Re-thinking Energy in Johnson County

FINAL REPORT

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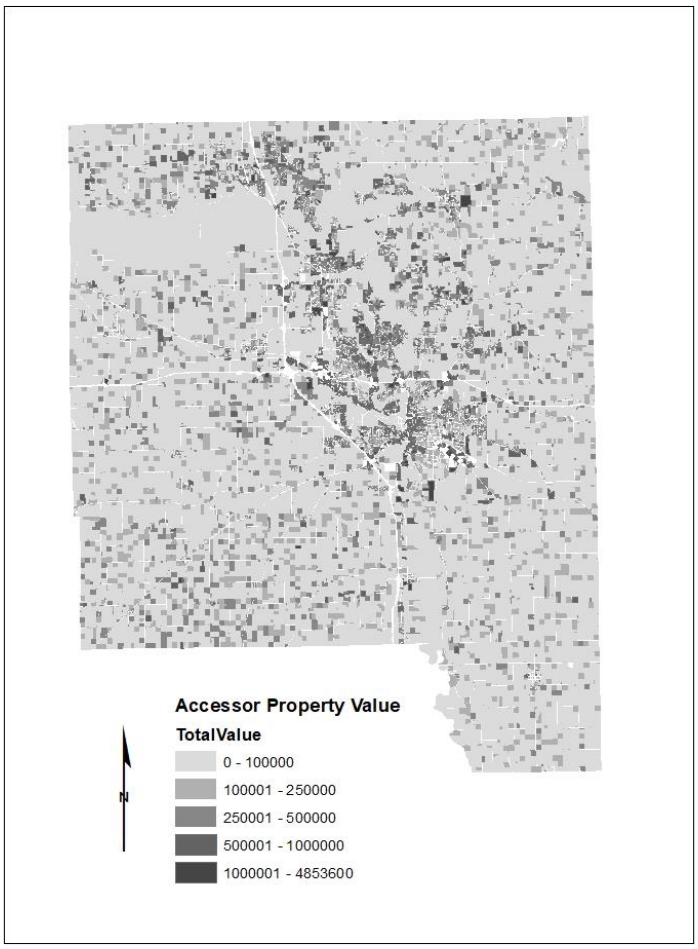
Introduction

Project Purpose, Scope and Area

Clean Energy Districts, such as the Johnson County Clean Energy District (JCED), are independent, voluntary, nonprofit structures aimed at empowering people to provide their own power locally through reduced energy, fortifying local economies by creating jobs and decreasing utilities used. This project provides concrete policy, finance, and technology guidance for energy efficiency improvements and renewable investment possibilities for the JCED. Johnson County is a unique and diverse region in Iowa, with urban population centers and open rural landscapes. The recommendations have been developed in collaboration with faculty at the University of Iowa, industry professionals, and community members.

We describe relevant energy related issues and trends, propose specific goals and objectives, and set the policy context by identifying regulations and describing federal, state and local policies and programs. We conclude each section with best management practices, identifying and drawing lessons from plans that effectively address the issues and provide alternative approaches, policy, and management strategies.

This report encompasses all of Johnson County, Iowa. According to the Johnson County accessor's office there are approximately 68,565 properties in the county in 26 census tracts. The population of Johnson County is 144,425 with a poverty rate of 17.7% and a median property value of $210,400. Property values are highest in the Iowa City area surround Iowa City as shown below.



Methodology and Approaches

Research and review of industry trends and best practices was carried out based on a broad range of information sources that include interviews with stakeholders, officials, utility service providers, as well as comprehensive surveys of comparable cities and counties, city planning documents, and a variety of other documents and publications.

Chapter 1. Public Outreach and Professional Training

The Johnson County Energy District has identified public Information and outreach as a central organizational goal. Interactive tools and resources can bring widespread energy literacy to Johnson County residents. This chapter describes visualization tools and energy-reduction promotion games that could be used to help Johnson County residents determine the energy usage of common household appliances and reduce their energy usage. By giving residents the tools to identify their own household energy usage, the JCED would empower residents to make household-level changes without major public outreach campaigns. This will increase public information and receptiveness to energy efficiency efforts, while allowing the JCED to focus limited funding to other programs.

In addition to residents awareness and behavioral changes, Johnson County needs construction professionals trained in energy efficient building and upgrades. This explores professional certification programs and recommends ways to promote these programs.

1. Household Energy Visualization and Energy-Saving Games and Apps

We researched exemplary appliance and household energy usage visualization tools and energy saving promotion games. Creating and maintaining a new application for Johnson County residents would be too resource-intensive, and many applications already exist that serve this purpose. We developed and considered an extensive list of suitable applications and programs (Figure 1) and tested them to identify a few products that would fulfill the needs of the JCED. These applications and programs were sorted and ranked on the following criteria: ease of use; actual or potential applicability to Johnson County; professional design of game-like design elements that communicate the credibility and importance of the information; and an emphasis on residential energy saving behaviors.

In addition, we explored best practices for implementing similar tools and public outreach strategies for lowering household energy usage. This included research on other energy related initiatives that demonstrated success and applying lessons learned in those projects as it relates to Public Information and Outreach.

Based on the criteria listed above, we selected the Chicago Neighborhood Energy Challenge, Dropoly, and Power House from the list of energy visualization and behavior promotion tools in Figure 1. This section describes these programs and applications to explore their usage, their value, and how they can be applied to Johnson County, and explores lessons learned from the three programs.

Game	Individual players	Teams	Residential	Multifamily	Workplace	Commercial	Community-based	School involvement	Utility involvement	Import utility data	Compare to neighbors	Educational focus	Live events	Tangible rewards	Virtual rewards only	Virtual world	Use social media	Facebook integration	Smartphone enabled	Customizable
Cool Choices	•	•			•									•						•
WeSpire	•	•			•									•			•		•	•
Ecoinomy	•	•			•									•						•
Vermontivate	•	•	•				•	•	•			•	•	•						
Power Agent		•	•						•	•		•			•				•	
JouleBug	•		•							•					•		•	•	•	•
Rock the Bulb	•		•				•		•				•	•						
Reduce the Use	•		•				•		•		•			•						
SMECO Savings	•	•	•				•		•					•			•	•		
Kansas Take Charge	•	•	•				•	•	•				•	•						
Energy Smackdown	•	•	•				•		•				•	•						
Chicago Neighborhood	•	•	•	•			•			•	•		•	•						
Carbon4Square	•	•			•	•	•					•			•					
Kukui Cup	•	•					•					•	•	•			•			
Beat the Peak	•	•	•				•	•	•					•					•	
Biggest Energy Saver	•		•				•		•					•			•			
San Diego Energy	•	•	•				•	•	•	•				•			•			
Opower	•		•						•	•	•				•		•	•	•	•
Leafully	•		•						•	•		•			•		•	•	•	
Dropoly	•	•	•	•			•	•				•		•						•
Energy Chickens	•				•										•	•				
Power House	•		•						•	•	•	•			•	•	•	•		

Figure 1.1: Currently available energy usage visualization tools.

The Chicago Neighborhood Energy Challenge

The Chicago Neighborhood Energy Challenge was a pilot program that challenged the nearly 750 residents of seven multifamily buildings in two different neighborhoods in Chicago. The program placed an emphasis on changing existing behaviors in order to reduce energy usage and utility costs. Participants were sent guiding material periodically, with instructions on how to reduce their energy usage and general information on energy literacy. The program utilized both monetary incentives as well as social pressures through active members in the community in order to increase participation. Buildings that saw the largest decrease in utility usage and highest levels of participation could receive thousands of dollars that could be reinvested into energy related projects, and top performing individuals could receive smaller sums of money as

well as other rewards such as museum passes. The participating buildings saw a 20% reduction in electricity, water, and gas usage reflecting a total $54,000 savings on utility bills, far above the original goals of the program. Lessons learned from this program highlights a need to provide a platform for participants to share their success, tips, and experiences with the program in order to promote the social dimension of the program, which helps spur participation and ensures continued use.

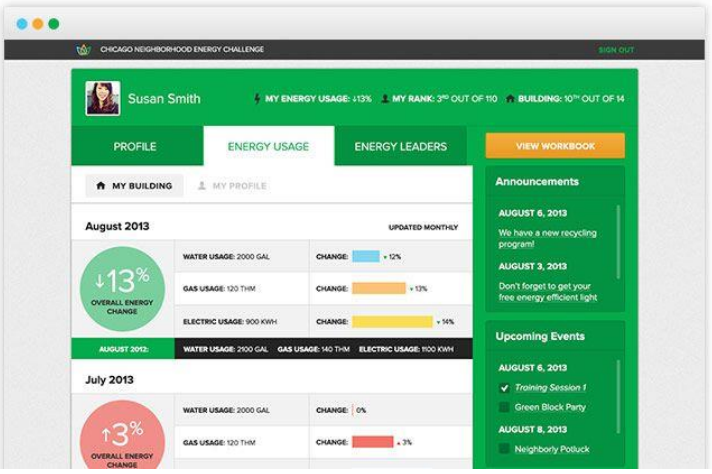


Figure 1.2. The Chicago Neighborhood Energy Challenge

Dropoly

Dropoly is an application that allows participants to input their zip code information, home details, and a recent energy bill to create a representation of their home and energy usage. The program then makes recommendations about strategies to reduce energy usage and utility bills. The program works for single and multifamily dwelling units and for all income groups. This application focuses mainly on the physical features of the home and changes and updates that can be made to maximize energy usage reduction (rather than behavioral changes).

Figure 1.2 Dropoly

Power House

Power House, the most "gamey" of this selection, focuses on familiarizing and educating players on the typical energy usage of a household and the importance of paying close attention to managing utilities. The game begins with the player assisting a virtual family with typical household chores, turning lights on and off as a family member enters the room. As the game progresses, more family members are added, increasing the difficulty and highlighting the difficulty of keeping up with the household's growing energy demand. Throughout the game, players are also offered tips and information on how to decrease their energy usage through behavior changes. This information can help the player not only in the next round of the game but can also be transferred to real life. Players can exchange the points they earn in the game for virtual upgrades to the home, such as energy efficient appliances, to increase their score in the next game. Players can also trade score points for real life items such as gift cards.

Figure 1.3. Powerhouse

Recommendations for Public Outreach

We recommend that the JCED adopt a public outreach strategy that takes elements from each of the programs and applications described in this section, as well as utilize lessons learned from these programs. First, from the Chicago Neighborhood Energy Challenge, the JCED should identify buildings and tenants, promote active participation and "gamify" social pressures for resident participation. Small monetary incentives would be ideal to boost program adoption and to achieve critical mass. Participants should be able to track their progress and share this progress with their neighbors, e.g., using a social media platform. Additionally, the JCED should create a resource repository for energy-conscious residents to further explore energy reduction techniques. This can be done by utilizing programs such as Dropoly, Power House, or other similar programs alongside typical sources of information.

2. Contractor Certifications

The Johnson County Energy District has also identified ensuring that local programs exist for contractor certification as an organizational goal. Energy efficiency within a household can only be achieved if the energy efficient systems and appliances are being installed by qualified contractors (at the time of construction or when upgrades are made). Currently, there are no local recognized certification programs relating to residential energy efficiency that operate at a large enough scale to fit the needs of the JCED.

To provide a trained and educated contractor workforce, the JCED would ideally collaborate with Kirkwood Community College to develop and expand certifications and continuing education courses for contractors in the Johnson County area in the areas of building science and energy efficient technology and appliance installation. Continuing education and professional development will also give local contractors the skills and resources required for the further development and maintenance of energy efficient technologies and systems that will become more widespread in the coming years.

First, we describe existing contractor certification programs and courses, focusing on their merits and scope to determine their applicability to Johnson County. We focus primarily on the certification programs and continuing education courses provided by organizations such as LEED, the Building Performance Institute (BPI), Energy Star, and the Department of Energy Building America Program (BAP). These programs serve as a roadmap for the principles and content of an effective contractor certification program that can be applied to the Johnson County area. Our recommendations stem from this research, as well as insights provided by Prof. Joe Greathouse, Associate Professor of Construction Management in the Industrial Technologies department at Kirkwood Community College, who focuses on construction and building science. We interviewed him over the phone and by email in April 2020.

Building Performance Institute Core and Advanced Certifications

The Building Analyst Certification offered by the Building Performance Institute (BPI) is a certification program that aims to educate contractors and building professionals on the basics of building science, and develop the skills necessary to perform energy audits, assessing building airflow, combustion safety, and data collection. These skills aid contractors in installation work by providing them the tools to consider the overall structure's energy usage, and the impacts and interactions of each sub-system on building safety and efficiency. The building Analyst Certification, a part of the broader Core Certifications offered by BPI, does not require hands-on training. These relatively low-cost core certifications act as entry points for contractors and building professionals to develop a baseline understanding of building science techniques that will aid in further certifications offered by BPI such as their Advanced Certification programs. Advanced Certifications, such as the Retrofit Installer Technician Certification, provide training to contractors and building professionals on how to install upgrades to A/C systems, building envelopes, roofing, ventilation, etc. The testing for these Advanced Certifications is far more rigorous, requiring candidates to complete both an online written exam and a field exam in which candidates complete hands-on tasks in their respective

certification field of study. Because the Advanced Certifications require a more in-depth examination process and come with a higher seal of professionalism, each certification can cost close to $1000, making them cost prohibitive for small firms.

LEED Certifications

The certifications offered by the Leadership in Energy and Design, a part of the U.S. Green Building Council provide contractors and building specialists with a highly regarded standard certification program that focuses on the green and efficient design and operation of structures. The certifications offered through LEED include the LEED Green Associate (GA), the foundational certification which denotes a basic competency in green building and building science principles, and the LEED AP with specialty, the advanced professional credential which signifies an expertise in green building, building science, and other components of the LEED rating system. Both certifications present LEED principles, explain the importance of green building and the role they serve in society, as well as recent technological advances that support LEED principles. The LEED GA certification educates professionals on the interrelationships between systems in retail and residential spaces, both new and old construction. The certification covers water efficiency, energy and atmosphere principles, material use, indoor environmental quality, as well as integrating the project into the surroundings and encouraging public outreach. The US Green Building Council provides educational material and various study resources through their website and the test is provided in an online format as well. The LEED AP Operation + Maintenance (LEED AP O+M) is designed for professionals and contractors to improve performance, heighten efficiency, and implement sustainable practices in existing buildings.

Recommendations

The JCED could adopt and endorse one or more of the existing contractor certification programs described above. If costs are prohibitive for small local construction firms (we did not explore this possibility), JCED could fundraise to support professionals in small local construction firms interested in receiving this training. In exchange, grant recipients could commit to implementing energy efficient strategies in their subsequent projects. This would require some fundraising and some tracking, but would be the fastest way to implement a certification program.

Alternatively, JCED could work with Kirkwood Community College faculty to develop a lower cost alternatives. Discussions with Joe Greathouse revealed that there are few of these continuing education certifications currently available, and that the largest barrier to creating such courses is class size. A minimum of 15 students need register for course offerings to be economical for both the college and individuals or businesses. This creates a considerable challenge in the development of a certification program, but the JCED could partner with Kirkwood Community College to get large groups of contractors (at least 15) to take the course at one time. The JCED could offer small incentives to cover part of the cost of the program. Since these courses are generally offered for $200 or less, incentives would be relatively low cost.

Chapter 2. Electrifying Transportation

While electrification represents a longer term goal for the Johnson Clean Energy District (JCED) and the electrification of transportation across the region may be taken on by many other stakeholders, there are a number of areas in which JCED can positively influence the development of a local, electrified transportation system. This chapter explores three areas of opportunity for the JCED to engage in.

First, we present a policy toolkit which contains potential policies and building codes the JCED can use to support contractor, city council, and county government decision-making and provide a framework for enacting policy around the electrification of transportation. This section will propose roles JCED can play in the formulation of local building and residence codes, provide recommendations aimed at improving Electric Vehicle (EV) readiness in Johnson County, and select a sample code adapted for Iowa City with particular attention to multifamily developments. To further develop tools that align with JCED's values of equity and access, we also propose a framework for developing a clean vehicle assistance program, which would be unique for a Clean Energy District in Iowa.

Second, in line with JCED's aspirations for improved consumer and contractor education, we provide guidance for a consumer and contractor education event for EVs. The creation of an EV event modeled after Winneshiek Energy District's Fest(EV)al will help achieve consistency with the Energy District model used in other parts of the state.

Third, in line with JCED's goal to reduce energy consumption, and to support local goals to reduce demand for parking and increase clean transportation options, we propose tools to develop an E-Bike Network. In this section, we evaluate various sites in North Liberty, Coralville, and Iowa City for their suitability and propose an initial pilot program supplemented by a map of six proposed sites in the region. At the end of the section, a potential funding source and tools for assembling a compelling funding application are explored.

1. Policy Toolkit: Building Codes

Although range anxiety and vehicle cost are beginning to wane as concerns for prospective EV adopters, many are unable to transition to EVs because their existing residences and buildings do not have EV Capable or EV Ready parking. One way to alleviate this concern is to build EV Readiness or EV Capability into building codes for new construction.

In January 2020, the International Code Council (ICC) approved EV Ready building codes to be published in the ICC's 2021 codes released October 2020 (Coren, 2020). While the codes are not binding, leading construction companies, states, and municipalities utilize the ICC in one form or another. For simplicity and consistency, we adopt the electric vehicle related definitions used in the newly approved ICC to inform a proposal of potential codes for Johnson County's municipalities to adopt. The definitions are included below, verbatim. These "general definitions" will be found in Section R202 (IRC N1101.6) in the International Residential Code as they were originally proposed by Frommer et al. in the 2019 document (Frommer et al., 2019).

Definitions

Electrical Vehicle Supply Equipment

The conductors, including the ungrounded, grounded, and equipment grounding conductors, and the Electric Vehicle connectors, attachment plugs, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the Electric Vehicle (Frommer et al., 2019).

Electric Vehicle Capable Space

Electrical panel capacity and space to support a minimum 40-ampere, 208/240-volt branch circuit for each EV parking space, and the installation of raceways, both underground and surface mounted, to support the EVSE (Frommer et al., 2019).

Electric Vehicle Ready Space

A designated parking space which is provided with one 40-ampere, 208/240-volt dedicated branch circuit for EVSE servicing Electric Vehicles. The circuit shall terminate in a suitable termination point such as a receptacle, junction box, or an EVSE, and be located in close proximity to the proposed location of the EV parking spaces (Frommer et al., 2019).

EVSE-Installed Space

This refers to the Electric Vehicle Supply Equipment being installed in the parking space, ready-to-charge. We assume a 240V, or Level 2 EVSE charger.

For reference, we also include the text for the new EV-Ready building code. This will provide a baseline off which to plan, as well as educate local entities what changes to building codes are forthcoming.

R404.2 (IRC N1104.2) Electric Vehicle (EV) charging for new construction. New construction shall facilitate future installation and use of Electric Vehicle Supply Equipment (EVSE) in accordance with the National Electrical Code (NFPA 70) (Frommer et al., 2019).

R404.2.1 (IRC N1104.2.1) One- to two-family dwellings and townhouses. For each dwelling unit, provide at least one EV Ready Space. The branch circuit shall be identified as "EV Ready" in the service panel or subpanel directory, and the termination location shall be marked as "EV Ready". Exception: EV Ready Spaces are not required where no parking spaces are provided (Frommer et al., 2019).

R404.2.2 (IRC N1104.2.2) Multifamily dwellings (three or more units). EV Ready Spaces and EV Capable Spaces shall be provided in accordance with Table R404.2.2. Where the calculation of percent served results in a fractional parking space, it shall round up to the next whole number. The service panel or subpanel circuit directory shall identify the spaces reserved to support EV charging as "EV Capable" or "EV Ready". The raceway location shall be permanently and visibly marked as "EV Capable" (Frommer et al., 2019).

Screenshot of *Table R404.2.2 (IRC N1104.2.2) EV Ready Space and EV Capable Space requirements* (Frommer et al., 2019).

