

*Disclaimer: These introduction and summary pages are based in part on the paper titled “Using Energy Performance Contracting to Advance Decarbonization and Resiliency in Local Government: A County of Maui Case Study” authored by Alexander Francois de Roode. These summary materials were prepared independently and were not reviewed or endorsed by Mr. de Roode.*

**Introduction & Overview: Using Energy Performance Contracting to Advance Decarbonization and Resiliency in Local Government: A County of Maui Case Study**

This independent, peer-reviewed research (published in 2025 by KTH Royal Institute of Technology) examines how Energy Performance Contracting (EPC) can be used by local governments to deliver infrastructure improvements without requiring upfront capital. The findings closely reflect the County of Maui’s approach under Contract C7619, using guaranteed energy and operational savings to fund projects such as energy efficiency upgrades, renewable energy systems, and water infrastructure improvements.

The paper highlights that EPC is most effective when used as a phased, programmatic approach, rather than a one-time project. This aligns with Maui’s existing contract structure, which was competitively procured and designed to support multiple phases over time. By doing so, the County can continue advancing projects that reduce operating costs, address deferred maintenance, and improve resiliency, without competing for limited capital improvement funds or increasing overall spending.

In simple terms, the research validates that Maui is already following a nationally recognized best practice: using EPC as a disciplined, performance-backed tool to modernize infrastructure, lower long-term costs, and support sustainability goals. The current and proposed phases under C7619 represent a continuation of this proven model, building on verified savings and expanding into additional high-value projects for the community.

**BFED Aligned C7619 Summary of: Using Energy Performance Contracting to Advance Decarbonization and Resiliency in Local Government: A County of Maui Case Study**

The paper reinforces that Energy Performance Contracting (EPC) is not just a financing tool, but a long-term infrastructure delivery platform, which directly aligns with how the County of Maui has already structured and is executing Contract C7619.

**1. C7619 as the Platform (Not a One-Off Project)**

The paper’s core concept – using EPC as a scalable, phased program, matches Maui’s approach under C7619:

- C7619 (awarded 2022) established a standing master ESPC framework, allowing multiple project phases without restarting procurement
- This converts EPC from a single project into a repeatable delivery mechanism for County infrastructure modernization

- Future phases (e.g., Phase 2, Phase 3) are incremental scope decisions, not new approvals of method or authority
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## **2. “Pay-from-Savings” Model Driving Real Projects**

The paper emphasizes financing projects through guaranteed savings. This is exactly how C7619 is positioned:

- ESPC enables projects to be self-funded from verified energy and operational savings
- TELP converts those savings into predictable, tax-exempt annual payments
- Key principle: no increase in total spending, only a shift in timing, funding source, and risk allocation

C7619 is not new spending, it is a capital efficiency strategy that accelerates infrastructure delivery without competing for CIP.

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## **3. Risk Transfer and Performance Guarantee**

C7619 shifts risk away from the County:

- Johnson Controls is responsible for design, construction, and performance
- Savings are measured, verified annually, and contractually guaranteed
- If savings underperform, the contractor is financially responsible

This is a risk-managed procurement model, not a speculative investment.

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## **4. Acceleration vs. Traditional Procurement**

Faster implementation is already realized under C7619:

- Existing contract eliminates the need for repeated procurement cycles
- Enables faster project development, approval, and execution compared to design-bid-build

C7619 is a procurement accelerator, not just a financing tool.

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## **5. Strategic Outcome: From Projects to Program**

Main Takeaway: EPC as a long-term transformation platform, directly supports Maui’s path forward:

- Phase 1 validates performance (savings achieved and verified)
- Subsequent phases expand into:
  - Water system infrastructure (DWS)
  - Renewables and resilience
  - Deferred maintenance backlog
  - Emerging opportunities (e.g., landfill gas, electrification)

C7619 is the County’s foundation for ongoing decarbonization, resilience, and infrastructure renewal, not a completed project.



