SARE Professional Development Program
BIOENERGY GENERATION AND ENVIRONMENTAL **SUSTAINABILITY:** COMMUNITY ISSUES

NORTH CENTRAL SARE
Sustainable Agriculture Research & Education
UW Extension

Bioenergy and Renewable Energy

Community Assessment Toolkit

Facilitating community participation in renewable energy development

ENVIRONMENTAL RESOURCES CENTER

UW Extension
University of Wisconsin–Extension

COLLEGE OF AGRICULTURAL & LIFE SCIENCES
University of Wisconsin-Madison

Bioenergy and Renewable Energy Community Assessment Toolkit

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Available electronically at: http://fyi.uwex.edu/biotrainingcenter/community-matrix-tools/

On-line training programs on bioenergy and sustainability, on-farm energy conservation and efficiency, and anaerobic digestion will be available electronically beginning April2011 at http://bioenergy-training.uwex.edu/

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Bioenergy and Renewable Energy Community Assessment Toolkit

Contents

Introduction to the Concept of Sustainable Renewable Energy Development

Rural communities are rich in natural resources, including land for agriculture, forestry, pasture, and wildlife habitat. This land asset has traditionally been applied toward production of food, feed and fiber. Increasingly, landowners are considering use of land for the production of renewable energy (or 'fuel') – in the form of dedicated bioenergy feedstocks, leasing of land for wind farms or transmission lines, or siting energy generating facilities (solar installations, digesters). Renewable energy (dedicated bioenergy crops, forest-based biomass, manure, wind, and solar) holds great promise for rural community economic development and as a means to achieve greater energy independence. Increased demand for land and feedstocks can provide new economic opportunities for farmers, foresters and rural land owners.

However, increased demand for bioenergy feedstocks and rural land can also lead to resource depletion, unsustainable land use practices, and other unintended consequences for wildlife, people, and communities. The development of renewable fuel sources must be planned carefully, with consideration of potential environmental, economic, and social consequences. Land use changes, in particular, must be evaluated against a full array of ecosystem services - those benefits to human well-being provided by nature, specifically land and natural resources (including land in agriculture or forest) (McDonald, 2010). Biomass producers are concerned about the economic viability and risks involved with renewable energy markets, as well as the agronomic potential, changes in production practices, and labor issues. For communities, issues of trade-offs, equity in distribution of costs and benefits, and potential for economic development may predominate.

For some, the development of a rural renewable energy industry portends great opportunity; for others, such development comes with potentially deleterious costs. Community decision-makers will increasingly be called upon to determine how to distribute benefits and mitigate or distribute costs, either through establishment of policies and criteria to regulate the industry, or through the negotiation process around siting and establishing a facility. Federal, state, and local government entities can also establish policies to support sustainable bioenergy by rewarding sustainable practices and distributing benefits equitably within the community.

Whether renewable energy – and specifically bioenergy – can move our society onto a more sustainable energy path, relative to our current trajectory, remains unresolved. Our intent with this toolkit is not to resolve this question, but rather, to encourage government entities, communities, and land-owners to engage in a process of public deliberation to assure that community residents have a voice in decision-making about renewable energy development within their own community. Communities can elect to impose a standard of sustainability for renewable energy development; in doing so, they set the criteria that industry must meet in order to be appropriate for a particular locale.

This toolkit provides a decision making tool (the matrix) to guide communities toward developing their own standard of sustainability and criteria for meeting that standard.

Defining Sustainability:

Sustainability is typically defined using the Brundtland Commission description of *sustainable development*: "**.** . . development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987: 43). This definition has as a starting point the assumption of equitable development achieved within the boundaries of the planet's carrying capacity. One critique of this definition is that it assumes that equitable 'development', or by implication – economic growth – can be sustainable. Nor does the definition provide a standard of needs.

Other definitions provide a standard of needs: Wackernagel and Rees, the originators of the ecological footprint concept, define sustainability as ". . . living in material comfort and peacefully with each other within the means of nature" (Wackernagel & Rees, 1996). While definitions of sustainability vary, most incorporate the concept of the three pillars of sustainability - environmental stewardship, economic prosperity, and social equity (Willard, 2002) .

Businesses are adopting these concepts in recognition that it is short-sighted to solely base business decisions on the criteria of short-term profitability. They are increasingly including environmental and social performance objectives in their assessment of the 'bottom line' (Elkington, 1998). Like businesses, communities are utilizing this 'triple bottom line' framework to guide planning and assessment practices. For example, 28 Wisconsin communities have adopted eco-municipality resolutions; many of these are adopting triple bottom line approaches and/or 'The Natural Step' approach in their planning activities (Sustainable Communities Capacity Center, 2010).

Defining Sustainable Bioenergy:

Extending the concept of sustainability to bioenergy, sustainable bioenergy production systems "*would be environmentally, economically, and socially viable now and for future generations and would move the world away from an unsustainable reliance on fossil fuels*" (Friedman, Morris, & Bomford, 2010).

Sustainable production and harvest practices can be specifically applied to various bioenergy source materials. For example, the Wisconsin Department of Natural Resources has created a set of guidelines for the production of dedicated bioenergy crops. The Wisconsin DNR utilizes a definition of sustainability that incorporates the concept of stewardship and intergenerational equity to guide the development of such practices: "*The stewardship of lands and resources dedicated to non-forest biomass production in ways that are environmentally, socially and economically sound across a broad range of scales, that does not negatively impact other ecosystems, and that can meet societal needs both now and into the future"* (Sample, D., personal communication, 10/12/2010).

If renewable energy generation is to meet the promise of improved sustainability (over current energy sourcing from fossil fuels), the use of these energy sources should be designed to meet multiple sustainability objectives, including:

(a) improving the environmental footprint of energy production and distribution (including reducing impacts on water, air, wildlife, climate, and biodiversity),

(b) improving the local and community economic benefits associated with production and distribution of energy,

(c) creating an energy system that enhances social benefits associated with energy production and distribution for communities, workers, and end-users of energy.

Sustainability Guidelines for Bioenergy:

Several international organizations and coalitions are attempting to put sustainability criteria and standards in place to guide the development of renewable energy resources. For example, the Roundtable on Sustainable Biofuels has established 'principles' concerning legality; planning, monitoring and continuous improvement; greenhouse gas emissions; human and labor rights; rural and social development; local food security; conservation; soil; water; air; use of technology, inputs, and management of waste; and land rights (Roundtable on Sustainable Biofuels, 2010).

For more links to organizations working on the development of international standards, see the eXtension publication "Sustainability Standards for Farm Energy" (Friedman, Morris, & Bomford, 2010) and the Council on Sustainable Biomass Production.

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Introduction to the Matrix

As the U.S. transitions to renewable energy, new opportunities and challenges are emerging as well. Federal and State policies are driving renewable energy markets, but however well designed, they often have unintended consequences. Local communities must find ways to proactively address the issues that surround renewable energy development if they wish to embrace these new technologies.

The purpose of the energy matrices is to help communities engage in a healthy dialogue about the status and future of local energy production.

Renewable energy can provide a means for communities to grow their local economies, reduce their carbon footprints, maintain their working lands, and become more energy independent and secure. But renewable energy, like any type of development, also impacts existing businesses, the environment and the broader community.

By proactively embracing and managing the issues surrounding renewable energy development, communities increase their odds of successfully developing the types of projects that make sense for the community, the environment, and the local economy.

