.

Q: *Can you talk more about the pandemic on the Dominion program?*
Vijeta Jangra: This program, as I mentioned, was launched in October 2020, around the time of the pandemic. When this program was designed, we thought they were generous rebate amounts. We didn't realize that certain changes in the situation; we had 400 rebates for workplace customers, and because of the pandemic, all employees moved to remote work and there were no employees to use the chargers. Organizations weren't interested in investing because there were no employees. The pandemic also impacted site visits.

Q: *Can you tell us why businesses and governments would turn to energy efficiency now? What's different about now vs the past?*
Elrika Hamdi: One word for that: economic competitiveness. We live globally in a competitive place. Private industries are part of the global marketplace, and energy costs are 30-40% of costs as a total. If a company advances their energy efficiency and reduces reliance on fossil fuels, that means they are more competitive in the global market in terms of price of products. The world is also interested in ESG practices. Being energy efficient opens up more investment from ESG investors.

Q: *What are the biggest challenges to large-scale adoption of these technologies that enhance energy efficiency?*
Akin Olumoroti: One of the biggest challenges we're finding is the education piece on both consumers and policy makers. Many policy makers don't understand the need for energy efficiency or the demand-side of energy. On the consumer side, there's the issue of mistrust of the government. There's also the issue of shared language; we don't have a share language for energy efficiency. We also need to design policy to advance energy efficiency and address unintended consequences from new policies.

Follow-up Question: *Do you think current policies are enough to spur demand for energy efficiency? What about regionality?*
Akin Olumoroti: The current policy today isn't enough. For the past couple of years, low-to-middle-income represent 27% of energy consumption in the US. Only 6% of energy efficiency investment has gone to this group. There's a need for us to rethink policy so that sector of the

population is served. Policy differs by region, and there is little the federal government can do.
Elrika Hamdi: Obviously, the US is more advanced in their implantations. Indonesia has done a lot on standardization and we're just now getting more in-depth. When talking about rebates for households, that's not available yet. There's still a lot to do and advanced technologies are prohibitively expensive right now.

Q: *Are there any best-practices or lessons learned you can offer from the implantation of Dominion's program?*
Vijeta Jangra: It's important to make sure and understand how you're designing policies and make sure they meet their objectives. 1) It is really important to have a simple process and provide clear instructions and guidance to approve their rebate application. It needs to be a "hand holding" type of process. 2) Robust and targeted marketing is crucial. 3) Have flexibility.

Q: *How do we put a financial value on energy efficiency?*
Elrika Hamdi: The cost of energy import is how we measure it. If EE can be measured by saving a percent of that, that' show you measure it.
Akin Olumoroti: Another question is to ask how much it would cost to use a different fuel, not only in dollar amounts, but also in terms of emissions, health benefits, and the environment.

Q: *To Akin, are there any examples of commercial buildings in the US using digitization to improve their EE?*
Akin Olumoroti: Yes, the Chrysler Building in New York.

Session 2. Financing Models for Energy Efficiency Projects

Panel Presentation #1 – Innovative Energy Efficiency Financing Scheme for Industrial and Commercial Sector in Indonesia

***Muhammad Ery Wijaya**, Senior Analyst, Climate Policy Initiative (CPI)*

Recently there is policy initiatives from Indonesia focusing on energy efficiency and ways to accelerate energy efficiency in Indonesia. Indonesia is the highest energy consuming economy in the Southeast Asia region. The commercial and industrial sectors in Indonesia are the biggest energy consumers. Current development of the commercial and industrial sector is switching from conventional fuel to electrified systems.

There are significant market opportunities and chances for energy efficiency starting from domestic energy policy. The domestic energy policy aims to reduce energy intensity by 1% per year and total of energy consumption reduction target of 17% compared to business as usual in 2015. These policies provide ambitious targets for governments to invest in energy efficiency and attract private investment to enter this business. A second market opportunity comes from the cooling required in the tropical environment of Indonesia. The growth of economy leads to the growth of cooling systems across all systems. Approximately 15% of industrial and commercial sectors use cooling systems every year, so it is increased by 15% of the growth. If you look at the contribution of these sectors to greenhouse gas emissions, cooling systems contribute to about 15% of the greenhouse gas emissions. A study in Indonesia showed that despite the fast growth of cooling systems in the economy, it was found that most of the cooling system appliances in Indonesia do not use energy efficiency features. Finally, the COVID-19 pandemic pushed forward the ideas of sustainability in the commercial

and industrial sectors to operate more efficiently. The demand is declining due to the restricted mobility.

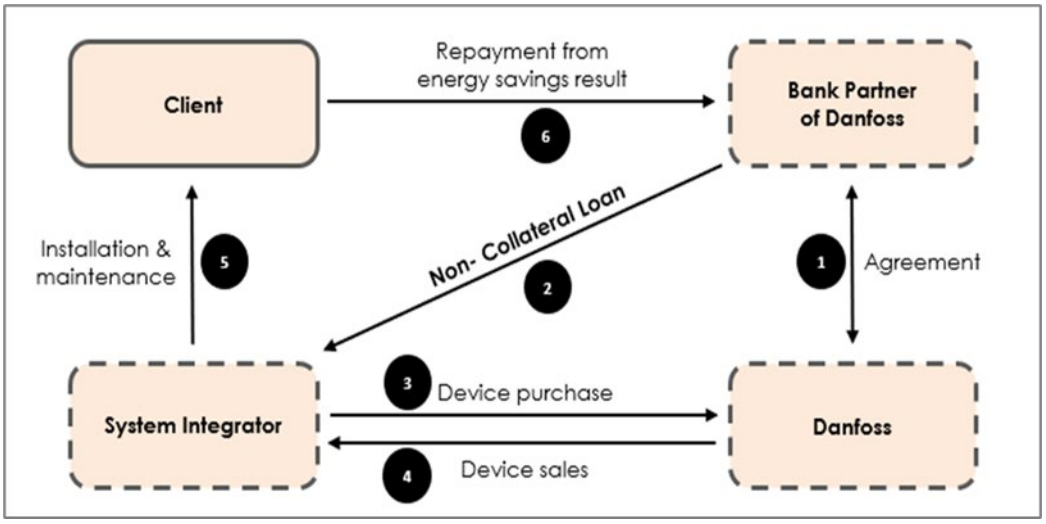
However, despite these interesting market opportunities, there are also challenges in Indonesia. Most of the challenges are around awareness of energy efficiency in commercial and industrial sectors. Energy efficiency can provide savings to make the business more competitive. In Indonesia, the price of energy is relatively low compared to other economies. Furthermore, in Indonesia, these companies can pass on energy costs to the consumers. Financial risk is also perceived by both clients and lenders on energy efficiency projects. If the energy efficiency progress falls below the promises due to the lack of technical capability or being provided the upper estimate of energy efficiency, then the lenders will see that energy efficiency is a high-risk investment. Another challenge is that clients are usually facing difficulties when accessing financing from banks. Clients with the most troubles in Indonesia are the clients with no collateral to get access or support for financing in energy efficiency implementation projects. Finally, ESCOs in Indonesia are usually small and face the same difficulty in accessing financing from banks.

There are a number of solutions that have been developed in overcoming the challenges facing energy efficiency in Indonesia. The first solution is the development of an innovative business model in energy efficiency mainly focused around raising confidence of risk and improving access to financing from banks. This business model has been successfully implemented by Danfoss, a worldwide Danish company that provides technology in cooling and heating. In the pre-implementation stage, Danfoss assess a client's historical electricity consumption through an energy audit. Danfoss also discusses potential monetary savings calculations. In the next stage, the implementation stage, Danfoss brings together three things: its globally demonstrated energy-savings technology, a bank partner, and a system integrator to install and maintain the system. After this stage is the next stage, which is called the measure & verification stage. This stage includes the DEMS (Danfoss Energy Management System) which is an online platform where client bank and Danfoss can observe the energy savings together. The relationship between the stakeholders in this solution case can be seen below.

This innovative business model can address common challenges in energy efficiency projects. This business model is a one-stop integrated solution to tackle these challenges, from its pre-implementation until MRV stage. There are a number of common challenges in an energy efficiency project, and this solution provides a method for the innovative business model to address the challenges. One common challenge is that the client and ESCO cannot gain access to bank financing. This innovative business model addresses that challenge by making it.

Danfoss's role is to bring in a bank partner for both the client and the ESCO. Another common challenge is that energy savings are less than what is needed to repay the bank loan. This innovative business model addresses that challenge by careful partner selection. Danfoss technology is proven to save 30% of energy consumption. Another common challenge is that energy savings data is not transparent, leading to low trust among parties. This innovative business model addresses that challenge by creating the monitoring system of DEMS and allowing access to this system by all parties. Another common challenge is that return and risk calculation is not clear to the client, leading to a dispute. This innovative business model addresses that challenge by allowing Danfoss to discuss financial projection together with the potential client first. Another common challenge is that unwanted behavioral change from the

client's energy consumption can raise issues. This innovative business model addresses that challenge by allowing Danfoss to study a potential client's historical consumption to predict this.



Another solution is a de-risking instrument to accelerate energy-efficiency business transactions. The two main challenges that this solution addresses are first, the lack of confidence and trust in the energy saving performance leading to potential clients' reluctance to invest in energy projects, and second, the high perceived risk which leads to the high cost of finance, ultimately leading to the increase of unwilling potential clients to implement in energy efficiency projects. This solution seeks out a seed grant that will be managed by Local Guarantee Company as Facility Manager. This is created as a method to guarantee as a de-risking instrument. This is to help with the stage of repayment from energy savings result as seen in the previous figure. The benefits to this solution include improving confidence level and trust of potential clients to implement energy efficiency projects given that potential risks have been distributed properly to other stakeholders, and reducing the perceived risk from loan providers / banks as more stakeholders participated to absorb potential risks, thus reducing cost of finance.

Panel Presentation #2 – Analysis of Financing Model for ESCO Business in Korea

***Juheon Seok**, Research Fellow, Korea Energy Economics Institute (KEEI)*

The speaker began her presentation by outlining the energy consumption status in Korea. The final energy consumption has increased at an average annual rate of 2.3% since 2000, which was 321 mtoe in 2019, and decreased slightly in 2019 after peaking in 2018. The industrial sector led to the increase in consumption, which was the largest share of the energy consumption at 61.8% in 2019. Buildings and transport sector increased as well. The current energy intensity in Korea was also described by the speaker. Korean energy intensity was higher than major developed economies although Korea's rate of energy intensity improvement decreased from 1.6% from 2010 to 2019. Energy intensity is an important indicator of how much energy is used by economy. Lower energy intensity means a lower cost of converting energy into GDP.

The speaker then discussed the topic of financing energy efficiency. The speaker's presentation included an image called the Ladder of financing options for EE investments.

This ladder was described as range of market maturity and financing with the top of the ladder being higher market maturity with commercial financing and the bottom of the ladder being lower market maturity and public financing. From the top of the ladder to the bottom were the following options: advanced commercial or project financing (ESCOs); vendor credit, leasing; commercial financing, bonds; partial risk guarantees; credit line with no commercial bank(s); credit line with development bank; public or super ESCOs; energy efficiency revolving fund; utility (on-bill) financing; budget financing, grants with co-financing; grants. The spectrum of financing options advances from financing options that rely more on public resources to those that rely more on commercial capital. Financing mechanisms should be selected based on the stage of market development and financing gaps. Over time, financing programs should seek to climb the ladder to more sustainable and commercial models.

