Ameren ILLINOIS | Energy Efficiency PROGRAM

BUSINESS SYMPOSIUM

Unlocking Critical Resources for Industrial Customers

Onsite Energy Technical Assistance Partnerships

U.S. DEPARTMENT OF ENERGY

Midwest

US DOE Resources for Industrial Customers

October 2024

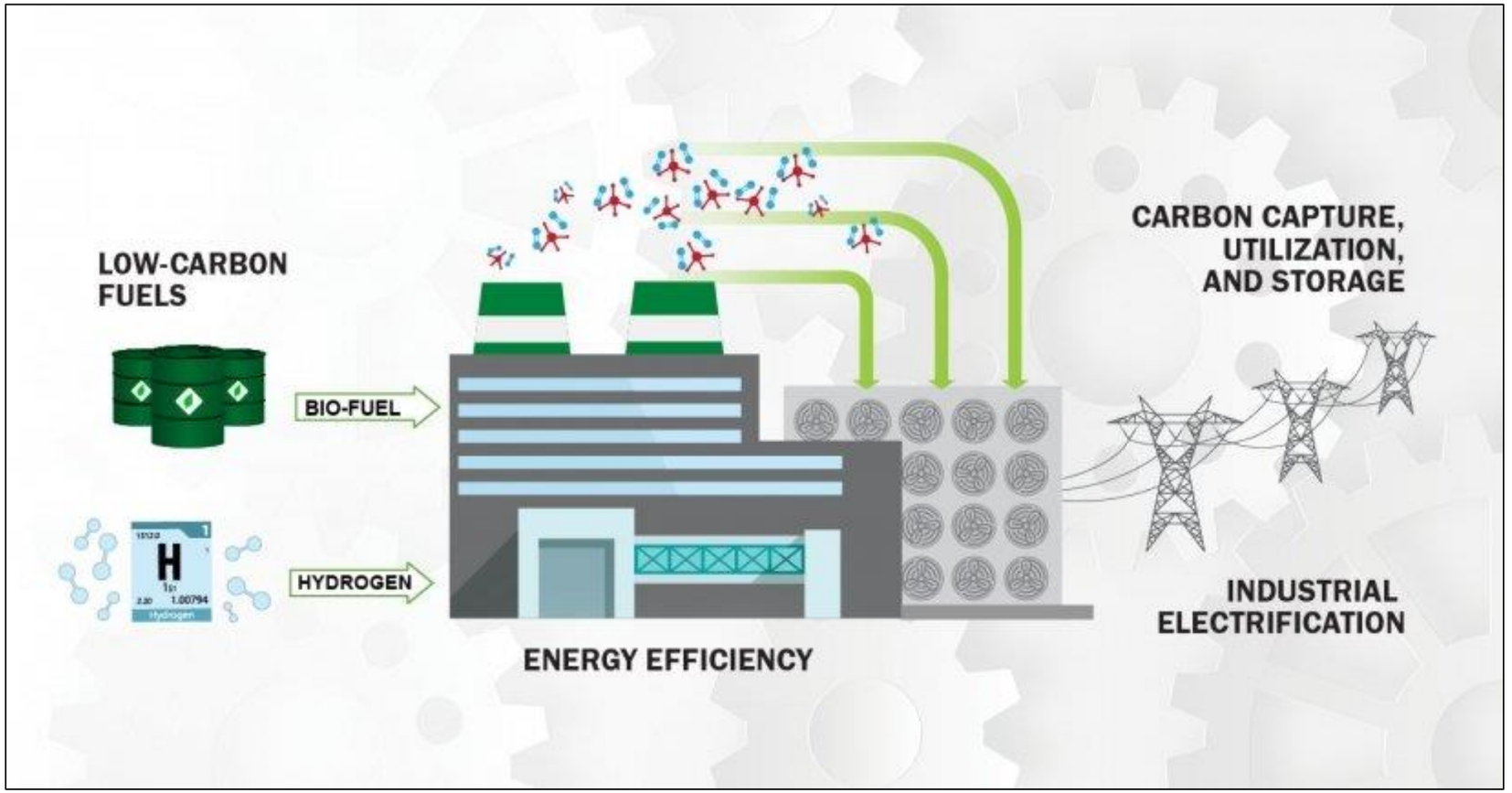
Agenda

- DOE Onsite Energy Technical Assistance Partnership (TAP)
- Onsite Energy TAP Technical Resources
- Federal Grants Available

Strategies for Decarbonizing U.S. Industries

The DOE Industrial Decarbonization Roadmap identifies 4 key technological pillars to significantly reduce emissions for these five subsectors studied. With the application of alternative approaches, 100% of annual CO2 emissions could be mitigated.

1. Energy Efficiency
2. Industrial Electrification
3. Low-Carbon Fuels, Feedstocks, and Energy Sources (LCFFES)
4. Carbon Capture, Utilization, and Storage (CCUS)



Source: https://www.energy.gov/eere/doe-industrial-decarbonization-roadmap

Onsite Energy Technical Assistance Partnerships (TAPs)

DOE's 10 regional Onsite Energy TAPs provide technical assistance to end users and other stakeholders about technology options for achieving clean energy objectives. Key services include:

Technical Assistance: Screen sites for opportunities to implement onsite energy technologies and provide advanced services to maximize economic impact and reduce risk from initial screening to installation to operation and maintenance.

End-User Engagement: Partner with organizations representing industrial and other large energy users to advance onsite energy as a cost-effective way to transition to a clean energy economy.

Stakeholder Engagement: Engage with strategic stakeholders, including utilities and policymakers, to identify and reduce barriers to onsite energy through fact-based, unbiased education.

Onsite Energy Technical Assistance Partnerships
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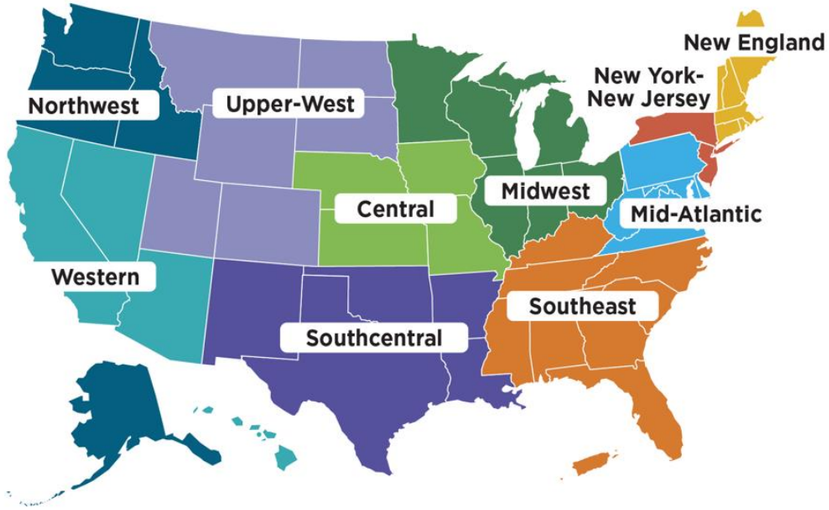

