Final Report

Generating Economic Development

An Energy Study of U.P. Industrial Parks

CUPPAD, MTU 2016

Award # 06-06-05950

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All the businesses willing to take the time to meet with the project team to discuss operations and energy.

Project Team

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EXECUTIVE SUMMARY

Economic development professionals, government officials, and businesses across Michigan's Upper Peninsula (the U.P.) have collectively determined addressing energy challenges as a priority for job growth in the Region. The purpose of the "Generating Economic Development" project was to study and research the cost and feasibility of implementing alternative energy solutions at the industrial park scale across the U.P. Seven (7) industrial parks were chosen for the purpose of this study. This report seeks to fulfill three objectives –

1. Present a current snapshot of the diversity in the U.P.'s energy consumers, energy infrastructure, rates, needs, challenges and opportunities.
2. Wherever possible, create a business case for alternative energy adoption for industrial park customers and commercial customers alike.
3. Make policy agnostic recommendations for industrial park managers, local Economic Development Organizations (EDO's), and local government to help secure long term energy cost savings to aid economic development and business retention.

Study Focus

The Michigan Public Service Commission defines "industrial" customers as businesses having at least 1MW (megawatt) of load for at least three consecutive months. Another useful distinction is that industrial customers are typically serviced at the transmission level and may own a portion of their transformer and distribution infrastructure. While industrial customers account for a significant portion of energy consumption in the U.P., most industrial park customers included in this study fall under the 'commercial' customer category.

While this focus on commercial businesses was not deliberate, it leverages a key insight - industrial customers have significant advantages over small and large commercial businesses in their ability to lower their energy costs. Due to their large consumption, they are able to secure competitive rate structures, either through negotiation with their utilities or exercising their Electric Choice option under current Michigan energy policy. They are more likely to have dedicated personnel on staff to routinely monitor their energy consumption and maximize efficiency of operations.

Indeed, this study revealed that many, if not most, businesses in these industrial parks recognize the value of energy savings, but few have made efforts to curb energy spending. Commercial customers in the Upper Peninsula account for nearly a quarter of all electricity in the U.P. Region, and pay nearly 27% of all electricity costs to the tune of $81 million every year. Indeed, the lack of widespread implementation of alternative energy technologies in the U.P. Region represents a 'market failure'.

Key Findings

This project explored many options for making energy costs more affordable to businesses in industrial parks. For most businesses, the cost of electrical energy far exceeded the cost of heating; so low cost electrical generation is the primary need in U.P. industrial parks. Although there are many options for the self-generation of electricity, the dominating factors in low adoption are reliability and investment risk.

Businesses depend on a reliable electric supply. Lights come on and machines are expected to start-up with the flick of a switch. Current grid supplied electricity is very reliable. Businesses count on and depend on this reliability for scheduling and production. Businesses also require no investment to be a utility customer.

There appears to be a fear of reduced reliability when a business takes electricity generation into its own hands. For the vast majority of people and businesses, electricity is not well understood and borders on magic – you cannot see it, it is everywhere, and it can kill you if you don't know what you are doing. In order to have a sizable portion of self-generated electricity, a significant investment is required not only in equipment but also in trained personnel.

From a purely technical and economic standpoint, we find that alternative energy technologies are viable in most industrial parks in the U.P. Based on extensive interviews with industrial park businesses, local planners, economic development agencies and industrial park managers, we observe that adoption of alternative energy technologies is universally not a priority for most businesses.

Many companies expressed no interest in investing in an area which was not part of their core business. Without qualified operators and maintainers, reliability is at risk. On small scales (<20KW), complete packages for solar and wind can provide a reduction in electrical costs without the need for bringing on additional personnel. As systems get larger and more complex, with integration to existing equipment and parallel operation with the utility, the need for dedicated energy personnel becomes mandatory. Businesses question where they will find these qualified people and how much it will cost and how much they will save in energy costs; versus paying for the high reliability utilities companies offer today.

We observe that a massive barrier to alternative technology adoption is the uncertainty in policy and legislative landscape. All businesses expressed strong reluctance in assuming the risk of making any capacity investments in face of unpredictable and rapid changes in energy policy. The future of the electric utility industry is unknown with all the federal and state regulatory proposals and plans currently on the table. Indeed, indulging in any cost/benefit analysis for each alternative energy technology for each industrial park is likely to become outdated and irrelevant in as little as six months, when Michigan legislature is expected to overhaul Michigan's energy policy. Then throw in the rapidly changing technology and the future cost of energy becomes extremely difficult to predict. Financial managers seem wary to make substantial investments in alternative energy strategies when there is no clear short term return-on-investment.

With this background, it is not surprising that the single most common solution adopted by businesses in U.P. industrial parks reduce energy costs is also most policy agnostic – energy efficiency. Regardless of changes in legislation or advances in alternative energy technology, using less energy quite simply means reduced energy costs.

We find common themes among businesses that have maximized energy savings through energy efficiency –

- A proactive approach to monitoring energy consumption, rates and costs. Early adopters of energy efficiency in U.P. industrial parks demonstrate a thorough understanding of their itemized monthly energy bills and the effects of energy rates on long term operational cost of running their business. When presented with opportunities for retrofitting or facility expansion, they have prioritized energy efficient lighting and equipment.
- Leveraging support from external agencies and programs. At many U.P. businesses, successful adoption of energy efficient technologies was prompted by an energy audit, initiated either by a professional energy efficiency contractor or energy optimization programs offered through their utilities. When presented with a clear business case for investing in energy efficiency technologies to reduce long term energy costs, we observe that businesses are quick, willing and eager to adopt.

In light of this, the single strongest recommendation for businesses in U.P. industrial parks is to develop a better understanding of energy costs, and to aggressively pursue energy efficiency. Several barriers may limit businesses from following up on such recommendations. For some businesses, utility bills may be handled off-site at a central office. Many businesses might not be able to dedicate the manpower to continuously monitor energy use.

Therefore, planners and economic development agencies in the U.P. should look to disrupt the 'market failure' of alternative energy adoption. At a very basic level, these professionals can support adoption by organizing periodic energy audits by qualified professional energy engineers, helping businesses access utility energy efficiency programs and by updating and providing clarity on local zoning and permitting ordinances.

For the remainder of this report, alternative energy technologies are evaluated on the *likelihood* of an individual business to *prioritize* the technology to reduce their energy costs. Based on our above discussion and evidenced by the current snapshot of U.P. industrial parks, alternative technologies are viable at many locations but are unlikely to be pursued as a priority by most businesses. However, visionary leadership from local planners and EDOs can elevate many of these technologies from priority to possibility, making the difference between neglect and adoption.

An example would be a study for the installation of a natural gas generator in an area with high electrical prices and low gas prices. In the Houghton Industrial Park, the cost of one KW of electricity is about eight times higher than the cost of one KW of natural gas. When all the mechanical and electrical efficiencies are taken into consideration, a natural gas generator can produce electrical power at half the cost of utility supplied power. This sounds like a terrific option for affordable electricity. Accounting for capital costs and installation of an EPA certified prime power generator, the potential return-on-investment would be about 6 years. Even if the generator is sized for future growth, there is still a need to have the utility as a backup during times of maintenance in order to avoid a complete business shutdown. Also, the generator operates most efficiently at its design point of rated power and low power running during evenings and weekends is inefficient and better handled by the utility. With volatility in long term natural gas prices – no single business is willing to make a commitment on a long term prediction, adding risk to investment in this technology. Local EDOs can foster partnerships between Alternative Energy Suppliers (AES), utilities and park tenants. Private AES developers can leverage economies of size with a large single natural gas generator providing locally generated cheap and clean power to industrial park tenants.

Individual businesses in Ironwood Industrial park that lack appropriate roof-space for solar PV can benefit from joint ownership in a large 'community solar' project. Indeed, current park infrastructure can support such a facility. Similarly, individual businesses in Luce County could benefit from long term Power Purchase Agreements (PPA) from just a single independent large turbine wind project located within park boundaries. As batteries and energy storage technology continues to mature, businesses in Norway-Vulcan industrial park could charge their batteries during inexpensive "off-peak" rates at nights, without necessitating moving all operations to the second workshift.

Rising energy rates, aging energy infrastructure, sheer diversity in businesses, utilities, rate structures and costs, and the dynamic policy landscape present challenges to energy cost reduction in U.P. businesses. Identifying, targeting and capitalizing on opportunities within those challenges can only be championed by proactive and strong leadership at local planning and development agencies.

The website www.saveupenergy.com was created as part of this project to keep businesses, EDO's, planners, and others informed with updates on legislation, maps, resources, etc.

GENERATING ECONOMIC DEVELOPMENT – AN ENERGY STUDY

Introduction

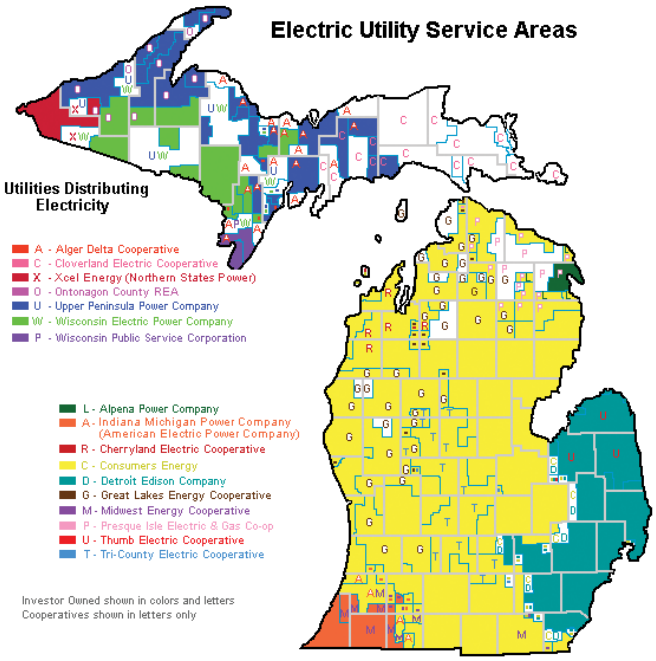
The purpose of the "Generating Economic Development" project was to study and research the cost and feasibility of implementing affordable energy solutions at the industrial park scale across Michigan's Upper Peninsula (the "U.P."). Seven industrial parks were chosen[1] for the purpose of this study. However, during the study it was noted that none of the industrial parks in this study are serviced by UPPCO (Upper Peninsula Power Company), a major electric provider in the U.P. Because of this, a general discussion about UPPCO can be found in further detail in the summary at the end of this report.

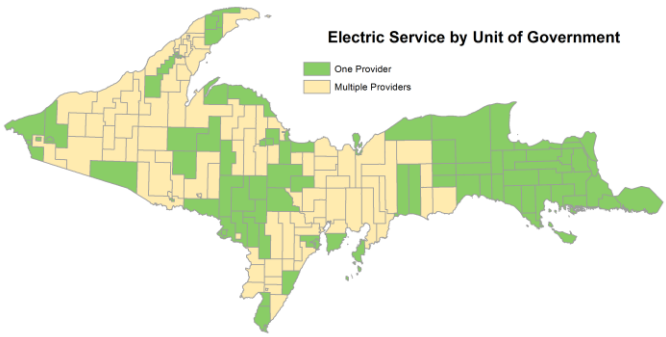
The U.P. region has high energy costs, which increases the cost of doing business in an area that already suffers from high transportation costs and limited wireless and broadband access. Economic development professionals, government officials, and businesses across the U.P. have collectively determined addressing high costs of energy as a priority. Over the past several years, an annual Energy Summit has been held in the U.P. and has been well attended. Additionally, the Central U.P. Regional Prosperity Collaborative ranked energy as the region's biggest need in an asset mapping activity in March 2014.

This project hopes to aid economic development organizations across the U.P. in assisting businesses with affordable energy solutions to mitigate the high costs of energy. Additionally, communities should have a better understanding of what kinds of policies and investments they should make to reduce the costs of energy for businesses.

Current Energy Situation of the U.P.

Energy infrastructure in Michigan is a tale of two peninsulas. More than 90% of all electric energy in the Lower Peninsula is supplied by just two utilities (Consumers and DTE). In contrast, the U.P. is serviced by four privately owned utilities (UPPCO, WE, WPS and XCEL), three rural electric co-ops (OCREA, Alger-Delta and Cloverland) and 13 municipal utilities. Their service areas are overlapping and non-contiguous, with no clear demarcation at municipal or county boundaries. The maps below show the areas covered by electric utilities – below left from the Michigan Public Service Commission, below right from CUPPAD (green areas have only one electric provider, tan have multiple). In the U.P., the eastern region is the only large area with a contiguous provider. While the control and ownership of some utilities in the region has undergone change, the service areas have remained largely intact in recent history.





[1] The original CUPPAD staff member involved in this project left CUPPAD mid-project, so specific reasons for choosing these seven parks is unknown, but it is believed they were chosen to provide a broad geographic distribution across the U.P. as well as various sizes in terms of tenets and energy use.

The U.P. is, at the current time, governed by Michigan's 2008 energy policy, briefly categorized as follows:

- **Electric Choice**: Up to 10% of all energy sold by each utility can be purchased from an alternative energy supplier. This means a small portion of ratepayers enjoy the privilege of choosing their electric utility regardless of their location. Additionally, any iron ore mining or processing facilities (Cliffs Mines) also enjoy this benefit. Choice is awarded on a first-come, first-serve basis. Status: Most utilities have filled up their choice quota and have customers on the waiting list[2], with the exception of Cloverland Electric Co-op and WPS. Several large businesses, schools and universities in the Upper Peninsula are realizing significant savings on their monthly energy bills by opting for electric choice.
- **Renewable Portfolio Standards**: 10% of all energy supplied by each utility has to come from a mixture of renewable energy sources. Currently, all Michigan utilities are on track to meet this target[3]. Utilities that do not own renewable generation can purchase Renewable Energy Credits (RECs) to meet the target. The chart on the following page shows all qualifying renewable sources.
- **Energy Optimization Standards**: All Michigan utilities are authorized to add a small surcharge to every utility bill. A typical residential customer might see a $1-$2 surcharge on their electric and gas bill. Utilities are authorized to use these funds to provide rebates for energy efficiency retrofits on a first-come first-serve basis.
- **Customer Renewable Self Generation**: Customers can reduce their energy consumption from the grid by installing renewable energy systems on their properties. The size of the system is limited by each customer's annual power and energy consumption. While customers do not get paid for the energy produced by these systems, they may receive credits on their bill. Smaller systems (<20KW typically residential size) are credited at full retail rate, and larger systems (20kW-150kW) are credited at wholesale rate. Currently, this program is under-subscribed with only 7% of available capacity being filled[4]. Energy from customer generation accounts for <0.02% of all electricity energy consumed in Michigan[5].

Michigan Energy Legislation

At present, several bills pending before MI legislature could fundamentally alter how Michigan produces, distributes and consumes energy. The dynamic changing landscape of energy policy in Michigan introduces a component of risk in terms of capacity investments in customer-owned self-generation for U.P. businesses.

For example, solar industry in Michigan is nascent. Energy from Solar PV forms a negligible portion (< 1%) of Michigan's Renewable Energy Standards (RES) and a miniscule portion (0.015%) of the overall energy mix.

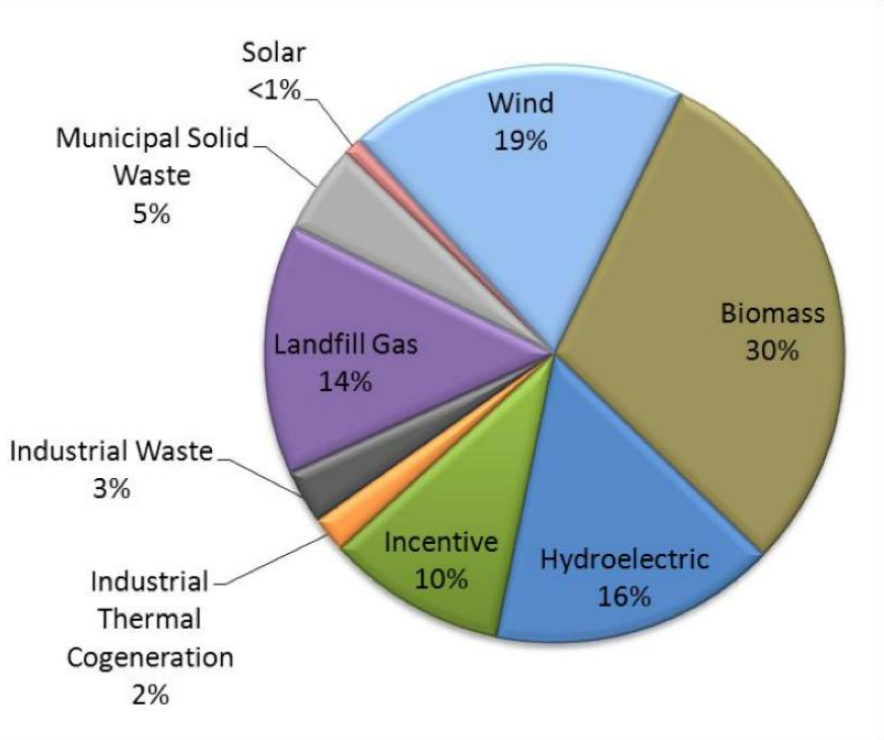
About 1600 Michiganders with solar on their property represent all of the solar in Michigan. These families and very few small businesses participate in net-metering, i.e., sending excess energy (example: during summers) from their solar PV to the grid in return for a credit.

[2] http://www.dleg.state.mi.us/mpsc/electric/restruct/reports/compreport2015.pdf

[3] http://www.michigan.gov/documents/mpsc/PA_295_Renewable_Energy_481423_7.pdf

[4] http://michigan.gov/documents/mpsc/netmetering_report_2014_final_496048_7.pdf

[5] http://www.utilitydive.com/news/michigan-senate-bill-would-erode-the-value-of-net-metering-for-solar-owners/403524/



Credits can be used during periods of net consumption (example: during winters). With proper system design, solar PV owners can generate enough energy annually to meet their consumption, with the grid effectively acting as a storage device.[6]

Current Michigan law offers credit at retail rate for every kWh of energy sent back to the grid with several parts of Michigan offer a good value proposition for solar PV due to high electric rates.

However, the new Michigan Senate Bill 438 proposes that customers with net-metering should buy ALL energy from the utility at retail rates, while receiving a credit ALL generation at wholesale rates. A utility can now treat individual solar owners the same way it treats large power plants, and will buy power from both at same rates. Indeed, Senate Bill 438 ends the 'net-metering' program and calls for a 'distributed generation' program.

Energy rates at wholesale prices are significantly lower ($0.04/kWh) than retail prices (MI average: $0.14/kWh). Such low rates severely delay the Return on Investment (ROI) on solar PV installations. At current market prices, the new Senate Bill 438 would result in a ~40-year payback on investing in a solar PV system, nearly 2 to 5 times longer than under today's laws.

Research shows that after the early adopters, consumers interested in solar are motivated by 'economic incentive variables'. A 40-year payback scares away new buyers, effectively ending any further interest in solar in Michigan.

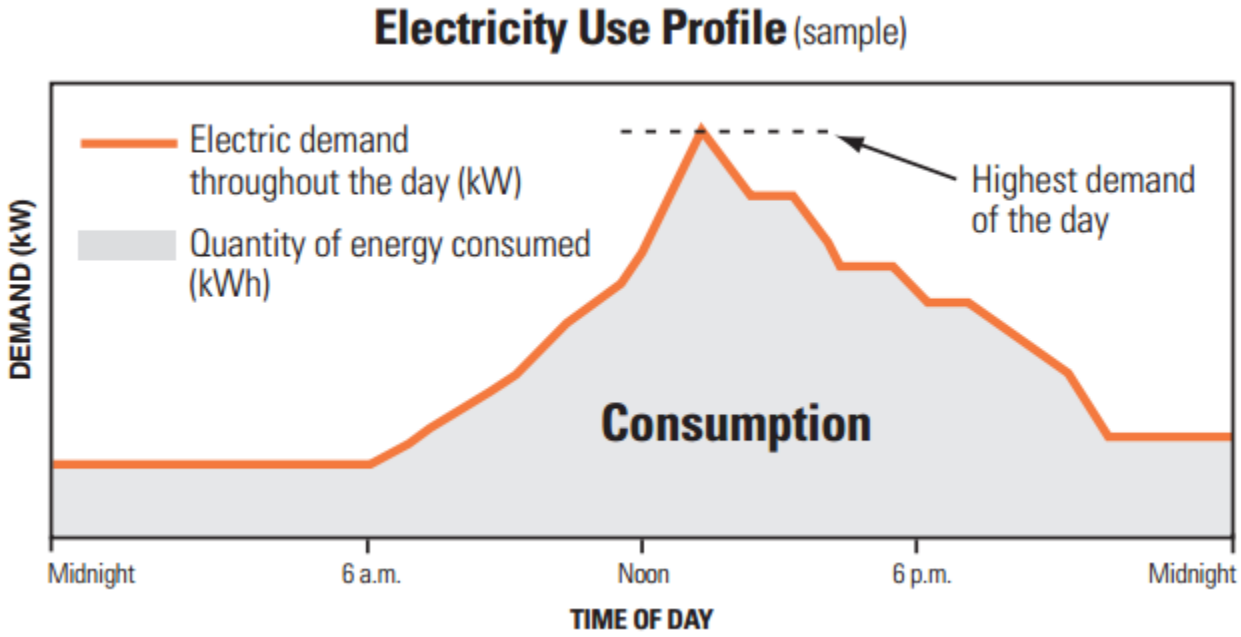
Simultaneously, Mercury and Toxic Standards (MATS) compliance requirements for coal plants across the country have been put on hold by SCOTUS. The President's Clean Power Plan has come under attack. Outcome of presidential election could reverse many policies established in the last couple of years. Pending SCOTUS case pitting a State's authority against FERC for determining new power providers/sources. The only clear policy has been the extension of wind and solar investment credits, but with a clear deadline on the end of subsidies. Add in the ethanol mandate, lack of a nuclear repository, growing concerns over methane and fracking – These are just examples of several policies poised to being overhauled and updated, illustrating the dynamic nature of Michigan and federal policy landscape. Faced with such uncertainties, many businesses are reluctant to invest in capacity intensive alternative energy technologies.

[6] (Photo Source: MPSC Report on RES Compliance)

Understanding the Michigan Electric Bill

- **kWh**: is a unit of Energy (a quantity, a measure of how much is used, like a gallon of water). A 60W light turned on for an hour consumes 60Wh of energy. 1000Wh = 1kWh
- **kW:** is a unit for Power (a rate, a measure of how fast something is used, like a flow rate for water in gallons per minute). Ten 60W lights turned on at the same time consumes a power demand of 600W. 1000 watts = 1kW
- Both kWh and KW are needed to describe a commercial customer's electrical use. The kWh accounts for the amount of energy used and the KW reflects the size of the wire and transformer needed to provide the maximum power required at any instance. Forty 100-watt light bulbs on for 10 hours consume 40kWh of energy. A 215 HP electric motor running for 15 minutes will use the same 40 kWh of energy but will pay significant more because of the power. The 160 KW for the motor requires significantly more infrastructure than the 4KW for the light bulbs

In the subsequent graphic, the curve traces power in kW, while the area under the curve is in units of kWh



Source: https://www.we-energies.com

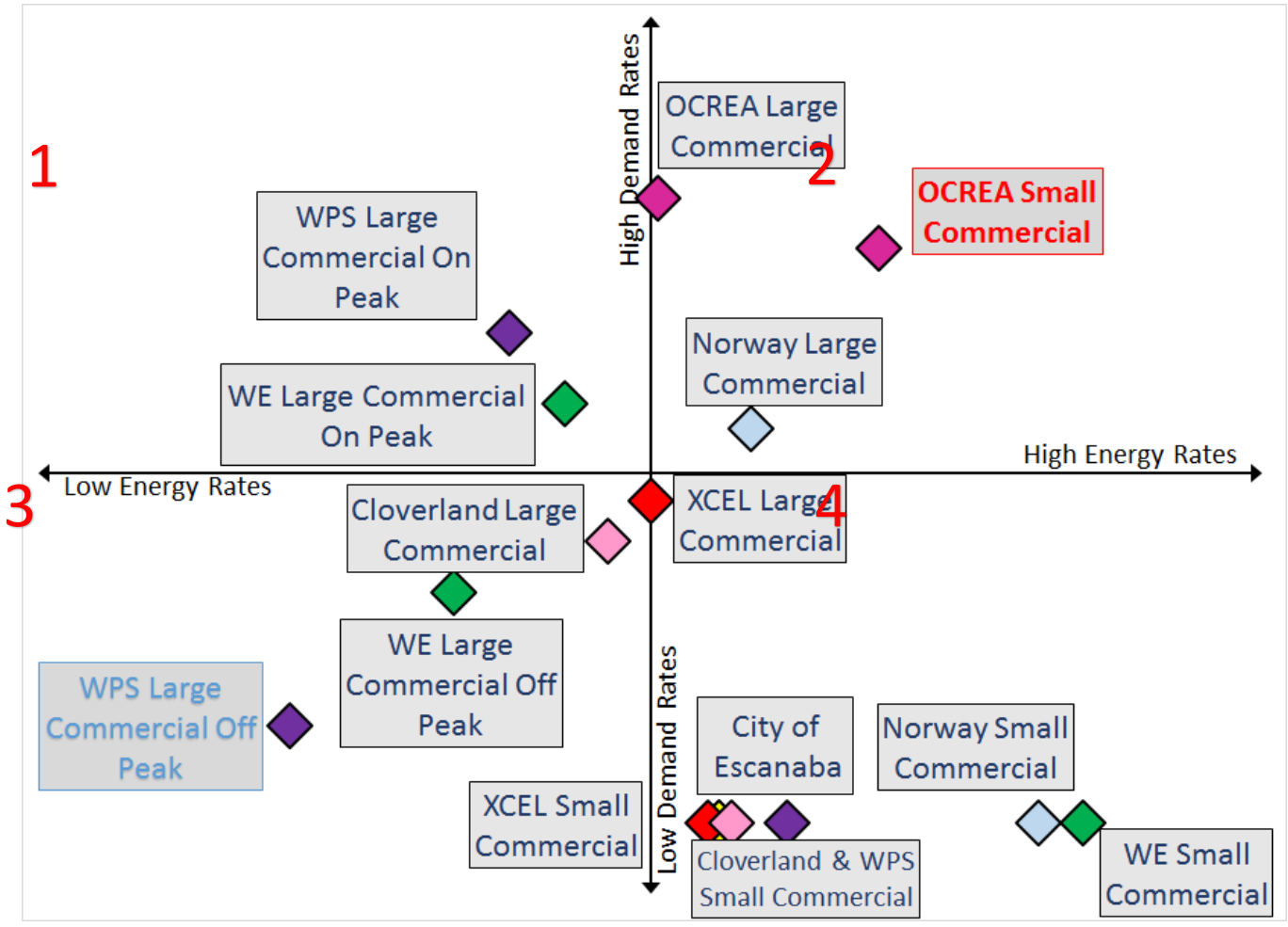
- **Daily Customer Charge:** Daily charge for the privilege of having an account with the utility company. It includes the cost for billing, metering, and reading your electric meter. This is a fixed monthly charge is independent and in addition to electricity consumption.
- **Power Supply Cost:** Essentially, this charge allows your utility to recover the ***projected*** cost of fuel and/or the cost of purchased power. If the utility's projections are higher than actual power supply costs, this charge might even be negative, although this does not happen too frequently. So while your base rates may stay the same, any additional charges your utility will have to pay for operational expenses, or unforeseen volatility in generation fuel prices etc. will be added to this portion of your bill. These have to be approved by the regulatory authority Michigan Public Service Commission, and are updated every month.
- **Demand Charge:** (Or 'Capacity kW'). This represents your peak monthly demand (power) in kW. You will most likely see this on a commercial/small business electricity bill, most residential customers are charged on their energy consumption in kWh.
- **Energy Charge:** This is the charge you pay for the energy in kWh consumed, at rates defined by your utility. Most utility companies further 'decouple' them into two distinct charges:
    - **Power Supply Energy Charge:** The cost of bringing electricity over transmission lines, from a generation facility (power plant) to a local distribution station.

- **Distribution Service Energy Charge:** The cost of bringing electricity from the local distribution station to your home.

- **MI Energy Efficiency Charge:** (Or 'Energy Optimization Charge'). The Michigan Public Act 295 authorized utilities to collect a small fee from customers to fund energy efficiency rebate programs. While this might sound like robbing Paul to pay Peter, this program has been largely successful. As documented in in an article for UPEDA here, **energy saved through this program was 10 times cheaper than the cost of building new fossil fuel plants**. One can apply for rebates on energy efficiency upgrades from utilities by clicking here.
- **Sales Tax:** Self-explanatory.

Summary of Rates

The four-quadrant chart below demonstrates balance between energy rates and demand rates, and provides a useful tool to visualize prioritizing alternative energy technologies. The color of the markers roughly corresponds to the colors of the utility service area map from MPSC in the introduction.

