



# Better Plants

U.S. DEPARTMENT OF ENERGY

## ENDING THE TYRANNY OF THE 2-YEAR PAYBACK: EFFECTIVE INDUSTRIAL FINANCING STRATEGIES

Better Buildings Summit  
May 27, 2015

U.S. DEPARTMENT OF  
**ENERGY**

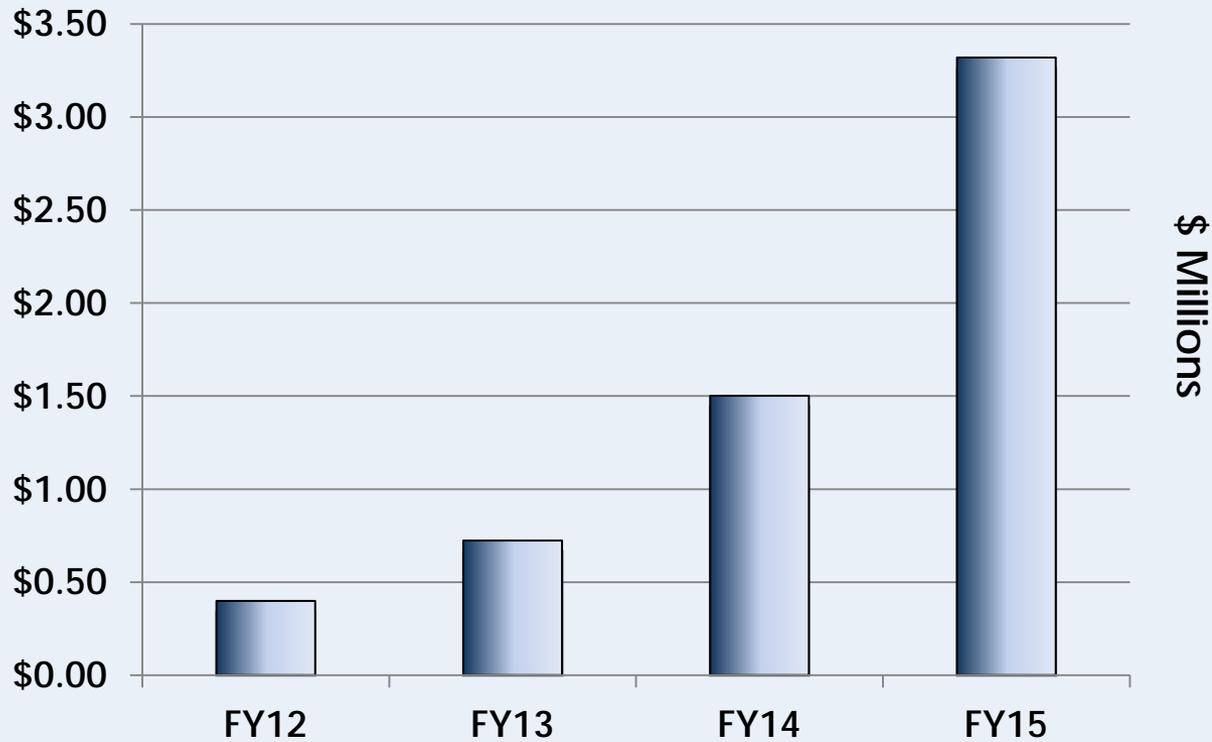
# Speakers

- Andre de Fontaine, U.S. Department of Energy (moderator)
- Richard Russell, Senior Energy Engineer, Nissan North America
- Gary Londo, Senior Energy Engineer, General Motors
- Bob Bechtold, President, Harbec, Inc.
- Bruce Schlein, Director—Alternative Energy Finance Group, Citi

## Winning Strategies For Investment In Energy Efficiency



## Capital Investment In Energy Savings And CO2 Reduction Projects Nissan North America Manufacturing Plants



# Corporate Sustainability Goal

## Nissan Green Program 2016

**Reduce CO<sub>2</sub> Emissions Per Vehicle by 27%  
by 2016 from 2005 Baseline**

# **Original Investment Guideline**

**1 Year Payback**

# Benchmarking

Winning Strategy #2: Benchmark Corporate Peers

## Benchmarking Findings:

- **Payback Periods Outside US > Than Inside**
- **Not All Companies Use A Simple Payback Criteria**
- **The Average Payback Period Was 3-5 Years Ranging from 1 to 8 Years**
- **Some Companies Differentiate Types (eg. HVAC, Lighting...)**
- **Others Established Set Asides Or Pooled Funds**

