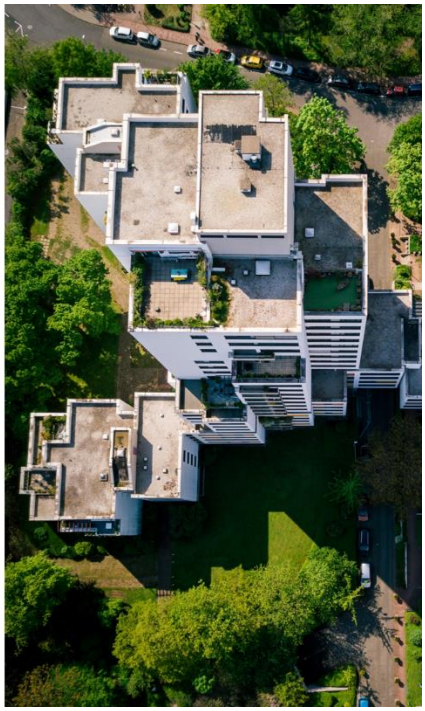
Summary of Stakeholder Consultation Workshop-2

(Result of Activity 2.3 and Activity 3.3)

Project: "Enabling Readiness for Up Scaling Investment in Energy Efficiency for Achieving NDC Goals in Thailand"



Prepared for

UNITED NATIONS SUPPORT OFFICE - NAIROBI (UNSOS)

By

INTERNATIONAL INSTITUTE FOR ENERGY CONSERVATION - ASIA (IIEC)

November, 2021

1 INTRODUCTION

The "Enabling Readiness for Up-Scaling Investments in Building Energy Efficiency for Achieving NDC Goals in Thailand" project is designed to support Thailand in achieving its national energy efficiency and GHG emission reduction targets in the building sector. The project is funded by the Green Climate Fund (GCF) in coordination with the Office of National Resources and Environmental Policy and Planning (ONEP)-GCF Thailand National Designated Authorities (NDA), and the Office of National Higher Education Science Research and Innovation Policy Council (NXPO)-Thailand National Designated Entity (NDE), and the Climate Technology Centre and Network (CTCN), as the delivery partner.

In Thailand, the Building Energy Code (BEC) is one of the core elements in the country's NDC Roadmap, and compliance with the BEC requirements, adoption of sustainable building materials, and effective construction practices serve as the cornerstone in meeting Thailand's GHG emission reduction targets in the building sector. This project has aimed at promoting greater compliance with the BEC through providing information on proven energy saving results, and long-term financial and economic benefits of priority energy efficiency technologies for buildings in Thailand.

Under the project, a series of consultation workshops is designed to share project findings with local stakeholders, and to seek their comments and suggestions to further strengthen the BEC compliance effort. The first stakeholder consultation workshop was successfully held in March 2021, and participated by more than 26 participants representing policy and regulatory bodies, and advocacy organizations in the Thai building sector. Results and recommendations gained from the first stakeholder workshop provided a common ground for continuing the assessment and prioritizing of BEC technologies.

The second stakeholder consultation workshop was organized to disseminate the outcomes of Task 2 (Technology Assessment) and Task 3 (Financial Assessment) to the relevant stakeholders. It should be noted that two separate consultation workshops were originally planned for Task 2 and 3, however, given the ongoing COVID-19 pandemic situation starting from April 2021, the project team proposed to combine the two separate workshops into one workshop, and this was agreed to by CTCN, NDE, and NDA during the third reporting period of the project (April to August 2021) in August 2021.

The second stakeholder consultation workshop was organized by the project team, with supports from CTCN, NXPO and the Department of Alternative Energy Development and Efficiency (DEDE) as a virtual meeting via the zoom application on Wednesday, October 20th, 2021. The workshop was attended by 62 participants from 40 organizations, representing policy and regulatory authorities, private sector developers, builders, academic institutes, as well as building designers, BEC-certified engineers/auditors, and construction companies.

2 SUMMARY OF 2ND STAKEHOLDER CONSULTATION WORKSHOP

Ms. Sirinya Lim, a representative of the Thai NDE, welcomed all participants to the second stakeholder consultation workshop, and the opening remark was given by Ms. Clara landeiro, the CTCN Regional Manager. Following the opening session, the project introduction, progress of activities, and workshop objective were presented by IIEC. After the introductory session, Mr. Prakob Eamsa-Ard, a representative of DEDE, updated all participants on the recently approved legal procedures for enforcement of the revised BEC 2020 , and the IIEC project team presented the analysis results of Task 2 and Task 3 – the techno-economic assessment of the priority energy efficiency technologies for five building types. Following the presentations, participants provided their comments and suggestions on the project findings through Zoom, online polls and chat box. The project team also received comments/suggestions by email after the workshop.

Figure 1: Second Stakeholder Consultation Workshop through ZOOM on October 20th, 2021

The workshop agenda and a full list of participants are given in Annex –I, and copies of all the presentations are given in Annex-2.

