



America's Most Energy-Efficient Manufacturing Plants

Webinar Series from U.S. EPA ENERGY STAR Program for Industry

Part 3: French Fries and Motor Vehicles

April 13, 2022

Noon ET

We'll get started in a minute. But while you're waiting...

How much energy does it take to:



Process 1000 lbs of frozen fried potatoes?



Assemble a car?

(~1,200 BTU of energy is needed to bring one gallon of room temperature water to a boil)

We'll get started in a minute. But while you're waiting...

How much energy does it take to:



Process 1000 lbs of frozen fried potatoes?
~4 million Btu



Assemble a car?
~5 million Btu

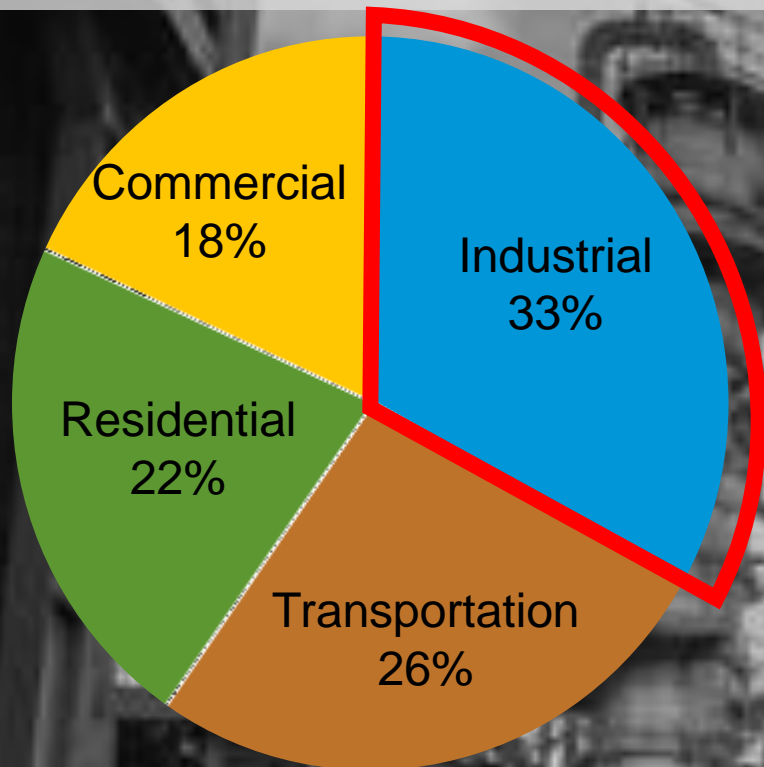


Bring gallon of 68°F water to boil
1,200 Btu

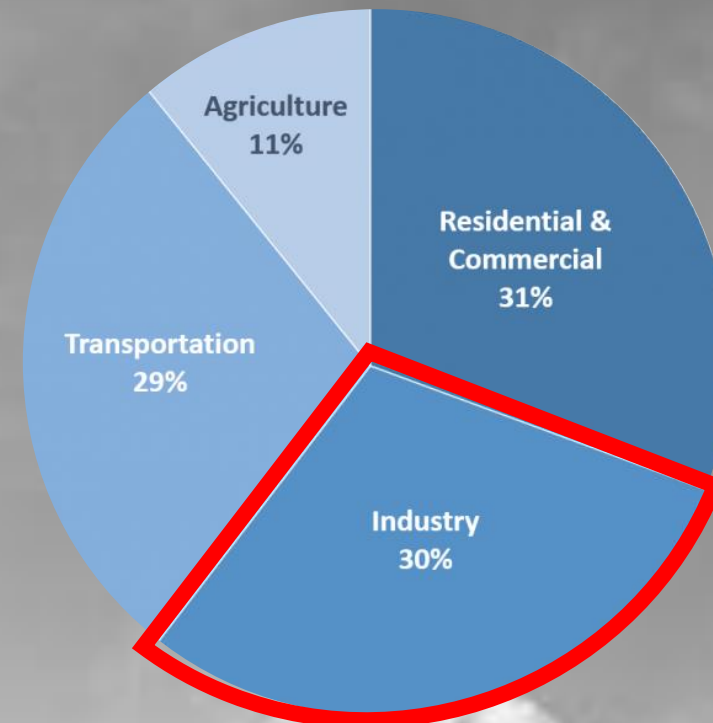
Sources: Based on Technical Documentation for the Development of Performance-based Industrial Energy Efficiency Indicators for [Food Processing Plants](#) (sample Energy Performance Indicators for FFP) and [Automobile Assembly Plants](#).

Why focus on plants?

Total U.S. energy consumption by end-use sectors (2020)



Total U.S. greenhouse gas emissions by end use sectors



Source: U.S. Energy Information Agency, *Monthly Energy Review*, Table 2.1 April 2021

Source: U.S. Environmental Protection Agency, <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions#electricity>. Accessed November 2021

We'll get started in a minute. But while you're waiting...

How much energy does it take to:



