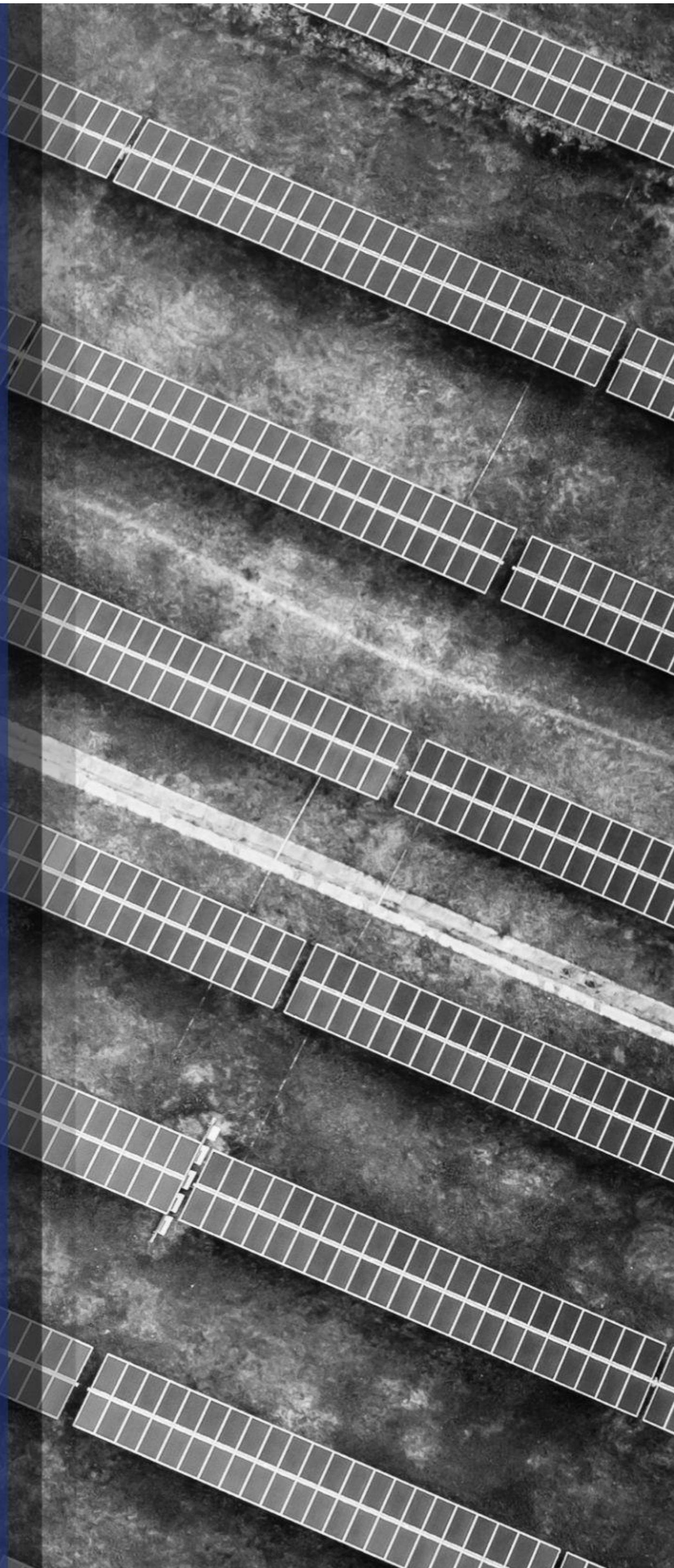
Feasibility Analysis of Implementing Sustainable Energy Utility (SEU)



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CITY OF BLOOMINGTON

Authorship & Acknowledgements

This report is the product of work performed for a capstone course during the Spring 2026 term by a group of graduate students at the O'Neill School of Public and Environmental Affairs at Indiana University Bloomington. These students are: Arista, Noel Baker, Sushobhan Bhattarai, Eveline Gordon, McKenzie Jones, Lauren McDonald, Bronwyn Meldrum, Liv Myers, Joshua Pine, Miles Powell, Laura Schairbaum, Evelyn Sellers, Trent Stocum, Farah Vianda, and Vincent Zarlengo.