Total Number of Parking Spaces	**Minimum number of *EV Ready Spaces***	**Minimum number of *EV Capable Spaces***
1	1	-
2 – 10	2	-
11 – 15	2	3
16 – 19	2	4
21 - 25	2	5
26+	2	20% of total parking spaces

R404.2.3 (IRC N1104.2.3) Identification. Construction documents shall indicate the raceway termination point and proposed location of future EV spaces and EV chargers. Construction documents shall also provide information on amperage of future EVSE, raceway methods, wiring schematics and electrical load calculations to verify that the electrical panel service capacity and electrical system, including any on-site distribution transformers, have sufficient capacity to simultaneously charge all EVs at all required EV spaces at the full rated amperage of the EVSE (Frommer et al., 2019).

JCED as an Information Repository for Contractors, Municipalities and Others

To further the impact of JCED, the organization could serve as an online hub, or clearinghouse of information on clean energy and energy efficiency education for the citizens, governments, and contractors of the region. In this case, it would be beneficial to create a page on JCED's website which links to PDFs or other associations to help municipalities create or update their building codes, for local businesses and contractors to understand what developments they may have to plan for. JCED could also include specific building codes the organization supports. Beyond the creation of the website, JCED could serve in a consultant role for local government leaders, guiding them through the implications of various codes. JCED could also provide guidelines and consultation to contractors on what new codes will require of them in terms of labor, equipment, or additional skill, and on how codes may vary among cities. Please refer to table 3.1 for each city's current building code status.

JCED as a Lobbying Partner to Reform State Code

According to the ICC, "The Iowa Code is based on the 2015 IBC, IRC, IMC, IECC, and IEBC for state owned and rented structures" (ICC - Iowa, 2017). A lobbying priority for the coalition of Energy Districts in the state could be to codify a more up-to-date IBC/IRC, one which includes the 2021 modifications for electric vehicles. This is likely to find allies with Iowa Environmental Council and other organizations. For municipalities who view or use the state as a reference for their own building and residential codes, this is likely to drive change within communities.

Working with Johnson County Cities on Code Implementation

Because Iowa is a home-rule state, local jurisdictions are not required to adopt the most current version of the Iowa Code (ICC - Iowa, 2017). Based on each local municipality's city code provided on their website, we assemble their current building and residence code status:

Table 2.2

City	IBC / IRC Status
Coralville, IA	2018 IBC / 2018 IRC
Hills, IA	State Code (2015 IBC / 2015 IRC)
Iowa City, IA	2018 IBC / 2018 IRC
Lone Tree, IA	2018 IBC / 2018 IRC
North Liberty, IA	2018 IBC / 2018 IRC
Oxford, IA	2009 IBC / 2009 IRC
Shueyville, IA	2015 IBC / 2015 IRC*
Solon, IA	2003 IBC / 2003 IRC**
Swisher, IA	2018 IBC / 2018 IRC
Tiffin, IA	2006 IBC, unique residential
University Heights, IA	Could Not Locate – Assume Similar to IC
West Branch, IA	State Code (2015 IBC / 2015 IRC)

*- Code does not verify which IBC/IRC Shueyville references, but in 2016 the City appeared to have held a hearing on approving the 2015 IBC/IRC.

**- 2005 Code is the newest code shared on Solon's website. Some changes are likely not accounted for.

Iowa City, Coralville, North Liberty and University Heights appear to have the most up to date building and residence codes, which may make them likely cities to adopt the updated 2021 IBC and IRC. In this case, JCED may act as a resource to provide them with information on what the major changes are. Rural towns like Lone Tree and Swisher have also adopted the 2018 IBC / 2018 IRC, and JCED could take a similar approach with these municipalities.

Tiffin is considered part of the urban metropolitan area, but appears to have not updated its building codes. Given that Tiffin is expected to continue to grow and develop single and multifamily residences, JCED could work with Tiffin to develop a modernized EV code that makes Tiffin an attractive site for energy efficient home buyers. With respect to non-residence building codes, working with Tiffin on support tools and communicating the benefits of adopting the 2021 IBC may be beneficial. While Tiffin and other municipalities may be concerned that updated building codes will increase the cost of homes to residents and developers, it should be noted that people aged 25-44 are among the most likely to purchase an Electric Vehicle, according to surveys (Plautz, 2019). As Tiffin considers how it will grow, the adoption of EV friendly building codes may give it a competitive edge in attracting future, young and environmentally conscious populations when they reach a home-buying age. Another benefit to

adopting EV Ready building code early is to avoid up to thousands of dollars per parking space in retrofitting costs in the long run (Frommer, 2018).

Cities with less up-to-date IBC/IRC adoptions include Hills, Oxford, Solon, Shueyville, and West Branch. Including updated IBC/IRC adoptions to their city code as part of broader comprehensive planning strategy may be a way to introduce this building code change to these cities.

A city's IBC/IRC status is important to understand because if the city makes use of an IBC, IRC, or both as reference, this is likely how it will implement changes with respect to EVs and building codes. A city may also use its own ordinance, or zoning ordinances. Understanding which cities adopt what help us to craft the best possible way about contributing to their EV Readiness. The Southwest Energy Efficiency Project documents case studies of cities who have developed EV Ready and EV Capable Codes, depending on what process their building code is based on here (Frommer, 2018). The document also provides insight on percentage based requirements for EV Readiness and EV Capability. Depending on the population, EV demand, municipality's climate action and adaptation goals, and municipal government's expertise, they may wish to modify codes accordingly.

Sample Residential Code

Palo Alto, California is a city of approximately 66,000, which makes it roughly comparable in size to Iowa City. The City's requirements are among the most ambitious in the country, calling for a minimum installation requirements of EVSE, as well as specific direction for an ambitious access plan for multifamily dwellings. The code goes beyond the requirements of the 2021 ICC code. References to California, specific code numbers, and terms have been removed and replaced with the terminology used by the City of Iowa City's code where applicable. Where location specific wording is not relevant, the exact phrasing will be used verbatim. The following adaptation of Palo Alto's code is proposed below. Please note that terms used will be consistent with the ICC's 2021 Codes as indicated in the definitions provided at the beginning of this chapter.

"EV Charging for Residential Structures. Newly constructed single family and multifamily residential structures, including residential structures constructed as part of a mixed use development, shall comply with the following requirements for electric vehicle supply equipment. All parking space calculations in this section shall be rounded up to the next full space.

Single Family Dwellings. The following standards apply to newly constructed Single Family Dwellings.

- *(a) In general. The property owner shall provide conduit only, EVSE-Ready Outlet or EVSE Installed for each residence.*
- *(b) Location. The proposed location of charging station may be internal or external to the dwelling and shall be in close proximity to an on-site parking space consistent with City guidelines, rules, and regulations.*

Multiple Dwellings. The following standards apply to newly constructed residences in a multi-family residential structure. Multiple dwellings are defined as any dwelling containing 3 or more dwelling units. Exceptions may apply.

(a) Resident parking. The property owner shall provide at least one EVSE-Ready Outlet or EVSE Installed for each residential unit in the structure.

(b) Guest parking. The property owner shall provide Conduit Only, EVSE-Ready Outlet or EVSE Installed for at least 25% of guest parking spaces, among which at least 5% (and no fewer than one) shall be EVSE Installed.

(c) Accessible spaces. Projects shall comply with relevant accessibility regulations, ensuring accessible electric vehicle parking.

(d) Minimum total circuit capacity. The property owner shall ensure sufficient circuit capacity, as determined by a relevant City Official or inspector, to support a Level 2 EVSE in every location where Circuit Only, EVSE-Ready Outlet or EVSE Installed is required.

(e) Location. The EVSE, receptacles, and/or raceway required by this section shall be placed in locations allowing convenient installation of and access to EVSE. If parking is deed-restricted to individual residential units, the EVSE or receptacles required by subsection (a) shall be located such hat each unit has access to its own EVSE or receptacle. Location of EVSE or receptacles shall be consistent with all City guidelines, rules, and regulations.

Exception: Multiple Dwelling Structures with Individual, Attached Parking. The property owner shall provide Conduit Only, EVSE-Ready Outlet, or EVSE Installed for each new constructed residence in multiple dwelling structure featuring a parking space attached to the residence and a shared electrical panel between the residence and parking space (e.g., a multiple dwelling structure with tuck-under garages.)"

The baseline code, from the City of Palo Alto, also provides for non-residential buildings and hotel-specific EV code. This information and the remainder of the building code can be accessed here ("Palo Alto Municipal Code," 2017).

2. A Local EV Subsidy Program

Action 2.2 of the Iowa City Climate Action and Adaptation Plan identifies an area in which the Johnson Clean Energy District can provide policy support to the City of Iowa City and potential neighboring cities on the electrification of transportation. Per Action 2.2, "The City will … explore community opportunities offering financial incentives to residents and businesses who purchase clean vehicles, including potential subsidies for buying or leasing an electric vehicle and at-home charging stations, and other potential incentives" ("Iowa City Climate Action and Adaptation Plan," 2018).

The development of a clean vehicle assistance program in Johnson County would be the first of its kind in Iowa, and provide an exciting future area for Energy Districts to work on. Johnson Clean Energy District can be a lead partner in the development of this program or simply provide a policy toolkit for other stakeholders to work with. Based upon comparable California assistance programs for clean vehicles, we recommend the development and consideration of the following.

Alternatively (or in addition), JCED could lobby for a Statewide Clean Vehicle Assistance Program. Forming a coalition of energy districts and environmental advocates, JCED and allies may wish to advocate for a statewide clean vehicle assistance program, and to serve as an administrator of the program. Given that the State of Iowa does not have a funded agency comparable to the California Air Resources Board and does not participate in emissions fees or cap-and-trade, we rule this out at this time and instead will proceed to provide a framework of considerations for building a localized clean vehicle assistance program.

Establishing a Clean Vehicle Assistance Program

This section will identify the core stakeholders involved in the California Clean Vehicle Assistance Program, identify their potential Johnson County area equivalents, and propose a framework based on the CVAP for developing a locally scaled program with cost estimates.

The development of the Clean Vehicle Assistance Program in California provides guidance on developing a subsidy program to expand access to Hybrid, PHEV, and BEV as well as supporting charging station infrastructure to lower income individuals ("Clean Vehicle Assistance Program," 2020). The California Clean Vehicle Assistance Program is a collaboration between the California Air Resources Board and the Beneficial State Foundation, which is an extension of the Beneficial State Bank, a community development bank/credit union based in Oakland, California ("Clean Vehicle Assistance Program," 2020). This system awards up to $5,000 in grants and opens access to low-risk, affordable financing to income qualified applicants for the purchase new and used clean vehicles ("Clean Vehicle Assistance Program," 2020).

Based on our review of the system, we propose the following 5-point structure:

1. Consider and Determine Where Financial and Administrative Resources Will Come From

- State program (California utilizes Cap & Trade)
- Municipal or County additional taxation measure, or included in budget
- Iowa City Climate Action Grants program and other city equivalents
- Iowa Economic Development Authority Possible Funding and Administrative Support
- Partnership with a community development credit union, similar to Beneficial State
    - May be able to develop foundation to help find funding for grants.
    - Can be used to approve and disburse grant funding.
    - Can provide favorable financing for low income groups.

Table 3.2 represents the financial institutions which are classified as Community Development Banks (CDBs) or Community Development Financial Institutions (CDFIs) in Eastern Iowa. If there is a physical branch located in the JCED area, we identify this in the column titled "Branch in Johnson County."

Table 2.3: Possible Community Development Financial Institution Partners

CDFI Name	**Branch in Johnson County**
Ascentra Credit Union	NO* (*- Johnson County is in service area)
Veridian Credit Union	YES (Coralville, Iowa City)
Neighborhood Finance Corporation	NO
IH Mississippi Valley Credit Union	NO* (*- Johnson County is in service area)
Dupaco Community Credit Union	NO (*- Johnson County is in service area)
Community 1st Credit Union	NO (*- Johnson County is in service area)

Information synthesized from NerdWallet.com

The initial evaluation suggests Veridian may be the most readily accessible partner in the region to work with in the development of a comparable vehicle assistance program. Additionally, Hills Bank and GreenState Credit Union, which are not registered as CDFIs per our research, could be considered as candidates for local partners with multiple branches in the region if a special agreement is reached.

2. Establish How Much The Clean Vehicle Incentives Cover

The California Clean Vehicle Assistance Program awards grants up to $5,000 for PHEVs and BEVs depending on income. For a hypothetical scenario in which we want 50 EV cars purchased annually in the Johnson County area by income qualified individuals, we calculate the following costs:

Not accounting for administrative costs, a county wide program which awards 50 grants of the maximum $5,000 each year would cost $250,000 per year. Further financial modeling analyses would need to be done and feasibility studies of where funding can come from is necessary to determine whether such a program can be administered locally at this time.

In addition to clean vehicle incentives covered in a local program, JCED and supporting stakeholders may be able to promote EV and EVSE rebates which may be stackable.

Stackable Existing Incentives for EVs in Iowa through the end of 2020:

- MidAmerican Energy Company $500 Rebate for New EVs ("Electric Vehicle Rebate," 2020).
- Alliant Energy Company offers up to $500 Rebate for EV Charging Stations – Level 2 ("Electric Vehicle Home Chargers and Rebates," 2020).

Beneficial State Bank has agreed to offer interest rates of 8% or less in California ("Clean Vehicle Assistance Program," 2020). If a Johnson County Clean Vehicle Assistance Program is to launch, interest rate ranges will have to be determined with the community development bank(s) that are chosen as partner(s).

3. Establish Consumer Eligibility Requirements

The creators of a localized program in the Johnson County area will need to consider what income ranges by household size are eligible for cars. California's program sets the maximum gross annual income, by household size, at 400% of the Federal Poverty Level 2020 ("Clean Vehicle Assistance Program," 2020). Alternatively, creators may look to the Iowa City Affordable Housing guidelines to set eligible income ranges.

The creators will also need to determine if the program will only cover cars or the supporting charging equipment as well, and if they do, whether there is a difference in how these are awarded.

4. Establish Requirements for Vehicles and consider what kind of vehicles will be eligible for financing

- Decide whether to fund only Hybrid Vehicles, Partial Hybrid Electric Vehicles, Battery Electric Vehicles, or only PHEVs and BEVs.
- Decide on any minimum requirement for the MPG or MPGe rating, minimum model year requirement, maximum mileage, requirement for no open recalls, and/or Inspection and vehicle history reporting requirement,

5. Establish Dealership Credentialing System

The California Clean Vehicle Assistance Program requires that a dealership be a franchise dealership or members of the Credit Union Direct Lending Program, and allows for dealerships not under these categories to be independently vetted.

According to a search query of CUDL AutoDirect, there are 3 qualified dealerships within 25 miles of Iowa City. Only 2 are in towns within the Johnson County area, and only 1 is completely within Johnson County boundaries. Table 3.3 presents potential nearby dealers which may pass the Credit Union Direct Lending pre-vetting:

Table 2.4

Coralville Used Car Superstore, 404 2nd Street, Coralville, IA 52241
West Branch Ford, Inc., 346 West Main Street, West Branch, IA 52358
Westdale Used Car Superstore, 3220 Wiley Blvd SW, Cedar Rapids, IA 52404

JCED could also help with credentials and/or set up the standards as to what qualifies for a dealership. Special consideration may be applied to VERV, a MOXIE Solar company in North Liberty, now specializing in used car sales of electric vehicles.

Leading EV Consumer and Contractor Education Events

The Winneshiek Energy District's Fest(EV)al hosted in 2019 provides an excellent Case Study to inform the creation of a unique event for the Johnson County Energy District.

The Johnson County Fairgrounds would be an ideal site for the event because it is well known, has adequate space and facilities to house electric vehicles with access to electricity, and can host alternative activities for family fun, educational forums, and vendors. The Winneshiek Energy District hosted their Fest(EV)al in 2019 at the Winneshiek County Fairgrounds ("Electric Vehicle Fest(EV)al," 2019).

Auto Dealers to invite include, but are not limited to:

Billion Auto – Chevy Buick GMC Cadillac, Billion Auto – Kia, Billion Auto – Honda, Billion Auto – Hyundai, Deery Brothers Chrysler Dodge Jeep Ram, Deery Brothers Ford Lincoln, Toyota of Iowa City, Carousel Mazda, Hartek Automotive, Iowa City Used Car Center, Coralville Used Car Superstore, Harris Boyz Auto, Carousel Preowned, Sharpless Auto Sales, Cooley Auto Sales, Liberty Motors, West Branch Ford and VERV Electric Vehicles.

The event should involve an Expo where dealers can showcase their new and pre-owned options for EVs. If dealers want to allow test driving around the fairgrounds, that will also be welcomed. Similarly, individual owners are invited to showcase their vehicles and charging equipment and share knowledge from their years of EV ownership, and may volunteer their vehicles for short test drives.

Additional vendors who provide EV incentives, accessories to EV charging, and solar charging capabilities can be invited. These include but are not limited to: MidAmerican Energy, Alliant Energy, MOXIE Solar, Smart Solar LLC, Simpleray Solar. MidAmerican Energy and Alliant Energy offer rebates for EVs and EVSE consumers can learn about, and solar companies could be invited to share possible Solar-EV systems with prospective consumers.

Workshops will be encouraged to be set up. Potentially valuable workshop hosts and resources include:
- Kirkwood Community College, which has multiple staff and students involved in EV and Hybrid Electric Vehicle courses and training programs. Kirkwood faculty who teach Photovoltaic Systems classes could similarly be invited to host a standalone workshops or partnered forums with solar industry leaders.

- The City of Iowa City and other municipalities in the Johnson County region which have experimented with electrifying their fleet should be invited to talk about their experiences, and network with other Johnson Clean Energy District community leaders.

- Representatives from the Sustainable Energy Discovery District at the University of Iowa could be invited to send staff to discuss their solar-charged EV system. Contractor education workshops about adapting to the future of electric vehicles in housing development, solar energy, and other industries could be planned.

- A partnership with Midwest Renewable Energy Association (MREA), which hosts dozens of workshops every summer at their Energy Fair in Wisconsin, could be utilized to access a wider network of expertise and specifically assist in the creation of a contractor education workshop. The MREA would also be able to promote its Training program and wide range of course offerings, which range from "solar PV, solar thermal, and small wind systems" and NABCEP training courses (Midwest Renewable Energy Association Course Offerings, 2020). A mixture of policy discussion, technical training sessions for contractors, interested students, and consumer programs on financing, owning, and maintaining EVs will make for a well-rounded program.

Music and fun activities are advised for kids and family members who may not be immediately interested in EVs. Local food restaurants with a history of supporting Climate Action in the region should be considered for vendors.

3. E-Bike Network Development

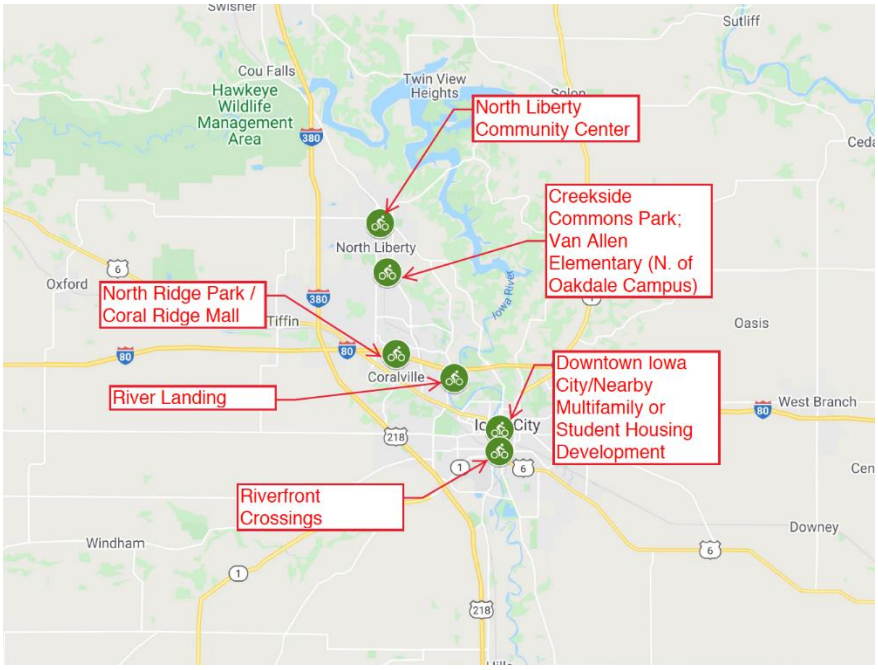
E-Bikes represent a potentially compelling alternative to Electric Vehicles that is more in line with the JCED's immediate priority of reducing energy consumption, and can provide added benefits of reduced car trips, reduced traffic, and improved air quality.