Process 1000 lbs of frozen fried potatoes?
~4 million Btu



Assemble a car?
~5 million Btu

More efficient

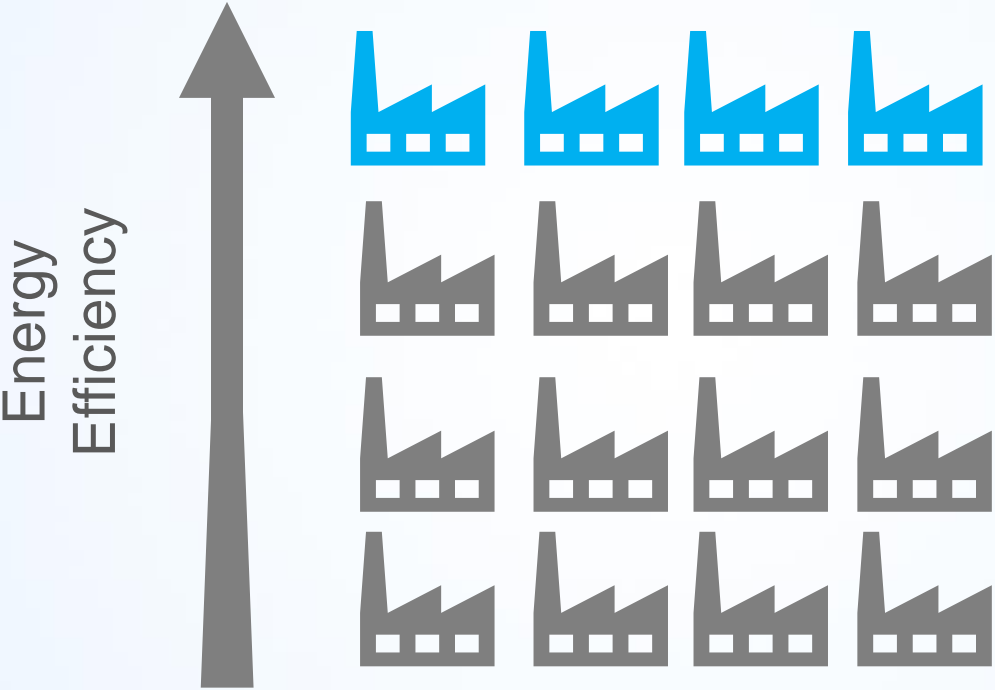
Less efficient

More efficient

Less efficient

America's most energy-efficient factories

Using less energy to produce the same product



How is plant energy efficiency measured?

ENERGY STAR Energy Performance Indicators (EPIs)

- [Auto Assembly](#)
- [Auto Engine](#)
- [Auto Transmission](#)
- [Cement](#)
- [Commercial Bread & Roll](#)
- [Container Glass](#)
- [Cookie & Cracker](#)
- [Flat Glass](#)
- [Frozen Fried Potato Processing](#)
- [Fluid Milk Processing](#)
- [Integrated Paper Mill](#)
- [Integrated Steel Plant](#)
- [Juice Processing](#)
- Metal Casting
 - [Aluminum](#)
 - [Iron](#)
- [Nitrogenous Fertilizer](#)
- [Petroleum Refining*](#)
- [Pharmaceutical](#)
- [Pulp Mill](#)
- [Wet Corn Milling](#)

Plant Energy Performance Indicator

Plant Characteristics

SPCS Code: 35371
ZIP Code: 27705
Location: Durham, NC
Year: 2016
Final Product Status: America's Most Affordable
US Units: 10,000
Energy Performance Index (EPI): 50
Annual Energy Cost (Total): \$500

Energy Consumption

| Energy Source | Annual Purchases (\$) | Annual Cost (\$) |
|----------------|-----------------------|------------------|
| Electricity | | |
| Gas | | |
| Distillate Oil | | |
| Residual Oil | | |
| Coal | | |
| Other | | |

Results

| Metric | Your Current Plant (2016) | Average Plant (2016) | Efficient Plant (2016) |
|--------------------------------|---------------------------|----------------------|------------------------|
| US Units | 10,000 | 50 | 75 |
| Energy Performance Index (EPI) | 50 | 50 | 75 |
| Annual Energy Cost (Total) | \$500 | \$500 | \$250 |

*ENERGY STAR recognizes third party tool for benchmarking energy performance of Petroleum Refineries.

www.energystar.gov/plants

How an EPI works

- Enter plant and energy data → Get score (1-100 scale)
- Based on underlying predictive energy use model from actual plant energy and production data

Plant Characteristics
 Data shown here is fictitious and for demonstration purposes.
 NAICS Code: 336111 and 336112

ZIP Code:
 Location:
 30-Year HDD (deg F):
 30-Year CDD (deg F):
 Notes:

| | Current Plant | Reference Plant |
|--|--------------------------------------|--|
| Year: | <input type="text" value="2020"/> | <input type="text" value="2019"/> |
| US Units | | |
| Production: | <input type="text" value="185,000"/> | # of vehicles <input type="text" value="0"/> |
| Line speed: | <input type="text" value="120.0"/> | VPH <input type="text" value="0.0"/> |
| Capacity (# of vehicles): | <input type="text" value="409,920"/> | <input type="text" value="34"/> |
| % Utilization (production/capacity): | <input type="text" value="45%"/> | <input type="text" value="0%"/> |
| HDD: | <input type="text" value="3,842"/> | deg F <input type="text"/> |
| CDD: | <input type="text" value="1,990"/> | deg F <input type="text"/> |
| Wheelbase of the largest vehicle produced: | <input type="text" value="115.0"/> | inches <input type="text"/> |
| Is this plant air-tempered?: | <input type="text" value="yes"/> | yes/no <input type="text"/> |

Energy Consumption

| Select Units | Electricity | Onsite Renewables | Gas | Distillate Oil | Residual Oil | Coal | Other |
|----------------------------------|-------------------------------------|----------------------|--------------------------------------|----------------------|----------------------|----------------------|--------------------------------|
| <input type="text" value="MWh"/> | <input type="text" value="98,500"/> | <input type="text"/> | <input type="text" value="550,000"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text" value="0"/> |
| Annual Purchases & Transfers | | | | | | | |
| Annual Cost (\$)* | | | | | | | |

Results

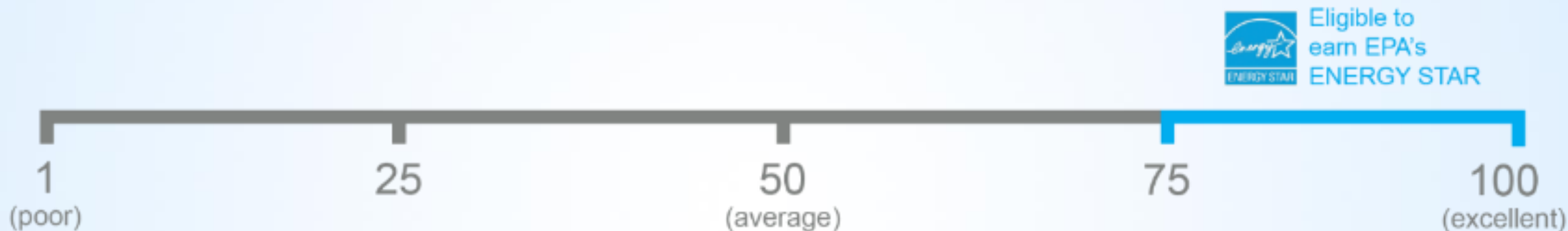
Display energy results in:

| | Your Current Plant | Average | Efficient |
|---------------------------------------|--------------------------------------|--|--------------------------------------|
| | Enter Name | Enter Name | Enter Name |
| | 2020 | 2020 | 2020 |
| Energy Performance Score | <input type="text" value="90"/> | <input type="text" value="50"/> | <input type="text" value="75"/> |
| Site Energy (MMBtu) | <input type="text" value="900,382"/> | <input type="text" value="1,127,070"/> | <input type="text" value="956,839"/> |
| Energy Intensity (Site MMBtu/vehicle) | <input type="text" value="4.87"/> | <input type="text" value="6.09"/> | <input type="text" value="5.17"/> |

Snapshot of key fields from [Automobile Assembly Energy Performance Indicator](#).