A Decision-Support Tool for Extension Educators

The matrix is a decision-support tool for Extension educators and other facilitators of community discussions about bioenergy and other renewable energy opportunities.

The matrix assessment provides a method for community decision-makers and interested stakeholders to assess potential renewable energy developments prior to proceeding with any development or type of development. By working through the matrices, stakeholders will have a sense of what could work for their own communities, what issues might arise for particular constituencies, what areas warrant further study or detailed analysis, and how benefits and costs are distributed locally and regionally.

There are a range of issues associated with renewable energy crop production that communities might consider in evaluating economic development or energy independence opportunities. These issues fall into the following categories:

- Environmental
    - Landscape change (crop production/harvesting)

    - Soil & water conservation,
    - Water quality
    - Air quality
    - Non-native species
    - Wildlife habitat,
    - Carbon sequestration,
- Economic
    - Economics of energy conservation & generation
    - Economic risk
- Social
    - Siting & operation of energy facilities
    - Workforce implications
    - Local economic impacts

The matrix provides a framework for a group of interested stakeholders to assess anticipated impacts by providing a comprehensive list of potential impacts, and questions associated with these impacts (see section 4 of the toolkit). Community leaders can choose to utilize the comprehensive listing of potential impacts, or to adapt this listing for location specific impacts (using the excel version of the matrix).

The matrix assessment can be regarded as a pre-feasibility study, and should not be confused with a full-scale feasibility study of a proposed development.

How to Use the Matrices

The matrices are intended to be used as a facilitation tool for community discussions in conjunction with other tools and techniques employed by local leaders, planners, community and economic development professionals. Depending on the situation the matrices might be used in a variety of different settings and by various users, including:

- as a pre-assessment tool for proposed renewable energy developments,
- as an educational tool for local planning boards and decision makers to highlight potential issues,
- as a reference tool for local decision makers to identify parties potentially affected by a new/proposed development,
- as a checklist for local landowners and entrepreneurs considering investing in renewable energy development - to help them think holistically about their proposals and anticipate community concerns,
- as handouts at public meetings where diverse opinions are being sought.

Components of a Community Process for Renewable Energy/Bioenergy Assessment

The authors of this toolkit recommend that the matrix assessment be used as a part of a community process that includes one or more of the following components:

1) Community education and discussion forums about renewable energy production and use,

2) A SWOT (strengths, weaknesses, opportunities, threats) process to evaluate resources available to a community,

3) Identification of key stakeholders who will form a task force, study group, or development committee, that commits to working through the matrix assessment and sharing results with the community,

4) Feasibility studies of specific proposals that are brought forth. If any bioenergy generation or development is to be pursued, further study and assessment of specific proposals will be necessary. Community checklist tools can help guide the process for communities that are further along in evaluating a particular facility or development.

Annual/Perennial Biomass (non-woody) for Heating or Electricity

Environmental Dimensions Matrix 1: Producing/Harvesting the Biomass

ENV 1

extension more mind reach	Grow energy biomass crop on current agricultural lands.	Grow energy biomass crop on ag. lands as conservation strips/ buffer zones	Convert Conservation reserve lands or marginal lands to energy biomass crop.
Biodiversity conservation			
Soil nutrient depletion			
Soil Health			
Water quality and quantity			
Carbon sequestration			

Annual/Perennial Biomass (non-woody) for Heating or Electricity

Environmental Dimensions Matrix 2: Processing and Converting the Biomass

ENV 2

	Facility development: Environmental Impact	Facility operation: Environmental Impact (note discharges)	Transportation of feedstocks to facilities & of products away from facility
Impacts on wetlands, forests, other natural assets			
Traffic, additional road construction			
Water quality and quantity			
Waste storage, processing, and disposal			
Air quality (emissions, particulate matter, dust)			
Odors			
Noise			
GHG emissions			
Energy use; potential for conservation or cogeneration			

Annual/Perennial Biomass (non-woody) for Heating or Electricity

Economic Dimensions Matrix 1: Producing the Biomass

ECON 1

extension more mind reach	Grow energy biomass crop on current agricultural lands.	Grow energy biomass crop on ag. lands as conservation strips/ buffer zones	Convert Conservation reserve lands or marginal lands to energy biomass crop.
Direct start up costs			
Medium & long term profit potential			
Economic risk/volatility of commodity market			
Impact on farmers: cost of learning/ integrating new production practices			
Impact on farmers: flexibility in land use & management			
Impact on crop commodity prices			
Impact on other farmers (e.g., if land was used for grazing, other)			
Impact on land purchase prices			
Availability of Federal/State incentives			
Other economic factors of biomass production			

Annual/Perennial Biomass (non-woody) for Heating or Electricity

Economic Dimensions Matrix 2: Processing and Converting the Biomass

ECON 2

extension more mind reach	Facility development: Environmental Impact	Facility operation: Environmental Impact (note discharges)	Transportation of feedstocks to facilities & of products away from facility
Job Creation and employment characteristics			
Effect on labor market (wages, benefits)			
Direct economic impact			
Secondary and induced economic impacts			
Changes in local tax base and land prices			
Cost to community (incentives), infrastructure development			
Profits/Risks for local investors			
Risk of adequate supply of biomass feedstock			
Impact on local economic development plans			
Impact on existing business			
Impact on tourism and recreational industries			

Annual/Perennial Biomass (non-woody) for Heating or Electricity

Social Dimensions Matrix 1: Producing the Biomass

SOC 1

extension more mind reach	Grow energy biomass crop on agricultural lands.	Grow energy biomass crop on ag. lands as conservation strips/ buffer zones	Convert Conservation reserve lands or marginal lands to energy biomass crop.
Land use changes (cultural, historical considerations)			
Impact on community character			
Impact of land-owner economic securityon community			
Distribution of benefits amongst participating land-owners			
Distribution of benefits to entire community			
Sustainability impacts - energy independence			

Annual/Perennial Biomass (non-woody) for Heating or Electricity

Social Dimensions Matrix 2: Processing and Converting the Biomass

SOC 2

extension more mind reach	Facility development: Environmental Impact	Facility operation: Environmental Impact (note discharges)	Transportation of feedstocks to facilities & of products away from facility
Community Decision Making: changes in cohesion & conflict			
Demand for increased community services			
Worker health effects/risks			
Changes in workforce development needs			
Traffic patterns and impacts			
Demand for emergency response capability			
Impact on sewerage services			
Noise impacts			
Air quality, dust particles, emissions			
Quality of life impacts			
Impact on community character			

Woody Biomass for Energy Production

Environmental Dimensions Matrix 1: Producing/Harvesting the Biomass

ENV 1

extension more mind reach	Grow woody biomass crop on marginal or fallow lands.	Selectively thinning or harvesting residual biomass from existing forest stands	Utilizing mill residues, urban tree and woody yard residues, brush piles, demolition waste
Biodiversity conservation			
Soil nutrient depletion			
Soil Health			
Water quality and quantity			
Carbon sequestration			
Land use			

Woody Biomass for Energy Production

Environmental Dimensions Matrix 2: Collecting/Refining the Biomass

ENV 2

eXtension more mind reach	Aggregating and transporting feedstocks and energy products to and from a bio-refining facility	Constructing a new facility or converting an existing one	Operating and maintaining a bio-refining facility
Traffic, additional road construction			
Spread of disease/pests			
Odors			
Air quality (emissions, particulate matter, dust)			
Noise			
GHG emissions			
Water quality and quantity			
Waste disposal, processing			

