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Assessment of the Implementation of Sustainable Energy Action Plans at Local Level. Case Study of Latvia

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***Abstract* – The need for sustainable energy management at the municipal level is growing, in order to meet EU climate goals. Multiple initiatives have been launched to support municipalities in energy planning and strategy development process. Despite available support, research shows mixed results about implementation of plans and strategies. This research paper analyses what targets municipalities set, how they monitor implementation of their sustainable energy action plans (SEAPs) and searches for the most important factors that have enabled or hindered the implementation of local SEAPs at Latvia. The article shows that, in some cases, there is evidence that SEAP development is a project-based activity, supported by external experts. From municipal personnel point of view, it is a project that ends with approved SEAP, but not a part of their future daily routine. Eventually implementation of the plan is difficult, because municipalities lack experience in daily management of energy data, distribution of responsibilities and implementation of procedures. Municipalities also tend to exclude important stakeholders in their SEAPs, like, private sector, household sector and transport sector, which lead to lower targets and lower achievements in GHG reduction.**

***Keywords* – Energy management; energy planning; municipality; sustainable energy action plan**

1. INTRODUCTION

By facing more and more climate change issues around the globe each year, the management of climate change has become major concern at European Union (EU) and scientific world [1]. On September 25th 2015, the UN General Assembly adopted The 2030 Agenda for Sustainable development, where 17 Sustainable Development Goals and 169 targets were defined [2]. By adopting this Universal Agenda, world leaders listed climate change as one of the priorities. In December 2015 at the Paris climate conference (Conference of Parties to the UN Framework Convention on Climate Change – COP21) 195 countries adopted a global climate deal, the so-called Paris Agreement, agreeing to keep the global average temperature rise below 2 ºC [3]. In December 2018 at the UN climate change Conference of Parties (COP24) at Katowice, world leaders agreed on measures for implementing the Paris agreement. Shortly before COP24 at Katowice, the European Commission adopted a European strategic long-

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term vision for a prosperous, modern, competitive and climate neutral economy "A clean Planet for all" stating that Europe can be climate-neutral by 2050 [4].

Many argue that cities are the most important actors at reaching climate goals, as the urban areas are consuming roughly two thirds of global primary energy consumption [5], [6]. Although in countries like Latvia, where around a half of the population is living outside big cities, energy planning and energy management in rural areas is crucial for meeting climate goals. Rural municipalities face even more issues with sustainable energy planning, because of scattered and decreasing population density and lack of internal municipal funding. Often towns and villages are struggling with maintaining district heating (DH) systems, as many residential buildings start to use alternative heat sources or renovates the buildings (increasing energy efficiency) resulting in significantly lower heat consumption. Decreased heat demand from DH can result in increased specific heat losses and prices [7]. Bariss et al. has found that increasing income and resulting growth in energy consumption can be an impediment for reduction of energy consumption [8], especially when all the rural areas are determined to develop.

In 2008, the Covenant of Mayors (CoM) initiative was launched to provide support for local municipalities which volunteer to reduce greenhouse gas (GHG) emissions; since then 7755 municipalities, both big and small, have joined the initiative [9], [10]. CoM has been successful with inclusion of small cities, especially in countries that lack comprehensive national frameworks, by providing tools and knowledge for energy planning [11]. But still several problems of SEAP implementations have been indicated in literature. Researchers Ivner and Gustaffson indicated that, even if municipality do follow up their SEAP, most likely only implementation of actions will be monitored, but not the impact of those actions. They argue that energy issues have to become a natural part of daily work [12]. Kamenders et.al emphasize a lack of expertise among municipal personnel [13], while Melica et al., concluded that small cities can successfully participate in climate initiatives if support by Covenant Territorial Coordinators (CTC) are provided (expert organizations or local governments like regions or provinces). The research showed that 98 % of all SEAPs submitted to CoM in Spain was developed with support from CTC, 93 % in Belgium and 70 % in Italy [11]. This shows the huge importance of external support for small municipalities.

The objective of this study is to analyse implementation of SEAPs in order to investigate if the approach of SEAPs is successful, what kind of targets have been set and how SEAPs have been monitored. As well, what are the most important factors that enabled or hindered the implementation of SEAPs. This study aims to increase knowledge of stakeholders (technical experts, energy managers, municipal officials and policy makers), so that they can make better decisions and design more effective procedures for reaching SEAP targets. Information have been collected through a survey in the form of a questionnaire, literature review and analyses of SEAPs.

