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CONTRACTORS' READINESS FOR ENERGY AWARENESS IN GOVERNMENT BUILDINGS: EVIDENCE FROM MALAYSIA

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Abstract

The Malaysian government has implemented Energy Management (EnM) within its Facilities Management (FM) practices to support Energy Efficiency and Conservation (EEC), aligning with national sustainable development goals. In government buildings across Putrajaya, energy awareness initiatives central to EnM are driven by Facilities Management and Maintenance (FMM) contractors under the supervision of Jabatan Kerja Raya Wilayah Persekutuan Putrajaya (JKR-WPP). Despite these efforts, energy-wasting behaviours persist, highlighting gaps in current awareness programmes. This study evaluates the readiness of FMM contractors to effectively implement energy awareness initiatives. Using an exploratory sequential design, the research began with qualitative phase using interviews to uncover readiness dimensions, followed by a quantitative phase to assess the extent to which these dimensions are present across contractors in Putrajaya. This study identified six key readiness factors: personnel, competency, processes, tools, monitoring mechanisms, and management support. The findings indicate that contractors demonstrate moderately above-average readiness but lack structured and standardised methodologies for planning, implementing, and evaluating awareness initiatives. The study highlights the need for comprehensive procedural guidelines to ensure consistent execution and sustained behavioural change among building occupants. Enhancing contractor capability is crucial to achieving broader EEC and sustainability objectives in government facilities. These improvements are crucial for supporting Malaysia's long-term sustainable development agenda.

Keywords: Facilities Management, Energy Management, Energy Awareness, Government Buildings

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INTRODUCTION

Malaysia has long treated Energy Efficiency and Conservation (EEC) as a national priority, supported by policies such as the National Energy Policy (1979), National Green Technology Policy (2009), and the National Energy Efficiency Action Plan (2015). These frameworks shape EEC efforts in the built environment (Kementerian Tenaga Teknologi Hijau dan Air Malaysia (Ministry of Energy Green Technology and Water Malaysia) [KeTTHA], 2015, 2017; Shaikh et al., 2017). To put these policies into action, the Government Lead by Example (GLBE) initiative introduced practical measures in government buildings, including energy audits, electricity cost reduction, temperature guidelines, and daily energy-saving practices (Ministry of Finance Malaysia (MoF), 2014).

Yet, energy-wasting behaviours continue to surface, showing that policy direction does not always translate into everyday practice. Current efforts still rely heavily on awareness campaigns, with limited integration of technology and structured energy management processes (C. W. Wai, Mohammed, & Ting, 2009). Studies consistently highlight that lasting change requires a formal Energy Management System (EnMS) to support proper monitoring, evaluation, and continuous improvement (Fiedler & Mircea, 2012; Introna, Cesarotti, Benedetti, Biagiotti, & Rotunno, 2014).

In Putrajaya, FMM contractors are responsible for carrying out awareness activities under performance-based FM contracts. However, there is little evidence on whether they have the right people, skills, processes, tools, and management support to do this effectively. This gap matters, as contractor capability directly shapes behavioural outcomes in government buildings and influences the success of national EEC goals. This study therefore explores how ready FMM contractors are to deliver energy awareness programmes in Putrajaya, aiming to identify strengths, uncover gaps, and help bridge the distance between policy and real-world implementation.

LITERATURE REVIEW

Energy Management as Driver of EEC

Energy management can be described as a collection of initiatives which are planned and implemented systematically with the aim of minimizing energy consumption within an organisation (Fiedler & Mircea, 2012). Thus, in relation with energy efficiency and conservation drive, energy management can be regarded as its driver. Energy management can be established either on its own, in which it is its own anchor practice, or embedded as part of FM scope. It is in this respect, energy management, as driver for dissemination of energy efficient practices in building operation, has been found to be a highly befitting scope to be inserted into FM (Min, Morgenstern, & Marjanovic-Halburd, 2016).

Another impetus for incorporation of energy management within FM practice is the on-going adoption of energy efficiency measures through legislative instruments, especially those that legally mandate adoption of those measures (Roberts, Bobrova, & Marjanovic-halburd, 2017). Nevertheless, even in jurisdictions in which the legislative efforts are still in contemplation stage, with yet-to-be-established take-off date, numerous organisations are taking the proactive step of incorporating energy management into their building operation, deeming it as worthy pursuits, with or without imposing legislation (International Facility Management Association [IFMA], 2011; Roberts et al., 2017).