# Using Energy Performance Contracting to Advance Decarbonization and Resiliency in Local Governments: A County of Maui Case Study

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**Abstract.** Energy Performance Contracting (EPC) can be used by local governments to contract energy services companies (ESCOs) to leverage energy savings to implement a wide-range of decarbonization and resiliency measures. Such measures not only reduce capital and operating costs, but can also lead to significant decarbonization and increased resiliency of built-environment and transportation assets. The County of Maui (CoM), Hawaii initiated an EPC program in 2018 which, in addition to cost savings, has resulted in significant advancements in decarbonization and resiliency. A literature review was conducted to identify best practices and lessons learned in EPC applied within local governments. A case study approach was also used based on the author's direct experience serving as a lead member of a team within the CoM who planned and implemented EPC within the organization over a four-year period from 2018–2022. A qualitative and quantitative assessment of decarbonization and resiliency benefits achieved by the CoM through its EPC initiative was conducted, as well as best practices for project development and project management. The CoM's EPC program resulted in advancing decarbonization and resiliency in operations and infrastructure. This EPC program has resulted in the implementation of substantial energy and water conservation measures, renewable energy and energy storage measures, and clean transportation measures that may otherwise not have been implemented or would have taken significantly longer to implement. To address deferred maintenance, public procurement obstacles, and a lack of available budgets, local governments should utilize EPC as an important tool to advance decarbonization, resiliency, and equity within their organizations and local communities.

**Keywords:** Decarbonization · Resiliency · Climate Change · Clean Energy · Local Governments

## 1 Introduction

### 1.1 Overview of Energy Performance Contracting

Barriers to successfully planning and implementing energy efficiency projects in local governments include: limited availability of required up-front capital; a lack of data regarding the performance of prior energy efficiency project; and uncertainty regarding

the long-term financial viability of proposed energy projects [1]. Local governments face significant constraints in carrying out energy efficiency projects due to both spending cuts and contraction of funding availability, as well as often lacking effective and efficient management and technical skills to implement such projects [2]. In order to address these challenges, local government entities should increasingly consider “alternative models of public procurement which increasingly exploit the private sector competencies in delivering energy efficiency projects” [3]. Energy Performance Contracting is a mechanism that can be used by local governments to address many of these barriers. According to the U.S. Environmental Protection Agency [4], EPC “is a turnkey service, sometimes compared to design/build construction contracting which provides customers with a comprehensive set of energy efficiency, renewable energy and distributed generation measures and often is accompanied with guarantees that the savings produced by a project will be sufficient to finance the full cost of the project”.

In order to implement EPC within their organizations, local governments enter into contractual agreements with energy service companies (ESCOs). As a part of these contractual agreements, ESCOs may provide “an energy saving plan, [install] energy efficient facilities, [offer] maintenance in the contract period, and [ensure] energy saving efficiency. The ESCO is responsible for all or most of the initial investment in energy efficient equipment” [5]. EPC thereby provides a mechanism by which local governments can enter into long-term contractual agreement with one or more ESCOs to leverage energy savings to pay for and implement a wide range of diverse decarbonization measures including: energy efficiency and energy conservation measures, renewable energy measures, clean transportation measures, waste diversion measures, and water efficiency and water conservation measures. The aforementioned measures can be categorized more generally as facility improvement measures (FIMs). As a combined portfolio, these FIMs can not only reduce capital and operating costs for local governments, but can also lead to significant contributions to decarbonization in local government operations, built-environments, and transportation assets. Additionally, these measures can contribute to increased resiliency and climate adaptation of local government buildings and infrastructure, thereby supporting adaptation of local communities to impacts of climate change and targeting equity disparities. Recognized barriers to increasing adoption of EPC by local governments include [6]: complexity of procuring EPC services leading to long project development time and high transaction costs; a deficiency or loss of data for existing energy projects compounded by turnover staff with EPC responsibilities; difficulty in assessing the performance of prior projects due to a lack of data standardization; a lack of relevant data to make the business case for EPC; and challenges in institutionalizing knowledge about EPC best practices.

