

GRAND RAPIDS



# CANNABIS

## ENERGY MANAGEMENT

BEST PRACTICES GUIDE

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# ACKNOWLEDGMENTS

The Guide would not have been possible without the insight and efforts of the Grand Rapids 2030 District’s Cannabis Sustainability Working Group (CSWG) members and peer reviewers. Particular thanks go to the development and review team.

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*This Guide was created through the expertise and insight of the individuals above and their associates, as well as references cited in the Resources Page.*





# ABOUT

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The Grand Rapids 2030 District's CSWG is a multidisciplinary advisory committee dedicated to empower the cannabis industry's participation in Grand Rapids' sustainability goals and prosper as businesses which contribute to the City's vibrant culture.



## PURPOSE

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The Grand Rapids Cannabis Energy Best Practices Guide (the guide) is designed to provide guidance for cannabis businesses to follow the City's current zoning, Zero Carbon, and relicensing regulations through cannabis energy management research. The Guide demonstrates that energy and resource management is a metric for business success and community stewardship. The City of Grand Rapids has specific environmental and social expectations of these businesses which are outlined in this guide. Cannabis businesses can utilize this guide to navigate the local best practices and expectations.

### LIMITATIONS

Readers will not find specific brand or manufacturer endorsements, rather the standards which the owner must be mindful of while choosing technology. The guide is written based on information that is currently available at this time, with the geographic scope of Grand Rapids, Michigan. Future editions will address additional topics with a broader scope of information.



# CANNABIS FACTS

## 2019-2020



MICHIGAN REPRESENTS AN ESTIMATED

# \$1.5 BILLION

CANNABIS MARKET AT BEGINNING STAGES

ESTIMATES SHOW THAT INDOOR GROWS  
SHOW A MEDIAN INCREASE OF



7 TIMES MORE ENERGY USE THAN A  
SIMILAR SIZED OFFICE BUILDING



U.S. GREENHOUSE GAS EMISSIONS  
RELATED TO GROW OPERATIONS IS  
PRESENTLY AT THE EQUIVALENT OF

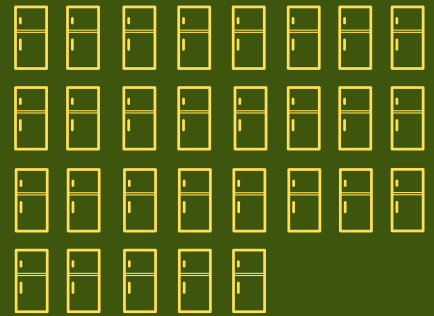
# 3 MILLION CARS



50% OF COLORADO'S  
LOAD GROWTH SINCE  
2012 IS ATTRIBUTABLE  
TO CANNABIS  
CULTIVATION



GROWING 4 CANNABIS PLANTS  
HAS THE ENERGY CONSUMPTION  
EQUIVALENT OF



29 REFRIDGERATORS.

CANNABIS GROWING  
OPERATIONS ACCOUNTED FOR

# 45%

OF COLORADO'S ELECTRIC  
GROWTH LOAD IN 2016.

# 3%

OF ELECTRICITY IN CALIFORNIA IS  
CONSUMED BY THE CANNABIS  
INDUSTRY IN 2019. THAT'S  
EQUIVALENT TO



# 1 MILLION

HOMES POWERED.