We propose a first round of docking stations for an E-Bike Network to be established at the sites shown in "Map 1" below. The first round emphasizes pilot program visibility to the public and accessibility to existing trail network, which was determined using Google Maps' bike directions and trail map location services.

The first will be a downtown Iowa City Docking Station near the Ped Mall, but it could also be included in new apartment developments as a way to reduce vehicle parking volume downtown. Iowa City Riverfront Crossings Park has been identified as another viable spot in Iowa City due to its proximity to the Iowa River trails, mixed use development, proximity to businesses and other recreational attractions. Iowa River Landing was chosen because of its proximity to an intermodal facility – an e-bike

docking station would help complete this area as a sustainable transportation hub. Iowa River Landing is also an excellent place for e-bike visibility, which will prompt further interest in future development. Coral Ridge/North Ridge Park area represents an area with close proximity to trails, housing – single family and multifamily alike, and the shopping mall. The trail proceeds North to connect with the Oakdale campus. North of the Oakdale campus is Creekside Commons Park, which is one of North Liberty's proposed docking points. Connectivity to the Oakdale campus and other major nearby employers makes this a potentially attractive e-bike docking point. The northernmost stop is near the North Liberty Community Center, which is in close proximity to major trails, businesses, and is a recreational and resource hub for the community, which will further contribute to high visibility, which should be a primary goal of the first rollout of the E-Bike Network. Exact locations of all points can be shifted as needed for connectivity to electrical power sources.

Map 1. Potential docking stations for E-bikes



Picture retrieved from Bike-Energy at: https://bike-energy.com/en/produkt/radabstellanlage-8er/

Funding Application Guide

JCED can be the leading organization to develop an e-bike network in the Johnson County by providing a clear funding plan for the project. People for Bikes funds bike infrastructure including bike racks and supporting infrastructure up to $10,000, but does not fund feasibility studies, signs, trailheads, bicycles, and educational programs ("Grant Guidelines - People for Bikes," 2020). It should also be noted that People for Bikes does not provide grant funding for projects in which their "funding amounts to 50% or more of the project budget" ("Grant Guidelines - People for Bikes," 2020). Using available information about the price of e-bikes and e-bike charging facilities, we assemble a project cost estimate in "Cost Estimate 1" below. Labor, permitting, and administrative costs associated with the project were not calculated and would increase the estimate if applied.

The "Bicycle shelter SALZBURG" (pictured above) has 4 E-Charging points, can hold up to 8 e-bikes, includes an already integrated charging system, and is priced at approximately (based on EU to USD Conversion) $15,600 USD ("Wheel parking system," 2020). An ideal system would have all 8 charging points available. The professional design of the bike rack and room for design panels on the side would allow for branding that advertises the E-Bike Network's Name, and collaborators like Johnson Clean Energy District. This makes the bike rack an easily-identified attraction and provides shelter from the elements, reducing wear and tear on the e-bikes. The cost and specifications of the shelter shown are meant only to provide a base estimate; there are likely more cost effective designs that can be employed and docking station providers closer than the Austrian example used.

An estimate of $1,100 per E-Bike is used. The e-bike we base our estimates on is the Aventon Pace 350 E-Bike model, which has 20 MPH assist and 35 mile range ("Pace 350 Ebike," 2020). If a user were to travel from the northernmost docking station at the North Liberty Community Center to Riverfront Crossings, the southernmost proposed station, and back to the North Liberty Community Center without charging, approximately 5 miles of range would be left over on a full charge. Most trips are expected to be shorter, but this allows for long-range trips (within reason) to be made without user anxiety. The same model is assumed to be used across all charging stations for a consistent look and simplicity. The price of e-bikes may be reduced with a bulk purchase, selection of a cheaper model, or in-kind donation. People for Bikes grant funding would not be applied to the purchase of any E-Bike.

Cost Estimates:

Item	**Cost per unit**	**Quantity**	**Total**
Bike Shelter/Docking Station w/ Charging System	$15,600	x6	$93,600 -10,000 People 4 Bikes Grant
E-Bike (4 per station)	$1,100	X24	$26,400
Total project estimate			$110,000

The pilot program could be scaled down to one or two stations, which would reduce the cost substantially. A scenario with one (1) bicycle shelter with charging system and four (4) associated e-bikes would cost approximately $20,000. 2 charging shelters and 8 e-bikes would bring the cost up to $40,000.

Application requirements for People for Bikes grant funding and brief guidance for each element of the application.

Application Requirement	Supporting Information/Guidance
1. Mission and History: Summarize your organization's mission and history. Pay particular attention to why and how you are invested in improving the environment for bicycling in your community.	Use existing "New Vision Statement" document. While JCED is not explicitly focused on transportation or bicycling, presenting the relationship between e-bikes and a clean energy transition and creating sustainable communities JCED's unique position as an energy district – a concept not familiar to much of the country – gives it a unique funding angle. JCED should emphasize its relationship with the Iowa City Climate Action and Adaptation Plan and surrounding community's broader goals of clean transportation.
2. Project Description: Please use this section to expand on the information provided in the Letter of Interest, if needed. In particular, please include the context for this project, information on related projects or efforts, and project partners, if relevant.	The project will create a network of e-bikes and docking stations across the IC Metro Area/Johnson County. The goal is to increase use of e-bikes to replace trips made by vehicles and promote sustainable behaviors across the county. Possible Partners: Bike Library, World of Bikes, Sugar Bottom Bikes, MPOJC, Iowa Bicycle Coalition, University of Iowa Engineering and Computer Science programs as app developer for e-bike monitoring system, University of Iowa School of Urban and Regional Planning
3. Community Benefits: Outline the benefits you expect this project to bring to the community, such as increase ridership, improved safety, changes in air quality, health, or congestion, and economic impact.	E-bikes will increase interest in biking in the region and introduce the region to a healthy, sustainable alternative for short-range trips to substitute for auto travel. Air quality improvements from reduced emissions, and reduced congestion are all anticipated.
4. Miles Built/Connected: State the miles of path or trail or other bicycle facilities you will be building and the miles of facilities connected by your project, if applicable.	The MPOJC Iowa City Metro Area trail map reports more than 70 miles of trail across the region. Specifically, the proposed e-bike

	docking stations pictured in Map 1 connect roughly 15 miles of existing trail.
5. Evaluation a) Measurable Outcomes: Describe what will change as a result of this project. b) Measurement: Describe your plans for measuring the success of your project. What will you measure (i.e. ridership, economic impact) and how.	Six e-bike charging station sites with fleets of docked e-bikes will be available to the public. We expect to see increased bike ridership, reduced vehicle trips, and increased social connectivity in the communities in which the e-bike networks are implemented. We will measure ridership by counting the number of times e-bikes are checked out, for what length of time, their overall destinations, and calculate the vehicle trips equivalent. We plan to use an app to collect this information.
6a. Support Letters • Elected officials (required) – mayor, city councilmember, alderman, state representative, governor, or federal elected official Federal legislator (recommended) – Congressional Representative or Senator Bicycle industry representative (required)– owner or manager of a bike-related business Business association representative (recommended) – leader from a Business Improvement District, Business Development office, Chamber of Commerce, or similar organization Business representative (required) – owner, manager, or principal employee of a business/corporation not related to bicycling	For Contact Information on All Elected Officials for Johnson County, visit Johnson County's website Federal Representatives: Sen. Chuck Grassley, Sen. Joni Ernst, Rep. Dave Loebsack Bicycle industry businesses from which to draw representatives: World of Bikes Geoff's Bike and Ski Iowa City Bike Library The Broken Spoke Sugar Bottom Bikes Iowa City Chamber of Commerce Member Directory can be utilized to find potential business references.
b) List of Board Members including their affiliations, (for applying non-profit organizations only) c) IRS determination letter for applying non-profit organizations only	IRS Documentation, board member lists need to be assembled by JCED.
d) Map/Plan of the project and area	See Map 1. The MPOJC Trail Map of Johnson County may also bolster the application's strength.

e) Photos (2-3) of existing bicycle facilities, related event, or “before” shot of location where infrastructure will be installed	Desired photos can be acquired from MPOJC, community parks and recreation departments, and University of Iowa.
f) Project Budget including pending or committed sources of funding and indicating how PeopleForBikes funding will be used g) Organizational Budget for the current year; you may alternately provide a link to your annual budget	See “Cost Estimate 1” on possible costs of e-bike fleet and charging equipment for a cost mock-up to inform a potential project budget. Organizational budget documentation needs to be assembled by JCED.

Chapter 3. Rental Units, Landlords, and Energy Consumption

Johnson County, Iowa has a population of approximately 151,000 people -as of 2018, 40% of whom live in rental properties (Occupied Housing Units: Renter Occupied, 2018). In order to achieve Johnson Clean Energy District's goal of reduced energy consumption in the residential sector, rental properties cannot be ignored. Homeowners have the capacity and incentive to make energy efficient changes to their homes because they can reap the benefits of long-term investments. Renters, on the other hand, do not have that incentive. According to the Iowa City Climate Action and Adaptation Plan "renters of multi-family housing do not have the same ability to implement and gain the benefits of energy efficiency as owners and residents of other forms of housing" (page 28). Landlords or rental property owners have the ability to make energy efficient changes but not the incentive, if their tenants pay their own utilities.

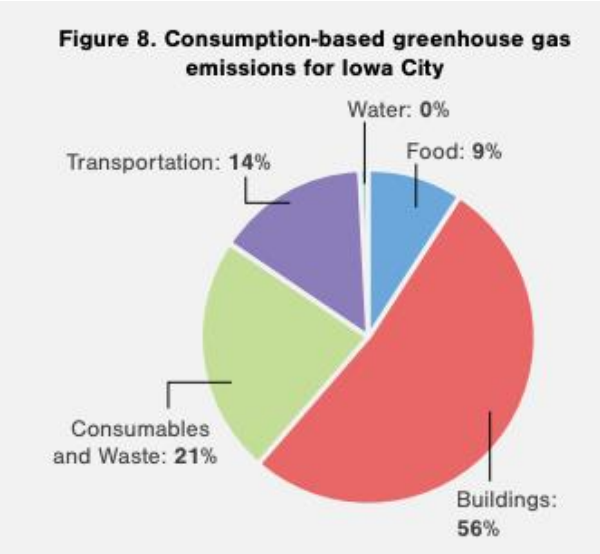


FIGURE 3.1: Buildings make up 56% of consumption-based greenhouse gas emissions for Iowa City. Source: Iowa City Climate Action and Adaptation Plan page 16, (Nations, 2020).

In Iowa City, buildings make up 56% of consumption-based greenhouse gas emissions and the residential sector makes up 21% of the total energy consumption of end-use sectors in the US (Nations, 2020) (U.S. Energy Information Administration, 2018). Energy used by buildings is created mainly from natural gas and coal. The use of these materials creates greenhouse gases which contribute to climate change. By reducing energy consumption, greenhouse gas emissions can also be reduced.

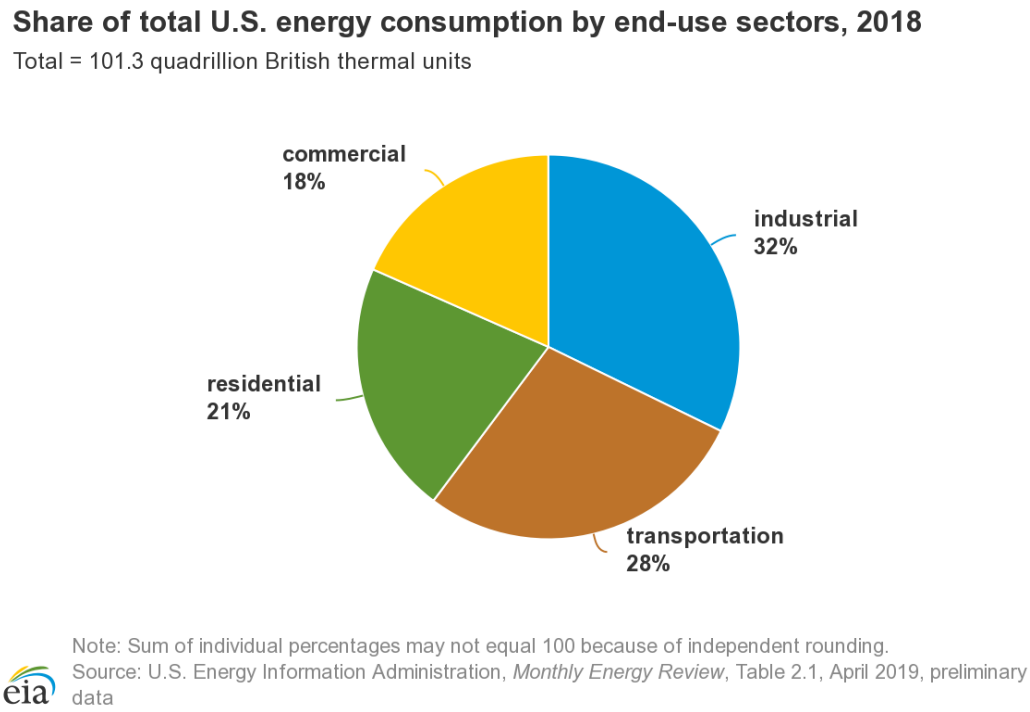


FIGURE 3.2: Residential sector makes up 21% of the total share of US energy consumption by end-use sectors in 2018. Source: U.S. Energy Information Administration

This chapter reviews the literature on energy consumption and reduction in rental properties, discusses best practices, and provides recommendations for the Johnson Clean Energy District on how to promote energy use reduction in rental units across Johnson County.

1. Rental Energy Consumption: Landlord and Tenant Split Incentives

Typically, in a landlord-tenant relationship only one party pays the utility bill and whoever does not pay does not have to bear the burden of inefficient decision-making and in turn will not behave optimally. Where landlords pay utility bills, they may chooses energy efficient investments in order to reduce the cost of utilities. However, tenants have no incentive to reduce energy consumption, and may, for instance, leave the lights on. Where tenants pay utility bills, they are more likely to seek to reduce their energy consumption, e.g., by turning down the thermostat. However, in this scenario, landlords are less likely to make energy efficient investments such as insulating walls and ceilings. The excessive energy used due to this underinvestment is responsible for approximately 0.5% of the total rental residential energy usage. Both situations result in “unnecessarily high energy usage, leading to higher utility bills and excessive carbon emissions” (Melvin, 2018).

As appliances and technology becomes more energy efficient, we could expect thatresidential energy usage decreases over the decades, but researchers have found that this is not the case. While electronic items are becoming more energy efficient, overall households today have more electronic items than ever before. This negates the energy use reduction that we would expect to see with new efficient items in households. A large portion of residential energy is used for building heating and cooling, water heating, and refrigerators. Researchers have determined that when landlords pay the tenants heating

bill, they were more likely to convert from oil-fired furnaces to natural gas fired furnaces, this would decrease the utility bill and energy usage after paying an upfront cost (Melvin, 2018).

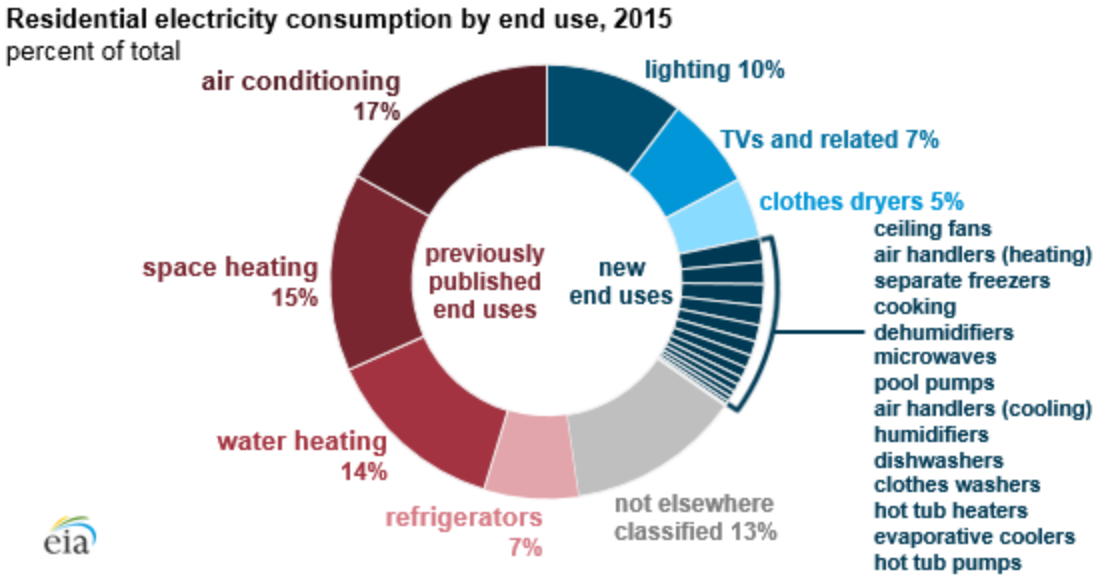


Figure 3.3: residential electricity consumption by end use. Source: EIA's residential energy survey now includes estimates for more than 20 new end uses, 2018

Heating and Cooling Degree Days

Iowa is located in the West North Central US Census Division which had 6,969 heating degree days in 2018 and 1,134 cooling degree days.

"Degree days are measures of how cold or warm a location is. A *degree day* compares the mean (the average of the high and low) outdoor temperatures recorded for a location to a standard temperature, usually 65° Fahrenheit (F) in the United States. The more extreme the outside temperature, the higher the number of degree days. A high number of degree days generally results in higher levels of energy use for space heating or cooling. ***Heating degree days*** (HDD) are a measure of how cold the temperature was on a given day or during a period of days. For example, a day with a mean temperature of 40°F has 25 HDD. Two such cold days in a row have a total of 50 HDD for the two-day period. ***Cooling degree days*** (CDD) are a measure of how hot the temperature was on a given day or during a period of days. A day with a mean temperature of 80°F has 15 CDD. If the next day has a mean temperature of 83°F, it has 18 CDD. The total CDD for the two days is 33 CDD." (U.S. Energy Information Administration, 2020).