2.1 SUMMARY OF THE PRESENTATIONS

The keynote of each presentation are summarized as follows:

Session 1: Update on the legal procedures and enforcement status of the BEC 2020

The revised BEC 2020 was approved by the Cabinet on July 8, 2020, and the revised BEC has been promulgated in the Government Gazette since November 12, 2020. The enforcement process of the revised BEC still continues

through an inter-ministerial collaboration between DEDE and the Department of Public Works and Town & Country Planning (DPT) under the Ministry of Interior (MOI). To actually enable the enforcement by DPT, the BEC enforcement has to be approved by the DPT-building control board, and it was submitted to the DPT-building control board for consideration and approval for enforcement under Section 8 of a DPT-ministerial regulation, under the Building Control Act, B.E. 2522. This was gone through several rounds of consultation and discussion between DEDE and DPT from January 2021 to September 2021.

On September 30, 2021, DPT has endorsed the enforcement of the revised BEC 2020. However, if there is an amendment to the Ministerial Regulations/Ministry Notifications regarding the BEC standards and criteria, or BEC certified methodology, the amendment shall be submitted to the DPT-building control board for consideration before publishing in the Government Gazette.

Implementation of the phase-step BEC compliance approach, as shown in Figure 2, will be undertaken once the relevant regulatory documents on the BEC criteria are issued, and these consist of the DEDE notification on the qualification criteria of BEC certified-training bodies and the certified BEC auditors, and the MOE ministerial announcement of the BEC criteria. The DEDE notification was already approved by the DEDE's Director General in September 2021, and it is in the process of promulgation in the Government Gazette. The MOE ministerial announcement was submitted to the Minister of Energy for approval, and it is expected to be signed off by November 2021

The immediate scope of BEC compliance will cover large new construction buildings with floor areas exceeding 10,000 square meters- effective by 2022. Figure 2 below shows that the enforcement scope will be extended to cover smaller buildings in subsequent years. The enforcement of the BEC is designated under Section 8 of the Building Control Act (B.E. 2552), and the new building that does not comply with the BEC will not be allowed for construction. The BEC enforcement will be carried out through an inter-ministerial collaboration between DEDE and DPT and Local Administration Organizations (LAOs).

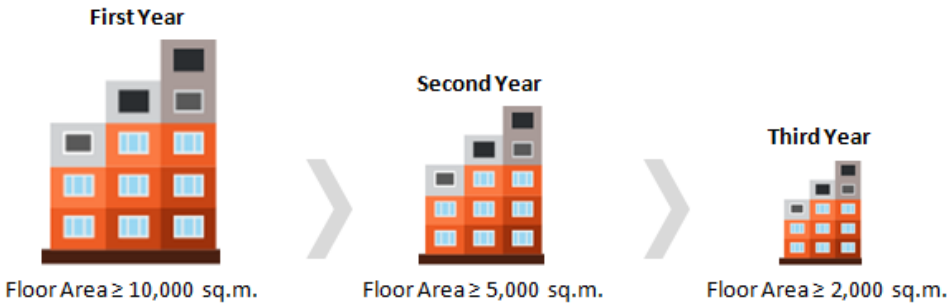


Figure 2: Phase-Step BEC Compliance Approach

SESSION 2: BEC technology assessment of five building types within the BEC framework

Before presenting the results of Task 2-Technology assessment of five building types within the BEC framework, the project team provided a short summary of the BEC ten-year energy baseline and benchmarking data which include average EUI profiles of the five building types, and the gap analysis of BEC performance over the 10-year implementation period. The analysis of the two BEC compliance approaches, i.e., prescriptive and total energy consumption compliance, was also presented.

The presentation highlights the BEC technology assessment methodology the criteria adopted, and the scoring approaches, as shown in Figure 3.