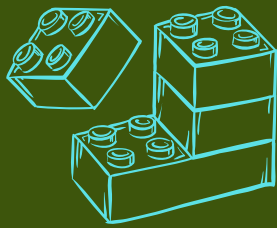




BUILDINGS ACCOUNT FOR

**39 %**

OF CO<sub>2</sub> EMISSIONS IN  
THE UNITED STATES



CANNABIS OPERATIONS WILL  
OCCUPY AN INCREASING AMOUNT  
OF COMMERCIAL BUILDING SPACE  
IN GRAND RAPIDS



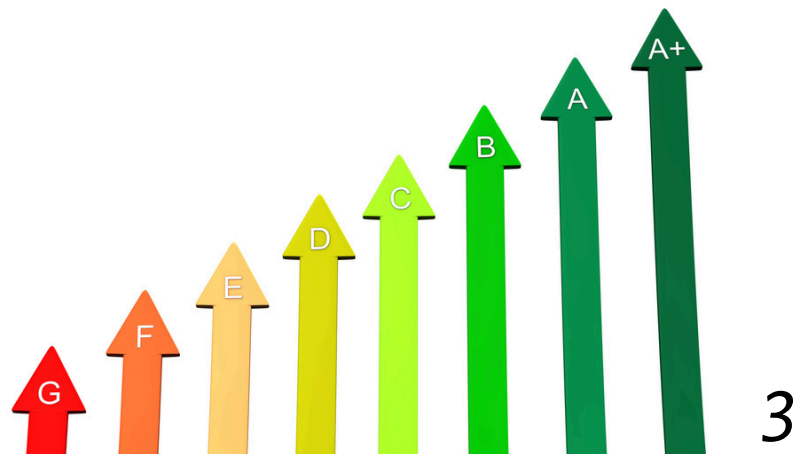
THE CANNABIS INDUSTRY PLAYS  
AN IMPORTANT ROLE IN THE  
STATE AND CITY AS THEY WORK TO  
DRAWDOWN CARBON

# WHY ENERGY MANAGEMENT MATTERS

Widely confirmed throughout peer-reviewed research, the cannabis industry is highly energy-intensive. The energy-intensity of indoor cannabis agriculture combined with increasing market popularity prompts local energy suppliers to adapt quickly to expected energy demand increases. For example, 45% of Colorado's electric growth load was to power the budding cannabis industry. If not properly regulated, the electric demands of cultivation facilities may cause energy shortages that affect local communities. For example, In 2015 Oregon's Pacific Power experienced at least 7 minor community outages after grow operations commenced. Cannabis growers have the opportunity to curb significant greenhouse gas emissions by engaging proactively from the beginning.

The City of Grand Rapids' Zero Cities Program and the Grand Rapids 2030 District have a goal of a zero-carbon clean energy city by 2050. The Cannabis industry will play a crucial role in achieving these energy reduction targets, as indoor agriculture is such a key energy consumer.

Energy supplier and municipal perspective aside, smart energy management is smart business. Treating energy as a manageable metric will keep your product competitive in the market. Smart energy management keeps your overhead low and your product price attractive.



# SUSTAINABILITY REQUIREMENTS TO RELICENSE IN THE CITY OF GRAND RAPIDS

## STARTING CONTACTS

1. Visit the Marijuana page on the City of Grand Rapids website
2. Contact the City Sustainability Team for enquiries regarding sustainability reporting
3. Visit Marijuana Regulatory Agency at Michigan.gov for state-level regulations
4. Call Consumers Energy Business Center to discuss your predicted energy load
5. Contact your Grand Rapids 2030 District
6. Contact City of Grand Rapids Environmental Services Department's Industrial Pretreatment Program

## BEFORE OPERATIONS CHECKLIST:

1. Join the Grand Rapids 2030 District and report energy use on Energy Star Portfolio Manager
2. Create and submit an environmental plan:
  - ✓ Work with your electrical contractor, mechanical contractor and utility to create a predictive energy load analysis
  - ✓ GHG emission expectations from operations
  - ✓ Energy & Water efficiency measures plans
  - ✓ Solid waste management plan including reporting annual tons of each type
  - ✓ Demonstrate that facility's ventilation, by-product, waste disposal, and water management (supply and disposal) doesn't contaminate the air, water, or soil
  - ✓ Prove that at least 50% of total plant canopy area illuminated by fixtures with photosynthetic photon efficacy of at least 1.9  $\mu\text{mol/J}$  when you begin operations