It has also been asserted that a purely technological approach, without accompanying behavioral approach, to embrace energy efficiency, will gradually render the gains from technological approach to peter out in the long run in the absence of sustained efforts to manage the energy usage that, left unmanaged, will eventually upstage the earlier gains from technological approach (Lo, Peters, & Kok, 2012). Hence, this observation also serves as another spur towards adopting energy management in FM as driver for behavioral approach in energy efficiency and conservation.

Energy Awareness as Component of Energy Management

In carrying out energy awareness initiatives, FMM contractors are bound by contractual obligations that follow a performance-based rather than a prescriptive approach. The contract makes only a brief reference to the requirement for conducting energy awareness activities and does not explain how these initiatives should be implemented (JKR, 2018b). This is consistent with JKR's overall FM practice, which relies on a performance-based system guided by Key Performance Indicators with Ascertained Performance Deduction (KPI-APD) to set expectations for contractors (JKR, 2018a).

Although the contract allows flexibility, it does not prevent contractors from meeting their responsibilities. Yet energy-wasting habits still appear in government buildings, even with reminders like posters and stickers. This suggests contractors may not be fully ready to deliver these efforts with the needed consistency. Similar gaps in readiness have been noted in facilities management contexts (Vengadesan et al., 2025), and low stakeholder awareness has also been shown to weaken energy-efficiency initiatives (Kamarazaly et al., 2024).

Needless to say, such behavioural change will only occur subject to some precursor. That precursor has been identified in a number of literatures as existence of awareness on the importance of energy savings (C. W. Wai, 2009; Yen & Wai, 2010). In the model for energy awareness development process expounded by Wai, Mohammed, & Alias (2006), raising awareness is regarded as the foremost external stimulus needed to commence the chain of thought

process and behavioural conduct, followed by facilitation, as in enabling conditions, and solidification, as in motivational factors, that will lead to sustained energy-saving behaviour. These insights show that energy awareness initiatives are not simple or one-off activities. For results to last, they must be delivered systematically rather than in an ad-hoc or trend-driven manner. In practice, this means energy awareness must be closely tied to broader energy management efforts to create consistent and lasting behavioural change.

In the International Organization for Standardization [ISO] standard for energy management, ISO 50001:2011 “Energy management systems - Requirements with guidance for use”, there are a number of elements that constitute a systematic energy management (ISO, 2011). Figure 1 below shows the main elements in the model of the standard.

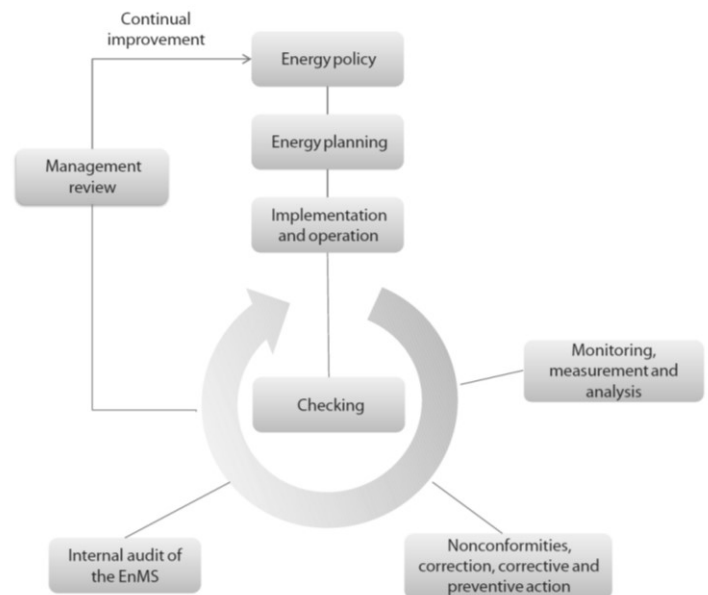


Figure 1: Energy Management System Model for ISO 50001:2011

Source: ISO (2011)

Under the element “Implementation and operation”, there is a requirement for “Competence, training and awareness”. The requirement specifies that organisation shall ensure its personnel have awareness on, among others, advantages of improving energy performance and impact on energy consumption brought about by their behaviour. Based on this ISO 50001:2011 requirement, initiatives related to raising awareness on energy efficiency indeed have been made to form part and parcel of energy management. In generic term, awareness can be described as the state of knowing about something in any

context complimented with the acknowledgement on what that something may entail. In this instance, the awareness can be specifically referred to as energy-saving awareness or simply energy awareness (Yen & Wai, 2010). In simple terms, energy awareness means understanding the benefits of saving energy and recognising the drawbacks of not doing so. In buildings, this responsibility naturally falls on those who manage and operate them daily, FM practitioners, who play a key role in helping occupants become more aware and adopt energy-saving behaviours.