The third section of the speaker's presentation was on financing methods for EE investments in Korea. The first topic was end-user's financing for EE projects. Energy users who are in need of energy efficiency improvements but have limited financial means or technical capacities to implement such projects on their own can hire an ESCO and use Utility Rebate Programs. ESCOs provide technical skills, assuming performance risks, facilitating access to finance from commercial lenders, and enabling energy users to repay initial costs through future savings. Utility Rebate Programs can reduce users' initial investment costs. Generally, the ESCO is a business that provides compressive energy solutions including designs and implementation of energy efficiency projects. In Korea, the ESCO is defined as to a company equipped with required facilities, capital, and technology and registered to the Ministry of Trade, Industry and Energy (MOTIE).

An energy performance contracting (EPC) is an innovative financing scheme offered by ESCOs to customers and a provision of energy savings with a guaranteed outcome. The key principle of the EPC is that the investment costs are financed from the resulting savings. The ESCO plans and conducts the project and receives only service fees from achieved savings. Clients will eventually benefit from both energy and costs savings after the end of the contract. Most EPC projects focus on the implementation of energy efficiency measures including lighting, HVAC, energy management and control, and envelope insulation.

In Korea, ESCO's have three energy performance contract models for energy users. These include new shared savings, guaranteed savings by ESCO financing, and guaranteed savings by energy users' financing. The EPC commits ESCO to installing the necessary equipment, provides a performance guarantee, and establishes the terms of any upfront or ongoing payments which are intended to be less than the financial savings realized by the project.

The first end-users' financing options in Korean EPC models is the "New Shared Savings Model". This model combines the advantages of the shared savings with those of guaranteed savings. ESCOs take on both financial and technical risk. Prior to implementation or projects, energy users confirm the payback plan to ESCOs according to estimated savings calculated by energy audit. ESCOs do not guarantee the energy savings and banks are not responsible for the savings. In the second option, which is called "Guaranteed savings by ESCO financing", ESCOs provide financing needed to implement projects and guarantee the energy savings. ESCOs take on both the financial and technical risk. In the third model, "Guaranteed savings by energy users' financing", the structure is the same as the original guaranteed savings model. Energy users assume on financing for initial costs, and ESCOs can help arrange users' project financing. ESCOs take only technical risk.

Another financing option is the ability to use the Utility Rebate Program. Energy users can use Utility Rebate Programs for their energy efficiency investments. The EERS programs offer financial incentives to upgrade energy efficiency products. Energy users can reduce their upfront capital costs of projects through rebate programs. Rebate programs is not direct financing method, but it can reduce initial costs and energy bills after upgrading.

On-Bill financing refers to a loan made to a utility customer. Their capital to implement the project is provided to the customer by the utility. The loan funds are provided directly by the utility, and regular monthly loan payments are collected by the utility bill until the loan is repaid. Savings from the funded improvements are expected to equal or exceed the new on-bill loan payments. Korean public utilities do not provide this on-bill financing in their EERS programs so far, but it is a very useful financing for both users and ESCOs to invest EE projects.

Financing options for ESCO business is another topic of the presentation. ESCOs can use public policy loan fund and factoring to finance their business. The policy loan fund is a fund where the government provides loans with low interest rates to ESCO business according to Energy Use Rationalization Act. Factoring of ESCO's receivables is an option where financial institutions purchase the receivables from the ESCO, thereby refinancing its portfolio and allowing the ESCO to finance more projects. Financial institution then continues to accept payments from the ESCO clients for the duration of the contracts.

The policy loan fund offers soft loans for energy saving facilities. The soft loan program offers long-term and low-interest rate loans to cover part of the investments in energy saving facilities in order to conserve energy and reduce GHG emission. ESCO investment projects (ESCO loan program) launched in 1993 have supported energy efficiency projects worth 1.7 trillion won and achieved 1.2 mtoe of savings from 2010 to 2020. In 2015, large ESCOs were excluded from the policy loan fund and after then, the fund size for ESCO projects declined rapidly.

ESCO Factoring was introduced to help financial institutions purchase ESCO's receivables and lend money in order to alleviate ESCOs' financial difficulties and debt ratio burden in 1999. ESCOs take on financing in the case of most EPC projects. When ESCOs take out loans for EPC investments, their credit capacity caps the total number of projects they can maintain in their portfolio. This is the reason why ESCOs face financial difficulties in their business. Legal disputes arose over energy savings in energy users, ESCOs, and financial institutes under the guaranteed savings contract. In April 2014, the Supreme Court ruled that the responsibility for energy savings guarantee of the EPC projects could not be attributed to the user but the financial institution that took over the receivables was responsible for some portion of savings. Subsequently, ESCO factoring was stopped in the market. From July 2015, the Ministry of Trade, Industry and Energy (MOTIE) introduced a new shared saving contract. Under the new contract, the obligation of energy savings guarantee according to factoring is not transferred to the financial institutions. Finally, factoring was resumed in the market in March 2016.

The speaker concluded their presentation with the following information. Because Korea's energy intensity is higher than other major economies, it is necessary to improve energy efficiency. In particular, energy efficiency investments are needed in the private sector. To promote private sector energy efficiency investments, the Korean government was introduced to ESCOs in 1993. ESCOs can help energy users who are lack of technology and financing for energy efficiency projects. There are three Energy Performance Contract Models to aid energy users' financing in Korea: New Shared Savings, Guaranteed Savings by ESCO, and

Guaranteed Savings by Energy Users' Financing. There are two financing models for ESCO business: policy loan fund and ESCO factoring in Korea although United States and China have many ESCO financing models: bonds, leasing, energy services agreements (ESAs), local government and private funds, and private equity financing, etc. To promote Korea's ESCO industry, it is required to develop more various financing models.

Panel Presentation #3 – Funding Scheme for Supporting Energy Efficiency Projects in Hong Kong, China

***Johnny Kam**, Senior Strategic Planner, CLP Power Hong Kong Limited*
***Tony Chan**, Senior Account Manager, CLP Power Hong Kong Limited*

The speakers began presenting by giving a background of the CLP Eco building fund. CLP Eco Building Fund was set up to support the carrying out of retrofitting or retro-commissioning to enhance the energy efficiency performance of building services installations for communal use in residential, commercial and industrial buildings. Activities take place in the communal area of residential buildings and the communal area of industrial buildings. The maximum subsidy for residential buildings is HK$300,000 per year, and the maximum subsidy for commercial/industrial/composite buildings is HK$250,000 per year. These include retrofitting projects and retro-commissioning. Retrofitting projects include replacement, upgrade, or retrofit of building services systems including lighting systems, HVAC systems, Lift & Escalator, and other electrical installations including water pumps. Retro-Commissioning is used to optimize building control and operation. This includes demand control ventilation and water pump/ air fan VSD control. Typical energy savings opportunities for retro-commissioning include automatically control indoor air temperature setting, install variable speed drive to control water supply temperature, reduce water pump impeller size, automatically control chilled water supply temperature, operate more number of cooling towers, install automatic tube cleaning devices to clean condenser tube, share cooling demand with more variable speed driven chillers or oil free chillers, share cooling demand with lesser constant speed driven chillers, automatically control fresh air intake, free cooling, reduce differential pressure setting of variable speed driven chilled water pump, and reduce air duct static pressure setting of variable speed driven air-handling unit (AHU).

Priority will be given to buildings fulfilling the following criteria: Buildings with multi-ownership, projects with higher energy saving cost effectiveness, ageing buildings, conducted energy audit or similar assessment before, new technology demo project or showcase project which will allow public visits, and good history of previous applications. The funding mechanism includes a higher subsidy percentage being offered to higher energy savings and/or shorter completion periods. The application process includes six steps: submit application after bid opened, pre-assessment by CLP, approval by vetting committee or CLP, award contract, post-assessment by CLP, award funding. There have been a number of successful cases for CLP. One case was lighting replacement where energy savings of 130,000 kWh was paid back in 4 months.

Question and Answer

Q: *How do the ESCO and energy users agree on the energy saving amount? Is there an independent third party to verify?*
Juheon Seok: As I know, there is no independent part for verification in Korea. In the first model, which is the New Shared Savings model, this contract usually applies compound energy savings like LED lighting. So, it is already known as fixed savings and thus you don't

need to worry about the energy saving amount. After the project, the ESCO measures the savings obtained and as I know, there are some standards for verification and measuring of energy efficiency projects as laid out by ESCO.

Q: *Is Danfoss an energy consultant?*
Eri Wijaya: Danfoss is basically a technology vendor and technology producer. They produce components for heating, cooling, and motion control. Danfoss will provide technology to the system integrators. The system integrators don't have cooperation with Danfoss so the system integrators are an independent company that will be verifying Danfoss.

Q: *How many applications do you receive in a year? What is the amount of funds dispersed to customers?*
Johnny Kam: Each year we set aside 100 million Hong Kong dollars, which is about 13 million USD for the subsidization program. We target 400 buildings each year as customers. Each year, we are more or less on target.

Q: *What are the reasons for partners to offer non-collateral loans?*
Eri Wijaya: Financial institutions brought by Danfoss, which has a long reputation of providing solutions to partners, are willing to support Danfoss projects based on their reputation without collateral. One of the problems of energy efficiency is providing collateral to the banks. This is a problem in financing these projects in any developing economies.

Q: *Can you talk about more detail about the IoT in the Chiller Optimization Project?*
Tony Chan: This is an interesting question to CLP as well. In principle, what he is talking about is a combination of several chillers and water pumps. The concept is that each chiller and water pumps may have their own characteristics in terms of optimized efficiency under different conditions. This allows us to collect data from the chill plant and determine which chiller has better performances in which conditions.

Q: *What are the major barriers to the ESCO industry in Korea?*
Juheon Seok: There are many barriers to the ESCO business in Korea. First, energy users are worried about the complexity of projects. Another is the financial barrier. Many of the ESCOs are small and do not have the capital required. Financial institutions like banks lack awareness or willingness to fund savings in energy efficiency. Most ESCOs are also single equipment providers, so they do not have enough technical skills to implement comprehensive ESCO projects for industrial processes.

Moderator Wrap-Up/Closing Remarks

The moderator then wrapped up the session with a short conclusion. She thanked the Host Economy as well as all the speakers and participants for their thoughtful questions/answers as well as suggestions and recommendations. She was extremely grateful to the speakers' contributions to the world of energy efficiency and trying to improve energy efficiency every day. In the first panel, the speakers focused on electric transportation which is a growing industry around the world, classic energy efficiency theory, and explaining the difference between energy efficiency and conservation. The moderator appreciated learning in great details about financial models in the second panel. She then invited the Vice Chair of APEC, Mr Pencheng Li, to offer closing remarks.

Mr Li appreciated APERC for their big efforts in organizing such a wonderful workshop. He also thanked speakers for their professional and interesting presentations. He particularly enjoyed active exchange of dialogue between the attendees and speakers. He hopes that the information shared on this workshop would be beneficial in formulating and strategizing energy efficiency improvement policies and measures in each APEC member.

Workshop Conclusions

The energy efficiency workshop was part of the APEC peer review on energy efficiency projects, and the overall objective of the Energy Efficiency Policy Workshop is to promote "high-performance" energy efficiency policy measures in the APEC member economies by sharing information and experiences. This half-day virtual workshop was designed to provide capacity building opportunities regarding energy efficiency project financing frameworks as well as to exchange ideas of various financing models in different economies. The workshop hosted speakers from different APEC economies, including United States, Indonesia, Korea, and Hong Kong, China.