2. METHODOLOGY

During this study an online in-depth questionnaire and SEAPs of all involved municipalities in Latvia were used. The study was organized under the framework of a H2020 funded project Compete4SECAP. The project Compete4SECAP aims at assisting local authorities to introduce an energy management system and initiate systematic implementation of climate mitigation and adaptation measures at the local level.

In Latvia there are 119 municipalities of which 110 are towns with rural areas or only rural areas and 9 are cities. Although only 15 municipalities have joined CoM, more than 40 local authorities have developed and approved their SEAPs. It is worth to notice that all SEAPs are

developed with massive support from expert organizations and EU projects (like Conurbant, SEAP+, Meshartility, 50000&1 SEAP, etc.). To collect the data used in this study, the municipalities (energy managers or person responsible for SEAP implementation) have been approached. From 42 municipalities, 11 agreed to answer an in-depth questionnaire about their SEAP and implementation process. Characteristics of municipalities included in this study are described in Table 1.

Questionnaire consisted of six parts – basic profile of the municipality, targets, data availability, SEAP implementation, monitoring and energy management system. Altogether 43 questions were included in the questionnaire. Collected data were complemented by information available from the approved SEAPs. Qualitative analysis was used to process and explain data. Structure of the questionnaire process is shown in Fig. 1.

For analysing the results, municipalities were divided in 4 groups based on population size – large municipality (>50 000 residents), medium municipality (30 000–50 000 residents), small municipality (10 000–30 000 residents), very small (<10 000 residents). Both large municipalities are cities and all others are towns with rural areas.

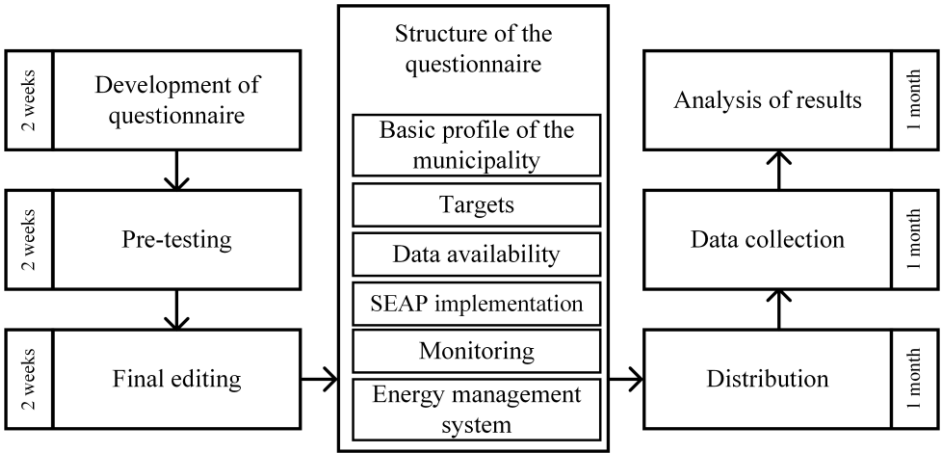

Fig. 1. Structure of the questionnaire process.

The period covered by SEAP varies among the 42 municipalities. All CoM signatories have developed their SEAPs before 2017 covering actions until 2020. Other municipalities have developed their SEAPs recently (in 2018) and the actions are planned until 2025.

TABLE 1. CHARACTERISTICS OF MUNICIPALITIES

Municipality	Size of municipality	CoM Signatory	SEAP period
A	Large	CoM	2014–2020
B	Large	CoM	2016–2020
C	Medium	CoM	2013–2020
D	Medium	CoM	2011–2020
E	Small	–	2016–2020
F	Small	–	2014–2020
G	Small	–	2015–2020
H	Small	CoM	2016–2020
J	Small	CoM	2013–2020
K	Small	–	2018–2025
L	Very small	CoM	2013–2020

3. RESULTS

3.1. Determined Targets at Municipalities

As Table 2 shows, all municipalities have committed themselves to a general CO_2 reduction target, and most of them have defined additional sector-specific targets. Both large and small municipalities set ambitious targets. The highest CO_2 targets have been set by small municipalities, but at the same time the lowest targets also. None of the two medium-sized municipalities have any additional targets mentioned.