Woody Biomass for Energy Production

Economic Dimensions Matrix 1: Producing/Harvesting the Biomass

ECON 1

extension more mind reach	Grow woody biomass crop on marginal or fallow lands.	Selectively thinning or harvesting residual biomass from existing forest stands	Utilizing mill residues, urban tree and woody yard residues, brush piles, demolition waste
Direct start up costs			
Medium & long term profit potential			
Economic risk/volatility of commodity market			
Impact on land owners: flexibility in land use & management			
Impacts on existing forest product industries			
Impact on crop land prices			
Availability of Federal/State incentives			
Other economic factors of biomass production			

Woody Biomass for Energy Production

Economic Dimensions Matrix 2: Collecting/Refining the Biomass

ECON 2

extension more mind reach	Aggregating and transporting feedstocks and energy products to and from a bio-refining facility	Constructing a new facility or converting an existing one	Operating and maintaining a bio-refining facility
Job Creation and employment characteristics			
Effect on labor market (wages, benefits)			
Direct economic impact			
Secondary and induced economic impacts			
Changes in local tax base and land prices			
Cost to community (incentives), infrastructure development			
Profits/Risks for local investors			
Impact on local economic development plans			
Impact on existing business			

Woody Biomass for Energy Production

Social Dimensions Matrix 1: Producing/Harvesting the Biomass

SOC 1

extension more mind reach	Grow woody biomass crop on marginal or fallow lands.	Selectively thinning or harvesting residual biomass from existing forest stands	Utilizing mill residues, urban tree and woody yard residues, brush piles, demolition waste
Land use changes; aesthetics			
Impact on community character			
Impact of land-owner economic security on community			
Distribution of benefits amongst participating land-owners			
Distribution of benefits to entire community			
Sustainability impacts - energy independence			

Woody Biomass for Energy Production

Social Dimensions Matrix 2: Collecting/Refining the Biomass

SOC 2

extension more mind reach	Aggregating and transporting feedstocks and energy products to and from a bio-refining facility	Constructing a new facility or converting an existing one	Operating and maintaining a bio-refining facility
Community Decision Making: changes in cohesion & conflict			
Demand for increased community services			
Changes in workforce development needs			
Traffic patterns and impacts			
Noise impacts			
Air quality, dust particles, emissions			
Quality of life impacts			
Aesthetics of facilities within community			

Corn Grain Ethanol

Environmental Dimensions Matrix 1: Producing/Harvesting the Feedstock

ENV 1

extension more mind reach	Increase corn prdn. on current ag. lands through intensification	Increase corn prdn. on current ag. lands through displacement of other crops	Convert other lands to croplands (select: CRP, grazing, marginal)
Biodiversity conservation			
Soil nutrient depletion			
Soil Health			
Water quality and quantity			
Carbon sequestration			

Corn Grain Ethanol

Environmental Dimensions Matrix 2: Processing and Converting the Feedstock

ENV 2

extension more mind reach	Facility development: Environmental Impact	Facility operation: Environmental Impact (note discharges)	Transportation of feedstocks to facilities & of products away from facility
Impacts on wetlands, forests, other natural assets			
Traffic, additional road construction			
Water quality and quantity			
Waste storage, processing, and disposal			
Air quality (emissions, particulate matter, dust)			
Odors			
Noise			
GHG emissions			
Energy use; potential for conservation or cogeneration			

Corn Grain Ethanol

Economic Dimensions Matrix 1: Producing the Feedstock

ECON 1

extension more mind reach	Increase corn prdn. on current ag. lands through intensification	Increase corn prdn. on current ag. lands through displacement of other crops	Convert other lands to croplands (select: CRP, grazing, marginal)
Direct start up costs			
Medium & long term profit potential			
Economic risk/volatility of commodity market			
Impact on farmers: cost of learning/ integrating new production practices			
Impact on farmers: flexibility in land use & management			
Impact on crop commodity prices			
Effect on commodity prices of other crops			
Economic impact on other farmers (livestock)			
Impact on land purchase prices			
Availability of Federal/State incentives			
Other economic factors of biofuel corn production			

Corn Grain Ethanol

Economic Dimensions Matrix 2: Processing and Converting the Feedstock

ECON 2

extension more mind reach	Facility development: Environmental Impact	Facility operation: Environmental Impact (note discharges)	Transportation of feedstocks to facilities & of products away from facility
Job Creation and employment characteristics			
Effect on labor market (wages, benefits)			
Direct economic impact			
Secondary and induced economic impacts			
Changes in local tax base and land prices			
Cost to community (incentives), infrastructure development			
Profits/Risks for local investors			
Risk of adequate supply of biomass feedstock			
Impact on local economic development plans			
Impact on existing business			
Impact on tourism and recreational industries			

Corn Grain Ethanol

Social Dimensions Matrix 1: Producing the Feedstock

SOC 1

extension more mind reach	Increase corn prdn. on current ag. lands through intensification	Increase corn prdn. on current ag. lands through displacement of other crops	Convert other lands to croplands (select: CRP, grazing, marginal)
Land use changes (cultural, historical, considerations)			
Impact on community character			
Impact of land-owner economic securityon community			
Distribution of benefits amongst participating land-owners			
Distribution of benefits to entire community			
Sustainability impacts - energy independence			
Anticipated impact on international markets			
Anticipated impact on food availability internationally			

Corn Grain Ethanol

Social Dimensions Matrix 2: Processing and Converting the Feedstock

SOC 2

extension more mind reach	Facility development: Environmental Impact	Facility operation: Environmental Impact (note discharges)	Transportation of feedstocks to facilities & of products away from facility
Community Decision Making: changes in cohesion & conflict			
Demand for increased community services			
Worker health effects/risks			
Changes in workforce development needs			
Traffic patterns and impacts			
Demand for emergency response capability			
Impact on sewerage services			
Noise impacts			
Air quality, dust particles, emissions			
Quality of life impacts			
Impact on community character			

Anaerobic Digestion

Environmental Dimensions Matrix 1: Biomass 'Collection' and Facility Operation

ENV 1

extension more mind reach	Utilizing existing animal manure – from farm or region	Increased utilization of high energy content feedstocks (cafateria waste, whey, glycerine syrup, stillage, etc)	Facility development and operation of the digester and related infrastructure, including transportation infrastructure
Soil nutrient balance			
Soil Health			
Water quality and quantity			
Air emissions, air qualty, odors			
Greenhouse gas emissions			
Energy use			
Noise			
By-product disposal, processing			

Anaerobic Digestion

Economic Dimensions Matrix 1: Biomass 'Collection' and Facility Operation

ECON 1

extension more mind reach	Utilizing existing animal manure – from farm or region	Increased utilization of high energy content feedstocks (cafateria waste, whey, glycerine syrup, stillage, etc)	Facility development and operation of the digester and related infrastructure, including transportation infrastructure
Start up costs for farmers/ community members			
Medium & long term profit potential			
Economic risk/volatility with product markets			
Impact on farmers: flexibility in land use & management			
Long term economics of facility construction and operation			
Impact on land purchase/rental prices			
Impact on farm structure/size			
Community economic impacts - jobs & additional spending			
Cost to community (incentives, infrastructure development)			
Changes to tax base			
Federal/State economic incentive programs			

Anaerobic Digestion

Social Dimensions Matrix 1: Producing the Feedstock (manure, other)

SOC 1

extension more mind reach	Utilizing existing animal manure – from farm or region	Increased utilization of high energy content feedstocks (cafateria waste, whey, glycerine syrup, stillage, etc)	Facility development and operation of the digester and related infrastructure, including transportation infrastructure
Landscape changes; aesthetics			
Landscape changes: equity & distribution of costs/benefits			
Landscape changes; sense of community & identity of community			
Farmer livelihood effects; impact on community			
Impact on farm structure/size			
New management practices			
Supply chain issues			
Equity of access: is technology available to all producers?			