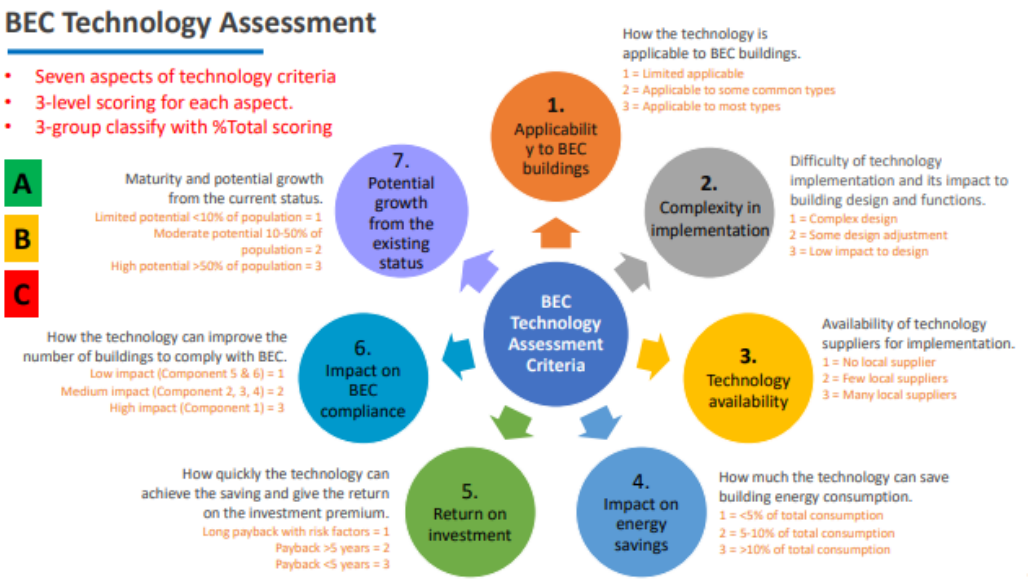


Figure 3: BEC Technology Assessment Methodology and Criteria for Prioritizing

The results of the technology assessment for the six BEC components and their relevance to building energy performance in each BEC component are presented. For each BEC component, commercially available technologies are evaluated for their applicability, impacts on building performance in terms of complexity in implementation, availability of suppliers in Thailand, impacts on the BEC compliance, impacts on energy saving, and potential market growth. The total score of each technology is summarized and depicted on the radar chart. More details of the section 2 presentation are given in Annex-2.

Examples of the assessment of each individual technology are shown in Figure 4 and Figure 5.

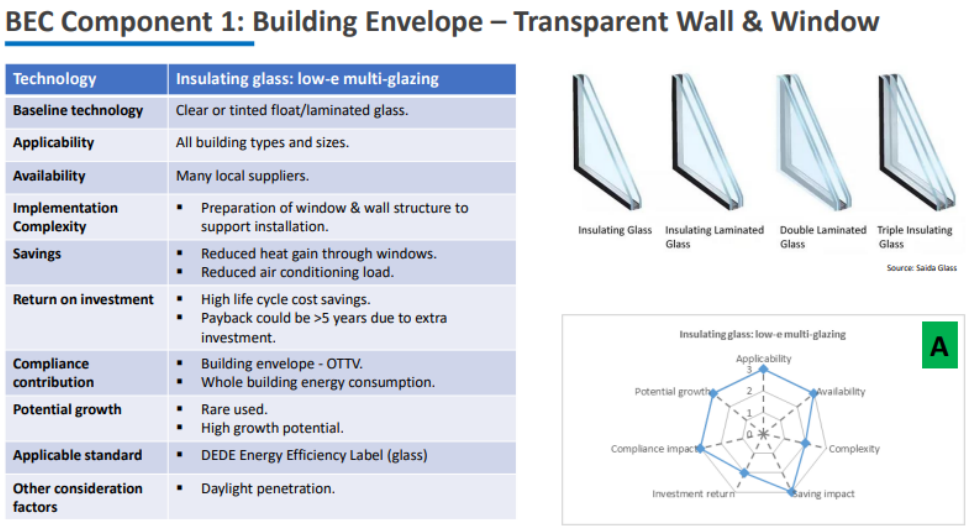
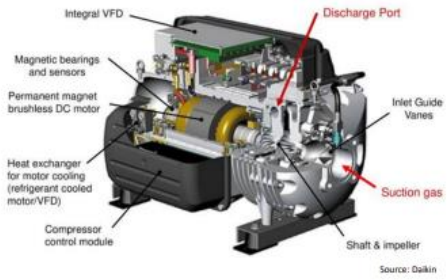


Figure 4: Example of Technology Assessment Findings – Transparent Wall & Window

BEC Component 3: Air Conditioning System

Technology	High efficiency chillers/Oil-free magnetic bearing chillers
Baseline technology	Standard electric chillers.
Applicability	Medium to large sized buildings with central chilled water air conditioning system.
Availability	Many local suppliers.
Implementation Complexity	Replacement of same capacity chiller with minor modification.
Savings	▪ Reduced air conditioning consumption.
Return on investment	▪ Good payback normally <5 years.
Compliance contribution	▪ Air conditioning system - AC. ▪ Whole building energy consumption.
Potential growth	▪ Become commonly used. ▪ High growth potential.
Applicable standard	▪ Ministerial of Energy notification prescribing high efficiency chillers for air conditioning systems, 2009.
Other consideration factors	▪ Part-load efficiency to cooling load variations. ▪ Comparison with high efficiency chillers.



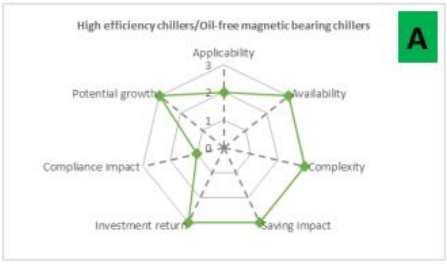


Figure 5: Example of Technology Assessment Findings – Air Conditioning System

The technology assessment results are used to classify technologies into high, medium and low priority group, as shown in Figure 6.