https://betterbuildingssolutioncenter.energy.gov/onsite-energy/taps

Onsite Energy Technical Assistance Partnerships

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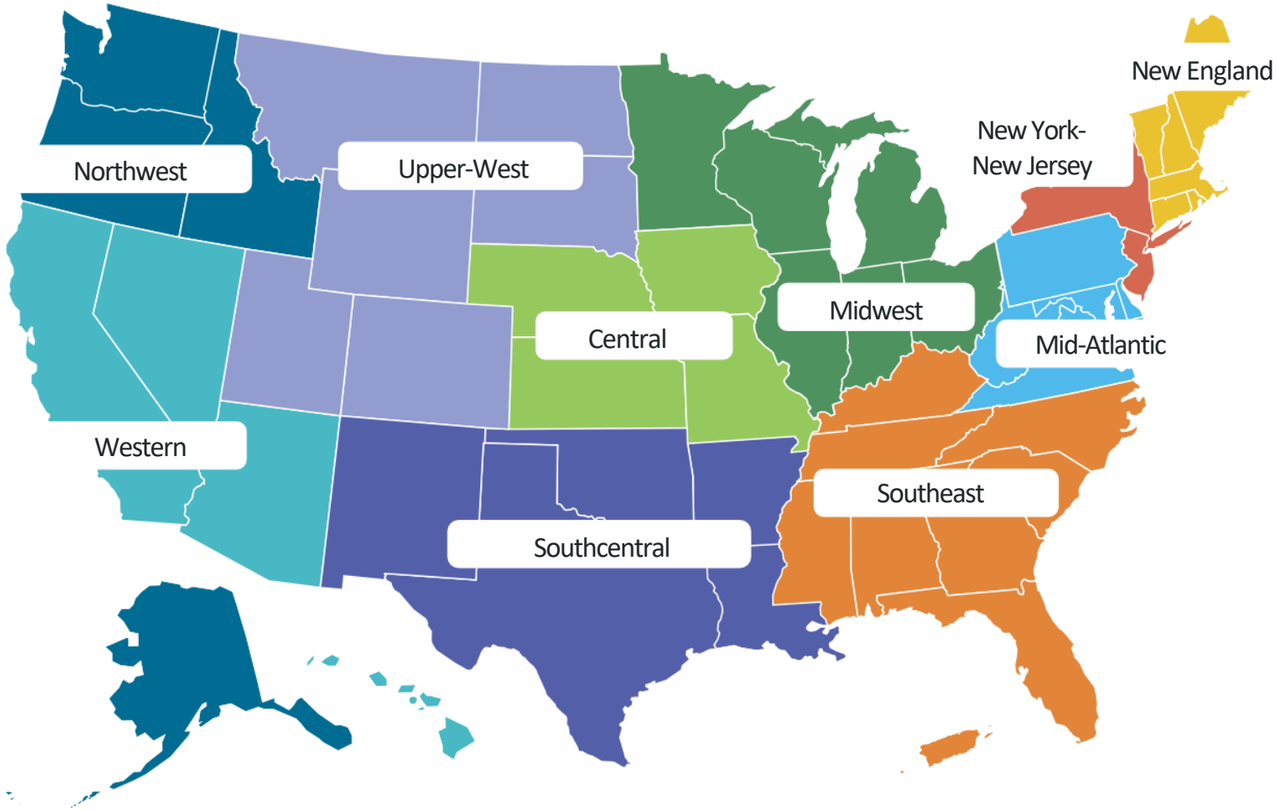

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Onsite Energy Program

The U.S. Department of Energy's (DOE) Onsite Energy Program provides technical assistance, market analysis, and best practices to help industrial facilities and other large energy users increase the adoption of onsite clean energy technologies.

battery storage | combined heat and power | district energy | fuel cells | geothermal | industrial heat pumps

renewable fuels | solar PV | solar thermal | thermal storage | waste heat to power | wind

Onsite Energy TAP Resources

Getting Started: How to Work with Your Onsite Energy TAP

Contact Your Regional TAP

Contact the Onsite Energy TAP in your region to start exploring onsite energy opportunities.

Discuss Site Characteristics, Goals, Objectives

Meet with the Onsite Energy TAP to discuss preliminary interest in onsite energy and learn about the facility's needs and energy-related goals.

Collect Site Data

Work with the Onsite Energy TAP to collect data needed to perform technical assistance (e.g., facility size, operations, electric and gas usage, etc.).

Conduct Analysis

Onsite Energy TAP works with technical analysis team to perform initial screenings for multi-technology options or advanced analysis to support project installations.

Review Results

When the results are ready, meet with your Onsite Energy TAP to review and discuss next steps (e.g., options worth further analysis or additional support available)

Factors to Consider for Facility Prioritization

Regional Geographic Factors	State and Utility Factors	Facility-Organization Factors	Site-Specific Factors
Are there sufficient solar or wind resources?	Is there a renewable portfolio standard in effect?	Is the facility owned or leased?	Is the roof/space acceptable for solar photovoltaics? Are there parking spaces for carport or canopy photovoltaics?
Are multiple facilities in proximity to one another?	Are there favorable utility and/or state incentives?	Is the facility important to key stakeholders?	Is there available land on which to install solar photovoltaics or wind turbines?
Are energy and demand charges high relative to the rest of the portfolio?	Are there favorable utility tariffs and programs?	Is there a positive long-term outlook for the facility?	Is there a suitable location for batteries, fuel cells, or combined heat and power infrastructure?
Are natural gas prices high relative to the rest of the portfolio?	Does utility interconnection support dispatchable generation?	Are greenhouse gas emissions calculation factors higher relative to the rest of the portfolio.	Are there large fossil-fuel heating loads and do they coincide with electric loads?
Are third-party ownership options legal?	Is net metering available?	Is the facility located near a disadvantaged community (DAC)?	

Technology-Specific Favorable Site-Attributes

	Solar Photovoltaics	Distributed Wind Turbines	Battery Energy Storage Systems	Combined Heat and Power Systems	Heat Pumps
High $/kWh Electricity Rate	↑	↑	N	↑	↓
High $/kW Demand Charge Rate	N	N	↑	↑	↓
High Nat. Gas Prices	N	N	N	↓	↑
Available Roof Space	↑	N	N	N	N
Available Land Space	↑	↑	N	N	N
High Heating Loads	N	N	N	↑	↑
24/7 Electricity and Heating Loads	↓	↑	↓	↑	N

↑ Positive | N Neutral | ↓ Negative

Note, the magnitude of each site attribute, the combination of two or more site attributes, and the combination technologies may have different outcomes than what is qualitatively characterized in this table as favorable, neutral and negative criteria.

Initial Technical Assistance – Example Results

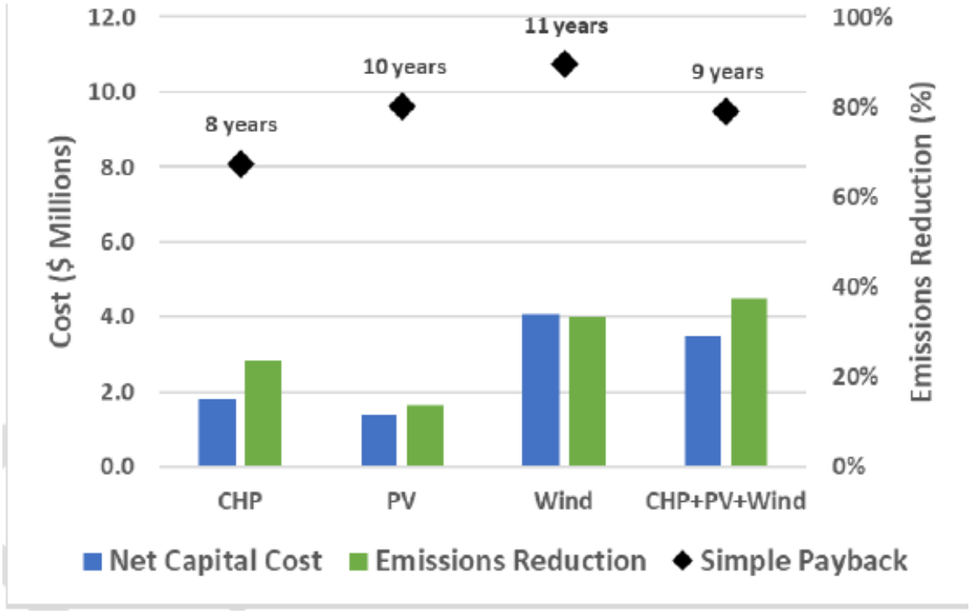
Table 1: Technology Down-selection

Technology	Analyzed for ITA	Option for ATA	Explanation
Combined Heat and Power (CHP)	Y	Y	Consistent thermal load makes CHP a viable option. Could consider alternative fuel option (landfill gas) indicated in data collection form to further reduce emissions as part of an ATA.
Solar Photovoltaic (PV)	Y	Y	Substantial roof/open parking lots area availability makes the site a strong candidate for solar PV. A more detailed PV analysis as part of an ATA could be used to further optimize system economics and performance.
Wind Turbines (Wind)	Y	Y	Land availability onsite makes wind turbine generation a viable option. A more detailed site assessment as part of an ATA could help determine ideal placement and whether trees would need to be cleared and how that would impact project economics and performance.
Battery Energy Storage System (BESS)	N	Y	Electrical load is flat, and the rate structure does not incentivize short-term load shifting. Even if there was a tariff option with high on-peak-to-off-peak price ratios, a 6+ hour duration battery would likely be needed to sufficiently shift a flat load. However, BESS could be evaluated as part of an ATA resilience scenario.
Concentrated Solar Thermal (CST)	N	Y	CST was not evaluated as part of the ITA but could be considered as an alternative to CHP as part of an ATA, especially if site emission reduction is a priority. There is sufficient undeveloped land to accommodate a significant CST system.
Geothermal Heat Pumps (GHP)	N	N	Space heating loads are negligible and do not warrant consideration of space heating solutions. GHP cannot serve facility's process heating loads.
Air Source Heat Pumps (ASHP)	N	N	Space heating loads are negligible and do not warrant consideration of space heating solutions. ASHP cannot serve facility process heating loads.
Industrial Heat Pumps (IHP)	N	N	Collected site data do not indicate the presence of a waste heat source that could be boosted by IHPs to serve process heating loads.
Hot Thermal Storage (HTS)	N	N	There is no time shift needed between CHP heat generation and the heating load, so HTS is not needed.
Chilled Thermal Storage (CTS)	N	N	CTS was not considered because there is no economic incentive for time shifting cooling load, for many of the same reasons as for BESS.