Anaerobic Digestion

Social Dimensions Matrix 2: Processing and Converting the Feedstock

SOC 2

extension more mind reach	Utilizing existing animal manure – from farm or region	Increased utilization of high energy content feedstocks (cafateria waste, whey, glycerine syrup, stillage, etc)	Facility development and operation of the digester and related infrastructure, including transportation infrastructure
Community Decision Making: changes in cohesion & conflict			
Changes in labor force; community services (schools, health care)			
Changes in labor force; workforce development needs			
Changes in need for emergency response capacity			
Impact on road construction and maintenance			
Impact on sewerage services			
Siting issues: impact on quality of life			
Transportation changes: impact on quality of life			
Impact of related infrastructure development (e.g. pipelines)			

Wind Energy

Environmental Dimensions Matrix 1: Wind Tower and Transmission Line Siting & Construction

ENV 1

eXtension more mind reach	Company owned wind turbines on privately owned property (incl. ag. lands)	Company owned wind turbines on public lands (e.g., offshore)	Privately owned wind tower (for individual assessment)
Changes in land use for property owner and at regional scale			
Soil health			
Fragmentation of land			
Biodiversity conservation; species habitat and range (flora/fauna)			
Water quality and quantity, impact on wetlands, hydrology			

Wind Energy

Environmental Dimensions Matrix 2: Wind Tower and Transmission Line Operations

ENV 2

extension more mind reach	Company owned wind turbines on privately owned property (incl. ag. lands)	Company owned wind turbines on public lands (e.g., offshore)	Privately owned wind tower (for individual assessment)
Changes in use of agricultural & forest land; impact on field contiquity			
Fragmentation of land – impact on farming practices			
Impact on migratory bird populations			
Impact on other wildlife (biodiversity, population size)			
Impact on GHG emissions (CO_2 & N_2O)			
Impacts of herbicide use – transmission line rights of way			
Health concerns: impact on humans and animals			

Wind Energy

Economic Dimensions Matrix 1: Wind Tower and Transmission Line Siting & Construction

ECON 1

extension more mind reach	Company owned wind turbines on privately owned property (incl. ag. lands)	Company owned wind turbines on public lands (e.g., offshore)	Privately owned wind tower (for individual assessment)
Direct startup costs for land-owners			
Federal/State economic incentive programs			
Availability of viable power company that will buy energy			
Impact on land owners: loss of land in production			
Impact on land owners: flexibility in land use & management			
Impacts on existing businesses/ farms - profitability			
Cost of transmission line and effect on consumer utility rates			
Direct economic impacts – jobs			
Indirect economic impacts – additional spending in community			

Wind Energy

Economic Dimensions Matrix 2: Wind Tower and Transmission Line Operations

ECON 2

extension more mind reach	Company owned wind turbines on privately owned property (incl. ag. lands)	Company owned wind turbines on public lands (e.g., offshore)	Privately owned wind tower (for individual assessment)
Direct and indirect economic impacts (maintenance, operation)			
Federal/State economic incentive programs – stability, policy changes			
Medium & long term profit potential for land owner			
Changing dynamics of wind markets			
Risk management impact			
Quality, quantity of electricity available for businesses, residents			
Equity of power purchase agreements			
Long-term costs of equipment maintenance			

Wind Energy

Social Dimensions Matrix 1: Wind Tower and Transmission Line Siting & Construction

SOC 1

	Company owned wind turbines on privately owned property (incl. ag. lands)	Company owned wind turbines on public lands (e.g., offshore)	Privately owned wind tower (for individual assessment)
Siting issues: impact on quality of life (e.g., noise, disturbance)			
Landscape changes; sense of community and aesthetics			
Appropriateness of public subsidies			
Community Decision Making: changes in cohesion & conflict			
Community understanding of development process; transparency			
Equity: distribution of costs and benefits			
Equity: Land contract terms (lease agreement, sale, easements)			
Neighbors willingness to grant access: power lines, easements?			

Wind Energy

Social Dimensions Matrix 2: Wind Tower and Transmission Line Operations

SOC 2

extension more mind reach	Company owned wind turbines on privately owned property (incl. ag. lands)	Company owned wind turbines on public lands (e.g., offshore)	Privately owned wind tower (for individual assessment)
Energy independence and energy security			
Community Decision Making: changes in cohesion & conflict			
Equity: distribution of costs and benefits (medium/long-term)			
Equity: does 'wind shadow' prevent development of future projects?			
Impact on future development patterns; (for example, tourism)			
Neighbors willingness to grant access: power lines, easements?			

Discussion Guide

The following questions can be used to guide discussions about impacts of biomass production, harvest, processing, and conversion. There are three sets of questions: the first set aligns with the matrices for annual/perennial biomass, woody biomass, and corn grain ethanol. The second set of questions corresponds to the anaerobic digestion matrix. The third set of questions corresponds to the wind energy matrix.

Biomass (annual, perennial and woody)

Biomass Production and Harvest

Environmental Questions:

Biodiversity conservation: How will biomass production and harvest activities impact plant species mix? How will biomass production and harvest activities impact wildlife habitat and food availability?
Soil nutrient depletion: How will biomass production and harvest activities impact nutrient availability and organic matter of soils? Will harvest activity cause compaction, erosion or run-off?
Soil health: How will harvesting activity cause changes to soil health? Consider ways that potential impacts to soil health can be mediated or buffered.
Water quality and quantity: How will biomass production and harvest activities impact groundwater or surface water quality or quantity?
Carbon sequestration: How will biomass production and harvest activities either reduce or increase the amount of carbon sequestration occurring from cropland? Consider the ways crops or residues are harvested, and ways to maximize sequestration.
Land use: How will biomass production and harvest activities impact the amount of land in agriculture, forest, or CRP land and the health of these lands?

Economic Questions:

Direct start up costs including technology and skill investments: Will growing or harvesting of biomass require specialized equipment? Will growers need new skills to manage agricultural lands, woodlots or forests for biomass?

Medium & long term profit potential: How long will it take for land owners/managers to realize a profit on their investment?
Economic risk/volatility of commodity market: Is there anticipated volatility in the biomass market?
Impact on farmers: **cost of learning & integrating new production practices**: Will farmers need to learn new production, establishment, and harvesting practices? Will land management practices change? (e.g., rotations, buffer zones, integration of annual & perennial crops)
Impact on farmers: flexibility in land use & management: Once land is dedicated to biomass production, is the land-owner locked in to that crop, management strategy or market?
Impacts on crop commodity prices: Will increased production of biomass (specifically dedicated bioenergy crops) have an impact on the commodity price of other crops?
Impact on other farmers: How will demand for biomass impact the supply of food, fiber, or feed? Will grazing lands be converted to growing dedicated bioenergy crops? What impact will this have on farmers who rent land at lower prices for grazing?
Impacts on land purchase prices: How will increased demand for biomass impact land prices?
Availability of federal/state incentives: Are there federal or state incentives (e.g., BCAP or similar programs) that make dedicating land to biomass for energy production economically feasible?
Other economic factors of biomass production: Are there any local or regional potential economic impacts of producing biomass for energy production that have not yet been considered?
Impacts on existing forest product industries: How will demand for biomass energy production impact other forest product industries in the region?