BEC Technology Priority

Group A: High priority

Greatly improve energy performance & BEC compliance with high return on investment.

Component 1: Building Envelope
- Low mass concrete block (AAC)
- Wall insulation with fiber glass, mineral wool
- Energy efficient coated glass: reflective glass, low-e film
- Insulating glass : low-e multiglazing
- Window shading devices
- Roof insulation with fiber glass, mineral wool or foams
- High solar reflective paint

Component 2: Lighting System
- High efficiency LED lamps (200 lm/W)

Group B: Medium priority

Low impact on BEC compliance but moderate savings & return on investment.

Component 1: Building Envelope
- Composite insulated panels with polyurethane, PIR, rockwool

Component 3: Air Conditioning System
- VRF/VRV air conditioning system

Component 3: Air Conditioning System
- High efficiency inverter split-type air conditioner
- High efficiency chillers/Oil-free magnetic chillers

Component 4: Hot Water Generation
- Heat pump hot water generation

Component 5: Renewable Energy Utilization
- Rooftop solar PV without grid selling and battery system

Group C: Low priority

Improve energy performance of some specific buildings & applications.

Component 2: Lighting System
- Energy efficient luminaires
- Lighting controls: occupancy, schedule controls
- Daylighting devices: light pipe, light shelves

Component 3: Air Conditioning System
- Absorption chillers
- Energy Recovery Ventilation (ERV)

Component 5: Renewable Energy Utilization
- Solar hot water generation

Component 6: Whole Building Energy Performance
- Building Energy Management System (BEMS): integrated building control
- Combined Heat and Power (CHP)

Figure 6: High, Medium and Low Priorities BEC Technologies

SESSION 3: BEC FINANCIAL ASSESSMENT OF FIVE BUILDING TYPES WITHIN THE BEC FRAMEWORK

In this session, the project team presented the result of Task 3-financial assessment of new buildings within the BEC Framework. The high and medium BEC technologies identified by technology assessment (Task 2) are used to simulate the energy performance of the five BEC building types. Parameters used in the financial analysis and

assessment are based on the parameters used by the BEC program (e.g., operating hours of the five BEC building types), and assumptions from common operation practices (e.g., utilization factors).

The financial assessment determined the scale of investment and return on incremental investment for each of the selected priority BEC technologies under different energy efficient building scenarios, i.e., BEC, High Energy Performance Standard (HEPS), High Energy Performance Plus (HEP+), and Net-Zero Energy Building (NZEB), against the baseline scenario.

Examples of the financial assessment results for the priority technologies are shown in Figure 7 and Figure 8