Table 2: ITA Analysis Summary

	BAU	CHP	PV	Wind	CHP+PV+Wind
Electricity Cost ($/year)	1,260,000	460,000	1,080,000	810,000	280,000
Natural Gas Cost ($/year)	450,000	880,000	450,000	450,000	880,000
Incremental O&M Cost ($/year)	-	150,000	40,000	70,000	180,000
Net Operating Cost Savings ($/year)	-	230,000	140,000	380,000	370,000
Net Capital Cost ($)	-	1,830,000	1,380,000	4,090,000	3,510,000
Simple Payback (years)	-	8	10	11	9
Site CO_2 Emissions Reduction (tonnes/year)	-	42,000	24,000	59,000	67,000
Site CO_2 Emissions Reduction (%)	-	24%	14%	33%	38%
System Size(s) (kW)	-	1,104	2,000	2,000	CHP: 1,104; PV: 2,000

BAU: Business as usual; CHP: Combined heat and power; PV: Solar photovoltaic; Wind: Wind power



Federal Grants

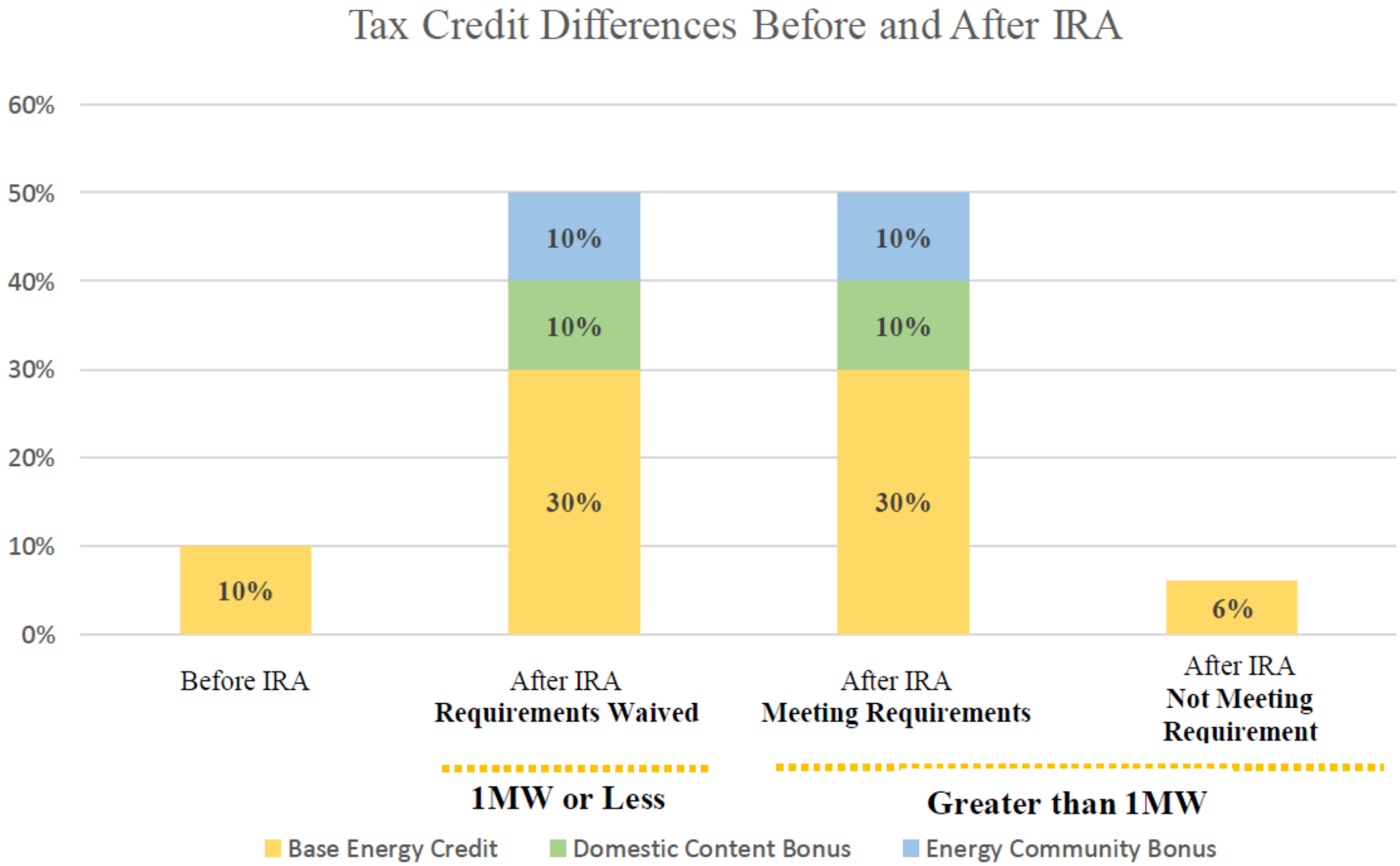
Inflation Reduction Act and Tax Credits

Source: Northeast Clean Heat and Power Initiative (NECHPI)

- Before the IRA, the old Section 48 for ITC qualified CHP at a lower rate. Section 45 for PTC qualified renewable powered CHP that met certain requirements.
- IRA extends Section 48 ITC to CHP gas or renewable at the 30% rate extends Section 45 PTC only available to qualifying renewable CHP and includes energy storage technologies and microgrid controllers (facilitate hybrid CHP).
- Before the bill, the ITC granted an energy credit of 10% (sunset 12/31/2021). The bill now extends the ITC under section 48 at the 30% rate for energy property beginning construction after 1/1/2022 and before 2025, and up to 30-40% through 2035.
- Credit Enhancements: There are bonus points to earn “beyond” the 30% ITC and PTC.
  - Domestic Content Bonus: additional 10% credit is rewarded for ITC or PTC if manufactured products that are components (ex: steel, iron) of the completed facility are required to be produced in the U.S.
  - Energy Community Bonus: additional 10% credit is awarded for ITC or PTC if a qualified facility is located on brownfields or in an energy community with fossil-electric plant retirements, coal mine closures or high unemployment rates.

Inflation Reduction Act and Tax Credits

Source: Northeast Clean Heat and Power Initiative (NECHPI)



IAC Implementation Grants

Bipartisan Infrastructure Law Provision 40521.b1

$80M in funding available in the first year (Additional funding available in the next couple years depending on demand).

Grants awards of up to **$300,000 per quarterly funding round**, at a 50% cost share[1] (**valid cost share options** include internal capital, in-kind contributions, state and local public programs, private loans – including SBA-guaranteed sources, utility programs, leases, and Energy Savings Performance Contracts).

Eligibility exclusively for **small-and-medium-sized manufacturing firms,**[2] and water and wastewater treatment facilities.

To **address energy assessment recommendations** by IACs, DOE Combined Heat and Power/Onsite Energy Technical Assistance Partnerships, or other third-party assessors deemed equivalent by DOE.

1. *50% cost share means that the applicant must cover at least 50% of the project cost. So, for instance, if an implementation project or projects costs $100k, DOE can make a $50k grant.*

2. *Small and medium-sized manufacturer (an entity that engages in the mechanical, physical, or chemical transformation of materials, substances, or components; or, a water or wastewater treatment facility) is a firm with: gross annual sales of less than $100M, fewer than 500 employees at the plant site, and annual energy bills of $100,000 - $3,500,000.* ***If the manufacturer/facility is an individual LLC that pays separate taxes from the parent company, then eligibility is based on the LLC.***

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Grant Eligibility Requirements

Annual Gross Sales[1]

- Few than $100M
- Based on **manufacturing firm/entity**

Number of Employees

- Fewer than 500
- Based on **facility/plant site**

Annual Energy Bills[1]

- Between $100K - $3.5M
- Based on **manufacturing firm/entity**

All three grant eligibility requirements can be determined using either last completed fiscal year or year in which the assessment was completed (if different)

1. If the manufacturer/facility is an individual LLC that pays separate taxes from the parent company, then eligibility is based on the LLC.