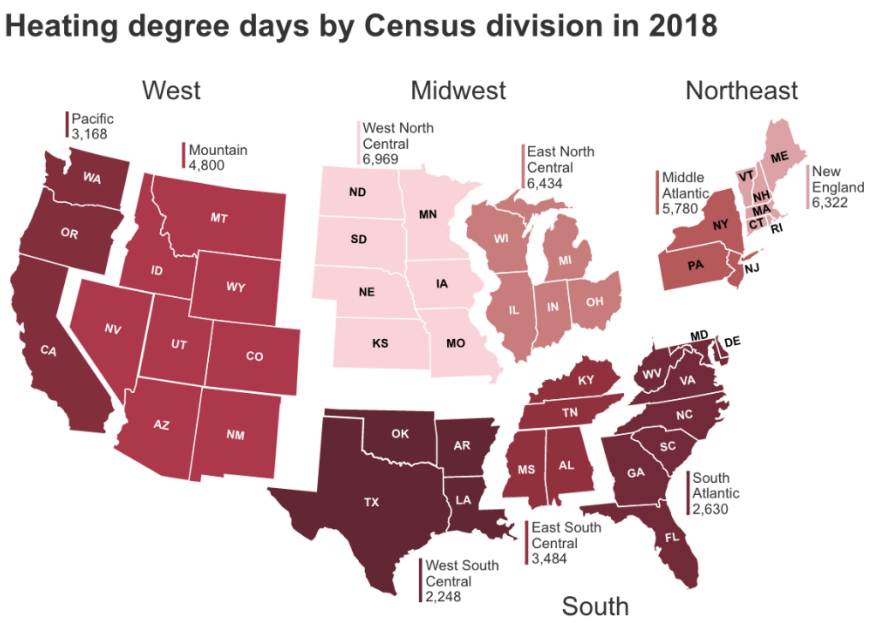


FIGURE 3.4: Heating Degree Days by Census Division in 2018 map. Iowa falls in the West North Central division and had the highest number of heating degree days

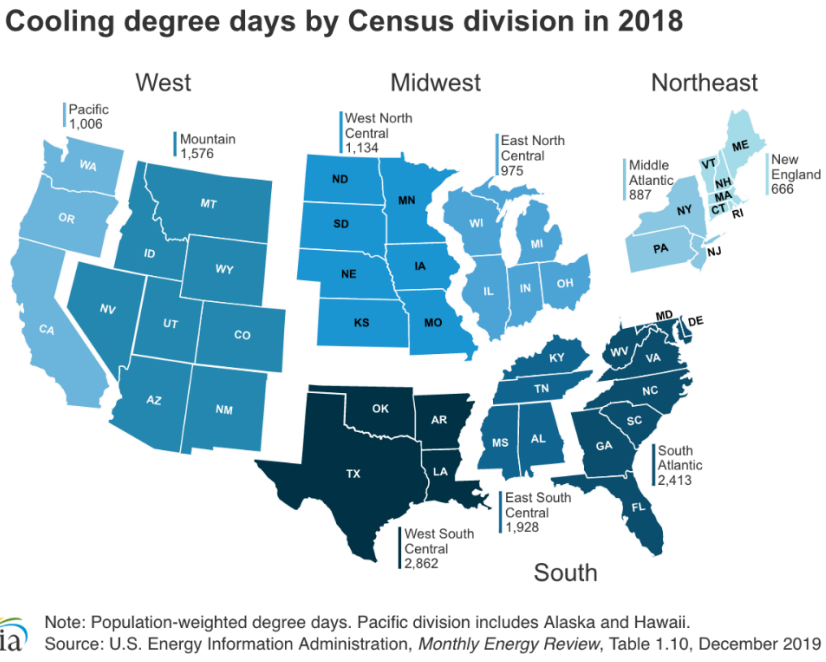


FIGURE 3.5 Cooling Degree Days by Census Division in 2018 map

The heating and cooling degree day maps show that the state of Iowa has many heating degree days and a moderate number of cooling degree days, indicating high expenditures on heating and cooling. Energy efficient investments, such as insulation, double pane windows, and seals around windows and doors, can reduce energy consumption by maintaining indoor temperatures.

Iowa City Climate Action and Adaption Plan

The 2018 Iowa City Climate Action and Adaptation Plan was updated in the Fall of 2019, and the city has declared a climate emergency. One of the focuses of the plan is to increase the energy efficiency of buildings. One of the targets for existing buildings is to retrofit 10% of all buildings by 2025 and 90% by 2050. Action 1.1 calls for an increase in energy efficiency in residences, which includes single-family and multi-family buildings, and expects a large impact on local greenhouse gas emissions.

	Action	Sector(s)	Cost	Local GHG Impact
	Buildings			
1.1	Increase energy efficiency in residences	Home Work Government	$-$$$	
1.2	Increase energy efficiency in businesses	Home Work Government	$-$$$	
1.3	Increase energy efficiency in new buildings	Home Work Government	$	
1.4	Increase on-site renewable energy systems and electrification	Home Work Government	$$	
1.5	Initiate community solar projects[1]	Home Work Government	$$$	
1.6	Support energy benchmarking tools	Home Work Government	$	
1.7	Continue to increase energy efficiency in City-owned buildings[2]	Home Work Government	$-$$$	

Table 3.1 Iowa City Climate Action and Adaptation Plan page 22 summary of actions. Action 1.1 is an increase in energy efficiency in residences, both single-family and multi-family.

The city's climate action plan states "Residents can reduce energy consumption in homes across Iowa City—from single family homes to apartments in multi-family buildings— through a more comprehensive approach to energy efficiency, including air sealing and insulation, efficient heating and cooling equipment, replacement of gas appliances with electric, and "quick fixes" like programmable thermostats, efficient lighting, and smart power strips. Building owners and renters can leverage existing programs to obtain energy audits that identify energy efficiency opportunities, and also to help finance the cost of implementation, such as those offered by MidAmerican Energy and Eastern Iowa Light and Power. The City will also work to align existing City loan programs to include energy efficiency where it is not specifically mentioned already, and identify external partners to develop appropriate additional outreach and financial mechanisms that facilitate large-scale participation. Residents can also use several free tools from the U.S. Environmental Protection Agency (U.S. EPA) such as the ENERGY STAR® Home Advisor tool for single family homes, or ENERGY STAR® Portfolio Manager for multifamily buildings"

2. Best Practices

Rocky Mountain Institute Framework

The Rocky Mountain Institute's framework for developing minimum energy standard for rentals contains seven steps.

- Step 1 Fit: Identify efficiency standards that are the right fit the rental housing stock.
    - Option 1: Integrate efficiency standards into short-term rental licensing
    - Option 2: Start a new rental licensing program
    - Option 3: Consider other triggers to improve efficiency of existing properties

- Step 2: Preform a preliminary analysis to forecast impacts
    - Energy saved
    - Carbon saved
    - Program implementation costs
    - Additional metrics as needed

TABLE 1
THE POTENTIAL IMPACT OF MESRS IN FIVE US CITIES

	Minneapolis	Philadelphia	Oakland, CA	Washington, D.C.	Boston
Percent rentals in residential market	52 percent	47 percent	60 percent	59 percent	66 percent
Quantity of rental units	91,000	318,000	102,000	174,000	179,000
Renter's license process in place?	Yes, renews annually	Yes, renews annually	Yes, renews annually	Yes, renews every two years	Yes, renews annually
Costs to city over three years	$1.12M	$4.24M	$1.55M	$1.63M	$2.42M
Annual energy saved (trillion Btu)	0.82 to 2.47	1.88 to 5.65	0.51 to 1.52	1.03 to 3.09	1.56 to 4.68
Annual energy cost saved	$15M to $46M	$45M to $134M	$20M to $61M	$20M to $61M	$53M to $158M
Annual carbon reduced (lbs CO_2)	192M to 577M	378M to 1,134M	78M to 233M	224M to 673M	295M to 885M
Energy inspectors required	23	82	26	45	46

FIGURE: RMI, step 2 impact, potential impact of MESRS in five us cities

- Step 3: Consult and partner with key stakeholders in the residential housing sector
    - Understand and address their concerns
    - Develop a cost-recovery strategy to ensure affordability
    - Identify compelling value proposition(s)
- Step 4: Co-develop financing options and incentives with utilities and lenders
    - Residential Property Assessed Clean Energy Program (DOE)
    - Utility incentives
    - Utility on-bill financing
    - Fannie Mae Homestyle Energy Loans

    - Home equity line of credit (HELOC)
    - Green banks/credit unions
- Step 5 Develop an implementation framework
    - Select energy efficiency measurement tool
    - Select energy target
    - Identify energy data collection requirements and reporting framework
    - Determine how approach differs between single-family and multi-family
    - Determine human capital needs
- Step 6 Develop compliance framework
    - Compliance timeline and pathways
    - Alternative compliance path
    - Cost caps
    - Exemptions
    - Noncompliance penalties
    - Verification
    - Multifamily considerations
- Step 7 Disclosure: Develop disclosure framework (Petersen, 2018)

<u>The case of Boulder, Colorado</u>

In 2010 Boulder, Colorado adopted and implemented the Rocky Mountain Institute Framework to create an energy standard for rental units. See the Petersen and Lalit's (2018) *Better Rentals, Better City: Smart Policies to Improve Your City's Rental Housing Energy Performance* for a detailed description of the framework. Boulder incorporated Smart Regulations (SmartRegs) into the Standard Long-Term Rental Housing License. This means that all rental properties in the city undergo SmartRegs inspections that evaluate buildings' energy efficiency. The inspector makes recommendations on ways to increase the energy efficiency, e.g., including wall and ceiling insulation, duct leakage, new heating and cooling systems, LED lighting, etc. Landlords had until January 2, 2019 to be compliant with the energy efficiency requirements set by the city. If landlords were not compliant, their rental license would expire.

In order to help landlords make the necessary investments, the city offered advising and rebates. According to a City of Boulder Rental Properties database, almost all rental properties within the city are compliant with the SmartRegs (City of Boulder, n.d.).

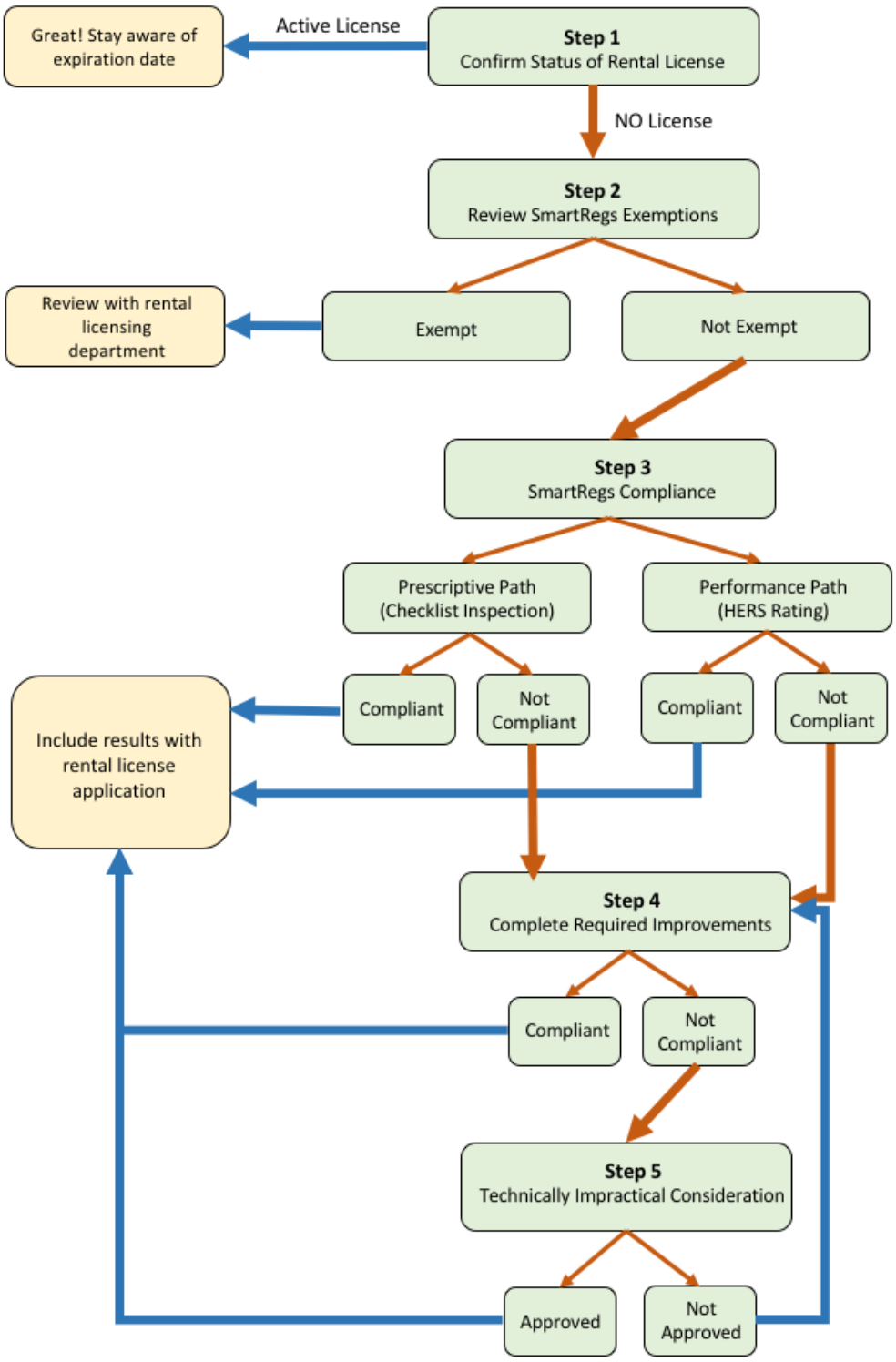


Figure: Boulder, CO SmartRegs compliance flow chart. Source City of Boulder, Colorado, 2020

To learn more about Boulder's SmartReg policy please visit https://bouldercolorado.gov/plan-develop/smartregs (City of Boulder, Colorado, 2020).

Iowa City, Iowa

In the Fall of 2019, Iowa City demonstrated its dedication to addressing climate change by declaring a climate emergency and updating the City's Climate Action Plan. The City Council expressed a desire to adopt a stricter energy code than the states'. However the city attorney advised against that. There was an opportunity to make a new apartment complex more sustainable than previous developments. The developers applied for a height bonus, typically granted for affordable housing provisions. In addition, the city council added several sustainability requirements:

"1. Meet LEED Silver certification with at least 8 points in the "Optimize energy performance" category. Points can be accrued through outperforming baseline building performance ratings.

2. Install enough rooftop solar to generate 150,000 kWh annually. If the project is phased, the first phase's solar installation must produce a minimum of 75,000 kWh annually.

3. Install "low flow" fixtures."

The building will also feature LED lighting. This amendment was unanimously approved by the city council and supported by the developers (Smith, 2019). This action, along with the City's Climate Action and Adaptation Plan, demonstrates the political will necessary for making changes to reduce residential energy consumption.

Recommendations

In order to reach JCED's goal of reducing energy consumption in rental units, the focus should be on the landlords because the changes they make will have longer-term outcomes than changing tenants' behaviors. There are several ways the Johnson Clean Energy District can promote energy efficiency in rental units across the county. One is helping cities in Johnson County develop minimum energy standard requirements. The second is to advocate for an additional requirement for rental permit approval, similar to Boulder' SmartRegs. These two recommendations focus on advocacy and therefore can be pursued during this era of social distancing.

Minimum energy standard requirements (MESR) can be developed using the Rocky Mountain Institute's framework described above. Each town in Johnson County may have unique minimum energy standard requirements based on current energy consumption, financial resources, and political will. This framework will help identify and reach energy consumption reduction goals.

In order to encourage landlords to meet the new minimum energy standard requirements, the Johnson Clean Energy District should work with each city and advocate making those standards a requirement for rental permit approvals. Landlords will be required to make changes and energy efficient investments for their properties, e.g., replacing large appliances with energy efficient ones. This new requirement for rental permits could exempt landlords who pay utilities since, as studies have shown, they are already more likely to make energy efficient investments in their properties. The JCED should use Boulder, Colorado as an example and a starting point. See the *Rental Housing License Handbook + SmartRegs Guidebook* from the City of Boulder (2020).

Chapter 4. The Potential of Anaerobic Digesters in Johnson County

This chapter explores farm-scale anaerobic digestion technology in Johnson County. Anaerobic digestion is an innovative process that turns animal and other organic waste into a resource and an opportunity for cost savings, additional revenues, and environmental stewardship. Iowa has a significant number of confined feeding operations that require manure management systems. Despite the abundant feedstock available in Iowa, only a handful of farms use anaerobic digestion technology. This report examines the potential for growth of the use of anaerobic digestion systems in Johnson County.

JCED seeks to reduce greenhouse gas emissions, strengthen local economies, and provide clean energy. Anaerobic digestion systems at animal feeding operations in Johnson County promote all those goals. Additionally, as JCED serves as an educational center for clean energy, the creation of an anaerobic digestion educational resource hub in the form of a website could be disseminated with JCED's help.

1. Anaerobic Digestion

Biogas recovery through anaerobic digestion (AD) is way to manage manure generated from livestock operations and organic wastes, while at the same time providing financial and environmental benefits. The basic process takes organic waste as a feedstock for bacteria to consume and produce two main products: biogas and digestate, which have many potential uses. Figure 1 below describes the process.

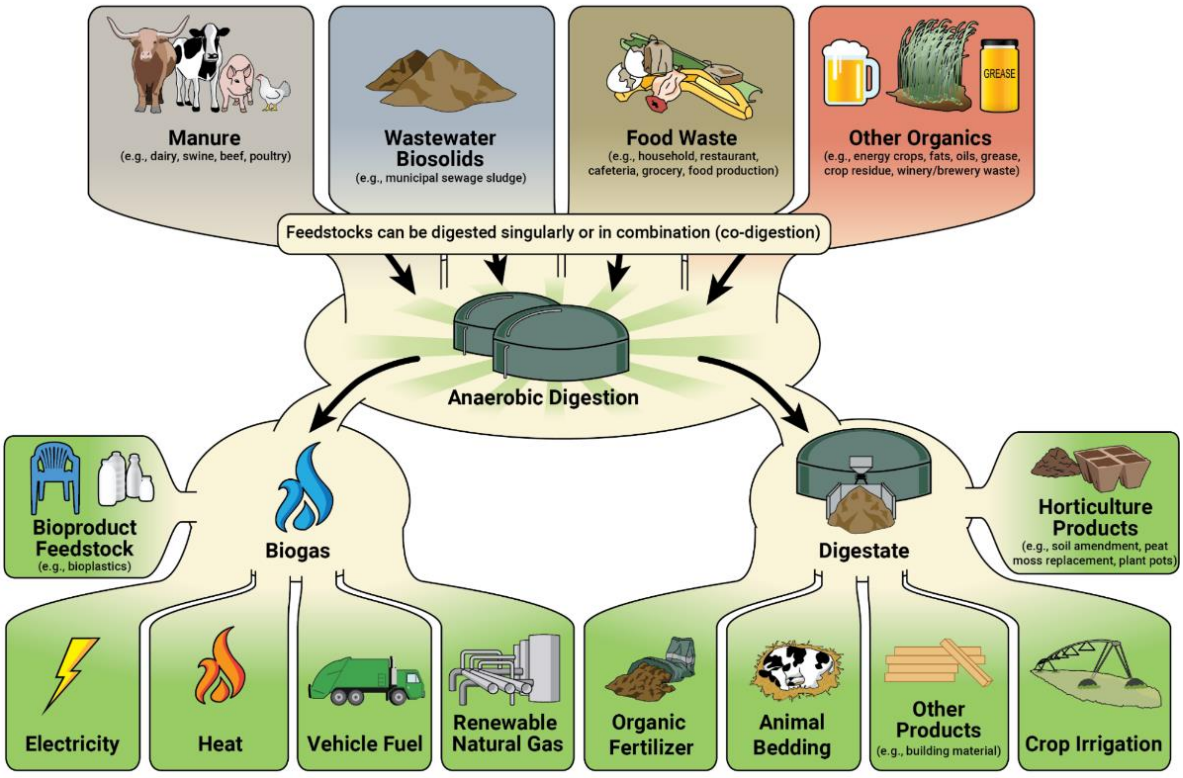


Figure 4.2. Anaerobic Digestion Process Overview

The US produces almost 340 million metric tons of manure per year (just in dry weight), highlighting the need for sustainable manure management systems (EPA, 2019). Last year, manure management systems were the fourth largest source of methane emissions in the US, totaling almost 62 million metric tons of CO2 equivalents (EPA, 2019). AD technology is a manure management process that produces electricity and contributes to climate change mitigation by reducing methane and carbon dioxide emissions. In 2019, AD systems on livestock farms reduced greenhouse gas emissions by 4.63 million metric tons of CO2 equivalent (EPA, 2019). Direct methane reductions accounted for the majority of these reductions. *Figure 2* shows the amount of direct and indirect greenhouse gas emission reductions from AD systems on farms since 2000.