ENERGY STAR Certified Plants

Most energy efficient plants in the nation



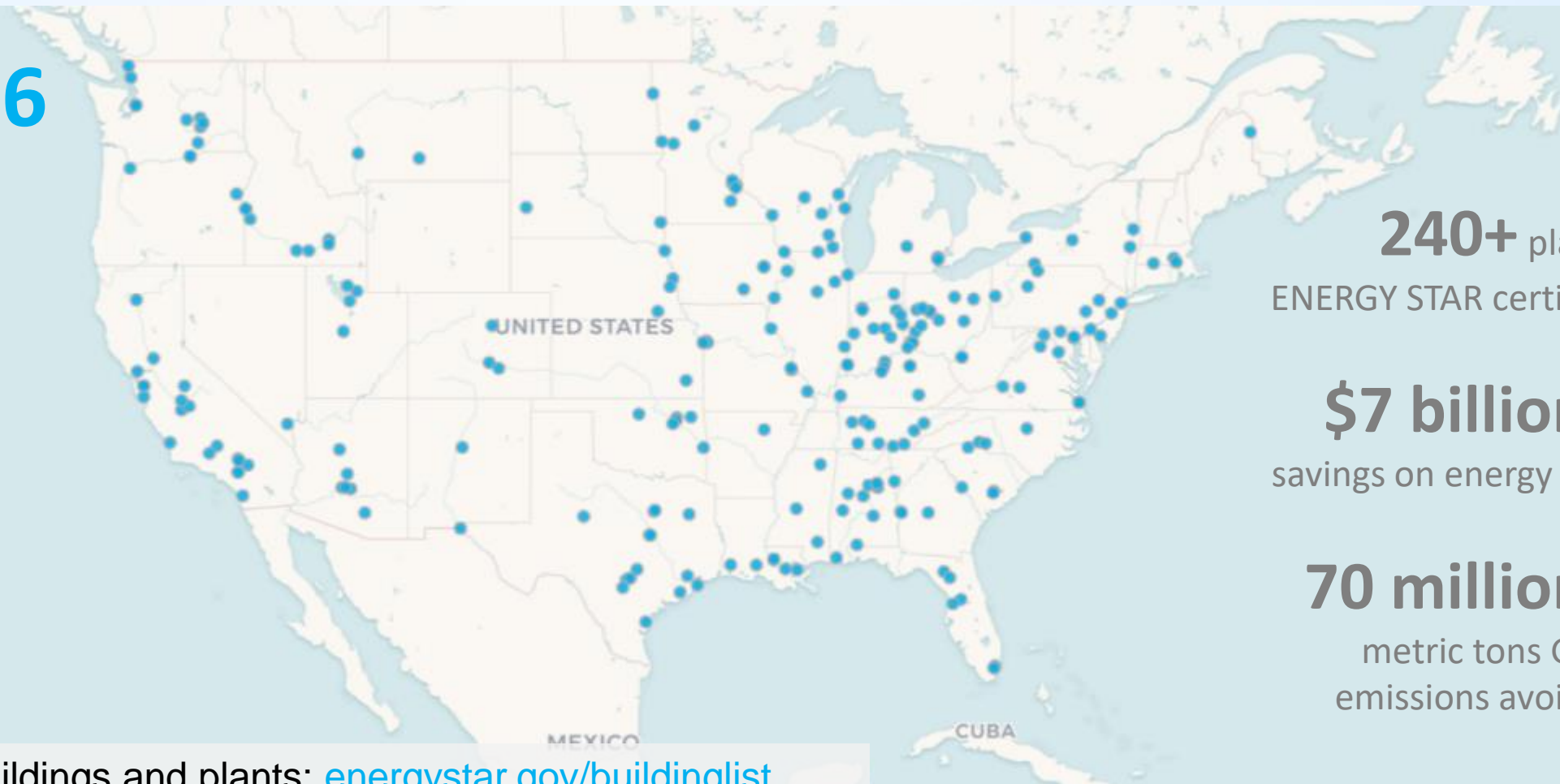
- Top quartile of efficiency
- Energy and production data is verified by Professional Engineer
 - Must apply for certification
- Facilities recertify annually to demonstrate continued performance

www.energystar.gov/plants

ENERGY STAR Certified Plants

America's Most Energy-Efficient Manufacturing Plants

Since 2006

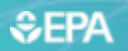


240+ plants
ENERGY STAR certified

\$7 billion+
savings on energy bills

70 million+
metric tons GHG
emissions avoided

Find certified buildings and plants: energystar.gov/buildinglist



ENERGY STAR. The simple choice for energy efficiency.



America's Most Energy-Efficient Manufacturing Plants

Today's Webinar



America's Most Energy-Efficient Manufacturing Plants

Today's Webinar



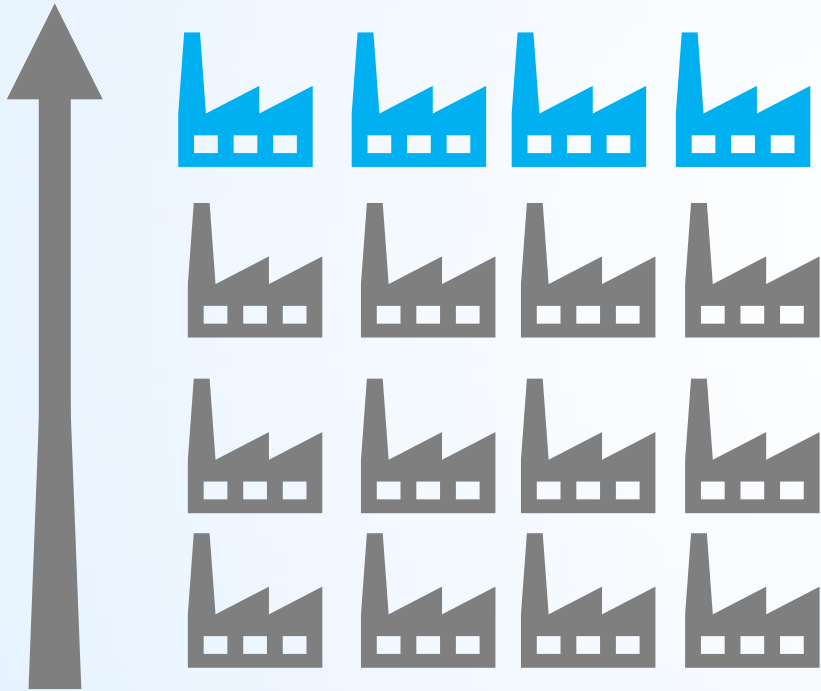
Trudy Slagle
Sr. Director, ESG Administration
Lamb Weston, Inc.