MESC OFFICE OF MANUFACTURING AND ENERGY SUPPLY CHAINS

Getting a Qualified Assessment

Option 1: Industrial Assessment Centers (IACs)

Receive a no-cost comprehensive assessment from one of 36 IACs located at four year-universities around the country. To locate the closest IAC and apply, visit: **https://www.energy.gov/mesc/locations-industrial-assessment-centers**

Industrial Assessment Center
U.S. DEPARTMENT OF ENERGY

Option 2: Onsite Energy Technical Assistance Partnerships (TAPs)

Receive a no-cost screening assessment for onsite clean energy technology deployment from one of 10 regional TAPs. To locate the closest Onsite Energy TAP and apply, visit: **https://betterbuildingssolutioncenter.energy.gov/onsite-energy/taps**

Onsite Energy
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Option 3: Third-Party Assessors

Receive an assessment* from a third-party assessor qualified as "IAC-equivalent:"

- Alternative Energy Systems Consulting, Inc.
- BASE Energy, Inc.
- Cascade Energy
- CLEAResult
- Cunningham Engineering PC
- Energy 350
- eSai LLC
- Frontier Energy, Inc.
- GENEDGE Alliance
- Go Sustainable Energy, LLC
- Lincus, Inc
- Michaels Energy
- New York State Energy Research and Development Authority: Flexible Technical (FlexTech) Assistance Program
- North Carolina Advanced Energy Corporation
- Pennsylvania Technical Assistance Program (PennTAP)
- QGM Consulting
- Rutgers Center for Advanced Energy Systems
- TRC
- Utah DEU StepWise Program

*DOE cannot guarantee that third-party assessments will be free

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The Application Process

When to Apply?

The IAC grants program **operates on a rolling basis** and applications may be submitted at any time through the year, with reviews after the following deadlines:

- July 1, 2024
- October 1, 2024
- January 10, 2025
- Later deadlines to come!

How to Apply?

Thanks to a unique partnership, in contrast to traditional DOE funding opportunities, the IAC grants program has a **very simple and straightforward application form and process.**

Applications should not take more than a couple hours and are filled out via Submittable.com, not a federal government website.

www.energywerx.org/iac

Other Questions?

The IAC grant program team will be hosting informational monthly office hours:

Click here to review **frequently asked questions (FAQs)**. If you have additional questions, please contact ENERGYWERX: info@energywerx.org

Summary

- The DOE Onsite Energy TAP began operation in January 2024.
- Onsite Energy technologies are mature and market ready.
- Onsite Energy Technologies range from gas powered (CHP, some Heat Pumps) to electrically powered (heat pumps, batteries) to renewably powered (waste heat, solar, wind).
- The Midwest Onsite Energy TAP can provide no-cost technical assistance to help your facility explore these technologies.
- Substantial federal incentives are available.

Onsite Energy Technical Assistance Partnerships
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Midwest

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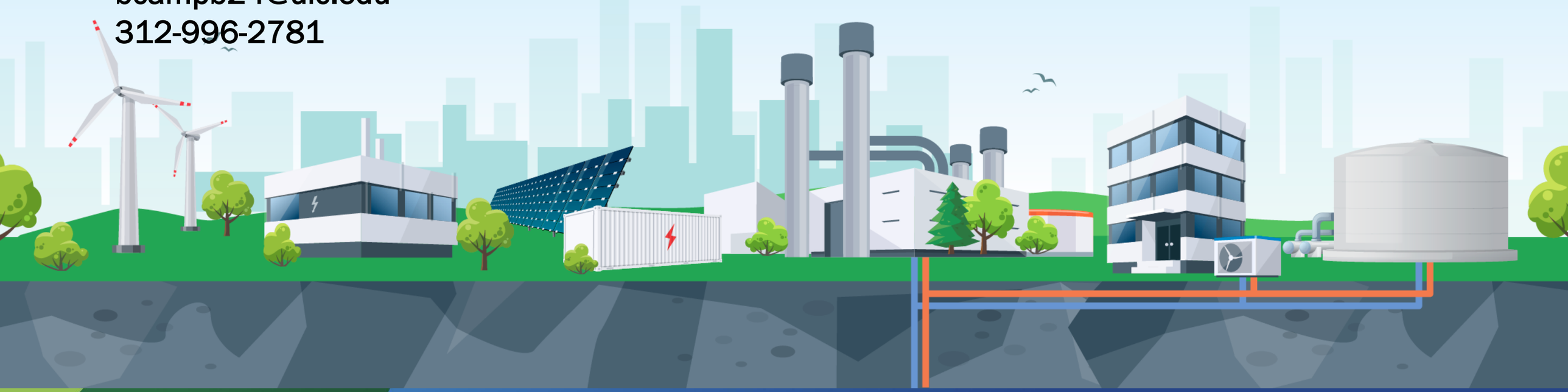

Energy Efficiency in a Manufacturing Enterprise

Rupesh Devapati and Saad Alsamraee (ITAC Leads)

Sanjeev Khanna, PhD, Director,
Midwest Industrial Training & Assessment Center (ITAC)
Mechanical & Aerospace Engineering
University of Missouri

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Industrial Training and Assessment Centers U.S. DEPARTMENT OF ENERGY

College of Engineering

Illinois Training and Assessment Center (ITAC) – An Introduction

- **Goals**: The ITAC provides energy efficiency, productivity, sustainability and economically competitive recommendations to small and medium (SME) manufacturing enterprises in the central Midwest region (Missouri, Kansas, Southeast Illinois and eastern Iowa).
- **Impact**: Save 5-7% in energy consumption to 100 SMEs with additional savings to non-participating SMEs, while producing job-ready students for the next decade in advanced manufacturing-energy-related fields.
- **Additional Goal:** Provide energy efficiency recommendations to medium (~100,000 sq. ft.) commercial buildings in the Midwest.

Midwest Industrial Assessment Center

Provides No-Cost Energy Assessment to Manufacturers in the Central Midwest

Reduce Energy Usage

Student Training

Teamwork

Waste Reduction

Outreach

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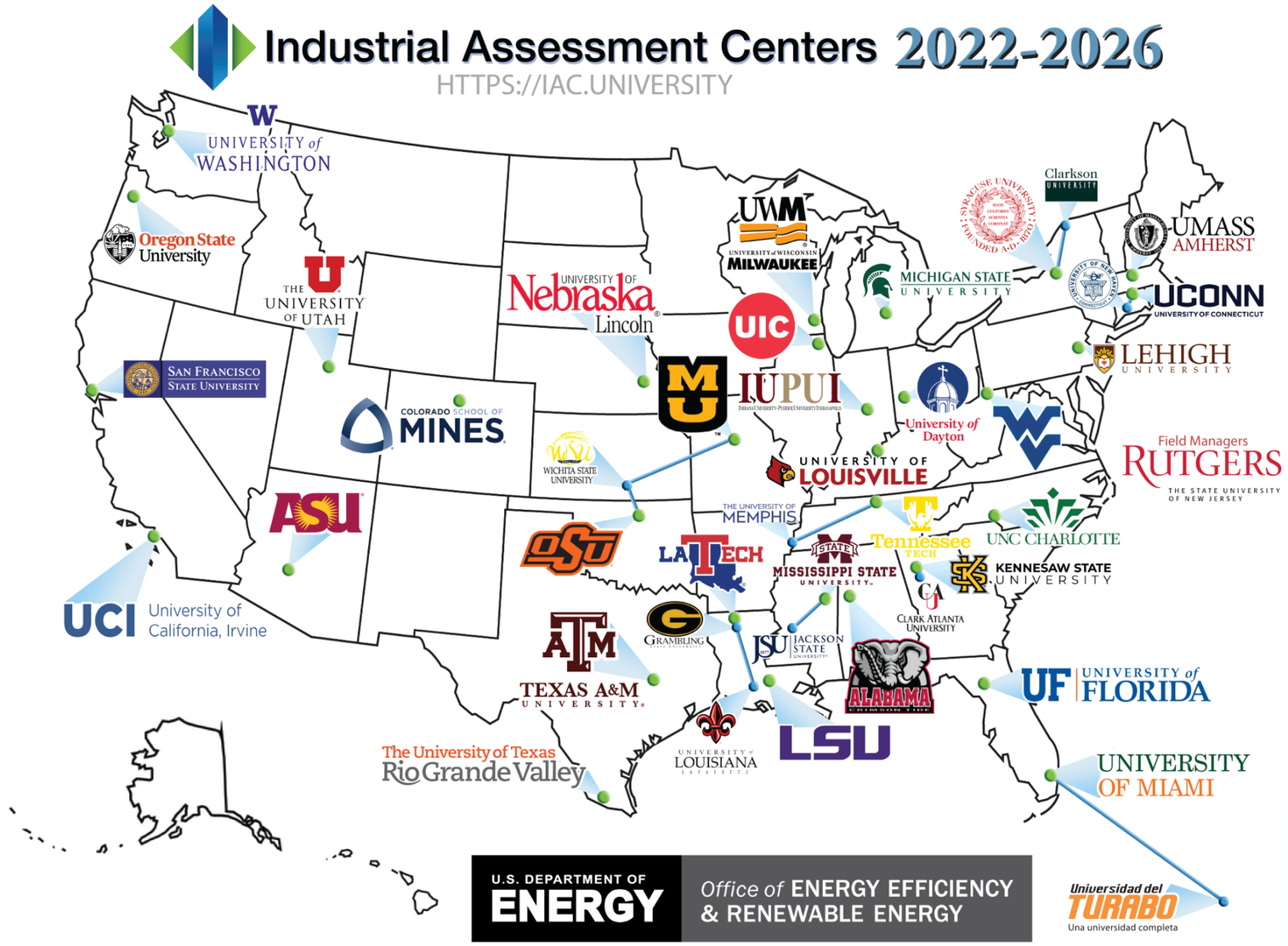
https://midwestiac.missouri.edu