The first panel focused on the development of the technologies and polices driving the energy technology. One of the most essential areas of sustainability development is improvement of energy efficiency technologies. Often most successful technologies have the supporting policy to achieve scale—government policy can stimulate development of new technology and often influence consumer behaviors/choices. For example, in the United States, President Biden signed into law the Infrastructure Investment and Jobs Act in November 2021. This bill sets aside US$7.5 billion to create a broad network of EV charging stations to expedite the adoption of EVs, reduce emissions, improve air quality and create good-paying jobs across the economy. The Biden administration set an ambitious target of 50% of EV sales shared in the United States by 2030 while building 500,000 chargers across the economy over next five years—currently, there are about 43,000 public charging stations. Such policies can encourage adoption of new technology and consumer preferences can also be positively altered over time.

Financing plays a key role in bringing infrastructure and energy projects to success. The second panel focused on the financing models for ESCOs and other entities that can help support these projects. The presenters shared energy efficiency finance models and what government and private sectors are doing to facilitate energy efficiency investment in their own economies, such as cost reduction incentives, risk management issues, tax incentives, etc. Although energy-efficiency projects are relatively low-risk investments, different types of barriers and challenges seem to exist in different economies.

Energy efficiency is one of the easiest and most cost-effective ways to combat climate change and also a vital component in achieving net-zero emissions. All speakers discussed various aspects of energy efficiency, but there were a number of key elements that were discussed throughout the workshop:

- Improved energy efficiency is expected to bring a number of benefits. However, energy efficiency projects are not as well understood by the public. Insufficient information and a lack of awareness of energy efficiency can be a contributing factor to the low level of interest;

- Financing of energy efficiency projects are one of the main obstacles to the energy efficiency projects described in the presentations and panels. Access to capital has been identified as the most important barrier to the deployment of energy efficient technologies. There are potential policy and market driven solutions that were suggested, with some recommendations offering successful test cases in their economies; and

- Measurement and verification of energy efficiency projects remains a significant concern for many stakeholders. Indonesia and Guidehouse speakers were able to shed light on how models can be developed for transparent measurement and verification, and these solutions may be the beginning of a wider industry-level implementation of a solution to measurement and verification.

ANNEXES

- Agenda
- Presentations

Workshop agenda

"Energy Efficiency Project Financing"	
APEC Expert Group on Energy Efficiency and Conservation 58th Meeting (EGEE&C) **Location**: (virtual/online) China **Date**: March 29, 2022 **Time**: 08:30 – 12:00 (Beijing time – GMT+8)	
08:30-09:00	Registration
09:00-09:05	Opening Remarks by Moderator **Barbara Tyran**, Director of the Macro Grid Initiative, American Council on Renewable Energy (ACORE) Welcome Remarks by APERC **Munehisa Yamashiro**, Vice President
Session 1	Project Financing: Expanding Investment in Energy Efficiency (Moderated Discussion)
09:05-10:00	• **Akin Olumoroti**, Manager, Research and Analysis, Alliance to Save Energy "*Energy Efficiency and Digital Technologies*" • **Elrika Hamdi**, Energy Finance Analyst, Institute for Energy Economics and Financial Analysis "Energy Efficiency in the Midst of Energy Crisis" • **Vijeta Jangra**, Managing Consultant, Guidehouse's Energy, Sustainability, and Infrastructure Practice *"Financing Options for EV Charging Infrastructure - A US Case Study"*
10:00-10:30	Discussion and Q & A
Session 2	Financing Models for Energy Efficiency Projects
10:30-11:20	• **Muhammad Ery Wijaya**, Senior Analyst, Climate Policy Initiative (CPI) *"Innovative Energy Efficiency Financing Scheme for Industrial and Commercial Sector in Indonesia"* • **Juheon Seok**, Research Fellow, Korea Energy Economics Institute (KEEI) *"Analysis of Financing Model for ESCO Business in Korea"* • **Johnny Kam**, Senior Strategic Planner and **Tony Chan**, Senior Account Manager, CLP Power Hong Kong Limited *"Funding Scheme for Supporting Energy Efficiency Projects in Hong Kong, China"*
11:20-11:50	Discussion and Q&A
11:50-12:00	Summary by moderator Closing Remarks by Host Economy **Li Pengcheng**, Secretary of the Energy Conservation Secretariat China National Institute of Standardization (CNIS)

ALLIANCE TO SAVE ENERGY
using less. doing more.

ENERGY EFFICIENCY & DIGITAL TECHNOLOGIES

Akin Olumoroti – Manager, Research and Analysis

03-28-2022

AGENDA

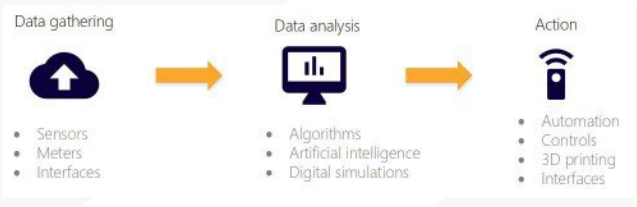
- Definitions and Myths
- Background
- Digital Technologies that enhance Energy Efficiency
- Enabling Infrastructure and Resources
- Enabling Policies
- Energy Efficiency (EE) Investment Gap
- Case Study
- Questions

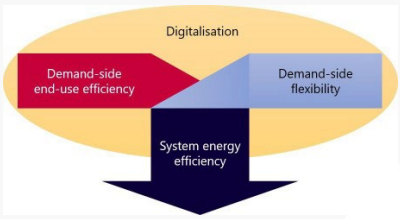
Definitions and Myths

- What is Energy Efficiency? Why Energy Efficiency?
- Traditional Energy Efficiency
- Energy Efficiency vs. Energy Conservation
  - *Conservation*: Using less energy by adjusting behaviors and habits.
  - *Efficiency* Using technology that requires less energy to perform the same function.
- **Active Efficiency**

BACKGROUND

- Active Efficiency
  - Benefits of traditional energy efficiency measures + opportunities presented by digital technologies
  - Why? Traditional energy efficiency alone may not get us there

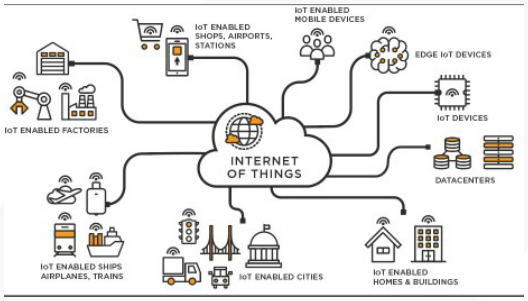




The Active Efficiency Collaborative – A coalition of industry leaders, NGOs, and public sector institutions working to accelerate the adoption of Active Efficiency.

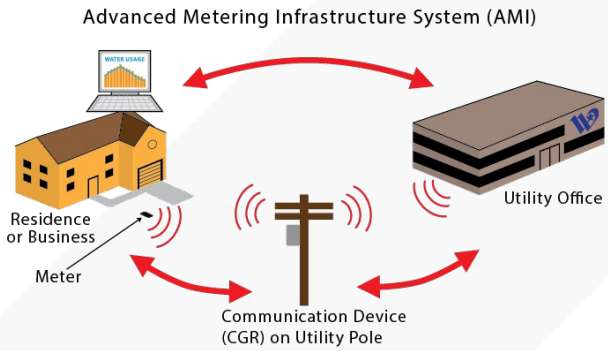
Digital Technologies that Enhance EE

- Internet of Things (IoT)
- Advanced Analytics and Cloud-based Platforms
- Predictive & Automated Controls

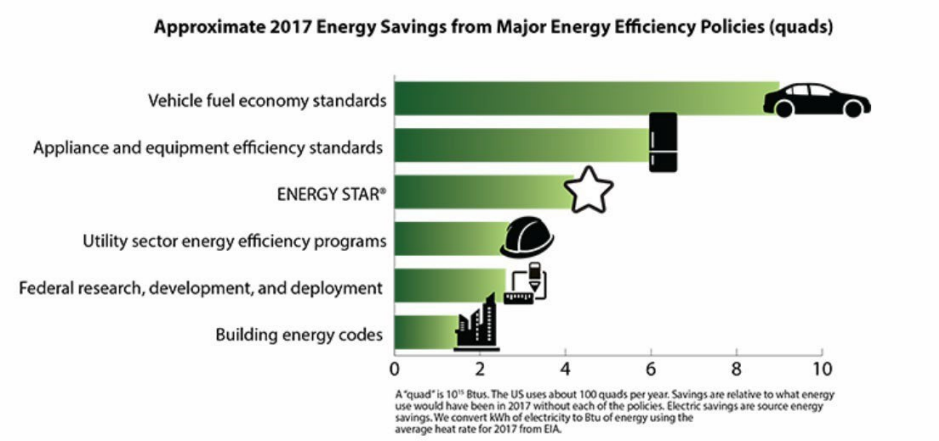


Enabling Infrastructure & Resources

- Advanced Metering & Controls
- Broadband
- Distributed Energy Resources
- Demand Response
- Beneficial Electrification
- Storage



Enabling Policies



- FERC Order 2222

Other Enabling Policies

- Performance-based Utility Programs
- Subsidies
- Nudges

Case Study- ACTIVE EFFICIENCY AT WORK

Energy to implement Centrica Business Solutions' Panoramic Power technology, reducing their energy consumption and unlocking significant cost savings.

Presentation last saved: 21m ago

11.4	$1.2M	308%
GWh cumulative energy reduction in 34 months	USD in avoided costs	return on investment

Ameresco's Active Efficiency Approach at Parris Island

The U.S. Department of Defense (DOD) is the **largest energy consumer** in the country. While DOD is a mission-critical institution with its top priority to protect the nation, it is increasingly exploring the security implications of climate change. In 2018, the Pentagon

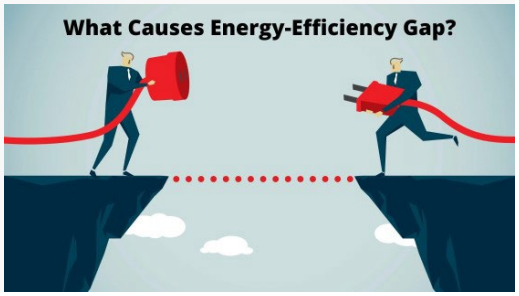
Energy Demand - 70% Reduction

Emissions Reduction – More than 37,000 metric tons of CO_2

Cost Savings - $6.9 M

The Energy Efficiency Gap

- Energy Efficiency investments should be more both from a consumer perspective and a societal perspective.
- **Possible Explanations**
  - Market Failures
  - Behavioral Failures
  - Hidden Costs



