

## Proposal Defense Feedback and Action Plan

### 1. Link between framework and household health/safety

- I will identify the factors that directly or indirectly impact household health and safety. Examples could include air quality, thermal comfort, hazard inspection, and structural integrity.
- I will define specific metrics related to health and safety that align with the health/safety criterion. For instance, I will measure air quality by assessing ventilation systems, moisture levels, and the presence of potential hazards like mold or lead.
- I will clearly articulate how the framework integrates health and safety factors into the energy audit and conservation measures. This could involve incorporating inspection checklists for health hazards, injury prevention measures, and considerations for the safety of vulnerable populations such as the elderly or children
- I will provide real-world case studies or examples of where the application of past initiatives similar to my framework resulted in tangible improvements in household health and safety, as evidence of the link between the framework and positive health outcomes.
- I will collaborate with health professionals or experts in building health to validate and strengthen the health and safety aspects of the framework

### 2. Merit of the work in terms of innovation?

- **Novel Framework Design:** The framework departs from traditional energy audits framework
- **Integration of multidisciplinary concept:** The framework integrates concepts from multiple disciplines, bringing together ideas from different fields -- energy modeling, software engineering, public health, social sciences -- to enhance the comprehensiveness and effectiveness of the framework
- **Adaptability and Flexibility:** The framework can be tailored to different types of residential buildings, climates, or socio-economic contexts
- **Incorporation of Advanced Technologies:** I will broaden the scope of the criterion of Accuracy to make allowance for cutting-edge technologies or methodologies including the use of artificial intelligence, machine learning, advanced simulation models, or other state-of-the-art tools.
- **Consideration of non-energy factors:** The framework goes beyond traditional energy-centric considerations and includes health, safety, and other non-energy factors, providing a holistic perspective to energy audits
- **Application to low-income housing:** This research takes advantage of the energy efficiency opportunities that low-income demography presents while addressing their unique challenge of high energy burden.
- **Potential for transformative impact:** This research could impact residential energy audits by reshaping current practices, policies, or technologies.

### 3. What methodology to use to achieve the aims of the research?

- **Literature Review:** I will conduct an extensive literature review to understand existing framework, methodologies, and research findings related to energy audits, conservation measures, and frameworks for low-income households. This will help to identify gaps in the current knowledge and inform the development of the framework.
- **Stakeholder Consultation:** I will engage with stakeholders, including representatives from low-income communities, energy experts, policymakers, and housing authorities, through interview, surveys, and focus group discussions to gather insights into specific needs, challenges, and priorities of low-income households regarding energy efficiency and safety.
- **Framework Development:** Based on the literature review and stakeholder input, I will redevelop the initial version of the framework. This process will involve defining the criteria, establishing evaluation metrics, and integrating both energy and non-energy factors.
- **Expert validation:** I will seek validation and feedback from experts in the field of energy, building science, and low-income housing. This will be done through expert workshops, conferences, or peer-reviewed publication. These inputs will enhance the credibility and robustness of the framework.
- **Software Selection and Testing:** I will implement the software testing for select software, document results, and analyze the strength and weakness of each software tool.
- **Case Studies:** If possible, I will apply the framework to real-world case studies involving low-income households, and also document the energy audit process, conservation measures implemented, and the outcomes in terms of energy savings and potential improvement in health and safety.
- **Iterative Refinement:** I will implement an iterative process of refinement based on feedback from stakeholders, experts, and the results of analyses to ensure that the framework evolves to address emerging challenges and remains applicable in diverse contexts.
- **Pilot Implementation:** Consider piloting the framework in a small-scale implementation to assess its feasibility and effectiveness in order to provide valuable insights before full-scale deployment.
- **Cross-Disciplinary Collaboration:** I will foster collaboration with professionals from diverse disciplines, including energy science, building science, software engineering, public health and social sciences to enrich the research and contribute to a more holistic understanding of the complex issues involved.
- **Ethical Considerations:** Since this research addresses the needs of a vulnerable group, I will ensure that I have and adhere to the right ethical guidelines, especially when dealing with low-income populations.

#### 4. How far are you into the research?

- I have been working on this for about a year and half and have completed about 70% of the tasks involved.
- I would like to give myself another year to complete the remaining tasks and get the thesis done.

## 5. Consider talking with KCDC?

- **Partnership and Collaboration:** I will seek to establish a collaborative partnership with KCDC to understand their current initiatives, challenges, and priorities related to energy efficiency and housing for low-income families.
- **Access to Low-Income Communities:** I will leverage KCDC's network and access to low-income communities to directly engage residents in the research process, and ensure that the framework that is developed is tailored to the specific needs and circumstance of the community
- **Health and Safety Assessment:** I will work with KCDC to conduct thorough assessments of potential health hazards, safety concerns, and structural integrity issues in their housing units.