All municipalities setting additional targets mostly plan to reduce energy consumption in sectors directly managed by municipal bodies; other sectors are encouraged to reduce energy consumption, without taking responsibility for achieving goals. From those who have set sector specific targets, all have committed themselves to reduce energy consumption at buildings owned by the municipality, five of them have committed to reduce energy consumption in energy production sector, but only one has decided to reduce energy consumption in transport and public lighting sectors.

The targets in all municipalities but one is set until 2020, with the base year varying from 2000 to 2016. This is mainly due to the fact that after several territorial reforms, municipalities still struggle with the collection of reliable historical data.

TABLE 2. DETERMINED TARGETS AT SEAPS OF EACH MUNICIPALITY

Municipality		**CO_2 saving, %**	**Target year**	**Base year**	**Other targets**
Large	A	35	2020	2006	1. Reduce energy consumption in buildings owned by municipality by 10 % 2. To encourage reduction in energy consumption in residential sector by 5 % 3. Reduce energy consumption in energy production sector by 5 % (base year 2012)
Large	B	10	2020	2010	1. Reduce CO_2 emissions by 40 % until 2030 2. Reduce energy consumption in buildings owned by municipality by 10 % (base year 2014) 3. To encourage reduction in energy consumption in residential sector by 5 % 4. Reduce electricity consumption by 5 % for public lighting (base year 2015) 5. Reduce electricity consumption by 5 % for public transport (base year 2015)
Medium	C	20	2020	2008	–
Medium	D	20	2020	2000	–
Small	E	40	2020	2010	1. Reduce CO_2 emissions by 45 % until 2030 2. Reduce energy consumption in buildings owned by municipality by 10 % 3. To encourage reduction in energy consumption in residential sector by 5 % 4. Reduce energy consumption in energy production sector (base year 2014)
Small	F	10	2020	2012	1. Reduce CO_2 emissions by 30 % until 2030 2. Reduce energy consumption in buildings owned by municipality by 10 % 3. To encourage reduction in energy consumption in residential sector by 5 % 4. Reduce energy consumption in energy production sector by 5 % (base year 2015)
Small	G	20	2020	2010	1. Reduce energy consumption in buildings owned by municipality by 5 % (base year 2014) 2. To encourage reduction in energy consumption in residential sector by 5 % 3. Reduce energy consumption in energy production sector by 5 % (base year 2012)
Small	H	40	2020	2008	1. Reduce energy consumption in buildings owned by municipality by 20 % 2. To encourage reduction in energy consumption in residential sector by 10 % (base year 2014)
Small	J	20	2020	2010	–
Small	K	20	2025	2016	1. Reduce energy consumption in buildings owned by municipality by 10 % (base year 2016) 2. To encourage reduction in energy consumption in residential sector by 5 % 3. Reduce energy consumption in energy production sector by 5 % (base year 2016)
Very small	L	20	2020	2007	–

3.2. Data Availability at Municipalities

The most significant areas where feedback about data availability in the municipal level were requested:

- CO_2 inventory;
- Energy consumption data;
- Data of energy costs.

Six (2 large, 4 small) out of eleven municipalities have compiled a CO_2 or GHG-inventory, five of which noted that they do it on a regular basis. During the survey participants were also asked (subjectively – 1 very important, 3 – moderately, 5 – not important) to rate how important the inventory is for development and implementation of SEAP measures. Answers varied significantly. While only two municipalities assessed CO_2 or GHG-inventory as very important, most rated it as moderately important. Municipalities without inventories rated this aspect from 1–3 (1 very important, 3 – moderately, 5 – not important), but municipalities that have compiled inventories gave rates from 1–5.

In order to assess energy data availability, municipalities were asked what kind of data they collect and how often. It seems that this is still an important issue as two municipalities (medium and very small) do not collect any data about public buildings. Four municipalities collect data for each building separately, three municipalities collect aggregated data for several buildings, and in two municipalities energy data are collected separately, but for some aggregated.

Half of the municipalities collect energy data and energy costs, however the other half only energy consumption data. In four municipalities data is collected by direct meter readings, and in other four digital transmissions (smart meters) of data is used, one municipality pointed out that they use a different technology. All municipalities collect monthly data except for one municipality which collects data annually.