The County of Maui (CoM), the local government entity located in Maui County, Hawaii, initiated an EPC program starting in 2018. In addition to substantial financial cost savings, this EPC program has resulted in significant organization-wide advancements in decarbonization and resiliency, as well as providing opportunities to target equity needs within local communities. Under Hawaii state law [7], State and County agencies are legally empowered to “evaluate and identify for implementation energy efficiency retrofitting through performance contracting.” This State of Hawaii law empowers agencies to “enter into a multi-year energy performance contract for the purpose of

undertaking or implementing energy conservation or alternate energy measures in a facility or facilities.” In addition, under this State statute [7], “energy performance contract means an agreement for the provision of energy services and equipment, including but not limited to building or facility energy conservation enhancing retrofits, water saving technology retrofits, electric vehicle charging infrastructure, and alternate energy technologies [...]. Energy conservation retrofits also include energy saved off-site by water or other utility conservation enhancing retrofits.” This broadening of scope beyond traditional energy efficiency measures to include renewable energy and clean transportation provides a mechanism via which local governments can make significant advancements in accelerating their decarbonization and resiliency objectives.

## **2 Methodology**

A literature review was conducted to identify best practices in EPC within local governments. A case study approach was also used based on the author’s direct experience having been a lead member of a team within the County of Maui who planned, initiated, and implemented EPC within the organization over a four-year period from 2018–2022. The author conducted a qualitative and quantitative assessment of the decarbonization and resiliency benefits of the CoM’s EPC initiative achieved as of the writing of this paper. Quantitative and qualitative comparisons were also conducted of EPC outcomes from other local and state government entities across the State of Hawaii. Conceptual frameworks are presented to provide guidance to local governments in navigating both pre-project and project phases of EPC initiatives, as well as in assessing the success and prioritization of EPC measures within their organizations.

## **3 Results and Discussion**

### **3.1 Scope of County of Maui’s Energy Performance Contract**

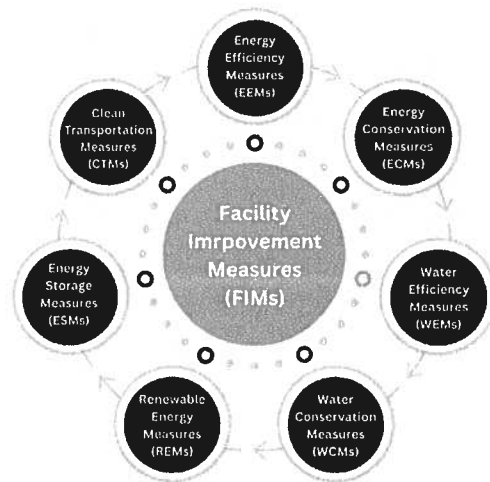
The CoM’s EPC program is projected to result in substantial cost savings and advances in decarbonization and resiliency for CoM operations and infrastructure. Over the next several years, this EPC program is projected to result in the implementation of energy and water efficiency measures, as well as renewable energy and clean transportation measures that may otherwise not have been implemented or may have taken significantly more time to implement outside of EPC. This includes FIMs contracted to be implemented at approximately 154 different County-owned facilities across Maui County. These FIMs include [8]: interior and exterior lighting retrofits, plug load controls, transformer upgrades, domestic water fixtures retrofits, irrigation well improvements, air infiltration reduction, window film application, and the deployment of renewable energy projects as well as electric vehicles and electric vehicle charging stations. The overall CoM EPC program is projected to result in a 38% reduction in domestic water use, 22% reduction in electricity use, and \$70 million saved over the life of the program with an investment of \$29 million paid for via utility savings [8].

A second phase of the project includes the implementation of up to 41 MW of solar photovoltaic (PV) and battery energy storage systems (BESS) deployed at numerous

sites throughout the County. In addition to increasing the resiliency of CoM facilities, including at a number of designated County resiliency hubs, by providing backup power and onsite renewable power generation for normal times as well as during emergencies and grid outages, the deployment of these clean energy projects will result in millions of dollars in electric utility savings by allowing the County to purchase solar power at approximately 30% less than the current electricity rate the County has historically paid to Hawaiian Electric Company (HECO), the local electric utility. As a further benefit, the County will not be responsible for operating or maintaining the PV and BESS systems, as they will be operated and maintained by a third party via a power purchase agreement (PPA) under the umbrella of the County's EPC. In terms of decarbonization, the Phase 1 projects under the County of Maui EPC initiative are estimated to result in a carbon impact equivalent to a reduction of 2,293 metric tons of CO<sub>2</sub> equivalent (MTCO<sub>2</sub>e) per year from being emitted into the atmosphere [8].