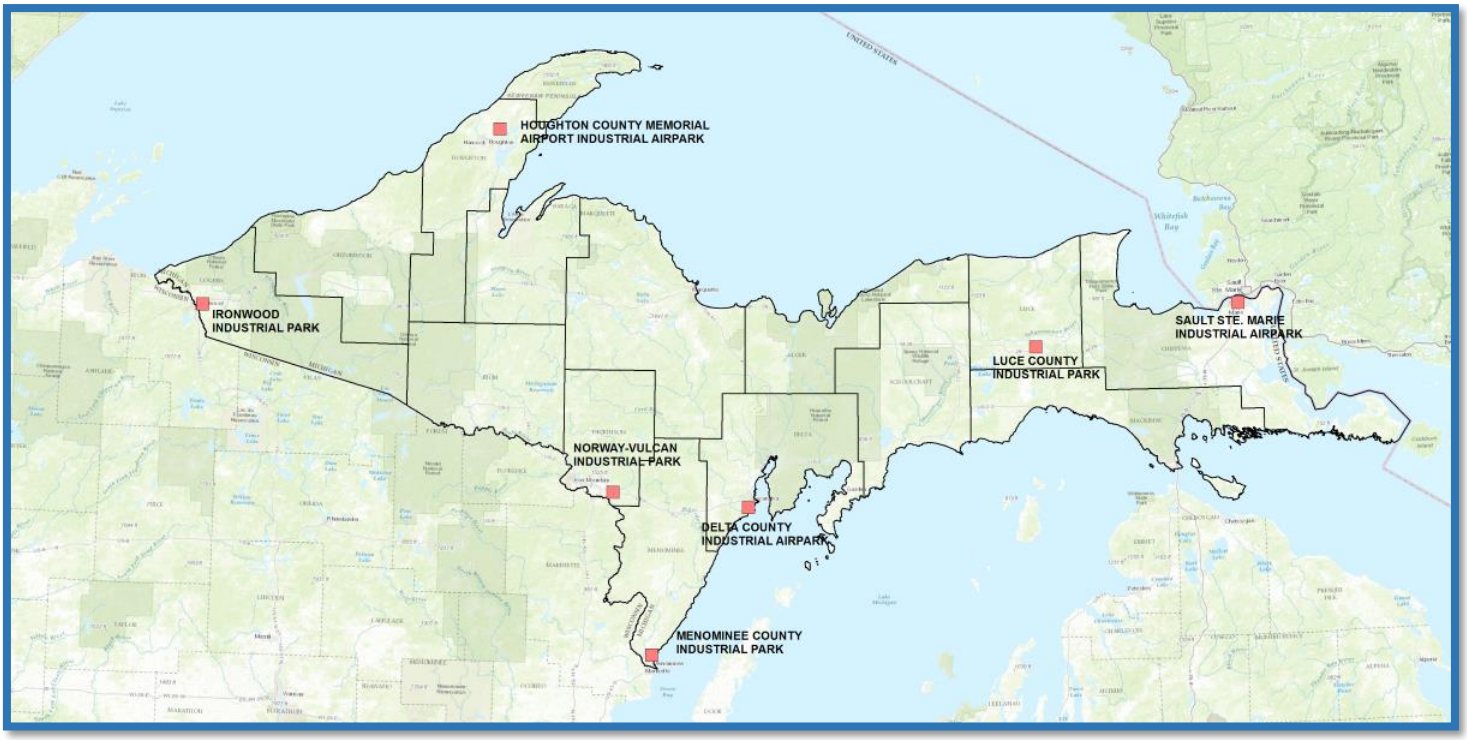


1. **Low Energy rates and High Demand rates** – Typically large energy consumers like manufacturing facilities. Industrial park customers that find themselves in this quadrant can realize energy cost savings by opting in for optional fixed flat rates. Some business might also realize savings by shifting operations to off-peak hours. This approach might be more ideal for operations with smaller workforces, as the challenge of finding qualified workforce willing to work second shift and weekends might outweigh the benefits of lower energy rates.

2. **High Energy and High Demand Rates** – Double whammy for ratepayers. The high demand rates of OCREA present a steep barrier to business retention, and job development in the region. To further the burden, OCREA does not offer a competitive rate structures to promote efficient use of electricity. Nearly all commercial and industrial customers regardless of the size of their operation are charged at high rates. While high energy rates offer viability for alternative energy adoption, customers are unable to significantly lower energy costs because the power demand portion of the bill is such a significant portion. Unlike most utilities, OCREA does not offer mechanisms to reduce demand like optional time of use rates, customer natural gas generation programs, and interruptible power options.
3. **Low Energy rates and Low Demand Rates** – Ideal for lowest energy costs, and subsequently presents low viability for many alternative energy options.
4. **High Energy rates and Low Demand Rates** – Typically offered to small commercial enterprises. The absence of demand rates offers viability for reducing energy consumption through adoption of alternative energy options. Michigan energy policy offers limited support for net-metered alternative energy solutions, but the absence of demand rates allows businesses to install such solutions "behind the meter". Phrased differently, for businesses in this quadrant, energy generated on site using alternative energy technologies is analogous to simply reducing their energy consumption, thereby saving energy costs.

INDUSTRIAL PARK PROFILES

The following section of this report details numerous items for each industrial park involved in the study (as shown on the map below). Each profile consists of general park information, community information, planning/zoning and environmental information, discussions and findings of site visits and visits with businesses, and a park summary discussing the various energy options and recommendations moving forward. Following each planning/zoning section is a table identifying if an alternative energy source would be either a "permitted land use" or a "conditional land use" under local zoning.

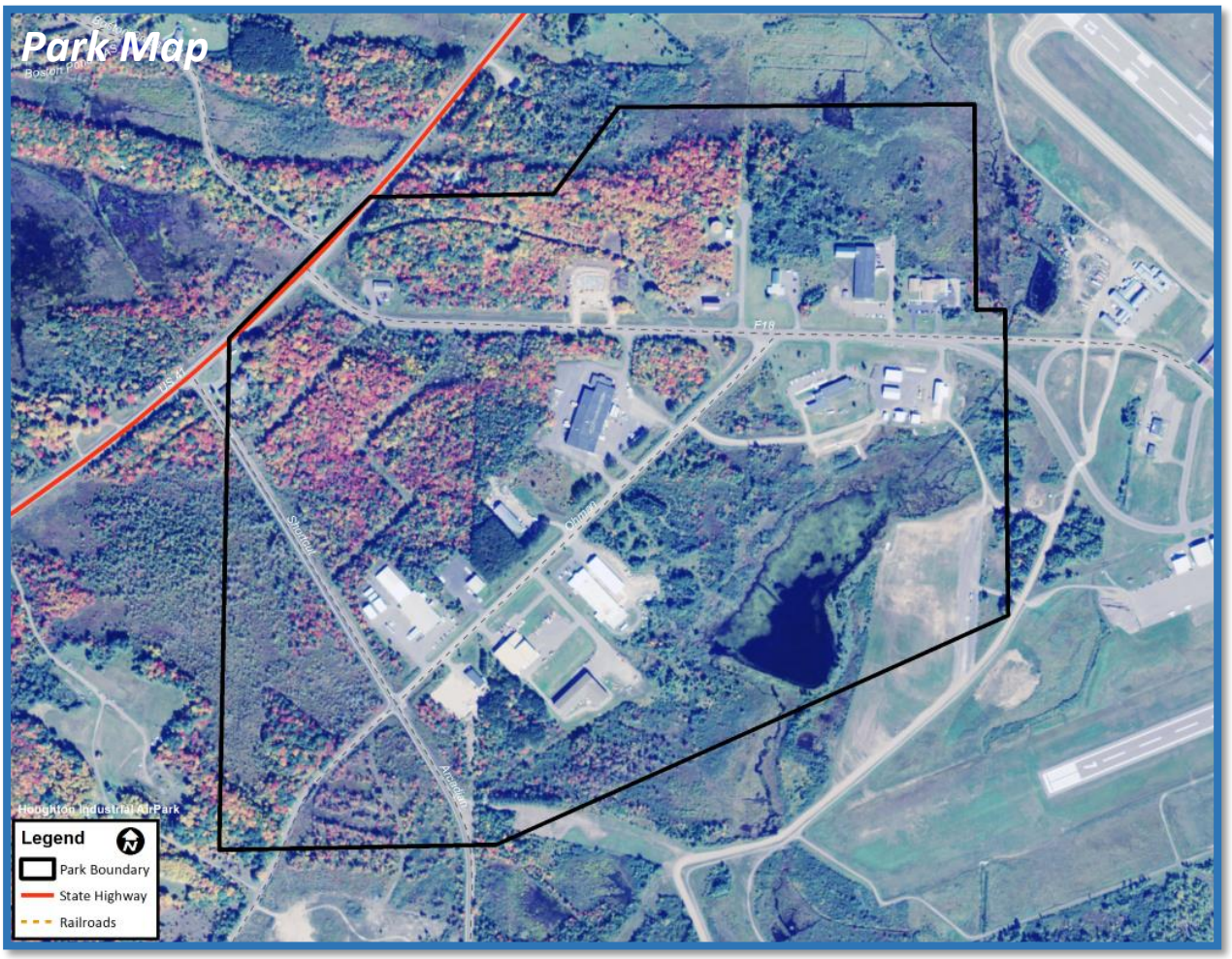


HOUGHTON COUNTY MEMORIAL AIRPORT INDUSTRIAL AIRPARK

General Park Information

The Houghton County Memorial Airport Industrial Park is 201.55 acres in size and is roughly 89% developed, 59% occupied. Sizes of lots varies from 3 acres to 23 acres, and the price of land per acre is roughly $4,000 average. US Highway 41 is less than 1 mile away, and the Houghton County Memorial Airport (CMX) is onsite. No rail is onsite or in the area.

Utilities for the park include Natural Gas (SEMCO), Water and Sewer (Houghton County), Electricity (Ontonagon REA), Broadband (Charter), Merit Fiber (select portions).



Community Information

Population (U.S. Census, 2010): 36,628 (Houghton County)

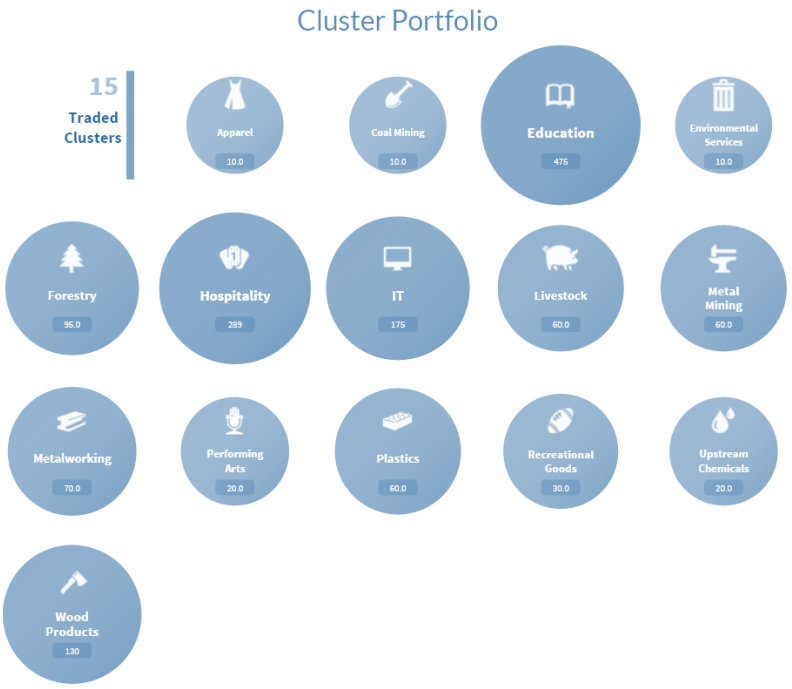
Unemployment Rate: 7.6% (Houghton County - MI BLM, 2014)

% of population high school graduate or higher: 91.5

% of population bachelor degree or higher: 9.7

% of population with a disability: 12.0

% of population that are veterans: 8.2



Planning/Zoning & Environmental Information

Franklin Township has no zoning ordinance, and Houghton County does not have county-wide zoning. However, the Houghton County Memorial Airport Industrial Park has its own covenants, which include regulations governing height and use. Buildings located on same site must be separated by 20 feet. Buildings and structures must not cover more than 40% of the total lot area. The Park's own covenants require a site plan approved by the Airport Committee. Plans must include construction materials, color scheme, grading, drainage; landscape and parking areas.

The Airport Clear Zone has a building height restriction of 50ft (exceptions may be made), however the Houghton Industrial Park is outside this zone. FAA height restrictions for tall structures apply to most of the Park and essentially prohibit the installation of any commercial size wind generation.

Recommended Application of Alternate Energy Options by Zoning Districts in Selected Communities

Zoning	Zoning	Alternative Options to Grid Electricity								
Jurisdiction	Districts	Nat. Gas	Solar	Wind	Geothrm'l	Bio-fuels	Battery	Compress Air Sys.	Gen.IV Nucl.*(2)*	Hydro.
Houghton Co.	Keweenaw	Permitted	Cond'l Per.	*(1)*	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	-
[No zoning,	Research Ctr.									
Restrict. Cov.]										

(1) Presence of airport makes the prospect for wind energy development unlikely.
(2) Generation IV nuclear reactors (3 cents/kWh) are 5-20 years from commercial application and may be used in conjunction with portable industrial scale batteries.

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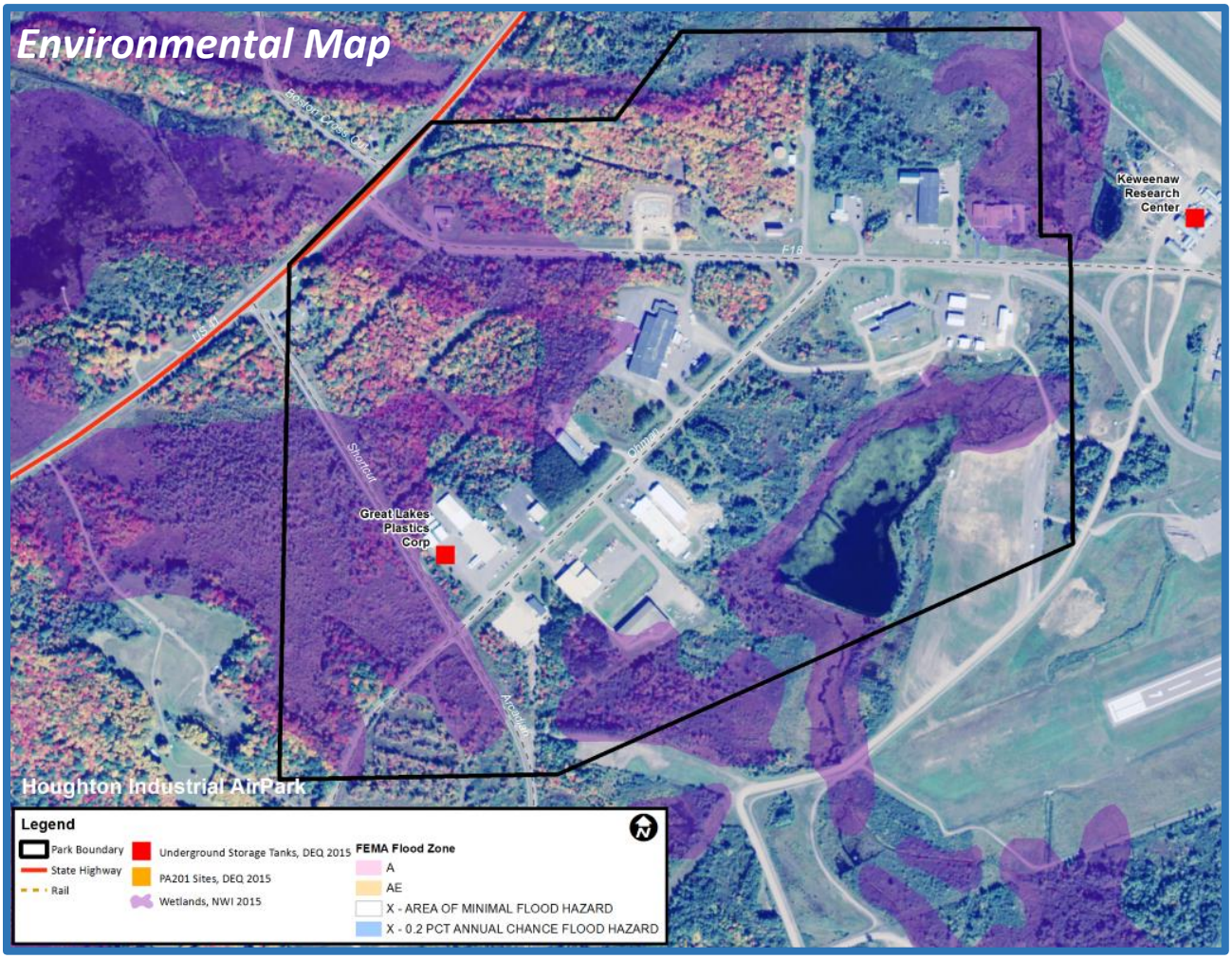


According to FEMA, the park site is not within any floodplains. The National Wetland Inventory shows that several lots are located within a wetland, and new construction (for energy generation facilities) in those areas would likely require a permit. The Michigan Natural Features Inventory provides a listing of rare and endangered species by County. Houghton County has 33 different plant and animal species listed under the MNFI. Because of the sensitivity of specific locations of these species, the MNFI has created the Biological Rarity Index, which provides a ranking (high, moderate, low) of finding a rare or endangered species in a certain location by Public Land Survey System (PLSS) Sections. No PLSS sections in or around the Houghton County site are identified in the BRI.

The EPA's ERMA (Environmental Response Management Application) provides data on sensitive habitats and species. Data from 1994 suggests several sensitive species in the area, primarily on Torch Lake, well east of the Houghton County site. According to the Michigan DEQ, no sites of environmental contamination (PA201 sites) are present within the park or the immediate area. Only one (1) site within the park boundary have underground storage tanks that have either been removed or closed. The KRC tank just to the east of the park has been removed.

Business Information/Site Visit

The Houghton County Memorial Airport Industrial Park has 14 active businesses, which provide around 200 jobs. This does not include the airport operations or businesses that operate "behind the fence", i.e. airport engineering and planning, hangers, private air services, and FAA weather station.

Business	Business Type
Design-o-Type Printers	Printer
Lamers Bus Lines	Buses-Charter & Rental
Lahti Self-Storage Units	Self-Storage Units
Mercy EMS, Inc.	Ambulance service
MTU/KRC	Engineering, research
Goodwill Industries	Rehab & wood shop
ThermoAnalytics Inc.	Engineering software
Warm Rain Corporation	Molded tubs/showers
Bay Engineering	Stump grinders
Schwan Sales Enterprises	Frozen food sales
Michigan Dept. of Transportation	Road maintenance
G & J Site Solutions	Construction, environmental
DA Glass of America	Glass treater
Houghton County Correctional Facility	Non-violent offenders

The Houghton County Memorial Airport Industrial AirPark has a wide variety of tenants from manufacturing (Warm Rain, DA Glass), public service (MDOT, Mercy Ambulance, GoodWill Industries), engineering (KRC, Thermoanalytics, Bay Engineering) and local service providers (Design-o-Type Printers, Schwanns frozen food delivery, CJ Site Solutions, Lamers Bus Lines). All tenants have expressed concern about their high energy costs, especially their electric bills.

Energy Information

SEMCO provides gas service, and the Ontonagon County REA provides electric service. The Airport is a significant energy consumer, and includes services to other areas of the AirPark including street lighting, water supply (delivery), and the billboard at the road entrance to the AirPark.

The Park's electrical service is provided by the Ontonagon County Rural Electrification Association (OCREA), which is the smallest electrical cooperative in the state of Michigan with less than 5,000 services. OCREA is a "member regulated" cooperative meaning the cooperative's Board of Directors sets rates and tariffs without the need for Michigan Public Service Commission (MPSC) review. The Park is at the far north end of OCREA's service territory. The distribution sub-station for the Airport Industrial Park is 2.5 miles away at Boston Location. The sub-station provides 12,740 volt 3-phase service to the park. At the airport boundary, all the electrical lines go underground. Transformers on each tenant's site reduce the voltage to the tenant's requirement.

Until recently the Park was facing an electrical capacity limit. The sub-station was limited to delivering 1,600 KW to both the Park and residential customers. In 2012 MTU had installed a 2,000 KVA transformer at their research facility because of an expected growth in research projects; however, they were required to limit consumption to 1,000 KW due to the sub-station's capacity. When the newest large manufacturer came into to Park in 2013, there were serious concerns about the electrical capacity and the possibility of brown-outs. After over ten years as being listed as a long-term plan, OCREA finally approved construction of a new 10,000 KW sub-station in 2015. The new sub-station went on-line in November 2015.

With a new sub-station rated at 10,000 KW the Park should have sufficient energy supply for years to come. Along with the increase in capacity the new sub-station will improve power quality and reliability by latching onto the high voltage transmission line, instead of being fed from an UPPCO distribution sub-station eight miles away. The next major electrical improvement to the Park would be the addition of a second supply line. With only one supply line, the airport and all the Park tenants are at risk of long-term outages due to overhead line incidents (wind, ice, trees)

Improving the capacity, quality and reliability of the electrical service to the airport and Park is great news for existing and future tenants. However, the greatest concern about electrical service is its cost. OCREA is the smallest cooperative in the state of Michigan. Their rates are the second highest in the nation! OCREA generates none of its own power; all energy is purchased from Wisconsin (WPS and WE Energies). With only 10 full time employees, it is difficult for this co-op to be proactive in utility management. Only a few basic rate schedules are offered to commercial and industrial customers: General Service (less than 10 KW), Large Power-1 (LP-1 20-150KW) and Large Power -2 (LP-2, greater than 150 KW). There are no Time-of-Use (TOU) rates.

For many of the large current tenants the Power Demand portion of their electric bill approaches 50% of their total bill. Power Demand is billed at $16.40 per KW for the greatest 15-minute average power during each month, i.e. running a 100 KW motor for 20 minutes adds $1640 to the monthly bill.

Electric Rates					
Utility	Service	Energy Rate [$/kWh]	Demand Rate [$/kW]	Fixed Rate (Single Phase) [$/month]	Fixed Rate (Three Phase) [$/month]
Ontonagon REA	Commercial (10KW - 150kW)	$0.11	$16.40	$28.00	$37.00
	Large Commercial (> 150kW)	$0.08	$17.80	$28.00	$37.00

Source – Michigan Public Service Commission Rate books, retrieved from
http://www.dleg.state.mi.us/mpsc/electric/ratebooks/ontonagon/ontonagonmemberregcur.pdf

SEMCO is the supplier of natural gas for the Park. Currently natural gas prices are low. Tenants wisely use natural gas heating and in production wherever possible, instead of using expensive electricity.

The current issue of concern with natural gas is capacity availability. The natural gas main that feeds the Keweenaw Peninsula is nearing capacity during the peak winter heating season. With the pipeline nearing its limit, new large quantities of natural gas may not be available on a full requirement basis (full requirements = 24/7 availability versus an interruptible service). Recently a Park tenant closely analyzed a 500KW prime power natural gas generator. SEMCO had to be consulted and approve the quantity of gas required. The next large natural gas customer may not be able to get a full requirement natural gas contract.

Current Natural Gas Rates – March 2016

SEMCO ENERGY Sales Customers	Energy Charges*	Balance and Demand Charges*	Energy Optimization Charge*	SEMCO Distribution Charge*	Main Replacement Program Charge	SEMCO Customer Charge
Residential	$0.26000	$0.06500	$0.01782	$0.17342	$1.61	$11.50
General Service 1 (GS-1)	$0.26000	$0.06500	$0.12093**	$0.18203	$3.56	$11.50
General Service 2 (GS-2)	$0.26000	$0.06500	$0.12093**	$0.13932	$22.43	$35.00
General Service 3 (GS-3)	$0.26000	$0.06500	$0.12093**	$0.10985	$106.33	$105.00
	Gas Cost Recovery (GCR) Charges					

*Costs and charges are billed on a per therm basis.
**Up to 90 Therms and $0.00001 per therm thereafter.

Source – SEMCO Natural Gas rates, retrieved from
http://semcoenergygas.com/Default.aspx?id=107&b=169&p=31

Path Forward for the Houghton County Memorial Airport Industrial Park

The high cost of electricity at the Houghton County Airport Industrial Park is a serious issue, which affects current tenants and future economic growth. Any electrical energy intensive business would have the Park on the bottom of their list of potential locations.

Energy Efficiency Retrofits

Energy Efficiency Retrofits need to be accomplished by individual businesses. Generally, the older the business (in the same location) the greater the opportunities for energy efficiency retrofits. Within the Park, within the last year all the street lighting was replaced with high efficiency LED lighting. For the smaller companies in the Park energy efficiency improvements are the most viable solution for lower energy costs. Changing to high efficiency lighting, replacing electric water heaters with gas heaters, and upgrading heating and cooling systems to newer high efficiency appliances will result in lower monthly energy bills.

MTU's Keweenaw Research Center has been in the Park since 1953. KRC has taken advantage of the energy optimization program offered through their local electrical supplier and upgraded most of their shop lighting. High bay areas which previously had 400-watt halogen lights were converted to high efficiency florescent lighting (T-8). Variable Frequency Drives (VFD) were added to large motors in order to provide soft starts (avoid high startup loads) and allow equipment to operate at lower speeds and consume less energy.

MTU moved their Advanced Powertrain Systems Research Center into a former manufacturing facility in the Park in 2012. One of the first building modifications undertaken was the installation of new switchgear for electrical distribution in the building. With a revenue grade power meter, individual metering of six feeder circuits, and sophisticated Building Monitoring System; electrical consumption is clearly understood and actions have been taken to reduce load and demand. Understanding a building's energy consumption is the first step in developing an energy efficiency program. For the large electricity consumers in the Park (Warm Rain, DA Glass, and to a lesser extent Goodwill Industries and Bay Engineering) energy efficiency improvements will be difficult to implement without major expenditures. Where energy costs are driven by processing equipment, often the only way to improve efficiency is replacing an expensive piece of equipment.

Natural Gas

Natural Gas is available to virtually all tenants in the Park. The current low price for natural gas has driven changes. When needing to replace an old electric hot water heater, virtually everyone is moving to natural gas. At KRC's winter vehicle testing buildings, where vehicles need to be thoroughly washed prior to entering the pristine snow test areas, on-demand, natural gas water heaters have significantly reduced costs and improved customer satisfaction when washing many vehicles.

The limited supply of firm demand natural gas is a concern to Park management and planners. Potential new tenants or expansion of existing tenants may not happen without firm demand. The current supply is adequate to provide firm demand to all heating requirements. New large manufacturing processes or the installation of a NG Generator to offset electrical costs may be prohibited with the current supply. The supply capacity is only limited during the winter heating months, but it will be difficult to find businesses who would consider a 7-month firm demand acceptable.

Solar

In Houghton County, MTU researchers have shown that solar makes sense, even in an area with so much snow. The reason solar makes sense is because the cost of electricity is so high and therefore any generation offsets the high supply costs and results in a good Return On Investment.

in 2015 OCREA changed their net metering policy from crediting excess generation at the retail rate to less than the wholesale price. They did not grandfather in the existing customers who had made investments based on retail price. After months of controversy the Board of Directors reversed their decision and returned to paying retail price for energy supplied to the grid. The flip-flop of the Board, combined with a member regulated cooperative with no MPSC oversight, demonstrates the risk involved in investing in alternative energy projects.

Currently, the Keweenaw Research Center has about 20KW of solar installed at its Main Engineering Building. With a 20KW system the solar energy produced is sufficient to meet most of the energy needs during unoccupied daylight hours (Saturday and Sunday at 2pm in the summer). The KRC has virtually no excess solar energy to ever send back to the grid.

Seeing the size of KRC's 20KW system makes businesses realize that meeting all your electrical needs with solar requires significant space and investment. With an unknown future for net-metering rates, the incentive for large systems will be further diminished. However, small systems which can satisfy some of the baseload will continue to be a viable option for every business (new terminology refers to these small systems as "negative loads").

Wind

Although the wind forecast maps show the Keweenaw Peninsula with high average wind speeds and an excellent location wind generation; the proximity of the industrial Park to a commercial airport essentially prevents any viable wind generation. The economics of wind generation are based on size, with taller wind turbines being more efficient and productive. Federal Aviation Association (FAA) height restrictions prevent any commercial size wind system.

Geothermal

Geothermal heating and cooling has potential in the Park, but the high cost of electricity makes geothermal heating more expensive than natural gas heating. The Keweenaw Research Center installed geothermal heat pumps when they built their new engineering center in 2012. Utilizing an abandoned mineshaft on their property, which had filled with water since closing decades earlier, KRC had access to massive quantities of 53^{o}F water. With 18 heat pumps in the KRC Engineering Center, room temperatures can be controlled as needed. The computer server room always needs cooling and that heat can be moved via the heat pumps to other locations. Unfortunately, because of the high cost of electricity, it is cheaper to heat the facility with a high efficiency natural gas boiler.

The flooded mine that KRC utilizes is not available to any of the other Park tenants. The distance from the mine to their buildings makes the plumbing costs unaffordable.

Biomass

On the Keweenaw Peninsula, the only biomass facility is the L'Anse Warden Plant, which is a former coal operation that converted to biomass. Part of the reason this plant remains viable is because it is a Combined Heat and Power system. The electricity goes on the grid as an alternative energy supplier (AES) and the heat is utilized by the neighboring Celotex plant. The facility is currently undergoing a renewal of its operation permit and concerned citizens have voiced concerns about the plant's emissions.

In the Houghton County Industrial Park, the most likely candidate for a biomass system would be Goodwill Industries. Goodwill Industries does a fair amount of wood processing (sawing, planning) and generates woody biomass waste that could be utilized in an energy system. Currently their wood waste is sold as bedding materials for farm animals.

New regulations by the EPA on wood burning equipment could have a significant impact on the biomass industry. Effective January 2016 all wood burning equipment must be emissions certified.

For the other tenants in the Park, biomass is not currently a viable option. The greatest hurdle for biomass in the Keweenaw is transportation cost. No trucker wants to haul a high volume, low weight product for a low price. Even though the region is rich in biomass material, no market has as yet developed.

Industrial Waste Heat Recapture

From an overall Park standpoint, recovery of heat from the sewer system was explored as an option in the past. The local sewer authority was adamantly against any heat extraction. With the sewer treatment plant located several miles away in Lake Linden, a great concern exists with the sewer piping freezing during the long hard winters.

On an individual basis, companies are already looking at waste heat recovery. The Keweenaw Research Center has water chilled heat exchangers on its large (100+HP) hydraulic test machines. Currently the extracted heat is returned to the mineshaft used for the geothermal heat pumps. As the supply water temperature in mineshaft increases, the performance of the heat pump increase. KRC is looking into changes in the system that would send this waste heat directly into building's heating loop.

Two companies make use of waste heat recapture in its most fundamental aspect. DA Glass and Warm Rain Industries both utilize manufacturing processes that require significant heat. The waste process heat ends up providing much of the heat necessary to heat the building during the winter months. Unfortunately, there is no viable option for utilizing most of this heat during the warm months. At best, the waste heat could be used for domestic water heating. Historically low natural gas heaters, combined with high cost of electricity and capital cost in equipment upgrades to such heaters does not make this a viable option.

RECOMMENDATIONS FOR BUSINESSES

Reduction in energy use can come from many different directions. Wind and solar off an opportunity for reductions in baseload but will never meet the high power demand of some customers. Biomass seems like a reasonable solution in an area surrounded by forests, but most companies do not want to spend the money and increase their staff just for energy.

The number one recommendation is for companies to become more active in understanding their energy usage. Complaining about a high monthly bill should be in the past. Companies should know how much energy they used yesterday and where/how that energy was used. With the knowledge of actual use loads, companies can make intelligent decisions for more efficient operations.

Conversion to LED lighting would be a quick ROI for most businesses. Replacement of old motors and use of VFD's could have a significant impact for some businesses.

With a significant portion of monthly energy costs coming from an exorbitant power demand rate, many of the easy to implement alternative energy solutions are likely to remain a low priority. Capital costs are high and the ROI is long.

RECOMMENDATIONS FOR EDOS

The local economic development agencies and Park tenants need to band together and push the utility (Ontonagon County Rural Electric Association – OCREA) for change. The last Cost of Service Study (COSS) for OCREA showed that industrial/commercial customers are over paying by 15% and subsidizing the seasonal customers who are not paying their fair share. With 25% of OCREA accounts being seasonal customers the Board of Directors are reluctant to impose a significant rate change. Yet it is the local business community that provides jobs for the local residents and therefore we believe the industrial/commercial sector should have a fair rate instead of the low use out-of-state seasonal customer. In addition, commercial/industrial customers have no defined representation on the Board of Directors. The co-op needs to see and appreciate the value of jobs in the community.