QUESTIONS

For further enquiries visit www.activeefficiency.org, www.ase.org or contact

Akin Olumoroti
Manager – Research and Analysis
aolumoroti@ase.org

Energy Efficiency in the Midst of Energy Crisis

The Age of Energy Efficiency is Now

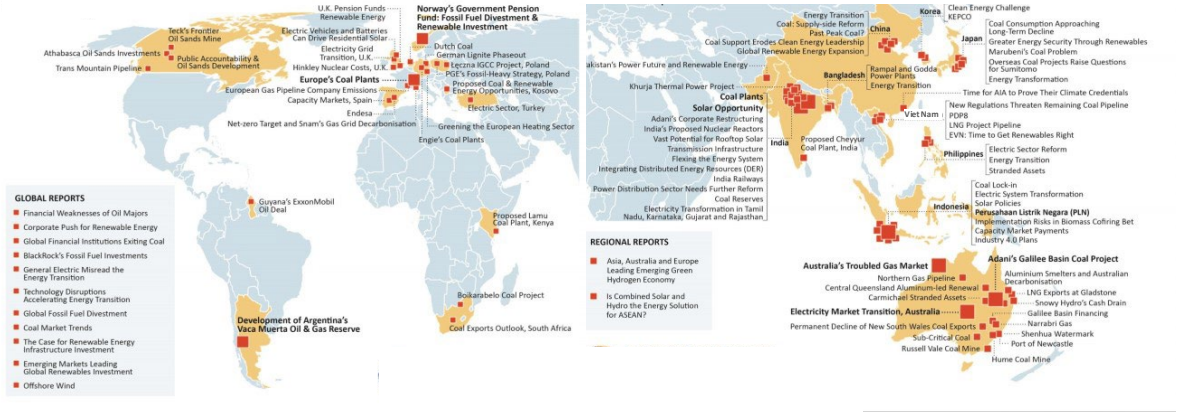
Elrika Hamdi, Energy Finance Analyst

29 March 2022

Institute for Energy Economics and Financial Analysis
IEEFA.org

A Snapshot of IEEFA

A global think tank with ground level comprehension



Institute for Energy Economics and Financial Analysis
IEEFA.org

The Backdrop: Increasing Risks of War

Natural gas as a share of gross available energy (%), 2020

THE NAKED TRUTH

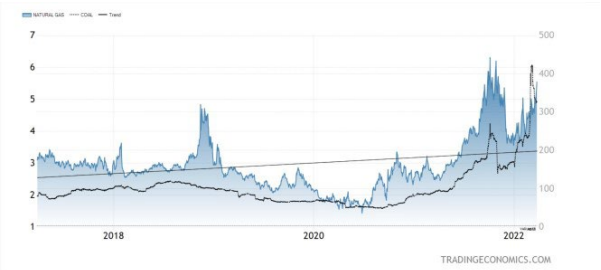
- Russia supplies more than 40% of EU's gas and coal imports, and a quarter of its crude oil
- Europe's daily energy bill to Moscow is €800mn.
- Analysts have put out concerns of current energy crisis to the 1970s oil crisis
- Energy security, independency, and affordability once again becomes the number one topic globally

Source: Financial Times

Institute for Energy Economics and Financial Analysis IEEFA.org

The Impact: Global energy supply crunch means another year of HIGH & VOLATILE energy prices for EVERYONE

Newcastle coal and Henry Hub natural gas price volatility over the last 5 years



"We are in an unprecedented time – incredible unprecedented effects both planned and unplanned"

Last week, Putin demanded EU's buyers to use Russian Ruble to pay for their imports of Russian gas – will not be accepted.

IHS Markit – S&P scenarios:

Most probable scenario: Gazprom starts negotiation process with their EU counterparts, could lead to slow burning of contract suspensions and terminations ➔ pressure on spot prices

Unlikely but still possible scenario: A full cut-off of Russian gas

Source: Trading Economics

Institute for Energy Economics and Financial Analysis IEEFA.org

Oil Consumption of APEC economies: What your import bill will look like for every $10/bbl increase in oil price.

Total Oil Consumption (all source)	2020											
APEC	000 bpd	ars per barrel	$ 50.00	$ 60.00	$ 70.00	$ 80.00	$ 90.00	$ 100.00	$ 110.00	$ 120.00	$ 130.00
Australia	890		$ 16.2	$ 19.5	$ 22.7	$ 26.0	$ 29.2	$ 32.5	$ 35.7	$ 39.0	$ 42.2
China	14225		$ 259.6	$ 311.5	$ 363.4	$ 415.4	$ 467.3	$ 519.2	$ 571.1	$ 623.0	$ 675.0
Hong Kong, China	285		$ 5.2	$ 6.2	$ 7.3	$ 8.3	$ 9.4	$ 10.4	$ 11.5	$ 12.5	$ 13.5
Indonesia	1230		$ 22.5	$ 26.9	$ 31.4	$ 35.9	$ 40.4	$ 44.9	$ 49.4	$ 53.9	$ 58.4
Japan	3268		$ 59.6	$ 71.6	$ 83.5	$ 95.4	$ 107.4	$ 119.3	$ 131.2	$ 143.2	$ 155.1
Malaysia	728		$ 13.3	$ 15.9	$ 18.6	$ 21.3	$ 23.9	$ 26.6	$ 29.2	$ 31.9	$ 34.5
New Zealand	148		$ 2.7	$ 3.2	$ 3.8	$ 4.3	$ 4.9	$ 5.4	$ 5.9	$ 6.5	$ 7.0
Philippines	378		$ 6.9	$ 8.3	$ 9.6	$ 11.0	$ 12.4	$ 13.8	$ 15.2	$ 16.5	$ 17.9
Singapore	1332		$ 24.3	$ 29.2	$ 34.0	$ 38.9	$ 43.8	$ 48.6	$ 53.5	$ 58.4	$ 63.2
Korea	2560		$ 46.7	$ 56.1	$ 65.4	$ 74.8	$ 84.1	$ 93.4	$ 102.8	$ 112.1	$ 121.5
Chinese Taipei	973		$ 17.8	$ 21.3	$ 24.9	$ 28.4	$ 32.0	$ 35.5	$ 39.1	$ 42.6	$ 46.2
Thailand	1271		$ 23.2	$ 27.8	$ 32.5	$ 37.1	$ 41.8	$ 46.4	$ 51.0	$ 55.7	$ 60.3
Viet Nam	491		$ 9.0	$ 10.7	$ 12.5	$ 14.3	$ 16.1	$ 17.9	$ 19.7	$ 21.5	$ 23.3
Mexico	1312		$ 23.9	$ 28.7	$ 33.5	$ 38.3	$ 43.1	$ 47.9	$ 52.7	$ 57.5	$ 62.3
Chile	347		$ 6.3	$ 7.6	$ 8.9	$ 10.1	$ 11.4	$ 12.7	$ 13.9	$ 15.2	$ 16.5
Peru	210		$ 3.8	$ 4.6	$ 5.4	$ 6.1	$ 6.9	$ 7.7	$ 8.4	$ 9.2	$ 10.0
Canada	2282		$ 41.7	$ 50.0	$ 58.3	$ 66.6	$ 75.0	$ 83.3	$ 91.6	$ 100.0	$ 108.3
United States	17178		$ 313.5	$ 376.2	$ 438.9	$ 501.6	$ 564.3	$ 627.0	$ 689.7	$ 752.4	$ 815.1

* Oil Cost in BOE - US Billion Dollars Per Year

Source: BP World Energy

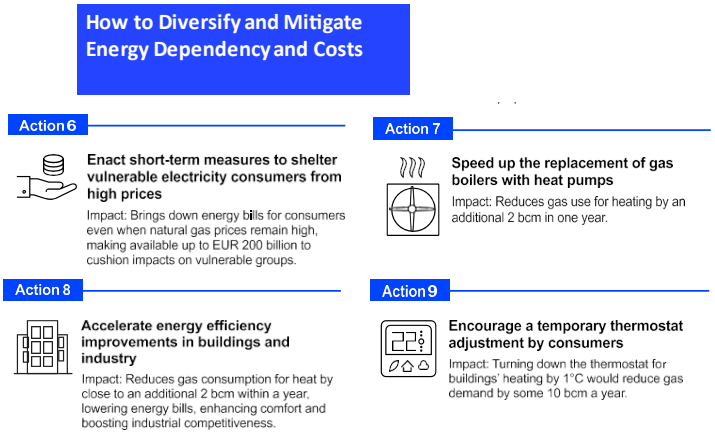
5

Institute for Energy Economics and Financial Analysis
IEEFA.org

Now is the tipping point for renewable energy and energy efficiency - EE should be put back at the forefront of Energy Transition policy

"We reaffirm energy efficiency as the "first fuel" and a critical component of our net zero strategies as it still represents the cleanest and, in many cases, the most cost-effective way to meet our energy needs."

- IEA Ministerial Communique 2022



Source: IEA

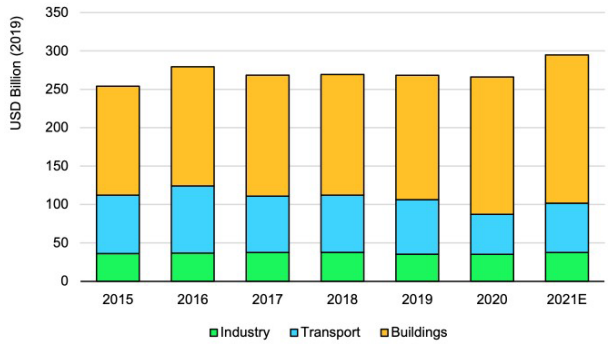
6

Institute for Energy Economics and Financial Analysis
IEEFA.org

Global investment trend in Energy Efficiency (EE)

Reached record levels in 2021, but still need to triple by 2030

Global investment in energy efficiency by sector, 2015-2021



Source: IEA

Barriers on EE funding

- Lack of similar projects for comparing expected savings
- Unclear metrics for analysing performance
- Unattractive small ticket size projects for lenders
- Lack of understanding in EE project risks, especially for domestic financiers
- No real policy incentives – energy subsidies and skewed policy preferences

Institute for Energy Economics and Financial Analysis
IEEFA.org

Potential game changing policy in EE looks promising

But it could start from as simple as changing a design logic to incorporate "a whole-system design"

A number of new promising EE policies:

1. EU "Fit for 55" new EE Directive
2. Italy 'Super Ecobonus' scheme for home renovations – 110% tax credit incentives
3. India's Energy Efficiency Services Ltd 'Super-efficient Air Conditioning' programme – affordability through bulk procurement
4. Mandatory audits and energy management systems in Tunisia, Morocco as well as China and the EU

Yet, it could start from changing design not technology

1. Walmart's energy savings from changing its operation design logic improved its energy efficiency by 40%.
2. Redesigning or designing an integrative system in buildings, factories, houses, equipment, vehicles – e.g. properly laying out some pipes could save 97% of pumping energy
3. Redesigning insulation system
4. Installation of solar rooftops or diversifying to micro-grids solution

"YOU CANNOT MANAGE WHAT YOU CANNOT MEASURE"

Institute for Energy Economics and Financial Analysis
IEEFA.org

In a new energy crisis era, the largest, safest, cheapest, cleanest and fastest way to address it is through energy efficiency and conservation

> *In urban areas, do we really need a one-tonne car to move a single person over short distances? Will we ever need larger and larger TV screens? Can't we do differently, while still living comfortably?"*
>
> ***- négaWatt***

THANK YOU

Institute for Energy Economics and Financial Analysis IEEFA.org

Guidehouse
Outwit Complexity

Financing Options for EV Charging Infrastructure: A US Case Study

Vijeta Jangra
Guidehouse

March 29, 2022

- Why Electrify Transportation?
- Financing Options for EV Charging Infrastructure
- Dominion Energy SCIP: A US Case Study

Why Electrify Transportation?