### 3.2 Portfolio of Facility Improvement Measures Under County of Maui EPC

As described in Fig. 1, Facility Improvement Measures (FIMs) identified in the County of Maui's (CoM) EPC include the following: Energy Efficiency Measures (EEMs), Energy Conservation Measures (ECMs), Water Efficiency Measures (WEMs), Water Conservation Measures (WCMs), Renewable Energy Measures (REMs), Energy Storage Measures (ESMs), and Clean Transportation Measures (CTMs). Together, these FIMs make up the portfolio of measures planned or implemented under various phases of the CoM EPC.



**Fig. 1.** Portfolio of Facility Improvement Measures (FIMs) under CoM EPC program.

The distinction between EEMs and ECMs relates to the more efficient use of energy for a similar end use being categorized as EEMs (e.g., retrofitting existing less efficient lighting with high-efficiency lighting), and the elimination or reduction of demand for energy end uses being categorized as ECMs (i.e., primarily achieved by implementing improved energy management and building automation, along with improved system

design for various energy using applications). Similarly, WEMs relates to a more efficient use of water resources for a similar end use (e.g., retrofitting less efficient water fixtures with high-efficiency fixtures), whereas WCMs are achieved by reducing or eliminating demand for water resource end uses and improving how the use of these water resources are managed and controlled. These energy and water savings opportunities also exhibit synergistic savings often referred to as the water-energy nexus, whereby savings and efficiencies achieved in one resource use area can directly impact savings and efficiencies in the other. An example of the water-energy nexus would be installing high-efficiency water fixtures that would in turn reduce energy intensive domestic hot water demand as well as reduce the need for energy intensive municipal wastewater treatment.

Planned REMs under the CoM EPC include consideration of various on-site power generation using renewable energy technologies. Due to the favorable economic viability, performance reliability, and reduced operations and maintenance costs as compared to other renewable energy technology options, solar photovoltaic (PV) was selected as the primary REM in the initial phases of the CoM EPC. In order to address the intermittent nature of solar PV power production, several proposed PV projects under the CoM EPC are planned to be coupled with BESS. The BESS systems are categorized as ESMs and help to “firm up” the intermittent nature of the PV power production. An added benefit of the BESS systems is that they provide the CoM with opportunities to participate in grid services programs offered by HECO, the local electric utility. This provides CoM with additional financial incentives to offset the costs of the PV + BESS systems, while also contributing to the resiliency and decarbonization of the CoM and of HECO, thereby contributing to overall community resiliency. Other REMs identified as a part of later stages of the CoM EPC include opportunities for waste to energy projects, such as landfill gas-to-energy (LFGTE) whereby methane emitted from landfills is captured and converted to renewable natural gas (RNG) to either power turbines that generate electricity or to be used as a fuel source for RNG vehicles. Another opportunity identified to be further explored is converting landfill gas (LFG) to hydrogen in order to power hydrogen vehicles. Yet another waste to energy project identified for further research is processing landfill waste using an anaerobic digester in order to directly generate methane gas that could then be used as RNG or hydrogen for fleet vehicles and/or power generation. As identified in Fig. 3, these waste to energy REMs were initially slated for consideration under Phase 4 of the overall CoM EPC program and would be contracted under a subsequent PPA.

Planned CTMs under the CoM EPC include electrification of the County vehicle fleet, including EV charging stations being deployed for both fleet and public charging. As previously mentioned, exploring fueling medium and heavy-duty County fleet vehicles using RNG and hydrogen were also identified as opportunities to explore.