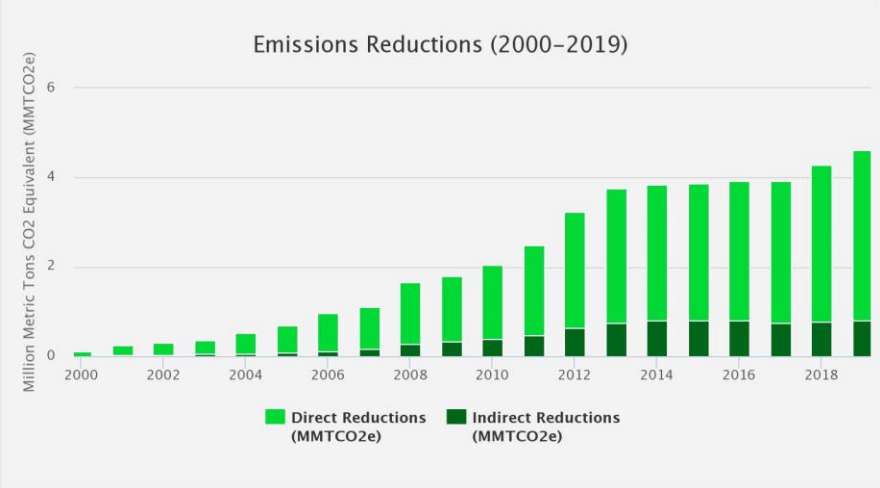


Figure 4.3. Direct and indirect greenhouse gas emission reductions from AD systems on farms since 2000. The chart shows greenhouse gas emission reductions are on the rise.

AD systems reduce greenhouse gas emissions, while also providing renewable, clean energy in rural areas. This is important because Iowa's economy is relatively energy intensive, with the industrial sector leading the state's energy consumption. If energy can be produced and used locally on farms, this will reduce the energy consumption burden on other sources of energy such as coal and natural gas. In 2019, the energy generation from AD systems on farms was approximately 1.28 million megawatt-hours equivalent (EPA,2019). Figure 3 illustrates the increasing energy output from AD systems since 2000.

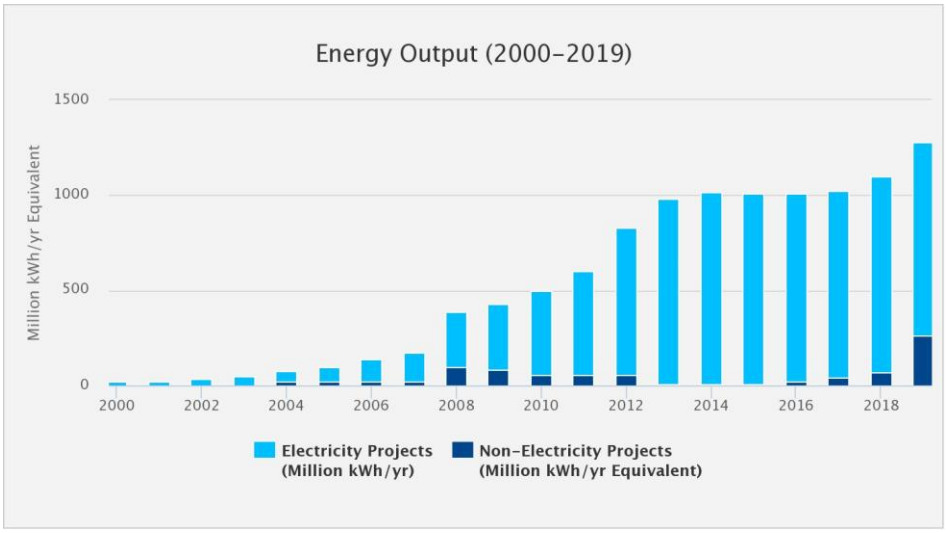


Figure 4 4. Energy generation from electricity and non-electricity projects on farms since 2000.

Some of the other direct benefits of AD for farmers include (AgSTAR, 2011):

- Additional farm revenue
- Renewable energy
- High quality liquid fertilizer
- Manure fiber
- Odor reduction
- Enhanced public image
- Rural job growth
- Flexible nutrient management

Despite the multitude of benefits, and increasing usage, AD utilization varies across the US. There are currently almost 250 farm-scale ADs with 34 new ones currently under construction (EPA, 2019). The upward trend of on-farm AD use for biogas is expected to continue, though there are some areas that are unexpectedly stagnant in growth. There are only four operational AD systems in place in Iowa as of 2019, even though there is widespread potential for the adoption of AD for agricultural purposes. As of 2019, Iowa was home to 23 million hogs who are producing tons of manure every day. University of Iowa professor Chris Jones stated that “Managing the waste from these animals is possibly our state’s most challenging environmental problem," (Jones, 2019). There are over 13,000 animal feeding operations in Iowa, 73 in Johnson County alone, each requiring manure management systems. AD systems using the manure from animal feeding operations could be incredibly beneficial to Iowa due to the large number of animal feeding operations located in the state. Additionally, Johnson County would be well suited to such systems due to the large urban areas in the county. AD systems work best when co-digesting manure with other sources of organic wastes, including cities.

2. Johnson County Farms and DA potential

The goal of this project is to create a map of the farms in Johnson County to advance the use of AD technology. The map examines the potential for growth by identifying candidate farms in the county as well as highlight spatial clustering where shared AD systems could be installed.

To determine the potential of implementing AD systems in Johnson County, data from all the animal feeding operations were collected from the Iowa Open Spatial Data regulated by the Iowa DNR. The database is updated on a daily basis by the Iowa DNR. The data was processed and filtered to retain the following characteristics: facility name, address, city, township, county, latitude, longitude, operation type, production type, and number of animal units. The data was then mapped by longitude and latitude according to the animal feeding operation type and size to determine the technically feasible farms where AD systems could be implemented. In addition, the map also shows clustering of farms that are not large enough individually, but that could, if combined, support AD systems. This could keep the economic and environmental benefits of AD technology but reduce the individual burden and responsibility of implementation and management operation.

In addition to this map, an interactive website was designed and created to serve as a resource for the Johnson County Clean Energy District and farmers interested in AD systems.

The feasibility of implementing an AD system on a farm depends on the following factors and other site-specific details: the type and scale of the livestock operation, how the manure is handled, the frequency of manure collection, and the potential end uses of the recovered biogas. Other important factors include farmers’ financial goals, operational and management responsibility, the ability to connect

to electrical and/or gas lines, energy agreements, and up-front costs and funding sources. This chapter focuses on the type and scale of livestock operation to highlight where potential systems could be located.

AD systems are technically feasible for farms that produce manure from cattle and swine and are large enough to support successful recovery projects. Potential candidates need to have a minimum of 500 head of cattle or a minimum of 2000 swine. Further analysis will need to be conducted for all candidate farms to identify farmers' interests and determine specifically how farm operations could support an AD system.

Findings

The data for all 73 Animal Feedlot Operations (AFOs) in Johnson County were mapped using longitude and latitude according to type and size. *Figure 2* displays farm products (blue for swine, orange for cattle beef, and red for cattle dairy). The size of the markers is scaled according to the number of animal units located at the farm. Swine animal units were scaled according to the 2000 animal units minimum threshold, and cattle were scaled according to the 500 animal units minimum threshold. This means that all farms with the largest scaled markers are large enough to support AD systems. According to *Figure 4* and the requirements for the type and size of farm needed to be technically feasible, there are only four farms (two swine farms and two cattle farms) large enough to sustain AD systems on their own. The details of these farms are shown in *Table 1* below.

Table 4.1. Candidate Farms sufficiently large to support AD systems in Johnson County

Swine farms larger than 2000 animal units:				
Facility Name	**Address**	**City Name**	**Operation Type**	**Animal Units**
Jim Shenk Home Farm	2171 500TH ST SW	Kalona	Confinement	2000
Ray Slach Farms - All sites	4306 Oasis Road	West Branch	Confinement	3840
Cattle beef farms larger than 500 animal units:				
Facility Name	**Address**	**City Name**	**Operation Type**	**Animal Units**
Thomas C. And Jane Hotz	5308 540th St. SE	Lone Tree	Confined/Open	550
Roger C. Stutsman	3154 480th St. SW	Iowa City	Confined/Open	675

There are four animal feeding operations in Johnson County that are technically large enough to support anaerobic digestion systems.

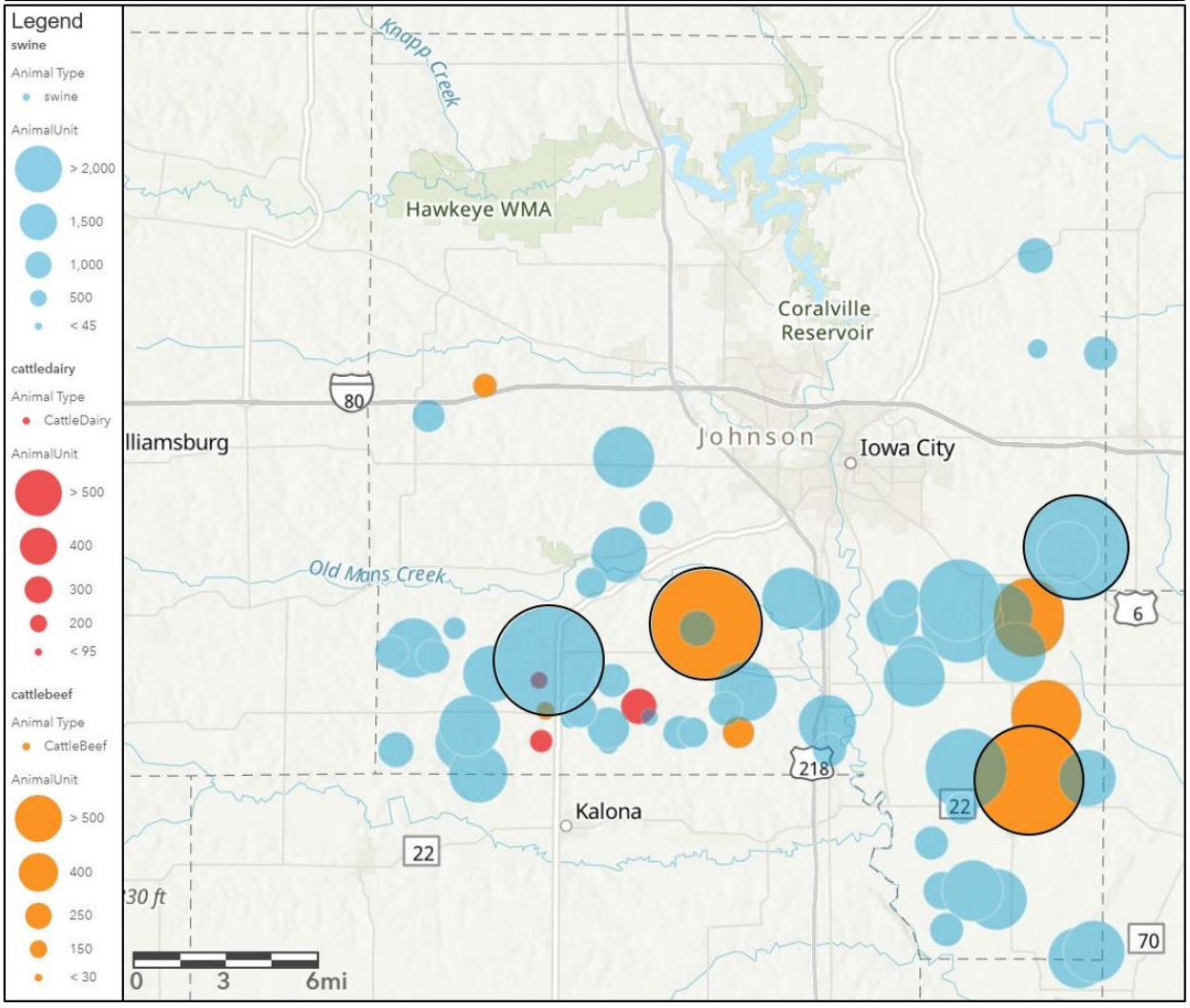


Figure 5.4. There are four animal feeding operation Johnson County that are technically large enough (minimum of 500 cattle of minimum of 2000 swine) to support AD systems.

While there are only four AFOs in Johnson county large enough to support AD systems on their own, more farms could use AD if they combine their manure. The map shows a clustering of farms of the same type. *Figure 5* shows that there are five clusters of individual swine farms in Johnson County that when combined, would be large enough to support AD systems. The details of these swine clusters and farms are shown in *Table 2. Figure 6 s*hows that there is one cluster of cattle farms that, if combined, are technically large enough to support AD systems. The details of these cattle clusters are shown in *Table 3.*

Table 4.2. Candidate swine farm clusters sufficiently large to support AD systems in Johnson County

Clusters of individual swine farms larger than 2000 animal units:

Facility Name	Address	City Name	Operation Type	Animal Units
Busy Bs Farm Inc.	1572 560th St SW	Kalona	Confinement	880
Troyer Farms Inc	1684 Johnson Washington Rd SW	Kalona	Confinement	800
Lavon Bontrager	DERBY AVE SW	Kalona	Confinement	999
			Sum	2679

Facility Name	Address	City Name	Operation Type	Animal Units
David Schott	5241 MAIER AVENUE	Riverside	Confinement	800
Thomas W Schott	5272 MAIER AVENUE SW	Riverside	Confinement	960
Darlene Gingerich	3304 540th St. SW	Riverside	Confinement	400
			Sum	2160

Facility Name	Address	City Name	Operation Type	Animal Units
Gama Home	5630 Johnson Louisa Rd SE	Nichols	Confinement	992
Todd Lorack - East Barn	5736 JOHNSON-LOUISA ROAD	Nichols	Confinement	1011
			Sum	2003

Facility Name	Address	City Name	Operation Type	Animal Units
James J. Ronan	660th Street	Lone Tree	Confinement	992
Rc Farms	4810 660TH ST SE	Lone Tree	Confinement	496
Jon Ronan	6565 Utah Ave SE	Lone Tree	Confinement	992
			Sum	2480

Facility Name	Address	City Name	Operation Type	Animal Units
Home Site	4680 TAFT AVE SE	Iowa City	Confinement	1440
G2 Pork Llc	5140 480th St SE	Iowa City	Confinement	960
			Sum	2400

There are five clusters of individual swine farms in Johnson County that when combined, are technically large enough to support anaerobic digestion systems.

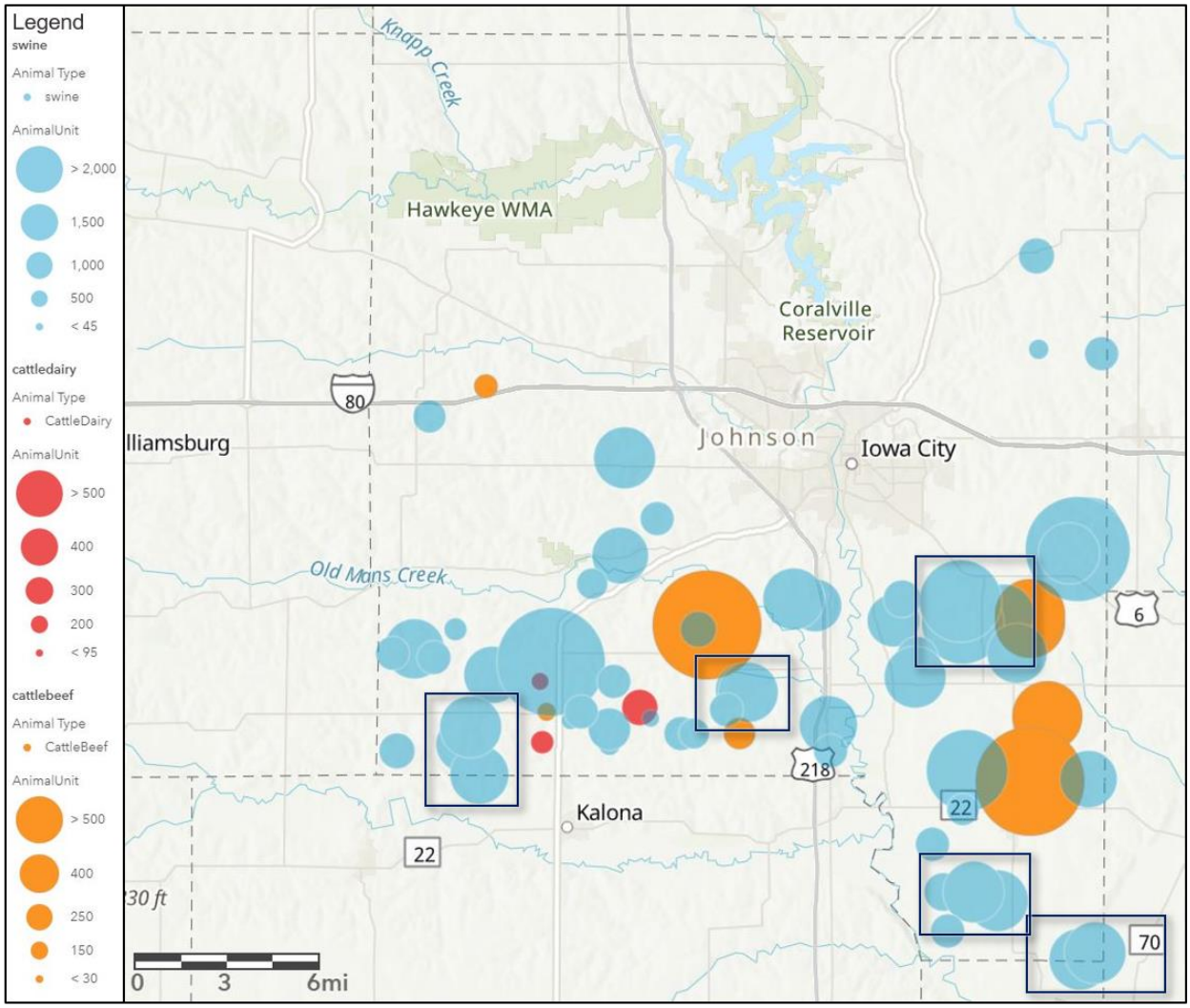


Figure 4.6. There are five clusters of individual swine farms in Johnson County that when combined, are technically large enough (minimum of 2000 swine) to support AD systems.

Table 4.3. Candidate cattle farm clusters sufficiently large to support AD systems in Johnson County

Cluster of individual cattle farms larger than 500 animal units:				
Facility Name	**Address**	**City Name**	**Operation Type**	**Animal Units**
Bernard Prybil	5115 480th St. SE	Iowa City	Open Feedlot	300
Bernard L. and Rowena Prybil	4744 Vincent Ave. SE	Iowa City	Open Feedlot	300
			Sum	600

There is one cluster of individual cattle beef farms in Johnson County that when combined, is technically large enough to support anaerobic digestion systems.