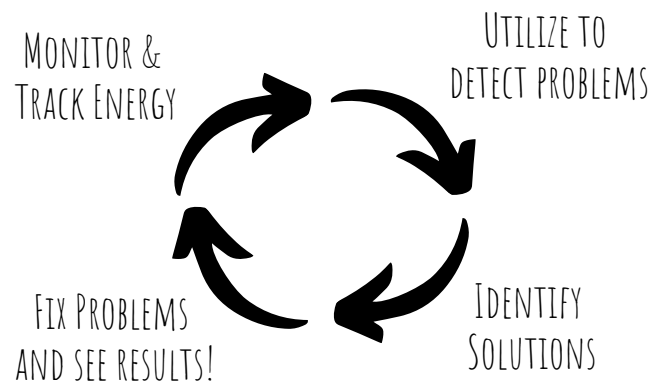
## WITHIN 16 MONTHS AFTER OPERATION START:

1. Update your Energy Star Portfolio Manager account with the utility bills since operations began
2. Submit ASHRAE II building audit or better to the Office of Sustainability
3. Annually update your sustainability plan with progress



# ENERGY BENCHMARKING

You can't manage what you don't measure. This is especially true with energy management. "Benchmarking" means measuring a building's energy use and then comparing it to the average for similar buildings. It allows you to contextualize your building's relative energy performance and helps identify opportunities to cut energy waste.



## HOW TO BENCHMARK WITH GR2030

- ✓ Join the [2030district.org/grandrapids](https://2030district.org/grandrapids)
- ✓ Register or login with **Energy Star Portfolio Manager**
- ✓ Add your properties
- ✓ Share with data by adding GR2030 as contact, and sharing read-only access with your property
- ✓ Enter energy, water, and optional waste & materials data as you receive your bills
- ✓ View results and improve your performance



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Tutorial



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Quick Guide



Download Add  
Contact Guide

# HOW TO CREATE A STRONG ENVIRONMENTAL SUSTAINABILITY PLAN

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## 1. ASSESS BASELINE

Measure your starting point. Examine your supply chain, building structure, operating energy footprint, and waste stream to identify your carbon footprint and baseline impact of operations. You must know your starting point to be able to measure progress.

## 2. IDENTIFY STAKEHOLDERS

Who does your business serve? Who is affected tangentially by your business decisions? Who are partners that will help you achieve your goals? What relationships do you need to foster to achieve your business goals?

A clear understanding of valuable stakeholder relationships will only benefit your business.

## 3. SET MEANINGFUL GOALS

Your goals can be ambitious; goals grant you permission to dream big. Make your goals science-based, rooted in quantifiable metrics, reflective of your business identity. Lastly, make them genuine.

## 4. DETERMINE OBJECTIVES

Envision how progress towards your set goals looks. Objectives should be crystal clear and realistic, with quantifiable targets and timelines associated with each objective. Identify key performance indicators (KPIs), metrics, and timeline.

## 5. SELECT FOCUS PROJECTS WITH TIMELINE INCLUDED

Start modestly and progress consistently. Set yourself up for realistic success from the get-go. Acknowledge all important initiatives to pursue, and outline the primary step for each of them. Dedicate a sincere effort to 1 or 2 initiatives, for the next 18 months.

## 6. MEASURING & RECORD & MODIFY & REPEAT

Develop an internal record-keeping structure to track progress towards the projects you've created. In the case that you reach a milestone or circumstances shift, revisit your projects, and make adjustments to stay on target. Remember your stakeholders and partnerships. We're here to support you!



# ENERGY MANAGEMENT 101

Energy is a metric for success for a business, not simply an operational expense. Smart management of your energy usage will decrease your overhead costs and keep the price of your product competitive.