Social Questions:

Land use changes (cultural, historical, neighborhood considerations): On a landscape level, will the increased production and harvesting of biomass have a significant impact on the landscape and people's relationship to the landscape?
Impact on community character: Are there potential conflicts around the use of agricultural lands, forests or woodlots for biomass for energy production?
Impact of land-owner economic security on community: How will potential improvement in economic security of land-owners impact the community as a whole?
Distribution of benefits among participating landowners: is the benefit equitable for participating land-owners?

Distribution of benefits to entire community: How will the non-farming community/non-land owning community benefit from changing land use practices associated with growing biomass for energy production?
Sustainability impacts – energy independence: How will growing or harvesting of biomass for energy production contribute to the community's goal of reducing imports of energy (fuel or electricity)? How will growing or harvesting of biomass for energy production contribute to the community's goal of reducing greenhouse gases?

Biomass Processing and Conversion

Environmental Questions:

Impact on wetlands, forests, and other natural assets: How will biomass processing and conversion impact existing wetlands, forests, and other natural assets, including ground and surface water.
Traffic, additional road construction: How will biomass processing and conversion impact traffic, road construction, and rail use?
Water quality and quantity: How will biomass processing and conversion impact municipal water resources? Is there potential for grey water to be recycled? Will water used in a production process be pre-treated before discharge? Where will waste water be discharged?
Waste storage, processing, and disposal: How are waste products from biomass processing and conversion processed? Will these be recycled? Are there potential by-products created from processing that can be utilized (e.g., ash)?
Air quality: Will biomass processing and conversion emit any particulate matter, dust, or other emissions that could affect human or animal health? What permitting applications are necessary? Will the industry utilize smokestack scrubbers?
Spread of disease/pests: How will biomass processing and conversion contribute to the spread or mitigation of the spread of undesired tree-borne diseases or pests?
Odors: Will biomass processing and conversion emit dangerous or unpleasant odors?
Noise: Will there be any significant increase or change in noise from biomass processing and conversion?
GHG emissions: Will biomass processing and conversion produce additional greenhouse gas emissions (from the transportation and processing/burning activities)?
Energy use; potential for conservation or cogeneration: Is there potential with the facility for conservation or co-generation? What will the energy balance of electrical production be? When feedstock production is taken into consideration, what is the life cycle analysis for energy use for production of energy from biomass feedstock?

Economic Questions:

Job creation and employment characteristics: (a) Existing job retention and creation: How will biomass processing and conversion affect the retention of existing jobs and the creation of new jobs? (b) Short-term versus long-term job creation: Will jobs created be short-term (e.g., construction) or long-term (e.g. new businesses for pellet furnaces, pelleting, trucking, facility operation, etc.)

Effect on local labor market including wages, benefits: How will new jobs from biomass processing and conversion affect the local labor market? Are the jobs likely to be paying high, living, or low wages?

Direct economic impact: How will biomass processing and conversion impact community economic development? (Job creation, increased spending, induced economic impact)

Secondary and induced economic impact: How will biomass processing and conversion impact demand for other local business goods/services? Will spending for biomass refining increase the number of dollars circulated locally? Is the community well-positioned to capture any new markets that a bioenergy industry might present? Will any increases in jobs likely be met with increased economic security, earning power, and household expenditures of labor force?

Changes in local tax base and land prices: What anticipated tax revenue will biomass processing and conversion bring in? Will there be any impact on land prices?

Cost to community (incentives, infrastructure development): Are biomass processing and conversion industries eligible for TIF financing? Is the community being asked to supply services (water, sewerage, other) or to develop any additional infrastructure?

Profits/risks for local investors: If a biomass processing and conversion industry is being financed by local investment capital, how risky is the investment? What mechanisms are in place to assure that investments can be recouped if the facility is not built or not operational? Is this level of risk healthy for the community?

Risk of adequate supply of biomass feedstock: Is there risk of inadequate supply of feedstock or temporary disruption of feedstock availability? Could the plant shut down or slow down for this reason? How would this impact the community? What backup feedstocks exist?

Impact on local economic development plans: Does the biomass processing and conversion facility fit with local economic development plans for the community? Will the community need to reevaluate its development plans?

Impact on existing businesses: Will the biomass processing and conversion facility have any impact (negative or positive) on existing businesses? Is there potential for conflict?

Impact on tourism and recreational industries: Will the biomass processing and conversion facility impact recreational industries, due to aesthetics of the plant, air quality, truck traffic, or other variables?

Social Questions:

Community decision making; changes in cohesion and conflict: How will biomass processing and conversion impact community cohesion? Will discussion, negotiation, and/or conflict have any impact on community character, cohesiveness, inclusivity, and/or patterns of social capital?

Demand for increased community services: How will any changes in employment patterns impact demand for social services (schools, health care, translation, emergency svcs.)? Does the community have the capacity to deliver these services?

Worker health effects/risks: How will biomass processing and conversion industries impact worker health (e.g., through emissions, exposure to hazardous substances, dangerous work assignments)?

Changes in workforce development needs: How will job creation impact work force training or retraining needs?

Traffic patterns and impacts: How will biomass processing and conversion impact traffic patterns and demand for road construction/maintenance?

Demand for emergency response capability: How will a biomass processing and conversion impact emergency response capacity? Are there risks of fire or hazardous spills?

Impacts on sewerage services: Will waste water or other effluents drain into the sewerage system? Is the system able to handle an increased load? Will biomass processing and conversion facilities have storm water management plans?

Noise impacts: Will biomass processing and conversion facilities cause any noise disturbance?

Air quality, dust particles, emissions: Are there emissions associated with biomass processing and conversion facilities? Have the developers taken care of necessary permitting applications? Will the industry utilize smokestack scrubbers?

Quality of life impacts: How will the existence of biomass processing and conversion facilities impact the quality of life for community residents?

Impact on community character: How will biomass processing and conversion facilities impact the landscape or sense of community? How will siting of facilities impact neighborhood aesthetics, neighboring institutions, facilities or operations, and property values?

Anaerobic Digestion

<u>Terms</u>:
Biogas = gas produced by the biological breakdown of organic matter through anaerobic digestion.
Digestate = the material remaining after anaerobic digestion of feedstock. Digestate is separated into solids (fiber) and filtrate (effluent). Digestate may be composted, used as animal bedding material, or pelletized for fertilizer.
Filtrate, effluent = the nutrient rich liquid by-product of the anaerobic digestion process

Biomass 'Collection' and Facility Operation

Environmental Questions:

Soil nutrient balance (including issues of phosphorus and nitrogen segregation and displacement): How will phosphorus be removed from the digestate? What is the plan for phosphorous (sale as fertilizer, export to other fields?) What by-products of the anaerobic digestion process will be returned to the soil (e.g., effluent, fiber, compost)? How will effluent be applied? Is there adequate land for spreading effluent? How will land managers assure adequate crop nutrition without excess nutrients?
Soil health: How will the diversion of manure for energy production, and changes in manure management and spreading, impact soil health? Will digestate be applied to fields, be used for bedding, or be exported out of the region? Will digestate be pre-treated before application to soils (e.g., composting to convert ammonia into organic, more stable forms of nitrogen)?
Water quality and quantity: How will the digester affect water quality and quantity? Will any increases in regional stocking rate of animal units impact water quality? Will effluent be pretreated to reduce levels of biochemical oxygen demand (BOD) and chemical oxygen demand (COD)?
Air emissions, air quality, odors: How will the digester impact odors associated with animal agriculture? Are there air quality issues that must be addressed with use of the digester? What emission control technologies will be implemented to control for nitrogen oxide gas? How will ammonium be managed?
Greenhouse gas emissions: How will the digester impact greenhouse gas emissions? Will any increases in regional stocking rate of animal units lead to increased GHGs?
Energy use: What energy sources are needed to operate the digester? Are there opportunities for utilizing heat from the process for combined heat and power benefits?