Guidehouse Outwit Complexity

Drivers of Transportation Electrification

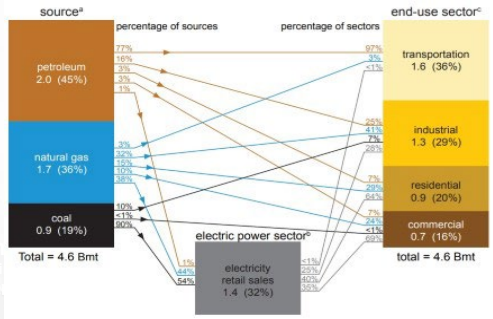
Geopolitics

- Energy Security
- Reduce Dependence on Oil
- Reduce Impact of Oil Price Volatility

Environment

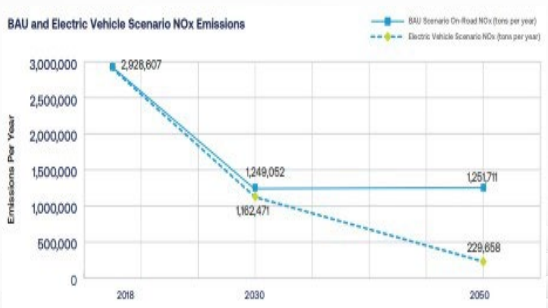
- Climate Change Policy
- Improve Air Quality

US CO_2 emissions from energy consumption by source and sector, 2020



Source: US Energy Information Administration (EIA), Monthly Energy Review (April 2021)

Comparison of On-Road Emissions Between Baseline and Electric Vehicle Case



Source: American Lung Association

Guidehouse Outwit Complexity

Drivers of Transportation Electrification

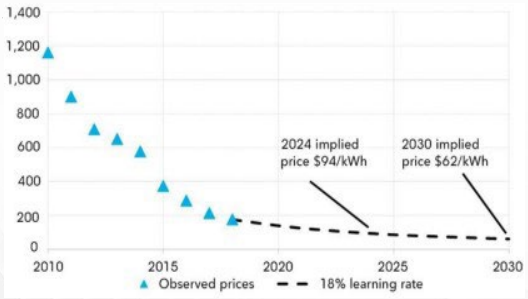
Technology

- Advancesin Battery Technology
- Advancesin Charging Technology
- Economiesof Scale

Consumer

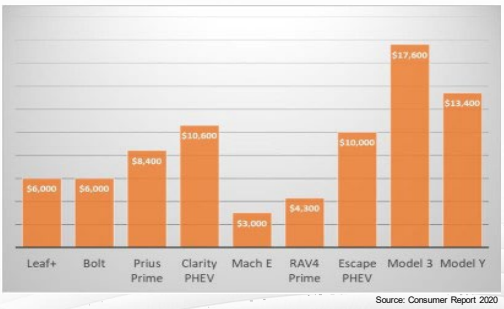
- LowerOperating Cost
- IncreasingDriving Range
- DecreasingPricesof EVs

Lithium-ion BatteryPrice (real 2018 $/kWh)



Source: BloombergNEF

LifetimeSavings FromEVs vs. Best-SellingICE Vehicles in Class



Source: Consumer Report 2020

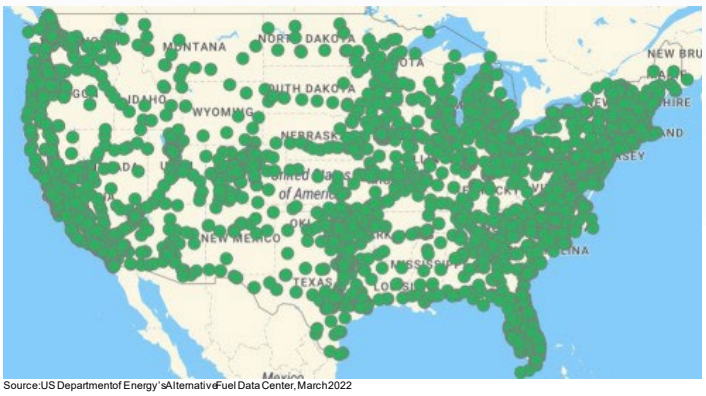
Guidehouse Outwit Complexity

EV Charging Infrastructure is Critical

Federal government has:

- a goal 50% of all new passenger cars and light trucks sold in 2030 be zero-emission vehicles
- a goal of 500,000 new chargers
- allocated $7.5 billion over 5 years to states for EV charging stations

Public ElectricVehicle Charging Stations in US



Source:US Departmentof Energy'sAlternativeFuel Data Center, March2022

Guidehouse Outwit Complexity

Financing Options for EV Charging Infrastructure

Guidehouse Outwit Complexity

Financing Options for EV Charging Infrastructure

Federal Programs

- Grants such as Low or No Emission Vehicle Grants, Alternative Fuel Corridor Grants, Surface Transportation Block Grant
- Loans such as Improved Energy Technology Loans
- Tax Credits such as Alternative Fuel Vehicle Refueling Property Credit
- Tax Exemptions such as Plug-In Electric Vehicle Weight Exemption

State Programs

- EVSE Grants in AR, CA, CO, DE, MA, MD, NJ, OK, PA and TN
- EVSE Loan Program in CA and FL
- EVSE Tax Credit in GA, OK, NY, DC and NM
- EVSE Tax Exemption in OK

Utility Incentives

- Commercial EVSE rebate by **DominionEnergy**, LADWP, PG&E, SDG&E, TEP, CEA, PWP, NHEC, Consumers Energy and Hawaii Energy
- School EVSE rebate by PG&E, NV Energy and Duke Energy
- EVSE Leasing Program by OUC in FL and MGE in WI

Private Investments

- Investments by Automakers such as Tesla, Nissan, Ford, BMW
- Investments by EV Charging Companies such as EVGo, Blink Charging, Electrify America
- Investments by Oil Companies like Shell, BP and Chevron

Guidehouse Outwit Complexity

Dominion Energy Virginia's Smart Charging Infrastructure Program

A US Case Study

Dominion Energy Virginia's Smart Charging Infrastructure Pilot Program

In 2020, Guidehouse and Dominion Energy Virginia partnered to develop and launch a new Smart Charging Infrastructure Pilot (or "SCIP") Program

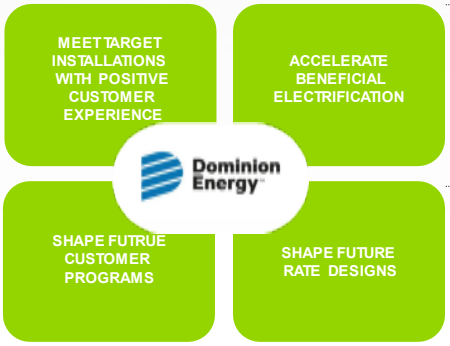
- Program was approved by the VA State Corporation Commission as part of Dominion's 10-year Grid Transformation Plan
- Program offers rebates to incent EV charging stations for multi-family communities, workplaces, transit bus depots and fast-charging locations
- Rebates cover infrastructure, chargers and network fees – range from $2,000 to $50,000 per project.

The data driven insights will help shape future EV customer offerings (including the design of potential managed charging programs)

Program Objectives and Expected Outcomes

- **Achieve target installation goals** for each targeted segment through focused and effective marketing channels
- **Maximize** customer engagement and satisfaction and quantify positive impacts

- **Leverage data** to better understand customers and develop programs that address future EV charging opportunities
- **Bolster innovation** for new technologies programs, network applications and services



- **Accelerate** EV adoption to drive down GHG emissions - and prove it
- **Collect data and report** for continuous improvement tracking and regulatory purposes
- **Accurately** quantify reductions in emissions for site installations

- **Shape regulatory outcomes** with a fact-based account of programs success
- **Establish groundwork** for managed charging programs in other segments
- **Minimize impact** that new EVSEs have on the distribution grid

Rebate Program Customer Segments

	Multi Family	Workplace	DCFC	Transit
Utility Infrastructure (per site)	$-	$-	$35,000	$35,000
Customer Infrastructure (per site)	$9,000	$9,000	$33,000	$33,000
Network Fee (per charger)	$2,000	$2,000	$5,000	$5,000
Equipment (per charger)	$4,000	$2,700	$36,000	$53,000
Chargers per Site	Min = 1, Max =4	Min = 1, Max = 10	Min = 2, Max = 4	Min = 1, Max = 6
Program Limit	25 Stations	400 Stations	30 Stations	60 Stations

Program Rollout Snapshot & Success

Design Phase Kickoff June 2020

SCIP Publicly Launched Oct 2020

First Application Nov 2020

First Rebate Payment Feb 2021

Program Conclusion Dec 2022

Marketing & Outreach Collateral

Watch DEV's SCIP webinar for more information

Program Highlights

- End-to-end program stood up within 5 months and rebates paid within 8 months
- IT Platform to manage end-to-end customer journey (e.g., application, rebate processing, data collection and analytics)
- Marketing and Outreach campaign drove program interest
- End-to-end customer service and support for program information with dedicated call center
- DCFC and Multi-family rebate segments now fully subscribed (as of March 2021).
- Data collection and reporting implemented to support program evaluation and regulatory reporting

The press release from Dominion: https://news.dominionenergy.com/2020-Dominion-Energy-Programs-Accelerate-Electric-Vehicle-Adoption-in-Virginia

The website for the SCIP program: https://www.dominionenergy.com/SCIP

Guidehouse Outwit Complexity

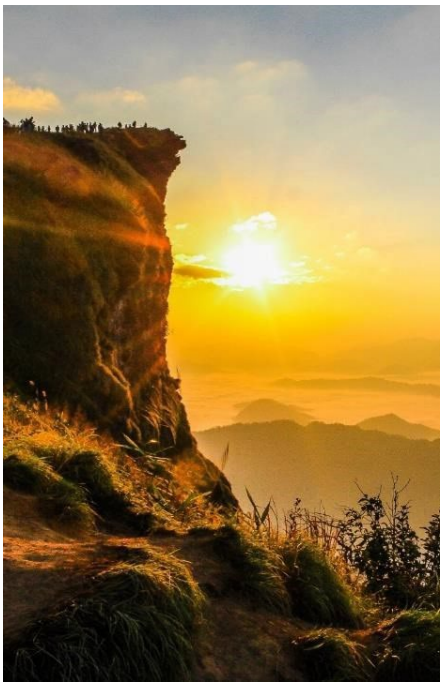
12

Guidehouse
Outwit Complexity

Thank you!