Steven Duong
Energy Engineer
Nissan North America

Listen for...

Energy
Efficiency



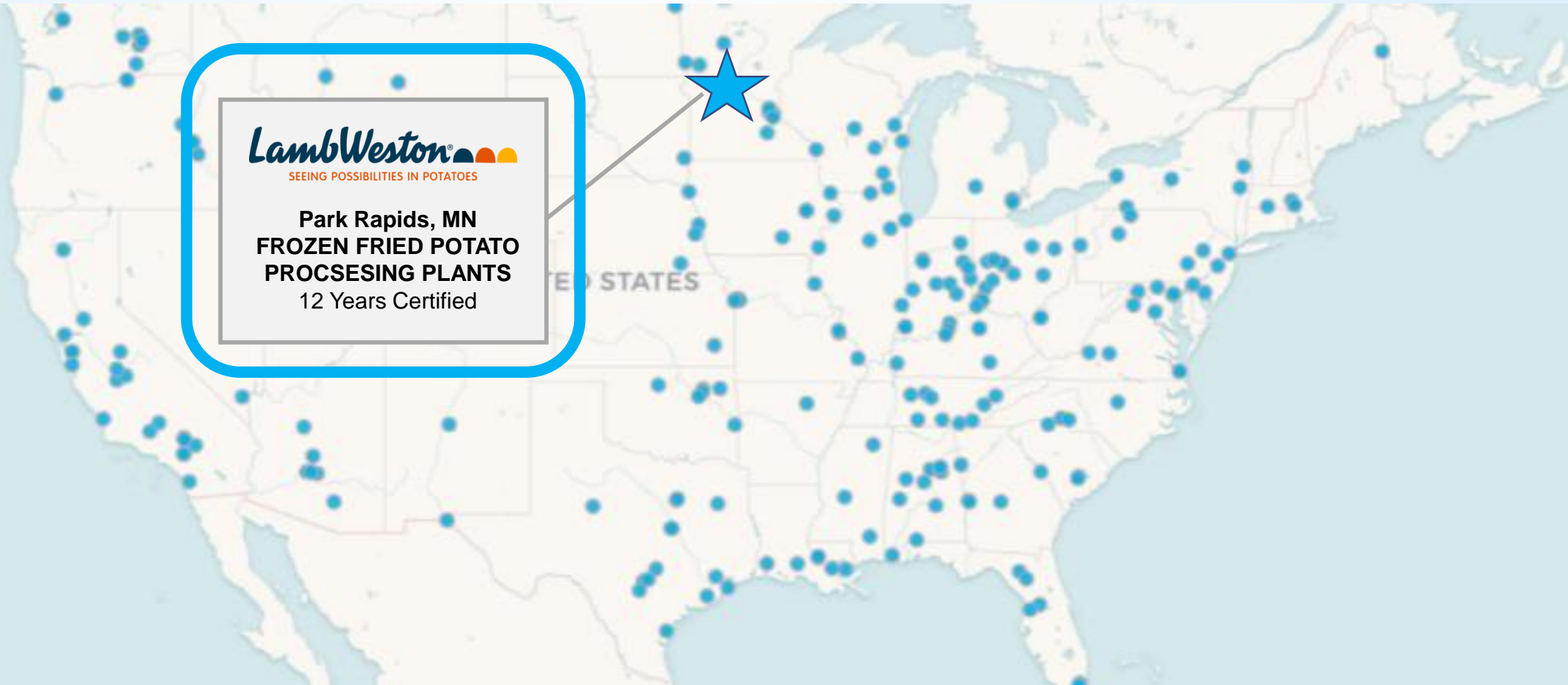
Can something similar be done in my plant or building?

How can I use ENERGY STAR to better manage energy and GHGs?



America's Most Energy-Efficient Manufacturing Plants

Today's Webinar



Lamb Weston, Inc.

America's Most Energy Efficient
Manufacturing Plants: French Fries



Company overview

70+

No.1

No.2

For more than 70 years, Lamb Weston has produced one of the world's favorite foods—fries and other frozen potato products—for restaurants and consumers the world over.

Leader in the Frozen Potato category, No. 1 North America Share, No. 2 Global share.