Noise: How will the digester impact noise and nuisance? Will there be noise associated with transport requirements for moving manure into a facility and by-products off the facility?
By-product disposal, processing: How is digestate being processed? What are digestate treatment options (addition of polymers, composting, other)?

Economic Questions:

Start up costs for farmers and community members: What are the costs to a farmer or community to establish an anaerobic digester, and for associated infrastructure? Who will bear these costs? Will farmers need to scale up their operations in order to make the facility cost-effective?
Medium & long term profit potential: How long will it take owners to realize a profit on their investment in the facility? How receptive are banks to financing these operations?
Economic risk/volatility of commodity market: Are there nearby markets for the biogas generated? Are these markets high value and stable? When dealing with utilities, will the utilities honor contracts for biogas at agreed upon rates when production is increased? Are there plans in place for generating added value from separated manure fiber? Is there potential to earn revenue by charging tipping fees for accepting off-farm food processing wastes?
Impact on farmers, flexibility in land use & management: Once a farm operation decides to operate an anaerobic digester, will the farmer be locked into a particular management strategy? Will this create a hardship for land owners?
Long term economics of facility construction and operation: Has the cost of long-term operation been factored into the anticipated payback schedule? What staffing will be required?
Impacts on land purchase/rental prices: How will the digester impact land values? Are there land availability issues that must be taken into account (e.g., land available for spreading or application of digestate)?
Impact on farm structure/size: Does the digester technology necessitate scaling up the farm operation and/or adding animal units? Do farmers have the economic capacity to expand, or the possibility of procuring loans for expansion? Do farmers have the management capacity to operate the digester and large-scale farm operations?
Community economic impacts – jobs and additional spending: Will the construction and operation of the anaerobic digester support new jobs, and at what wage structure? What impact will the availability of new jobs (either short-term or long-term) have on the community? Are any indirect economic benefits anticipated, such as increased spending in the community?

Cost to community (incentives, infrastructure development): Will the community/municipality incur any of the costs associated with facility or infrastructure development? Where will the financing come from (e.g., increased taxes)? How equitable is the distribution of costs for the development? Can the community bear anticipated and unanticipated costs (e.g., if cost of facility development is greater than anticipated?). Is the project eligible for TIF financing? Will the community be asked to supply services (water, sewerage, other) or to develop any additional infrastructure?
Changes to tax base: Will there be economic benefits accrued to the community through increased tax revenue from the business operating the digester?
Federal/state economic incentive programs: Are there federal or state incentives available that improve the economically feasibility of the anaerobic digester?

Social Questions (Matrix 1, farm level impacts):

Landscape changes; aesthetics: On a landscape level, will the anaerobic digestion facility have a significant impact on the landscape and people's relationship to the landscape?
Landscape changes: equity and distribution of costs/benefits: In the case of community digesters, how are costs/benefits distributed for participating farmers? Are the benefits distributed to the entire community or to a smaller sub-set of the community? Are the landscape changes borne by the entire community or a smaller sub-set of the community?
Landscape changes: sense of community and identity of community: If a farm, farms, or community are developing anaerobic digesters, how will this impact the sense of community and the identity of the community?
Farmer livelihood effects; impact on community: How will potential improvement in economic security of farmers impact the community as a whole?
Impact on farm structure/size: Does the digester technology privilege one size or structure of operation over others? Will the availability of incentives and/or technology privilege one size or structure of operation over others?
New management practices: Will farmers have access to training to safely operate digesters?
Supply chain issues: How will anaerobic digestion facilities impact supplies of farm inputs? How will by-products of the digestion process impact other farms?
Equity of access: Is the anaerobic digestion technology available to all producers? Is the Extension infrastructure equipped to train digester operators of all sizes and scales in safe operating procedures? Do all farm operators and/or digester operators have access to information about effective and safe digester operation?

Social Questions (Matrix 2, community level impacts):

Community decision making: **changes in cohesion and conflict:** Will an anaerobic digester affect community cohesion? Is there potential for conflict around the facility?
Changes in labor force; community services (schools, health care): How will changes in employment patterns (new jobs) impact demand for social services (schools, health care, translation, emergency svcs.)? Does the community have the capacity to deliver these services?
Changes in labor force; workforce development needs: How will changes in employment patterns (new jobs) impact demands for training or retraining the work force?
Changes in need for emergency response capacity: How will anaerobic digesters impact community emergency response capacity and infrastructure?
Impact of road construction and maintenance: If new roads (or pipelines) are required, has the community put in place a plan to minimize disruption caused by construction?
Impact on sewerage services: Are any additional sewerage services required due to the digester? Is the municipality responsible? Is the industry responsible? What regulations are in place guiding sewerage systems?
Siting issues: impact on quality of life: How will residents be impacted by the siting of the facility? Will there be any changes in noise, air pollution, dust, or other nuisance in the vicinity of the digester?
Transportation changes: impact on quality of life: Will collection, aggregation, and transport of materials have an impact on traffic patterns and roads? Will increased traffic impact some residents disproportionately?
Impact of related infrastructure development: How will the creation of supporting infrastructure impact neighbors and community residents? Could the siting of a facility be contentious due to neighboring institutions, facilities or operations?

Wind Energy

Wind Tower and Transmission Line Siting & Construction

Environmental Questions:

Changes in land use for property owner and at regional scale: How will the siting and construction of wind turbines and transmission lines impact land use change for individual property owners? How will a transition line impact land use at the regional scale? Will these impacts be short-term (during construction) or long-term (continuous during operation)?

Soil health: Will construction activities cause compaction, erosion, or run-off? Are there any long-term soil health issues? Consider ways that potential impacts on soil health can be mediated or buffered.

Fragmentation of land: Will the siting and construction of wind turbines and transmission lines cause fragmentation of land that could lead to a more limited habitat and range, or a restriction of movement for species? Can any detrimental impact be mitigated in any way (e.g., habitat corridors, change in siting)?

Biodiversity conservation: Are the wind turbines sited in zones where birds are likely to fly during migration? How will transmission lines impact animal species well-being? Are there other anticipated impacts on plant or animal species mix, wildlife habitat and food availability, or prevalence of invasive or pest populations?

Water quality and quantity, impact on wetlands, hydrology: How will the siting and construction of wind turbines and transmission lines impact wetlands or affect hydrology (temporarily, due to construction or permanently, due to siting)? Will construction activities contribute to run-off to waterways? Note the different impacts of transmission line construction on different regions, across the length of the line.

Economic Questions:

Direct start up costs for land owners: What costs will be incurred by the land owner in construction of wind turbines or transmission lines? How will loss of revenue from agricultural fields during the construction phase be offset?

Federal/state economic incentive programs: Are there federal or state incentives that make dedicating land to wind turbine and transmission line construction economically feasible for land owners? (or are incentives tied up with the electricity generator or commission?)