Strategies for Conducting Energy Awareness Initiative

There exist numerous literatures on various strategies that can be deployed to effect behavioural change towards energy-saving behaviour through energy awareness initiative (European Energy Agency [EEA], 2013; ISO, 2011; Lee et al., 2013; Mastura; Low Sheau-Ting, 2015; Mulville et al., 2016; Ting et al., 2011; C. W. Wai et al., 2009; Zierler et al., 2017). They involve a mix of approaches revolving in a cycle that, at the basic, start with appraisal of current situation, then crafting most suitable awareness slant to be driven through the targeted audience from a menu of available communication channels, tracking the message deployment and measuring the outcomes, making necessary adjustment to suit the evolving progress and to further improve upon it, and finally performing overall review whereby the cycle will recur continually (Carbon Trust, 2011; Natural Resources Canada, 2011; United States Department of Energy [DoE], 2007). The standard for energy management system ISO 50001:2011 succinctly describe this process as “Plan – Do – Check – Act (PDCA) continual improvement framework” – a framework of taking “actions to continually improve energy performance” (ISO, 2011, p. v). All these elements in conducting energy awareness initiative point to incontrovertibility of the need to possess, or at least having access to, the necessary wherewithal to embark on energy awareness initiative on the part of entity designated to drive it. C. Wai et al., (2006), in their conceptual framework of “Energy Awareness Development Process”, designate such entity as “transferor”, that is the side that create and transfer message for raising awareness, as opposed to the “receiver”, that is the targeted audience for whom awareness is to be raised.

Awareness raising message can be conveyed through various forms of media to generate the commencing stimuli that affect senses such as visual, audio, taste, smell and feel. However, for energy-saving awareness only visual and audio are considered appropriate as the conveying inlet points for the message (C. Wai et al., 2006). Some of the channels to roll-out awareness message is verbal / face-to-face conveyancing through presentation, workshop, meeting, training, walk-about and targeted meet; written communication by way of fliers, periodicals and write-ups posted on notice boards; visual messaging such as posters and stickers;

audio messaging such as through public announcement; and active involvement of users by invitation for ideas. (JKR, 2017; Lee, Choong, Mohammed, & Abdullah, 2013; Mastura; Low Sheau-Ting, 2015).

The multitude of channels that can be utilised may confound the awareness drivers on which channel, or channels, should be used. It is suggested that instead of looking at each channel in isolation, they should be blended to produce the most optimal combination to roll-out energy awareness message, taking into account the context in which the message will be conveyed (Mastura; Low Sheau-Ting, 2015).

Approach for Energy Management and Awareness in FM

JKR has taken the approach of incorporating energy management within its FM practice, instead of EnM being its own anchor practice, as demonstrated by the inclusion of provision for such within its standard form of contract for FM. Some of the obligations on the FMM contractors that due to the provision are providing continuous support service for monitoring and managing energy usage as part of client's energy management system; conducting initiative to raise energy awareness amongst building occupants; and appointing suitably qualified personnel as energy manager / officer who will be a member of contractors' on-site team as the main point person for the running of energy management and conducting energy awareness initiative (JKR, 2018b).

RESEARCH METHODOLOGY

The study involves two respondent groups: one key JKR energy management officer and 31 FMM contractors' energy managers, with sampling designed to reflect meaningful variation in energy performance across buildings. Given the single JKR personnel, a qualitative key-informant interview is conducted, while purposive maximal variation sampling is applied to select FMM respondents who best capture representativeness and comparability. As referred to Creary et. al, (2015) and Kallio et. al (2016), semi-structured interviews guided by themes related to energy awareness, management practices, performance differences and organisational constraints are carried out, with data analysed through systematic coding (open, axial, and thematic) using qualitative software. Ethical clearance, informed consent, confidentiality and secure data handling are observed throughout. Limitations include the small sample size, qualitative scope and the localised context, which constrain broader generalisability but offer rich contextual insight. For the data analysis, both deductive and inductive approaches will be utilised to produce a more holistic outlook from the analysis. In this research, theme can be described as topical grouping of issues at hand under which the issues will be categorised and assigned to themes perceived as most suitable accordingly. A review on the resultant themes, relationships among the

themes and the newly conceptualised framework will be performed. Through the review, researcher will attempt to form opinions on the resulting outcomes. It is also intended to validate literature-derived findings and uncover additional insights. Specifically, it aims to confirm the relevance of the influencing factors affecting FMM contractors' readiness to implement energy awareness initiatives and to assess, as far as practicable, whether these factors are present or absent within the interviewees' organisational contexts.