## 6. Define each of the terms very well or more clearly.

- **Literature Review:** I will conduct further literature review to identify existing criteria used in similar frameworks or research studies, and ensure that each term is clear enough.
- **Define scope of each criterion:** I will clearly articulate objectives of the research in terms of specific goals to achieve and what will not be addressed. Wherever possible or applicable, I will ensure that each objective or criterion is SMART: Specific, Measurable, Achievable, Relevant, and Time-Bound.
- **Use of Clear Language:** I will avoid jargons and technical terms that may be unclear to others, and use clear and simple language that can be easily understood by a diverse audience, including those without specialized knowledge in energy or building sciences.
- **Quantifiable Metrics:** Wherever possible, I will express the criteria in quantifiable metrics. For instance, instead of a general term like "improve indoor air quality," I would specify measurable parameters such as acceptable levels of pollutants or ventilation rates.
- **Test Criteria for Consistency:** I will reassess the criteria for consistency and coherence, and ensure that there are no conflicting or redundant criteria, and that each criterion contributes uniquely to the overall objective of the research or framework.
- **Validation with Experts:** I would validate my defined criteria with subject matter experts in the field to seek their inputs in refining and improving the clarity of the criteria.

## 7. Consider/address the different low-income households in the U.S.

- **Define Low-Income Thresholds:** I will clearly define the thresholds or criteria I am using to categorize households as low-income, leveraging federal poverty guidelines, but also considering regional variations and cost-of-living differences.

- ***Urban vs. Rural Distinctions:*** I will acknowledge the distinctions between urban and rural low-income households, since urban areas may face challenges related to energy efficiency in multi-unit buildings, while rural areas may have different infrastructure and accessibility issues.
- ***Housing Types and Structures:*** I will consider the diversity in housing types and structures, because low-income households may reside in single-family homes, multi-family apartments, mobile homes, or public housing.
- ***Cultural and demographic considerations:*** I will recognize the cultural and demographic diversity within low-income communities as it relates with their unique needs, preferences, and challenges faced by different ethnic and cultural groups.
- ***Collaborate with Local Agencies:*** I will collaborate with local housing authorities, community development organizations, and energy assistance programs, to understand their initiatives, and leverage their expertise to ensure that the framework aligns with local strategies for addressing energy challenges in low-income communities.

## **8. Scope of time to complete the research - Jan-Dec, 2024**

December 2023: Initial Planning and Proposal Refinement

- Refine research proposal based on feedback from Committee
- Finalize research questions, objective, and overall scope of the study
- Conduct further literature review to identify gaps and relevant studies

Jan-Feb: Stakeholder Engagement and Framework Refinement

- Engage with stakeholders, including representatives from low-income communities, housing authorities, and energy experts.
- Use feedback to refine framework
- Collaborate with experts to validate and refine framework

March-April: Software Selection and Testing

- Develop a systematic approach for testing selected software against framework
- Begin testing process and document the strengths and weakness of each software tool

May: Preliminary Results Analysis and Framework Refinement

- Analyze the preliminary results of the software testing
- Refine framework based on insights gained from the testing phase
- Consider adjustments to criteria, metrics, or evaluation methods as needed

June-Oct: Final Data Analysis, Writing and Submission

- Complete final data analysis

- Begin drafting thesis, including the introduction, literature review, methodology, results, and discussion chapters
- Seek feedback from Committee on thesis drafts
- Finalize and submit thesis

Nov-Dec: Post-Submission: Defense and Revisions

- Prepare thesis defense
- Revise thesis based on feedback received during defense
- Submit final version of thesis

### **9. Provide software companies the opportunity to address any concerns with results before publishing**

- I will ensure that the testing process and methodology are well-documented and transparent so that software companies can understand how the testing was conducted
- I will prepare feedback reports for each software company, clearly outlining the criteria used for evaluation, the testing process, and specific findings.
- I will communicate with software companies about my intentions to share the results with them before publication and invite their feedback.
- I will set a specific timeline for software companies to provide feedback to ensure the publication process remains on track
- I will be open to incorporating valid feedback into my analysis and making the appropriate adjustments, especially if the insights provided could enhance the accuracy or completeness of the results.
- I will maintain objectivity and integrity with research finding, and be ready to explain methodology and defend results when necessary
- I will include software companies in the acknowledgement, recognizing any valuable input that contributes to refining the research.
- I will inform the software companies about the acceptance of the research for publication when necessary and share copies of the paper with them before it is officially released

### **10. Consider the impact of different weather/location on ECMs**

- I will tailor the selection of ECMs based on the specific climate characteristics of different climate zones
- I will consider how energy performance modeling tools could be used to simulate the impact of ECMs in different climates
- I will conduct a study to understand how certain measures degrade or perform differently in response to variation in temperature, humidity, or other climate-related variables.