Availability of viable power company that will buy energy: Prior to entering into agreements to lease or sell land for construction of wind turbines or transmission lines,

have land-owners assured that the electricity generated will be purchased by a viable power company?
Impact on land owners: loss of land in production: How will development of wind turbines and/or transmission lines impact income potential from agriculture? Will the arrangements with turbine owners/power generators assure long term income potential?
Impact on land owners: flexibility in land use and management: How will development of wind turbines and/or transmission lines impact land-owner management strategies?
Impacts on existing businesses/farms – profitability: How will the development of wind turbines and/or transmission lines economically impact local businesses and farms? Will power from wind turbines be made available to the community or exported out of the area?
Cost of transmission line and effect on consumer utility rates: How will the costs of developing new transmission lines be covered? Will consumer utility rates go up? Will state and federal incentive programs defray some of the costs?
Direct economic impacts – jobs: How will new construction jobs impact the local community? Is the community prepared to train the workforce in jobs related to a green economy, such as turbine installation and maintenance?
Indirect economic impacts – additional spending in the community: How will new construction and installation jobs associated with wind energy impact spending in the community and demand for other goods and services?

Social Questions:

Siting issues; impact on quality of life (e.g. noise, disturbance): How will the siting and construction of wind turbines and transmission lines impact noise or disturbance, as perceived by neighbors and other residents?
Landscape changes; sense of community and aesthetics: On a landscape level, how will the siting and construction of wind turbines and transmission lines impact the landscape and people's relationship to the landscape?
Appropriateness of public subsidies: Are residents in agreement about the appropriateness and use of public subsidies for development of wind energy?
Community decision making: changes in cohesion & conflict: Are there potential conflicts around the use of agricultural land or public lands for siting wind turbines? Will discussion, negotiation, and/or conflict have any impact on community character, cohesiveness, inclusivity, and/or patterns of social capital?
Community understanding of development process; transparency of process: Do landowners have access to information about the development process? Are all those individuals affected included in decision making regarding siting of facilities and

transmission lines, and able to understand contract arrangements? How can residents assure transparency in the workings of the wind turbine operators and electric utilities?

Equity: distribution of costs and benefits: How are the costs and benefits of wind turbine and transmission line construction distributed (to land owners and to other community residents)?

Equity: terms of land contract with developer (lease agreement, sale, and easements): How are contracts being negotiated? Are contracts being negotiated equitably and transparently?

Neighbors' willingness to grant access for power lines, honor wind easements: To what extent is the ability of participating landowners to generate a consistent power supply contingent on neighbors honoring wind easements? If so, are neighbors willing to enter into such agreements, and likely to abide by them? Will neighbors be asked to grant access for power lines, and if so, under what conditions?

Wind Tower and Transmission Line Operations

Environmental Questions:

Changes in use of agricultural and forest land: impact on field contiguity: How will the operation of wind turbines impact contiguity of agricultural and forest lands? How will any fragmentation and loss of field and forest contiguity affect species range and migration and/or hydrology?

Fragmentation of land – impact on farming practices: Will the operation of wind turbines and transmission lines have an impact on agricultural and forest land management? What lands will be taken out of agricultural production? Will any loss of production be offset with improved revenue to land owners? Will any loss of production affect the agricultural enterprise of the area?

Impact on migratory bird populations: How will the operation of wind turbines and transmission lines impact migratory bird populations?

Impact on other wildlife (biodiversity, population size): How will the operation of wind turbines and transmission lines impact biodiversity and population size of flora and fauna in ways other than those mentioned for construction of the lines? Are there ways to mitigate potential negative impacts on flora and fauna?

Impacts on GHG emissions (CO_2 & N_2O): How will the operation of wind turbines impact greenhouse gas emissions? How much energy can be generated for the benefit of the locality, the region (thereby offsetting GHG emissions from other sources)?

Impacts of herbicide use – transmission line rights of way: What management practices are anticipated in the maintenance of the transmission line (mowing, herbicide use, and other practices)? How will these practices impact farms, wildlife, and flora?

Health concerns: impact on humans and animals: How will the operation of wind turbines and transmission lines impact human and animal health? How will potential stray voltage be monitored and managed? How will safety considerations for maintenance and operation of the turbines be incorporated into standard operating procedures?

Economic Questions:

Direct and indirect economic impacts (maintenance, operation): How will the operation of wind turbine(s) impact the economics of the community (e.g., long term job creation, increased spending within the community).

Federal/state economic incentive programs – stability, changes in policy: Is the economic viability of wind power dependent on federal or state incentive programs? Are these incentives likely to continue? Are incentives necessary beyond the start-up phase?

Medium- & long-term profit potential for landowner: Will the landowner continue to benefit, over time, from the leasing or sale of land for wind turbines or transmission lines, or from the operation of the turbine and sale of power to the utility? Does the contract arrangement allow the landowner a percentage of the profits from power generated? What are the terms of the contract for medium- and long-term profit potential, and for renegotiation of the lease?

Changing dynamics of wind markets: As the renewable energy market matures, will wind power remain economically viable? Is the anticipated long-term market for sales of electricity generated by wind power stable and reliable?

Risk management impact: How will risk in energy markets be mitigated? What assurances will the landowner and community have to assure that the long-term investment will be operational and profitable into the future? What mechanisms are in place to mitigate risk associated with the long-term viability of the wind turbine operating company and electricity provider?

Quality, quantity of electricity available for businesses, residents: Will the electricity generated be available to the community at affordable rates? Is the service reliable and consistent? What mechanisms are in place to store electricity during times of surplus wind and minimal demand, and to make it available during times of peak demand?

Equity of power purchase agreements: How are power purchase agreements negotiated with individual land owners/wind turbine operators? Are the contracting arrangements transparent and equitable? Is the utility willing to negotiate collective bargaining on contracts?

Long-term costs of equipment maintenance: Who will bear the costs of long-term maintenance and operation of the turbine (s)? (e.g. landowner, utility, community) Have long-term equipment maintenance costs been factored in to the feasibility plan?

Social Questions:

Energy independence and energy security: How will the operation of the wind turbines contribute toward energy independence goals? Will the community gain in energy security due to operation of wind turbines and/or sale of electricity to a utility?

Community decision making: changes in cohesion & conflict: Are there potential conflicts around the operation of wind turbines? Will discussion, negotiation, and/or conflict have any impact on community character, cohesiveness, inclusivity, and/or patterns of social capital?

Equity: distribution of costs and benefits (medium-/long-term): How are the costs and benefits of wind turbine and transmission line operations distributed (to land owners and to other community residents)?

Equity: does 'wind shadow' prevent neighbors from developing future projects?: Are those land owners who do not site wind turbines on their land during an initial phase of wind development precluded from siting wind turbines on their property in the future, due to the wind shadow that results from operation of a turbine?

Impact on future development patterns; ability to support other assets for economic development (for example, tourism): How will the operation of wind turbines impact future economic development? How might the wind turbines support community goals for auxiliary economic development? How will the operation of wind turbines impact recreational industries?

Neighbor agreement: are neighbors willing to grant access for power lines, honor wind easements?: Are neighbors willing to grant access for maintenance and enhancement of turbines and power lines? Have long-term wind easement arrangements been worked into contracts with neighbors who control access?

Community Assessment Checklist for Renewable Energy

In addition to "triple bottom line" impact considerations, communities will need to address various other areas of inquiry in their assessment of renewable energy generation opportunities. The following checklist introduces six key topics that communities should consider as part of an assessment process.