## PREDICTIVE LOAD ANALYSIS

In load forecasting, the "load" is your building's demand (in kW) or energy consumption (kWh). Therefore, to predict your load, multiply all energy-using equipment's power rating (kW) by the amount of operation time (hour). Understanding the power rating of your equipment will help you predict the operating expenses from utilities such as electricity, gas, steam, and water. Utilities are more than an operating expense; they are measurable inputs to production. Work with your electrical/mechanical contractors to fill out your own load analysis (See Appendix 1). Once completed Consumers Energy's Business Center is ready to support your project needs. You can reach them at 800-805-0490. Consumers Energy Business Energy Efficiency Programs can also identify available energy-efficient measures, perform walkthroughs of existing facilities, and connect you to cash rebate opportunities. Contact the Business Energy Efficiency Program today at 877-607-0737.

## KNOW YOUR EUI

Energy Use Intensity (EUI) quantifies energy (kBtu) per square foot. Indoor production facilities have highly energy-intensive buildings. To calculate your EUI, first convert your utility units to kBtu, and sum them.

Here's a quick "cheat sheet" to help:

1 kWh = 3.412 kBtu  
1 CCF = 102 kBtu  
1 therm = 100 kBtu  
1 steam pound = 1.04 kBtu

TOTAL kBtu / square footage of your building =  
Energy Use Intensity.

For context, a highly energy-intensive building would generally be 300 and above. "Zero Net Energy-ready" buildings have a source EUI of 25. The Energy Star website displays Median EUIs by the market sector.

## CALCULATE YOUR GHG EMISSIONS

Now that your energy usage is organized, you can also use the **US EPA's Green House Gas Calculator** to calculate your emissions.

The carbon content of direct heating fuels such as natural gas is fairly consistent, though the carbon content of electricity depends on the grid's fuel mix (identifiable by your zip code on the EPA GHG Calculator). Using onsite renewable energy generation will reduce your carbon footprint.

To learn more and record your energy use, please visit [Energy Star Portfolio Manager](#), or [energystar.gov](http://energystar.gov)



# ENERGY AUDITS

An energy audit is an analysis of a building that indicates how you can reduce energy consumption and save energy costs. Its insight can lead to significant savings on your business's utility bill and O&M. Energy audits reveal your usage patterns, identify saving opportunities, and elucidated the map of your energy use. Listed below are descriptions of audit levels and what each is designed to accomplish.



PRELIMINARY	LEVEL 1	LEVEL 2	LEVEL 3
<p><i>Preliminary Energy Use Analysis:</i></p> <ul style="list-style-type: none"><li>• Most basic energy audit</li><li>• Analysis of historic energy use and costs.</li><li>• Energy use is typically benchmarked</li></ul>	<p><i>ASHRAE Audit Level 1 – Walk-Through Analysis:</i></p> <ul style="list-style-type: none"><li>• The basic starting point for building energy optimization</li><li>• Involves interviews with select facility staff</li><li>• A review of utility bills or other operating data</li><li>• A walkthrough of the facility</li><li>• The goal is to identify glaring areas of energy inefficiency.</li><li>• The data is compiled and used to complete a preliminary report detailing low-cost/no-cost measures and potential capital improvements for further study in subsequent audits.</li></ul>	<p><i>ASHRAE Audit Level 2 – Energy Survey and Analysis:</i></p> <p>This includes the ASHRAE Level 1 analysis, and adds:</p> <ul style="list-style-type: none"><li>• Detailed energy calculations and financial analysis of proposed energy efficiency measures.</li><li>• Energy consumption is broken out by end-use, identifying areas that present the greatest efficiency opportunities.</li><li>• Utility rates are analyzed to determine if there are rate change opportunities.</li><li>• Key building representatives are interviewed for insights into building operational characteristics, potential problem areas, and to define financial and non-financial goals of the audit.</li></ul>	<p><i>ASHRAE Audit Level 3 – Detailed Analysis of Capital Intensive Modifications:</i></p> <ul style="list-style-type: none"><li>• Engineering analysis of the potential capital-intensive projects identified in the ASHRAE Level 2 Analysis.</li><li>• More detailed field data gathering and more rigorous analysis.</li><li>• Existing utility data is supplemented with sub-metering of major energy-consuming systems and monitoring of those system's operating characteristics.</li></ul>
	<p>This level of detail is adequate for prioritizing energy efficiency projects and to assess whether a more detailed audit is necessary.</p>	<p>This level of detail is adequate to justify project implementation.</p> <p>REQUIRED BY THE CITY</p>	<p>This level of detail is typically reserved for complex commercial and industrial buildings.</p>