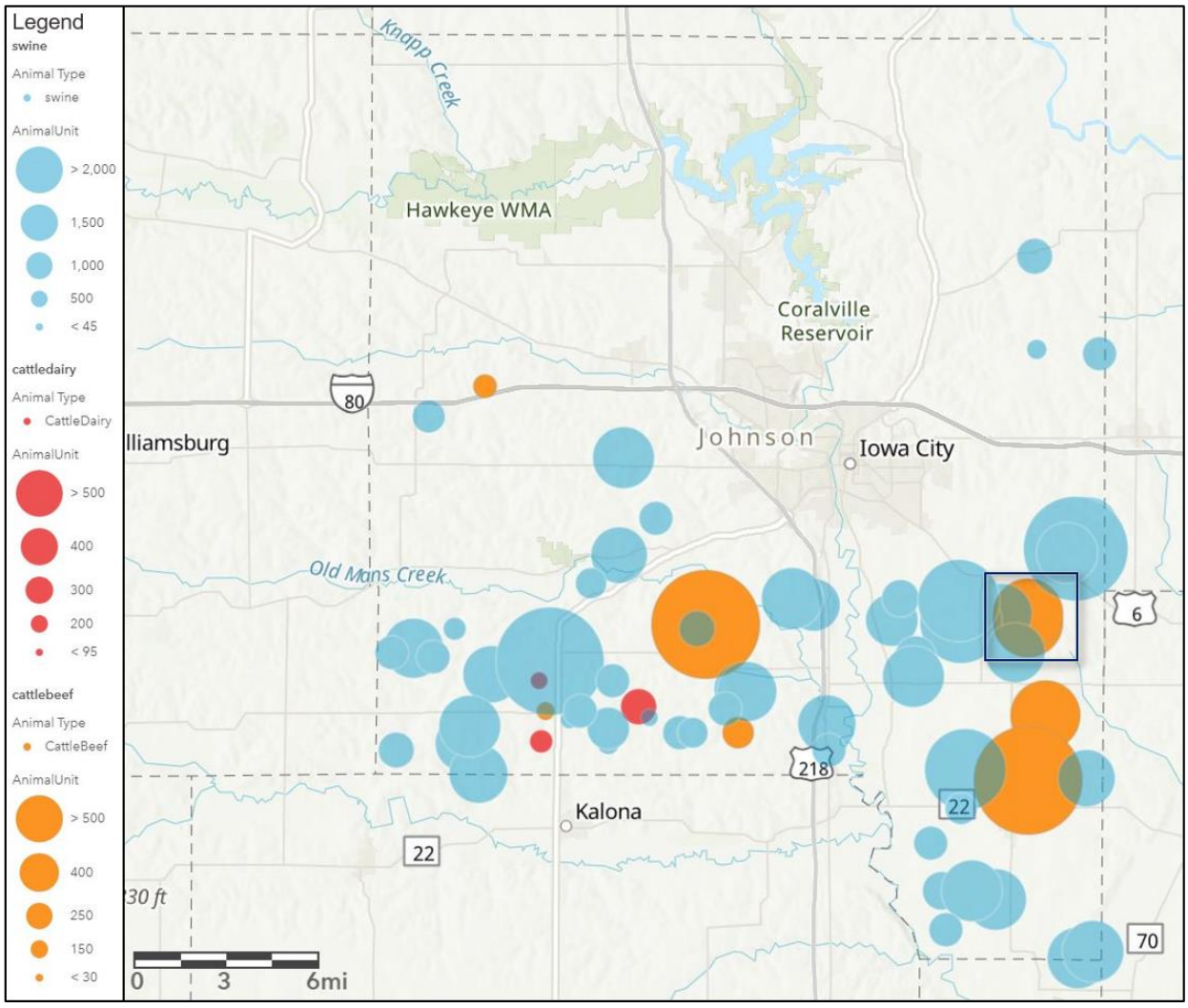


Figure 4.7. There is one cluster of individual cattle farms in Johnson County that when combined, are technically large enough (minimum of 500 cattle) to support AD systems.

3. Interactive Website

An interactive website was designed and created to serve as a resource for the JCED and farmers who are interested in AD systems. Some of the design features include: resources to learn more about AD systems and their benefits; success stories from livestock farmers who have successfully installed and used AD systems on their farms; state and federal funding opportunities; a form for users to input new or additional data about their farm; and a map with all of the AFOs in Johnson county that can be sorted by type and size for future analysis. A screenshot of the website can be seen in *Figure 7* below showing some of these details.

Figure 8. The Potential of Anaerobic Digestion Technology in Johnson County Iowa interactive website landing page showing some of the available resources the site provides.

4. Recommendations and Funding sources

The AFO data in the maps above show that there is potential to implement 10 AD systems in Johnson County. Identifying candidate farms is the first step for introducing AD systems into Johnson County. These farms need to undergo further analysis to determine whether they can support AD systems. Additional analysis will be needed for the clusters of farms as well. Interviewing the farmers of candidate farms to determine interest is the next step towards implementation. If farmers are interested, further feasibility studies of the farm can be conducted to determine if their manure production and site can support an AD system. The website can serve as a resource for the farmers of candidate farms and others who are interested in AD systems.

One of the major drawbacks of AD systems is the large up-front capital cost of building the system. Farmers cannot always finance these projects, in addition to the costs associated with maintenance and operation. There are multiple state and federal funding opportunities that mitigate financial burdens for farmers. Iowa provides multiple incentives and policies to support AD construction and operations on

livestock farms. *Table 4* below shows some of the incentives that can be used for AD systems. Additionally, as the data shows, cooperative AD systems that serve multiple farms can be of great benefit. Researchers from NC State and the University of Wisconsin-Madison recently created a techno-economic optimization model that showed that cooperative systems could actually be more economically beneficial than single-farm AD systems (Sharara et al, 2020).

Table 4.4. State and federal policies and incentives that can reduce the financial burden on famers wanting to implement AD systems on their farm.

Federal Polices and Incentives		
Name	**Category**	**Policy/Incentive Type**
Qualified Energy Conservation Bonds (QECBs)	Financial Incentive	Loan Program
USDA - Rural Energy for America Program (REAP) Loan Guarantees	Financial Incentive	Loan Program
USDA - Rural Energy for America Program (REAP) Grants	Financial Incentive	Grant Program
Modified Accelerated Cost-Recovery System (MACRS)	Financial Incentive	Corporate Depreciation
Clean Renewable Energy Bonds (CREBs)	Financial Incentive	Loan Program
Interconnection Standards for Small Generators	Regulatory Policy	Interconnection
State Polices and Incentives		
Name	**Category**	**Policy/Incentive Type**
Interconnection Standards	Regulatory Policy	Interconnection
Alternative Energy Law (AEL)	Regulatory Policy	Renewables Portfolio Standard
Methane Gas Conversion Property Tax Exemption	Financial Incentive	Property Tax Incentive

Detailed financial modeling will need to be conducted on a site-specific basis for any farm interested in implementing and AD system. Some of the ways to improve favorable project economics include:

- Creating an additional source of revenue from electricity sales or other types of energy sales such as tariffs for biogas, feed-in tariffs, or renewable energy certificates through renewables portfolio standards.
- Obtaining direct financial assistances for up-front costs through loans and grant programs
- Seeking additional revenue generating options such as finding additional uses for on-farm heat, accepting organic waste from other businesses, producing fertilizer, partnering with a local educational institution for research, or tourism.
- Getting creative with financing mechanisms such as tax credits and low interest program investment loans in addition to different business models for maintenance and operation.

To conclude, this chapter examined the potential of AD systems in Johnson county. AD provides farmers with sustainable options for environmental and economic benefits as it is a manure management system that produces biogas. Johnson County has ten sites where farm-scale AD systems could be implemented as an AD system for one farm or a cooperative AD system serving multiple farms. A website was created to serve as a resource to share this information with the people of JCED and farmers of Johnson County who are interested in AD technology. This report and website lay the foundational framework to meet the future goals of JCED. Future steps still need to be taken such as interviewing the candidate farm owners, conducting further feasibility studies, and working through the economics of such a project.

Chapter 5. Energy Burden of Low-Income Households in Johnson County

Johnson County Clean Energy District's (JCCED) seeks to advance energy efficiency through an *energy justice* lens. The Iowa City Climate Action plan lists social equity as a guiding principle and lists two actions that are relevant to energy justice: Action 1.1 calls for utilizing energy audits for energy efficiency in renter occupied residences and Action 4.1 calls for assessing community vulnerability (City of Iowa City, 2017).

Energy justice seeks to redress the disproportionate burden of national and regional energy policies on low income communities. Energy justice is based on the principle that all people should have equal protection from the disproportionate costs and impacts of energy policies and decision-making processes impacting power generation, distribution, transmission, consumption, and maintenance of power systems, while ensuring equitable access to energy resources (Joroff, 2017). An energy justice approach to reducing energy consumption and increasing energy efficiency should consider the race, class, socioeconomic characteristics of populations served, identify existing barriers to energy justice, and recommend strategies to address those barriers. Applying justice principles in energy policy requires: identifying unequitable distributions in terms of energy security and fuel poverty, recognizing when low income, minority and otherwise disenfranchised communities are disproportionately burdened, and remedying injustices through interventions in energy production, distribution and/ or consumption (Jenkis, McCauley, Heffron, Stephan, & Rehner 2015).

In this chapter, we focus on the energy consumption dimension of energy justice. Energy burden, the uneven proportion of households' incomes devoted to energy costs, is a form of inequity that disproportionately impacts low income communities. Low income households will thus benefit the most from energy efficiency measures that can reduce their energy costs burden. Energy justice principles promote opportunities and interventions in and for low income communities to reduce energy costs for the households who are the most cost burdened. This chapter maps out areas of the county where energy burdens are the highest and proposes goals and strategies to reduce low income communities' energy burden through energy efficiency policies and outreach. This chapter also provides an overview of federal energy assistance and weatherization assistance programs that can support JCED's goals, and makes recommendations based on the findings as well as conversations with Sara Baron of the Johnson County Affordable Housing Coalition.

1. Johnson County Energy Burden Assessment

This assessment examines energy burden among low income households and maps those by Census tracts to identify areas where interventions are most needed. We also distinguish between owners and renters. We used the Low-Income Energy Affordability Data (LEAD) tool of the U.S. Department of Energy (which uses 2010 census data and American Community Survey 5-year estimates) to identify energy burden across housing tenure, household income, energy type, and building type and all Johnson County's census tracts (Ma, Laymon, Day, Oliveira, Weers, and Vimont. 2019).

Electricity and natural gas make up the bulk of households' utility costs. The costs of electricity and gas are lower in Iowa compared to the nation, but can still be prohibitive for low income households (figures 5.1 and 5.2 below for the US and Iowa). This chapter presents an energy burden assessment of Johnson County for low income communities, defining low income households based on the area median income (AMI).

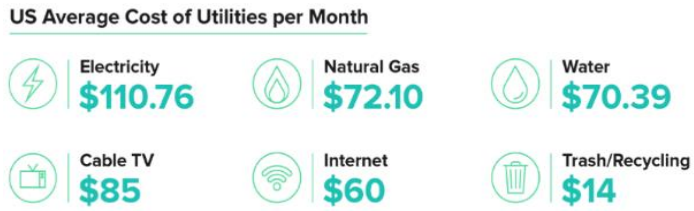


Figure 5.1. Nationwide utility costs per month Source: www.move.org/utility-bills-101

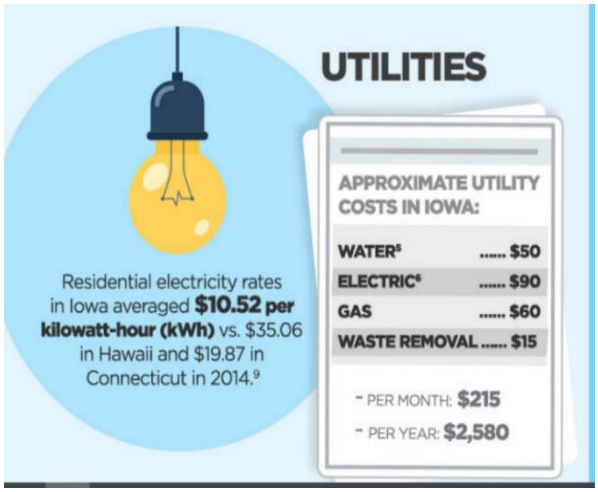


Figure 5.2. Utility costs in Iowa Source: www.spacesimply.com/iowaliving

In this assessment, we use three AMI-based income thresholds (<30%, 30-60%, 60-80% AMI). The graphs below show the energy burden for owner and renter occupied households in 2018 for Johnson County. Energy burden is calculated as a proportion of household income and shown separately for gas and electricity costs.

Figure 5.3: Energy Burden Among Owner-Occupied Low-Income Households

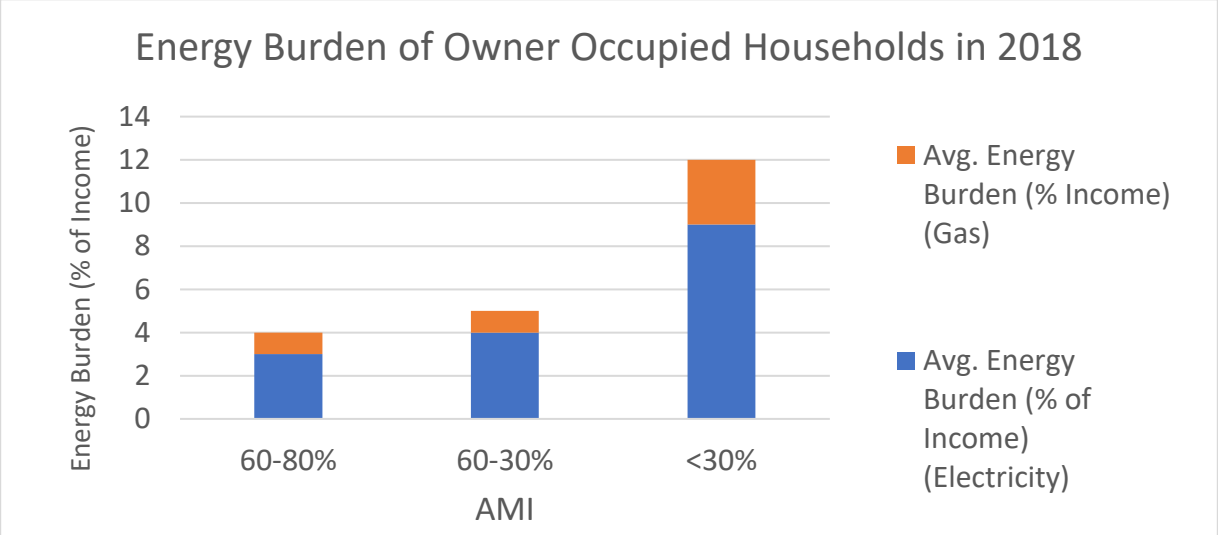


Figure 5.4: Energy Burden Among Renter Occupied Low Income Households

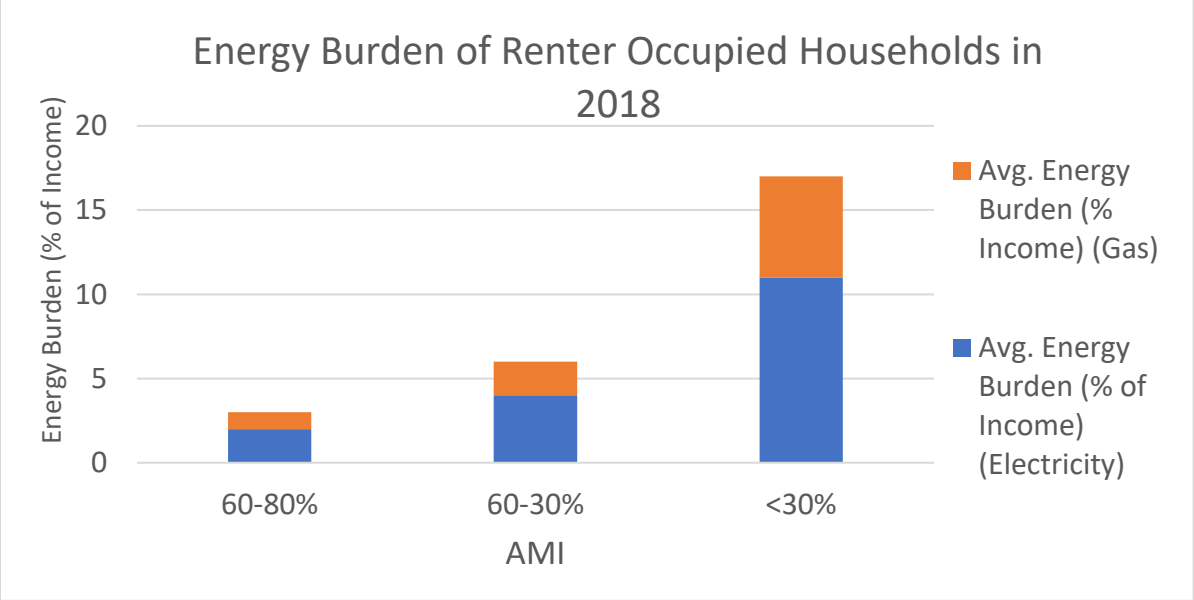


Figure 5.5: Energy Burden Among <30% AMI Owner Occupied Households based on Census Tracts in Johnson County

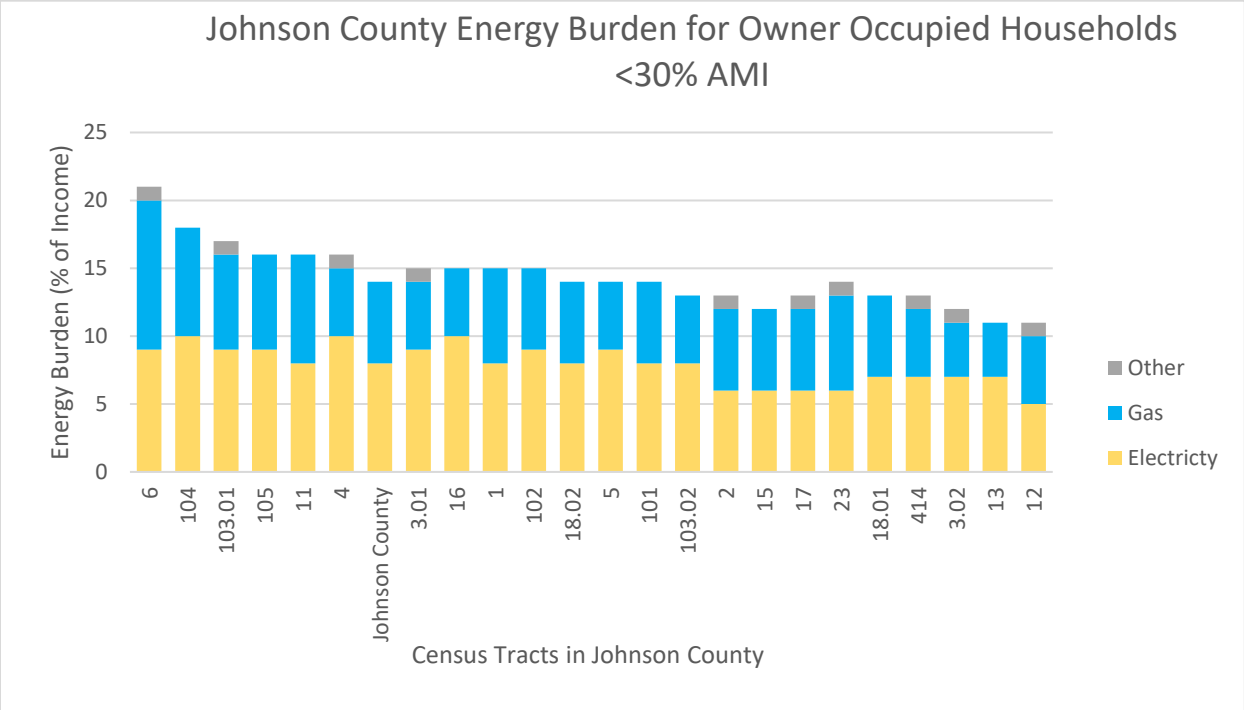
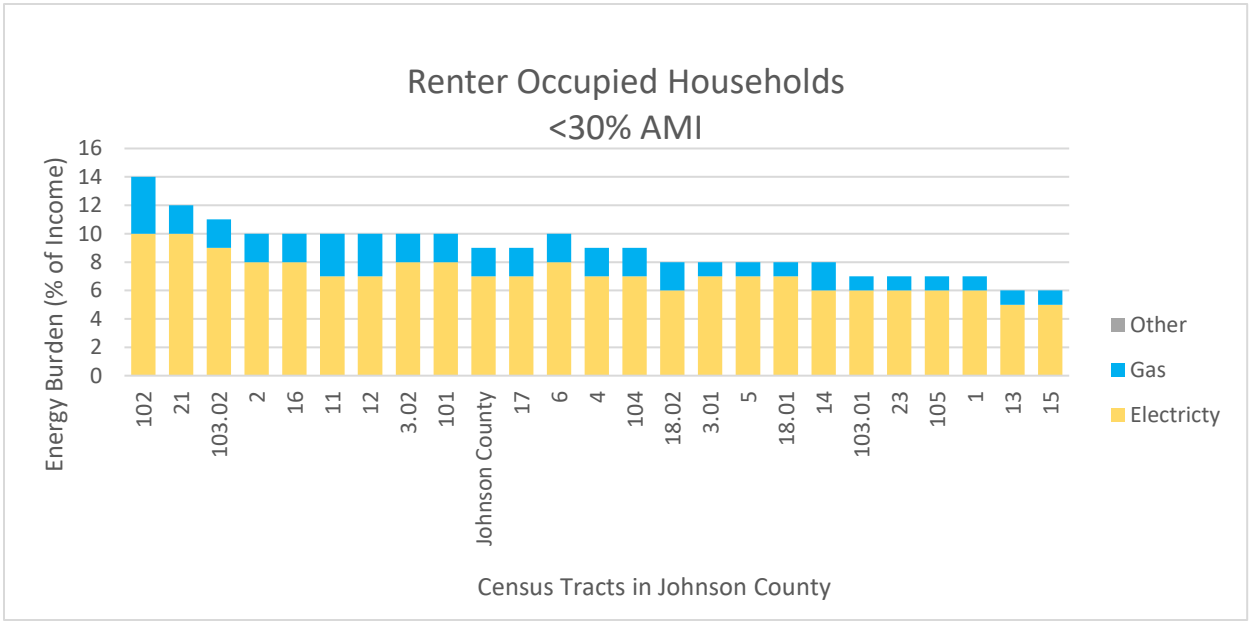