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Executive Summary

Introduction

This assessment, performed by a capstone class of graduate students at Indiana University, examines the feasibility of implementing a Sustainable Energy Utility (SEU) in the City of Bloomington, Indiana. As it was determined in the research phase that such a framework would not be legally feasible without express permission from Duke Energy, alternative scenarios were developed and analyzed that could still allow Bloomington to move toward achieving its carbon emissions reduction goals. These scenarios range from low complexity and a low level of additional investment to more complex and requiring increased capacity and collaboration.

The feasibility study was divided into two phases. The first focused on preliminary research to understand the social, financial, technical and environmental, and legal implications of making changes to the electricity supply in Bloomington. The second phase used this background to inform three analyses key to evaluating the potential scenarios. The first was a Scenario Pillar Alignment Analysis, in which the framed scenarios were compared in their abilities to satisfy or improve the attributes, or Pillars, of electric utility service defined in Indiana Code § 8-1-2-0.6: Reliability, Affordability, Resiliency, Stability, and Environmental Sustainability. The second was a risk analysis to identify and rank factors that could impact implementation in terms of likelihood of occurrence and magnitude of impact. The last was a stakeholder impact analysis to evaluate relevant stakeholders, their current level of interest and influence along with potential position, and how best to engage them for mutual benefit.

Background

Bloomington's Climate Action Plan sets ambitious targets of reducing greenhouse gas emissions below 2018 levels by 2030 and reaching carbon neutrality by 2050, with the Energy and Built Environment sector accounting for most citywide emissions. The city has already taken meaningful steps through programs such as the Bloomington Green Home Improvement Program, the Solar, Energy Efficiency, and Lighting Program, Bloomington Energy Works, and the Sustainable Neighborhoods Grant Program. Community sentiment generally supports climate action, renewable energy, and household energy savings. However, trust in city performance has declined in recent years, which creates an implementation barrier for new programs. Bloomington also faces high energy burden among lower-income households, making affordability and equity central to any future energy strategy.

Financially, the report finds that Bloomington can draw on a mix of municipal, state, federal, non-profit, and utility-sponsored tools, but that not all models used elsewhere are transferable to Indiana. Municipal bonds, green bonds, tax increment financing, and guaranteed energy savings contracts are viable municipal financing tools, while grant-funded and public-private partnership approaches can support targeted energy efficiency and renewable energy initiatives. By contrast, Bloomington cannot rely on mechanisms such as mandatory utility surcharges, carbon market revenues, etc., as the legal and regulatory framework of the city does not allow for it. The most practical funding avenues would be those which expand existing city programs, leverage outside grant support, and work through partnerships with Duke Energy.

Regarding technical capacity, Bloomington's strongest clean energy option is solar photovoltaic deployment, noting that geothermal electricity generation and utility-scale wind power are much less practical in the local context. Bloomington has favorable rooftop solar conditions, strong zoning support, and a growing base of installed solar. However, rooftop solar potential cannot meet the entirety of the city's electricity demand. The city's emissions profile also shows that electricity is a major source of community-wide greenhouse gases. This means that local solar can produce meaningful reductions even if it cannot replace the grid. Brownfield redevelopment may also offer additional siting opportunities, though space competition and site restrictions can limit the scalability of that option.

Legally, the primary barrier to an SEU is Indiana's utility territorial framework, which reverses retail electric service in Bloomington to Duke Energy so long as Duke provides "adequate" service. The report explains that Bloomington would face a major legal risk if it attempted to furnish electricity directly to residents without written approval with Duke and the IURC. Violations of service territory rules could result in costly litigation and penalties, meaning that the most promising legal avenues for Bloomington right now are narrower than a city-wide SEU. Avenues include expanding behind-the-meter generation, developing a municipally owned microgrid limited to city facilities, challenging utility adequacy, pursuing service-territory changes with utility agreement, or building a partnership with Duke around community solar or other energy models. Given these constraints, the report shifts away from a standalone SEU and instead evaluates more feasible alternatives that still support Bloomington's climate action goals.