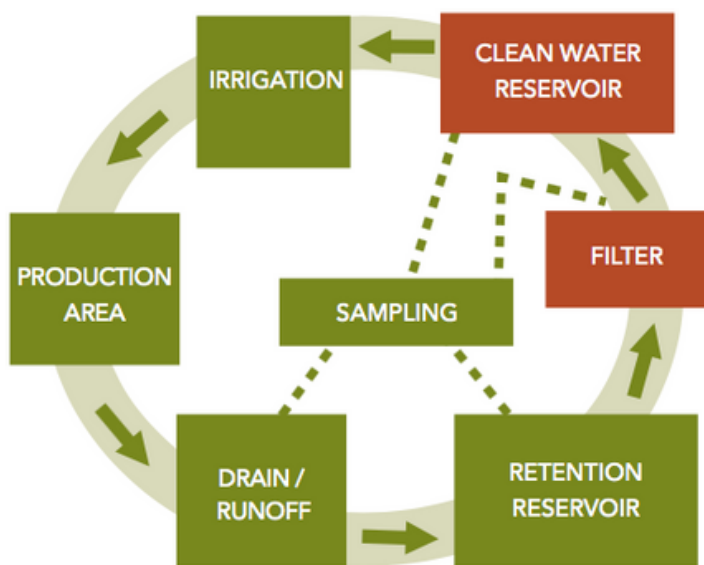
# WASTE WATER & TOXINS

The City of Grand Rapids' Industrial Pretreatment Program (IPP) controls the release of pollutants into the wastewater system by monitoring the discharge of significant industrial users. A "significant industrial user" is defined as an entity who discharges 25,000 or more gallons per day of process water, or contributes 5% or more of the average dry weather capacity to the water recovery facility. If you believe you have a reasonable potential of adversely affecting the water recovery facility, connect with the IPP to assess how to move forward.



## Quick Tips

Contact your city's Industrial Pretreatment Program for permitting requirements, applications, and wastewater characterization for pollutants including sampling frequency and reporting. For Grand Rapids, contact Industrial Pretreatment Program at 456-3633 or email at [IPP@grcity.us](mailto:IPP@grcity.us)



*Diagram of Irrigation Water Recapture Process, Denver Public Health & Environment retrieved from Cannabis Environmental Best Management Practices Guide*

## Items to be aware of from the Environmental Services Department:

- Facilities should contact IPP for permitting requirements, applications, and wastewater characterization for pollutants including sampling frequency and reporting.
- Know your trusted PFAS labs: how they test, who tests, frequency of testing, & cost.
- Know each of your water and sewer meters and accounts. Monitor water intake, reuse, plant water uptake, and discharge quantities. Be mindful that you only pay for what you discharge.
- Familiarize yourself with the Industrial Pretreatment Program requirements: sanitary versus process piping, sampling manholes, flow proportional sampling requirements, etc.



## INDUSTRY EXAMPLE

Massachusetts-based Garden Remedies' water reclamation strategy reclaimed 425 gallons of condensate per 500 gallons of water used. The remaining 75 gallons were supplied by the municipality. For Garden Remedies, reduced water bills weren't a major motivator for the grow; rather water reclamation is environmentally sound and ensures quality of the product with pure water for the plants.