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ITAC Locations in U.S. Universities

https://IAC.University

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Historical Results Nationally

- Over 21,640 assessments
- Over 161,118 recommendations
- Over $141,141 average annual savings (recommended)
- SRI survey:

IAC graduates accumulate significantly more energy efficiency skills, with a higher market value, compared to two control groups.

Source (October 2024): https://iac.university

Quarterly National Snapshot (Recent Quarter)

Plastics and Rubber Products Manufacturing (326)	17
Transportation Equipment Manufacturing (336)	16
Chemical Manufacturing (325)	10
Fabricated Metal Product Manufacturing (332)	9
Food Manufacturing (311)	9
Machinery Manufacturing (333)	7
Beverage and Tobacco Product Manufacturing (312)	6
Nonmetallic Mineral Product Manufacturing (327)	5
Textile Mills (313)	5
Electrical Equipment, Appliance & Component Manufacturing (335)	4
Printing and Related Support Activities (323)	3
Wood Product Manufacturing (321)	2
Primary Metal Manufacturing (331)	2
Computer and Electronic Product Manufacturing (334)	2
All Other Manufacturing	7
Others	19

National Snapshot (To Date)

NAICS	Description	Assessments	Recommendations	Recommended $ Savings
311xxx	Food Manufacturing	1,191	9,502	$220,729,492
312xxx	Beverage and Tobacco Product Manufacturing	271	2,068	$55,920,404
313xxx	Textile Mills	124	916	$18,411,797
314xxx	Textile Product Mills	70	534	$8,628,316
315xxx	Apparel Manufacturing	51	398	$4,451,211
316xxx	Leather and Allied Product Manufacturing	10	64	$388,803
321xxx	Wood Product Manufacturing	431	3,068	$100,708,853
322xxx	Paper Manufacturing	363	2,929	$90,621,771
323xxx	Printing and Related Support Activities	239	1,924	$27,228,773
324xxx	Petroleum and Coal Products Manufacturing	112	819	$38,768,146
325xxx	Chemical Manufacturing	695	5,479	$199,098,961
326xxx	Plastics and Rubber Products Manufacturing	1,000	8,276	$150,897,532
327xxx	Nonmetallic Mineral Product Manufacturing	357	2,633	$99,121,983
331xxx	Primary Metal Manufacturing	541	4,560	$147,630,107
332xxx	Fabricated Metal Product Manufacturing	1,317	10,380	$150,128,040
333xxx	Machinery Manufacturing	798	6,257	$79,516,941
334xxx	Computer and Electronic Product Manufacturing	377	2,806	$50,594,134
335xxx	Electrical Equipment, Appliance, and Component Manufacturing	270	2,102	$37,430,845
336xxx	Transportation Equipment Manufacturing	851	6,632	$119,810,826
337xxx	Furniture and Related Product Manufacturing	223	1,673	$21,906,302

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Eligibility to Request a No-Cost Assessment

- **Must be a US Manufacturer**
  - Standard Industrial Classification (SIC) 2000-3999
  - Less than 500 employees
  - Gross annual sales below $250 million
- **Annual energy bills:**
  - Greater than $100,000
  - Less than $3,500,000
- **Within 150-200 miles of an IAC**
- **Exceptions to the criteria are possible with DOE permission.**

The Energy Assessment is Free!

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Assessment Process

- **Pre-assessment questionnaire**
  - Provide 12 months of utility bills
- **One (most common) or two-day on-site visit**
  - Engineering measurements using data loggers and equipment
  - Requires on-site electrician/maintenance personnel
- **Process analysis and recommendations**
- **Confidential report**
  - Details the analysis, recommendations, energy and cost savings, and corresponding payback period
- **Follow-up within about 11-12 months**
  - Verify implementation status

IAC Database

- Online collection of all the publicly available assessment and recommendation data. This includes information on the type of facility assessed (size, industry, energy usage, etc.) and details of resulting recommendations (type, energy & dollars savings, etc.).
- As of 10-11-2024, the IAC database contains:
  - **21,661 Assessments**
  - **161,279 Recommendations**
- The database can be searched by:
  - Assessments: industry type, size, year, energy costs, products
  - Recommendations: type, savings, cost, implemented
  - Industry Type: SIC and NAICS

https://iac.university/download

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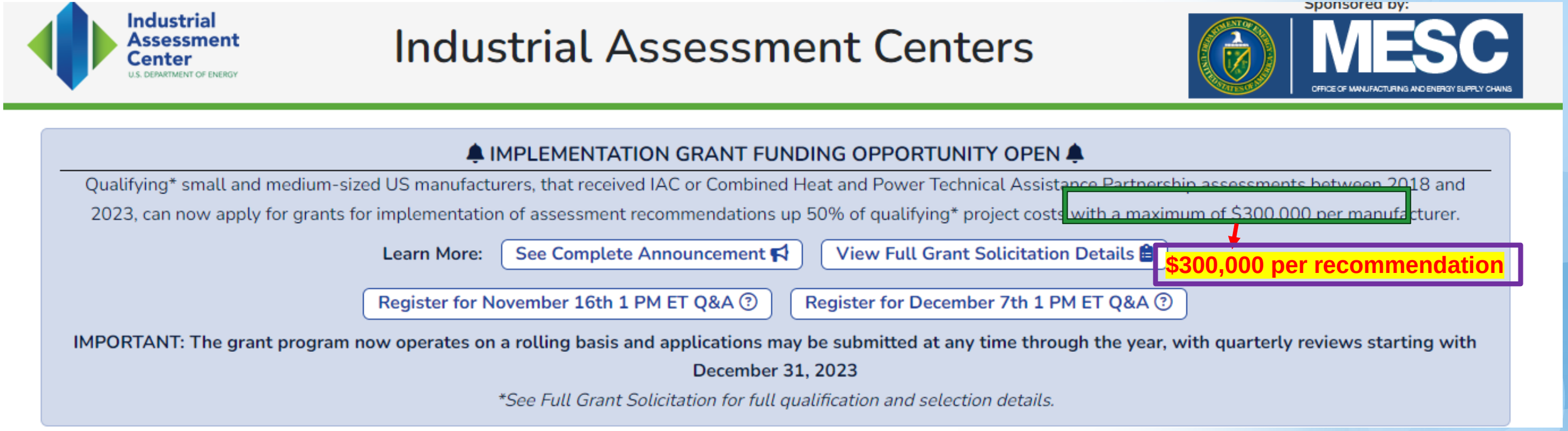
IAC Database (cont.)