Our global presence



27
PLANTS

SOLD IN
100+
COUNTRIES

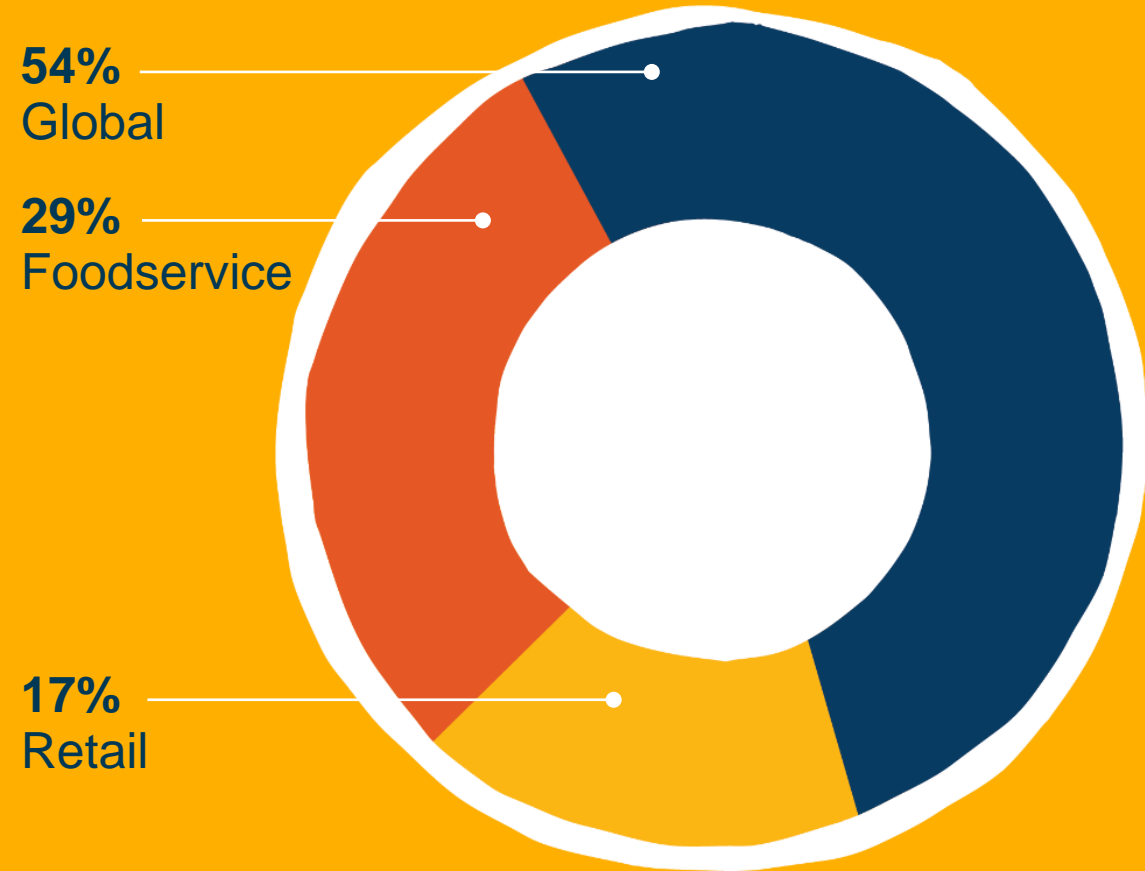
Our business structure

Global Business Unit: Top 100 North American restaurant chains and international sales primarily to Latin America, Asia Pacific, and Australia.

Foodservice Business Unit: North American foodservice distributors and restaurant chains outside of the top 100.

Retail Business Unit: High-profile grocery store chains.

Customer segments



A preferred potato partner



Our products are sold primarily to commercial distributors, restaurant chains outside the top 100 North American based restaurant chains, and non-commercial channels.

The average relationship length with our customers is 28 years and our longest standing customer has been with us for 47 years.

Committed to sustainability



Lamb Weston is working to use less energy and water, create less waste, and responsibly source packaging and other materials. We have set ambitious 2030 goals to guide this work including:

- 20% reduction in Scope 1 & 2 GHG emissions per pound produced.
- 20% water use reduction per pound produced.
- 50% reduction in food waste generated during processing.
- Zero waste-to-landfill

Facility overview



- The Lamb Weston/RDO Frozen Foods plant in Park Rapids, Minnesota, is situated in the Upper Midwest's potato growing region.
- The facility makes frozen potato products, including french fries in a variety of cuts, as well as hash browns, Potato Stix, Tater Roundabouts®, and Tater Puffs®.
- Products are distributed to restaurants and retail grocery stores throughout North America.

Facility overview



- The plant was originally constructed in 1981, became associated with Lamb Weston in 1992.
- A joint-venture agreement was formed in 1995 between Lamb Weston and RD Offutt Co. to form Lamb Weston/RDO Frozen Foods.
- Significant expansions in the mid- to late- 1990s, in addition to other facility modifications, have increased production capacity of the plant.

Our potato process

From skin-on fries to simple-ingredient chips, Lamb Weston's experts can help create the perfect product in a wide variety of cuts, coatings and flavors for our customers.





Sustainability



The team in Park Rapids is dedicated to sustainability, as evident in the following features:

- A state-of-the-art waste treatment facility generates renewable energy in the form of biogas, which is then combusted in boilers to reduce natural gas usage by 18%.
- Water, natural gas, and power usage are benchmarked and tracked daily, to ensure responsible use of resources.
- Awarded 15 Minnesota Pollution Control Agency Operation Awards from the State Commissioner.
- Recognized within Lamb Weston as a sustainability leader with:
 - 11 Sustainable Development Awards
 - Excellence in Zero Waste with +98% landfill diversion

12 Consecutive years certified

- Climate change performance metrics = energy performance metrics
 - Overall company performance
 - Plant specific KPIs, goals and road maps
 - EPI annual results benchmarking
 - All locations

84 EPI score: 2021

Enter in your information below to get started.

Country:

State/Province:

Postal Code:

Year Ending:

Calculate



Frozen Fried Potato Processing Plant Energy Performance Indicator

Version 2.0, Release 10/15/2019

Plant Characteristics

NAICS Code:

ZIP Code/Postal Code:

Location:

30-Year HDD (deg F):

Notes:

Current Plant

Year:

Total Potato Input:

Frozen Product Warehouse:

HDD:

Results

Weather Station ID: 727453
Weather Station Name: PARK RAPIDS MUNI KON

Time Period: June 01, 2020 - May 31, 2021
Annual HDD: 8762 °F
Annual CDD: 471 °F

Measurement: °F °C

Energy Consumption

Select Site Energy Units: Electricity (kwh), Onsite Renewables (MWh), Gas (MMBtu), Distillate Oil (Gallons), Residual Oil (Gallons), Coal (MMBtu), Other (MMBtu)

| | Electricity | Onsite Renewables | Gas | Distillate Oil | Residual Oil | Coal | Other |
|------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| Park Rapids 2021 | <input type="text" value=""/> | <input type="text" value=""/> | <input type="text" value=""/> | <input type="text" value=""/> | <input type="text" value=""/> | <input type="text" value=""/> | <input type="text" value=""/> |
| Annual Purchases & Transfers | <input type="text" value=""/> | <input type="text" value=""/> | <input type="text" value=""/> | <input type="text" value=""/> | <input type="text" value=""/> | <input type="text" value=""/> | <input type="text" value=""/> |
| Annual Cost (\$)* | <input type="text" value=""/> | <input type="text" value=""/> | <input type="text" value=""/> | <input type="text" value=""/> | <input type="text" value=""/> | <input type="text" value=""/> | <input type="text" value=""/> |



The following three projects demonstrate Park Rapids' approach to energy efficiency which combines:

 Investment



 Continuous Improvement



Compressed Air

Refrigeration Upgrades

Biogas Utilization

Compressed air

Consolidating and updating the compressed air system:

Compressed air is used at multiple process steps including food quality monitoring equipment, product sizing equipment, and packaging equipment.

- Upgraded compressed air system by relocating compressors to a central area and adding a single, low pressure drop, full flow refrigerated dryer.
- New master control systems, monitoring equipment and large air receiver deliver consistent air pressure.
- Re-plumbed system to remove pressure restrictions
- Went from 110 psi to 90 psi system.
- Reuse of heated 'cooling water' from compressors and air dryers to offset steam usage.
 - Installed heat exchanger to preheat water for use additional processing steps.