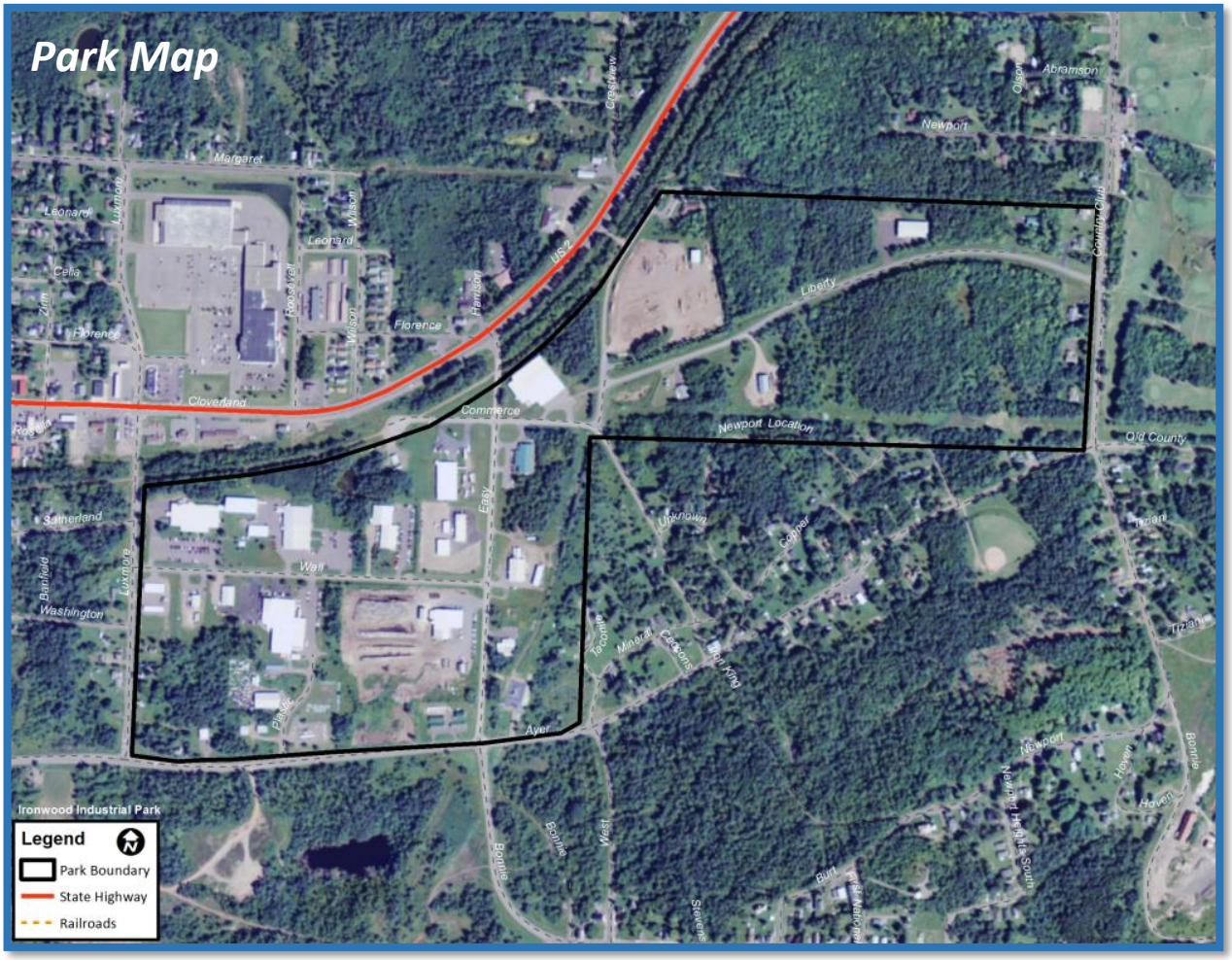
Until OCREA changes from its historic operating model, the industrial/commercial customers need to investigate every method available to reduce energy consumption, but more importantly reduce power demand which is at an obscenely high rate. With MTU nearby, hopefully an innovative solution may become viable i.e. utility scale storage. Since OCREA offers no time-of-use or demand response programs, industrial customers have no options except for reducing usage.

IRONWOOD INDUSTRIAL PARK

General Park Information

The Ironwood Industrial Park is 160 acres in size (consisting of the original/older section and a newer section to the east of the original) and is roughly 69% occupied. Sizes of lots varies from 1.5 acres to 10 acres, and the price of land per acre is roughly $2,000 average for city-owned lots. The City of Ironwood Community Development has an active and proactive program. The Ironwood Industrial Development Corporation (IIDC) is also very active. Several tenants in the Industrial Park have representatives on the IIDC Board of Directors. The park has an Industrial Facilities Tax Exemption and Personal Property Exemption PA 328.

US Highway 2 is less than 1 mile away, and the Gogebic-Iron County Airport () is located about 6 miles away. No rail is located onsite, but a rail line north of town is not in use and could be used. Utilities for the park include City of Ironwood for water, Gogebic-Iron Wastewater Authority for sanitary sewer, Xcel Energy for natural gas and electric, Charter and AT&T for cable/internet/phone, and Merit Network for fiber.



Community Information

Population (U.S. Census, 2010): 5,387 (City of Ironwood); 16,427 (Gogebic County)

Unemployment Rate: 8.7% (Gogebic County - MI BLM, 2014)

% of population high school graduate or higher: 92.3

% of population bachelor degree or higher: 2.0

% of population with a disability: 15.5

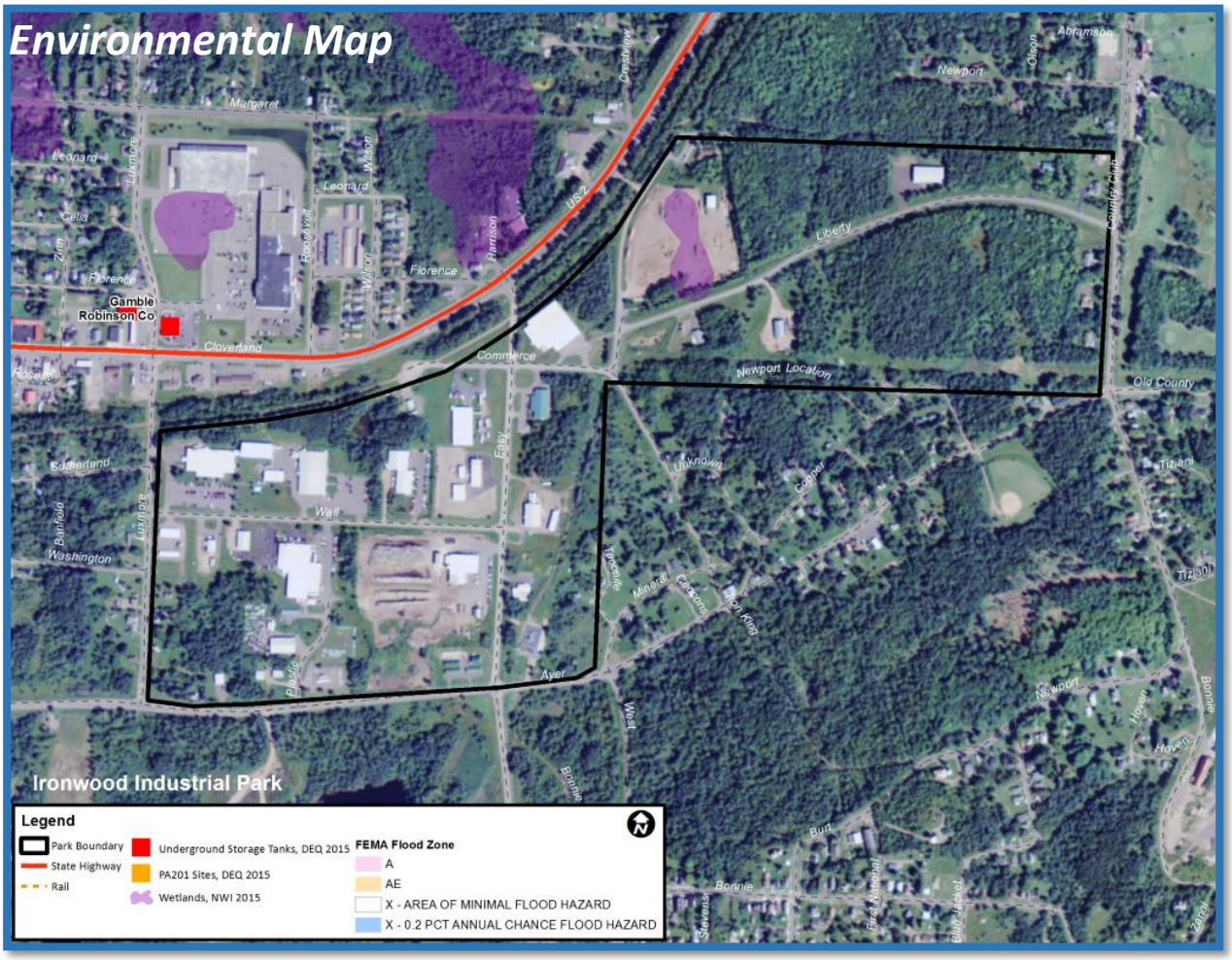
% of population that are veterans: 10.8

Planning/Zoning & Environmental Information

The Industrial Park falls under City zoning, and is in an Industrial zoning district. Energy generation may be permitted as a conditional accessory use. Structures would have to comply with the building height regulations (max. 50 ft.) and setback regulations (front: 30 ft.; side: 30 ft.; side abutting residential: 100ft) and must be screened from the view of roads and adjacent properties by berms/fencing/landscaping. Some types of generation (biomass; industrial waste heat recapture) may not be possible under the current ordinance, as it states that the production of gas and the "incineration, reduction or dumping of offal or garbage" is a prohibited use. However, prohibiting small-scale generation using these methods is likely not the intent of the zoning ordinance, and a text amendment could be made to clarify this. A site plan is required for all construction in the Industrial district.

Recommended Application of Alternate Energy Options by Zoning Districts in Selected Communities

Zoning	Zoning	Alternative Options to Grid Electricity								
Jurisdiction	Districts	Nat. Gas	Solar	Wind	Geothrm'l	Bio-fuels	Battery	Compress Air Sys.	Gen.IV Nucl.*(2)*	Hydro.
Ironwood City	Industrial	Permitted	Permitted	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	-
	PUD	Permitted	Permitted	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	-	-
				(1) Presence of airport makes the prospect for wind energy development unlikely.						
				(2) Generation IV nuclear reactors (3 cents /kWh) are 5-20 years from commercial						
				application and may be used in conjunction with portable industrial scale batteries.						
										3/24/2016



According to FEMA, the park site is not within any floodplains. The National Wetland Inventory shows that one small area within the park is wetland, however that site is currently developed. No other areas in or around the park contain wetlands. The Michigan Natural Features Inventory provides a listing of rare and endangered species by County. Gogebic County has 39 different plant and animal species listed under the MNFI. Because of the sensitivity of specific locations of these species, the MNFI has created the Biological Rarity Index, which provides a ranking (high, moderate, low) of finding a rare or endangered species in a certain location by Public Land Survey System (PLSS) Sections. The entire Ironwood Industrial park is in an area identified as having a low probability of finding endangered or rare species.

The EPA's ERMA (Environmental Response Management Application) provides data on sensitive habitats and species. Data for the Ironwood Park does not exist, which draws the conclusion that no sensitive habits are in the area. According to the Michigan DEQ, no sites of environmental contamination (PA201 sites) are present within the park or the immediate area, and no underground storage tanks are currently present.

Business Information/Site Visit

The Ironwood Industrial Park has 23 tenants and provides about 450 jobs.

Business	Business Type
Jacquart Fabric Products	Custom Sewing/Upholstery
Burton Industries	Manufacture electronic components
Enbridge	Pipeline management
Pisani Distributing Company, Inc.	Beverage distributor
Lock it Up Storage of Ironwood	Self-storage units
Cramblits Welding, LLC	Welding Supply and Fabricating
Ironwood Plastics, Inc.	Custom Injection Molding
Ottawa Forest Products, Inc.	Manufacturer of Pallets
former Cayuga Industries	Vacant, For Sale, 45,000 sq-ft
Precision Tool & Mold	Design/Build Plastic Injection molds
Bratu's Hardwood Interiors	Mill-to Order: paneling, flooring.
Hope Animal Shelter	Animal shelter
Hobby Wheel Storage	Self-storage units
Lakes Gas/Midland Services	Propane Delivery and tank storage
Auto Salvage/junkyard	Auto Salvage/junkyard
Keweenaw Land Association Limited	Management of forest resources
Kevin's Self-Storage	Self-storage units
Ironwood Storage, Inc.	Self-storage units
Care-A-Van	Convalescent Transport Service garage
Basom Trucking	Garage
XCEL Service Center	Electric and Natural Gas provider
IIDC Spec Building	Vacant
Trolla & Sons	Garage/storage

The energy consumption per business ranges from minimal (i.e. garages and self-storage units) to very high (Ironwood Plastics, Ottawa Forest Products, Burton Industries, and Jacquart Fabric Products). All the high energy use is electrical, natural gas is only used for space heating and hot water heaters.

Ottawa Forest Products is a manufacturer of pre-cut pallet components. They supply all the wood parts needed to build a pallet, which allows customers to build pallets as-needed and avoid all the problems associated with transporting and storing bulky pre-assembled pallets.

OFP's operation consists of taking 8-ft logs, de-barking, sawing, shaping, packaging and shipping. Recently they have been running two shifts, each 10 hours per day and 4 days per week. OFP's production capacity is dependent upon the supply of raw material (logs). Weather and large demands by the paper mills can limit supply and force them to a single shift.

OFP's operation is electric motor intensive. A couple of 100 HP motors power the largest machines. One of the saw machines uses five 40 HP motors. Large blowers are used to move chips and sawdust, while power conveyors move product from station to station. For the production line to flow continuously, all equipment operates simultaneously.

OFP's electric bill regularly exceeds $10,000 per month. Energy usage was over 100,000 kWh and power demand was 370 KW. One interesting issue was the Demand Power Factor at 69%, which caused the billable demand power to be raised to 486 KW. OFP does not have the resources to investigate their electrical energy load (no monitoring). The effective electrical rate was $0.118/kWh and about 33% of their bill was due to the demand charge. Natural gas is used only for heating when upwards of 4,000 Therms/month are needed. During the summer months, usage drops to 60 Therms/mo for domestic hot water.

OFP generates substantial wood waste from their manufacturing operation. They have investigated on-site utilization for heat and power but did not pursue due to the high capital investment and low return on investment. Instead they sell their waste to Excel (who burns it in their Ashland power plant) and to several pellet manufacturers. Selling wood allows OFP to concentrate on their core business and not bring in new people to operate a generation plant.

There may be opportunities for OFP to take advantage of new power factor correction devices installed in their plant, time-of-day rate schedules, and possibly qualify for a high load factor discount. Any decision on changes to a rate schedule requires better knowledge of their load profile. OFP had the paperwork for Retired Engineers Technical Assistance Program (RETAP) but had not followed up on it as of yet.

Burton Industries is a manufacturer of circuit board and electronic assemblies. Most of their facility operates in a controlled temperature and humidity environment in order to meet quality control requirements in a situation susceptible to electro-static discharge (ESD). Burton Industries supports a niche market need for low scale production just past prototypes but below the high quantity production which is provided by the Asian suppliers. An example product is the circuit board and assembly of a high end security/trail camera (one of the fastest units for triggering and repeated photos available).

The main building has an energy bill which exceeds $10,000 per month. Electrical use dominates the energy consumption (natural gas portion is only $100/mo.). Electrical use is for a large air compressor and the circuit board manufacturing process. Large pots of molten solder and pre-heating of circuit board assemblies in electric ovens appear to drive electric consumption.

The manufacturing operation generates so much excess heat that it must be directly vented outside. Even that is not sufficient. The production facility runs air conditioning all year around – even during the winter in the U.P. The air conditioning is required to maintain a production environment within strict temperature and humidity limits.

During April of 2015 the manufacturing facility consumed almost 100,000 kWh and had a power demand of 250 KW, with a power factor greater than 95%. The plant has two electrical meters and consumption is almost equally divided between them. The effective electrical rate was $0.110/kWh and about 25% of their bill was due to the demand charge.

The production facility often runs two shifts, each working 10 hours per day, four days per week. The large lead solder pots are turned on at 4 am and off at 6:30 pm. The four-day production is assumed to save money just because of the solder heating requirements.

Opportunities may exist for better rate schedules due to time-of-day rates for a two shift operation and possibly a high load factor discount because of a long duration even load. No simple solution is known which would allow them to utilize their excess waste heat.

Jaquart Fabric Products (JFP) is a custom sewing and upholstery operation which is mainly known as the manufacturer of Stormy Kromer apparel but they are also a producer of pet beds. JFP has a 90,000 sq-ft facility spread out between several buildings. In addition to their production facility they have a retail store and inventory warehousing on site. Electrical bill is about $5,000 per month and evenly divided between their two main buildings (JFP1 and JFP2). Power demand ranged from 58 to 110 KW.

JFP currently operates one shift with the majority of workers working 7 am to 3 pm. JFP has conducted an energy audit. Based on the recommendations of a lighting engineer, they have upgraded most of their lighting to high efficiency T-8's in order to reduce electrical cost and improve lighting for workers. More data would be required in order to make any recommendations for this manufacturer.

Ironwood Plastics is a manufacturer of plastic injection molded parts primarily for the automotive industry. With 158 employees, Ironwood Plastics is the largest company in the Park. The manufacturing operation is based around 37 presses (plastic injection molding machines). The facility is running 24/7: three shifts per day and limited production on the weekend. The business has been growing and currently is nearing capacity at this location with no floor space for additional machines and approaching the limit of their electrical capacity.

The plastic injection molding operation is energy intensive. Plastic granules are first dried and then transported to the presses. At the press the plastic is heated with electrical heaters to 350-750 oF. The molding die clamps shut and the hot plastic is injected with a force up to 770 tons. The die and parts are cooled with heated water. The presses range from hydraulic, to hybrid, to pure electric. Almost every press utilizes a robot. The operation is so heat intensive that two 25-ton air-conditioning units operate year around.

In January 2011 they used 350,000 kWh at a cost of $29,000 and an effective rate of $0.084/kWh. Since then the operation has grown and in September they used almost 550,000 kWh at a cost of $54,000 and an effective rate of $0.099/kWh. They seemed content with the billing and pleased that the effective cost had not risen sharply as their production increased over the years.

In order to make recommendations for this facility a better understanding of their load profile is required along with understanding the current rate schedule. With a 24/7 operation they likely could benefit from time-of-day rate schedules. They probably have a high load factor and qualify for a discount. As the major electric consumer in the Park, the utility company should be working much closer with them.

Ironwood Plastics initiated the process with RETAP, however the amount of information required would have taken significant time and was not completed.

Energy Information

Both natural gas and electricity are provided by XCEL/Northern States Power. Around 2014 Xcel upgraded/replaced the electrical sub-station at the southeast corner of the Park. The sub-station appears to be state-of-the-art and is supplied by dual high voltage lines. Xcel offers several electrical rate schedules for commercial and industrial customers. Time-of-day, demand control, and high capacity factor discounts are just some of the options available. Xcel is uniquely different from most of the other electrical utilities serving the U.P. Xcel covers the entire electric supply from generation to transmission to distribution. They serve the west half of Wisconsin and large portions of Minnesota. A small portion of Gogebic and Ontonagon Counties are their only penetration into Michigan. In general, their rate schedules for Michigan do not change as frequently as other states; a point that several customers in the Park commented about (planning based on stable prices). Xcel customers receive a single billing statement that includes all the electrical and natural gas consumption for the company and summarizes the total energy costs for the premises.

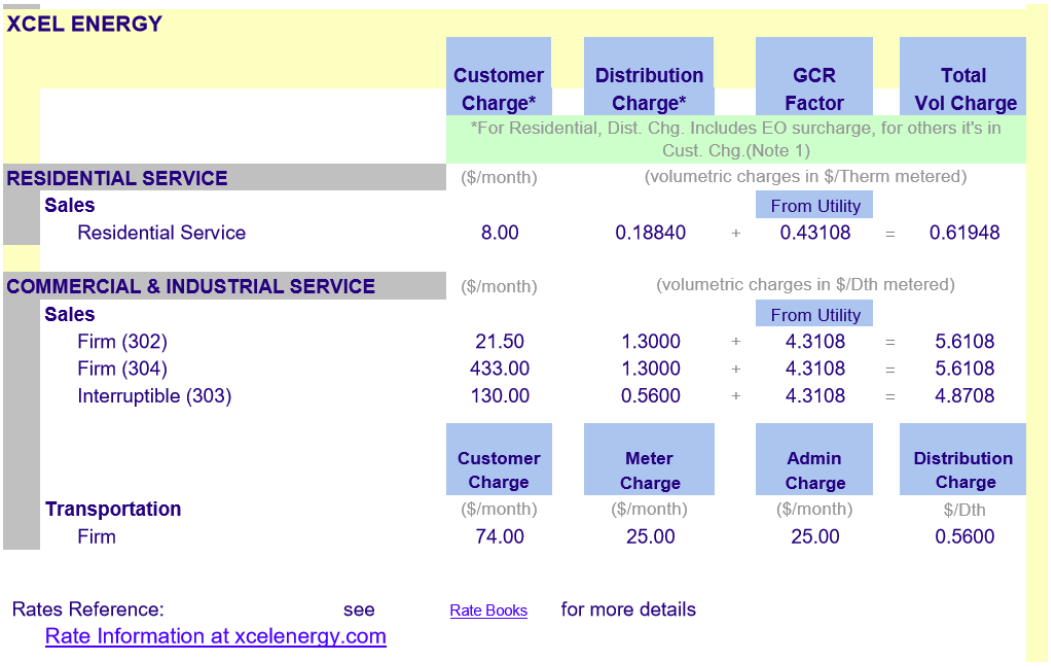
Electric Rates

Utility	Service	Energy Rate [$/kWh]	Demand Rate [$/kW]	Fixed Rate (Single Phase) [$/month]	Fixed Rate (Three Phase) [$/month]
XCEL	Small Commercial	$0.09	$0.00	$11.50	$16.50
	Large Commercial	$0.08	$9.20	$55.00	$55.00

Source- Xcel Electric Rate Books, retrieved from http://www.xcelenergy.com/staticfiles/xe/Regulatory/Regulatory%20PDFs/rates/MI/Mie_Section_4.pdf

Note- In addition to the above rates, Xcel also charges a $0.077/kWh rate for Power Factor adjustment charges. The System Power Factor Adjustment is applied, when customer's Measured Demand is greater than 100 kW for 4 of 12 consecutive billing months. The System Power Factor Adjustment is not applied if the Measured Demand remains below 100 kW for 12 consecutive months. (source – Xcel Electric Rate Books)

An Xcel representative is on the IIDC Board. Some industrial customers had concerns about energy costs, but most believed the rates were fair (by comparison to other rates across the U.P., the Ironwood rates are very reasonable). Xcel offers Energy Financial Analysis tools online.



XCEL ENERGY

	Customer Charge*	Distribution Charge*		GCR Factor		Total Vol Charge
	*For Residential, Dist. Chg. Includes EO surcharge, for others it's in Cust. Chg.(Note 1)					
RESIDENTIAL SERVICE	($/month)	(volumetric charges in $/Therm metered)				
Sales				From Utility		
Residential Service	8.00	0.18840	+	0.43108	=	0.61948
COMMERCIAL & INDUSTRIAL SERVICE	($/month)	(volumetric charges in $/Dth metered)				
Sales				From Utility		
Firm (302)	21.50	1.3000	+	4.3108	=	5.6108
Firm (304)	433.00	1.3000	+	4.3108	=	5.6108
Interruptible (303)	130.00	0.5600	+	4.3108	=	4.8708
	Customer Charge	**Meter Charge**		**Admin Charge**		**Distribution Charge**
Transportation	($/month)	($/month)		($/month)		$/Dth
Firm	74.00	25.00		25.00		0.5600

Rates Reference: see Rate Books for more details
Rate Information at xcelenergy.com

Source – Michigan Public Service Commission gas rates, retrieved from http://www.dleg.state.mi.us/mpsc/gas/rates/gasrates.pdf

Path Forward for the Ironwood Industrial Park

The Ironwood Industrial Park is in a good position relative to its energy. Many communities in the U.P. can only hope for such a favorable energy scenario. Ironwood's affordable energy comes from Xcel. With a large multi-state utility and only a small footprint in Michigan, the Ironwood area reaps the benefits. The small concentrated footprint in Michigan not only produces many customers per mile of line but makes frequent appearances in front of the Michigan Public Service commission uncommon, resulting in stable rates.

Energy Efficiency Retrofits

Opportunities exist for all tenants for incremental improvements in energy efficiency, primarily in lighting. For the large power and energy users, there is no inexpensive method to become more efficient in their operations. RETAP has visited some of the facilities, however feedback from park businesses indicate that in this instance, RETAP was not able provide much assistance.

Solar

All existing customers are large energy users with machines with large loads, subsequently have large power demands, making net-metered solar for individual businesses a low priority option. However, the active business community with several park tenants and utility representatives on Ironwood Industrial Development Corporation board, combined with large open areas with adequate solar potential make Ironwood Industrial Park a strong candidate for a community solar project.

Wind

Not a highly viable option because of insufficient space for a wind turbine of sufficient capacity to make a difference.

Geothermal

Geothermal heating and cooling is not implemented by anyone at this time. With their large electric loads, building heating costs only form a relatively small portion of their energy expenditure. As a result, even though geothermal energy remains viable in this park, geothermal heating and cooling is likely to remain a very low priority for all current businesses.

Future adoption prospects look optimistic. Low electric rates combined with the absence of gas pipeline at some parcels within this park make geothermal an attractive option for a new businesses coming into the park, specifically a small commercial businesses with office space.

Biomass

A couple of companies generate wood waste. At this time the companies prefer to sell their wood waste instead of making the capital investment in new equipment. There seemed to be a Keep It Simple attitude – just concentrate on your core business and do not get involved with new high tech complicated equipment just to save a few dollars.

Industrial Waste Heat Recapture

There are a couple of operations that have excess heat that has no use and is thrown away. We have no solution for this problem. It is a problem – operating air conditioning systems during U.P. winters is fundamentally wrong.

RECOMMENDATIONS FOR BUSINESSES

Primarily due to affordable electricity, companies within the Ironwood Industrial Park do monitor their daily usage and just pay their monthly bills. Opportunities exist for energy efficiency, but companies need to better understand how and where the energy is used

The largest electrical consumers in the Park should investigate the option of using an Alternative Energy Supplier.

Ottawa Forest Products should address their low Power Factor. The cost of Power Factor Correction equipment may have a good return on investment by eliminating the current penalty they pay for a low power factor.

Companies with excess heat need to remain current on new technologies which someday may allow for the capturing and re-use of the energy in their waste heat. Today, there is no simple/affordable answer.

RECOMMENDATIONS FOR EDOS

Smaller companies face barriers to energy efficiency upgrades since they cannot support an electrical efficiency engineer on staff. A community or regional sponsored engineer maybe the most viable solution.

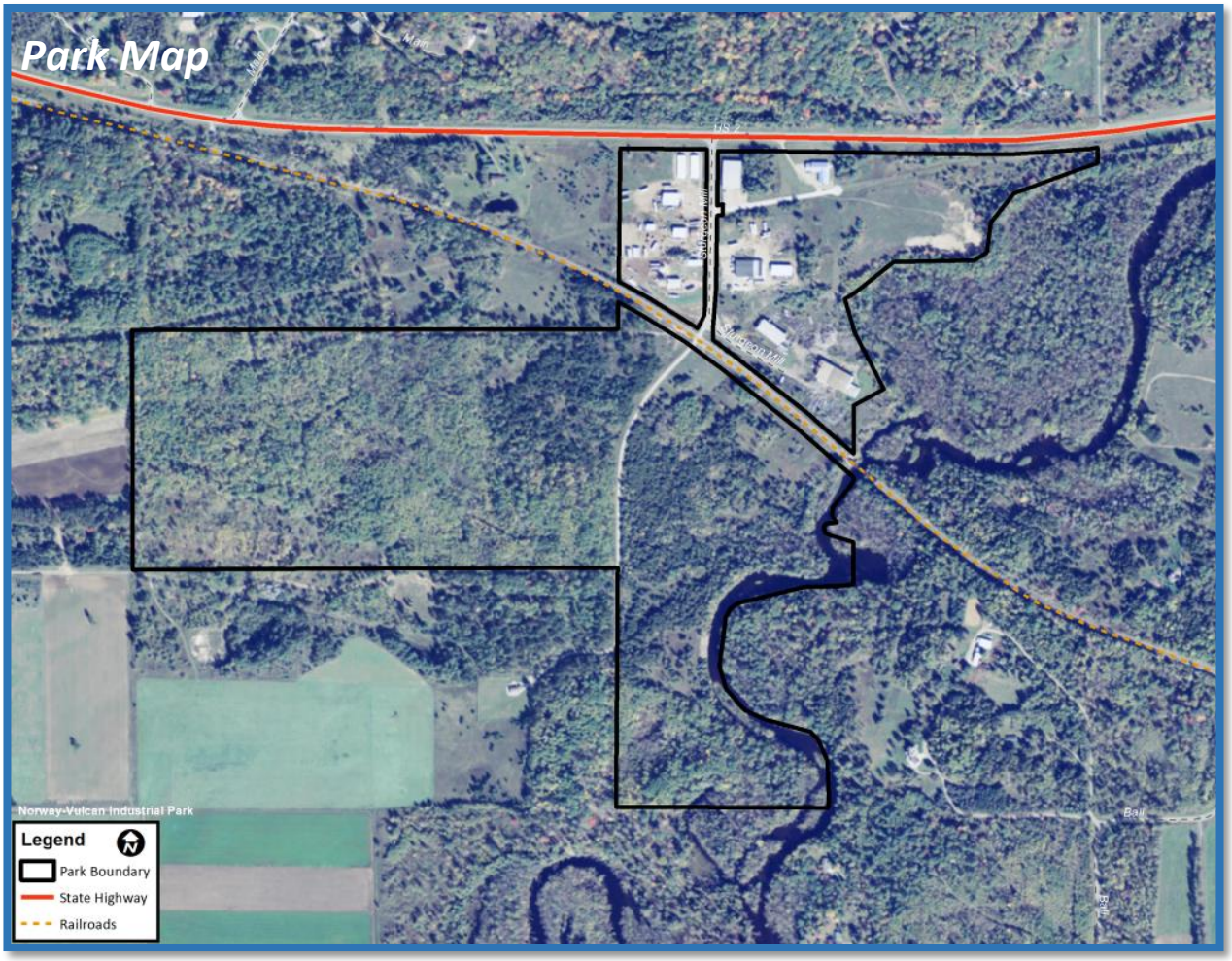
Overall, the Ironwood industrial park community can serve as a role model for proactive governance of an industrial park in this region.