- A Recommendation Index is available for all assessment recommendation codes (ARC) and Recommendation Implementation Rates can be charted by center, years or state.
- Nationwide locations of assessments and recommendations can be mapped using the IAC Activity Map.
- Top Ten lists of assessments and recommendations can be generated for specific criteria.
- The IAC database is also available for download.

https://iac.university/download

Implementation Grant Funding Under IRA



https://www.energywerx.org/opportunities/iacimplementationgrants

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NEW:

ISO 50001 and 50001 Ready-certified manufacturing facilities can now apply for grant funding, provided they meet all other eligibility

Regional Impact of Midwest ITAC

- **In the period 2007-2023:**
  - 335 industries assessed
  - 165 Million kWh /yr electric usage savings
  - 281 MW electric demand savings
  - 450 Billion BTU /yr fuel savings
  - Cumulative CO_2 savings: 0.79 Million tons/yr
  - Cumulative dollar savings: $113 Million (over $330,000/industry)

Current and Future Emphasis of ITAC

- Reduce energy consumption.
- Reduce electric demand.
- Reduce waste, with emphasis on water.
- Workforce development for energy sector.
- Promote decarbonization of the manufacturing sector.
- Promote the use of renewable energy, especially solar energy, in manufacturing enterprises.
- Promote energy storage solutions and resiliency in the manufacturing sector.
- Provide energy assessments to industry in disadvantaged communities and counties.

MU Energy Assessment Example: Aluminum Sheet and Foils

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- Plant square footage: **181,000 sq. ft.**
- Annual energy costs: **$1,400,000**
- Identified **12 energy-saving** recommendations
  - Recommended savings:
    - Electric usage: **593,000 kWh**
    - Demand: **1,500 kW-mon/yr**
    - Natural gas: **38,000 MMBtu**
    - Total cost savings: **$475,000**
    - CO_2 reduction: **5,600,000 lbs. (2,800 tons)**

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Energy-Saving Recommendations

#	ARC	Description	Savings	Cost	Payback
1	2.4239	ELIMINATE OR REDUCE COMPRESSED AIR USAGE	$9,256	$56,316	6.1
2	2.4146	USE ADJUSTABLE FREQUENCY DRIVE OR MULTIPLE SPEED MOTORS ON EXISTING SYSTEM	$33,512	$15,473	0.5
3	2.1233	ANALYZE FLUE GAS FOR PROPER AIR/FUEL RATIO	$11,627	$2,400	0.2
4	2.6127	MAINTAIN AIR FILTERS BY CLEANING OR REPLACEMENT	$1,502	$320	0.2
5	2.4236	ELIMINATE LEAKS IN INERT GAS AND COMPRESSED AIR LINES/ VALVES	$1,882	$315	0.2
6	2.4111	UTILIZE ENERGY-EFFICIENT BELTS AND OTHER IMPROVED MECHANISMS	$1,053	$160	0.2
7	2.7221	LOWER TEMPERATURE DURING THE WINTER SEASON AND VICE-VERSA	$3,709	$750	0.2
8	2.2424	USE HEAT IN FLUE GASES TO PREHEAT PRODUCTS OR MATERIALS	$38,678	$132,100	3.4
9	2.7224	REDUCE SPACE CONDITIONING DURING NON-WORKING HOURS	$1,760	$3,671	2.1
10	2.1135	REPAIR FURNACES AND OVEN DOORS SO THAT THEY SEAL EFFICIENTLY	$49,532	$3,900	0.1
11	3.1175	USE A DIFFERENT OR RECYCLED RAW MATERIAL	$109,087	$116,979	1.1
12	2.3132	RECHARGE BATTERIES ON DURING OFF-PEAK DEMAND PERIODS	$213,792	$1,700,000	8.0
APPROXIMATE TOTAL (understanding savings potentially overlap)			$475,390	$2,032,384	

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ITAC Student Intern Training

- Energy efficiency in manufacturing systems
  - In-house training and MAE4350/7355 semester course
  - Workshop on ISO 50001 Energy Management Standard
  - Workshop on Cybersecurity
  - Workshop on Water and Wastewater
  - Workshop on Power Plant Systems and Building Energy Control
  - In the future, add a workshop on Smart Manufacturing
- Student Interns also get paid. ☺

ITAC Resources

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https://iac.university

IAC Resources

IAC Assessment Protocol

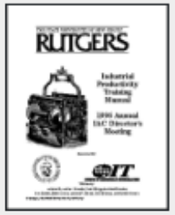
The following guidelines are designed to describe the process of a typical IAC energy assessment.

View Assessment Protocol

IAC Case Studies

These case studies highlight specific assessments with notable recommendations and implementation.

View All Case Studies



IAC Related Published Papers

The IAC centers published multiple papers each years based on and inspired by IAC related activities.

View All Published Papers

IAC Technical Documents

Includes IAC program manuals, guidelines, and other related technical documents.

View All Technical Documents

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Resilience in Manufacturing

- Decarbonization
- Renewable energy sources
- Energy storage that can assist in following the demand in a cost-effective manner
- Suitable policies, regulations, incentives and market forces needed
- Future technology in renewables and carbon capture is still a moving target

Screening Tool for Industrial Resilience (STIR)

- The **STIR** is a risk-informed, high-level resilience planning web tool to be made available to IACs. It provides a short list of potential solutions to mitigate risk and improve resilience based on key risk drivers identified in the STIR risk assessment. These findings are meant to complement the traditional findings of the IAC assessment process.
- The **STIR** focuses on characterizing risk associated with three main risk sources: *energy and water outages*, *disruptions due to failure of a critical asset* and *supply chain disruptions*.

HTTPS://STIR.PNNL.GOV

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Screening Tool for Industrial Resilience (STIR)

- **The outputs** of this analysis can be useful to a manufacturer that is trying to mitigate a loss of profit due to time loss caused by an outage or equipment failure.
- **The STIR** provides tailored risk analysis and visuals that can help the business determine which areas may be resilience weaknesses.
- If funding for resilience solutions is limited, the STIR can help demonstrate where the funds will be best spent to mitigate profit loss during a resilience event. Additionally, the STIR provides solution suggestions as a starting place and links to resources to learn more.

HTTPS://STIR.PNNL.GOV

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Resilience for Manufacturers

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- Resilience refers broadly to the ability to anticipate, prepare for and adapt to changing conditions and to withstand, respond to and recover rapidly from disruptions through adaptable and holistic planning and technical solutions.
- Key elements and outcomes of resilience planning include:
  - **Optimized operations** to reduce energy and water use, as well as peak demand, that enable the site to meet energy and water requirements.
  - **Trained personnel and capabilities** to rapidly recover from disruptions due to planned and unplanned events.
  - **Actionable strategies for diverse solutions** that address resource and infrastructure needs to minimize the consequence of interruptions to key processes during normal and disrupted operations.

STIR Tool Overview

- The STIR is broken out into four key sections:
  1. Sitewide Information
  2. Asset Information
  3. Disruptions
  4. Outputs

- The first three sections require user input from data collected during the pre-site and site visits. The Outputs section provides a short list of potential resilience solutions based on key risk drivers identified in the previous sections.