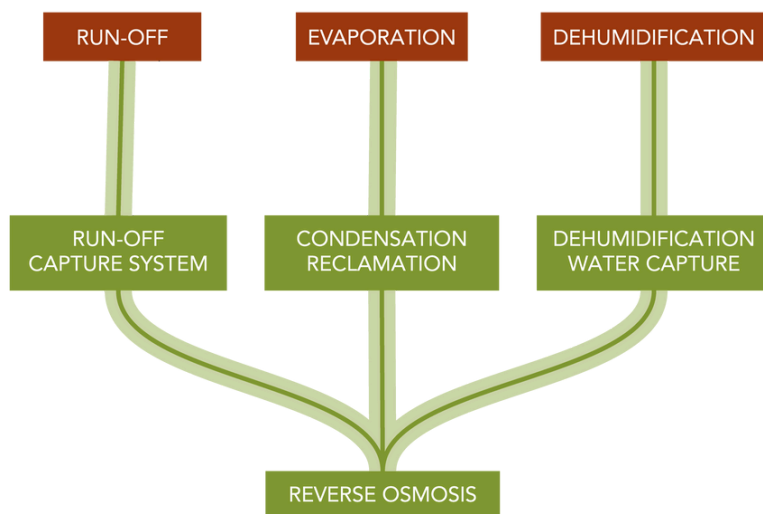


*Pictured: Garden Remedies' Water Reclamation system*

# WATER EFFICIENCIES

PLANTS DON'T CONSUME WATER...THEY BORROW IT

## WATER RECLAMATION STRATEGIES



Water can be wasted in Cannabis cultivation in 3 ways: wastewater from irrigation runoff, evaporation and transpiration, and wastewater from dehumidification equipment. All these can be addressed in your environmental plan through water reclamation strategies.



**Condensation Reclamation:** Collects water that transpired off the plant or evaporated from the soil into the open air. Reclaiming 1 gallon can save up to 6 gallons from the municipal supply.



**Reverse Osmosis (RO):** Static pressure pushes spent water through a permeable membrane to purify it. RO can produce waste of 0.5 - 5 gallons of dirty water to 1-gallon clean water. Clean water is injected with nutrients and sent again to the plants through the closed-loop system.

## ADDITIONAL WATER CONSERVATION TIPS:

- ✓ High-efficiency equipment will pay itself off
- ✓ Automated irrigation methods
- ✓ Cover all reservoirs to minimize evaporation
- ✓ Run "spent" nutrient solution through RO



# HAZARDOUS OUTPUTS

## LEAVE NO TRACE

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The City of Grand Rapids Zoning holds the Cannabis industry to expectations of excellent facilities operations and community stewardship. No ventilation, by-product, or water disposal shall contaminate the air, water, soil, or the building structure itself. Operation outputs must be managed in a manner that won't reduce the life expectancy of the building due to heat, mold, or other hazards.

The Zoning requires that contaminants be controlled and eliminated by these 5 industry best practices methods:

1. Use activated air scrubbing and carbon filtration system for exhaust air at all times.
2. Size fans by cubic feet per minute (CFM) equivalent to the building volume (length x width x height) / 3. Use filters that are rated for the applicable CFM.
3. Maintenance: keep air scrubbing and filtration system up to date. Follow the manufacturers' recommendations for filter changes.
4. Maintain your negative air pressure inside the building.
5. Keep doors and windows closed except expected foot traffic.





# 5 ENERGY EFFICIENCIES YOU SHOULD CONSIDER

Are you wondering what equipment will yield you the best product, operations cost, and lowest EUI? You are managing an ecosystem inside a closed industrial building. A single change can have systemic consequences. Remember to take a systems-design approach from the big picture view.



## LED LIGHTING

LED lights save operational costs and have an adjustable wavelength to support plants developmental stages.



## HVAC & HUMIDITY

HVAC has to be adjusted to the types of lights in use. Investing in max efficiency will pay back in the long run.



## BUILDING CONTROLS

Controls for water, lighting, and humidity decrease wasted valuable resources.



## BUILDING ENVELOPE

In Michigan, we're a net heating climate. Consider minimizing thermal bridging and heat loss through high R-value insulation and air sealing.



## RENEWABLE ENERGY

Consider installing on-site renewable generation such as thermal heat pumps or solar.