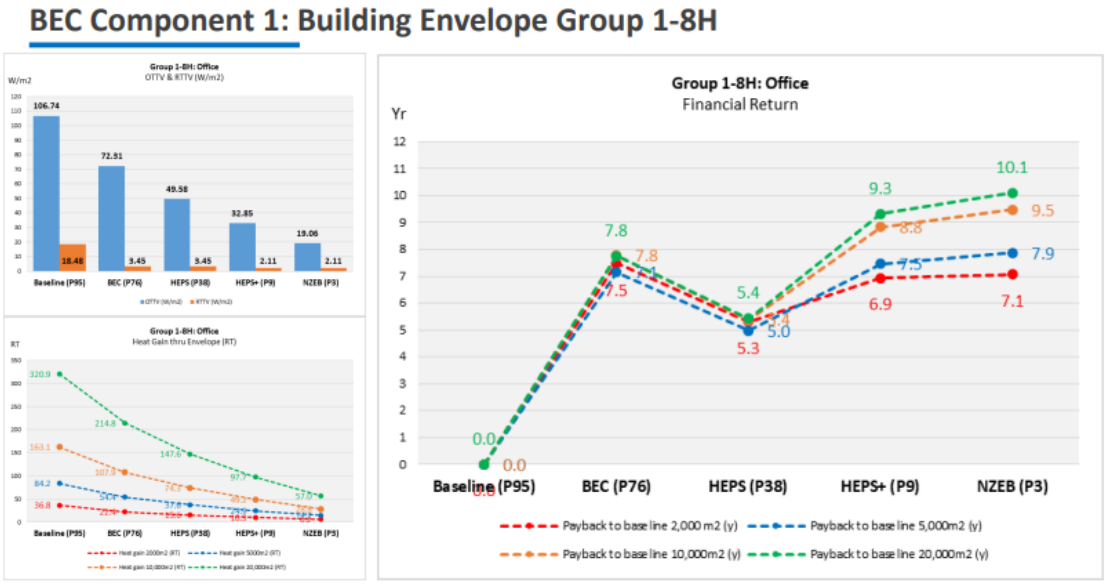
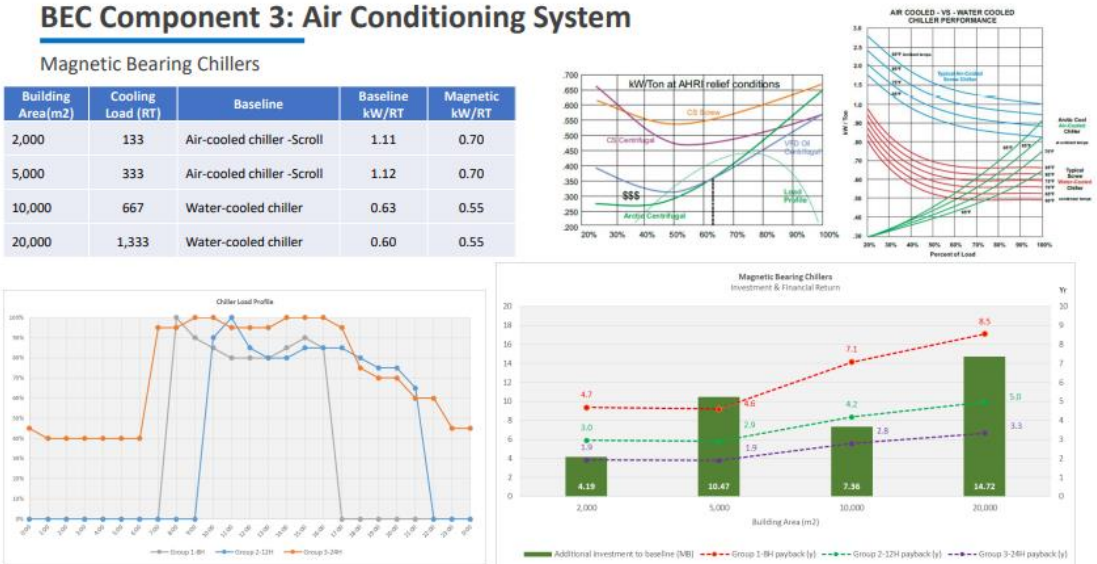


Figure 7: Example of BEC Financial assessment for prioritizing technologies in component 1



Building Area(m2)	Cooling Load (RT)	Baseline	Baseline kW/RT	Magnetic kW/RT
2,000	133	Air-cooled chiller -Scroll	1.11	0.70
5,000	333	Air-cooled chiller -Scroll	1.12	0.70
10,000	667	Water-cooled chiller	0.63	0.55
20,000	1,333	Water-cooled chiller	0.60	0.55

Figure 8: Example of BEC Financial assessment for prioritizing technologies in component 3

The results of the financial assessment are combined with the results of technology assessment in task 2 to develop recommendations on possible technology options that can be promoted to achieve the targets set in BEC, as shown in Figure 9.