Heat reclaim

Refrigeration upgrade

Reducing system head pressure and saving horsepower:

- Replaced older technology valves with motorized valves operating based on cooling needs.
- Added piping, valving and controls to moderate compressor operating pressure needs.
 - One compressor builds enough pressure to feed the system while the others run at low flow.
- Installed VFDs on all fans and a new control system.
- Reduced head pressure from 150 psi to 120-130 psi average



Freeze tunnel

Biogas utilization

Increasing biogas production and renewable fuel use:

- Biogas is produced and collected from an on-site anaerobic digester used in wastewater treatment.
- Added two additional nozzles to the biogas burner at the boiler.
- Reduced the pressure drop and flow restriction.
- 100% of biogas is now used in the boiler vs. a portion having to be flared as waste heat.
 - 18% biogas utilization improvement



Biogas piping

Project work

In addition to the below project benefits, this work placed the facility's EPI score at 87 in years following implementation.

Financials

- Total project cost: ≈\$970,000 and
- Annual savings: ≈\$400,000 + rebate ≈\$200,000
- Simple payback: less than 2 years

Results

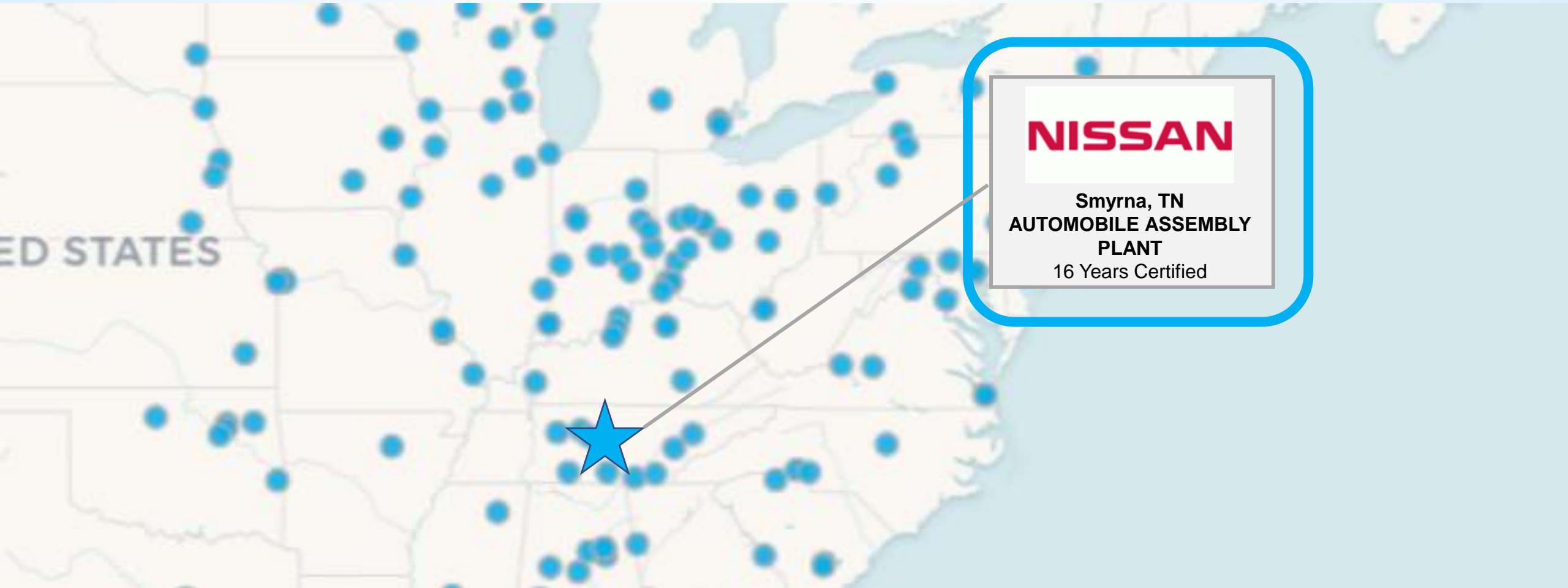
- ≈23,000 dekatherms natural gas per year
- ≈3,000,000 kilowatt hours per year
- ≈4,000 metric tonnes Scope 1 & 2 GHG emissions

THANK YOU!



America's Most Energy-Efficient Manufacturing Plants

Today's Webinar





America's Most Energy-Efficient Manufacturing Plants Webinar

Smyrna Vehicle Assembly Plant

Steven Duong, Energy Engineer



Nissan North America, Inc.

■ Company Overview

Nissan Smyrna

Vehicle Assembly Plant

Square feet **6.3 Million**

Annual Capacity: **650,000 Vehicles**

Campus: **857 Acres**

Jobs: **7,100**



Nissan Canton

Vehicle Assembly Plant

Square feet **5.0 Million**

Annual Capacity: **500,000 Vehicles**

Campus: **1440 Acres**

Jobs: **5,000**

Nissan Decherd

Powertrain Plant

Square feet **1.6 Million**

Annual Capacity: **1.5 million Engines**

Campus: **968 Acres**

Jobs: **2,500**



Nissan Non-Production

Aftersales & Support Operations

Square feet **7.8 Million**

No. of Sites: **50**

Jobs: **5,500+**

Goals for Sustainability

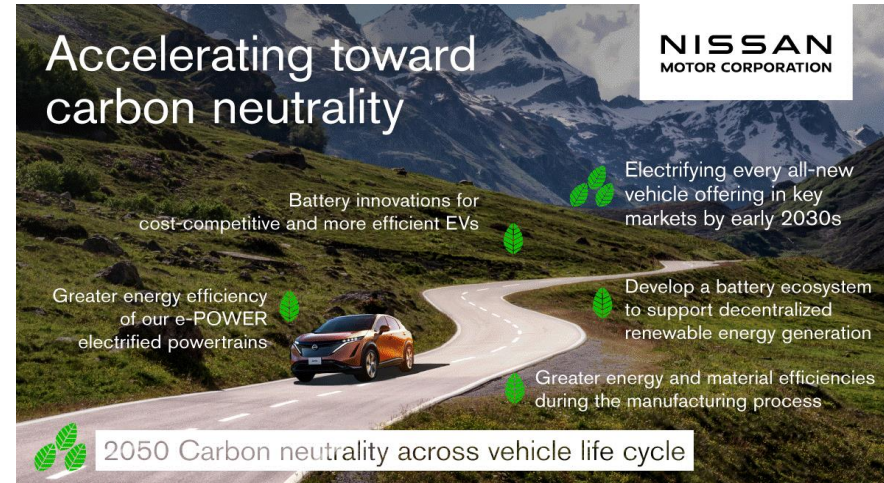
■ Carbon Neutrality 2050

Nissan sets Carbon Neutral goal by 2050

- Battery innovations including solid-state and related technology
- Further development of Nissan's e-POWER
- Development of a battery ecosystem
- Manufacturing process innovations