1. Public Policy

Many communities have some level of policies in place to help guide renewable energy project decision-making. For example, development should be aligned with the communities comprehensive plan and zoning code. Federal, state and local policies may provide other types of regulations as well as incentives for renewable energy projects.

1. Does your community want a renewable energy project?
2. Have you developed renewable energy policies?
3. Do you have a comprehensive energy plan?
4. Does your comprehensive plan address energy?
5. Does your community understand existing policies that may influence renewable energy development?
6. Has your community audited their permitting process to see if there are contradictions and inconsistencies? From an outsider perspective, can one understand the rules?
7. Have you engaged the environmental and business communities? Raised awareness and understanding?
8. Have you taken steps to get different interest groups involved?
9. Do your current policies address long-term sustainability issues? Equity issues?
10. Are there policies in place to ensure a viable long-term supply of feedstocks for bioenergy?
11. Are there adequate resource protection, preservation, and effective conservation measures in place?

2. Organizational Capacity

Whether a project is proposed by a community or a developer, the success of proposed renewable energy projects is often contingent on sufficient organizational capacity at the local level. Communities that are proactively engaged in discussions around appropriate renewable energy options are better prepared to address potential project proposals or to identify potential community-owned projects.

1. Is there a task force, committee, or other network actively looking at renewable energy opportunities in your community?
2. Are resources available to make this a priority? To take an aggressive stance?
3. Is there an interdisciplinary group working on renewable energy opportunities across your county, region, and state? Are they actively networking with decision-makers?
4. Have you inventoried human assets available in your community?
5. What local expertise exists? What needs to be brought in?
6. Is there a planning process in place?

3. Cooperative Development and Leadership

Recognizing that energy projects can be complex, and that a range of regulatory agencies are involved, it is important to engage representatives of various agencies in discussions about the project from an early stage of development.

1. From the development side, are there one or more people who are an active liaison with higher levels of government?
2. Are the Departments of Agriculture, Commerce, Transportation, Natural Resources, and Workforce Development involved in discussions about the project?
3. Are decision-makers aware of available programs such as grants, incentives, etc?
4. Are decision-makers proactively engaging regulatory agencies?
5. Are economic development directors and local officials attending seminars and workshops to learn about renewable energy developments?

4. Developer and Technology History

A number of new and promising biomass process technologies are entering the field these days; many are in the pilot stages while others, like corn grain ethanol, are more mature and have undergone efficiency improvements. The developer should provide a history of the process technology to be used, as well as a list of other existing facilities of the proposed project size using this technology.

1. How mature is the technology being utilized to process the biomass into fuel?

2. What are the environmental impacts of these processes (odor, particulates, noise, etc.)?
3. Who is the management team? What is their experience?
4. Who will actually own the facility after construction is completed?
5. Will the owner be operating the facility or will this be contracted to another party?
6. Does the technology vendor(s) provide performance guarantees? If so, do they have the financial strength to back these up?

5. Community Support

Nothing can sink a renewable energy project as effectively as community opposition. Opposition can be based on any number of factors, from concern about environmental, economic, and social impacts to philosophical rejection of a technology or process. Community leaders can benefit from engaging community residents in the assessment of proposed renewable energy developments, and from understanding concerns and proactively seeking means to mitigate concerns.

1. Is there community support for the project?
2. Who will own and operate the facility?
3. What has the developer done to build community support for the project?
4. What impacts or problems have occurred in other projects of the same type and how will the developer address these issues?
5. Does the developer need or want community investment in the facility?
6. How dependent is the developer on access to local investment capital in order to fund the project.
7. Is this a one-time project for the developer or does the developer have multiple projects in a number of locations?
8. What is the financial strength of the developer?
9. Where will the facility be located in relation to the community's population?
10. Will this create any unintended problems?

6. Siting, Infrastructure, and Operational Considerations

Establishing a bioenergy facility can have long-term positive and/or negative impacts on a community. Careful consideration to siting can mitigate negative impacts and built community support for the process. Appropriate infrastructure must be available, or the community must commit to developing the necessary infrastructure.

1. Where will the bioenergy facility be located, and is there zoning to support that location?
2. Will the facility employ workers from within the community or rely on new workers coming into the community?
3. Will the facility pay local taxes?
4. Will there be the need to develop additional infrastructure (water, sewer, roads, rail, emergency response capability, etc.)?
5. Will the facility contribute to local infrastructure development, quality of life, or community charities?
6. How will the facility change the quality of life?
7. Will the facility support existing businesses and industries?
8. What is the potential for long-term economic viability?
9. What types of risks might the facility present to the community?

This checklist was derived from the following articles:

Dane, A. et al., “Preparing for the Bio-Economy,” UW Extension.

Walsh, P. “Proposed Community Bio-Fuels Projects in Wisconsin – How to Gauge Their Chance for Success,” UW Extension.

Liebl, D. “Siting Industrial Facilities – a Community Checklist,” UW Extension, Solid and Hazardous Waste Education Center.

Community Participation: Lessons Learned

The following is a list of ways to encourage community involvement in decision-making concerning renewable energy development. The list was derived from conversations with people who have researched the social components of renewable energy development and with individuals who have been involved in either the opposition to or development of renewable energy projects.

Key Lessons Learned:

Hold community conversations about energy use, conservation, and renewable energy generation *prior* to making decisions about a specific project.

- Information sessions can provide a context to learn about and discuss issues for the community, including:
  - what is renewable energy/bioenergy,
  - what are energy conservation and/or generation goals for this community,
  - what are the pros and cons for various forms of renewable energy?
- Information sessions, public dialogue forums, and other discussion settings provide opportunities for community members to propose specific activities to conserve or generate energy:
  - how can our community move toward energy conservation and/or energy generation,
  - what impact would specific types of energy generation have on our community (social, economic, environmental),
  - what types of initiatives or projects would fit with community goals and plans?

Communicate information about specific proposals using an open and transparent process.

- Develop a process to engage the community in discussion about specific proposals
  - Early opportunities for discussion provide a safe context for issues to be aired and can help identify areas where further studies are needed (e.g., feasibility, engineering, environmental impact, etc.).
  - County level hearings are for permitting, and that's too late in the process for getting effective public participation.

- Conflict of interest (real or perceived) must be dealt with openly (individuals should excuse themselves if there is a conflict of interest).

Public meetings should be well organized and offer a systematic way for people to comment

- Well-organized public comment process/protocol allows community residents to participate in ways that are recognized and understood.
- Make sure that there is a formal way to take comment, and that this process is followed in an organized and consistent manner.
- Have comment cards for those who do not want to make oral comments at meeting.
- Develop a process to look at social and environmental impacts systematically.

Conduct the business of project proposal review with professionalism and due diligence

- Board members should conduct business and interactions with professional demeanor.
- Opposition comments or organizations should be listened to and taken seriously.

Pre-existing zoning plans are a pre-requisite for an open decision-making process

- Does the town have a zoning plan? Does a particular proposal fit with the existing zoning plan? If a plan is already in place, new facilities should meet the specifications of that plan.
- What is the rezoning process, if this is necessary?

Allow for negotiation around difficult issues

- The community is an equal partner in negotiation with a developer; community leaders should demand that community concerns are addressed.
- Provide means to assure community about points of concern
  - Specify chief community concerns and negotiate to assure that potentially negative impacts are mitigated.
  - Community Benefits Agreements can be established to provide assurances.