Municipalities were also asked to comment on the main challenges concerning the generation and collection of energy-relevant data in the public sector. Most comments were about the human factor – responsible persons make mistakes, forget, miss deadlines. Also, many procedural issues were mentioned, like collection of data is forgotten because of lack of procedure in cases of sick leave or other issues, no common methodology for collection of data, etc.

3.3. SEAP Implementation

To understand what commitments municipalities are ready to take for implementing the SEAP, questions about the human resources and financial resources dedicated for the SEAP were asked. It is expected that better results will have at the municipalities with more personnel involved, and more financial resources dedicated for SEAP activities.

As Table 3 shows, all municipalities except D, have officially delegated responsibility to implement SEAP to some department or administrative body, but the level of position responsible for it vary significantly. While most of municipalities have assigned a responsibility to a department or a director of department, for two municipalities executive directors are responsible, which can indicate a lack of responsibilities at the everyday management level. From five respondents that gave answer about a number of people responsible for SEAP implementation, one municipality (G) has assigned responsibilities to ten persons, other four (A; C; J; K) municipalities have one person. Some activities that have been supported by expert organizations are used. Municipalities pointed out that support from experts were used for developing SEAPS and energy audits, finding solutions for improving energy efficiency in buildings etc.

TABLE 3. RESPONSIBILITIES AND FUNDING FOR SEAP IMPLEMENTATION

Municipality	What department or administrative body is responsible for the implementation of the SEAP/SECAP in your Local Authority?	Could you please estimate the number of staff being responsible for the implementation of the SEAP/SECAP?	Could you please estimate the share of labour costs of the staff responsible for the implementation of the SEAP/SECAP funded by third party funds?	For which tasks are external consultants and research institutions predominantly involved (if at all)?
A Large	Deputy Executive Director (regarding properties)	1	0 %	Mostly the Department of Development is working with SEAP issues. For some specific tasks external consultants are hired, like local University
B Large	City Council, Department of Development		0 %	Experts are involved for performing energy audits, for certification of energy management system and development of planning documents
C Medium	Infrastructure development department	1	0 %	–
D Medium	–		–	–
E Small	Energy manager		–	–
F Small	Deputy Executive Director (regarding properties and environment)		0 %	Consultations from state owned financial institution "Altum" about insulation projects of multi-apartment houses
G Small	Executive Director	10	1–10 %	–
H Small	Technical project manager of department of economic activities		11–25 %	Municipality is a partner in the "Life Adaptate" project, during which development of SECAP (sustainable energy and climate action plan) is planned
J Small	Executive Director	1	0 %	–
K Small	Department of planning and development	1	76–100 %	–
L Very small	SEAP working group		0 %	The external consultants are involved in finding solutions for improvement of municipal building energy efficiency, to perform the energy audit and do research on the initial situation

Only one municipality (municipality B) from all questioned municipalities was able to specify allocated budget for SEAP implementation, others gave only an estimate. It is worth noting, for municipality B 67 % of all budget for SEAP was planned to be covered by EU funds and only 9 % by a municipal budget. Other municipalities explained that annual municipal budget is not coordinated within SEAP, but instead within a local development plan. However, some activities overlap also with SEAP activities, so in many cases implementation of SEAP is a side effect from the municipal budget standpoint. Other municipalities also commented that a lot of third-party funding is used for investments in bigger infrastructure projects.

Ten out of eleven municipalities have established a working group dedicated to SEAP implementation. However, meeting frequency of working groups is rather low: in two municipalities (B and G), the energy team meets once a year, at municipality H meetings are organised on a quarterly basis. Others noted meetings are not regular but based on necessity. Municipality C, has not established an energy team, however they have established two separate working groups. One targets energy efficiency in multi-apartment buildings whereas the second one focus on other climate and energy issues.