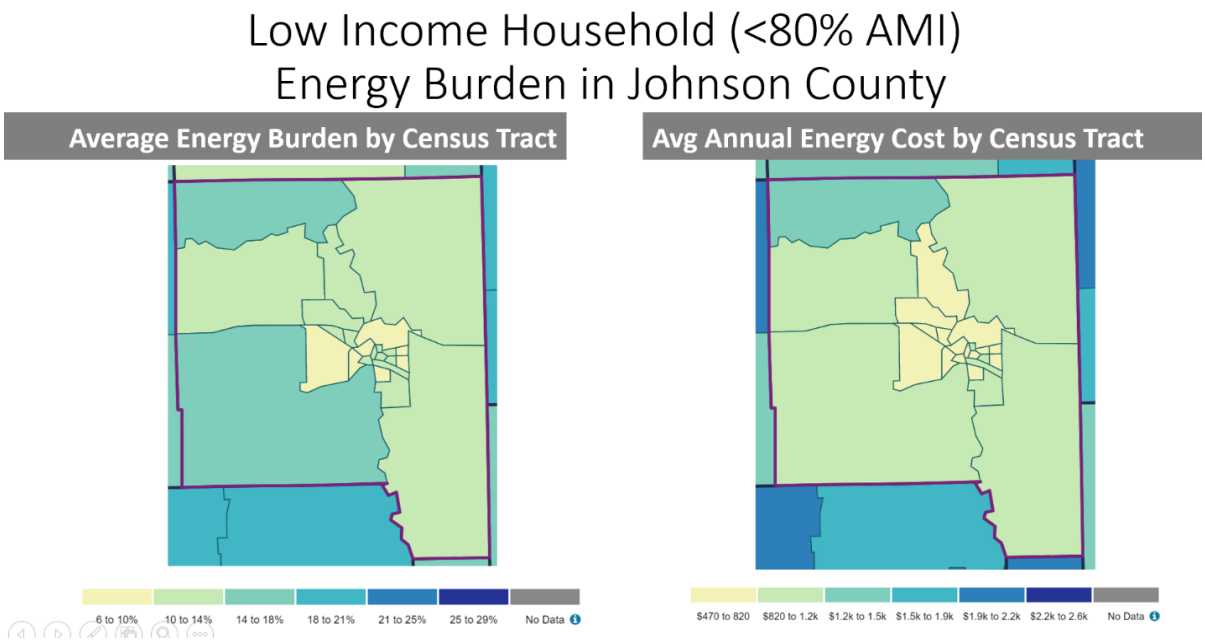
Figure 5.6: Energy Burden Among <30% AMI Renter Occupied Households based on Census Tracts in Johnson County



Overall 3% of Iowa and 2% of Johnson County residents are energy-burdened (based on 2016 Census Data and American Community Survey 5-year estimates). However, those averages hide wide disparities. In Johnson County, households earning <30% AMI experience the most severe energy burden among all three income categories. **About 12% of the poorest homeowners and 17% of the poorest renters (<30% AMI) are energy-burdened.** In contrast, 2-4% of renters and homeowners earning between 60 and 80% of the AMI are energy-burdened, and 5-6% of homeowners and renters earning between 30-60% of the AMI are energy-burdened (Figures 5.3 and 5.4).

Figures 5.5 and 5.6 reveal the four census tracts with the highest proportion of energy-burdened households: Census Tracts #6, 102, 103.01, and 104. A map of average energy burden and average annual energy cost for low income households making less than 80% AMI is shown for Johnson County in Figure 5.7. The darker shades indicate higher energy costs experienced by households.

Figure 5.7: Johnson County Low Income Household Energy Burden Assessment



The areas with the highest proportion of energy-burdened renters are:

- Census Tract #102: Northwest quadrant of Johnson County

The areas with the highest proportion of energy-burdened homeowners are:

- Census Tract #6: Iowa City between the Iowa River and University Heights, between the University of Iowa and Highway 6

- Census Tract #103.01: Tiffin and West of Tiffin between I80 and the Iowa River, between Tiffin and the Western County Boundary

- Census Tract #104: Southwest quadrant of Johnson County

In addition, figures 5.3 to 5.6 reveal that most of the energy burden for low income households stems from electricity costs, probably in part because natural gas is relatively cheap in Iowa. We do not know how many households heat their homes with electricity, but if most of the electricity usage goes to cooling, this would suggest that high energy costs for low-income households are driven by cooling rather than heating costs.

Energy burden for the poorest households (<30% of AMI)

The poorest households are the most heavily energy-burdened. Energy efficiency efforts in the homes of very low income households (<30% AMI), and especially reducing cooling needs, have the potential to dramatically reduce energy burdens. Table 5.1 shows that there are 1,815 homeowner households earning <30% AMI in Johnson County, and that energy costs account for 15% of their total income (v. 18% for all of Iowa's 58,274 homeowners earning <30%AMI).

Overall, Johnson County's 1,815 very low income **homeowners** (<30% AMI) spend between 15% of their income on energy bills. Low income homeowners' energy burden is the highest in Census tract #6 (between University Heights and the Iowa River in Iowa City), where low income homeowners spend 21% of their income on energy bills (Table 5.2). This amounts to 46 homes, which could be priority targets for energy efficiency interventions.

The 9,346 low-income (<30% AMI) **renters** in Johnson County spend between 9% and 12% of their income on energy on average (Table 5.3). This lower energy burden (v. homeowners) could stem from economies of scale in apartments buildings compared to independent furnaces and H/VAC systems, and/or from the inclusion of utilities in rents. The largest concentration of very low-income renter households is in Census Tracts #11 and #16, the student residential area located in Iowa City on the North Side and between Iowa Avenue and the Iowa Interstate Railroad Tracks in Iowa City.

Table 5.1: Average Energy Burden for <30% AMI Homeowner Households

Name	Avg. Energy Burden (% Income)	Number of Households
Iowa	18	58,274
Johnson County	15	1,815

Table 5.2: Average Energy Burden for **homeowner households** <30% AMI in Johnson County

Johnson County Energy Burden Assessment for Owners		
Location	Energy Burden (% of income) and Utility Share	Housing Count
Johnson County	15%	1815
Census Tract 103.01 in Johnson County	17%	202
Census Tract 103.02 in Johnson County	13%	56
Census Tract 18.02 in Johnson County	14%	38
Census Tract 2 in Johnson County	13%	60
Census Tract 3.01 in Johnson County	15%	48
Census Tract 13 in Johnson County	11%	67
Census Tract 15 in Johnson County	13%	85
Census Tract 16 in Johnson County	15%	20
Census Tract 17 in Johnson County	13%	71
Census Tract 21 in Johnson County	-	11
Census Tract 23 in Johnson County	13%	15
Census Tract 5 in Johnson County	14%	116
Census Tract 6 in Johnson County	21%	46
Census Tract 11 in Johnson County	16%	24
Census Tract 12 in Johnson County	11%	37
Census Tract 18.01 in Johnson County	13%	153
Census Tract 105 in Johnson County	17%	229
Census Tract 4 in Johnson County	16%	71
Census Tract 104 in Johnson County	18%	217
Census Tract 3.02 in Johnson County	12%	13
Census Tract 101 in Johnson County	14%	57
Census Tract 1 in Johnson County	15%	83
Census Tract 102 in Johnson County	15%	37
Census Tract 14 in Johnson County	13%	58

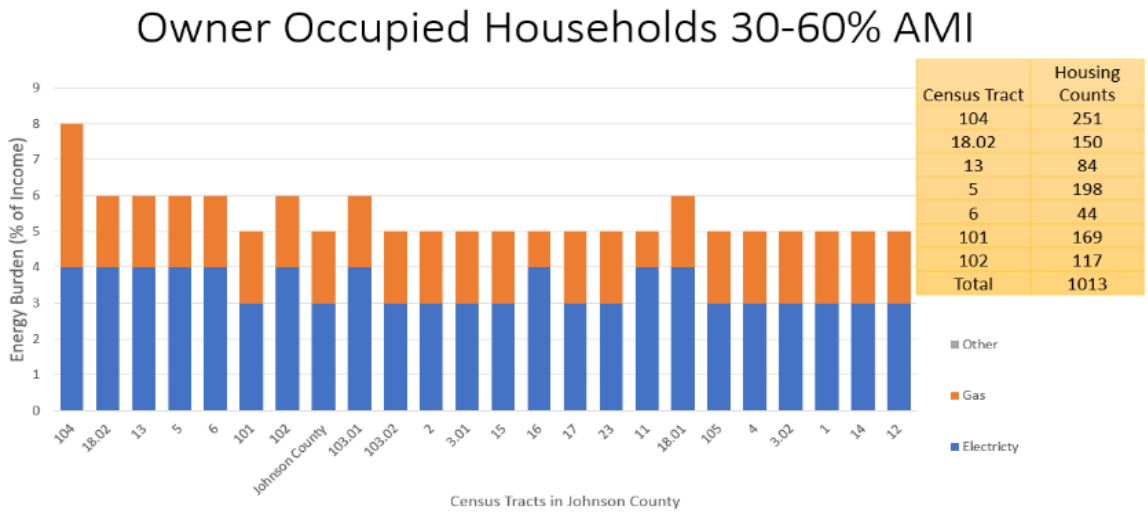
Table 5.3: Average Energy Burden for **Renter Households** <30% AMI in Johnson County

Johnson County Energy Burden Assessment for Renters		
Location	Energy Burden (% of income) and Utility Share	Housing Count
Johnson County	9%	9,346
Census Tract 21 in Johnson County	12%	453
Census Tract 103.02 in Johnson County	11%	184
Census Tract 2 in Johnson County	10%	311
Census Tract 16 in Johnson County	10%	2,114
Census Tract 11 in Johnson County	10%	795
Census Tract 12 in Johnson County	10%	113
Census Tract 3.02 in Johnson County	10%	758
Census Tract 101 in Johnson County	10%	58

Energy burden for households earning 30-60% of the AMI

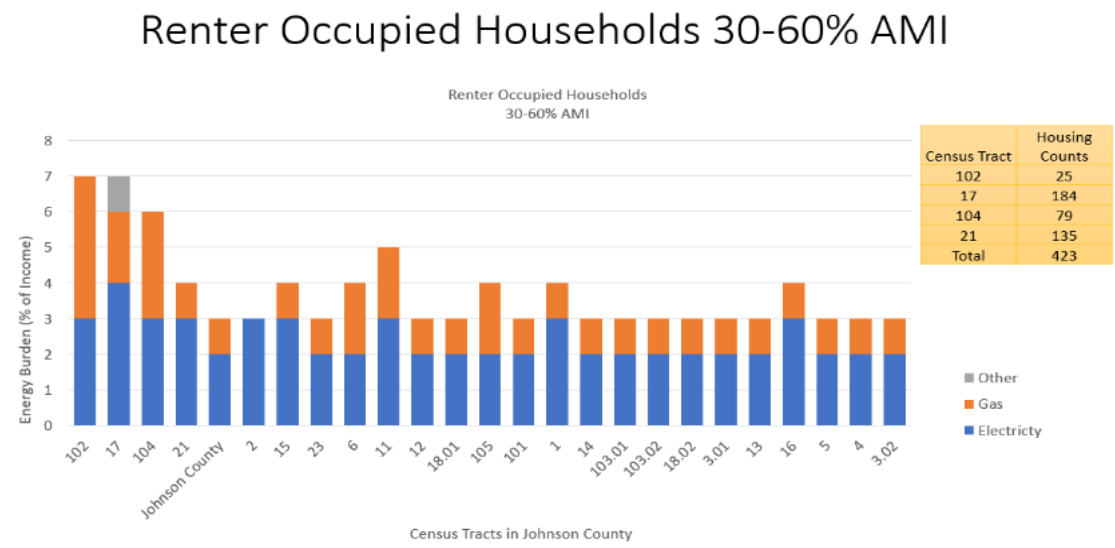
Figures 5.8 and 5.9 show the energy burden for households earning 30-60% of the AMI. The most energy-burdened homeowners at this income level are disproportionately in Tract #104 (Southwest Quadrant of Johnson County, shown in Figure 5.7). The most energy-burdened tenants at this income level are in Tracts #102 (Northwest Johnson County), #104 (Southwest Johnson County) and #17 (South Iowa City, between the Iowa Interstate Railroad Tracks and Highway 6). Each figure includes the number of housing units concerned by high energy burdens in each tract.

Figure 5.8: Energy Burden for Owner Occupied 30-60% AMI Households in Johnson County



Census Tract	Housing Counts
104	251
18.02	150
13	84
5	198
6	44
101	169
102	117
Total	1013

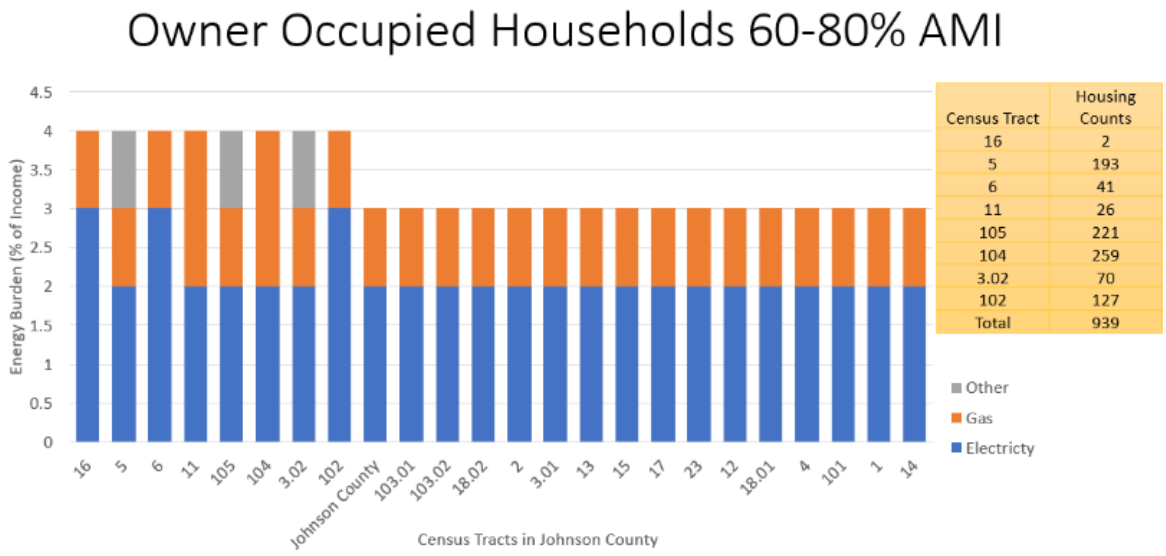
Figure 5.9: Energy Burden for Renter Occupied 30-60% AMI Households in Johnson County



Census Tract	Housing Counts
102	25
17	184
104	79
21	135
Total	423

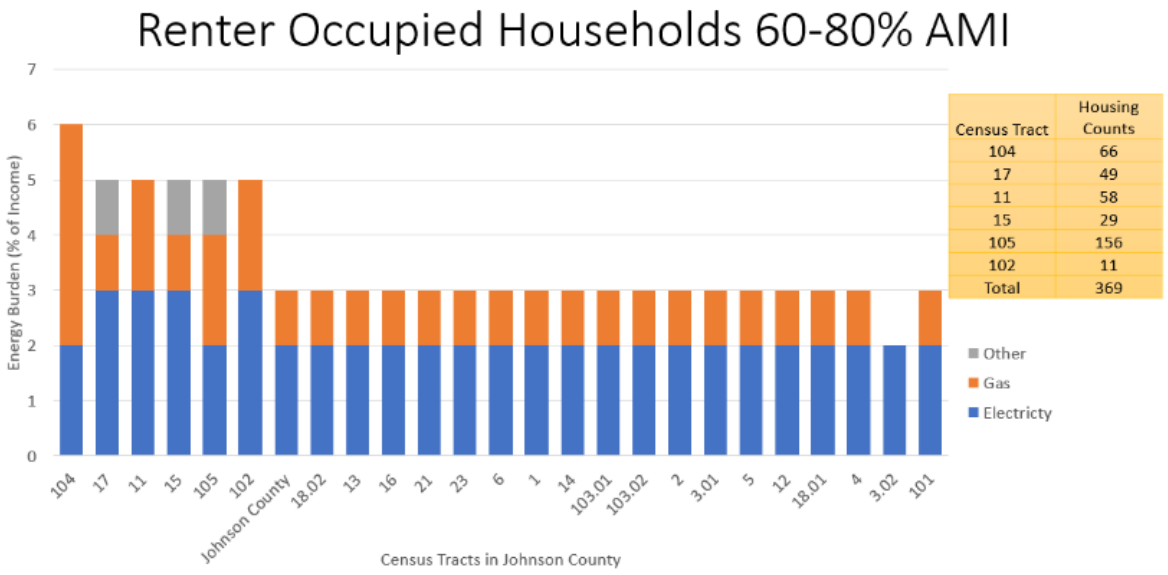
Energy burden for households earning 60-80% of the AMI

In this income category, there are more energy-burdened homeowners than renters. Johnson County's average energy burden for owners and renters earning 60-80% of the AMI is 5% and 3%, respectively (Figures 5.10 and 5.11). The housing counts estimates for each census tract is included in each figure. Southwest Johnson County (census tract 104) has the highest number of energy-burdened homeowners in this income category (251). The highest concentration of energy-burdened renters in this income category (184 households) is in Iowa City, between the Iowa Interstate Railroad Tracks and Highway 6 (census tract 17).



Census Tract	Housing Counts
16	2
5	193
6	41
11	26
105	221
104	259
3.02	70
102	127
Total	939

Figure 5.10: Energy Burden for Homeowners earning 60-80% AMI



Census Tract	Housing Counts
104	66
17	49
11	58
15	29
105	156
102	11
Total	369

Figure 5.11: Energy Burden for Renters earning 60-80% AMI

2. Priority interventions and recommendations

This assessment reveals how many low-income households are energy-burdened, whether they own or rent their homes, and where they are located in the county. We found that about 12% of the poorest homeowners and 17% of the poorest renters (<30% AMI) are energy-burdened and spend on average 15% of their income on energy bills. In contrast, about 5% of those earning 30-60% and 60-80% of the AMI are energy-burdened and they spend 3-5% of their income on energy costs. Thus, priority should be given to increasing energy efficiency and reducing energy costs **for households earning <30% of AMI**.

We also found that electricity costs are the largest part of poor households' utility bills, suggesting that reducing **electricity usage** should be priority.