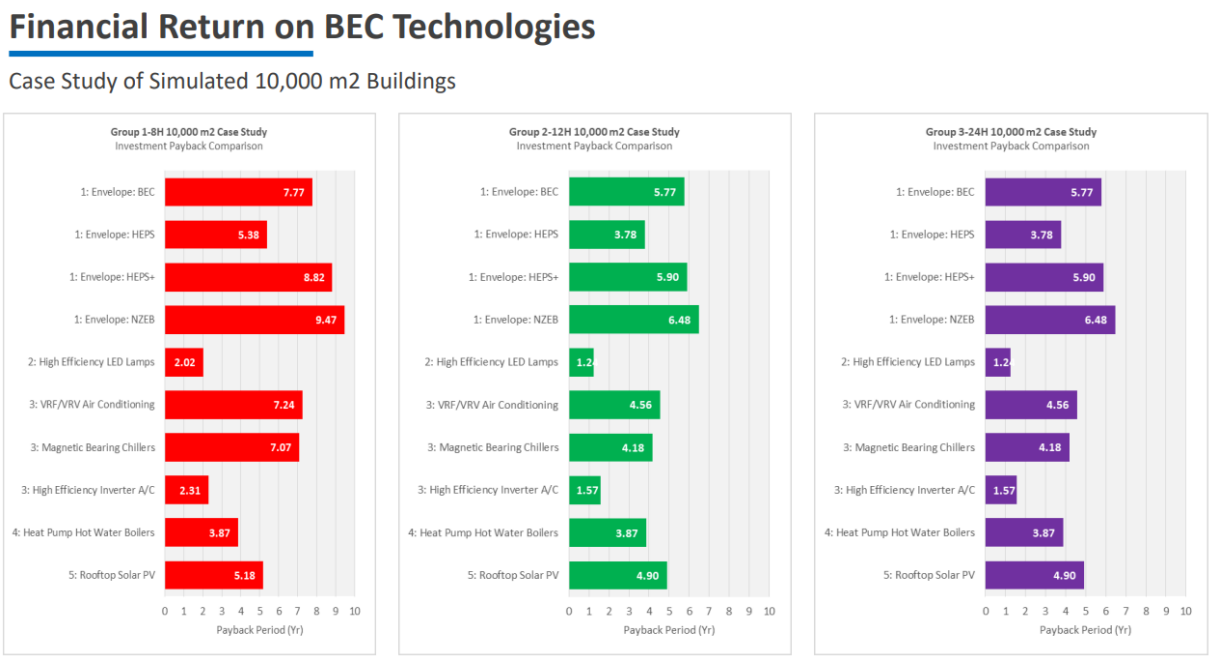


Figure 9: Summary of the possible technology options to achieve the targets set in BEC.

Subsequently to the presentation session, an open discussion was moderated by the project team to seek stakeholders' comments and suggestions to strengthen the project results and efforts further for the next activities.

2.2 WORKSHOP EVALUATION

The project team conducted the workshop evaluation through online polls during and at the end of the consultation workshop, and the evaluation assessment is performed based on the following three aspects.

1) Suitability of the assessment framework approach and analysis results
2) Valuable and Usefulness of the information.
3) Quality of Workshop Organization

Each participant evaluated the abovementioned aspects based on a five Likert scoring method, and the evaluation results are shown in Figure 10 to Figure 12.

SUITABILITY OF THE ASSESSMENT FRAMEWORK APPROACH AND ANALYSIS RESULTS:

More than 80% of participants are satisfied and agreed with the assessment framework approach and criteria used for the BEC technology and financial assessment. However, 8% of the participants felt somewhat satisfied, and 12% are abstained.

More than 82% of the respondents were satisfied with the overall result of Task 2-Technology assessment, and 73% of the respondents are satisfied with the Task 3-Financial assessment results.

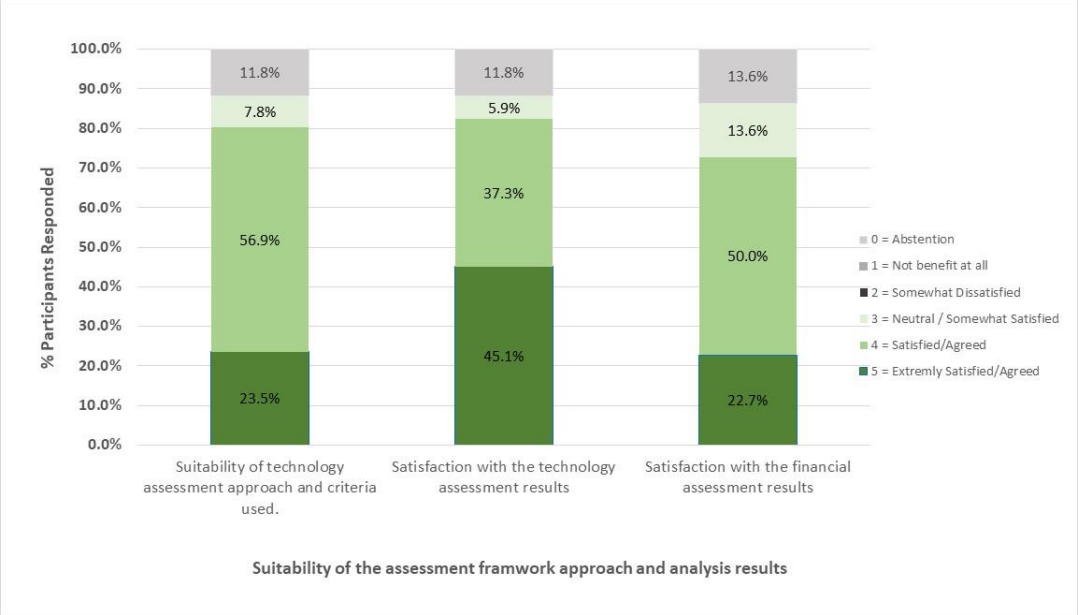


Figure 10: Evaluation of Suitability of the Assessment Framework Approach and Results

VALUABLE AND USEFULNESS OF THE INFORMATION AND RESULTS:

The participants viewed that the contents are useful and valuable. More than 50% of participants agreed that the technology assessment and financial results are helpful to BEC auditors, BEC developers, designers, and investors. More than 76% of respondents agreed that the results are helpful to support policy implementation.