Scenario Outlines

The four alternative scenarios that were developed to support CAP goals in the absence of a full SEU are outlined below, along with assumptions used in analysis.

Business-as-Usual (BAU)

- Current programs Bloomington Green Home Improvement Program (BGHIP) and Solar, Energy Efficiency, & Lighting (SEEL) continue at their current pace and level of funding over 10 years, measured by MWh taken off grid (solar generation added and abatement from energy efficiency projects).

Enhanced Programming

- Increases resource allocation to current BGHIP and SEEL programs and expands scope for broader engagement and eligibility over 10 years.
- This scenario is broken into 50%, 100%, and 200% increases in annual project rollout rates, measured in MWh taken off the grid.

Municipal Microgrid

- Expand municipally-owned rooftop solar capacity and develop a microgrid that includes behind-the-meter distribution network for city buildings and battery storage.
- This scenario is broken into current municipal solar capacity (MW) as well as 50%, 100%, and 200% increases in capacity, with 10 microgrid locations chosen based on city building density.

Community Solar

- Modeled after a pending Doug Otto United Way Project in Columbus (Indiana), this scenario involves the City of Bloomington financing, building and managing a community solar grid with cooperation from Duke Energy. The energy produced would be split 50/50 with Duke, with the 50% sold to grid being applied to consumers, and 50% retained for municipal use.
- This scenario would target low- and moderate-income (LMI) households for energy credits and is broken into community solar array sizes of 1 MW, 1.2 MW, and 2MW.

Methodology

The second phase used background research to further evaluate the four scenario pathways. These scenarios were compared through a Scenario Pillar Analysis utilizing Indiana's Five Pillars of electric utility service. The project also included a risk analysis to identify the likelihood and severity of key implementation barriers, and a stakeholder analysis to assess which actors were most likely to influence or shape each scenario. Together, these methods were intended to compare the feasibility, trade-offs, and implications of each scenario in a consistent and decision-oriented manner.

Scenario Pillar Alignment Analysis

The Scenario Pillar Alignment Analysis adapted Indiana's Five Pillars of electric utility service by defining specific metrics and connecting the environmental sustainability pillar to health and ecosystem impacts as well as Bloomington's greenhouse gas emission reduction goals. A qualitative rating from Poor to Excellent was applied to how each pillar is impacted by the four scenarios. Each scenario included several pathways to inform the City's decision-making about scaling efforts and potential realistic pathways as municipal priorities may shift and financial capacity decreases or expands.

The Business-as-Usual Scenario resulted in limited improvements in all pillars and shows continued dependence on the central (high emissions) grid and provides minimal emissions reduction. Anticipated energy efficiency measures and distributed energy resources (DERs) are not impactful enough to reduce grid stress during peak demand periods, leading to minimal improvement in reliability, resilience, and stability. Similarly, affordability concerns remained largely unchanged. The current programs do not fully address high up-front costs and restrictive eligibility requirements, and lower-income households not enrolled in the City's programs will continue to face disproportionately high energy burdens. For the Environmental Sustainability pillar, the addition of PV solar will have limited impact on City climate goals, continue detrimental impacts of fossil-fuel generation, and make marginal improvements on air quality and public health outcomes.

Under the Enhanced Programming Scenario, expansion of the City's current energy programs at 50%, 100%, and 200% of current levels would largely be insufficient to impact the five pillars. Dependence on the central grid would remain high. The modelling suggests that even under a 200% increase in project rollout, peak demand reductions would be modest. Rigid hour-to-hour load profiles from distributed solar developments prevent stability gains, producing rigid hour-to-hour load profiles absent additional storage deployment. Finally, resiliency gains from enhanced outage survival durations would benefit only a limited number of individual households, businesses, and organizations with solar installations, and these gains would not be delivered on neighborhood scales or system-wide absent additional aggregated storage capacity.