NORWAY-VULCAN INDUSTRIAL PARK

General Park Information

The Norway-Vulcan Industrial Park is 182 acres in size and is roughly 22% developed. Sizes of lots varies depending on type of development. The park has tax incentives available. US Highway 2 is less than 1 mile away. There are no airports or air services in the nearby area. The park does have a rail line running through it that could possibly be utilized.

Utilities for the park include City of Norway for water and some electric, WE Energy for electric, and Norway City for cable and internet.



Community Information

Population (U.S. Census, 2010): 2,845 (City of Norway); 26,168 (Dickinson County)

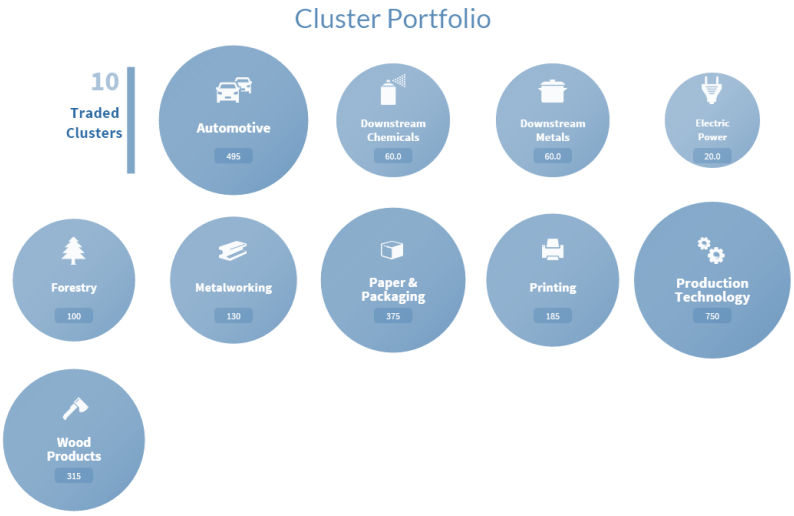
Unemployment Rate: 6.6% (Dickinson County - MI BLM, 2014)

% of population high school graduate or higher: 93.1

% of population bachelor degree or higher: 1.4

% of population with a disability: 15.2

% of population that are veterans: 10.1

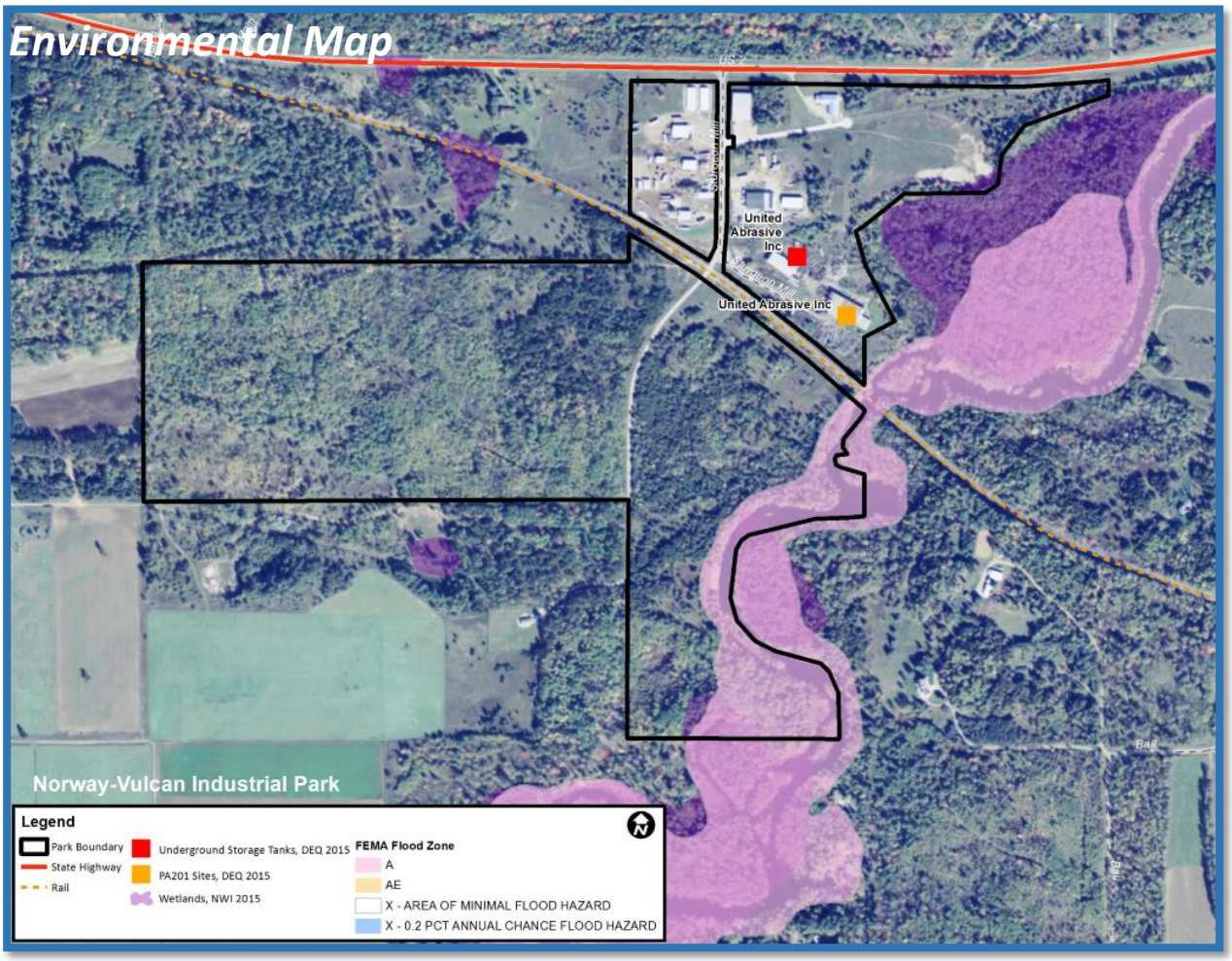


Planning/Zoning & Environmental Information

The Industrial Park falls under Township zoning. The ordinance specifically identifies utility substations and wind turbines as conditional uses. Wind turbines are to be primarily for generation of power for the property on which it is located. The ordinance states "This provision shall not be interpreted to prohibit the sale of excess power generated from time to time from a wind turbine designed to meet the energy needs of the principal use." Minimum lot size within the Industrial district is 20,000 square feet. Minimum lot width is 150 feet. Setbacks are a 50-foot front setback when parking is in the front, 30-foot front setback when parking is the rear, 25-foot side setback, 30-foot rear setback, 40-foot maximum building height. A site plan process in included in the zoning ordinance. Setbacks are present and building heights are restricted to 40 feet.

Recommended Application of Alternate Energy Options by Zoning Districts in Selected Communities

Zoning Jurisdiction	Zoning Districts	Alternative Options to Grid Electricity								
		Nat. Gas	Solar	Wind	Geothrm'l	Bio-fuels	Battery	Compress Air Sys.	Gen.IV Nucl.*(2)*	Hydro.
Norway Comm.	Rural Res.	Permitted	Cond'l Per.	Cond'l Per.	-	-	-	-	-	-
(City-Twp. Zng.)	Rsourc.Prod.	Permitted	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	-	-	-	-
	Industrial	Permitted	Permitted	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	-
				(1) Presence of airport makes the prospect for wind energy development unlikely.						
				(2) Generation IV nuclear reactors (3 cents/kWh) are 5-20 years from commercial						
				application and may be used in conjunction with portable industrial scale batteries.						
										3/24/2016



According to recently updated FEMA flood data, a flood zone (A zone) exists around the Sturgeon River that runs along the east side of the park area. No development currently exists within this flood zone. The National Wetland Inventory shows several areas of wetlands in the area. Only the southern portion of the park along the Sturgeon River show as possibly having wetlands. The Michigan Natural Features Inventory provides a listing of rare and endangered species by County. Dickinson County has 37 different plant and animal species listed under the MNFI. Because of the sensitivity of specific locations of these species, the MNFI has created the Biological Rarity Index, which provides a ranking (high, moderate, low) of finding a rare or endangered species in a certain location by Public Land Survey System (PLSS) Sections. The entire industrial park is within an area identified as low probability of having endangered species. The area directly south of the park is identified as having a high probability.

The EPA's ERMA (Environmental Response Management Application) provides data on sensitive habitats and species. Data for the Norway-Vulcan Park does not exist, which draws the conclusion that no sensitive habits are in the area. According to the Michigan DEQ, one site within the park is identified as a PA201 site of environmental contamination – United Abrasive Inc. This site is also identified as having an underground storage tank, which has been closed/removed.

Business Information/Site Visit

The Norway-Vulcan Industrial Park has 6 active tenants and provides 35 jobs.

Business	Business Type
Vulcan Wood Products	Manufactures wood pellets
Starship Enterprises	Manufactures wood products
Fabricating Machining & Repair	Turbine repair
United Abrasives	Distribute and recycle abrasives
Barglind Trucking	Garage and Self-Storage Units
Dickenson/Iron County Social Services	Food Distribution Warehouse

The Vulcan/Norway Industrial Park is unique because it is serviced by two different electric utilities. All the current tenants, located between the highway and the railroad, are on We Energies. All the vacant land south of the railroad would be serviced by the City of Norway's municipal electric system (Norway Power & Light). Norway gets about 2/3's of their electricity from the Sturgeon Fall Hydro facility, the remainder comes from WPPI. Originally built in 1906 the four turbines supply an average of 2.3 MW and have a peak capacity of 5 MW. Currently, 2 of 4 turbines are out of service for repairs. Ideally, they would like to attract a "green" company (i.e. solar panel manufacture) and promote the idea of a green company operating on 100% renewable power. The natural gas provider is DTE. None of the current tenants use large quantities of natural gas in their operations and several tenants do not have natural gas service.

Sturgeon River Millworks was the largest tenant in the Park, until a fire in March 2015 completely destroyed the facility. The lot is currently being used as a parking lot for semi-trailers.

Currently, the most energy intensive tenant in the Vulcan Industrial Park is ***Vulcan Wood Works***, a producer of wood pellets (approx. 10,000 tons/year). The operation is large motor intensive. There are two 150 HP motors (pictured at right), a 125 HP and several smaller motors – all running simultaneously. We Energies has a prime time rate and an off-peak rate for industrial customers. If Vulcan Wood Works runs during prime time, it's cost to make pellets is 5 times more than when running off-peak. The owner would rather pay workers a premium for working night shift and weekends instead of paying the prime time electric rate.

There is no natural gas line to the building. Biomass residue (bark, chips, sawdust) is burned on-site for heat. If the opportunity to switch electric providers was available, Vulcan Wood Works would have substantial savings in energy costs and would consider increasing the number of employees.

Starship Enterprise is a wood products manufacturer, making items such as flooring, pallets, moldings and piece parts. The facility is a daytime operation and the electric bill runs roughly $3,000/month from WE Energies. Starship operates on a 480 volt 3-phase system with an 800-amp service (665KVA). The facility's largest motors are a pair of 50 HP units. There is also two 30 HP, and 12 motors in the 7 ½ to 10 HP range. Starship is not currently considering an off-hours operation. Starship would also like the opportunity to switch electric providers. Currently there is no natural gas line to the building, and Starship burns biomass residue for heat.

Fabricating Machining & Repair, LLC is the newest tenant in the Park. The business was formerly located in Norway and had considered constructing a new building in the Park south of the railroad (Norway Municipal Electricity) but made a financial decision to purchase an existing structure which was vacant (former Patton Archery building). The business is still in a growing phase, with more machines coming on-line. Currently the facility has a 400 amp, 480 volt 3-phase service (332KVA). FMR is approaching their service capacity and expect to upgrade. Their machining centers are in the 20 to 60 HP range and typically only one machine is in operation at a time. That may change as they grow to a 10-12 person operation. They may eventually have a cumulative 300 HP in the next 1 – 1½ years. FMR is serviced by We Energies but as with other tenets in the park, would welcome the opportunity to switch providers. Considering FMR repairs the turbines for Norway's hydro-plant, they would prefer to support the local municipal provider. FMR does plan on upgrading the shop lighting to T-8's or LED. The facility uses a minor amount of natural gas for heat.

Energy Information

The Vulcan/Norway Industrial Park is unique because it is serviced by two different electric utilities - City of Norway Power and Light - a local municipal utility and WE Energies - a Wisconsin based Investor Owned Utility (IOU), with a railway line through the industrial park separating the service territories of these utilities.

All the current tenants, located between the highway and the railroad, are on We Energies. WE customers pay high electric rates during "on-peak" hours – typically first-shift. Businesses can instead opt in for cheaper 'flat rate' charges. The decision to operate only during off-peak hours was the only viable option for one company to stay in business. Other businesses were reluctant to adopt a similar strategy, citing concerns about being unable to recruit quality workforce that would be willing to operate under a non-traditional work schedule.

All the vacant land south of the railroad would be serviced by the City of Norway's municipal electric system (Norway Power & Light). Norway gets about 2/3's of their electricity from the Sturgeon Fall Hydro facility, the remainder comes from WPPI. Originally built in 1906 the four turbines supply an average of 2.3 MW and have a peak capacity of 5 MW. Currently, 2 of 4 turbines are out of service for repairs. Ideally, they would like to attract a "green" company (i.e. solar panel manufacture) and promote the idea of a green company operating on 100% renewable power. The natural gas provider is DTE. None of the current tenants use large quantities of natural gas in their operations and several tenants do not have natural gas service.

This dynamic of locally generated clean energy vs expensive energy from Wisconsin is source of great consternation for all businesses in this park. Every business in the industrial park expressed their frustration at their inability to choose power from their own local municipal utility.

Electric Rates

Utility	Service	Energy Rate [$/kWh]	Demand Rate [$/kW]	Fixed Rate (Single Phase) [$/month]	Fixed Rate (Three Phase) [$/month]
Norway	Small Commercial	$0.13	$0.00	$35.00	$35.00
	Large Commercial	$0.09	$11.25	$80.85	$80.85
WE	Small Commercial (< 30MWh/month)	$0.14	$0.00	$14.79	$29.10
	Large Commercial On Peak *	$0.07	$11.96	$68.38	$68.38
	Large Commercial Off Peak	$0.05	$6.57	$68.38	$68.38

***On-peak demand charge** (On Peak-Power Supply - all kW) is for highest level of demand between 9 a.m. and 9 p.m. weekdays during the billing period.

In addition to the above rates, WE also charges a Power Factor Demand penalty of $18.7/kW/month.

Source- Norway City Utility Ordinance, retrieved from http://mi-norway.civicplus.com/DocumentCenter/View/626 and WE Energies Rate Summary, retrieved from https://www.we-energies.com/business/michigan_service_rates/

Natural Gas

Current effective rates

RATES EFFECTIVE FOR GAS SERVICE — DTE Energy

Applicable To All Districts
Issued By: Regulatory Policy & Operations

December 2015

Rate Schedule No.	Rate Schedules	Monthly Customer Charge 2/	Monthly IRM Surcharge 3/	U-17822 Monthly Credit/ Surcharge 4/	COMMODITY CHARGE PER 100 CUBIC FEET (Ccf) 1/ Distribution Charge (Non-Gas) 2/	GCR Factor 5/	Energy Optimization Surcharge 6/	Reservation Charge 7/	Credit/ Surcharge 8/	Credit/ Surcharge 9/	Credit/ Surcharge 10/	Total Rate Applicable to December 2015 Cycle
A	Residential Rate 11/	$ 10.50	$ 1.54	$ (1.21)	$ 0.24942	$ 0.40700	$ 0.01777	$ 0.02800	$ -	$ -	$ -	$ 0.70219
AS	Low Income Senior Citizen Rate 11/	$ 10.50	$ 1.54	$ 1.23	$ 0.24942	$ 0.40700	$ 0.01777	$ 0.02800	$ -	$ -	$ -	$ 0.70219
2A	Multi-Family Dwelling Service Rate											
	Meter Class I	$ 10.50	$ 6.42	$ 9.70	$ 0.24942	$ 0.40700	$ 0.01427	$ 0.02800	$ -	$ -	$ -	*$ 0.69869*
	Meter Class II	$ 26.20	$ 6.42	$ 5.05	$ 0.24942	$ 0.40700	$ 0.01427	$ 0.02800	$ -	$ -	$ -	$ 0.69869
GS-1	Non-Residential General Service 12/	$ 26.20	$ 4.40	$ (0.39)	$ 0.24821	$ 0.40700	$ 0.01427	$ 0.02800	$ -	$ -	$ -	$ 0.69748
GS-2	Large Volume Rate 12/											
	< 100,000 Mcf	$ 590.00	$ 4.40	$ -	$ 0.19995	$ 0.40700	$ 0.01427	$ 0.02800	$ -	$ -	$ -	$ 0.64922
	> 100,000 Mcf	$ 590.00	$ 4.40	$ -	$ 0.19995	$ 0.40700	$ 0.00135	$ 0.02800	$ -	$ -	$ -	$ 0.63630
S	School Rate 12/	$ 200.00	$ 48.38	$ (243.12)	$ 0.15968	$ 0.40700	$ 0.01427	$ 0.02800	$ -	$ -	$ -	$ 0.60895
ST	Small Volume Transportation 13/ thru 17/											
	Cost Based	$ 2,030.00	$ 194.99	$ -	$ 0.07959	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.08094
	Optional - Minimum	$ 2,030.00	$ 194.99	$ -	$ 0.02300	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.02435
	Optional - Maximum	$ 2,030.00	$ 194.99	$ -	$ 0.13618	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.13753
LT	Large Volume Transportation 13/ thru 17/											
	Cost Based	$ 3,660.00	$ 500.00	$ -	$ 0.06001	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.06136
	Optional - Minimum	$ 3,660.00	$ 500.00	$ -	$ 0.02300	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.02435
	Optional - Maximum	$ 3,660.00	$ 500.00	$ -	$ 0.09702	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.09837
XLT	Extra Large Volume Transportation 13/ thru 17/											
	Cost Based	$ 9,100.00	$ 500.00	$ -	$ 0.05068	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.05203
	Optional - Minimum	$ 9,100.00	$ 500.00	$ -	$ 0.01800	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.01935
	Optional - Maximum	$ 9,100.00	$ 500.00	$ -	$ 0.08336	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.08471
XXLT	Double Extra Large Volume Transportation 13/ thru 17/											
	Cost Based	$ 120,000.00	$ 500.00	$ -	$ 0.01652	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.01787
	Optional - Minimum	$ 120,000.00	$ 500.00	$ -	$ 0.00500	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.00635
	Optional - Maximum	$ 120,000.00	$ 500.00	$ -	$ 0.08336	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.08471

Source – DTE Gas Rates, retrieved from https://www2.dteenergy.com/wps/wcm/connect/902be969-c10b-4232-9a85-f878c8f98093/rateCard.pdf

Path Forward for the Norway-Vulcan Industrial Park

The Norway/Vulcan Park was one of the smallest Parks in the study. The two electrical energy intensive companies in the Park are electric motor operations. There is little opportunity to improve the efficiency of these motors which need to run at a fixed speed and simultaneously. The decision to operate only during off-peak hours was the only viable option for one company to stay in business. Other businesses were reluctant to adopt a similar strategy, citing concerns about being unable to recruit quality workforce that would be willing to operate under a non-traditional work schedule.

Two companies in the Park generate much wood waste residue which gets used for heating their buildings. Wood heat is so cheap that no effort is made to insulate. There may be a possibility of increasing building efficiency and then being able to sell excess wood residue, but the benefits of such an upgrade may only yield marginal savings on energy bills.

There is ample land available, but new tenants have not been attracted to the area. All the current tenants have WE Energies as their electric provider, and universally expressed dissatisfaction with their electric service provider. All current tenants would prefer to be customers of the local municipal electric provider, Norway Power & Light. Tenants anticipate lower rates with their local utility. A large majority (estimated average annual 80%) of Norway Power and Light energy is sourced locally from their hydroelectric facility.

Industrial park tenants strongly expressed their support for local renewable energy versus buying electricity from a Wisconsin based utility. Every tenant we spoke with voiced their frustration with their inability to become a customer of their own local Norway Power & Light utility.

Energy Efficiency Retrofits

Energy efficiency opportunities exist for all tenants, primarily in lighting. For the large power and energy users with large electric motors operating at fixed speeds, there is method to become more efficient in their operations.

Natural Gas

Natural gas pipeline is not available at several businesses. With cheap indoor heating provided through waste wood residue, natural gas heating or co-gen is not currently a viable option for business in this industrial park.

Solar

Current MI net-metering law allows solar and other alternative energy systems net-metered to the grid to only mitigate the energy charges, and do not help reduce the demand portion of a facility's energy bill. All existing customers are large energy users with machines with large loads, subsequently have large power demands, making net-metered solar unviable.

Wind

Considerations similar to solar PV adoption limit the adoption of wind energy by any individual business in the park. While state level wind feasibility maps identify this area as having only marginal wind development capacity for small wind turbines, micro-wind patterns within the industrial park might make it a viable option for the development of a large wind turbine project.

Geothermal

With their large electric loads, building heating costs only form a relatively small portion of their energy expenditure. As a result, even though geothermal energy remains viable in this park, geothermal heating and cooling is not implemented by anyone at this time and will remain a very low priority for all current businesses.

Future adoption prospects look optimistic. Low electric rates combined with the absence of gas pipeline at some parcels within this park make geothermal an attractive option for a new businesses coming into the park, specifically a small commercial business with office space.

Biomass

Two companies repurpose residual product (barks, chips etc.) for heating their buildings. The size of their operation is small, and their waste product is limited. Scaling up this operation to a larger biomass facility may continue to remain unviable for the near future.

Industrial Waste Heat Recapture

No known waste heat sources.

RECOMMENDATIONS FOR BUSINESSES

Check large motor operations and verify they are not paying a penalty for low power factors. In some instances, Power factor correction might be a significant portion of monthly energy costs. In such instances, power factor compensation devices may off a good return on investment.

RECOMMENDATIONS FOR EDOS

All current tenants are on We Energies, yet Norway Power and Light would service most of the undeveloped land in the Park.

With nearly 80% of their energy supply generated locally through renewable hydroelectricity, the City of Norway can market itself as a 'green energy zone', becoming an attractive destination for businesses with corporate sustainability goals that require a significant portion of their energy to come from renewable sources. As a municipal utility, Norway Power and Light is uniquely positioned to offer several value added services to complement their standard utility supply –

- Bundling cable, electric, water and sewer services into packages from a single provider.
- Offer on-bill financing to support alternative energy and energy efficiency upgrades.
- Help support local economic development and business retention by negotiating attractive rate structures for new businesses, and provide rate incentives for increasing employment and job growth.

The number one recommendation for this Park is to support existing businesses in their desire to switch to Norway Power and Light. Local planners are advised to closely follow a case currently pending[7] before Michigan Supreme Court that could provide clarity on resolving territorial disputes between municipal and regulated utilities in Michigan.

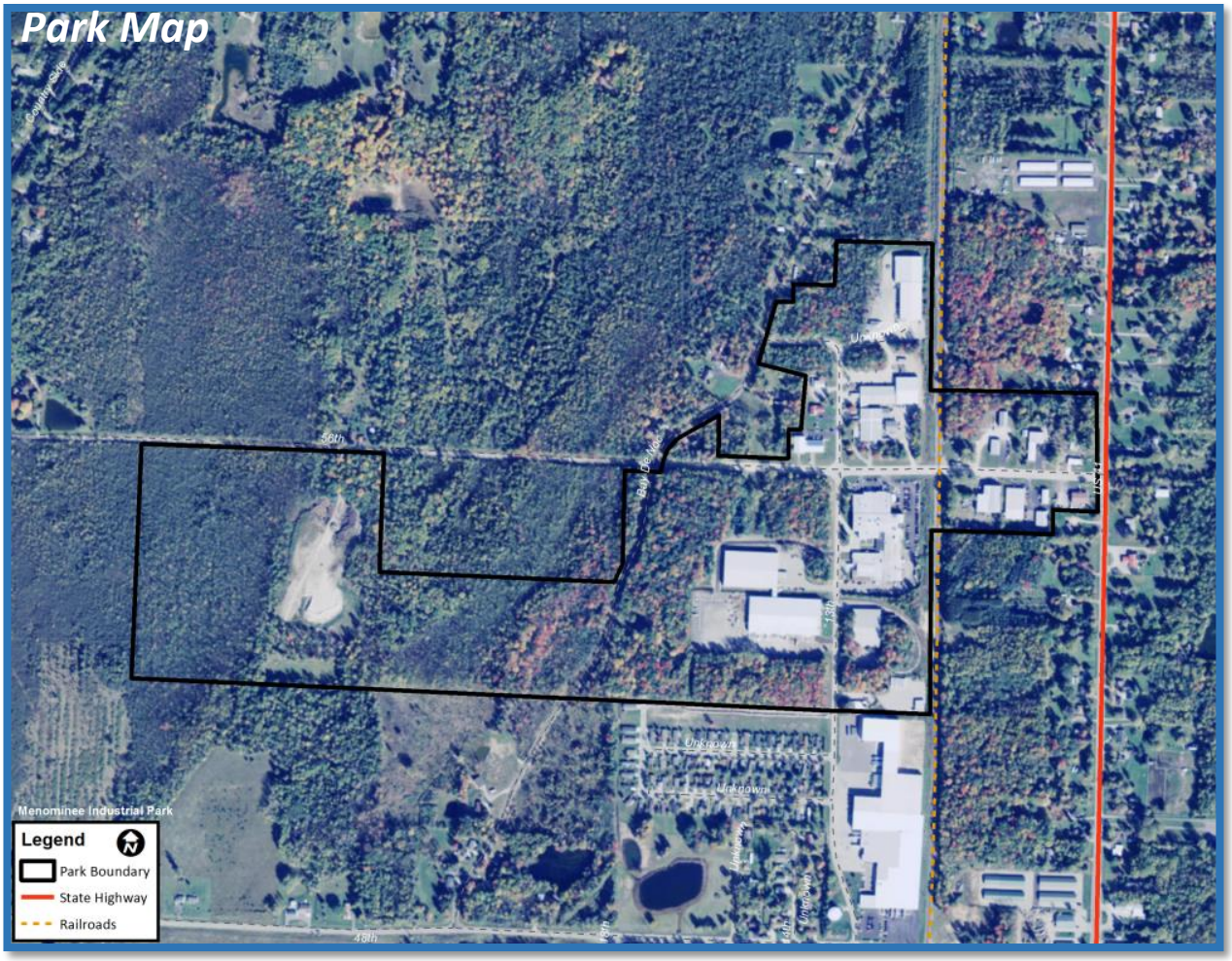
[7] http://courts.mi.gov/Courts/MichiganSupremeCourt/Clerks/Documents/briefs-archive/2015-2016/151053/151053_AC-MMEA.pdf

MENOMINEE COUNTY INDUSTRIAL PARK

General Park Information

The Menominee County Industrial Park is 140 acres in size and is roughly 39% occupied. Sizes of lots varies from .72 acres to 40 acres, and the price of land per acre is roughly $2,000 average for County/City-owned lots. The original portion of the Park is 40 years old and almost completely occupied, with only two small vacant lots available. The City has purchased additional acreage to the west of Bay De Noc Road; a 10-acre parcel has a pending sale and the remaining 59.5 acres is undeveloped and will require infrastructure expansion. The park has an Industrial Facilities Tax Exemption. US Highway 41 is less than 1 mile away, and the County Airport is located about 3 miles away. Rail is directly adjacent to the park.

Utilities for the park include Wisconsin Public Service for both gas and electric.



Community Information

Population (U.S. Census, 2010): 8,599 (City of Menominee); 24,029 (Menominee County)

Unemployment Rate: 6.7% (Menominee County - MI BLM, 2014)

%% of population high school graduate or higher: 90.7

% of population bachelor degree or higher: 2.8

% of population with a disability: 16.6

% of population that are veterans: 9.9

Planning/Zoning & Environmental Information

The Industrial Park falls under City Zoning, and is in the Industrial Park Zoning District. Power generation requires a special use permit (and payment of associated fee), granted by the City Planning Commission. A technical reading of the zoning ordinance would mean that any construction that generates power would then require a special use permit. The M-2 zone requires a 50ft building/structure setback from street; 10ft setback for sides. Lot coverage by buildings and structures shall be no greater than 1/3 of site. Maximum building height is 75 feet, with an exception for appurtenances to mechanical or structural functions. Freestanding towers shall not exceed 1.5x the maximum building height. A site plan process in present in the zoning ordinance.

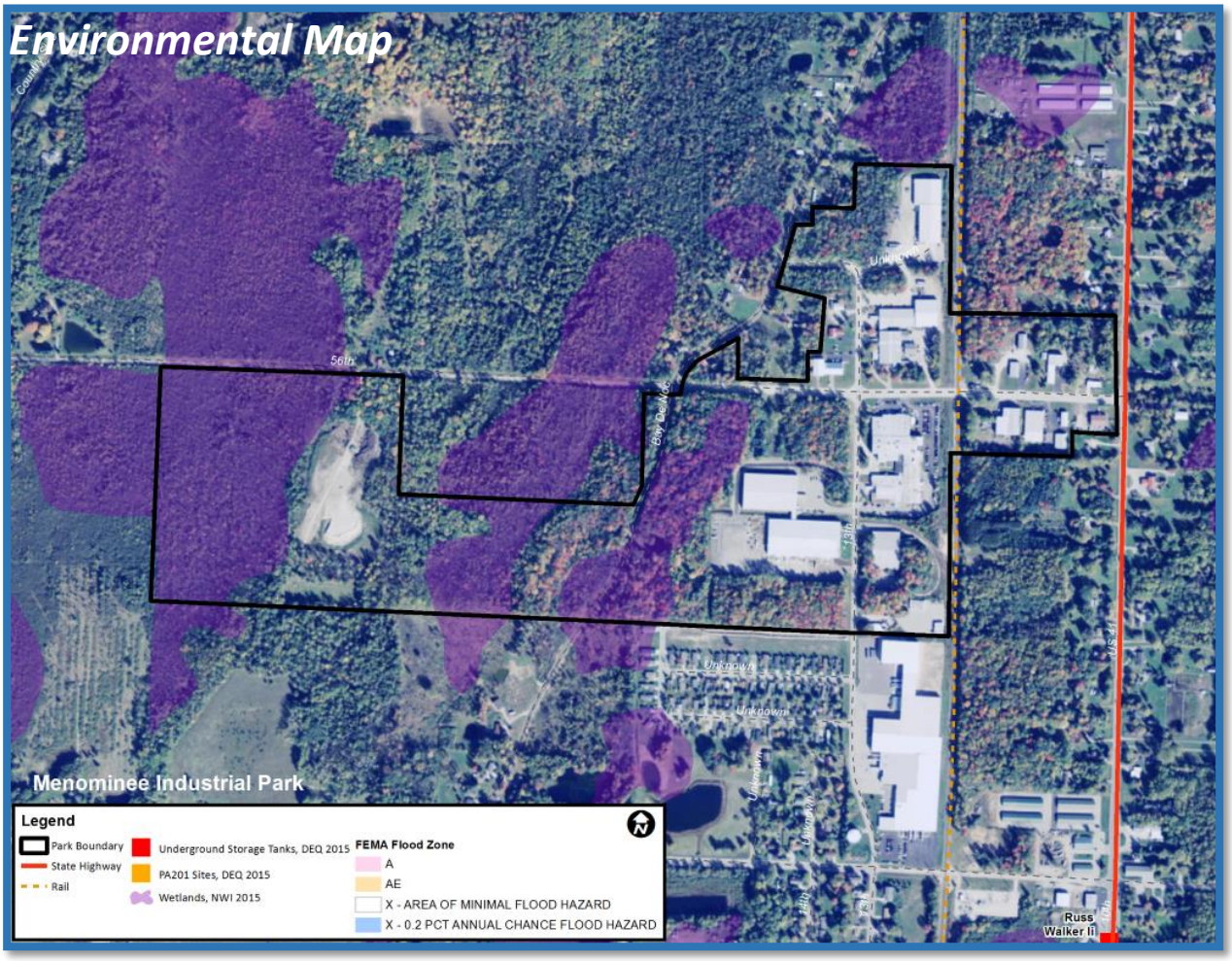
Outdoor heating units are prohibited by local ordinance, defined as the following: "Accessory structures located on a parcel of land that supply a source of heat to another structure that is not attached to the outdoor heating unit, whether located on the same or a different parcel of land. Any form of heat generated from the outdoor heating unit is intended to be within the coverage of this section, whether burning wood, coal, natural gas, any other combustible material or electrically powered. Any buildings or structures located within the City must be heated by systems wholly contained within the building to be heated. Outdoor heating units are not permissible and may not be installed or operated in the City. Industrial heating plants that services more than one building are not included in this definition and are not prohibited by this section."