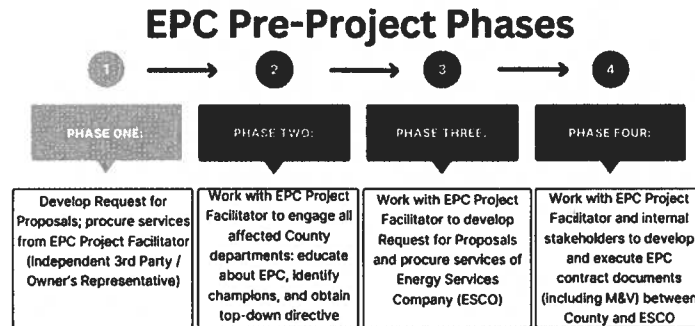
### **3.3 Pre-project and Project Phases of the County of Maui EPC**

Prior to initiating a comprehensive EPC initiative, it is highly recommended that local governments engage an EPC project facilitator to serve as an independent third party or owner’s representative for pursuing EPC. This provides local governments with critical expertise, guidance, and support as they navigate the complexities of establishing and implementing an EPC program. An EPC project facilitator can provide support in key

areas including: “supporting the customer in selecting its ESCO; facilitating an understanding of the ESCO pricing and guarantee; acting as a critical communication liaison between customer stakeholders and the ESCO; delineating risks and responsibilities of both parties; and reviewing and advising on ESCO engineering studies, financial proformas, M&V plans, and more” [9]. In addition, as local government entities advance towards the contractual phases of EPC, it is recommended that they secure outside legal counsel with expertise in EPC and knowledge of their state laws and regulations in order to supplement their own internal legal counsel. Both of these expert resources were procured by the County of Maui in their EPC journey. Further guidance can be obtained by approaching other state and county agencies who have already pursued EPC, as they may be able to provide best practices and lessons learned to local governments that are new to the EPC process. This approach was taken by the CoM and yielded significant insights provided by the City & County of Honolulu (C&CH) and the State of Hawaii Department of Business, Economic Development, and Tourism (DBEDT) along with the Hawaii State Energy Office (HSEO). Among the critical resources provided by these entities were draft requests for proposals (RFPs) and legal contractual document templates that could then be customized to meet the specific needs and context of the CoM.

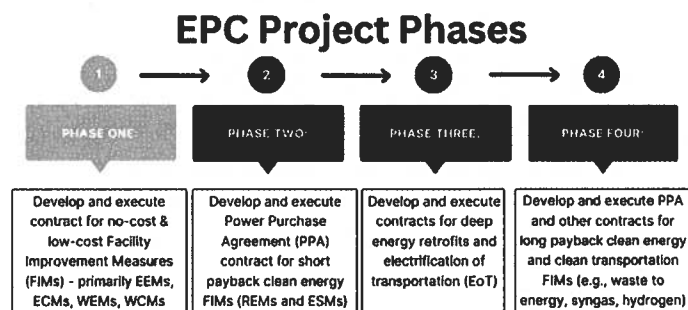
A key recommendation for local governments pursuing EPC is to structure their EPC programs under an organization-wide umbrella rather than having departments undertake individual EPC contracting. One of the main advantages to taking an organization-wide approach is that it allows for consistency in EPC across departments and provides efficiencies by centralizing contract management, as well as legal and financial oversight. The contractual complexities of EPC are not to be taken lightly and the burden of managing such complexities is reduced by having these responsibilities centralized and more streamlined. However, it is important to allow project-level oversight and direction to be undertaken by departments whose facilities will be involved in the actual implementation of EPC projects. This involves obtaining buy-in and dedication of staff and other resources by each department. Much of this context setting and organizational structuring is important to establish in pre-project phases of EPC. As shown in Fig. 2, EPC pre-project phases can be categorized into four phases. During phase two of the EPC pre-project phase, it is important to obtain top-down buy-in and directive in order to ensure that department heads and their staff understand that this initiative is a top priority. At this stage, it is also important to engage with and educate departments in order to ensure they understand how and what the EPC program is intended to accomplish for the organization. This includes contextualizing the EPC initiative within not only a cost-savings and capital improvement projects (CIP) context, but also in alignment with decarbonization, resiliency, and equity goals and objectives of the organization. To further anchor this context within the EPC initiative, it is vital to include very specific language in the RFP used to select an ESCO that will be contracted to partner with local government in structuring and implementing EPC programs. This includes identifying specific goals, objectives, and deliverables directly tied to decarbonization, resiliency, and equity projects and priorities. Examples of this approach in CoM’s EPC initiative include, specifying deliverables in the RFP and subsequent contracts related to advancing CoM’s efforts to establish a network of resilience hubs across Maui County, ensuring