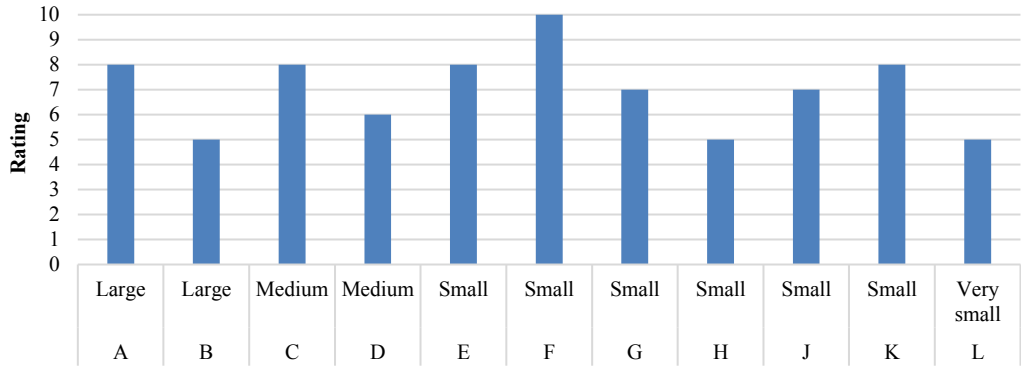

Fig. 2. Ratings of political support for implementing climate and energy related measures from 1 (lowest) to 10 (highest).

Municipalities were asked to rate the political support on a scale from 1 to 10. As Fig. 2 shows, municipalities identify that political support is from 5 to 10. Such results could be closely related to the budget dedicated for SEAP implementation, but not only. Municipality F has noted that climate and energy issues are integrated within daily routines of all municipal departments and are not budgeted or analysed separately. This makes it hard to assess if high political support is backed up by substantial actions. While municipality B rate political support for climate and energy issues only with 5, they were the only ones able to provide information on the budget of the implemented measures. They also commented that municipality should involve more specialists for implementing energy management system, invest more in smart solutions for data collection and energy saving and dedicate more resources for organizing energy saving campaigns. Municipality A remarked that capacity of one person is not enough for managing the whole energy sector. Municipalities G, H, J noted that there are not enough investments made in the energy sector, and that there are restrictions for municipalities to take long term loans, which reduces the ability for municipalities to conduct larger investments. Municipalities D, L mostly commented about the lack of proper communication between municipal departments, and the lack of awareness among municipal employees about energy and climate targets.

Municipalities were asked to list three main activities of their SEAPs, see Table 4.

TABLE 4. MAIN ACTIVITIES INCLUDED AT SEAPS

Municipality		Action A	Action B	Action C
A	Large	To establish data online management and monitoring system	Renovation projects for all schools. At some schools it includes energy efficiency measures – automatic control or radiators, new ventilation solutions	Renovation projects of particular buildings
B	Large	Energy efficiency measures at buildings funded by ERDF	Modernization of tram infrastructure	To expand public lighting and renovate existing one, funded by municipal budget
C	Medium	To increase energy efficiency of public buildings	To build boiler house powered by wood chips	Energy efficiency measures at apartment buildings. ("Labs nams" Ltd. has been created to support the process)
D	Medium	The renovation of preschool educational institution "Pasaciņa" is in progress, of "Pepija" has been finished	Transportation sector – 2 electrical cars bought in 2016	Construction of heating and water supply for two streets, construction of new heat pipes to connect three new streets to existing district heating network
E	Small	–	–	–
F	Small	Energy efficiency project of municipalities New castle (cultural heritage) and energy efficiency project of culture centre, financed by third-party funding	Development of energy-efficient requirements for procurement of new vehicles	Energy efficiency project of elementary school (project finished in 2017)
G	Small	To introduce Energy Performance Contracting principles, for renovation projects		
H	Small	To collect and analyse energy data	To replace existing municipal fleet with new, more energy-efficient vehicles	Replace street lights with more efficient ones
J	Small	Renovation and insulation of municipal buildings	Partly to change public lighting bulbs to LED	Procurement of 2 electric automobiles
K	Small	The Energy action plan 2018–2025 has been developed	The energy management system working group is established	
L	Very small	–	–	–

The main activities included in SEAPs mostly included renovation projects for municipal buildings or public lighting. This shows that municipalities deeply focus on municipal infrastructure instead of including different sectors. Some municipalities like, A, H, K, only starts to analyse and properly collect data, which could lead to better decisions in the future. Municipalities J, B and D are the only ones who declared actions related to the transport sector. Even though municipalities tend to include measures only related to their own infrastructure, many of them indicate lack of financial resources. Most importantly, municipality D indicated the risk of low-quality energy audits and low quality renovation projects, which can cause lower energy savings resulting in low efficient investment. Miezis et al. has also highlighted the problem with low quality construction works in Latvia, that reduces trust in renovation projects and potential energy savings [14].