Race to Zero

- Nissan joined the "Race to Zero" campaign supported by the UN as the first Japanese automaker.
- Nissan signs "The Business Ambition for 1.5°C" campaign
- Nissan joins the Science Based Targets initiative



[Nissan sets carbon neutral goal for 2050 \(nissannews.com\)](https://nissannews.com)



[Nissan brings its innovation and excitement to the 'Race to Zero' \(nissannews.com\)](https://nissannews.com)

NNA-Smyrna Plant

■ Background

Nissan's first U.S. manufacturing facility with production beginning in June 1983

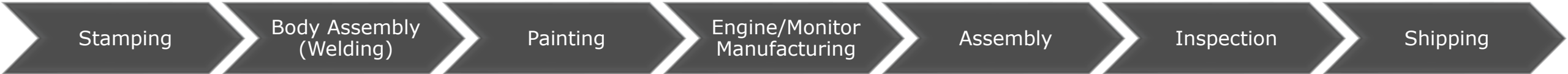
Production capacity of 650,000 vehicles annually

ENERGY STAR® Certified Facility for 16 consecutive years



Smyrna Plant

■ Process



Activities to Improve Energy Performance

■ Energy Treasure Hunts

2-3 day events focused on low to no cost energy saving opportunities

Teams consisted of members from Maintenance, Production, and Engineering

2,388 MWh of electric opportunity identified in 2022

4,289 MMBtu of natural gas opportunity identified in 2022



Activities to Improve Energy Performance

■ Compressed Air Brigades

Compressed air is used throughout the facility for pressing parts, painting bodies, moving parts (w/vacuum), and many other processes.

Teams identify and tag compressed air leaks with the Fluke ii900

Quick and easy repairs are made on the spot

Remaining identified leaks are entered into the CMMS as work orders to be completed

1,960 MWh identified so far in 2022



Activities to Improve Energy Performance

Employee Engagement

Challenged employees to find energy savings at home and at work

Developed awareness of energy at home and related to energy at work

- Compressed air – related to volume of Goodyear blimps
- Open dock doors – leaving the door open at home

Outlets:

- Nissan TV
- Newsletters
- Driver's Seat Phone Application



FLIP THE SWITCH A 5-million square foot facility like Nissan Canton requires a lot of power for everything from robots and equipment to heating, cooling, and lighting. Every day, energy engineers throughout Nissan's facilities work to identify areas to save energy and energy-related costs.

One of those areas is lighting. "Flip the Switch" is a new idea aimed at raising awareness of the costs related to leaving lights on over the weekend and even in between shifts. Even though it might not seem like much, the costs add up!

Did you know:

- A single work area with roughly 150 lights left on over the weekend costs **\$10**.
- The plant has about 5,000 work areas, which equals **\$333**.
- If they're left on every weekend, the cost to light areas where no one is working skyrockets to **\$17,000**.
- Leaving lights on between breaks drives the cost to more than **\$30,000** a year!

What can you do? It's easy. If you're the last one out of a work area at the end of your shift, Flip the Switch. It saves energy and helps everyone's bottom line.

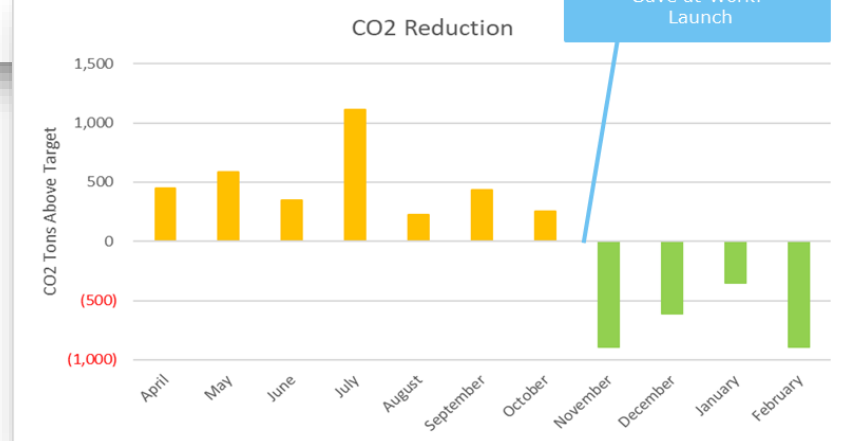
Questions or comments? Email us at DriversSeat@nissan-usa.com.

Do you heat your house with the windows open?

- Seal and insulate your heating and cooling ducts
 - Can reduce your bill by up to 20%
- What size heater would we need to heat the town of Smyrna?
 - Not very effective and very costly
- 1 Dock Door Left Open Costs \$3,500 per year
 - How many do you see open?



Save at Home!
Save at Work!



Activities to Improve Energy Performance

■ Energy Dashboards and Scorecards

Gives visibility of energy performance to plant personnel and management

Energy Tracking

- Shop Energy Dashboards
- Customizable KPI's
- Budgets & CPUs
- Scorecards

Future

- Additional metering / changes
- On-Site Suppliers
- "Metering" other operations




Plant Weekend Energy Use Scorecard (07/26 - 08/01)

| | Electricity (kW) | Compressed Air (cfm) | Water (gpm) | Natural Gas (MCF/hr) |
|---------------------|------------------|----------------------|-------------|----------------------|
| Body | 65% | 62% | 100% | 100% |
| Fascia Paint Line 1 | 65% | 65% | 100% | 100% |
| Fascia Paint Line 2 | 86% | 72% | 100% | 100% |
| Paint Line 1 | 73% | 86% | 100% | 100% |
| Paint Line 2 | 75% | 74% | 100% | 100% |
| Stamping | 78% | 59% | 100% | 100% |
| Trim & Chassis/PQA | 59% | NA | NA | 100% |

Where:
 Weekend reduction target is a % reduction from usage during production. The targets for each utility are listed to the right.
 Electricity and Compressed Air: Target (Green) = 75% reduction, Threshold (Yellow) = 65% reduction
 Water and Natural Gas: Target (Green) = 99% reduction, Threshold (Yellow) = 95% reduction