that GHG emissions impacts are tracked and communicated to both internal and external stakeholders, and advancing CoM's electrification of transportation (EoT) initiative for fleet vehicle electrification and public electric vehicle (EV) charging. Although it is possible to procure services of more than one ESCO for an EPC initiative, working with a single ESCO is recommended unless a specialized ESCO is needed for specific projects (e.g., water supply or wastewater projects). Ideally, a single ESCO with sufficient expertise in all needed areas is selected to simplify and streamline the structure and implementation of EPC programs.



**Fig. 2.** Pre-project phases of County of Maui's Energy Performance Contract (EPC).

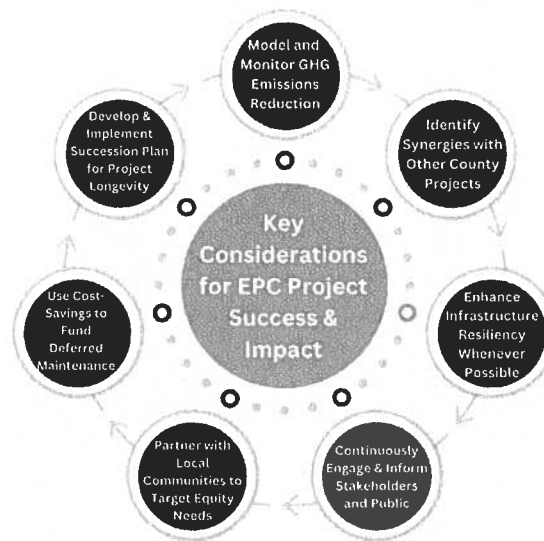
Once pre-project phases of EPC have been completed and an ESCO has been selected to participate in a local government EPC program, the EPC project phases can then be further developed and contracted. At this stage, it is important to obtain contractual commitments from ESCOs that they will continue to partner with local governments to achieve not only "low hanging fruit" quick payback projects, but also commit to working with local government to pursue the more difficult to fund and difficult to implement longer payback and more complex projects, such as those described in phases three and four in Fig. 3 below. Far too often, ESCOs will undertake quick payback projects only to decline participating in future phases that involve longer payback projects due to the complexity and level of effort needed to realize these projects.



**Fig. 3.** The various project phases of County of Maui's Energy Performance Contract (EPC).

### 3.4 Key Considerations for EPC Project Success and Impact

As illustrated in Fig. 4, key considerations for optimizing the success and impact of EPCs by local governments should include: modelling, monitoring, and reporting GHG emissions reductions resulting from EPC projects; identifying synergies with other county projects so as not to duplicate or confound efforts; intentionally seeking out opportunities to enhance infrastructure resiliency as a part of EPC whenever possible; continuously engaging with and informing stakeholders and the public about EPC progress and scope; partnering with local communities during EPC project planning and implementation in order to target community equity needs; using cost savings resulting from EPC projects to fund deferred maintenance and other high priority longer payback projects; and ensuring that local governments have succession plans in place to ensure EPC program continuity and that institutional memory is preserved.



**Fig. 4.** Key considerations for optimizing the success and impact of the CoM's EPC program.

In order to assess and prioritize project opportunities under EPC, local governments can use an assessment methodology similar to the one depicted in Table 1 below. This type of assessment can be conducted both at the broader FIM category level as well as at the level of individual FIMs within a FIM category. Table 1 provides an example of an evaluation of two separate FIMs identified under CoM's EPC program.