For affordability, while the Enhanced Programming Scenario delivers meaningful reductions in energy burden for program participants, expansion of existing programs even at the maximum level of 200% does not reach a large number of households. Current program rebates would not be likely to reduce the high upfront costs for low-income households. Finally, the impacts of the Enhance Programming scenario on Environmental Sustainability are notable but insufficient for meeting Bloomington's Climate Action Plan goals.

In the Municipal Microgrid scenario, pillar impacts vary widely depending on the level of expansion of municipal DERs. Solar and microgrid capacity increases lead to positive rankings for reliability and resiliency pillars; however, stability will be negatively impacted due to significant fluctuation in hourly load demand when solar and battery resources are depleted. Affordability benefits shift following a 50% capacity increase pathway because power sharing allows the city to pay off the high upfront capital of its distribution network at this capacity. Increasing microgrid capacity beyond this level continues to improve this scenario's affordability because the city would only need to continue to finance the solar and storage component of the microgrid. A municipal microgrid with a 200% capacity expansion in municipal solar results in the most significant positive impact on four out of five pillars, and has an especially positive impact on regional pollutants for environmental sustainability.

In the Community Solar scenario, grid reliability, resiliency, and stability are impacted at the regional grid level rather than locally and not quantifiable with the model used in this study. For the affordability pillar, the 2 MW pathway estimated could reduce the average low-income energy burden from 21.54% to 8.37% for a few hundred participating households, generating a total annual bill credit of $1,054.31 per household. Capital expenditures for a municipally funded array and battery storage would require significant public investment, estimated at $5.86 million for a 2000 kW buildout. Complementary energy efficiency interventions would still be needed to fully reach the national 6% affordability threshold. For the environmental sustainability pillar, while GHG emissions and local pollutants can be avoided to some extent, this scenario should be implemented mindfully as it has the potential for negative emissions and ecological impacts if a ground mounted model requires detrimental land use changes.

The pillar alignment results for each scenario were qualitatively ranked based on the quantitative calculations and then combined into one table for comparison. Provided as Table 1, this overall visualization may prove useful for BCOSR as a springboard for future analyses into specific actions. Here, it informs the discussion and recommendations provided at the end of the Executive Summary and the Report itself.

Table 1. Integrated Pillar Alignment Results

	BAU	Enhanced Programming			Municipal Microgrid				Community Solar		
Pillar		**50%**	**100%**	**200%**	**Current capacity**	**50%**	**100%**	**200%**	**1 MW**	**1.2 MW**	**2 MW**
Reliability	Poor	Poor	Poor	Fair	Poor	Fair	Fair	Good	Poor	Poor	Poor
Affordability	Fair	Fair	Fair	Fair	Fair	Good	Good	Good	Fair	Fair	Good
Resiliency	Poor	Poor	Poor	Poor	Poor	Poor	Fair	Good	Poor	Poor	Poor
Stability	Poor	Fair	Fair	Poor	Fair	Fair	Fair	Poor	Fair	Fair	Fair
Environmental Sustainability (GHG Emissions)	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Fair	Poor	Poor	Poor
Environmental Sustainability (Energy Share)	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor
Environmental Sustainability (Regional Pollutants)	Poor	Poor	Fair	Good	Fair	Good	Good	Good	Fair	Fair	Fair

Risk Analysis

The risk analysis identified the main barriers which could affect each scenario's feasibility. Across all scenarios, the most recurring concerns were local budget constraints and unstable funding streams. These broad risks shaped every option, but each scenario also carried its own distinct vulnerabilities tied to scale, legal authority, and implementation complexity. These risks, based on likelihood of occurrence and magnitude of impact, were ranked for each scenario and are provided in Figure 1.