Finally, we identified the **geographical areas** where interventions are most needed:

Highest density of low-income energy-burdened renters

- Northwestern quadrant of Johnson County (Census Tract #102)
- Iowa City between University Heights and the Iowa River (Census Tract #6)
- Iowa City student residential area on the North Side (Census Tract #11)
- Iowa City student residential area between Iowa Avenue and the Iowa Interstate Railroad Tracks (Tract #16)
- Iowa City between the Iowa Interstate Railroad Tracks and Highway 6 (Tract #17)

Highest density of low-income energy-burdened homeowners

- Southwest Quadrant of Johnson County (Census Tract #104)
- Iowa City between the Iowa River and University Heights, between the University of Iowa and Highway 6 (Census Tract #6)
- Tiffin and West of Tiffin between I80 and the Iowa River, and between Tiffin and the Western County Boundary (Census Tract #103.01)

Energy assistance programs

In Iowa, energy bill assistance is available through the Low Income Home Energy Assistance Program (LIHEAP) and the Weatherization Assistance Program (WAP). Both are federal programs that support low-income households.

LIHEAP helps low income homeowners and renters pay a portion of their heating bills during winter months. Currently, applicants must be at or below 175% of the 2020 federal poverty guidelines to qualify. LIHEAP served about 82,00 Iowa households in 2019. According to LIHEAP's 2018 data, 68.3% of low-income households served by the program heat their homes with gas, and 22.4% heat their home with electricity. Gas is relatively cheaper in Iowa than other states, and as we saw above, electricity is a larger portion of low-income households'

energy bills. Thus, utility payment assistance that helps pay for electricity rather than gas would better relieve Johnson County households' energy burden.

If further analysis reveals that summer cooling creates more costs burdens than winter heating, and thus that the LIHEAP program is insufficient, JCED could work with the County to provide summer months cooling assistance to very-low income households.

Weatherization audits

Home weatherization and insulation improvements can reduce energy usage and costs. Insulation leaks cost residents significant amounts of money. Home weatherization audits are thus essential, especially for energy-burdened households. The Iowa City Climate Action Toolkit includes state and federal-level resources for weatherization (City of Iowa City, 2019).

The Green Iowa AmeriCorps, based at the University of Northern Iowa, and funded by the Iowa Energy Development Authority, can partner with JCED to assist energy-burdened households. Green Iowa performs energy audits by visiting homes and identifying air leaks, gaps in insulation, other sources of energy losses, mold, and humidity. Green Iowa provides recommendations to homeowners, but does not implement home improvements or recommend specific contractors. However Green Iowa coordinates small home improvement supplies, with items donated by local providers, such as door and window seals. JCED could increase access to weatherization supplies by coordinating donations from community organizations such as Habitat for Humanity or local home improvement stores. Addressing the dearth of local contractors knowledgeable about (and interested in) home energy efficiency upgrades and improvements calls for the contractor training recommendations made in Chapter 1.

Another consideration: Manufactured housing

An important consideration for implementing energy efficiency programs for low income households in Johnson County is that many low-income households live in manufactured housing (Sara Baron, Johnson County Affordable Housing Coalition). Manufactures/mobile homes have very poor insulation properties. In older mobile homes, in particular, the insulation can fall to the bottom of the walls, leaving large portions of the walls uninsulated. Those households thus spend more money to heat and cool their homes. Since manufactured homes are often not suitable for home improvements, weatherization programs for mobile homes tend to be low priority.

An easy way to determine whether home have good or poor roof insulation is to conduct an informal windshield survey after a light snowfall. Home with no snow on the roof (i.e., where the snow melts) indicates poor roof insulation. This method offers a low-cost way to further explore census tracts with the highest energy burdens to locate homes in most need for home weatherization audits.

Relationship and trust-building

In order to implement energy efficiencies, JCED will need to build relationships and trust with local communities. Renters may not feel comfortable, or may not be allowed, to make changes in their home. Low-income households may experience shame associated with poverty, and may not feel comfortable with in-home audits. Another barrier is that low income residents may be undocumented or have issues with law enforcement, and could be reluctant to let strangers into their home. It is therefore important that weatherization or energy efficiency efforts take place in neighborhoods where JCED has built trust.

Thus, it may be most valuable for JCED to start building relationships in one neighborhood rather than scatter its efforts throughout the county. Based on our results, we suggest that JCED starts building relationships with the 46 homeowners in Iowa City in the area located between the Iowa River and University Heights, and between the University of Iowa and Highway 6 (Census Tract #6). This is the area where low income homeowners experience the highest energy burden (21% of their income on average).

Coordination with other local organizations

In addition to the Green Iowa AmeriCorps, we identified several community organizations that can work with JCED on increasing homes' energy efficiency:

- Johnson County Affordable Housing Coalition, low income housing
- Habitat for Humanity, home improvements for low income households
- Beloved Communities Initiative, racial justice initiatives and coalitions
- Center for Worker Justice, Eastern Iowa worker and housing advocacy
- Black Voices Project, African American community organization
- IC Compassion, community immigration support

Conclusion

Low Income households are often burdened by high energy costs because their homes are not energy efficient. We used the Department of Energy's LEAD toolkit to conduct an energy burden assessment for Johnson County and identify which households and parts of the county are most energy-burdened. The assessment reveals that households earning under 30% of the AMI are the most energy-burdened, and reveals the parts of the county where low income renters and homeowners are most energy-burdened. We make recommendations about which homeowners to target first.

Addressing energy burdens for renters will involve a different set of intervention priorities, which are discussed in Chapter 3 (Rents, Landlords and Energy Consumption).

Chapter 6. Benchmarking Building Energy Consumption

Johnson County already receives a large portion of its power from renewable sources. The next step towards sustainable energy is to increase energy efficiencies. A barrier to addressing inefficient energy uses is that the only entity that collects buildings' energy usage data is the utility MidAmerican Energy. The lack of publicly available data on building energy usage makes it difficult to track progress. Thus, to benchmark and track energy efficiency, the county should require energy use data reporting (by the utility, residential, commercial and industrial building owners, or property managers). This chapter reviews best practices for energy benchmarking.

The idea of benchmarking energy usage has precedent in Iowa. In 2019, the Des Moines City Council passed legislation requiring large commercial buildings to disclose their energy usage, which will eventually be made public. When this legislation was passed, over 20 other American cities had implemented similar requirements, e.g., Minneapolis, St. Paul, and Chicago (whotv.com). Energy usage disclosure policies are adopted to track progress in energy efficiencies and energy usage, allow comparisons across buildings, and to incentivize efficiency improvements. Benchmarking gathers energy use data from buildings and evaluates how efficient buildings are compared to similar structures. Buildings are evaluated in terms of Energy Usage Intensity (EUI) (Harvard), which is the total energy use divided by the building's total floor area. Benchmarking also supports ongoing energy auditing to track changes over time (energyandfacilities.harvard.edu).

To propose a benchmarking program suited for Johnson County, we examine local, national and international benchmarking programs, from Des Moines, San Francisco, Boulder and the European Union.

1. Case Study: Des Moines

Des Moines is the only Iowa City that benchmarks energy (and water) usage. The ordinance adopted by the Des Moines city council states that the benchmarking program goals are: to bolster the health, safety, and welfare of the community by improving the energy efficiency of city-owned buildings and other structures that fall into the scope of the monitoring. By doing this, the city aims to "foster a sustainable local economy through environmentally sound building practices and energy efficiency (City of Des Moines)".

The Des Moines benchmarking program includes municipal and large commercial buildings at or above 25,000 square feet in total building gross floor area (City of Des Moines). Buildings that must report have two options to analyze their energy usage. They can use the ENERGY STAR Portfolio Manager, developed by the U.S. Environmental Protection Agency. They can also use the Iowa B3 Benchmarking Program. Both tools analyze the energy efficiency of buildings, calculate a total score, and compare the building efficiency to other similar structures. Owners that fails to comply with the benchmarking can be fined by the Community Development Director.

In practice, in May of each year, building owners must generate a report stating the building's energy and water usage for the previous calendar year. This data is verified to ensure that the required data is submitted properly. Starting in 2022 the program will start releasing energy reports every July. Exceptions are made to the benchmarking requirement for unoccupied buildings, buildings that averaged 1 person or less on a daily basis, and in the case of undue hardships associated with the reporting (e.g., giving away trade secrets) or if the building is LEED certified.

The city plans on using the data for "offering programs, services, and incentives related to energy use and water use efficiency and management for the covered property (City of Des Moines)". The city can provide aggregated or anonymized data for research purposes to academic and non-commercial research interests that aims to advance the goals of the benchmarking program. The city will need written permission from building owners to provide non-anonymized property data.

2. Case Study: San Francisco

Since 2015, the state of California has an overarching state benchmarking policy, which includes utility companies, commercial buildings larger than 50,000 square feet, multifamily residential buildings over 50,000 square feet, and state agencies (EnergyStar). The city of San Francisco expands the state's program to include all non-residential buildings over 10,000 square feet (SF Environment). Reporting mechanisms are is similar to Des Moines'. Owners of eligible buildings must use the ENERGY STAR Portfolio Manager tool to report energy usage annually (SF Environment). The is then used to calculate an energy intensity score, and a rating on a scale of 1-100 assesses the performance of each building. The Portfolio Manager tool also records the energy source for the building. This data is then used to calculate the greenhouse gas emissions of each structure.

The San Francisco benchmarking program shows that benchmarking can be used for a broader range of buildings than Des Moines. However, San Francisco resources are much greater that Johnson County's. A more viable model for Johnson County may be one based on a similar size community.

3. Case Study: Boulder

Boulder, Colorado in similar to Iowa City in many ways. They are both mid-sized cities, although Boulder has a slightly larger population. Both cities are home to large public universities, and both are political outlier (generally more progressive) than their states. Unlike California, Colorado does not have a statewide benchmarking policy. This leaves energy benchmarking and reporting responsibilities to the cities that choose to do so. Boulder enacted its benchmarking policy in 2015. Reporting requirements apply to commercial and industrial buildings that are larger than 20,000 square feet, and to all the new commercial and industrial buildings that are larger than 10,000 square feet (City of Boulder, 2020).

Boulder has ramped up the size requirement gradually since the policy passed, starting at 50,000 sq. ft in 2016, shifting to 30,000 sq. ft in 2018, and then to 20,000 sq. ft in 2020 (City of Boulder). This gradual increase gave businesses more time to prepare for the reporting and makes the project more palatable for the business community. Like other benchmarking programs, Boulder requires that building owners submit their data through the ENERGY STAR Portfolio Manager once a year (City of Boulder).

In addition, Boulder also requires buidilng owners to pursue energy efficiencies through retrocommissioning and lighting upgrades. This makes the Boulder model more impactful than Des Moines' and San Francisco. Retrocommissioning is a way to improve the efficiency of an existing building. It is essentially the process of fine-tuning a building to be more energy efficient (Building Efficiency Initiative). It does not necessarily require new equipment, and is a low-cost way to improve efficiency. For instance, lights can be turned off when no one is on the premises, and heating and cooling systems can be recalibrated so they not used at the same time (Building Efficiency Initiative). Boulder requires that building owners go through with this procedure within 5 years of their first energy report, and every 10 years after that (City of Boulder). Owners need to provide the city with a report on the retrocommissioning and the actions they took to make their building more efficient (City of Boulder).

Boulder also mandates lighting upgrades to improve efficiency. Within five years of the first benchmarking report, the building owner need to improve their interior and exterior lighting using options that meet the City's power allowance (City of Boulder). Buildings also need to implement time switches and occupancy sensors, which help using lights only when needed.

Boulder's benchmarking plan is very thorough in its efforts to achieve energy efficiency, and its required efficiency improvements goes farther than San Francisco's. However, its minimum square footage for existing structures is twice as large of San Francisco's.

4. Case Study: the European Union

The European Union has pursued greater efficiency amongst its building stock, but through a different means. Instead of relying on data collection an educational approach with benchmarking, they go further and require efficiency upgrades. The Energy Performance of Buildings Directive (EPBD) covers small residential buildings, which are excluded from American models so far (except for San Francisco which covers multi-family residential complexes larger than 50,000 sq feet). This exclusion leaves out a large amount of the structures and all single-family homes. The E.U.'s directive, on the other hand, applies to all buildings.

The EPBD has three goals: to decarbonize the building supply by 2050, to establish a stable environment for investments, and to enable businesses and consumers to make more informed decisions in regards to energy and money (EPD).

The E.U. requires all member states to create a plan for the long-term renovation of their building stock. These plans mush show how they will meet decarbonized building goal set by the E.U., and must provide progress reports every ten years in 2030 and 2040. While they create their roadmap to efficiency, member states must reach energy efficiency targets along the way (EPD).

The directive also sets out performance requirements. These levels must be set by member states for all new buildings, structures that undergo major renovations, and with it the replacement and retrofitting of building (EPD). Those improvements could be in the walls, roofs, and heating and cooling systems of a building (EPD). With these requirements, the building stock should become more and more efficient over time.

Finally, the E.U. gives ratings to each housing unit (each building, apartment and condo). Consumers who search for rental apartments or a condos in any European city see the energy performance of unit. Every time a house of condo is sold, a specialized inspector must conduct an energy audit on-site and provide a performance certificate for the unit (EPD). All units' efficiency is public information when they are on the market, allowing comparisons with other units. Energy efficiency is measured in kWh per square meter, and expressed in an A to G score, (D = 151 to 230 kWh/m^2). Structures built to be extremely efficient have a more rigorous rating model (D= 21-35 kWh/m^2). See Figure 6.1.

Overall, the European Union's Energy Performance Building Directive is a sweeping policy that aims at increasing energy efficiency in all types of buildings. It has ambitious goals that it sets out to fulfill, and it lays the groundwork on how it is going to reach it. Lessons can be learned from this model and implemented into U.S. cities.

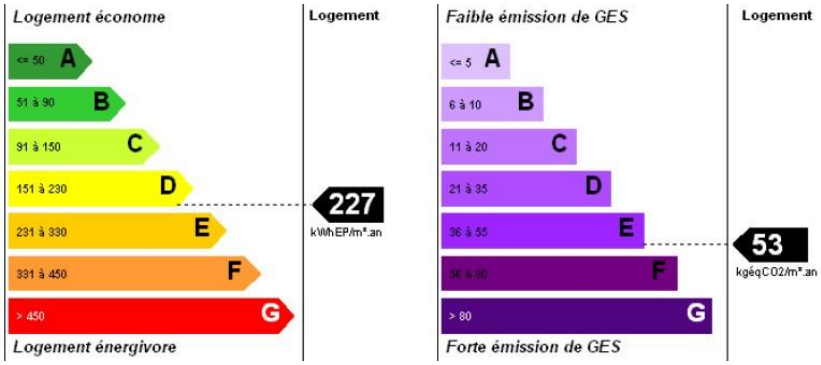


Figure 6.1. French version of the European requirement for energy efficiency disclosure for all buildings and housing units.

(Similarly, starting in 2020, New York City buildings over 25,000 ft2 will be required to display their efficiency score and corresponding letter grade near building entrances, using the following scorecard, see Figure 6.2.)

Energy Grade	Energy Star Score
A	85-100
B	70-84
C	55-69
D	1-54
F	Non-Compliant
N	No ES Score or Exempt

Figure 6.2 Source: Letter Grade Law LL95, April 2019 New York City Climate Mobilization Act

5. Recommendations

An energy benchmarking system and the data generated will allow Johnson County communities and building owners to better pursue energy efficiency. San Francisco's model includes many buildings under its mandate. Des Moines is the only city in Iowa with a benchmarking policy, includes water consumption tracking, but it falls short of other systems. Boulder's plan is ambitious and goes further than San Francisco and Des Moines with its emphasis on actual improvements. Ideally, Iowa City and Johnson County would model their legislation on Boulder's, and add a water consumption reporting component (as Des Moines). Water consumption tracking is only going to become increasingly important in times of climate change and droughts.

The San Francisco plan and the EU model show that benchmarking is feasible on buildings under 20,000 square feet. Ideally, Iowa City and Johnson County should strive for benchmarking all buildings over 10,000 square feet, perhaps starting at 20,000 square feet and widening the mandate over time. Johnson County should include, as San Francisco, reporting by multi-family residential structures over 50,000 square feet.

The E.U.'s directive is the most ambitious proposal, but is clearly feasible: Iowa City and Johnson County could require energy use history be reported when a housing unit is sold. This information would be gathered and, over time, the city would get a good picture of energy usage of residential buildings.

Those benchmarking requirements will impose new costs on building owners, which cal be alleviated by phasing in from larger to smaller buildings. They will also require a trained workforce of energy auditors, and thereby create new green jobs. Chapter 1 touches on efforts JCED could undertake to help create this new workforce in partnership with Kirkwood Community College.

In sum, Iowa City and Johnson County should pursue energy benchmarking. It should include **all buildings that 10,000 square feet or larger (perhaps starting with those 15,000 square feet or larger)**. Building owners would be required to report energy usage for the past year, as well as their water usage. Five years after the first report, and 10 years after that, **all eligible buildings will have to retrocommission their structure to improve energy efficiency, and document those changes**. In addition, they will have to change their lighting to the best efficient option, including timers and motion sensors for interior lighting. Lastly, **requiring energy reporting for residential units (condos, duplexes, and single family homes) when they are sold** should be pursued. This would address a major blindspot of US benchmarking programs which usually exclude residential buildings. This is not only feasible, but would also turn Iowa City and Johnson County into models in the Midwest.

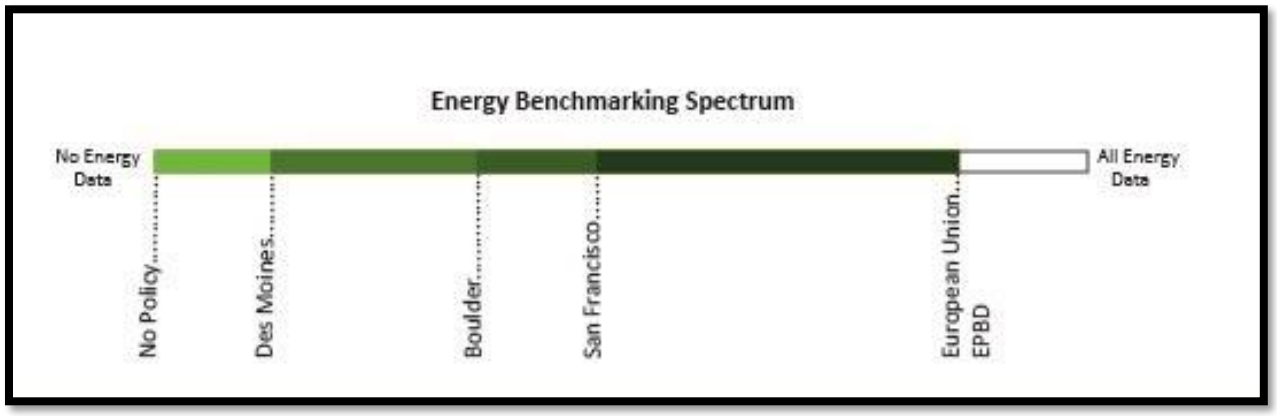


Figure 6.1. Visual representation of the benchmarking programs generated by Heather Flynn

Conclusion

This report is intended to assist the Johnson County Clean Energy District and its initiatives with data, best practices, and recommendations. This report provides strategies to implement:

- A public outreach strategy that engages homeowners and tenants in energy savings efforts (via social media and / or app. games)
- A contractor certification program with Kirkwood Community College
- A policy toolkit for developing a clean vehicle assistance program and electric vehicle event
- An electric bicycle network
- A strategy to addressing energy consumption and reduction in rental units
- Anaerobic digester technology on farms to reduce greenhouse gas emissions and provide clean energy
- Benchmarking to better pursue energy efficiency in residential, commercial and industrial buildings
- Energy efficiency efforts through the lens of energy justice, prioritizing low-income Johnson County residents who are the most energy-burdened.

In conclusion, Johnson County Clean Energy District will face challenges and opportunities in the future. This report provides both general policy and specific directions to address barriers and challenges building on best practices. This will allow the JCED to navigate the options that are available and develop, strengthen and grow.

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