Contact: vijeta.jangra@guidehouse.com

13



CLIMATE POLICY INITIATIVE

Innovative Energy Efficiency Financing Scheme for Industrial and Commercial Sectors in Indonesia

Ery Wijaya, Ph.D.
Senior Analyst

Market Opportunity and Challenges of Energy Efficiency in Commercial and Industrial Sectors

Market Opportunities	Challenges
1. Domestic energy policy to reduce energy intensity by 1% per year and total of energy consumption reduction target of 17% compared to business as-usual in 2015	1. Low awareness on energy efficiency in commercial and industrial sectors
2. Usage of cooling systems in Indonesia continues to increase by 15% per year in the industrial, commercial, and private sectors and contribute to 15.4% of energy-related GHG emissions	2. Financial risk perceived by both clients and lenders on energy efficiency project
3. Cooling system appliances in Indonesia do not widely use energy efficiency features such as VSD or inverter compressors (BPPT, 2020).	3. Clients are usually face difficulties in accessing financing from banks
4. Covid-19 Pandemic pushes commercial and industrial sectors to operate efficiently	4. ESCOs in Indonesia are usually small and face the same difficulty in accessing financing from banks

3

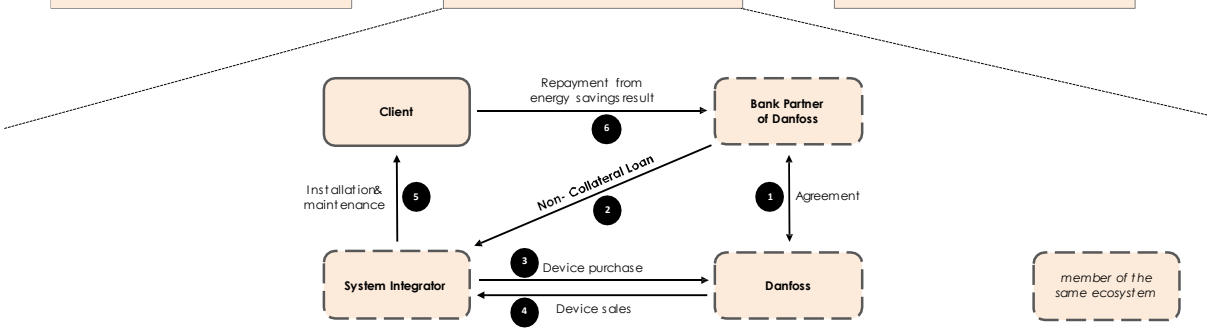
Approach #1: Developing Innovative Business Model in Energy Efficiency

This project is supported by P4G – Partnering for Green Growth and the Global Goals 2030

The schematic of innovative business model

This business model has been successfully implemented by Danfoss at a hotel in Jakarta, with required capital around USD 200K

Pre-Implementation	Implementation	Measure & Verification
Danfoss assesses client's historical electricity consumption through an energy audit. Danfoss also discusses potential monetary savings calculation.	Danfoss brings together (1) its global-proven energy-savings technology, (2) bank partner, and (3) system integrator to install and maintain.	DEMS (Danfoss Energy Management System) is online platform where client, bank, and Danfoss can observe the energy savings data together.



5

The innovative business model can address common challenges in Energy Efficiency (EE) projects

This business model is a one-stop integrated solution to tackle these challenges, from its pre-implementation until MRV stage

Common Challenges in EE Project	How the Innovative Business Model Addresses the Challenges
Client and ESCO cannot gain access to bank financing	It is Danfoss' role to bring in bank partner for both client and ESCO
Energy savings is less than what is needed to repay bank loan	Danfoss technology is proven to save 30% of energy consumption
Energy savings data is not transparent, leading to low trust among parties	DEMS can be accessed by all parties (i.e. client, bank, Danfoss).
Return and risk calculation is not clear to the client, leading to dispute	Danfoss will discuss financial projection together with potential client first.
Unwanted behavioral change from client's energy consumption	Danfoss will study potential client's historical consumption to predict this.

6

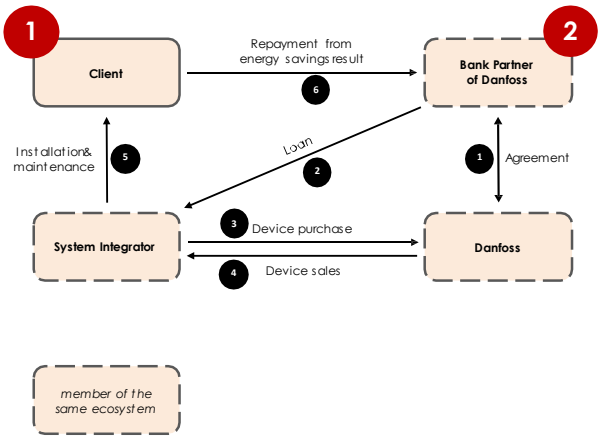
Approach #2: De-risking Instrument to Accelerate Energy-Efficiency Business Transaction

This project is supported by The Energy Transition Partnership (ETP) and UK Partnering for Accelerated Climate Transitions program

CLIMATE POLICY INITIATIVE

Danfoss

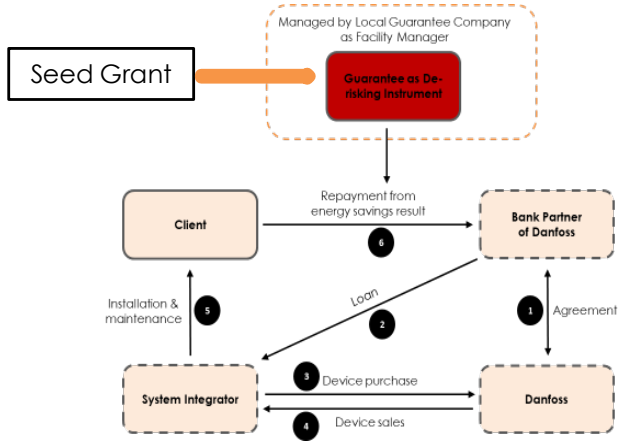
Challenges on the implementation of innovative business model



1. Lack of confidence/trust in the energy saving performance, leads to potential clients reluctant to invest in energy efficiency project
2. High perceived risk, lead to the high cost of finance. This then increases unwillingness potential clients to implement in energy efficiency project.

8

An integrated ecosystem to accelerate EE business transaction



Benefits

1. Improve confidence level/trust of potential clients to implement energy efficiency project as the potential risks has been distributed properly to other stakeholders
2. Loan providers/banks perceived risk will be reduced as more stakeholders participated to absorb potential risks, thus cost of finance could be reduced

9

Contact –

CPI: climatepolicyinitiative.org
The Lab: climatefinancelab.org
USICEF: usicef.org
Global Landscape of Climate Finance: climatefinancelandscape.org

@climatepolicy
@climatepolicyinitiative

CLIMATE POLICY INITIATIVE

Thank You

Analysis of Financing Model for Energy Efficiency Investments in Korea

Juheon SEOK
2022.03.29

에너지경제연구원
Korea Energy Economics Institute

Contents

1. Current Status of Energy Consumption in Korea

Energy intensity

- Korean energy intensity was higher than major developed economies although Korea's rate of energy intensity improvement decreased to 1.6% from 2010 to 2019.
  - Energy intensity (energy/GDP) : an important indicator of how much energy is used by economy. Lower energy intensity means a lower cost of converting energy into GDP.

< Energy intensity improvement in Korea and major economies, 2000-2019 >

	2000	2005	2010	2015	2019	Average Annual Rate	
						00 → 10	10 → 19
KOREA	0.179	0.156	0.15	0.141	0.130	△1.8%	△1.6%
JAPAN	0.102	0.10	0.092	0.079	0.071	△1.0%	△2.8%
GERMANY	0.111	0.106	0.101	0.083	0.077	△0.9%	△3.0%
United States	0.165	0.149	0.136	0.120	0.111	△1.9%	△2.2%

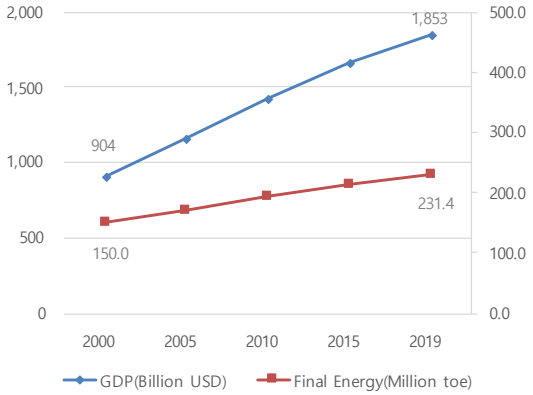
Note : TEPS/GDP (TOE per thousand 2015 USD PPP)
Source: Energy Indicators, OECD Library

1. Current Status of Energy Consumption in Korea

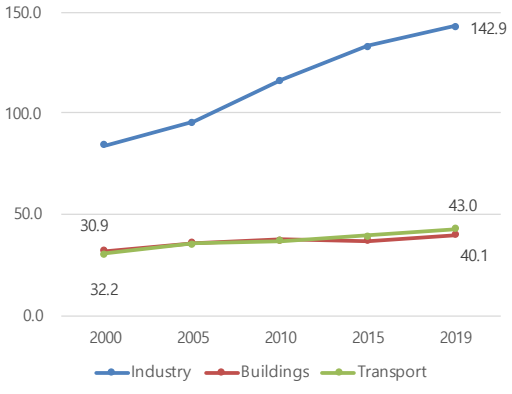
Final demand and GDP in Korea

- Final energy consumption has increased at an average annual rate of 2.3% since 2000, which was 231 million toe in 2019, and decreased slightly in 2019 after peaking in 2018.
- Industrial sector led to the increase in consumption, which was the largest share of energy consumption, 61.8% in 2019.
- Buildings and Transport increased as well.

<Final energy consumption and GDP>



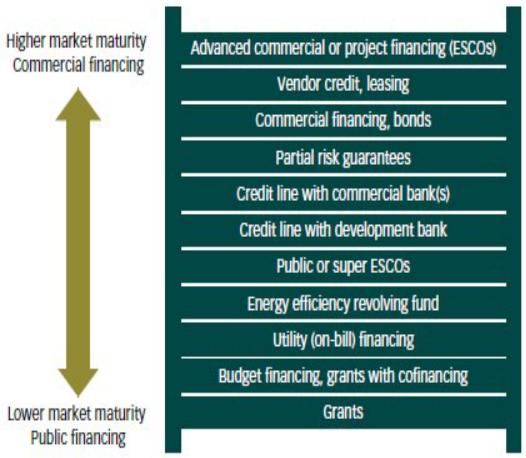
< Final Energy Consumption, by sector>



2. Financing Energy Efficiency

Financing mechanisms to support EE investments

< Ladder of financing options for EE investments >



Source : World Bank(2018), Financing Energy Efficiency, Part 1: Revolving Funds

- The spectrum of financing options :
  - Advance from financing options that rely more on public resources to those that rely more on commercial capital.
  - i.e. grants and public funds → leasing and project financing
- Financing mechanisms should be selected based on stage of market development and financing gaps.
- Over time, financing programs should seek to dimb the ladder to more sustainable and commercial models.

5

3. Financing Methods for EE Investments in Korea

End user's financing for EE projects

- Energy users who are in need of energy efficiency improvements but have limited financial means or technical capacities to implement such projects on their own can (1) hire an ESCO and (2) use Utility Rebate Programs.
  - ESCOs provide technical skills, assuming performance risks, facilitating access to finance from commercial **lenders**, and enabling **energy users to repay initial costs through future savings.**
  - Utility Rebate Programs can reduce users' initial investment costs.

6

3. Financing Methods for EE Investments in Korea

What is an Energy Service Company (ESCO)?

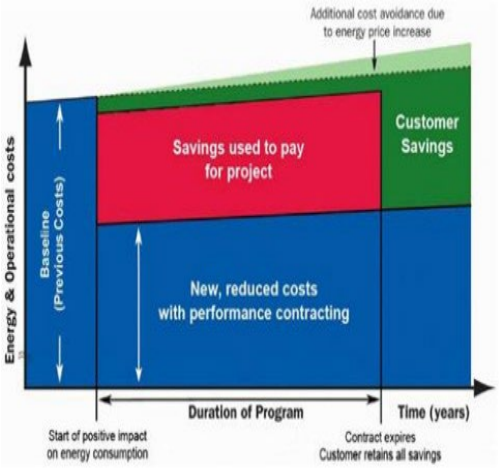
- Generally, the ESCO is a business that provides compressive energy solutions including designs and implementation of energy efficiency projects.
- In Korea, the ESCO is defined as to a company equipped with required facilities, capital, and technology and registered to the Ministry of Trade, Industry and Energy (MOTIE).