Recommended Application of Alternate Energy Options by Zoning Districts in Selected Communities

Zoning	Zoning	Alternative Options to Grid Electricity								
Jurisdiction	Districts	Nat. Gas	Solar	Wind	Geothrm'l	Bio-fuels	Battery	Compress Air Sys.	Gen.IV Nucl.*(2)*	Hydro.
City of Menominee	Industry	Permitted	Cond'l Per.	*(1)*	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	-
	Indus.Park	Permitted	Cond'l Per.	*(1)*	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	-

(1) Presence of airport makes the prospect for wind energy development unlikely.
(2) Generation IV nuclear reactors (3 cents/kWh) are 5-20 years from commercial application and may be used in conjunction with portable industrial scale batteries.

3/24/2016



According to FEMA, the park site is not within any floodplains. The National Wetland Inventory shows that wetlands are present in three areas within the park, primarily in the western portion. A permit may be required depending where on-site energy development may occur. The Michigan Natural Features Inventory provides a listing of rare and endangered species by County. Menominee County has 43 different plant and animal species listed under the MNFI. Because of the sensitivity of specific locations of these species, the MNFI has created the Biological Rarity Index, which provides a ranking (high, moderate, low) of finding a rare or endangered species in a certain location by Public Land Survey System (PLSS) Sections. At the Menominee County site, an area to the east of US-41 is identified as having a low probability. The park itself is not within the risk area.

The EPA's ERMA (Environmental Response Management Application) provides data on sensitive habitats and species. Data from 1993 suggests several sensitive species along the shoreline of Green Bay. No species are identified within the park area. According to the Michigan DEQ, no sites of environmental contamination (PA201 sites) are present within the park or the immediate area, and no underground storage tanks are currently present.

Business Information/Site Visit

The Menominee County Industrial Park was the oldest/most established industrial park in the study. With 11 actives businesses the Park provides 700 jobs.

Business	Business Type
Anchor Coupling	Hydraulic Hose Assemblies
Nu-Vu Food Services Systems	Manufactures baking ovens
Great Lakes Foods	Grocery wholesaler
Hakd Tool & Die	Tool & Die
CMB Manufacturing	Manufactures brooms and brushes
Anderson Manufacturing	Manufacturer of wood furniture
Zeratsky Extreme Heating & Cooling	HVAC, alternative Energy
L&S Electric	Industrial Electric Supply & Repair
Christensen Machinery & Supplies Co, Inc.	Industrial supplier, machine sales & repair
Columbia Pipe & Supply Company	Plumbing supplier
K & KW, LLC	Warehouse

CUPPAD and MTU met the Director of the Menominee Business Development Corporation (MBDC) at Great Lakes Foods in Menominee. Although Great Lakes foods is not located directly within the Industrial Park boundary, it is considered part of the Industrial Park area. Representatives from Great Lakes Foods sat down with CUPPAD and MTU to discuss energy issues and what steps the company has taken to reduce energy waste and improve energy efficiencies.

Great Lakes Foods is a 270,000 sq-ft facility with 120 employees. They have been in the same location for 50 years and recently expanded under the new ownership who invested millions in upgrading the facility. About 35% of the facility is refrigerated with cold rooms operating at 30oF and freezer sections at -18oF. 61 electric forklifts and carts are used in the operation. The facility's electric service is a unique situation where the primary provider is Wisconsin Public Service for both electricity and natural gas. However, Great Lakes Foods has a multi-year contract with Constellation. A review of one bill indicates they pay WPS for energy and Constellation for demand. Natural gas is used only for heat, so bills are a normally a few hundred dollars in the summer and significantly more in the winter. During the "artic" cold spell of January 2015, natural gas costs exceeded $12,000. The company has made many efficiency upgrades through Efficiency United and have plans for more in the future.

No other site visits were able to be done in this park, however discussions with MBDC painted a general picture of energy situations at other businesses.

Energy Information

Wisconsin Public Service (WPS), an Investor Owned Utility based in Wisconsin provides both electric and gas service within this industrial park. WPS has a large service territory in Wisconsin, but only half of Menominee County constitutes their footprint within Michigan.

Despite such a small service territory, WPS is the third largest utility in the U.P. by total electricity supplied, accounting for nearly a quarter of all U.P.'s electricity consumption. With such high energy consumption in a small service area combined with proximity to generation sources in Wisconsin, WPS customers enjoy some of the lowest residential and commercial rates in the U.P.

Electric Rates

Utility	Service	Energy Rate [$/kWh]	Demand Rate [$/kW]	Fixed Rate (Single Phase) [$/month]	Fixed Rate (Three Phase) [$/month]
WPS	Small Commercial (< 25MWh/month)	$0.10	$0.00	$25.00	$25.00
	Large Commercial On Peak	$0.06	$13.95	$123.00	$123.00
	Large Commercial Off Peak	$0.03	$2.75	$123.00	$123.00

Source - WPS Electric Rate book, retrieved from http://www.wisconsinpublicservice.com/company/mi_tariffs.aspx

Natural Gas

WISCONSIN PUBLIC SERVICE CORPORATION
MONTHLY GAS RATES
EFFECTIVE: MARCH 2016

MICHIGAN System Sales Customers	Customer Charge Daily / Monthly (per meter)	EO Charge Daily / Monthly (per meter)	Local Distribution Service Charge (per therm)	EO Charge (per therm)	Gas Cost Recovery Factor (per therm)	Business Month Effective Rate (per therm)
GRgM (Residential Firm)	$0.1643/$5.00		0.08564	0.01660	0.31565	0.40129
Cg-SM (Small Comm Firm)	$0.2465/$7.50	$0.0823/$2.50	0.08514		0.31565	0.40079
Cg-LM (Large Comm Firm)	$2.3671/$72.00	$1.5851/$48.21	0.06214		0.31565	0.37779

Source- WPS Gas Rate Book, retrieved from http://www.wisconsinpublicservice.com/company/pdf/sales.pdf

Path Forward for the Menominee County Industrial Park

Businesses and EDO representatives interviewed for this project expressed strong satisfaction with their utility provider, WPS. The Menominee Industrial Park is in an envious position with very affordable electric rates. Similar to the situation in Ironwood, except with Wisconsin Public Service being the provider, there is a large utility company with a small concentrated footprint in Michigan. This results in the lowest commercial/industrial rates in the U.P. Part of the economics of low cost power is the short distance from generation sources.

For the record, it is important to note that the dynamics of local generation vs electricity from Wisconsin appear entirely absent in this park. Indeed, all individuals expressed skepticism in the benefits of shifting policy landscapes that could disentangle U.P.'s energy system from Wisconsin and connecting the electric grid in the two Michigan peninsulas. In the face of the lowest electric rates in the region, such skepticism is understandable, and perhaps even justifiable.

Energy Efficiency Retrofits

Great Lakes Foods is an excellent example of a company that takes energy consumption seriously. All their lighting is high efficiency. Managers use behavioral energy efficiency methods and open communication with employees to prevent abuse of internal heating and thermostat settings. Working closely utility representatives, they have taken advantage of energy efficiency programs. Great Lakes Foods actively monitor their monthly consumption, and actively work on squeezing more efficiency out of their operations. Due to such a proactive approach to energy efficiency, Great Lakes Foods are able to realize significant lifetime savings by prioritizing energy efficient technologies with every upgrade or expansion of their facility.

Solar

Very low energy and demand rates for large commercial businesses makes solar currently a low priority option for high energy users like manufacturing facilities. Some smaller commercial businesses like suppliers or warehouses may realize some savings through adoption of small rooftop solar PV. The presence of an alternative energy business within the airpark could accelerate some of these transitions.

Wind

Not a highly viable option because of insufficient space for a wind turbine of sufficient capacity to make a difference. Menominee-Marinette Twin County Airport (General Aviation) runway is in-line with the Park. With only 1000 ft. between the airport and Park, FAA height restrictions may limit the size of wind turbines.

Geothermal

Geothermal heating and cooling is not implemented by anyone at this. For large energy consumers and manufacturing facilities in this industrial park, building heating costs do not constitute a significant portion of their energy expenditures. Cheap electricity rates make geothermal a viable option for new customers with a small energy footprint, like office spaces, could implement geothermal to heat and cool their buildings. Current historically low natural gas prices could make this a low priority option, but long term volatility in natural gas prices could accelerate some of these transitions.

Biomass

There is some biomass utilization in the Park, but insufficient information to provide specific recommendations.

Industrial Waste Heat Recapture

Insufficient information to make a specific recommendation for all businesses. In the cold winter months, outside temperatures could fall below temperatures inside a cold storage facility. Under such circumstances, by circulating naturally cold outside air by incorporating ambient air cooling technologies, cold storage facilities could reduce some of their energy consumption.

RECOMMENDATIONS FOR BUSINESSES

- Most alternative energy retrofits are currently unviable.
- Savings may be realized by aggressively pursuing energy efficiency, as in the case of Great Lakes Foods. Develop a good working relationship with utility representative to access energy optimization and efficiency programs.

RECOMMENDATIONS FOR EDOS

The greatest issues facing Menominee Industrial Park is an aging infrastructure in the original Park and the lack of any infrastructure in the area available for expansion. With the City of Menominee owning the infrastructure there may be unique opportunities within the Park, but there are also liabilities when infrastructure ages and/or reaches capacity limits. Menominee needs to understand where they are at with their current system and if that impedes further expansion.

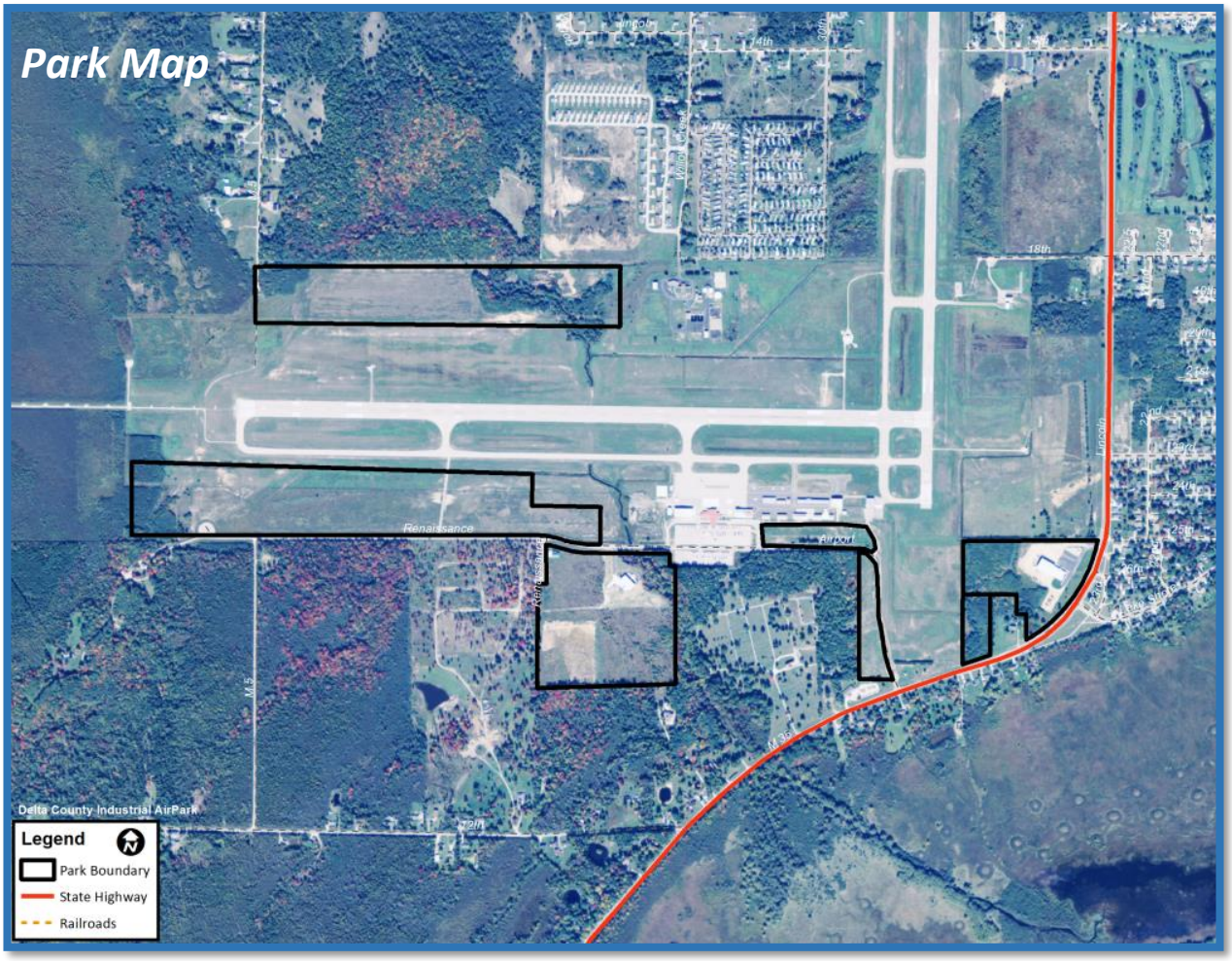
Local EDO can help replicate and expand the successes of energy efficiency projects Great Lakes Foods to other tenants in the industrial park.

DELTA COUNTY INDUSTRIAL AIRPARK

General Park Information

The Delta County Industrial AirPark is 132 acres in size and is roughly 16% occupied – 110 acres unoccupied. Sizes of lots varies from 1 acre to 40 acres, and the price of land starts at $0.10/square foot for lease, dependent on acreage. Sale starts at $15,000/acre, dependent on acreage. The Park is not contiguous: some parcels are available along S. Lincoln Rd. and Airport road on the south side and another portion of the Park is accessible off 13.75 Rd and 5th M Lane. The north section is wooded and has no utilities into parcels and is NOT within the city limits. FAA restrictions is causing problems with selling some parcels, so long term leases are being offered. Drainage ditches create development issues on some parcels.

The industrial park is located in the Delta County Airport Industrial Renaissance Zone. The Zone designation will continue until 2017. Taxes abated under the Michigan Renaissance Zone Law include: Single Business Tax, State and City income tax, General Property Tax, Industrial Facilities Tax, Commercial Forest Tax, Neighborhood Enterprise Zone Tax. Tax relief will be phased out in 25% increments beginning 2015. State Highway M-35 is less than 1 mile away, as well as US-2 and US-41. The County Airport is located on-site. Nearest railroad access is at Whitetail Industrial Park approximately two miles away. Rail service is provided by CN. Utilities for the park include City of Escanaba for water and wastewater (underground), DTE for natural gas, and Merit Network for fiber.



Community Information

Population (U.S. Census, 2010): 12,616 (City of Escanaba); 37,069 (Delta County)

Unemployment Rate: 8.3% (Delta County - MI BLM, 2014)

% of population high school graduate or higher: 91.2

% of population bachelor degree or higher: 4.1

% of population with a disability: 17.9

% of population that are veterans: 11.4

Planning/Zoning & Environmental Information

The Industrial Park falls under City zoning, and is in the Light Industrial Zoning District. The City would have to change the zoning or develop a text amendment to allow "electrical power generation," as this is currently neither a permitted nor special use. A site plan is required for all industrial buildings and uses. Escanaba has all development procedures outlined clearly on its website (http://www.escanaba.org/ldt). The City participates in the MEDO's Redevelopment Ready Communities program, which indicates it has development-friendly procedures. The entire industrial park is subject to FAA regulations due its location on airport property. Any construction must be approved by the FAA (Part 77 regulations) and Michigan Aeronautics Commission.

Recommended Application of Alternate Energy Options by Zoning Districts in Selected Communities

Zoning	Zoning	Alternative Options to Grid Electricity								
Jurisdiction	Districts	Nat. Gas	Solar	Wind	Geothrm'l	Bio-fuels	Battery	Compress Air Sys.	Gen.IV Nucl.*(2)*	Hydro.
Escanaba City	Light Mnfr.	Permitted	Permitted	*(1)*	SLU Permit	SLU Permit	SLU Permit	SLU Permit	-	-
	Indus.Park	Permitted	Permitted	SLU Permit	SLU Permit	SLU Permit	SLU Permit	SLU Permit	-	-
	Hvy.Mnfr.	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted	SLU Permit	-

(1) Presence of airport makes the prospect for wind energy development unlikely.

(2) Generation IV nuclear reactors (3 cents/kWh) are 5-20 years from commercial application and may be used in conjunction with portable industrial scale batteries.

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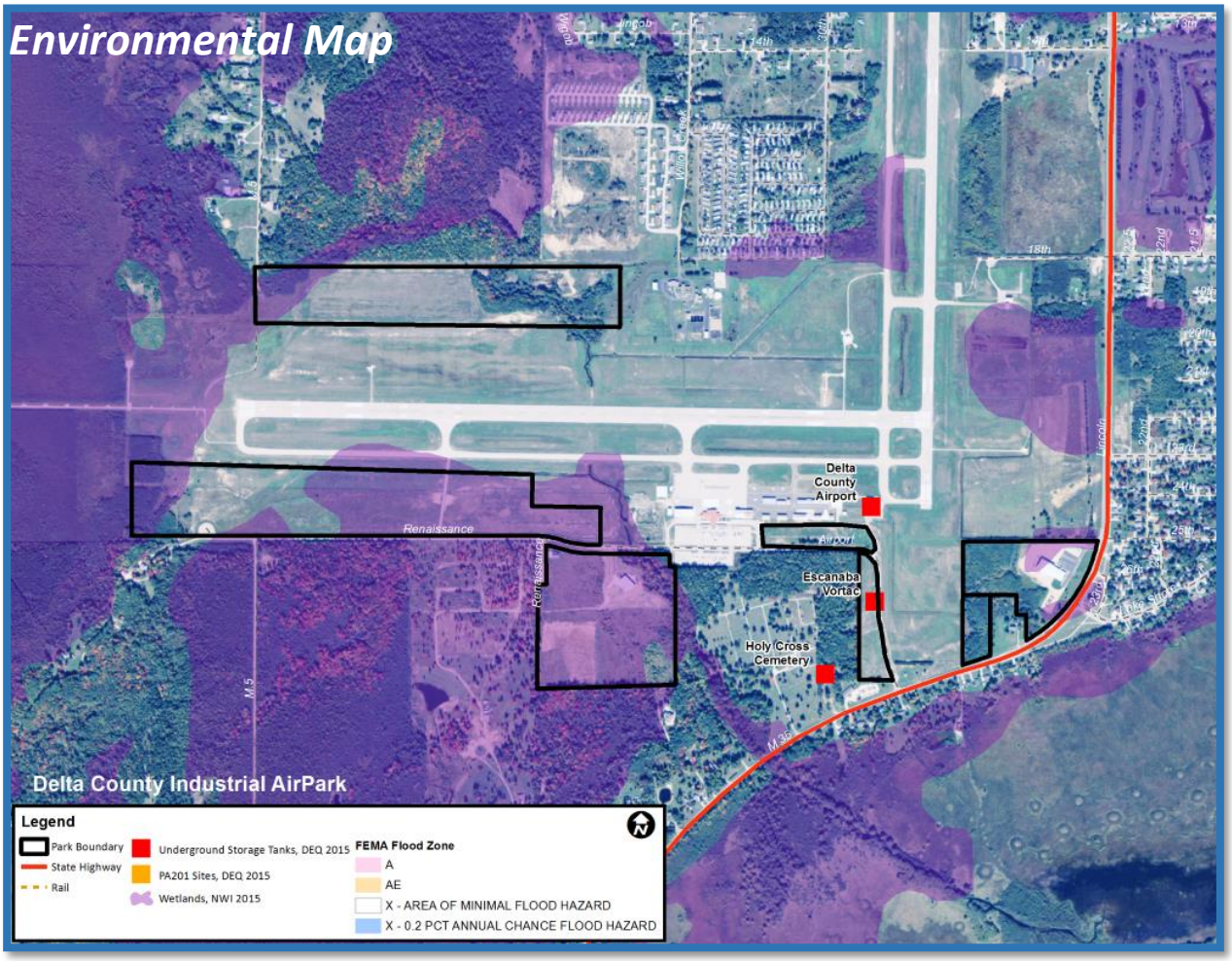


According to the latest FEMA flood maps, dated 1998, a flood zone (A zone) exists along Portage Creek. The National Wetland Inventory shows that wetlands are present in the southwest portion of the industrial park, particularly along Portage Creek. Although the NWI shows wetlands, significant development has already occurred in the area. A permit may be required depending where on-site energy development may occur. The Michigan Natural Features Inventory provides a listing of rare and endangered species by County. Delta County has 88 different plant and animal species listed under the MNFI. Because of the sensitivity of specific locations of these species, the MNFI has created the Biological Rarity Index, which provides a ranking (high, moderate, low) of finding a rare or endangered species in a certain location by Public Land Survey System (PLSS) Sections. At the Delta County site, the Section 38N23W01 (east portion of park area) is identified as having a high probability of finding endangered or rare species.

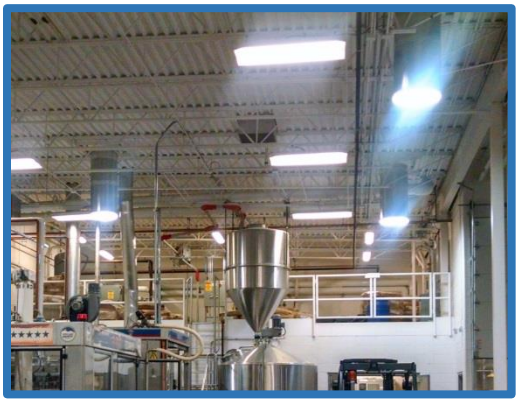
The EPA's ERMA (Environmental Response Management Application) provides data on sensitive habitats and species. Data from 1994 suggests several sensitive species in the area, primarily on the shoreline side of M-35. No species are identified within the park area. According to the Michigan DEQ, no sites of environmental contamination (PA201 sites) are present within the park. Three (3) sites in the area have underground storage tanks that have either been removed or closed.

Business Information/Site Visit

The Delta County Industrial AirPark has three active businesses and provides 30 jobs. Similar to the Houghton County Memorial Airport Industrial Park, airport operations were not included in this study.

Business	Business Type
Roland Machinery Co	Heavy Equipment
Upper Hand Brewery	Craft Brewery
Silas Enterprises	Commercial Appraiser

CUPPAD and MTU met with the Manager of the Delta County Airport and Industrial AirPark. The discussion focused mainly on the development of the parcels in the Park and around the airport, and the history of the Park's development. It is interesting to note that most of the available lots at the Delta County AirPark are available by lease only, as FAA regulations do not allow the sale of those properties. This has created an interesting business development concept, as most businesses prefer to purchase land and make invests on owned-property rather than leased-property.



A meeting was held with Upper Hand Brewery, a recent addition to the Park. A division of Bell's Brewery, Inc. in Lower Michigan, the site is on its third expansion since initial development in 2014. Initially an 11,500-square-foot facility, it has grown to include a tasting room and new area for increased tank capacity. The facility has incorporated several energy-efficiency technologies, including solar lighting (pictured to the right) and freezers.

The only other active business at the Delta County AirPark is Roland Machinery Company, located off Highway M-35. Roland Machinery is a heavy equipment dealer, primarily machines for the logging industry, with a show room and repair facility. CUPPAD and MTU were unable to schedule a visit with Roland.

Silas Enterprises is a commercial appraiser with a small office/garage with a small energy requirement.

Energy Information

The Delta County Industrial Park belongs to the City of Escanaba's municipal power system. In the past, the City operated its own generation facility: two fifty-year-old 12.5 MW coal fired steam generators and a 15 MW diesel turbine. Around 2010 the City sold the plant and began accessing power via ATC's two 69 kV transmission lines to their substation. The ability for the City to negotiate an "all requirements energy" Power Purchase Agreement resulted in the low rates for their customers, similar to a large industrial customer electing to use an Alternative Energy Supplier. The City of Escanaba's 30MW annual peak load ranks them as a significant consumer in the U.P., i.e. the small OCREA cooperative has a peak load of only 5.5MW. The City is unique in the U.P. for the city's direct involvement in providing affordable energy to its residents

Escanaba City utility, which provides electricity service to the park, is a Midcontinent Independent Systems Operator (MISO) market participant, with historically low rates. As a result, Delta County Industrial Park enjoys the lowest electric rates among all the parks studied for this report, and is very likely among the lowest rates in the state. These low rates have remained stable for many years, and are expected to continue to remain so.

Discussions with industrial park manager and utility representatives identified an alignment in shared objectives of economic and community development. City planning and development stakeholders demonstrate a strong and cohesive partnership with city utilities, resulting in a proactive approach to business development and retention through electricity rate setting and addressing barriers to alternative energy adoption.

We know very little about Park's infrastructure, other that electricity is provided by the local municipality. Where is the nearest substation? Is there any limit on the quantity of power available? A common issue throughout this study was finding information on the available electrical infrastructure capacity, and if it could adequately support additional businesses.

Electric Rates – City of Escanaba Utility

Utility	Service	Energy Rate [$/kWh]	Demand Rate [$/kW]	Fixed Rate (Single Phase) [$/month]	Fixed Rate (Three Phase) [$/month]
City of Escanaba	Small Commercial	$0.09	$0.00	$8.38	$16.75
	Large Commercial	$0.09	$0.00	$6.31	$6.31

Source- Escanaba Electric Ordinance, retrieved from http://www.escanaba.org/images/5/file/Ordinances/ord1159%20electric%202015.pdf

Natural Gas - DTE ENERGY

Current effective rates

RATES EFFECTIVE FOR GAS SERVICE

DTE Energy

Applicable To All Districts
Issued By: Regulatory Policy & Operations

December 2015

Rate Schedule No.	Rate Schedules	Monthly Customer Charge 2/	Monthly IRM Surcharge 3/	U-17822 Monthly Credit/ Surcharge 4/	COMMODITY CHARGE PER 100 CUBIC FEET (Ccf) 1/ Distribution Charge (Non-Gas) 2/	GCR Factor 5/	Energy Optimization Surcharge 6/	Reservation Charge 7/	Credit/ Surcharge 8/	Credit/ Surcharge 9/	Credit/ Surcharge 10/	Total Rate Applicable to December 2015 Cycle
A	Residential Rate 11/	$ 10.50	$ 1.54	$ (1.21)	$ 0.24942	$ 0.40700	$ 0.01777	$ 0.02800	$ -	$ -	$ -	$ 0.70219
AS	Low Income Senior Citizen Rate 11/	$ 10.50	$ 1.54	$ 1.23	$ 0.24942	$ 0.40700	$ 0.01777	$ 0.02800	$ -	$ -	$ -	$ 0.70219
2A	Multi-Family Dwelling Service Rate											
	Meter Class I	$ 10.50	$ 6.42	$ 9.70	$ 0.24942	$ 0.40700	$ 0.01427	$ 0.02800	$ -	$ -	$ -	*$ 0.69869*
	Meter Class II	$ 26.20	$ 6.42	$ 5.05	$ 0.24942	$ 0.40700	$ 0.01427	$ 0.02800	$ -	$ -	$ -	$ 0.69869
GS-1	Non-Residential General Service 12/	$ 26.20	$ 4.40	$ (0.39)	$ 0.24821	$ 0.40700	$ 0.01427	$ 0.02800	$ -	$ -	$ -	$ 0.69748
GS-2	Large Volume Rate 12/											
	< 100,000 Mcf	$ 590.00	$ 4.40	$ -	$ 0.19995	$ 0.40700	$ 0.01427	$ 0.02800	$ -	$ -	$ -	$ 0.64922
	> 100,000 Mcf	$ 590.00	$ 4.40	$ -	$ 0.19995	$ 0.40700	$ 0.00135	$ 0.02800	$ -	$ -	$ -	$ 0.63630
S	School Rate 12/	$ 200.00	$ 48.38	$ (243.12)	$ 0.15968	$ 0.40700	$ 0.01427	$ 0.02800	$ -	$ -	$ -	$ 0.60895
ST	Small Volume Transportation 13/ thru 17/											
	Cost Based	$ 2,030.00	$ 194.99	$ -	$ 0.07959	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.08094
	Optional - Minimum	$ 2,030.00	$ 194.99	$ -	$ 0.02300	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.02435
	Optional - Maximum	$ 2,030.00	$ 194.99	$ -	$ 0.13618	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.13753
LT	Large Volume Transportation 13/ thru 17/											
	Cost Based	$ 3,660.00	$ 500.00	$ -	$ 0.06001	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.06136
	Optional - Minimum	$ 3,660.00	$ 500.00	$ -	$ 0.02300	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.02435
	Optional - Maximum	$ 3,660.00	$ 500.00	$ -	$ 0.09702	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.09837
XLT	Extra Large Volume Transportation 13/ thru 17/											
	Cost Based	$ 9,100.00	$ 500.00	$ -	$ 0.05068	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.05203
	Optional - Minimum	$ 9,100.00	$ 500.00	$ -	$ 0.01800	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.01935
	Optional - Maximum	$ 9,100.00	$ 500.00	$ -	$ 0.08336	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.08471
XXLT	Double Extra Large Volume Transportation 13/ thru 17/											
	Cost Based	$ 120,000.00	$ 500.00	$ -	$ 0.01652	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.01787
	Optional - Minimum	$ 120,000.00	$ 500.00	$ -	$ 0.00500	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.00635
	Optional - Maximum	$ 120,000.00	$ 500.00	$ -	$ 0.08336	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.08471

Source – DTE Gas Rates, retrieved from https://www2.dteenergy.com/wps/wcm/connect/902be969-c10b-4232-9a85-f878c8f98093/rateCard.pdf

Upper Hand Brewery is a good example of a business that prioritizes energy efficiency as a part of their corporate sustainability culture. Despite very low electric rates, Upper Hand Brewery is able to realize energy savings through installing energy efficient technologies as a part of their facility expansion.