3.4. Monitoring and Energy Management System

Monitoring is an essential part of energy management. Only two municipalities C and L answered negatively on the question about whether the local authority monitors the state of implementation and/or impacts of measures. Municipalities B, E, H, K, and D only monitor implementation of SEAP, but implementation and impact of measures or activities are monitored at municipalities A, F, G, and J.

From 11 only three municipalities do not have any experience with the design and implementation of an energy management system. Municipal councils of all small and large municipalities have adopted a resolution about the adoption of energy management and have an energy manager in place, from which six have developed an energy management manual and five (both large – A; B; and small – F; G; H) have an energy management system in place.

For municipalities A and B, implementation of a certified energy management system (EnMS) is required by the Energy Efficiency Law. A number of municipalities (with population above 10 000 and territory development index above 0.5 (development index is generalised indicator, based on eight different statistical indicators)) are required to implement EnMS, however they are not obliged to certify. For other municipalities development, implementation and certification of EnMS is voluntary. According to survey results, five municipalities have not implemented EnMS despite the legal requirements.

Scope and boundaries of the EnMS vary among five municipalities. It should be noted that all municipalities with the EnMS in place, have organized informative campaigns concerning energy management activities and all of them do CO_2 or GHG inventory on a regular basis. As boundaries of the EnMS vary among municipalities and in most of the municipalities EnMS has only recently been introduced, it is hard to assess the impact of the EnMS on the overall implementation of the SEAPs compared to municipalities without EnMS in place. More analysis on long term and short term gains from EnMS is required.

4. DISCUSSION AND CONCLUSIONS

Implementation of SEAPs has been analysed in 11 different Latvian municipalities. Results show that most of the municipalities still struggle a lot with reaching their energy and climate goals, although municipalities in Latvia tend to be very cautious with commitment towards high energy and climate targets. They all have a CO_2 reduction goal, as it is the main reason for developing SEAP at all, but by analysing sector-specific goals it is not clear whether local authorities have identified which sectors are the most important in reducing CO_2, and whether they understand how the CO_2 target could be reached. Also, all municipalities set higher goals for sectors they have full control, like energy efficiency in municipal buildings. But when it comes to the private sector, local authorities avoid taking any responsibility of energy consumption trends and set very low targets. This can be due to a lack of knowledge and understanding how to influence and support change of behaviour in their communities. Also, it could be explained by the lack of involvement of stakeholders at target setting phase and selection of the measures. Gustafsson et al. already highlighted the issue of unwillingness to adopt and implement strategies, when municipalities exclude important stakeholders from target setting process, resulting in targets which municipalities do not have a control of, or not setting a targets at all [15]. In some cases, there is evidence that when the development of SEAP is heavily supported by external experts, there is no real motivation inside the municipality to adopt the strategy which leads to the opinion that a lack of funding is what keeps them from reaching their goals. Most of the studied municipalities could not distinguish how much financial resources is used for SEAP activities and for most of them there is no specific budget for it. SEAP implementation is seen as a side effect from

the municipal budget point of view, and only activities that overlap or can be easily integrated in activities of local development plan are conducted. Implementation of other activities is considered only when external funding is available. As the analysis highlighted in a few examples (struggle with data collection, data analysis) municipalities lack qualified personnel for energy management. This contributes to the fact that some municipalities analyse only realized measures, but not their impact on the amount of greenhouse gas emissions.

This research has led to the conclusion that municipalities lack knowledge how to set responsibilities and procedures to create the continuity of SEAP in their daily processes. In small rural municipalities, short-term project-based external support from experts does not solve the knowledge deficiency in the long-term. To meet ambitious climate and energy goals in the rural regions of Latvia, comprehensive and affordable tool should be developed for municipalities to enable them to control their energy consumption and most importantly, to enable them to understand the data for acting accordingly. One of such is systematic energy management, however further in-depth research should be done in order to analyse the full effect of SEAP and EnMS implementation on long-term energy performance.

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