ANALYSIS AND DISCUSSION

Interviewee Selection

Figure 3 below shows the ranking of FMM Contracts According to Average Year-to-Year Building Energy Intensity (BEI) Reduction Performance. Having ranked the FMM contracts in a way that is more reflective of the thrust of energy management, selection of interviewees can be duly made in accordance with prescribed sampling technique. The sampling selection is illustrated graphically in Figure 2.

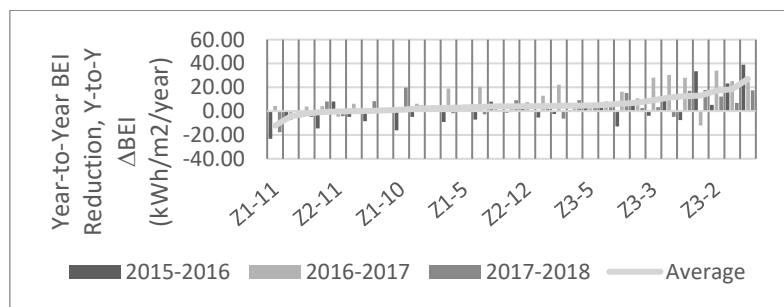


Figure 2: Ranking of FMM Contracts According to Average Year-to-Year BEI Reduction Performance

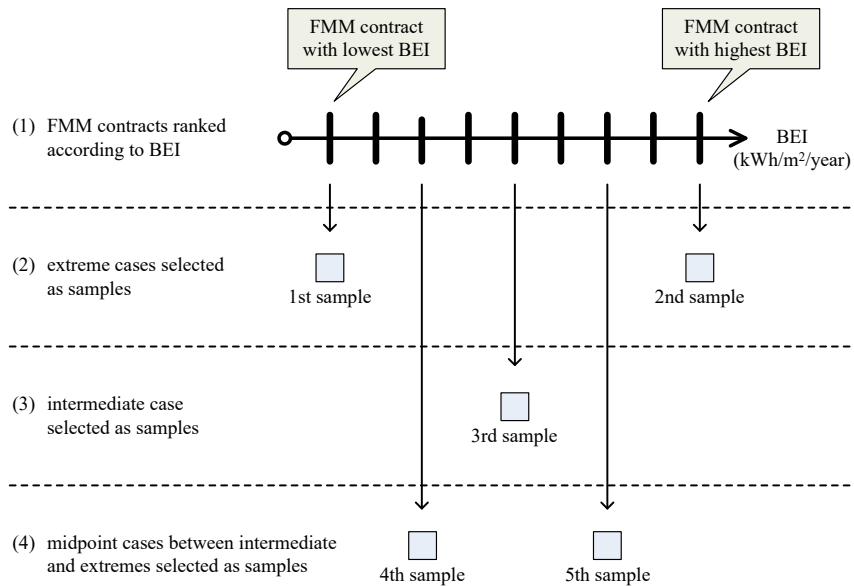


Figure 3: Selection of Interviewees through Purposive Sampling Technique by Performance Ranking for Representativeness and Comparability

The finalised interview list is as follows.

Table 1: List of Interviewees

No.	Position	Organisation	Sample's Ranking by Y-to-Y Δ BEI Performance	Tag
1	Energy Management Coordinating Officer	JKR-WPP	–	JC-1
2	Visiting Energy Manager	FMM contractor	Rank 1	Z3-1
3	Energy Manager	FMM contractor	Rank 2	Z1-3
4	Energy Manager	FMM contractor	Rank 3	Z2-2
5	Energy Manager	FMM contractor	Rank 4	Z1-10
6	Energy Manager	FMM contractor	Rank 5	Z1-11