Escanaba city utility is currently investigating a novel community solar project, where ratepayers can lease panels on a single large installation owned and operated by the city utility. Such a project can leverage economies of scale and can reduce barriers for solar PV adoption for some industrial park customers.

Energy Efficiency Retrofits

Upper Hand Brewery is a good example of how low energy rates are not a barrier for energy cost reductions. Retrofitting lighting with LEDs still offers a good payback for most customers in this park.

Natural Gas

Natural Gas is available in abundance at this industrial park, and is used widely. Low energy rates and very low demand rates make any creative application of natural gas co-gen (CHP) systems currently a low priority option at this park.

Solar

Despite low rates, solar PV remains viable for most customers in this park, and is made accessible through a proposed community solar project. Community solar allows ratepayers to buy individual panels on a jointly owned large solar PV array. Such a consolidated project offers many advantages to business that are constrained by lack of adequate roofspace or solar potential on their own facilities. A preliminary study into the feasibility of this project is expected to conclude in May, 2016.

Wind

Proximity to the Delta County Airport runway, and subsequent FAA regulations make wind energy an unviable option for most businesses in this park.

Geothermal

Geothermal is currently not implemented by any businesses in this park, with building heating being a small portion of energy costs. However, in a possible future with higher gas prices and low electric rates in this industrial park make geothermal a viable option for new small businesses coming into the park.

Biomass

Biomass is currently not implemented by any businesses in this park. With the absence of any businesses within the park that use wood product, biomass is likely to remain an unviable option in this park.

Industrial Waste Heat Recapture

Current businesses are unlikely to produce enough waste heat to make Industrial Waste Heat Recapture a viable option. However, Upper Hand Brewery has already implemented ambient air cooling technology, reducing their energy consumption by partially circulating naturally cold outside air during some winter months.

RECOMMENDATIONS FOR BUSINESSES

Once most energy efficiency savings are realized, businesses can investigate additional cost savings through investment in community solar project currently under development.

RECOMMENDATIONS FOR EDOS

With some of the lowest electric rates in the State, Delta County's EDO is poised to attract large energy consumers.

As a municipal utility, Escanaba's City Utility, much like Norway City Utility, is uniquely positioned to offer several value added services to complement their standard utility supply –

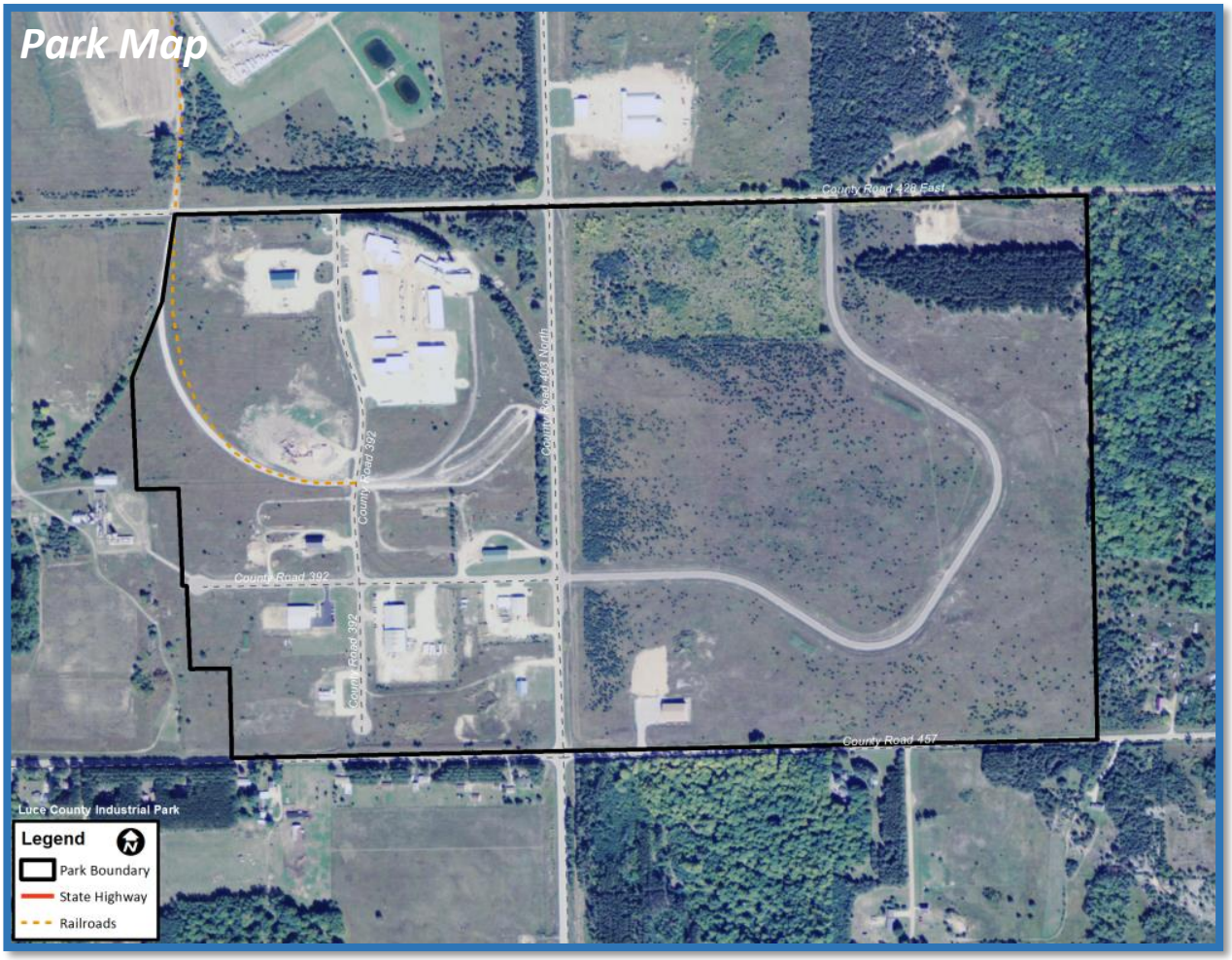
- Bundling cable, electric, water and sewer services into packages from a single provider.
- Offer on-bill financing to support alternative energy and energy efficiency upgrades.
- Reduce barriers for solar PV adoption through community solar projects.
- Help support local economic development and business retention by negotiating attractive rate structures for new businesses, and provide rate incentives for increasing employment and job growth.

LUCE COUNTY INDUSTRIAL PARK

General Park Information

The Luce County Industrial Park is 298 acres in size and is roughly 52% occupied. Sizes of lots varies from 1 acre to 40 acres. State Highway M028 is less than 2 miles away, and the Luce County Airport is located about 3 miles away. Nearest railroad access is north approximately two miles. Service provided by CN.

Utilities for the park include Pentland Township for water and sewer, SEMCO for natural gas, Cloverland Electric Co-op for electric, and AT&T for phone and internet.



Community Information

Population (U.S. Census, 2010): 2,674 (Pentland Township), 6,631 (Luce County)

Unemployment Rate: 8.4% (Luce County - MI BLM, 2014)

% of population high school graduate or higher: 86.0

% of population bachelor degree or higher: 1.9

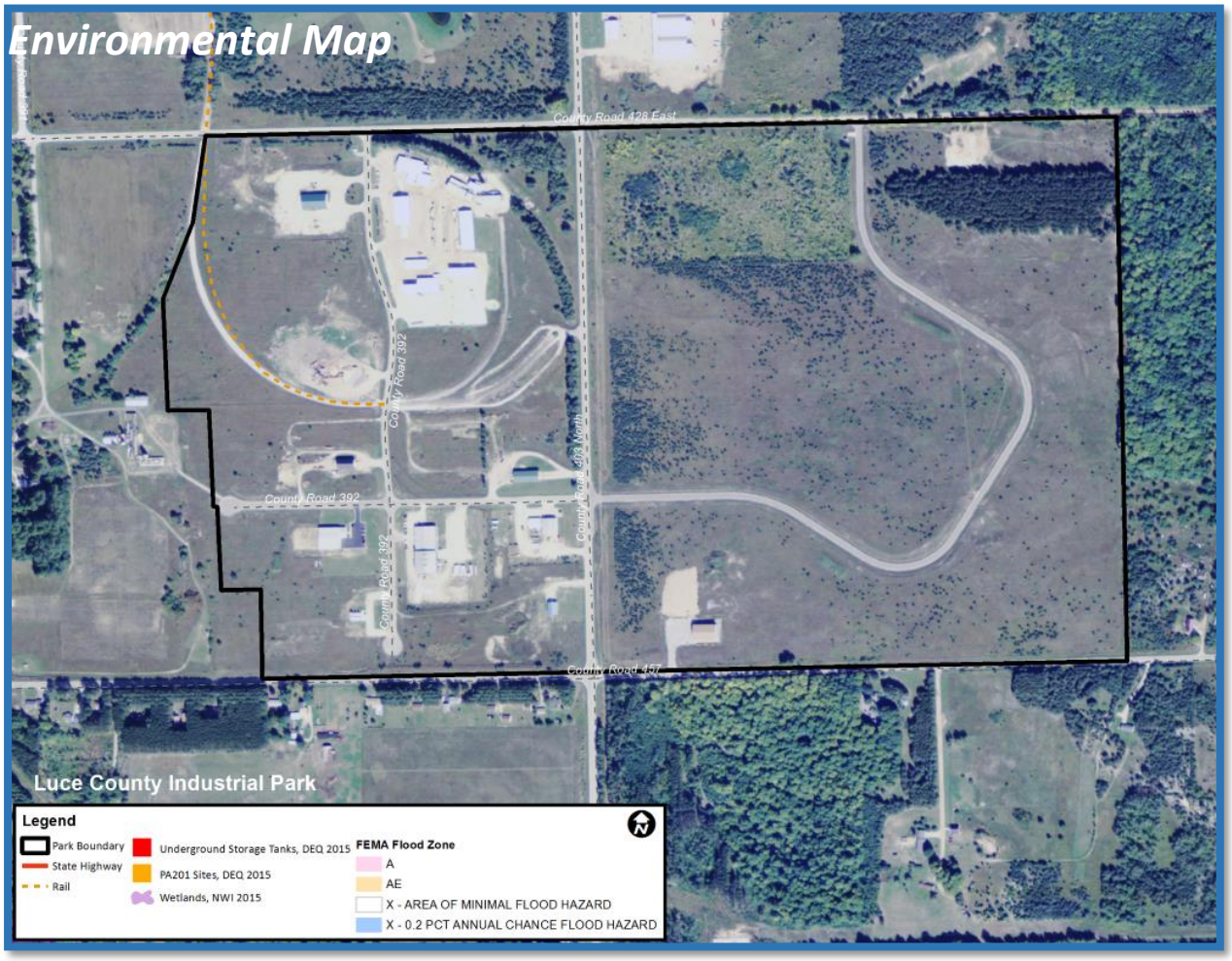
% of population with a disability: 21.3

% of population that are veterans: 8.8

Planning/Zoning & Environmental Information

The Industrial Park falls under Luce County Zoning, and is in an Industrial Zoning District. The County would have to change the zoning or develop a text amendment to allow "energy generation," as this type of use or similar is not specifically identified. Setbacks are 50 feet minimum setback, 10-foot minimum side yard width, 25-foot minimum rear yard depth, 50% maximum lot coverage. A formal site plan process is not spelled out in the current zoning ordinance. An application for approval is required, and requires a property sketch indicating the use of the property and any structures. The County should add a formal site plan review process for complex developments.

Recommended Application of Alternate Energy Options by Zoning Districts in Selected Communities										
Zoning	Zoning	Alternative Options to Grid Electricity								
Jurisdiction	Districts	Nat. Gas	Solar	Wind	Geothrm'l	Bio-fuels	Battery	Compress Air Sys.	Gen.IV Nucl.*(2)*	Hydro.
Luce County	Res-Forest	-	-	-	-	-	-	-	-	Cond'l Per.
	Industrial	Permitted	Permitted	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	-
				(1) Presence of airport makes the prospect for wind energy development unlikely.						
				(2) Generation IV nuclear reactors (3 cents/kWh) are 5-20 years from commercial						
				application and may be used in conjunction with portable industrial scale batteries.						
										3/24/2016



According to FEMA, the park site is not within any floodplains. The National Wetland Inventory shows no areas in or around the park that contain wetlands. The Michigan Natural Features Inventory provides a listing of rare and endangered species by County. Luce County has 43 different plant and animal species listed under the MNFI. Because of the sensitivity of specific locations of these species, the MNFI has created the Biological Rarity Index, which provides a ranking (high, moderate, low) of finding a rare or endangered species in a certain location by Public Land Survey System (PLSS) Sections. At the Luce County site, no areas around or in the park are listed as having any endangered species.

The EPA's ERMA (Environmental Response Management Application) provides data on sensitive habitats and species. Data for the Ironwood Park does not exist, which draws the conclusion that no sensitive habits are in the area. According to the Michigan DEQ, no sites of environmental contamination (PA201 sites) and no underground storage tanks are present within the park.

Business Information/Site Visit

The Luce County Industrial Park has nine active businesses in the Park and provides 100 jobs.

Business	Business Type
Banks Hardwoods	Kiln-dried lumber facility
ZD Metal Products	Magnesium die-cast facility
Northern Wings Repair	Aviation Components Repair
Great Lakes Truck Service	Truck and heavy equipment repair
Walther Farms	Potato Farm warehouse
Burton Forest Products	Wood products trucking
Kerr Forest Management	Logger
Michigan Department of Transportation	Garage
Zellar Excavating	Garage
Burbach Oil Company	Fuel Oil

Northern Winds Repair, Inc. refurbishes aerospace equipment and has 19 employees. The business started in Engadine (20 miles to the south) and grew exponentially. In 2008, Northern Winds Repair built a new facility in the County Industrial Park, and have recently expanded. Interestingly, the business is very energy conscious. The new facility was built with T-8 lighting, and conversion to LED's has begun. All light switches are shielded and the server room runs at 45 oF by pulling in outside air. Northern Winds hopes that energy will follow their broadband internet experience, which is fighting to get good access and ending up with reliable service at half the cost. Northern Winds Repair does have a concern about energy *quality* with their high precision measurement instrumentation and magnetic flux inspection equipment, but have not experienced problems thus far.

Banks Hardwoods produces kiln dried hardwood boards and currently has 17 employees. The operation is motor intensive with (4) 50HP, (5) 35HP, and many others less than 20 HP. Motors range from 30 years old to replacements in the last year. Almost all motors run at constant speed and simultaneously. Their electric bills run about $10K/month. A main shift works a 5-day, 40-hour week. The kilns run 24/7 with loads taking 8 to 30 days to dry. The kilns use 180oF steam. The 900 HP steam generator is primarily fired from their wood waste and is EPA certified for emissions. Natural gas is available as a backup, but would cost $1200/day. The steam plant is operating at 25% capacity. The company has acquired addition adjacent lots for expansion but currently is limited by supply from sawmills (they do not rough saw logs). Banks Hardwoods has taken advantage of energy efficiency programs by upgrading some lighting and plan to do more in the future. There was a lack of awareness with choice, time-of-use, power factor penalties or demand charges. With excess steam generation capability, could be a possibility of selling to other tenets in the park. Wood waste is ground up for the boiler for steam production and excess wood is given away. Excess sawdust is given to a local cattle farm for animal bedding.

ZD Metal Products, Inc. manufactures magnesium castings, primarily for the automotive industry. The facility employs 33 people, and electric bills run upwards of $6K/month. The operation was running 24/7 but more recently have improved operations. Electric ovens are used to always keep a 2,000 lb. molten mass of magnesium at 1300 degrees. Magnesium fire/explosion risks require a constant neutralization gas. The power company is aware of their critical operation requirement. Their ovens are assumed to be a resistive load that requires high energy and operates at a high capacity factor. Recent energy audits have encouraged them to pursue high efficiency lighting. They have considered permanent backup generation for critical process control but have yet to experience a problem which would prioritize this need. In the cold seasons they utilize the residual oven heat for building heat. During the summer months they need high ventilation for the excess heat.

Energy Information

Beyond basic information like the electric service provider being Cloverland, the industrial park manager did not have a lot of information regarding existing energy infrastructure or capacity limits deterring future park expansion. We assume a lot of power is coming into the area because of the State Prison and LP mill, but we don't know how much is available to the Park. New customers must consult with the utilities about their plans to determine if infrastructure upgrades are needed.

Electric Rates

Utility	Service	Energy Rate [$/kWh]	Demand Rate [$/kW]	Fixed Rate (Single Phase) [$/month]	Fixed Rate (Three Phase) [$/month]
Cloverland	Small Commercial	$0.09	$0.00	$15.00	$30.00
	Large Commercial	$0.07	$8.03	$110.00	$110.00

Source- Based on Cloverland Utility Electric Rates, retrieved from http://cloverland.com/electric-rates/

Current Natural Gas Rates – March 2016

SEMCO ENERGY Sales Customers	Energy Charges*	Balance and Demand Charges*	Energy Optimization Charge*	SEMCO Distribution Charge*	Main Replacement Program Charge	SEMCO Customer Charge
Residential	$0.26000	$0.06500	$0.01782	$0.17342	$1.61	$11.50
General Service 1 (GS-1)	$0.26000	$0.06500	$0.12093**	$0.18203	$3.56	$11.50
General Service 2 (GS-2)	$0.26000	$0.06500	$0.12093**	$0.13932	$22.43	$35.00
General Service 3 (GS-3)	$0.26000	$0.06500	$0.12093**	$0.10985	$106.33	$105.00
	Gas Cost Recovery (GCR) Charges					

*Costs and charges are billed on a per therm basis.
**Up to 90 Therms and $0.00001 per therm thereafter.

Source – SEMCO Natural Gas rates, retrieved from http://semcoenergygas.com/Default.aspx?id=107&b=169&p=31

Path Forward for the Luce County Industrial Park

The Park is doing well despite its isolated location. The three largest energy consumers are all proactive and clearly demonstrate the viability of U.P. businesses. Under the Cloverland Electric Cooperative, their electric rates are quite reasonable. All companies have taken actions to make their operations as efficient as possible. The biggest issue uncovered at this Park was the unknown capacity. With three currently large electric consumers, remaining capacity is unknown and a limiting factor for growth. As a Park nears its capacity, expansion to additional capacity is expensive and could be the primary deterrent to future development.

The greatest opportunity in this Park appears to be the under-utilized of Banks Hardwood steam plant. There may be opportunities to provide low cost heat to a nearby facility.

Energy Efficiency Retrofits

Businesses in the park demonstrate a proactive to energy efficiency, having already realized savings through some "low hanging fruit" energy efficiency opportunities like LED lighting retrofits. When a business replaces existing equipment or expands its facility, some marginal savings may be achieved through newer energy efficient equipment.

Natural Gas

Low energy rates and very low demand rates make any creative application of natural gas co-gen (CHP) systems currently unviable at this park. For businesses with uninterrupted power supply requirements paramount to their operations, small natural gas backup generator options are recommended.

Solar

After savings through energy efficiency retrofits are prioritized and realized, Solar PV remains a viable option for many businesses in this park. For the record, interviews indicated that many businesses are reluctant to assume the risk of making large capacity investments in alternative generation solutions in the face of a rapidly evolving legislative and policy landscape.

Wind

While large resolution wind maps provided by NREL indicate that Luce County region has poor to marginal capacity for small scale wind adoption, the industrial park does experience regular moderate gusty winds. Looking into the future, an anemometer study could reveal micro wind patterns demonstrating a stronger capacity for wind adoption in this park. Presently however, many businesses are reluctant to assume the risk of making large capacity investments in alternative generation solution.

Geothermal

Geothermal is currently not implemented in any business in this park. At historic low gas rates, Geothermal is likely to remain not viable for all business in this park.

Biomass

Biomass is currently implemented in this park, with a large wood processing facility reuses wood-waste for steam production. A small quantity of excess wood is given away for heating local schools and homes. Looking into the future, this business can investigate electricity self-generation by augmenting their steam plant with generation capacity and running the steam plant at full capacity. Biomass is unlikely to be a viable option for other businesses in this park.

Industrial Waste Heat Recapture

Industrial manufacturing facilities are likely to realize some cost savings from capturing excess heat. Some businesses already implemented ambient air cooling technology, reducing their energy consumption by partially circulating naturally cold outside air during winter months.

RECOMMENDATIONS FOR BUSINESSES

The greatest opportunity in this Park appears to be the under-utilized of Banks Hardwood steam plant. There may be opportunities to provide low cost heat to a nearby facility.

RECOMMENDATIONS FOR EDOS

Luce County Industrial parks enjoys the benefit of low electric rates from Cloverland utility, along with two separate power lines coming into the park, providing resilient power. Interviews indicated that for many businesses in the park, the challenges of transportation and communication in this location are somewhat outweighed by the affordable and reliable power supply in this industrial park. Local EDOs can leverage this to attract additional businesses into the area.

The biggest issue uncovered at this Park was the unknown electric capacity. No one knew how much capacity was available for the next large consumer. Plenty of land is available for new tenants, so electric supply capacity could be the limiting factor on growth. With two very large electric consumers adjacent to the Park (the State Prison and Louisiana Pacific Mill), a lot of power already flows to the area and is likely to be able to support business expansion.

SAULT STE. MARIE INDUSTRIAL AIRPARK

General Park Information

The Sault Ste. Marie Industrial AirPark is 52.97 acres in size and is roughly 34% occupied. A 200-acre parcel on the southwest side of the runway will be developed into additional industrial, commercial and housing sites. Sizes of lots varies depending on development, and the price of land per acre is roughly $5,000 per acre, which is negotiable depending on development and job creation. The park has tax increment funding available to assist with site prep, permit fees, sewer/water/gas/electric/fiber service into buildings. Other state funding (MEDO, MDOT, USDA, USEDA) is available based on job creation. The I-75 Business Spur is less than 1 mile away, and the Sault Ste. Marie Municipal Airport/Sanderson Field is on-site. The airport provides a 5,234 x 100-foot runway. No rail is located onsite, but a rail spur is available off-site.

Utilities for the park include Cloverland Electric Co-op for electric service, City of Sault Ste. Marie for water, DTE for natural gas, and a number of high-speed internet providers are available.

Community Information

Population (U.S. Census, 2010): 14,144 (City of Sault Ste. Marie); 38,520 (Chippewa County)

Unemployment Rate: 9.4% (Chippewa County - MI BLM, 2014)

% of population high school graduate or higher: 89.0

% of population bachelor degree or higher: 6.1

% of population with a disability: 18.8

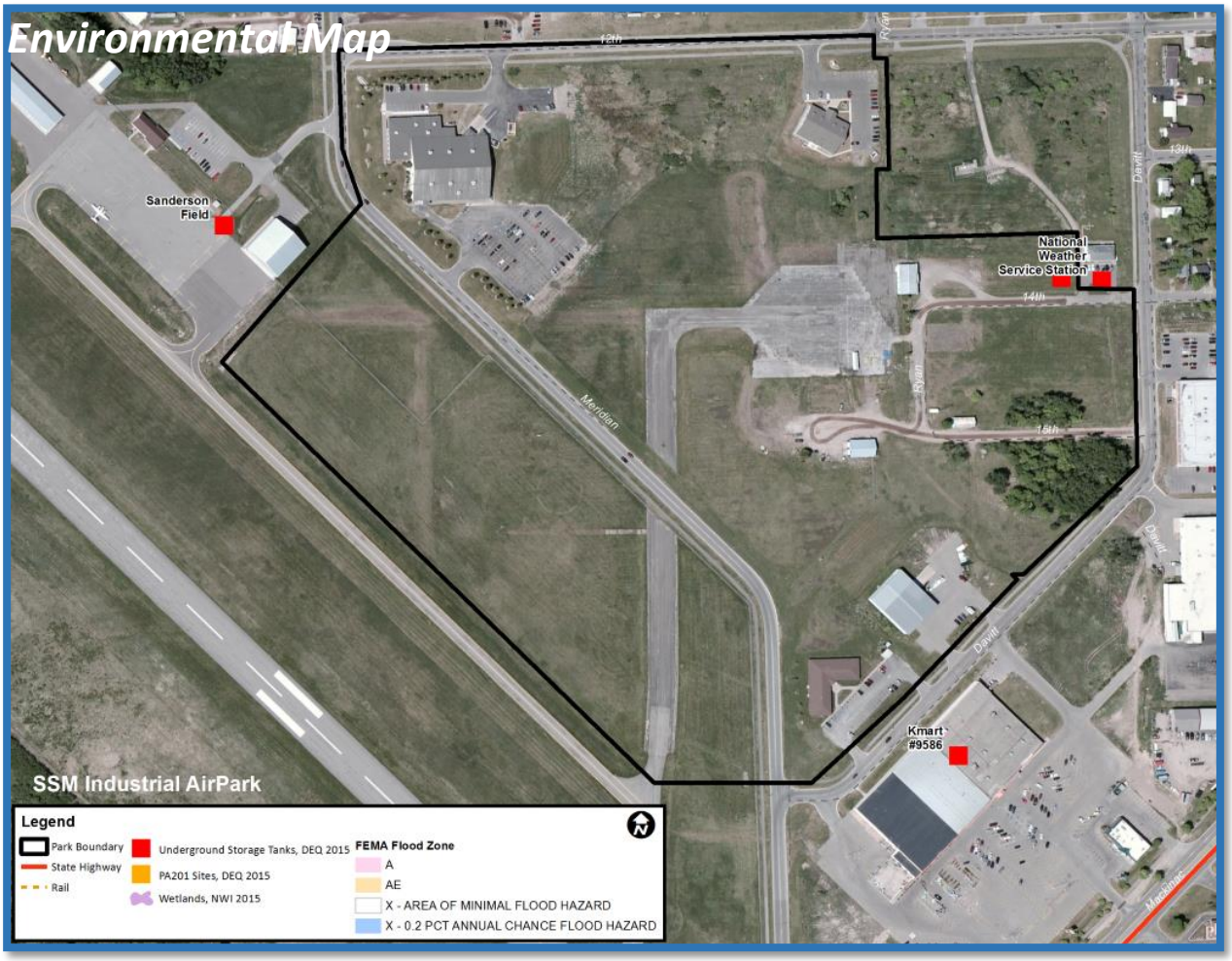
% of population that are veterans: 7.6

Planning/Zoning & Environmental Information

The Industrial Park falls under City Zoning, and is in an Industrial Zoning District. The following are listed as permitted principal uses: "Warehouse, storage and transfer and electric and gas service buildings and yards, excluding gas treatment and gas pumping stations, railroad transfer and storage yards. Water supply and sewage disposal plants. Water and gas tanks and holders." And "Utility and public service facilities and uses including storage yards." Maximum structure height is 8 stories or 85 feet. Minimum front yard setback is 20 ft.; minimum side setback is 5 ft.; minimum rear setback is 10 ft.

Site plan review is required. Because the site is on/near the municipal airport property, development may have to comply with applicable FAA regulations.

Recommended Application of Alternate Energy Options by Zoning Districts in Selected Communities										
Zoning	Zoning	Alternative Options to Grid Electricity								
Jurisdiction	Districts	Nat. Gas	Solar	Wind	Geothrm'l	Bio-fuels	Battery	Compress Air Sys.	Gen.IV Nucl.*(2)*	Hydro.
City Sault Ste. Marie	I-1, Industrial	Permitted	Cond'l Per.	-	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	Cond'l Per.	-
	I-2, Industrial	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted	Cond'l Per.	-
				(1) Presence of airport makes the prospect for wind energy development unlikely.						
				(2) Generation IV nuclear reactors (3 cents/kWh) are 5-20 years from commercial						
				application and may be used in conjunction with portable industrial scale batteries.						
										3/24/2016



According to FEMA, the park site is not within any floodplains. The National Wetland Inventory shows no areas in or around the park that contain wetlands. The Michigan Natural Features Inventory provides a listing of rare and endangered species by County. Chippewa County has over 100 different plant and animal species listed under the MNFI. Because of the sensitivity of specific locations of these species, the MNFI has created the Biological Rarity Index, which provides a ranking (high, moderate, low) of finding a rare or endangered species in a certain location by Public Land Survey System (PLSS) Sections. The Sault Ste. Marie Industrial Park is not in or near any identified BSI areas.

The EPA's ERMA (Environmental Response Management Application) provides data on sensitive habitats and species. Data from the city map shows several sensitive habitats along the St. Marys River, but nothing near or in the Industrial Park. According to the Michigan DEQ, no sites of environmental contamination (PA201 sites) are present within the park or the immediate area. Some sites with underground storage tanks are nearby (Sanderson Field, Kmart, and a National Weather Station), but none within the park boundary.

Business Information/Site Visit

The Sault Ste. Marie Industrial AirPark is relatively new has only one large industrial operation and a couple small businesses which provide around 200 jobs.

Business	Business Type
Precision Edge Surgical Products	Manufacturer of surgical instruments
12th Avenue Professional Building	Medical Offices
AGX Imaging	Film processing and scanning
SSM Advanced Resources and Technology (SSMART)	Business support

Precision Edge, LLC. was built in 2000 and employs 182 people, currently operating 20 hours per day, Monday through Thursday. The office remains open 7am -5pm on Friday. Precision's electric bill ranges around $19K to $24K per month. There is no single large load, many small loads and a climate controlled facility. They have always engaged energy efficiency. Additional roof insulation was added during the roof replacement project. Originally built with efficient T-8 lighting, they are in the process of converting the entire facility to LED lighting. The first area of lighting conversion resulted in a $3K/month savings. They have access to load monitoring via Cloverland, but they not do use it often. Precision is also under the former Sault Edison rate structure.

A new facility was recently built in Boyne City in Lower Michigan. Even though there was enough land adjacent to the current facility, Precision Edge believed the workforce was not sufficient in the Sault for the increase in operations and chose to build elsewhere.