# REFERENCES

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# RESOURCES

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1. **Balancing the Environmental Costs of Cannabis:** <https://www.visualcapitalist.com/balancing-environmental-costs-cannabis/>
2. **City of Grand Rapids Environmental Sustainability Page:**  
<https://www.grandrapidsmi.gov/Government/Departments/Sustainability/Environmental-Sustainability?BestBetMatch=sustainability|d13b95b2-5146-4b00-9e3e-a80c73739a64|4f05f368-ecaa-4a93-b749-7ad6c4867c1f|en-US>
3. **City of Grand Rapids Marihuana Page:** <https://www.grandrapidsmi.gov/Government/Programs-and-Initiatives/Marijuana>
4. **Commercial Buildings Energy Consumption Survey (CBECS):** <https://www.eia.gov/consumption/commercial/>
5. **Consumers Energy Business Center:** <https://www.consumersenergy.com/business/customer-service>
6. **Consumers Energy Business Energy Efficiency:** [https://www.consumersenergy.com/business/energy-efficiency?utm\\_source=startsaving&utm\\_medium=redirect&utm\\_campaign=business-energy-efficiency&utm\\_content=startsaving](https://www.consumersenergy.com/business/energy-efficiency?utm_source=startsaving&utm_medium=redirect&utm_campaign=business-energy-efficiency&utm_content=startsaving)
7. **Consumers Energy Utility Rebates:** <https://www.consumersenergy.com/business/energy-efficiency/special-programs/agriculture>
8. **EGLE's Protecting Water Resources When Growing and Processing Cannabis Guidance:**  
[https://www.michigan.gov/documents/deq/deq-tou-wrd-Guidance-MarihuanaGrowingProcessing\\_636576\\_7.pdf](https://www.michigan.gov/documents/deq/deq-tou-wrd-Guidance-MarihuanaGrowingProcessing_636576_7.pdf)
9. **EGLE's Water Withdrawal Assessment (WWA):** [https://www.michigan.gov/egle/0,9429,7-135-3313\\_3684\\_45331\\_45335-477090--,00.html](https://www.michigan.gov/egle/0,9429,7-135-3313_3684_45331_45335-477090--,00.html)
10. **Energy Star Portfolio Manager:** <https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager>
11. **Industrial Pretreatment Program: Applying for a Wastewater Discharge Permit:**  
<https://www.grandrapidsmi.gov/Services/Apply-for-a-Wastewater-Discharge-Permit>
12. **LINC UP:** <https://lincup.org/>
13. **Michigan's Marijuana Regulatory Agency (MRA) Licensing Reports:** <https://www.michigan.gov/mra/0,9306,7-386-100002-512385--,00.html>
14. **Resource Innovation Institute (RII) Michigan Cannabis Facility Design & Optimization, Michigan Efficient Yields workshop Youtube playlist:** [https://www.youtube.com/watch?v=YaxTiYBMLWU&list=PLBqTCoNZ-cS2bowMt-vKLRgoAQ-\\_PRW9O](https://www.youtube.com/watch?v=YaxTiYBMLWU&list=PLBqTCoNZ-cS2bowMt-vKLRgoAQ-_PRW9O)
15. **MiGBC's Grand Rapids 2030 Program:** <https://www.2030districts.org/grandrapids>



SAMPLE ENERGY SELF AUDIT FORM

Name:	
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Grow Type	
Cultivation Sq. Ft.	
Building Type	
Building Age	

Basic Overview	
Annual Energy Used (kWh)	
Annual Water Used	
Production (Dried Wt.)	

Month	Energy (kWh)	Water (gal)	Production (Dried Wt.)
Janurary			
Feburary			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			

Growing System					
Grow Medium Description					
Plant Phase	Capacity (# of Plants)	Cycle Duration	Cycles Per Year	Irrigation Type	
Irritgation Schedule/ Amount	Lighting Type	Make	Model	# of Lights	Lighting Hours

Equipment	Make	Quantity	(hrs/day)	Location/Phase Used
HVAC				
Ocsillating Fans				
Fertigation				
Dehumidifiers				