**Table 1.** Assessment and prioritization matrix for EPC FIMs.

FIM	FIM Category	Decarbonization Benefits	Resiliency Benefits	Economic Benefits	Equity Benefits	Additional Considerations
PV + BESS	REM & ESM	Reduces reliance on fossil fuels and substitutes fossil fuels with renewable power generation	Provides ability for critical county services to continue to operate during grid power outages	Provides more affordable power and allows for savings to be redirected to other critical community needs	Provides greater energy security and business continuity to critical community services. Ability to target historically underserved or difficult to reach local communities and provide more reliable services	Need to address embodied emissions, end of life disposal/reusability/recyclability of materials, and ability for infrastructure to remain operational during high intensity natural and human-caused disasters. Should consider participation in community solar
EoT (public charging)	CTM	Reduces community's reliance on fossil fuel-based transportation fuels	Enhances ability for community to continue to operate vehicles in the event of an imported fuel supply disruption	Reduces cost of vehicle ownership for community by eliminating fuel costs and reducing maintenance costs	Provides opportunity for income constrained community members to charge EVs. Particularly those who cannot afford or not able to install their own EV chargers	Adds load to electric grid and operations & maintenance costs for charging infrastructure. Need to determine cost structure if local government entity seeks to make public EV charging cost neutral to cover O&M costs

## 4 Conclusion and Recommendations

As previously stated, recognized barriers to successfully planning and implementing energy efficiency projects in local governments include: limited availability of required up-front capital; a lack of data regarding the performance of prior energy efficiency project; and uncertainty regarding the long-term financial viability of proposed energy projects [1]. These barriers often limit local governments' ability to make significant progress in the decarbonization and climate adaptation of their facilities and infrastructure. In order to address the lack of available capital improvement and operating budgets required to significantly advance decarbonization and climate adaptation and to address significant deferred maintenance and public procurement obstacles for facility improvement measures, local governments should utilize EPC as a primary tool to urgently advance decarbonization and resiliency initiatives within their organizations.

Areas of further research could include developing a decision-making framework that considers not only conventional financial payback or return on investment (ROI) criteria

in prioritizing projects to pursue under EPC, but also includes decarbonization, resiliency, and equity impacts as criteria for project prioritization under EPC. One approach to using these traditionally non-financial criteria in EPC project prioritization is to attribute a financial quantitative value to the decarbonization, resiliency, and equity potential of available projects. This could be considered in terms of cost avoidance, whereby the cost of not investing in decarbonization, resiliency, and equity could be estimated and attributed to the project prioritization and selection process. As an example, if a County-owned community center did not get selected for improvements that would increase its ability to withstand hurricane force winds or major flood events and did not receive investments in backup power systems to mitigate power outages, a quantitative assessment could be made to quantify the cost of infrastructure damage and business continuity disruption to that facility. This example is primarily a financial valuation of infrastructure resiliency. To quantify the financial value of decarbonization, the value per MTCO<sub>2e</sub> in established carbon markets could be used as a proxy. Quantifying the financial value of equity impacts is a more complex and difficult task. This author suggests establishing a method for converting qualitative attributes of a project into quantitative valuation metrics. This could result in a multiplier or factor being applied to the financial valuation of a project to account for the equity impacts that would result from its implementation relative to other projects. This could allow for projects being considered under EPC that target historically underserved or frontline communities to receive higher prioritization than projects that do not serve such communities.

**Acknowledgments.** The author would like to acknowledge the efforts undertaken to launch the County of Maui's EPC initiative and the willingness and motivation of County departments and the executive and legislative branches to seeing this effort through. The author encourages the County to continue to leverage EPC as a mechanism to advance decarbonization, resiliency, and equity across Maui County, while simultaneously achieving cost savings for Maui County taxpayers and continuing to help meet the critical needs of Maui County's local communities.

**Disclosure of Interests.** The author was previously employed by the County of Maui and was directly involved in the CoM EPC initiative. He has also provided energy consulting services to Johnson Controls who serves as the ESCO for the County of Maui.

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