7

3. Financing Methods for EE Investments in Korea

What is an Energy Performance Contracting (EPC)?

- EPC is an innovative financing scheme offered by ESCOs to customers and a provision of energy savings with a guaranteed outcome.



Source : Pernetta and Bender, Introduction to EPC and ESCOs, ficompass

- The key principle of EPC is that **the investment costs are financed from the resulting savings.**
- The ESCO plans and conducts the project and receives only service fees from achieved savings.
- Clients will eventually benefit from both energy and cost savings after the end of the contract .
- Most EPC projects focus on the implementation of energy efficiency measures including lighting, HVAC, energy management and control, and envelope insulation.

8

3. Financing Methods for EE Investments in Korea

EPC models in Korea

- In Korea, ESCOs have three Energy Performance Contract Models for energy users **; (1) New Shared Savings, (2) Guaranteed Savings by ESCO financing, and (3) Guaranteed Savings by Energy users' financing.**
  - The EPC commits the ESCO to installing the necessary equipment, provides a performance guarantee and establishes the terms of any upfront or ongoing payments, which are intended to be less than the financial savings realised by the project.

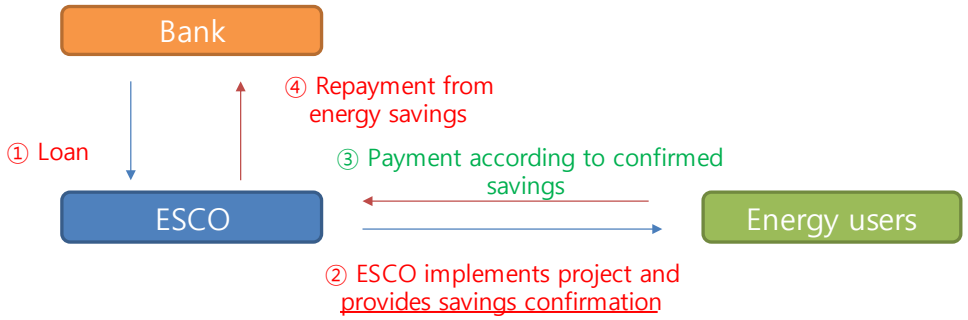
⇒ **ESCO's service fees (upfront payments) < achieved savings from the EE project**

9

3. Financing Methods for EE Investments in Korea

End users' Financing Options in Korean EPC Models

- **(1) New Shared Savings Model**
  - Combining the advantages of the shared savings with those of Guaranteed savings.
  - ESCOs take on both financial and technical risk.
  - Prior to implement projects, energy users confirms the payback plan to ESCOs according to estimated savings calculated by energy audit.
  - ESCOs do not guarantee the energy savings and banks are not responsible for the savings.

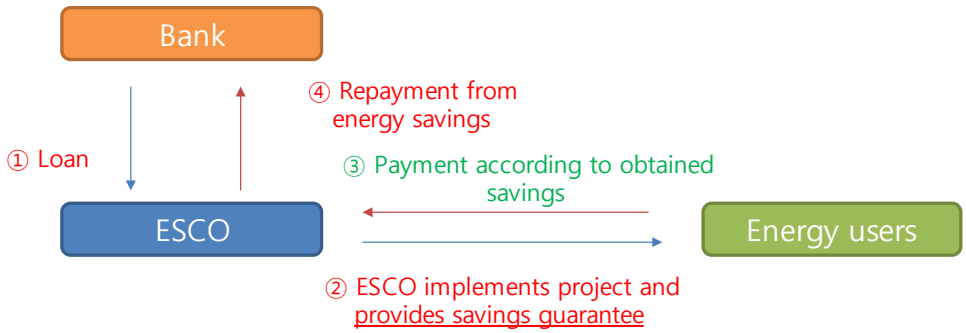


10

3. Financing Methods for EE Investments in Korea

End users' Financing Options in Korean EPC Models

- **(2) Guaranteed Savings by ESCO financing**
  - ESCOs provide financing needed to implement projects and guarantee the energy savings.
  - ESCOs take both financial and technical risk.

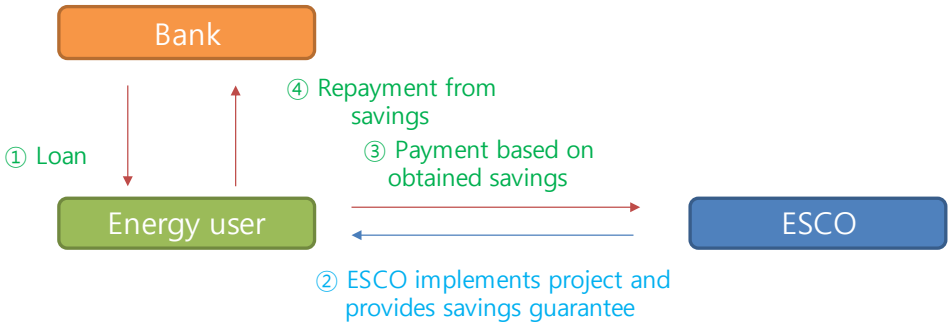


11

3. Financing Methods for EE Investments in Korea

End users' Financing Options in Korean EPC Models

- **(3) Guaranteed Savings by Energy users' financing**
  - Same as the original Guaranteed Savings model.
  - Energy users assume on financing for initial costs. (bank or their own equity)
    - ESCOs can help arrange users' project financing.
  - ESCOs take only technical risk.

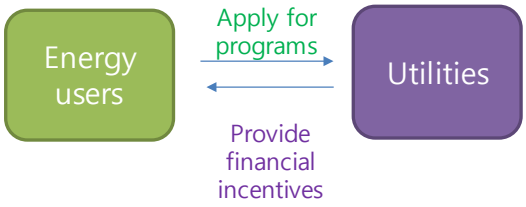


12

3. Financing Methods for EE Investments in Korea

End user's Financing by using utility rebate program

- **Energy users can use utility rebate programs for their energy efficiency investments.**
  - EERS programs offer financial incentives to upgrade energy efficiency products.
  - Energy users can reduce their upfront capital costs of projects through rebate programs.
  - Rebate program is not a direct financing method but it can reduce initial costs and energy bills after upgrading.



<Utility Rebate Program>

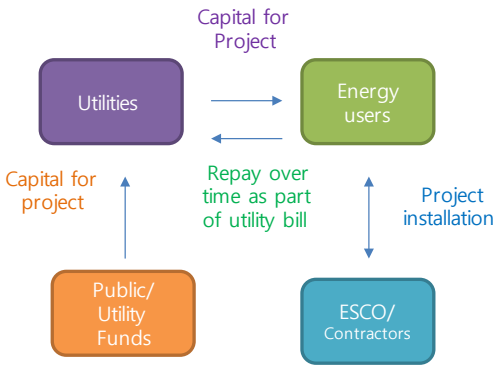
13

3. Financing Methods for EE Investments in Korea

What is On-Bill Financing (OBF)?

- **On-bill financing** (OFB) : refers to a loan made to a utility customer. The capital to implement the project is provided to the customer by the utility

  - **The loan funds** are provided directly by the utility
  - **Regular monthly loan payments** are collected by the utility bill until the loan is repaid.
  - **Savings** from the funded improvements are expected to **equal or exceed the new on -bill loan payments.**
    ⇒ "Bill neutrality"



- Korea public utilities do not provide this on-bill financing in their EERS programs so far. But it is a very useful financing for both users and ESCOs to invest EE projects.

14

3. Financing Methods for EE Investments in Korea

Financing Options for ESCO Business

- ESCOs can use policy loan fund and factoring to finance their business.

➢ Policy loan Fund

- Government provides loans with low interest rate to ESCO business according to Energy Use Rationalization Act

➢ Factoring of ESCO's receivables

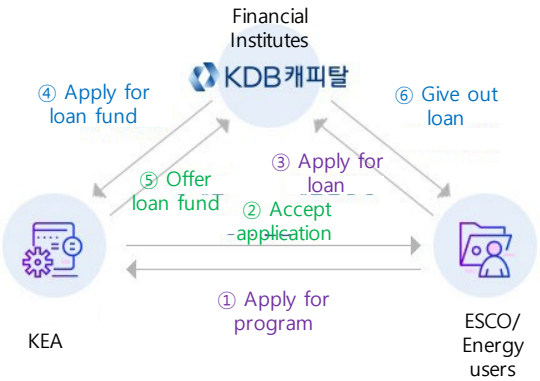
- Financial institution buys the receivables from the ESCO, thereby refinancing its portfolio and allowing the ESCO to finance more projects.
- Financial institution then continues to accept payments from the ESCO clients for the duration of the contracts.

15

3. Financing Methods for EE Investments in Korea

Policy Loan Fund : Soft Loan for Energy Saving Facilities

- **Soft Loan program** offers long-term and low-interest rate loans to cover part of the investments in energy saving facilities in order to conserve energy and reduce GHG emission.



- **ESCOs** that have a new shared savings contract with energy consumers
- **Energy users** that have a guaranteed savings contract by users' financing

16

3. Financing Methods for EE Investments in Korea

ESCO investment projects in Policy Loan Fund

- The ESCO investment projects(ESCO loan program) launched in 1993 has supported energy efficiency projects worth 1.7 trillion won and achieved 1.2 million toe of savings from 2010 to 2020.
- In 2015, large ESCOs were excluded from policy loan fund and after then fund size for ESCO projects decreased rapidly.

< Savings and financial support of ESCO investment projects>

		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	total
ESCO investment projects	Savings (k TOE)	95	211	233	175	166	157	96	32	55	8	67	**1,295**
	Financial support (KRW billion)	131	298	277	310	254	163	124	52	54	16	41	**1,719**

Source : KEA(2021), Energy Report 2021

17

3. Financing Methods for EE Investments in Korea

ESCO Factoring

- Factoring was introduced to help financial institutions purchase ESCOs' receivables and lend money in order to alleviate ESCOs' financial difficulties and debt ratio burden in 1999.
- ESCOs take on financing in the case of most EPC projects. When ESCOs take out loans for EPC investments, their credit capacity caps the total number of projects they can maintain in their portfolio.
- This is the reason why ESCOs face to financial difficulties in their business.

18

3. Financing Methods for EE Investments in Korea

Legal disputes on ESCO Factoring

- Legal disputes arose over energy savings in energy users, ESCOs, and financial institutes under the guaranteed savings contract.
- In April 2014, the Supreme Court ruled that the responsibility for energy savings guarantee of the EPC projects could not be attributed to the user but the financial institution that took over the receivables was responsible for some portion of savings.
- Subsequently, ESCO factoring was stopped in the market.
- From July 2015, the Ministry of Trade, Industry and Energy(MTIE) introduced a new shared saving contract. Under the new contract, the obligation of energy savings guarantee according to factoring is not transferred to the financial institutions.
- Finally, factoring was resumed in the market in March 2016.

19

4. Condusions

- Because Korea's energy intensity is higher than other major economies, it is necessary to improve energy efficiency.
- In particular, energy efficiency investments are needed in the private sector.
- To promote private energy efficiency investments, Korea government was introduced to ESCO in 1993.
- ESCO can help Energy users who are lack of technology and financing for energy efficiency projects.