Tracking Plant Performance

ENERGY STAR Automobile Assembly Plant EPI



Automobile Assembly Plant Energy Performance Indicator

Version 2.4, Release 11/23/2021

Plant Characteristics

NAICS Code: 336111 and 336112

ZIP Code: 37167

Location: Nashville, TN

30-Year HDD (deg F): 3,729

30-Year CDD (deg F): 1,616

Notes:

| | Current Plant | Reference Plant |
|--|---------------|-----------------------|
| | Current Plant | Reference Plant |
| Year: | 2021 | 2021 |
| US Units | | |
| Production: | 185,000 | # of vehicles 180,000 |
| Line speed: | 120.0 | VPH 120.0 |
| Capacity (# of vehicles): | 409,920 | 409,920 |
| % Utilization (production/capacity): | 45% | 44% |
| HDD: | 3,842 | deg F 3,621 |
| CDD: | 1,990 | deg F 1,840 |
| Wheelbase of the largest vehicle produced: | 115.0 | inches 115.0 |
| Is this plant air-tempered?: | yes | yes/no yes |

Energy Consumption

Select Units

| | Electricity | Onsite Renewables | Gas | Distillate Oil | Residual Oil | Coal | Other |
|------------------------|------------------------------|-------------------|---------------|----------------|--------------|-------|------------|
| | MWh | kWh | MCF (1000 CF) | Gallons | MMBtu | MMBtu | MMBtu |
| Current Plant | Annual Purchases & Transfers | | | | | | |
| 2021 | 98,500 | | 550,000 | | | | 0 |
| | Annual Cost (\$) | | | | | | |
| | Enter cost | | Enter cost | | | | Enter cost |
| Reference Plant | Annual Purchases & Transfers | | | | | | |
| 2021 | 100,000 | | 500,000 | | | | 0 |
| | Annual Cost (\$) | | | | | | |
| | Enter cost | | Enter cost | | | | Enter cost |

* Entering cost data is optional and does not impact the computation of the Energy Performance Score.

Results

Display energy results in: **US Units**

| | Your Current Plant | Your Reference Plant | Average | Efficient |
|---------------------------------------|--------------------|----------------------|---------------|---------------|
| | Current Plant | Reference Plant | Current Plant | Current Plant |
| | 2021 | 2021 | 2021 | 2021 |
| Energy Performance Score | 90 | 87 | 50 | 75 |
| Source Energy (MMBtu) | 1,533,545 | 1,494,010 | 1,919,643 | 1,629,704 |
| Site Energy (MMBtu) | 900,382 | 854,200 | 1,127,070 | 956,839 |
| Annual Energy Cost (\$/year) | \$0 | \$0 | \$0 | \$0 |
| Number of Vehicles | 185,000 | 180,000 | 185,000 | 185,000 |
| Energy Cost/Vehicle (\$/vehicle) | 0.00 | 0.00 | 0.00 | 0.00 |
| Energy Intensity (Site MMBtu/vehicle) | 4.87 | 4.75 | 6.09 | 5.17 |

Automobile Assembly and Automobile Engine Plant EPI scores are updated monthly.

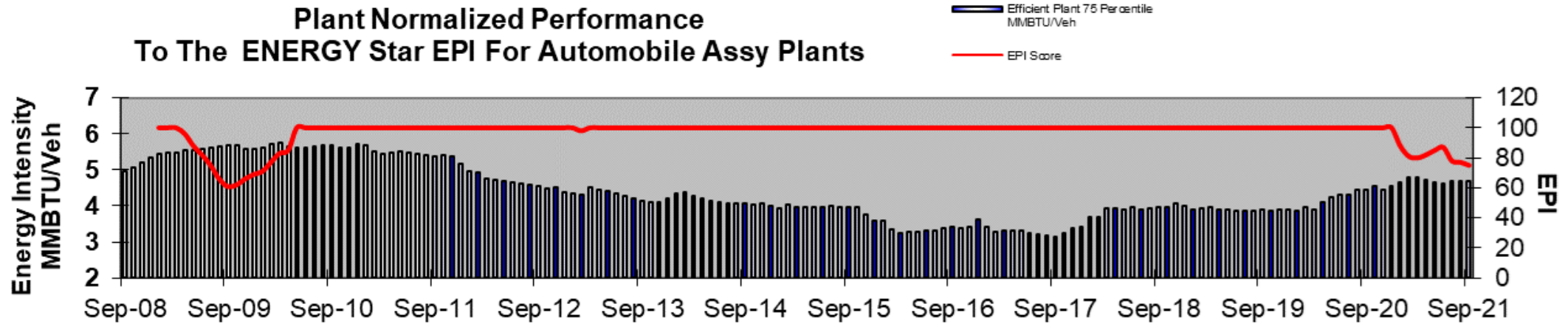
Plant characteristics, recorded weather data, and energy consumption are entered as the inputs.

***Data is fictitious and for demonstration purposes only.**

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NISSAN
GROUP OF THE AMERICAS

Tracking Plant Performance



Energy engineers and managers monitor energy intensity and the EPI score through a trend chart

- This gives visibility as to where each site's EPI score may land for certification

When scores begin to trend downward, engineers can use the EPI to determine the driver by comparing the benchmark electric and thermal energy intensities to the actual

Communicating Energy Performance

■ Internal and External

Internal

- CO2 Emissions Targets
 - Operational improvement-focused
- Energy Management System (ISO 50001) Review
 - Annual Executive Review

External

- ENERGY STAR Certification and Partner of the Year
- Nissan Green Program (NGP) Sustainability Report

Thank you



Sectors eligible for ENERGY STAR certification

- [Auto Assembly](#)
- [Auto Engine](#)
- [Auto Transmission](#)
- [Cement](#)
- [Commercial Bread & Roll](#)
- [Container Glass](#)
- [Cookie & Cracker](#)
- [Flat Glass](#)
- [Frozen Fried Potato Processing](#)
- [Fluid Milk Processing](#)
- [Integrated Paper Mill](#)
- [Integrated Steel Plant](#)
- [Juice Processing](#)
- Metal Casting
 - [Aluminum](#)
 - [Iron](#)
- [Nitrogenous Fertilizer](#)
- Petroleum Refining
- [Pharmaceutical](#)
- [Pulp Mill](#)
- [Wet Corn Milling](#)



2022 ENERGY STAR
Certified Plant
application deadline
November 30, 2022

www.energystar.gov/plants