MTU also had the opportunity to sit down with the Director of Generation at ***Cloverland Electric Co-op***, the electric provider for the Eastern U.P. Overall the discussion went very well and touched on many topics. In the Eastern U.P., a "large" customer is one who typically has its own substation, like Louisiana Pacific in Newberry or one of the several quarries in the Eastern U.P. A business like Precision Edge is not considered large in this regard. It is interesting to note that currently no energy flows between Canada and the United States. Cloverland's nuclear component comes from a PPA with a plant in Lower Michigan. The hydro facility on the St. Marys River has been generating upwards of 51% of Cloverland's power (with high volume of allotted flow due to high lake levels and the loss of Manistique Paper). Cloverland has been upgrading to 2-way smart meters, which has been beneficial in pinpointing outages and identifying theft. Solar and Wind have a minimal impact with only 36 customers net metered. Cloverland is also looking forward to Member Regulation and the ability to quickly implement rate changes (especially reductions).

Energy Information

See Cloverland information on previous page.

Electric Rates					
Utility	Service	Energy Rate [$/kWh]	Demand Rate [$/kW]	Fixed Rate (Single Phase) [$/month]	Fixed Rate (Three Phase) [$/month]
Cloverland	Small Commercial	$0.09	$0.00	$15.00	$30.00
	Large Commercial	$0.07	$8.03	$110.00	$110.00

Source- Based on Cloverland Utility Electric Rates, retrieved from http://cloverland.com/electric-rates/

Natural Gas

RATES EFFECTIVE FOR GAS SERVICE — DTE Energy

Applicable To All Districts
Issued By: Regulatory Policy & Operations

December 2015

Rate Schedule No.	Rate Schedules	Monthly Customer Charge 2/	Monthly IRM Surcharge 3/	U-17822 Monthly Credit/ Surcharge 4/	COMMODITY CHARGE PER 100 CUBIC FEET (Ccf) 1/ Distribution Charge (Non-Gas) 2/	GCR Factor 5/	Energy Optimization Surcharge 6/	Reservation Charge 7/	Credit/ Surcharge 8/	Credit/ Surcharge 9/	Credit/ Surcharge 10/	Total Rate Applicable to December 2015 Cycle
A	Residential Rate 11/	$ 10.50	$ 1.54	$ (1.21)	$ 0.24942	$ 0.40700	$ 0.01777	$ 0.02800	$ -	$ -	$ -	$ 0.70219
AS	Low Income Senior Citizen Rate 11/	$ 10.50	$ 1.54	$ 1.23	$ 0.24942	$ 0.40700	$ 0.01777	$ 0.02800	$ -	$ -	$ -	$ 0.70219
2A	Multi-Family Dwelling Service Rate											
	Meter Class I	$ 10.50	$ 6.42	$ 9.70	$ 0.24942	$ 0.40700	$ 0.01427	$ 0.02800	$ -	$ -	$ -	$ 0.69869
	Meter Class II	$ 26.20	$ 6.42	$ 5.05	$ 0.24942	$ 0.40700	$ 0.01427	$ 0.02800	$ -	$ -	$ -	$ 0.69869
GS-1	Non-Residential General Service 12/	$ 26.20	$ 4.40	$ (0.39)	$ 0.24821	$ 0.40700	$ 0.01427	$ 0.02800	$ -	$ -	$ -	$ 0.69748
GS-2	Large Volume Rate 12/											
	< 100,000 Mcf	$ 590.00	$ 4.40	$ -	$ 0.19995	$ 0.40700	$ 0.01427	$ 0.02800	$ -	$ -	$ -	$ 0.64922
	> 100,000 Mcf	$ 590.00	$ 4.40	$ -	$ 0.19995	$ 0.40700	$ 0.00135	$ 0.02800	$ -	$ -	$ -	$ 0.63630
S	School Rate 12/	$ 200.00	$ 48.38	$ (243.12)	$ 0.15968	$ 0.40700	$ 0.01427	$ 0.02800	$ -	$ -	$ -	$ 0.60895
ST	Small Volume Transportation 13/ thru 17/											
	Cost Based	$ 2,030.00	$ 194.99	$ -	$ 0.07959	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.08094
	Optional - Minimum	$ 2,030.00	$ 194.99	$ -	$ 0.02300	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.02435
	Optional - Maximum	$ 2,030.00	$ 194.99	$ -	$ 0.13618	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.13753
LT	Large Volume Transportation 13/ thru 17/											
	Cost Based	$ 3,660.00	$ 500.00	$ -	$ 0.06001	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.06136
	Optional - Minimum	$ 3,660.00	$ 500.00	$ -	$ 0.02300	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.02435
	Optional - Maximum	$ 3,660.00	$ 500.00	$ -	$ 0.09702	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.09837
XLT	Extra Large Volume Transportation 13/ thru 17/											
	Cost Based	$ 9,100.00	$ 500.00	$ -	$ 0.05068	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.05203
	Optional - Minimum	$ 9,100.00	$ 500.00	$ -	$ 0.01800	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.01935
	Optional - Maximum	$ 9,100.00	$ 500.00	$ -	$ 0.08336	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.08471
XXLT	Double Extra Large Volume Transportation 13/ thru 17/											
	Cost Based	$ 120,000.00	$ 500.00	$ -	$ 0.01652	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.01787
	Optional - Minimum	$ 120,000.00	$ 500.00	$ -	$ 0.00500	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.00635
	Optional - Maximum	$ 120,000.00	$ 500.00	$ -	$ 0.08336	N/A	$ 0.00135	$ -	$ -	$ -	$ -	$ 0.08471

Source – DTE Gas Rates, retrieved from https://www2.dteenergy.com/wps/wcm/connect/902be969-c10b-4232-9a85-f878c8f98093/rateCard.pdf

Path Forward for the Sault Ste. Marie Industrial AirPark

Precision Edge is a great example of a new successful energy conscious business in the U.P. When they originally built their current building they installed high efficiency T-8 lighting. Now, 16 years later they have made the commitment to upgrade the entire facility to LED lighting. In their office area all light switches have guards to prevent easy manual access because all the lighting is on occupancy controlled sensors.

Precision Edge has plucked all of the low hanging energy efficiency fruit, yet they continue to look for areas of improvement. Their machines are all new and have limited opportunities for increased efficiency. Operating in a controlled temperature and humidity environment they are look at ways to maximize HVAC efficiency.

This facility is not considering alternative energy solutions (wind /solar/biomass) because energy is affordable and they do not want to divert capitol and manpower towards anything other than their core business. With a growing business and a need to expand, they built a new facility in the Lower Peninsula, where electric rates were nearly double, because they consider the availability of workers a much higher factor than the cost of energy.

Energy Efficiency Retrofits

Precision Edge demonstrates a proactive to energy efficiency, having already realized savings through energy efficiency opportunities like LED lighting retrofits. When a business replaces existing equipment or expands its facility, some marginal savings may be achieved through newer energy efficient equipment.

Natural Gas

Low energy rates and very low demand rates make any creative application of natural gas co-gen (CHP) systems currently unviable at this park.

Solar

After savings through energy efficiency retrofits are prioritized and realized, Solar PV remains a somewhat viable option for many businesses in this park. However, with the size of business operations and monthly energy consumption, large businesses may be reluctant to assume the risk of making large capacity investments in alternative generation solutions.

Wind

While large resolution wind maps provided by NREL indicate that Sault St. Marie has a marginal capacity for wind adoption, the industrial park is surrounded by open expanses of land that could be ideal for small scale wind generation. However, this industrial park is close to the Salt. St. Marie airport, making any possible wind projects unviable in this industrial park.

Geothermal

Geothermal is currently not implemented in any business in this park. Low electric rates make geothermal a viable option. Historically low natural gas prices in addition to building heating costs for large manufacturing facilities like Precision Edge only constituting only a small portion of their energy expenditure, make heating and cooling using geothermal a low priority option for all customers in this industrial park.

Biomass

Biomass is not currently implemented in this park. With the nature of businesses in the park, Biomass is likely to remain an unviable option for the foreseeable future.

Industrial Waste Heat Recapture

No know waste heat sources, and insufficient information to make strong recommendations.

RECOMMENDATIONS FOR BUSINESSES

Precision edge is an example of a business that takes energy efficiency seriously, having upgraded all their machinery to energy efficient equipment and committing to installing LED lighting. Only recommendation is to consider scheduling a routine energy audit every few years with a qualified energy professional who can outline actionable items for upgrades.

RECOMMENDATIONS FOR EDOS

As with Luce County, Sault Ste. Marie falls under the benefit of having low electric rates from Cloverland. In addition, the location of the Park brings added benefit – near the municipal airport, rail, and I-75 corridor. The City EDO can leverage this to attract additional businesses into the area.

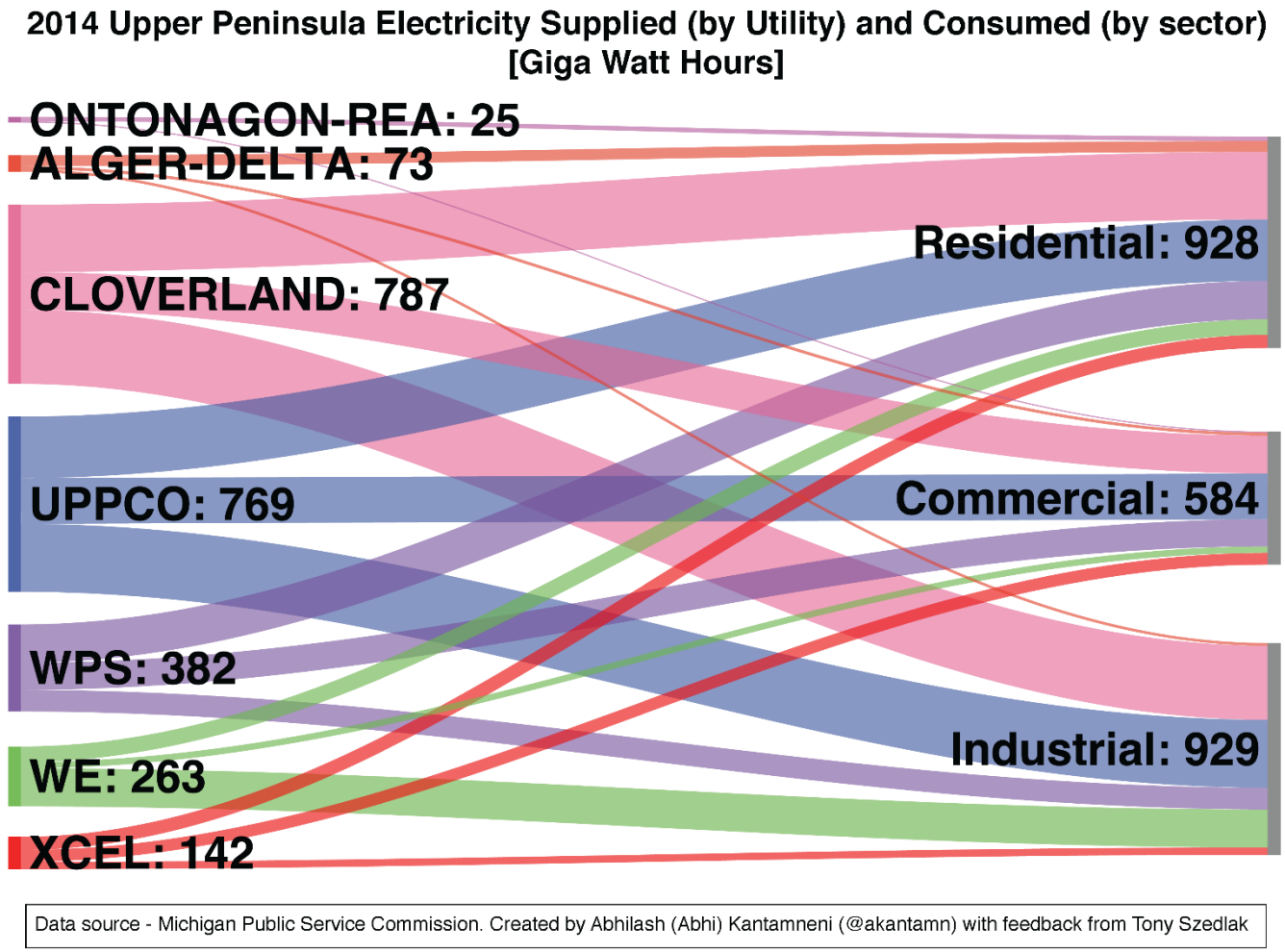
Similar to Luce County Industrial park, the electric infrastructure capacity is currently unknown. As a relatively newer industrial park with plenty of unoccupied land, this is unlikely to be a problem. The one concern with development of alternative energy infrastructure is the location near the airport and any possible FAA regulations.

ENERGY SUMMARY

The intent of this project was to determine energy solutions for larger commercial and industrial businesses in seven industrial parks around the Upper Peninsula. While most alternative energy options are viable at the seven industrial parks included in this study, the *likelihood* of an individual business to *prioritize* specific technology to reduce their energy costs may be limited. This section identifies the technical viability, opportunities and barriers to adoption specific to each alternative energy option. For example, to determine the exact solution and application for wind power at a site, an anemometer would have to be installed at the site with ongoing data collection for one year or more before any educated determination could be found. This same situation applies to other energy options, such as biomass, solar, etc. Because of this, this project and subsequent report takes a larger, general view on energy use, energy applications, and current legislative and policy issues surround energy in the Upper Peninsula. Very specific recommendations are difficult to present at this time, as more data, information, and time are required to do so.

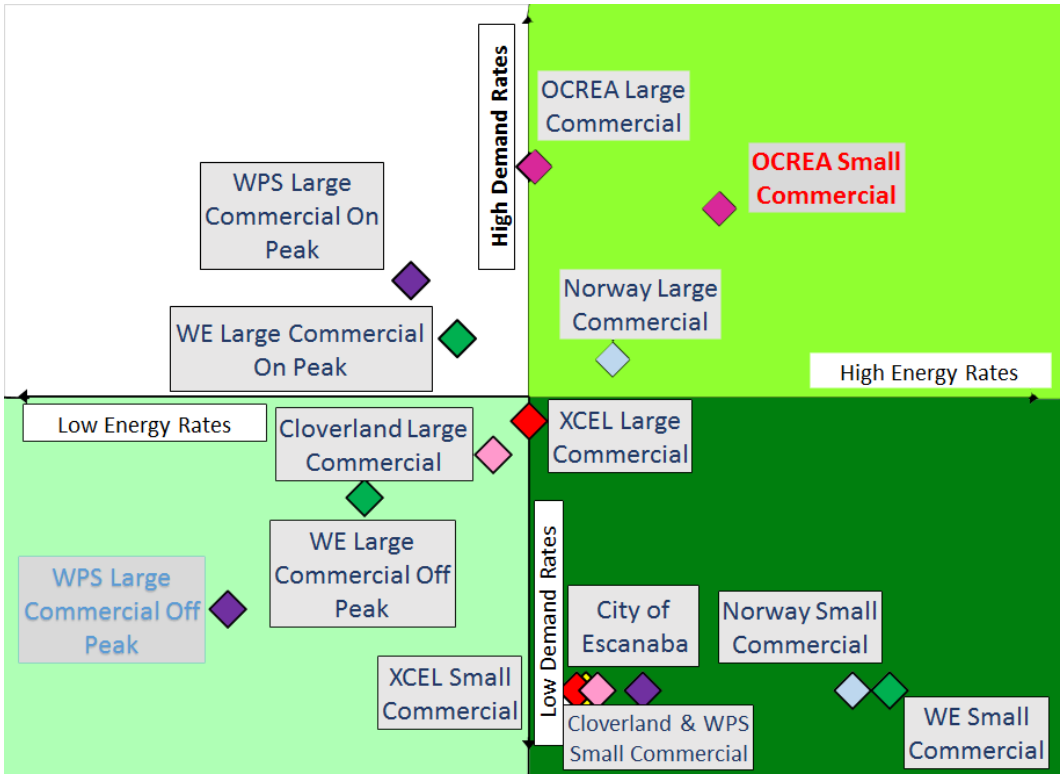
Summary of Electricity Consumed by Sector and by Utility

The Sankkey diagram below represents the total energy consumption by utility on the left hand side, and consumption by sector on the right. The colors of the flow roughly correspond to the colors of utilities in the U.P. utility service area map in the introduction of this report.



Solar PV

As discussed in earlier sections, Michigan's net-metering policy offers support only for customer self-generation using alternative energy technologies for systems sized smaller than 20kW, and offers very limited support for larger systems. Additionally, net metered systems can only mitigate energy costs and cannot be used to reduce power demands. This policy landscape makes solar viable for small commercial customers in quadrant 4. Even if the desired system size is greater than 20kW, such systems can be installed "behind the meter" to simply reduce the energy consumption of a facility. Behind the meter installation of solar and wind is extremely unlikely to reduce demand charges, because the power produced by such systems is unlikely to always coincide with peak power consumption.



Very Low Priority

Low Priority

Med. Priority

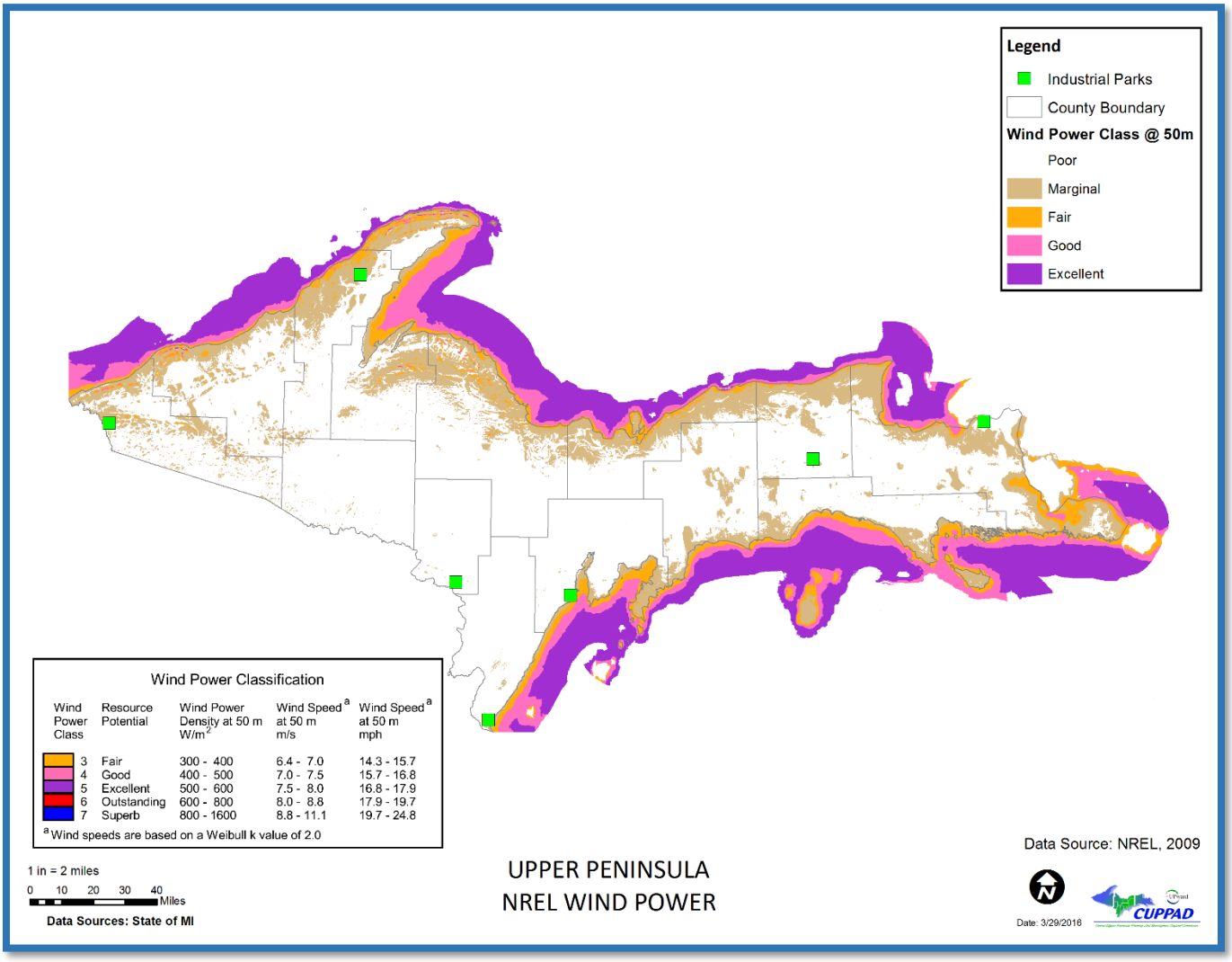
Priority

The Keweenaw Research Center has proven in the past several years that the payback of solar panel installations can be realized quickly, even in the harsh snowy environment of the Upper Peninsula (U.P.) of Michigan. When prices for energy are high like they are in the Western U.P. from the Upper Peninsula Power Company (UPPCO) or the Ontonagon Rural Electric Cooperative Association (OCREA), it is easy to justify an investment in solar panels that can be realized in 7 to 10 years. With the cost of solar panels at $~$3/watt installed the cost of solar is affordable to residential as well as commercial customers. Federal Tax incentives and net metering make this payback closer to the 7-year rate. Even without the tax incentives, solar is a good investment since once the investment is covered and solar panels last >25 years, the installation provides nearly free energy for 10+ years

of its useful life. With the progress in solar over the past 10 years it is likely the higher efficiencies and further hard and soft costs of solar will be lower. A calculator to estimate the size, costs and payback of solar PV for businesses in each of the industrial parks is available under the Resources section of the project website[8].

Wind Energy

This study also revealed that most locations in the U.P have poor to marginal wind energy capacity for turbines at 50m high – height typically used for wind turbines ideal for commercial enterprises. Additionally, many industrial parks are also located inside or in the near vicinity of an airport runway and may be subject to FAA regulations limiting wind energy adoption. However, studying micro-wind patterns at key locations within industrial parks using anemometers was beyond the scope of this project. Such a study could upgrade the wind viability at some locations, specifically Luce County and Sault. St. Marie industrial parks. With shifting policy landscape and rising utility bills, such park locations could emerge as viable candidates for wind adoption in the future.

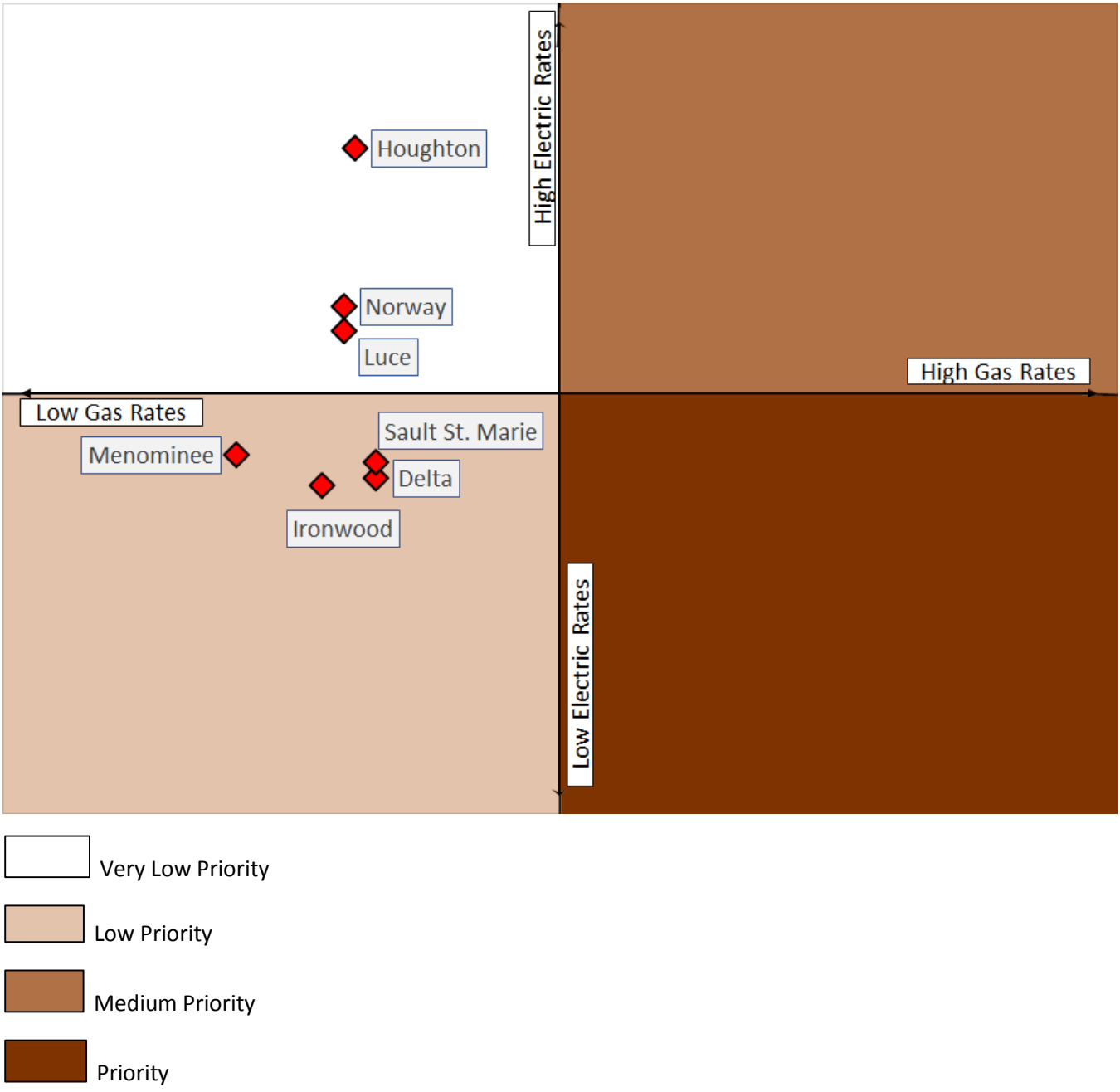


[8] www.SaveUpEnergy.com

Wind energy is technically feasible at the home level in the 1 to 2 Kw range. Initial costs, maintenance, noise, and less than optimal wind make this available to only a few in the U.P. More efficient wind opportunities are available to serious investors at the 1 to 2 Megawatt range. These must be installed in high wind areas and at heights of about 100 feet. Opportunities for wind have been explored at the prime locations and some have been installed, for example in the garden Peninsula of the U.P. Other locations have experienced local resistance due to social issues such as danger to birds, bats, and noise concerns. Many Industrial Parks have already created rules that restrict wind energy technologies within their boundaries.

Geothermal Viability

Geothermal energy uses underground wells to pump water to heat or cool facilities. NOTE: for this report we discuss only "low grade" geothermal which is used for heating or cooling. "High grade" geothermal, with water temperatures above 180F are needed for any potential to generate electricity. As such, geothermal energy is considered an alternative energy source and qualifies for many federal and state tax incentives. However, due to historically low gas process and higher effective energy rates in this region, geothermal heating or cooling is expected to remain a low priority option for most industrial parks. While Michigan Tech KRC is able to successfully implement geothermal heating due to the presence of an underground mineshaft with higher than average temperatures, but such proximity to an abandoned mineshaft is unique and unlikely to be replicable in many locations. Volatility in natural gas prices may transform this scenario, but is unlikely to happen in the near future.



Geothermal Heat Pump installations can provide both heating and air conditioning to a home or a commercial/industrial building. The secret lies in the ability of a refrigerant that goes through phase changes. Compression of the gas to a liquid generates heat that can be harvested to heat a room. Expansion from a liquid to a gas can extract heat from a room. Buildings with both heating and cooling needs, for example computer servers that generate heat, thus requiring external cooling, and human occupied rooms that require heating in the winter are good candidates for heat pump systems.

The key is finding a constant temperature source of heat (such as the earth) that can condition the working fluid to a known temperature. In the U.P. of Michigan, abandoned mine shafts with flooded water are conditioned to approximately 55 degrees Fahrenheit, perfect for both heating and cooling. In Wisconsin, heat pumps are popular with ground loops excavated within the yard that circulate a working fluid to extract the constant temperature of the earth a few feet below the surface. Heat pumps require electricity to operate. Therefore, too high a rate de-rates their economics. Another factor is the Coefficient of Performance (COP). This is the amount of heat produced per amount of electricity required. The higher the COP, the better the economics will be.

When Natural Gas (NG) is at a low price and the price of electricity is high, a higher COP in the range of 5 to 6 is required. When the price of NG starts to climb, lower COP's (less than 5) will prove to make heat pumps competitive even with the current high electrical rates in the Western U.P. Industrial Park residents should explore the possibility of heat pumps and the access to a heat source through abandoned mine shafts, ground loops, or ponds to reduce their energy costs. This was successfully implemented by the Keweenaw Research Center at the Houghton County Memorial Airpark utilizing an abandoned mine shaft. Further, solar installation can help reduce the effective electrical rate for the facility, making the heat pump installation part of a cohesive energy cost reduction plan.

Biomass for Heat Energy or Electricity Generation

Biomass would seem to be the preferred source for energy in the U.P. and indeed, residential customers enjoy a low cost for heat energy if they can afford the physical labor to obtain cord wood. To make biomass heat viable for a business however, it is not that easy. Wood is more profitable at the paper mills than at the biomass plant. Paper mills turn waste wood into black liquor and burn that to make energy for their internal uses. Other wood processing facilities that do not turn wood into paper, sell their wood waste to companies for bedding for animals, pellet making, or for the few facilities that actually use wood furnaces. Biomass to electricity is inefficient compared to other liquid or gas energy sources. It only becomes viable when the waste heat is used at the same facility for other uses, for example, facility heating or process heating. A company that is in the wood business would have to make a serious decision to generate electricity in addition to their other business and either use the electricity on site or find a market for the energy depending on their generator size. Current break even estimates are at the ~20 megawatt generator size. Entry into this market requires approval by Federal agencies at considerable cost starting at $25,000 for the first permit.

Industrial Waste Heat Recovery

Many of the businesses in the study have heat generation processes that needed to be dissipated. Heat recovery is an option for heating a building but does require some investment and management. Technologies to turn heat into electricity exist but are very inefficient. As these options mature, energy managers need to be aware of how to exploit them to the benefit of the business.

Industrial waste heat recovery technologies for industrial park businesses in this study suffer from a paradoxical problem – any facility that is large enough to generate enough waste heat is also most likely to benefit from cost

savings from capturing the waste heat, since building heating is likely to be a very insignificant portion of their energy expenses.

Visionary planning can aid in developing some novel and innovative value-streams from capturing waste heat, for example – diverting waste heat to community greenhouses and growing fresh local produce even in the winter months. The evaluation of such opportunities is beyond the scope of this project.

Energy Storage Systems

Large scale energy storage systems are currently in development and are available to businesses and homes to reduce total energy costs. Only when the energy stored can be produced at a lower cost is this viable. Energy rates based on time of use or created with less expensive technologies make storage a viable technology to reduce costs. Currently storage systems are expensive and require sophisticated control algorithms to utilize.

Natural Gas Generators and CHP

The price of NG and the efficiency of NG generators has recently made them a viable alternative for electrical energy generation. This could be for load leveling reducing demand charges or to crate off-grid situations. The generator needs to meet stringent emissions laws. Right sized generators of this category are available in the US now. As long as the business has sufficient NG supply this is a viable alternative to high priced electricity. Combining NG electrical generation with waste heat recovery from the generator, Combined Heat and Power (CHP) is the best way to reduce electricity and energy costs.