20

4. Condusions

- There are three Energy Performance Contract Models to aid energy user' financing in Korea : (1) New Shared Savings, (2) Guaranteed Savings by ESCO financing, and (3) Guaranteed Savings by Energy users' financing.
- There are two financing models for ESCO business: policy loan fund and ESCO factoring in Korea although the United States and China have many ESCO financing models : bonds, leasing, energy services agreements (ESAs), local government and private funds, and private equity financing, etc.
- To promote Korea's ESCO industry, it is required to develop more various financing models.

21

Thank You

에너지경제연구원
Korea Energy Economics Institute

CLP Eco Building Fund Introduction

CLP Power Hong Kong Limited
March 2022

Information Classification: Proprietary

Energy for Brighter Tomorrows

Content

- CLP Power Hong Kong Limited (CLP)'s initiatives on Energy Efficiency and Conservation
- CLP Eco Building Fund Introduction
- CLP Eco Building Fund Successful Cases

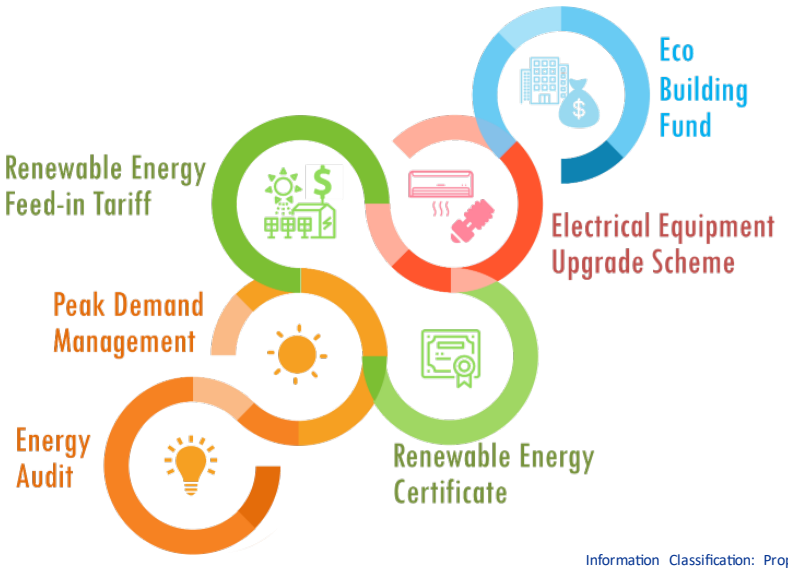
CLP 中電

CLP Initiatives on Energy Efficiency and Conservation

Information Classification: Proprietary

Energy for Brighter Tomorrows

CLP Initiatives on Energy Efficiency & Conservation



Eco Building Fund

Objective

CLP Eco Building Fund was set up to support the carrying out of retrofitting or retro-commissioning to enhance the energy efficiency performance of building services installations for communal use in residential, commercial and industrial buildings

CLP Eco Building Fund Introduction

Energy for Brighter Tomorrows

Basic Information

Communal Area of Residential Buildings

Communal Area of Commercial and Industrial Buildings

Residential Buildings

Maximum Subsidy*

HK$ 300,000 per Year

*The ceiling of subsidy amount depends on the type of building and tariff account

Commercial / Industrial / Composite Buildings

Maximum Subsidy*

HK$250,000 per Year

*The ceiling of subsidy amount depends on the type of building and tariff account

Retrofitting Projects

Retro-commissioning

Scope of Fund – Retrofitting Projects

Retrofitting Projects

Replacement, upgrade or retrofit of building services systems, for example:

- Lighting System
- HVAC System
- Lift & Escalator
- Other Electrical Installation (including water pumps)

LED Lighting

Water-cooled Chiller

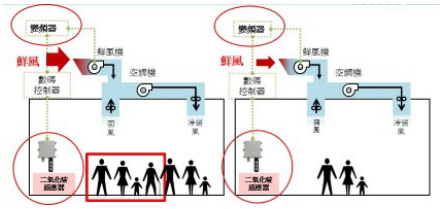
EC Plug Fan

Solar Film

Scope of Fund – Retro-commissioning

Retro-commissioning to optimise building control and operation, for example

- Demand Control Ventilation
- Water Pump / Air Fan VSD Control



Typical Energy Saving Opportunities for Retro-commissioning

Energy Saving Opportunities
1. Automatically Control Indoor Air Temperature Setting
2. Install Variable Speed Drive to Control Water Pump/Fan Speed
3. Reduce Water Pump Impeller Size
4. Automatically Control Chilled Water Supply Temperature
5. Operate more number of Cooling Tower
6. Install Automatic Tube Cleaning Device to Clean Condenser Tube
7. Share Cooling Demand with more Variable Speed Driven Chillers or Oil-free Chillers
8. Share Cooling Demand with lesser Constant Speed Driven Chillers
9. Automatically Control Fresh Air Intake
10. Free Cooling
11. Reduce Differential Pressure Setting of Variable Speed Driven Chilled Water Pump
12. Reduce Air Duct Static Pressure Setting of Variable Speed Driven Air-Handling Unit (AHU)

Priority

Priority will be given to buildings fulfilling the following criteria:

- Buildings with multi-ownership;
- Projects with higher energy saving cost effectiveness;
- Ageing buildings;
- Conducted energy audit or similar assessment before (For example, EU part of BEAM Plus EB);
- New technology demo project or showcase project which will allow public visits;
- Good history of previous applications

Funding Mechanism

Higher subsidy percentage will be offered to higher energy saving and/or shorter completion period.

Funding to Residential Building or SMEs

Project Type	Completion period after project approval	Subsidy (project cost)
Retrofitting Project with Higher Energy Efficiency (For example, Lighting, Air-conditioning)	<9 months	50%
	≥9 – <18 months	40%
	≥18 – <24 months	35%
Retrofitting Project with Low energy Energy Efficiency (For example, Lift, Escalator)	<9 months	30%
	≥9 – <18 months	25%
	≥18 – <24 months	20%
Retro-commissioning or implementation of smart/ IT technologies#	<9 months	$0.9/kWh
	≥9 – <18 months	$0.8/kWh
	≥18 – <24 months	$0.7/kWh

*Coefficient of Performance of the new chiller(s) is 10% better than that stipulated in the prevailing Building Energy Code (for whole project completed on or after 24 May 2021)

The subsidy amount shall not exceed the project cost

Subsidy Cap

HK$300,000
cap/building/year, HK$1m/application, whichever is lower

HK$400,000
(1) For chiller replacement project* with new COP exceeds latest BEC by 10%

(2) For chiller replacement projects completion date is within the same year of approval

Limited Special Offer

Subsidy Cap
+HK$100,000
Achieving both conditions 1 and 2 above

Funding Mechanism

Higher subsidy percentage will be offered to higher energy saving and/or shorter completion period.

Funding to BT/LPT Large Business Customers

Project Type	Completion period after project approval	Subsidy (project cost)
Retrofitting Project with Higher Energy Efficiency (For example, Lighting, Air-conditioning)	<9 months	40%
	≥9 – <18 months	30%
	≥18 – <24 months	25%
Retrofitting Project with Low energy Energy Efficiency (For example, Lift, Escalator)	<9 months	20%
	≥9 – <18 months	15%
	≥18 – <24 months	10%
Retro-commissioning or implementation of smart/ IT technologies#	<9 months	$0.9/kWh
	≥9 – <18 months	$0.8/kWh
	≥18 – <24 months	$0.7/kWh

*Coefficient of Performance of the new chiller(s) is 10% better than that stipulated in the prevailing Building Energy Code (for whole project completed on or after 24 May 2021)

The subsidy amount shall not exceed the project cost

Subsidy Cap

HK$250,000
cap/building/year, HK$1m/application, whichever is lower

HK$350,000
(1) For chiller replacement project* with new COP exceeds latest BEC by 10%

(2) For chiller replacement projects completion date is within the same year of approval

Limited Special Offer

Subsidy Cap
+HK$100,000
Achieving both conditions 1 and 2 above

Tips on Application

Number of bids required for tender

Project Amount	Number of Bids required
>$5,000 - <$10,000	2
≥$10,000 - <$200,000	3
≥$200,000	5

Funding Calculation – Illustration

Given:

- Building Type: Commercial
- Tariff Type: SMEs
- Project Completion: < 9 months after approval

➢ Subsidy for Lighting: HK$90,000 x 50%	HK$45,000
➢ Subsidy for Chiller: HK$500,000 x 50%	HK$250,000
Total Subsidy:	**HK$295,000**

Application Process

Tips on Application

- May engage a Qualified Service Provider (QSP) and/or Energy Saving Facilitator (ESF) to support the application
- Minimum number of bids is required
- Improvement works must be completed no more than 24 months after approval

CLP Eco Building Fund Successful Cases

Information Classification: Proprietary

Energy for Brighter Tomorrows

Successful Case – Lighting Replacement

Customer looked for quick win solutions → CLP offered a free energy audit → Customer applied for Eco Building Fund → Customer replaced existing lighting to LED → Customer received funding 50% project sum

Around 1,200 T8 lamps; Project cost ≈$100,000;

Replaced with LED lamps; 50% subsidy received;

Energy Saving ≈130,000kWh Payback in 4 months

We help our customers to implement quick win projects to reduce operating cost!

Successful Case – Knowledge-based Chiller Plant Optimization

Customer looked for IoT solutions for chiller plant → CLP shared market available solutions → Customer applied for Eco Building Fund → Customer implemented optimisation solution → Customer received full subsidy for the project

Project Highlights:

- It's a **new built shopping mall**
- The solution provides **continuous data analysis** and **automatic control** of system operations to achieve **optimum chiller system efficiency**
- Annual **energy saving** ≈ 250,000 kWh **(5% of A/C consumption)**
- Project cost ≈ $170,000 **(100% subsidised by Eco Building Fund)**

Even new building can achieve significant energy saving!

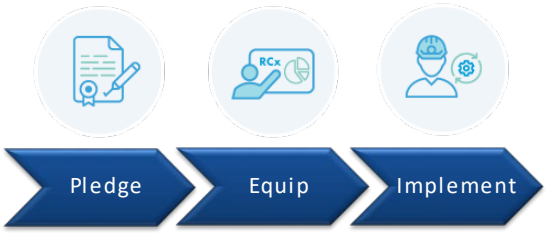
CLP Eco Building Fund
Promotions & Facilitations

Full Range of Promotions of CLP Eco Building Fund

- CLP Webpage
- eDM
- CLP Youtube
- Facebook
- LinkedIn
- eNewsletter
- Bill insert
- Commerce Chambers
- Professional Institutions

CLP 中電

Additional Support to Customers



- Offer free retro-commissioning training
- Provide technical and financial support

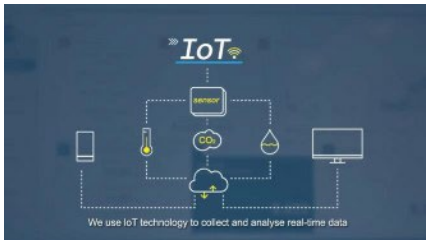
Supported by:

CLP Energy Audit Service

CLP Eco Building Fund

CLP 中電

Smart Energy Award – Winner's Showcase



Video Link

Thank You

Information Classification: Proprietary

Energy for Brighter Tomorrows