STIR Inputs

Sitewide Information

- Site details
- Key processes
- Process operation
- Supply chain

Asset Information

- Client assets
- Asset condition
- Redundant systems

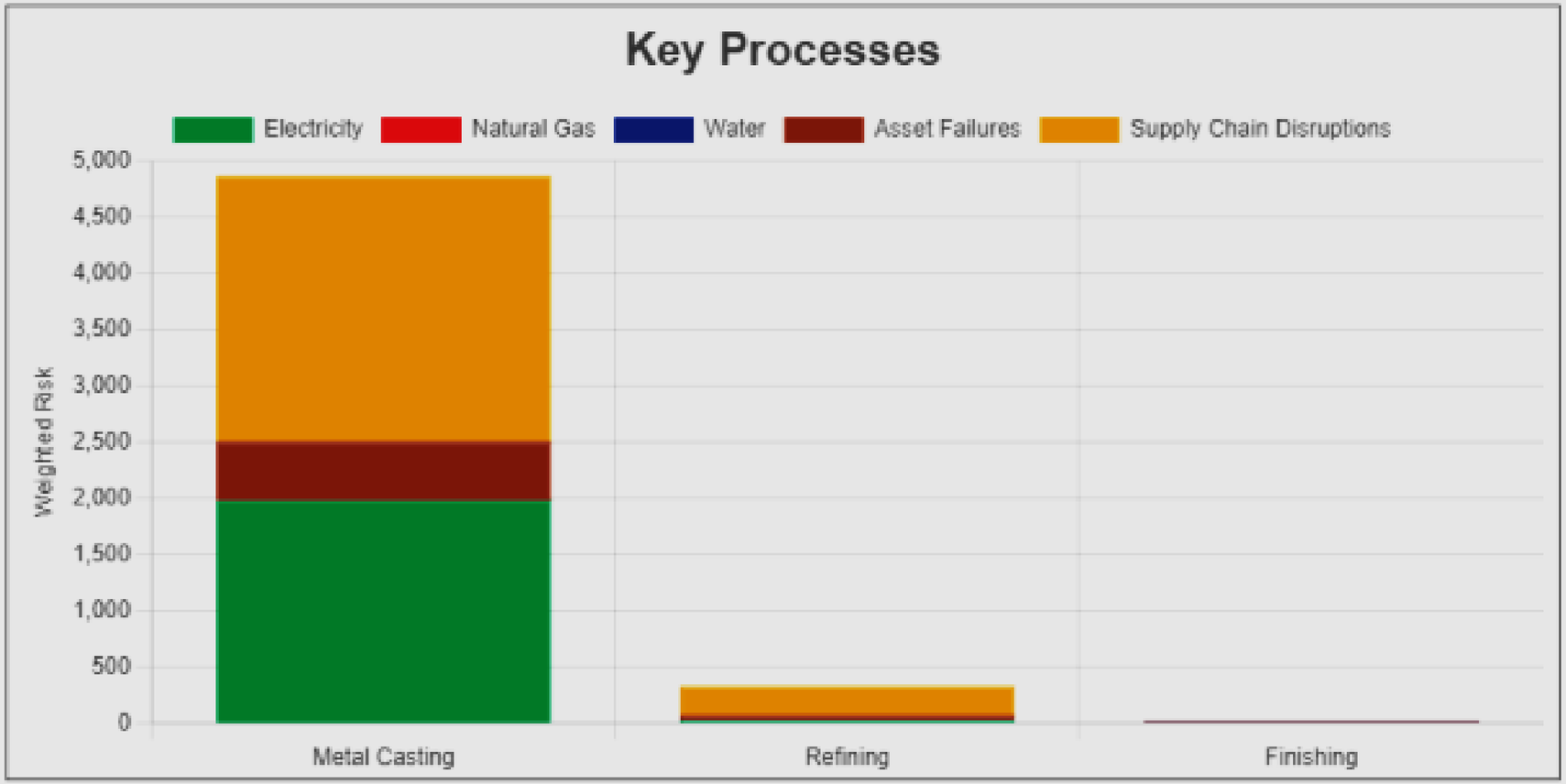
Disruptions

- Hazards
- Critical asset failure
- Supply chain disruptions

STIR Output

The top three key processes driving risk are:

Metal Casting; Refining; Finishing



Key Processes	Electricity	Natural Gas	Water	Asset Failure	Supply Chain
Metal Casting	1,981.2	-	-	523.5	2,361.0
Refining	28.9	-	-	44.8	255.0
Finishing	9.8	-	3.3	5.9	-
Weighted Risk by Category	**2,019.9**	**-**	**3.3**	**574.1**	**2,616.0**

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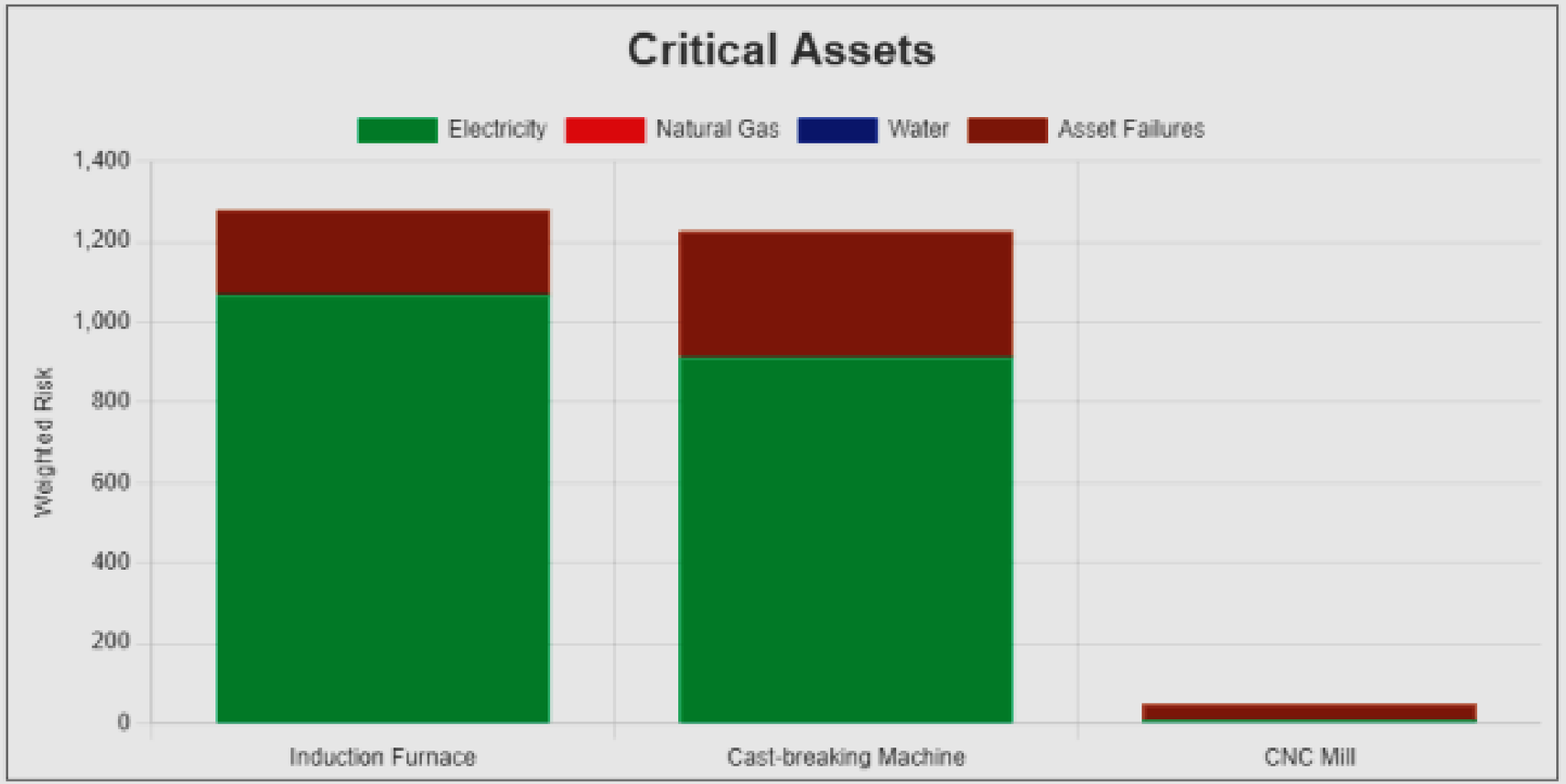
STIR Output

The top three critical assets driving risk are:

Induction Furnace; Cast-breaking Machine; CNC Mill



Critical Assets	Electricity	Natural Gas	Water	Asset Failure
Induction Furnace	1,068.4	-	-	209.8
Cast-breaking Machine	912.8	-	-	313.8
CNC Mill	10.1	-	-	38.4
Weighted Risk by Category	**1,991.3**	**-**	**-**	**561.9**