Interview responses reveal a consistent view that contractors are trying to deliver energy awareness activities, but their efforts are often limited by structural and operational challenges. Several key factors shape how effectively these initiatives are carried out. Success relies heavily on strong client commitment, close cooperation between the client, JKR, and contractors, adequate manpower, and a basic level of energy awareness within FMM teams. While contractors generally meet basic competency requirements, many still

depend on informal knowledge sharing, borrowed staff, and occasional visits from energy managers, with dedicated personnel remaining a common gap. Awareness activities follow GP SPT JKR guidelines but tend to be reactive and inconsistent, with no standard feedback mechanisms or clear behavioural measurement. Communication tools such as posters, stickers, and email reminders are widely used, yet messaging is not standardised and often developed on the spot. Monitoring mainly draws on utility bills and sub-meters, but indicators like BEI or carbon index are applied unevenly. Management support appears through recognition programmes and some centralised units, although budget limits and unclear job scopes remain persistent barriers. Overall, contractors show moderately strong readiness, rated around 4.5/5, but improvements are needed in staffing, tools, structured processes, and consistent monitoring to strengthen the overall impact of awareness initiatives.

Influencing Factors

Table 3 shows the thematic issues touched on by interviewees during interview sessions, it is observed most of the influencing factors identified earlier in the literature review are in-sync as among issues distinguished by the interviewees to occupy their top-most concerns in the running of energy management, generally and conducting energy awareness initiative, specifically.

It is also found that two (2) influencing factors are not mentioned by any of the interviewees as significant thematic issues that merit to be accorded a remark:

- (1) having full-time energy manager at site; and
- (2) conducting energy awareness survey before and after initiative.

The absence of remark on this two (2) influencing factors as thematic issues during interviews may indicate several possibilities. For full-time energy manager at site, the nil mention may be due to the ubiquitous presence of the factors that they no longer strike interviewees' mind as issue of concern. For conducting energy awareness survey before and after initiative, this may indicate the same phenomenon of ubiquity leading to nil register in interviewees' mind, or it may indicate unawareness amongst interviewees on the essentiality of establishing baseline when embarking on any energy management programme, as espoused earlier by numerous literatures during literature review. Thus, these findings call for further examination in quantitative phase of this research.

Table 2: Validation of Influencing Factors

Influencing Factors		LR	JC- 1	Qualitative Interview				
				Z3- 1	Z1- 3	Z2- 2	Z1- 10	Z1- 11
Personnel	Dedicated energy manager	√	√				√	√
	Full-time energy manager	√						

Influencing Factors		LR	JC-1	Z3-1	Z1-3	Z2-2	Z1-10	Z1-11
Competency	Adequate supporting staff	√	√	√	√		√	√
	Adequate competency	√	√					√
	In-house reference	√	√	√	√		√	
Process	External reference	√						√
	Established procedure	√	√	√	√		√	√
	Standard or guidelines	√	√	√		√		√
Tools	Awareness survey before & after	√						
	Access to communication channels	√	√	√	√	√	√	
	Suitable & adequate technologies	√	√		√	√	√	
Checking	Method to measure initiative effectiveness	√	√	√	√		√	√
	Data access for initiative checking	√	√	√	√		√	
	Regular tracking to monitor initiative	√	√	√		√	√	
Management support	Regular reporting to management	√		√	√	√	√	
	Regular budget allocation	√			√	√		√
	Organisation-wide EnM coordinator	√			√			
	Centralised EnM division/unit	√	√					√

Observable Emerging Themes

Throughout the course of interviews, two (2) themes were observed to have emerged in a number of sessions that apparently were not unearthed earlier during literature review. The tabulation of the themes' occurrence is provided in Table 3 below.

Table 3: Observation on Emerging Themes

Emerging Theme	Literature review	JC-1	Z3-1	Z1-3	Z2-2	Z1-10	Z1-11
Collaboration within FMM team	Nil		√	√	√		
Client agencies' commitment & participation	Nil	√	√		√	√	

The emergence of these themes may be due to several possible reasons. For collaboration within FMM team, this may be due to most literatures on FM and energy management are not overly concerned with the matters of team

dynamics and cohesion of team members, since such subject are mostly the forte of other related fields such as organisational behaviour, for which the literatures on the fields, for example, by McShane and Glinow (2018), would have covered in abundance. Nonetheless, the fact of its mention by several interviewees indicates the seriousness placed by some of them on the issue, as understandably, the collaboration, or rather the lack of it, among FMM team members can be reasonably induced as one of important factors in influencing the contractors' readiness to embark on any enterprise, energy management and energy awareness initiative included. The other emerging theme, commitment and participation by client agencies, as occupants of government office building, the absence of which, in literatures on FM and energy management, may be due to unique situation for government office buildings in Putrajaya, whereby the building utilisation involves three (3) separate entities – client agencies who, as building occupants, are the assets owners, JKR-WPP, as responsible agency for building maintenance, is the assets manager, and the appointed FMM contractors as assets handlers (JPM, 2003, 2009, 2012).