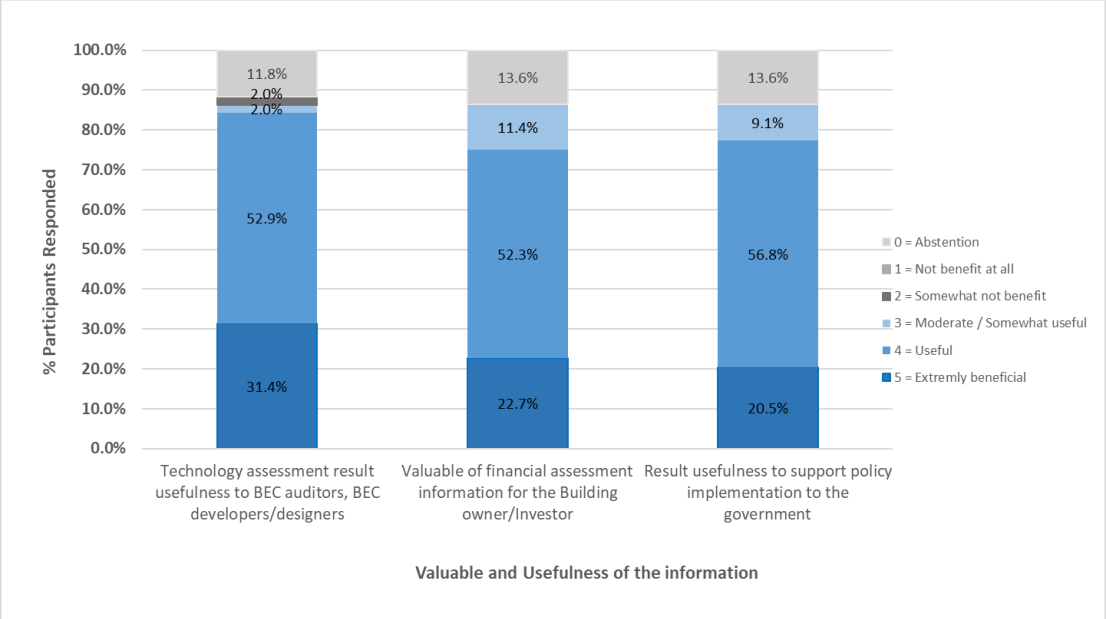


Figure 11: Evaluation of Information and Results Presented

QUALITY OF WORKSHOP ORGANIZATION:

More than 65% of participants were satisfied with the overall BEC study results obtained from the seminar, and 21% responded with somewhat satisfied. More than 86% of the participants felt satisfied with the overall workshop organization arrangement. The detailed evaluation results toward the quality of workshop organization is shown in Figure 12.

Figure 12: The participants' Responses on the Quality of Workshop Organization Arrangement

3 ANNEX-1: AGENDA AND PARTICIPANT LIST

3.1 AGENDA

Stakeholder Consultation Workshop # 2
Project "Enabling Readiness for Up Scaling Investment in Energy Efficiency for Achieving NDC Goals in Thailand"
Wednesday, 20th October 2021

ZOOM online meeting, Time 09.00-12.00 AM (BKK time)

Agenda	
08.45 – 09.00	**Online Registration**
09.00 – 09.05	**Welcome Remark and Opening** *By: Representative of NXPO and CTCN (if CTCN available)*
09.05 – 09.15	**Update on progress of the BEC 2020 legal procedures and enforcement status** *By: Representative of DEDE*
09.15 – 09.20	**Introduction of Project Background and Workshop objectives** *By: IIEC*
09.20 – 10.30	**Prioritizing of Technology Assessment and Potential of technology for BEC (Task-2)** *By IIEC*
10.30 – 10.40	Online Coffee break
10.40 – 11.30	**Financial assessment and energy saving potential within the BEC Framework (Task- 3)** *by IIEC*
11.30 – 12.00	**Q&A and Discussion**
12.00 – 12.10	Online-workshop evaluation survey (5 min) and Wrap up (5 min)
Remark:	Please scan QR Code for registration or confirmation through the email attached here. Email: swachirapuwadon@iiec.org Registration QR code ** The presentation will be conducted in Thai language **

3.2 PARTICIPANT LIST

Total 62 persons registered from 40 organization as list below:

No.	Name	Organization	Title
1	Ms. Clara Landeiro	Climate Technology Center and Network (CTCN)	Regional Manager
2	Ms. Sirinya Lim	Office of National Higher Education Science Research and Innovation Policy Council (NXPO)	Division Director of Innovation Economy
3	Ms. Sirinporn Daengphuang		Policy analyst
4	Mr. Prakob Eamsa-Ard	Department of Alternative Energy Development and Efficiency (DEDE)	Head of Building standard regulation and enforcement group
5	Ms. Chalermluk Jitrumpueng		Senior specialist Engineer
6	Assoc. Prof. Dr. Atch Sreshthaputra	Faculty of Architecture, Chulalongkorn University (CU)	Associate Professor
7	Mr. Vorasun buranakarn		Director of the center specializes in building technology and environment.
8	Assoc.Prof.Dr. Chanikarn Yimprayoon	Faculty of Architecture, Kasetsart University (KU)	Associate Professor
9	Assoc. Prof. Dr. Prechaya Mahattanatawe	Faculty of Architecture, Silpakorn University (SU)	Associate Professor
10	Assoc. Prof. Dr.Pantuda Puthipiroj		Associate Professor
11	Mr. Tayagorn Charuchaimontri		Lecturer/Researcher
12	Ms. Sopit Chaichana	Faculty of Architecture, Thammasat University Thanyaburi	Lecturer/Researcher
13	Assistant of Professor Dr. Aphichat Srichat	Faculty of Technology, Udon Thani Rajabhat University	Assistant Professor
14	Dr. Kuskana Kubaha	King Mongkut's University of Technology Thonburi (KMUTT)	Dean of School of Energy Environment and Materials
15	Mr. Phakhawat Hunchat	Rajamangala University of Technology Lanna Phitsanulok	Lecturer/Researcher