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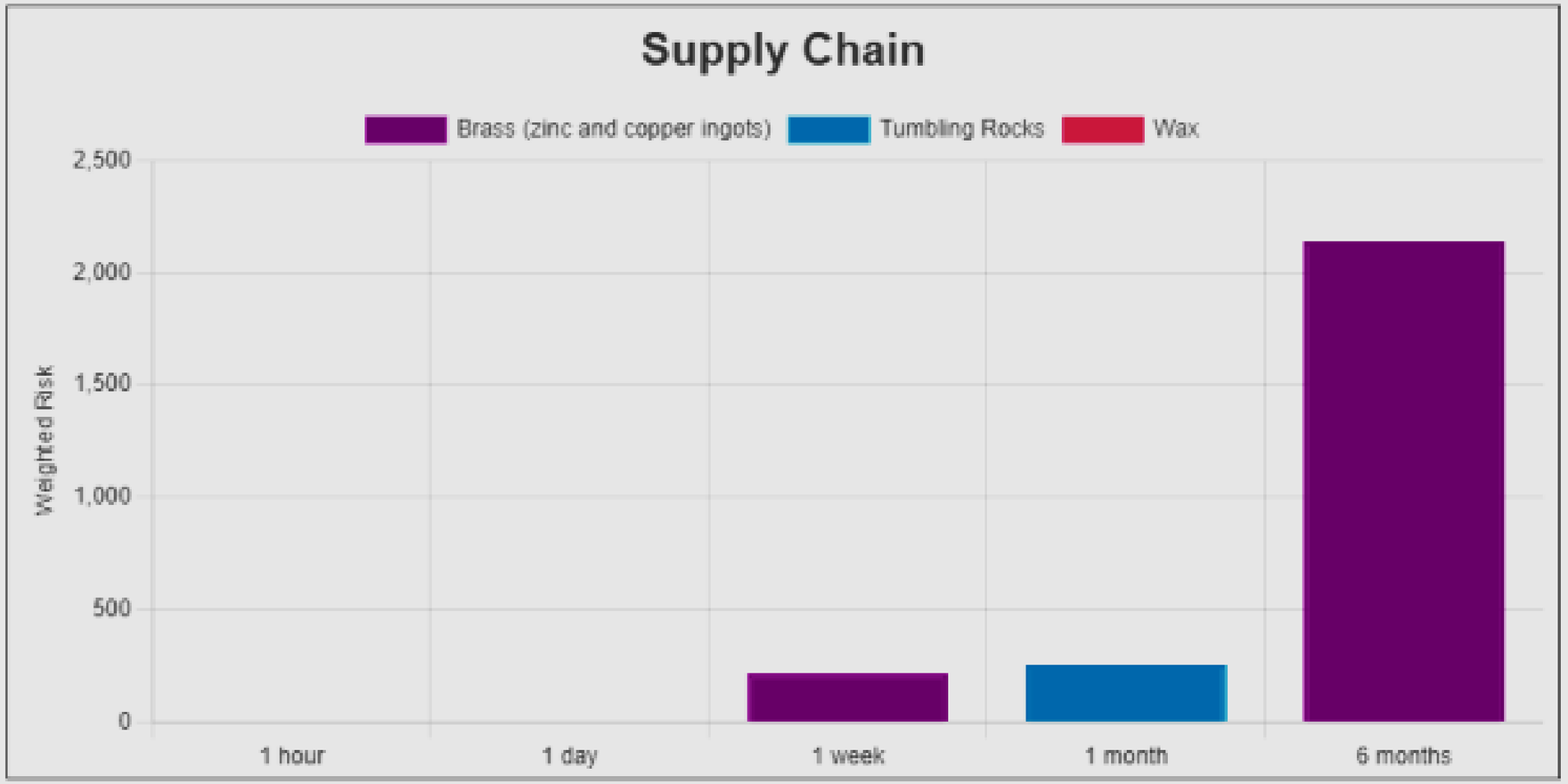
STIR Output



Critical Inputs	1 hour	1 day	1 week	1 month	6 months	Total Weighted Risk
Brass (zinc and copper ingots)	-	-	217.5	-	2,143.5	2,361.0
Tumbling Rocks	-	-	-	255.0	-	255.0
Wax	-	-	-	0.3	-	0.3
Weighted Risk by Category	**-**	**-**	**217.5**	**255.3**	**2,143.5**	**2,143.5**

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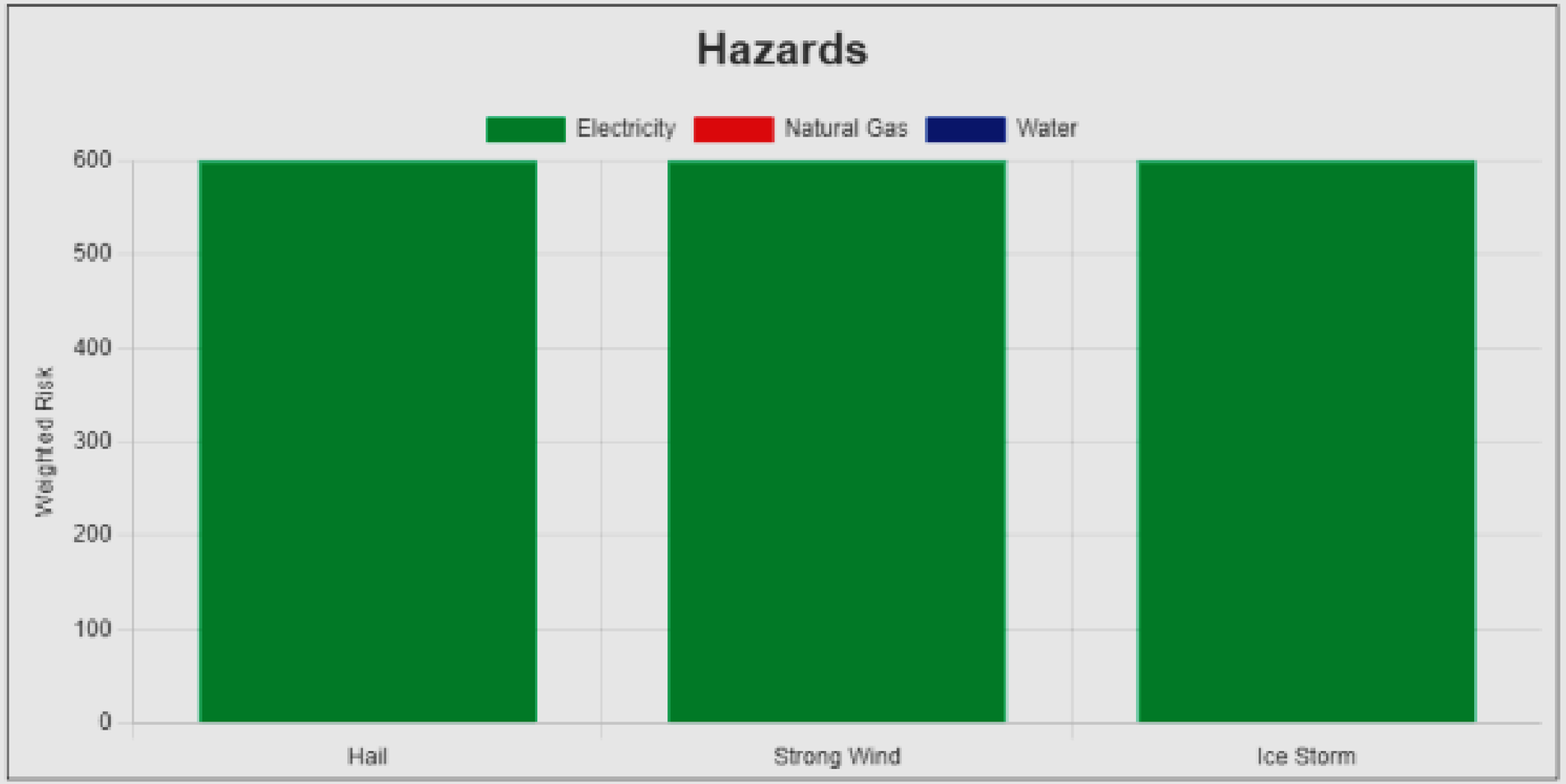
STIR Output

The top three hazards driving risk are:

Hail; Strong Wind; Ice Storm



Hazards	Electricity	Natural Gas	Water
Hail	600.0	-	-
Strong Wind	600.0	-	-
Ice Storm	600.0	-	-
Weighted Risk by Category	**1,800.0**	**-**	**-**

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Resilience Solutions: Hazard Mitigation

- Implement wind hardening.
- Implement winter weather hardening.
- Coordinate with local and/or regional emergency management.
- Develop pre-event plant checklists.

Resilience Solutions: Sitewide

- Explore grid flexibility opportunities.
- Identify opportunities for transmission redundancy.
- Develop distributed resources.
- Develop emergency/continuity plans.

Resilience Solutions: Critical Assets

- Replace assets nearing end-of-life.
- Store replacement parts for critical assets.
- Support critical assets with a redundant electricity system.
- Implement energy efficiency measures for runtime extension.
- Store critical replacement parts.

Midwest IAC Receives 2022 Center Of The Year Award

- “2022 Center of the Year Award” from The US Department of Energy (DOE) was given to the Midwest Industrial Assessment Center (IAC) in the College of Engineering.
- The Midwest IAC was chosen by the Office of Energy Efficiency and Renewable Energy (EERE) from among 39 IACs in the United States.
- This award is in recognition of the IAC’s staff for its outstanding contributions to industrial energy efficiency.
- John Smegal, DOE Program Manager, presents the 2022 Center of the Year Award to Sanjeev Khanna, director of Midwest IAC.

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Need an Energy Assessment Of Your Manufacturing Plant Or Commercial Building?

- **Please contact:**

  Dr. Sanjeev Khanna

  Professor and Director, Midwest ITAC

  Email: khannas@missouri.edu

  Phone: 573 884 9109

- **Or visit the website:**

  https://MidwestIAC.Missouri.edu

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Thank You!