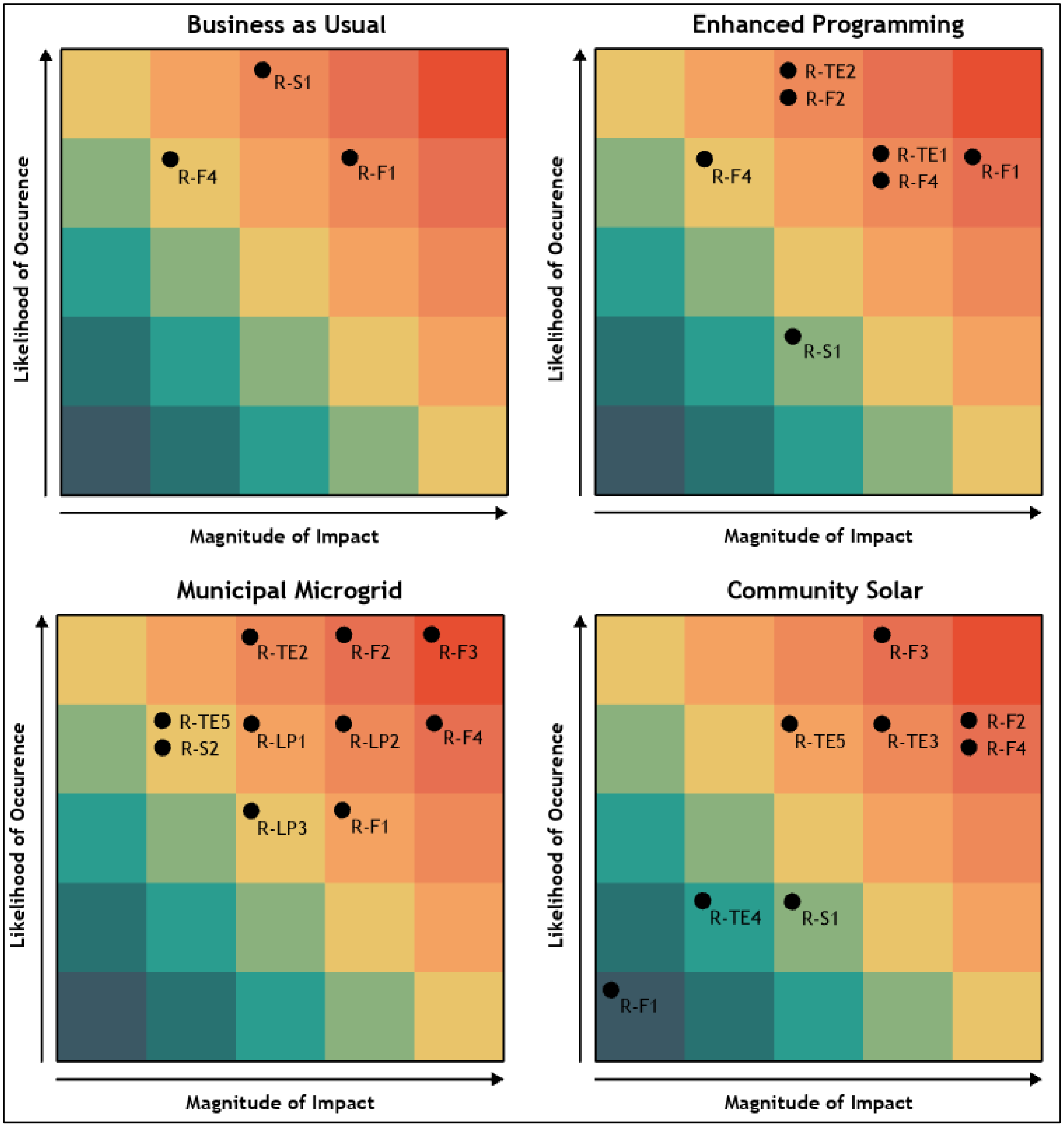

Figure 1. Overview of Risk Analysis Results, ranking risks by likelihood of occurrence and magnitude of impact. See the Appendix for Risk Code Identification.