As reviewed earlier, the current literatures available thus far on modes for acquiring FM services by client encompass either unipartite arrangement, through in-house setup with occasional out tasking (delegating specific tasks to outsider on temporary basis without surrendering any control), or bipartite arrangement, of which the prominence model will be outsourcing, varying in degrees from single outsourced service, partially-outsourced services to wholly-outsourced services, for which the client still retain the tasks of integrating various FM services, or a total FM procurement, for which even the integration is performed by the external party. Even if there is third-party in the bipartite arrangement, it will be in the form of sub-provider, such as sub-contractor, who only deal with the main services provider, that is the party contracted by the client, and does not directly with the client in the absence of the main service provider (Ikediashi et al., 2012; Jensen, 2017; Jensen et al., 2013; Jeynes, 2014; Kamarazaly, 2007; Kurdi et al., 2011; Pickard, 2011, 2012; Pitt et al., 2016; Stanley, 2009; Usher, 2004). This differs drastically in the case study, whereby the FMM contractors, as entities working on behalf of JKR-WPP, are vested with certain qualified mandate by the contracting party, that is JKR-WPP, to deal directly with clients in delivering their services as per contractual provisions (JKR, 2016b, 2018b). This renders the arrangement for FM services delivery for government buildings in Putrajaya, practically, a tripartite arrangement. As current coverage on tripartite arrangement for FM services acquisition in literatures is practically nil, this can explain why the issue of clients' commitment is not discernible during literature review yet it manifests itself during qualitative interview.

Revision of Theoretical Framework

The qualitative findings offer fresh insight that helps refine the original theoretical framework developed from the literature. While the initial model reflected key readiness dimensions from FM and energy management studies, the interviews revealed additional factors specific to Putrajaya's government buildings. As a result, the two emerging themes make it necessary to adjust the framework rather than rely solely on the literature-based version. The revision will be carried out through realignment between the existing framework and the emerging themes. To do that, a check is carried out to spot any interrelatedness between the emerging themes and the framework, as it is currently framed. It is resolved that the emerging themes can be readily slotted into the existing major themes, *collaboration within FMM team* into *personnel*, and *client agencies' commitment and participation* into *management support*. Hence, the revised breakdown of influencing factors that constitute the theoretical framework appears as in Table 4 below.

Table 4: Revised Breakdown of Influencing Factors

Major factors	Influencing Factors					
	Personnel	Competency	Process	Tools	Checking	Management Support
Sub factors	1. Dedicated energy manager 2. Full-time energy manager 3. Adequate supporting staff 4. Collaboration within FMM team*	1. Adequate competency 2. In-house reference 3. External reference	1. Established procedure 2. Standard or guidelines 3. Awareness survey before & after	1. Access to communication channels 2. Suitable & adequate technologies	1. Method to measure initiative effectiveness 2. Data access for initiative checking 3. Regular tracking to monitor initiative	1. Regular reporting to management 2. Regular budget allocation 3. Organisation-wide EnM coordinator 3. Centralised EnM division/unit 4. Clients' agencies' commitment & participation*

*. Emerging theme.

CONCLUSION

This study assessed how ready Facilities Management and Maintenance (FMM) contractors are to implement energy awareness initiatives in government buildings throughout Putrajaya. The findings indicate that while contractors show commitment and possess basic technical capability, many initiatives are still delivered on an ad-hoc basis. Without structured planning, delivery, and evaluation, it becomes difficult to create consistent practices or encourage long-term behavioural change among occupants.

The results point to the need for a more organised and unified framework to guide awareness efforts. Clear procedures such as setting baselines, engaging stakeholders, tailoring communication, and tracking outcomes would strengthen implementation and ensure continuity. Embedding these elements within a broader Energy Management System (EnMS) would further support measurable and sustained improvements. Achieving this will also require stronger backing from contractors and client agencies, especially in terms of dedicated personnel, adequate resources, and coordinated oversight.

By identifying the operational challenges faced by FMM contractors, this study helps clarify how behavioural-based energy initiatives can be better embedded within public-sector facilities management. The findings highlight the importance of aligning organisational commitment, management structures, and day-to-day practices to enhance the impact of national EEC goals. Future research may expand on this work by comparing readiness across different regions or building types, evaluating the cost–benefit of more structured awareness frameworks, and exploring how behavioural measures interact with technological solutions over time.

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