No.	Name	Organization	Title
16	Mr. Jirasak Pukdam	Rajamangala University of Technology Thanyaburi (RMUTT)	Lecturer/Researcher
17	Ms. Sunsuda Jiemjit		Lecturer/Researcher
18	Mr. Somchai Thipeye	Rattanakosin University	Lecturer/Researcher
19	Dr. Chanakan Puemchlad	Thailand Institute of Scientific and Technological Research	Senior Researcher
20	Mr. Chatuphon Uthaisri		Researcher
21	Mr. Piti Anontapant	Thailand Facility Management Association (TFMA)	Association President
22	Mr. Pichayapong Boonlue	3M Thailand Limited	Senior Application Engineer
23	Ms. Uraiwan Oudomsinca	Asset World Corp public company limited	Technical support manager
24	Mr. Wisanu Wimolsuknopparat		Engineer
25	Ms. Phatamaporn Potisri	Azbil(Thailand)	Assistant Energy Manager
26	Mr. Jetsada Phraeknanthoe	Bangkok University	Lecturer/Researcher
27	Mr. Suchat Sophimai	CP Land Co., Ltd.	Engineer
28	Mr. Mongkol Sirilek	CPN KORAT CO.,LTD.	Senior Manager
29	Mr. Teera Phongphan		Head of the Department-Electrical Systems
30	Ms. Raweewan Ngeabprasert	Delta Infra One Co., Ltd.	Sales Executive
31	Mr. Sarun Panyatham		Vice President
32	Ms. Natapat Tanadit	Designer	Engineer
33	Mr. Komsan Mulper	Double Nine CND Co., Ltd.	Engineer
34	Mr.Supachai Panyavee	Energy Conservation Technology Co., Ltd.	Managing Director
35	Mr.Patinya Jeerapornmongkol		Engineering Manager
36	Mr.Nanthakran Klinsang		Engineer
37	Mr.Yotsapat Thanapongphasin		Engineer
38	Mr. Metha Chaiprasop	Future Engineering Consultants Co., Ltd.	Engineer
39	Ms. Panrekha Promta	Gigajule Co., Ltd	Project Engineer
40	Mr. Thirawat Sarindu	ITEM Co. ltd	President
41	Ms.Yaichompoo Nakprasit	LPN Wisdom Co., Ltd.	
42	Mr. Thiti Upanan		

No.	Name	Organization	Title
43	Ms. Preenapha Phumchumphon		
44	Ms. Nichakarn Laosamathikul		
45	Mr. Ronnakorn Petchang	Nongkae Cogeneration Power Plant/Independent BEC auditor	MTN Manager
46	Mr. Palakorn Jukseda	Provincial Electricity Authority of Thailand (PEA)	Manager
47	Mr. Thanapong Usupan		Engineer
48	Mr. Lursukd.Nakharintr	PTT Global Chemical Public Company Limited (PTTGC)	Senior Engineer
49	Mr. Thawil Khwankitsakulveera	Quality Construction Product Co., Ltd.	
50	Mr. Kamolwiz Taninnara	Rachata Co., Ltd.	Project Manager
51	Mr. Panupant Phapant	Siam Cement Group (SCG)	
52	Mr. Thanaporn Pokwanavit		
53	Mr. Wattanachai Kaikhuang	SPKW Energy Auditor	Energy Auditor/BEC auditor
54	Mr. Chayaphol Thumaksorn	Independent consultant	BEC auditor
55	Mr. Chaisil Jinanang	Independent consultant	BEC auditor
56	Mr. Koson sonthong	Independent consultant	BEC auditor
57	Mr. Vikrom Plianbamrung	Independent consultant	BEC auditor
58	Mr. Sommai Phon-Amnuaisuk	International Institute for Energy Conservation (IIEC)	Director - Asia Pacific
59	Mr. Sran Sribhibhadh		Senior consultant, M&E Expert
60	Ms. Sopin Wachirapuwadon		Project manager
61	Ms. Aungsanant Thipthaweecharn		
62	Ms. Wilaiwan Kunchansombut		

4 ANNEX-2: PRESENTATIONS

4.1 SESSION 1

4.2 SESSION 2 AND 3