The Business-as-Usual scenario carried the lowest implementation risk, but also the least transformative impact. Its main concerns are equity gaps in program access, unreliable grant funding, and local budget constraints, which could limit the city's ability to expand existing energy programs meaningfully. The Enhanced Programming scenario adds risks tied to low technology adoption, structural barriers to solar, solar cost volatility, and continued funding uncertainty, even though its structure may help to reduce equity concerns. The Municipal Microgrid scenario faces the highest overall risk profile, with major challenges including high capital costs, budget constraints, legal disputes over utility territorial rights and duplication statutes, permitting complexity, and weather-dependent solar generation. The Community Solar scenario has fewer legal barriers than a microgrid, but still faces substantial risks such as high capital needs, limited space for infrastructure, solar cost volatility, local budget constraints, and potential habitat impacts from ground-mounded installations.

Overall, the risk analysis suggests that the more ambitious the scenario, the greater the financial, legal, and technical risk. Based on this analysis, Business-as-Usual is the safest path, but it offers limited progress toward climate goals. Enhanced Programming appears to be the most balanced option as it builds existing programs while avoiding some of the legal complexities. While Municipal Microgrid and Community Solar may offer larger long-term benefits, they depend on stronger funding and much more permissive legal conditions.

Stakeholder Analysis

Many relevant stakeholders exist across the public, private, and nonprofit sectors who could serve as allies or obstacles within the identified scenario options. Not only are the pillar alignment and level of risk for the scenarios important, but so are the stakeholder networks that exist in relation to them. By identifying stakeholders and assessing their likely levels of interest and influence as well as their positions, groups of key stakeholders, and strategies to engage with them, can be identified for each scenario; both those who may serve as strong allies and those who may need to be convinced of the scenario's benefit. All stakeholders were listed, analyzed, and mapped in figures for each scenario that demonstrate who the key stakeholders are. These figures are combined for the Executive Summary and are provided as Figure 2.