Compared to other alternative energy technologies evaluated in this study, NG can uniquely offer significant energy cost savings to large manufacturing facilities by managing their demand through “peak-shaving”. For businesses whose electric demand is a large portion of their energy bills, a fast responding NG generators can follow the load and maintain it within a predefined maximum limit.

Rapid advancements in energy storage technology herald an era of significant energy savings when combined with NG for “peak shaving”. Energy rates based on time of use or created with less expensive technologies make storage a viable technology to reduce costs. Currently, such hybrid NG+storage systems are expensive and require sophisticated control algorithms to utilize.

LOCAL PLANNING, ZONING, POLICY SUMMARY

Local units of government in the U.P. have been dealing with alternative energy for several years, some more than others. Some areas of the U.P. have been proactive and positive about alternative energy sources, working with landowners, developers, and manufacturers to ensure that alternative energy options are viable yet not intruding on the health and safety of the public. Other areas have attempted to allow alternative energy and have been met with resistance by the general public, stating reasons of noise, visually unappealing infrastructure, or other various reasons. There is no common, one-size-fits-all solution for alternative energy development at the local level.

Small scale energy options have been much more successful and popular in the U.P., as individual property owners place solar panels on rooftops, small wind turbines in yards, etc. These small scale items are much more flexible to manage in local zoning and planning policies. Large scale energy options have been much more difficult to develop – the large tracts of land required to develop such options is usually the biggest hurdle.

From a planning and policy standpoint, each unit of government and each region of the U.P. is unique and different and will handle alternative energy development in different ways. Because this study focused on industrial options in industrial parks, zoning for these types of development are usually in an industrial zoning district, which tends to be the most flexible and least restrictive. Alternative energy development in industrial areas would most likely have little resistance from the public and neighboring properties. However, commercial applications of alternative energy can take place in downtowns, near residential areas, etc. The best recommendation for local units when it comes to zoning alternative energy is to be informed and be open to change. Each type of technology comes with its own type of adverse effects or zoning regulations.

Natural gas, especially with a combined cycle, where alternate or peaking electricity is produced in combination with the production of industrial process heat or space heating might be one of the best options in terms of lower cost and efficiency. The main problem with natural gas is that it is not always present at a given industrial site. Even if it is present, the gas company may not have adequate capacity to reliably supply a major new demand. Natural gas is a well-known commodity with a long history of conventional uses. External adverse effects from natural gas use are typically fairly minimal; little to no noise, gas leak/explosive risk is controlled, no adverse visual effects, no vibrations, and no smell other than that which is added. The exhaust from combustion typically has little to no smoke. What is often perceived as smoke is actually water vapor.

The primary potential adverse effect from solar panels might be the production at certain times of the day and/or year of visual glare. This can become a particular problem for airplane pilots either during take-off or landing. Therefore, if used on or near an airport, steps must be taken to prevent the creation of such visual glare events. The only other option is to not permit the use of solar panels in the vicinity of an airport. It is assumed that adequate glare prevention steps can be taken in most cases. Solar remains a variable power source, reducing its value as an alternative energy source. If solar can be pared with an industrial scale battery, the variability element might be eliminated. As it currently stands it cannot be reliability used for peaking purposes.

Wind towers have multiple considerations. Adverse external effects of wind turbines are said to include; bird and bat deaths, noise (incl. infrasound, [a sub-audio sound]), shadow flicker, vibration, visual pollution, and alleged health effects. If located in an industrial site, some of these effects would be mitigated. Any noise generated would be against the background noise of an industrial environment. Any vibration, visual effects and/or health concerns would be similarly mitigated. Wildlife effects and/or shadow flicker may remain concerns. Wind is also a variable power source, reducing its value as an alternative energy source. If wind can be pared with an industrial scale battery, the variability element might be eliminated. As it currently stands it cannot be reliability used for peaking purposes.

Burning or processing of bio-fuels are the most likely to produce adverse external odors. Noise and gas emissions may also be concerns to be controlled.

Geo-thermal would have no major adverse effects that would need to be regulated by local zoning.

An interesting alternative energy source to keep an eye on is Generation IV Nuclear power. Generation IV nuclear power plants are a set of nuclear reactor designs currently being researched for commercial applications, with depending on the particular design, technology readiness levels varying between the level requiring a demonstration, to economical competitive implementation. Most of these designs, with the exception of the BN-1200 reactor, are generally not expected to be available for commercial construction before 2030–40. China is building a pebble-bed reactor currently and hopes the technology will be commercially available worldwide within the next five (5) years. Depending on the reactor design, the power rating may range from small (10 MWe) to large (1,000+ MWe). A Flibe Energy (250 MWe) design is small enough that it could be ship or barge mounted, which might be a consideration for some of the industrial sites chosen. Nuclear power plants in Michigan are technically exempt from local zoning regulations. However, to be successfully sited, any proposed nuclear power plant proposal would still need to demonstrate that any potential adverse external effects would be totally prevented, controlled, or mitigated. Generation IV nuclear power plants have made great strides in this regard. Generation IV nuclear reactors are intended to have a number of significant advantages over the current light water nuclear reactors (LWR). Relative to current nuclear power plant technology, the claimed benefits for 4th generation reactors include:

- Nuclear waste that remains radioactive for a few centuries instead of millennia,
- 100-300 times more energy yield from the same amount of nuclear fuel,
- Broader range of fuels, and even unencapsulated raw fuels (non-pebble MSR, LFTR).
- In some reactors, the ability to consume existing nuclear waste in the production of electricity, that is, a Closed nuclear fuel cycle. This strengthens the argument to deem nuclear power as renewable energy.
- Improved operating safety features, such as (depending on design) avoidance of pressurized operation, automatic passive (unpowered, uncommanded) reactor shutdown, avoidance of water cooling and the associated risks of loss of water (leaks or boiling) and hydrogen generation/explosion and contamination of coolant water.

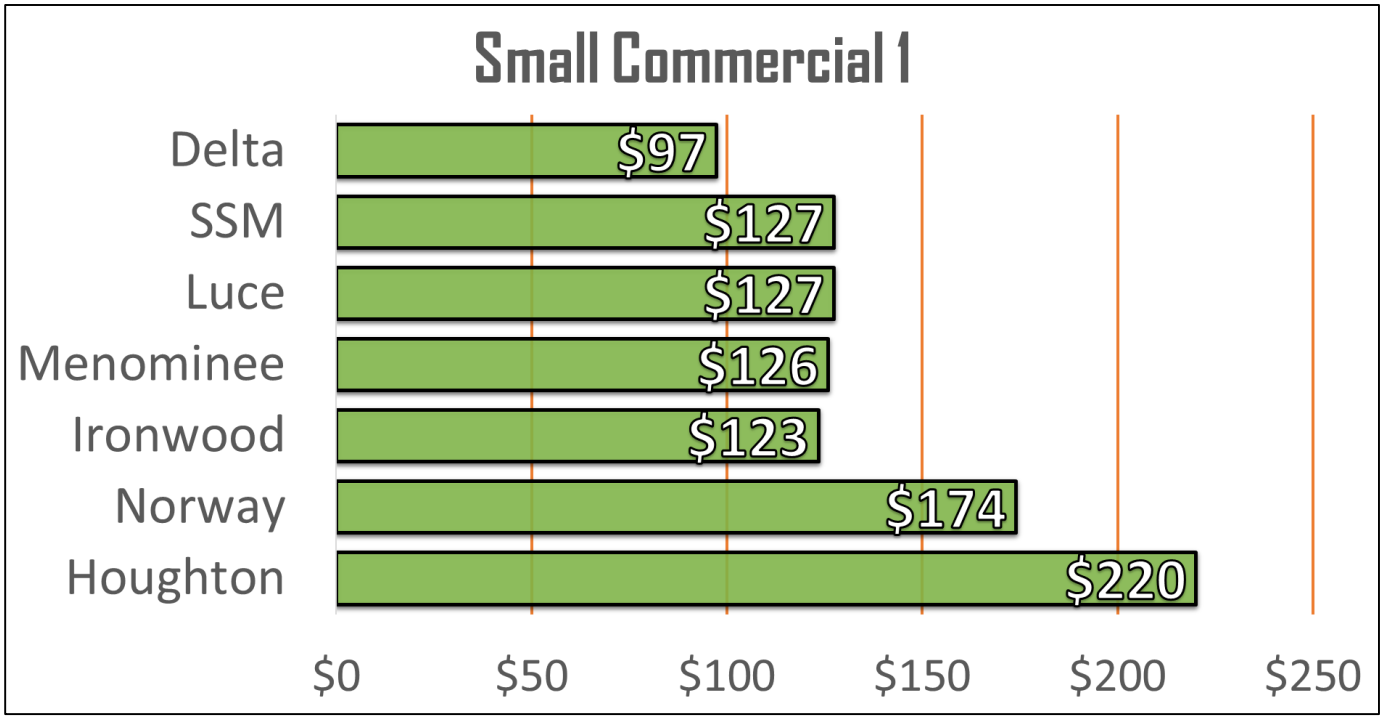
Presently the majority of reactors in operation around the world are considered second generation reactor systems, as the vast majority of the first-generation systems were retired some time ago, and there are only a dozen or so Generation III reactors in operation (2014). Generation V reactors refer to reactors that are purely theoretical and are therefore not yet considered feasible in the short term, resulting in limited R&D funding.

With technologies changing more rapidly than local governments can zone for, the best place to start is to develop basic and simple regulations for alternative energy and adjust as development occurs.

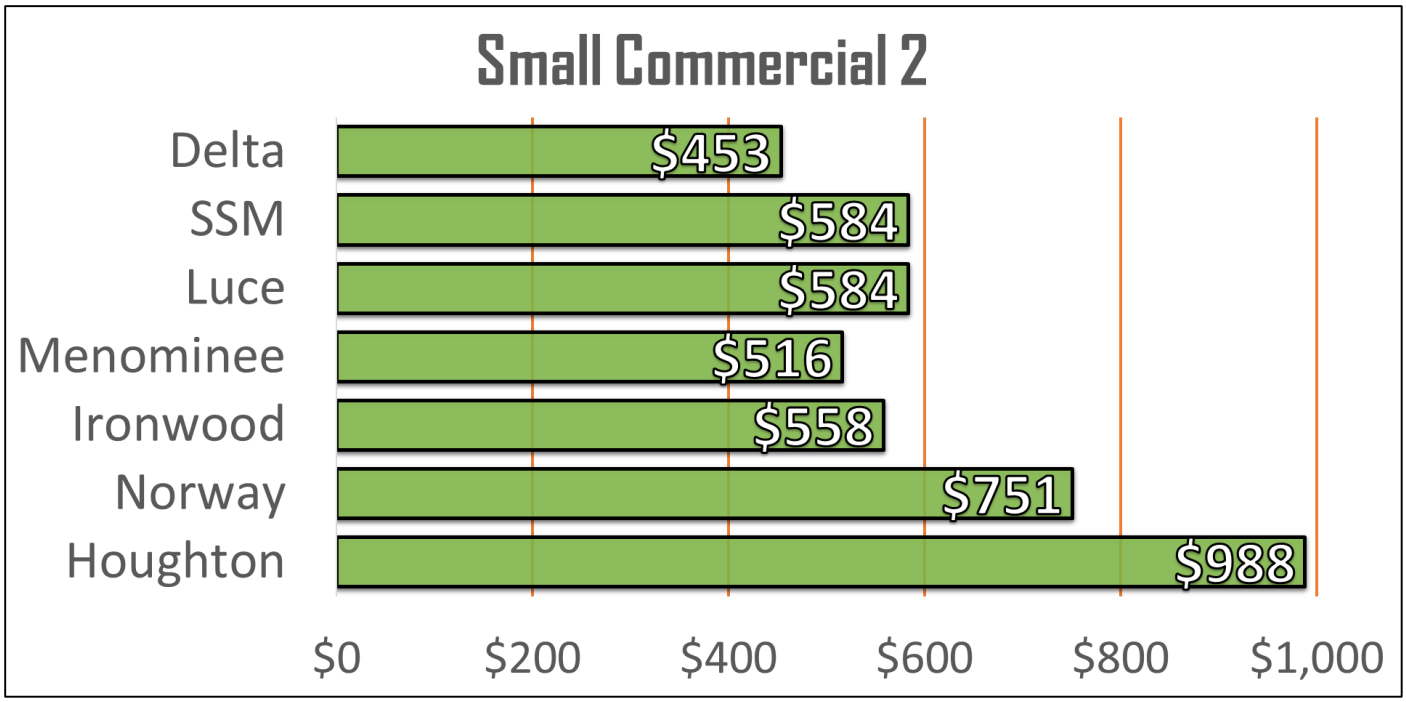
SUMMARY

The sheer diversity in the type of businesses, number of utilities, rates, rate schedules, zoning regulations and local ordinances in the seven industrial parks included in this study make summarizing this report a challenge. While the previous sections identified a path forward for individual industrial parks, this section consolidates and condenses the information into a short summary most relevant to each of the three planning zones in the UP.

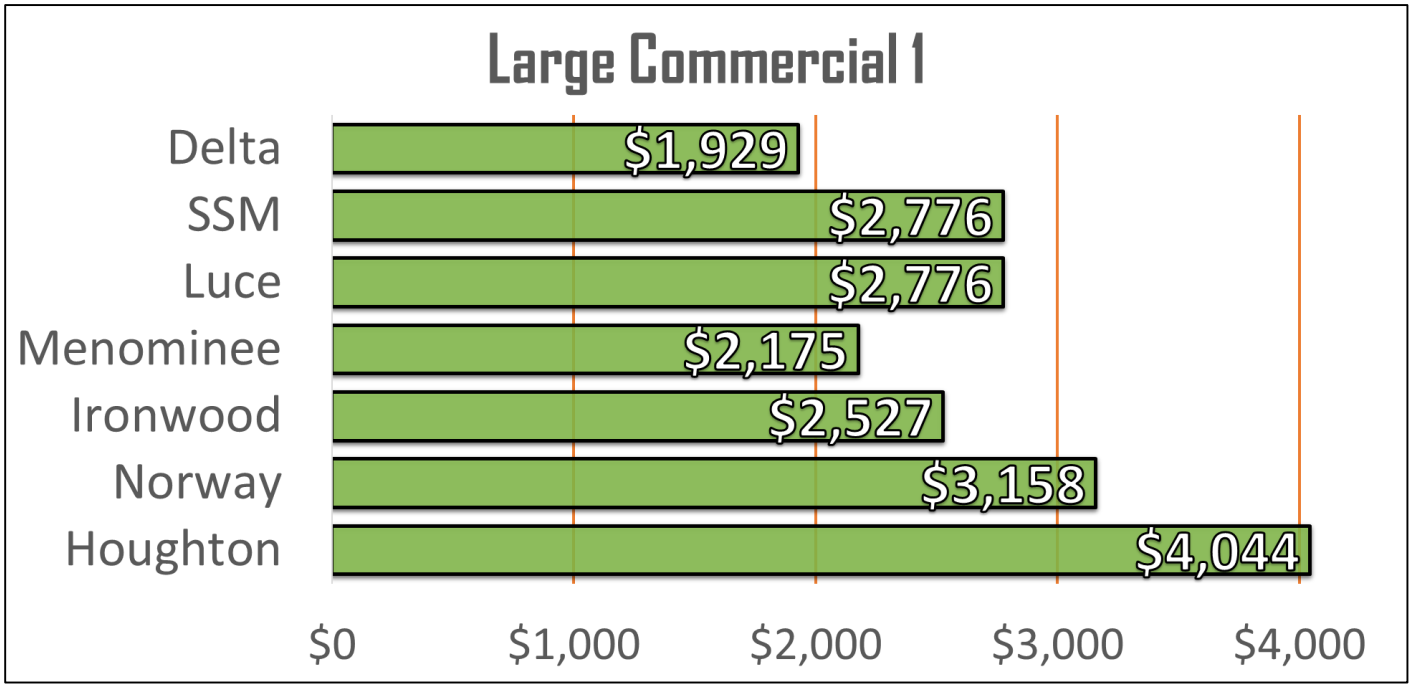
Summary of Average Monthly Electric Bills



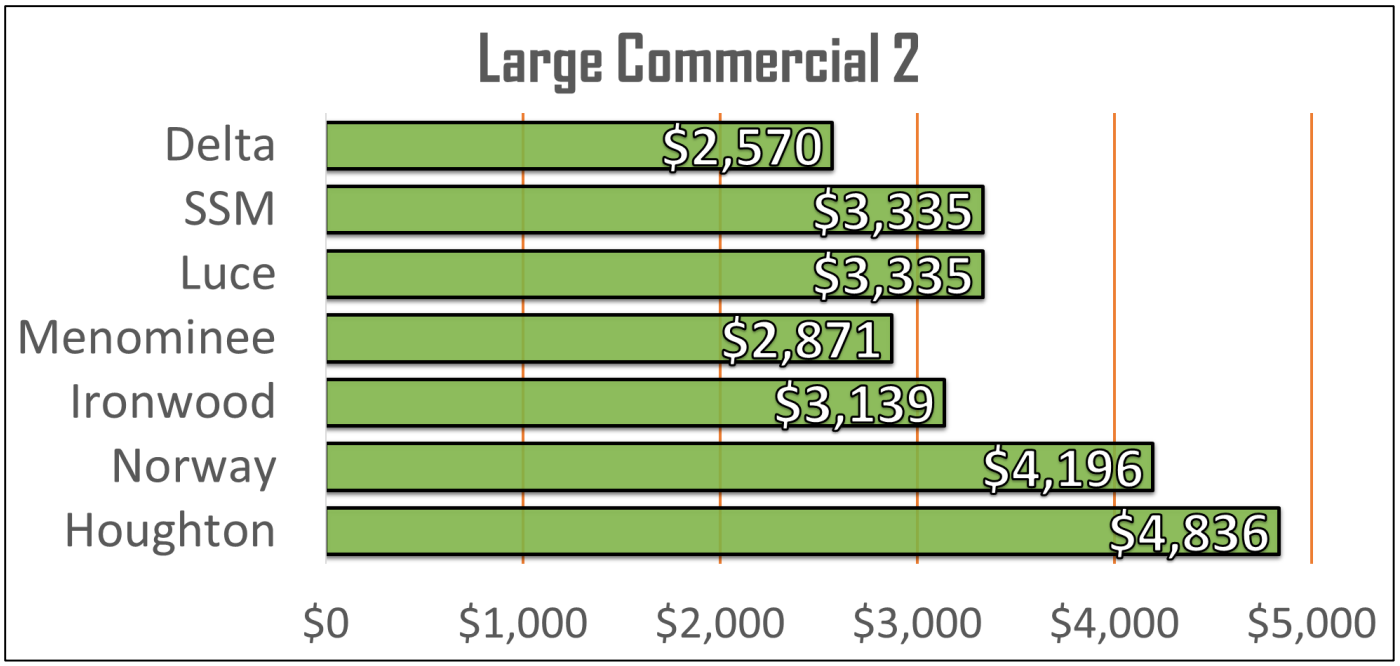
Average Monthly Electric bills of a Small Commercial business (as defined by the Michigan Public Service Commission with a monthly power demand of 5 kW and energy consumption of 1,000 kWh) at the seven industrial parks studied for this report.



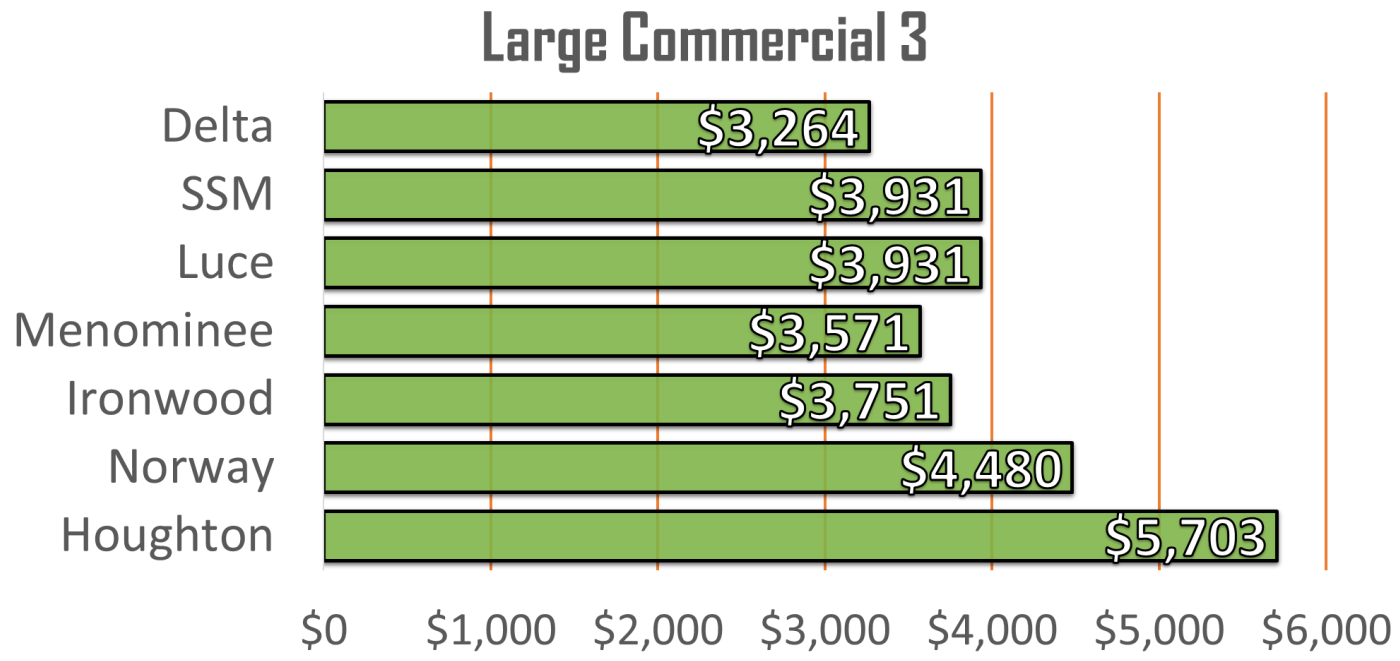
Average Monthly Electric bills of a Small Commercial business (as defined by the Michigan Public Service Commission with a monthly power demand of 25 kW and energy consumption of 5,000 kWh) at the seven industrial parks studied for this report.



Average Monthly Electric bills of a Large Commercial business (as defined by the Michigan Public Service Commission with a monthly power demand of 100 kW and energy consumption of 21,600 kWh) at the seven industrial parks studied for this report.



Average Monthly Electric bills of a Large Commercial business (as defined by the Michigan Public Service Commission with a monthly power demand of 100 kW and energy consumption of 28,800 kWh) at the seven industrial parks studied for this report.



Average Monthly Electric bills of a Large Commercial business (as defined by the Michigan Public Service Commission with a monthly power demand of 100 kW and energy consumption of 36,000 kWh) at the seven industrial parks studied for this report.

Western Upper Peninsula

Energy in the Western U.P is a study of contrasts. The high cost of electricity at the Houghton County Airport Industrial Park is a serious issue, placing barriers on current tenants and future economic growth. Locating a business in the Houghton Industrial Park can cost anywhere between 25% -125% more in energy expenses compared to any other industrial park included in this study. The last Cost of Service Study (COSS) for OCREA showed that industrial/commercial customers are over paying and subsidizing the seasonal residential customers. Businesses have no defined representation on OCREA Board of Directors and OCREA's rates are not subject to regulatory oversight from the Michigan Public Service Commission.

At a time when utilities around Michigan and the country are working with their large energy consumers to reduce peak demand, lower energy consumption and increase customer owned self-generation, OCREA offers limited opportunities for commercial businesses to reduce their energy costs. A limited state-mandated energy optimization program offers energy efficiency retrofits like LED lighting. However, customers receive no respite from OCREA's demand rates, which are the highest in the state of Michigan. As a small rural utility with less than 5000 customers and supplying less than 0.03% of all electricity in Michigan, OCREA might be ill equipped to serve the needs of commercial and industrial customers.

While natural gas from SEMCO is available, reliable and currently affordable year round, long supply is term capacity limited by infrastructure, as the Western UP region is serviced by a narrow gas pipeline. The next manufacturing business that might require very large natural gas generator for its operations is unlikely to be guaranteed uninterrupted service during peak winter months.

The Ironwood Industrial Park is in a good position relative to its energy with affordable rates from their service provider - Xcel. With a large multi-state utility and only a small footprint in Michigan, the Ironwood area reaps the benefits. With such low rates, most alternative energy options are likely to remain a low priority for most businesses. The Ironwood Industrial Development Corporation (IIDC) represents an active business community, with a Board of Directors that includes park tenants and utility representatives. Such a proactive business community presents unique opportunities for alternative energy adoption at the scale of the entire industrial park. Overall, the Ironwood industrial park community can serve as a role model for proactive governance of an industrial park in the UP.

Central Upper Peninsula

The Delta County Industrial AirPark enjoys the lowest electric rates in the region through its city utility, Escanaba Power and Light. City of Escanaba is a Midcontinent Independent Systems Operator (MISO) market participant, and has historically offered very low rates. As a municipal utility Escanaba Power and Light has greater flexibility in offering custom and competitive rate structures to industry park businesses in support of the city's economic development goals. Municipal utilities in Michigan can also offer on-bill financing for alternative energy upgrades on their customer's facilities. Escanaba Power and Light is also studying the feasibility of a community solar project, allowing for greater solar adoption for businesses that might not have adequate rooftop solar potential on their own facilities.

From a purely energy perspective, the Delta County Industrial AirPark is among the best destinations for businesses moving to the U.P., with a robust energy infrastructure and cheap electric rates.

Menominee County Industrial Park is in an envious position with very affordable energy rates, offered through Wisconsin Public Service (WPS) for both natural gas and electricity. WPS has a large service territory in Wisconsin, but covers only half of Menominee county in Michigan. Despite such a small footprint, WPS is the third largest utility in the UP by total electric energy supplied. The greatest issues facing Menominee Industrial Park is an aging infrastructure in the original Park and the lack of any infrastructure in the area available for

expansion. With the City of Menominee owning the infrastructure, there may be unique opportunities for upgrading infrastructure in support of economic and community development. Currently, the hard numbers on Menominee's energy infrastructure are not available, impeding further expansion.

In the Norway-Vulcan Industrial Park, an old railway line separates the service territories Wisconsin Electric (WE) and City of Norway Power and Light for electricity. At present, all businesses are located on one side of this line and are serviced by WE, which has the second highest electric rates of all industrial parks included in this study. All business customers expressed a dissatisfaction with their rates. Additionally, they remain frustrated at their inability to choose service from their own city utility, which produces nearly 80% of its energy locally using clean hydropower. Businesses moving into the park are advised to incorporate these dynamics into their choice of location within the industrial park. Natural gas is not available at all park locations

Eastern Upper Peninsula

Luce-County and Sault St. Marie industrial parks are serviced by Cloverland Electric Cooperative. Effective January 2016, Cloverland returned to being member-regulated in an effort to reduce costs of MPSC fees and to have greater flexibility in establishing policies and rates to benefit their customers. Cloverland has a large contiguous service area in the Eastern UP with reasonable electric rates.

The largest energy consumers in both industrial parks are proactive and clearly demonstrate the vitality of U.P. businesses. All companies have taken actions to make their operations as efficient as possible, and continue to look for additional opportunities.

The biggest issue at these parks was the unknown infrastructure capacity. With three currently large electric consumers at Luce-County industrial park, remaining capacity could be a limiting factor for growth. As a Park nears its capacity, expansion to additional capacity is expensive and could be the primary deterrent to future development.

Overall Summary

For most businesses in this study, we find that access to transportation, communication infrastructure, operational supply-chain efficiency and availability of skilled workforce take precedence over energy costs as barriers for economic development and job growth. With the exception of businesses in Houghton-County and Norway-Vulcan industrial parks, customers in other industrial parks expressed a general satisfaction with the electric rates and service of their utility service provider.

That is not to say that businesses are not concerned about energy costs. Indeed, monthly electric and gas bills form a significant portion of operational expenses for most businesses. Most businesses interviewed for this study recognize the value of energy savings, but few have made efforts to curb energy spending.

From a purely technical and economic standpoint, we find that alternative energy technologies are viable in most industrial parks in the U.P. However, systems large enough to provide significant energy savings requires a significant investment is required not only in equipment but also in trained personnel. Businesses question where they will find these qualified people and how much it will cost and how much they will save in energy costs; versus paying for the high reliability utilities companies offer today.

We observe that a massive barrier to alternative technology adoption is the uncertainty in policy and legislative landscape. All businesses expressed strong reluctance in assuming the risk of making any capacity investments in alternative solutions in the face of unpredictable and rapid changes in energy policy. Indeed, just within the timeline of this study, changes to Michigan's energy policy and dangers of pending legislation necessitated redaction of early findings and recommendations.

The future of the electric utility industry is unknown with all the federal and state regulatory proposals and plans currently on the table. Any specific recommendations made here are likely to be outdated in as early as six months.

With this background, identifying, targeting and capitalizing on opportunities for energy cost reduction can only be championed by visionary leadership in this region. All regional stakeholders – industrial park businesses, local EDCs, planning and development agencies, and in many cases, utilities share common goals of reducing energy expenditure. Yet, achieving widespread reduction of energy expenditure might beyond the capability of any individual stakeholders.

This report presents a simple, elegant and long term solution for UP stakeholders to disrupt this market failure – put in place a single qualified professional or organization to serve as an Energy Manager for the entire Upper Peninsula region. Key responsibilities would include, but not be limited to:

- Continuously monitor the policy landscape, and align regional objectives with state and federal goals.
- Helping businesses understand their energy bills and costs.
- Keep up with advances in alternative energy technologies, and identify opportunities for adoption.
- Help businesses access energy optimization programs offered through utilities.
- Organize routine and periodic energy audits.
- Consolidate economies of scale, and create opportunities for affordable energy adoption at an industrial park scale. For example, partnering with an alternative energy supplier to build community solar or wind projects to benefit all businesses in the park.
- Create a business case for affordable energy options for businesses in industrial parks. For example, partner with energy efficiency contractors to offer performance-guaranteed upgrades to equipment.
- Work with local units of government to create funding tools like PACE financing to facilitate alternative and affordable energy adoption.
- Help industrial park managers understand the capacity limits of their energy infrastructure.
- Assist businesses in securing representation on boards of utilities that lack regulatory oversight from MPSC.

With commercial customers in the UP spending roughly $81 million every year in electricity costs, and with risk of volatility in long term price of natural gas, the benefits of saving at least 0.1% of energy expenditure will far outweigh the payroll costs of UP's own Energy Manager.

Until this position is defined, refined and filled, for the near future local stakeholders can continue to use www.SaveUpEnergy.com to access resources and tools to remain informed on most of the above issues.