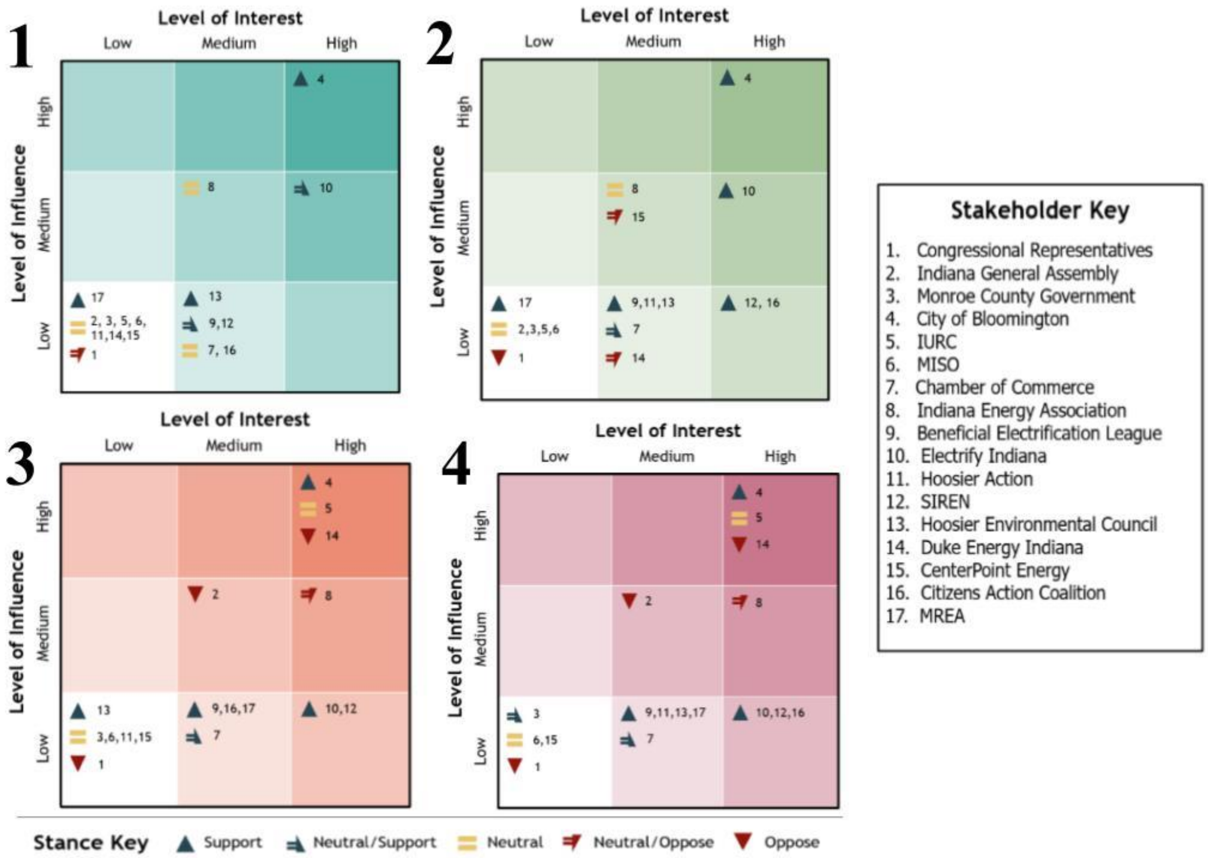

Figure 2. Stakeholder Mapping for the Four Scenarios: (1) Business as Usual, (2) Enhanced Programming, (3) Municipal Microgrid, and (4) Community Solar.

The key stakeholders in the Business-as-Usual scenario are the City of Bloomington and Electrify Indiana. The City supports its own current programs and policies, and City bodies both legislative and administrative are the ones responsible for formulating and implementing them. EI has stronger influence and interest than its fellow nonprofits due to its current status as a partner of the City's Department of Economic and Sustainable Development.

The key stakeholders in the Enhanced Programming are the City of Bloomington, Electrify Indiana, and SIREN. Stakeholders who may be of greater importance depending on the specifics of the mitigative programming include CenterPoint Energy and the Indiana Energy Association. The City maintains its positions of high interest, high influence, and support under this scenario for good reason; City bodies would be responsible for the budgeting, development, implementation, and impact measuring for any new or expanded programs and policies. Electrify Indiana holds significant interest and heightened influence as an existing City partner and could therefore have a larger role in the development and/or implementation of augmented programming. SIREN also holds significant interest, as the Enhanced Programming scenario potentially opens the door to the re-establishment of a past program of theirs. CenterPoint Energy and the Indiana Energy Association, of which CenterPoint is a member, may stand in opposition to the Enhanced Programming scenario depending on the specific mitigative programming that the City pursues.

The key stakeholders in the Municipal Microgrid scenario are the City, Duke Energy, the IEA, and the IURC. Bloomington's municipal government, who is strongly in favor of energy and climate action, would have the single largest influence over this project, given that it involves the connection of municipal buildings. Duke could try and challenge this project legally or through lobbying with the general assembly, and as the legally recognized sole provider of electricity service in Bloomington, they would have the legal right to do so. The IEA as a trade association would be expected to be behind any of Duke's positions, and the IURC would be involved in any potential legal challenges, though they are intended by law to be a neutral party in their application of state law in these cases.

In the Community Solar scenario are Duke Indiana, the City of Bloomington, and the IURC are the most prominent stakeholders, necessitating an intensive and sustained engagement approach. Duke and the City are the stakeholders of the utmost importance for this scenario, as they would need to negotiate an agreement under which Duke would allow construction of community solar under a negotiated management and financial plan. This plan would then be presented to the IURC, who hold the ability to approve or deny the project.

Discussion

In general, the analyses attempt to provide a comprehensive view of the opportunities and constraints associated with implementing each scenario. Results for all scenarios, as well as the risk and stakeholder engagement analyses across all four scenarios, inherently carry complexity and limitations, both of which constrain how results can be interpreted when forming recommendations or assessing potential synergies across scenarios. As such, the discussion aims to address these concerns and their implications, as well as present areas for future work that were beyond the scope of this report.

Business-as-Usual, serving primarily as a baseline for comparison, is discussed comparatively less than the modeled counterfactual scenarios due to its poor performance across the pillars, and as such, is not discussed at length in explanations of potentially synergistic outcomes or implications for long-term planning.

Analyses imply that the Enhanced Programming scenario would achieve some emissions and reductions and deliver community co-benefits over a baseline pathway, but that this pathway would be insufficient to meet the main climate mitigation and electric service improvements sought by the city, mainly because it does not deliver aggregated energy resource benefits and faces an uncertain funding landscape. Increased resource allocation to existing programming and potential expansion into new areas of municipal activity could, then, serve as a supplement to other, more comprehensive initiatives.

The Municipal Microgrid scenario, at the highest capacity, results in substantial progress towards the city's climate goals in renewable energy expansion and emissions reductions. This is largely due to economies of scale. However, it falls short of distributing these benefits directly to

Bloomington’s residents. This initiative would impact municipal operations, energy costs, and emissions rather than the community at large. While future financial benefits could potentially be redistributed throughout the local economy by programming expansions, it is crucial to recognize the inherent tradeoffs of this scenario.

Community solar maintains a degree of reliance on Duke Energy's cooperation but demonstrates stronger direct benefits for Bloomington's low- and moderate-income (LMI) residents compared to the microgrid scenario. While community solar does not push energy cost burdens below the national 6% affordability threshold at lower capacities, a 2 MW buildout achieves a "Good" rating due to economies of scale. Ecologically, the scenario's impact remains moderate, as land clearing requirements, relatively low generation capacity, and continued grid dependence limit its emissions reduction potential. From a risk perspective, most components fall within a poor-to-fair range, with unreliable grant funding rated as "Very Unlikely" given the strength of available funding mechanisms; however, the heavy reliance on grants and municipal budgets remains a concern given the high capital expenditure involved. Despite these limitations, the Community Solar scenario holds the strongest potential among all scenarios to broaden renewable energy access particularly for renters, LMI households, and residents without structurally sound rooftops provided that Duke Energy's cooperation is secured and that suitable land, financing, and program structures are in place to ensure long-term affordability and durability.

Recommendations

Based on the results of the analyses and considerations discussed above, the following set of recommendations have been developed to help Bloomington move closer to its emissions reduction goals as well as improve affordability for low-income residents. Recommendations are organized into short-term and long-term processes depending on whether Bloomington could begin implementation soon or whether they would require external planning and collaboration or funding sources that would require more time. Within those time frames, recommendations are rank-ordered based on highest to lowest predicted impact. Additionally, stakeholder engagement recommendations are presented that should be implemented in an ongoing fashion to increase support, mitigate risks from influential parties, and enhance collaborative possibilities.

Short-Term Recommendations

- Expand municipal solar and battery capacity to prepare for future implementation of a microgrid.
- Further evaluate feasibility of a municipal microgrid through refined cost and benefit estimates paired with Bar-certified legal review.
- Expand support for resident solar and energy efficiency initiatives through increased resource allocation to BGHIP, SEEL, and relevant energy programming.
- Seek additional grant and external funding opportunities to increase financial capacity for energy related programs.
- Evaluate the potential impacts of a city-administered peak demand response program.

- Develop positive interactions with Duke and find a trusted community non-profit partner to facilitate community solar logistics.

Long-Term Recommendations

- Create a partnership with Duke to implement a community solar array to benefit a set number of low-income households.
- Develop the distribution network to transition municipal solar and battery systems to a full microgrid to take advantage of power-sharing.
- Collaborate with neighboring municipalities and large-load industry consumers to serve as an example for creating facility microgrid systems.
- If necessary, develop a plan for legal action to challenge the current monopoly utility regulations in conjunction with other Indiana entities.

Ongoing Recommendations

- Follow future Indiana General Counsel legislative sessions and advocate for policies that allow community solar developments independent of incumbent utilities' discretion.
- Engage with stakeholders to increase support, mitigate risks, and create opportunities for future collaboration.