# Results

**\$2.6 MM In Efficiency Project Investment**  
**\$2.1 MM In Cost Savings**  
**17,500 Tons – CO<sub>2</sub>**

# Results:

**This Year Nissan North America  
Will Spend More Than \$3MM  
To Reduce Energy Use**

# ENERGY REDUCTION AND ENERGY PERFORMANCE CONTRACTING

2015 Engineering Society of Detroit

2015 U.S. Department of Energy Better Buildings Better Plants

Gary J. Londo  
Energy Leader/Senior Energy Engineer  
Global Facilities

May, 27 2015



GENERAL MOTORS

# AGENDA

GM ENERGY MANAGEMENT AND GOALS

TYPES OF ENERGY PROJECTS

ENERGY PERFORMANCE CONTRACTING OVERVIEW

THE NEED FOR SPEED

**140** GLOBAL  
MARKETS

DESIGNING & ENGINEERING  
**100 VEHICLES**  
AROUND THE WORLD

GENERAL MOTORS



# OVERVIEW OF GM MANUFACTURING

Build 10 million vehicles per year= \$1 billion in energy

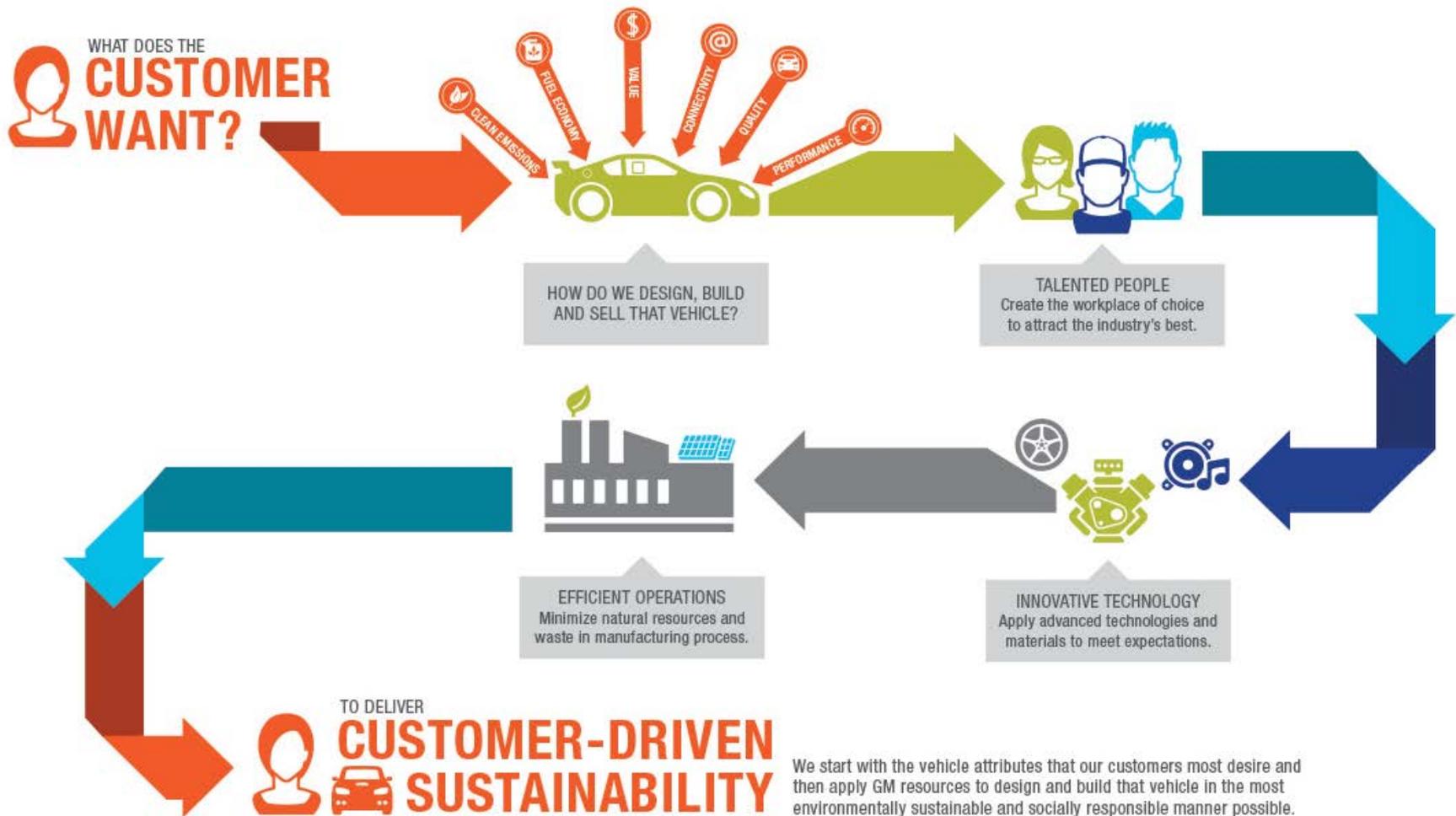
Enough electricity to power 1 million homes

Carbon equivalent of 172 million trees for 10 years

Enough water to fill 166 billion glasses



# GM CUSTOMER DRIVER SUSTAINABILITY FOCUS





**WE STRIVE TO REDUCE  
EMISSIONS & PETROLEUM  
DEPENDENCE BY BEING  
MORE ENERGY EFFICIENT**



**Reduce  
Use**



**Renewable  
Energy**



**Reduce  
Emissions**

## EMISSIONS REDUCTION AT GLOBAL FACILITIES



**CO<sub>2</sub>  
Emissions  
Reduction**

**28%**

FROM 2005 – 2010

**11%**

FROM 2010 – 2014

**60%**

SINCE 1995

## ENERGY USE REDUCTION AT GLOBAL FACILITIES

**28%**

FROM 2005 – 2010

**3.34 M**

METRIC TONS  
GREENHOUSE GAS  
EMISSIONS AVOIDED

**11%**

FROM 2010 – 2014

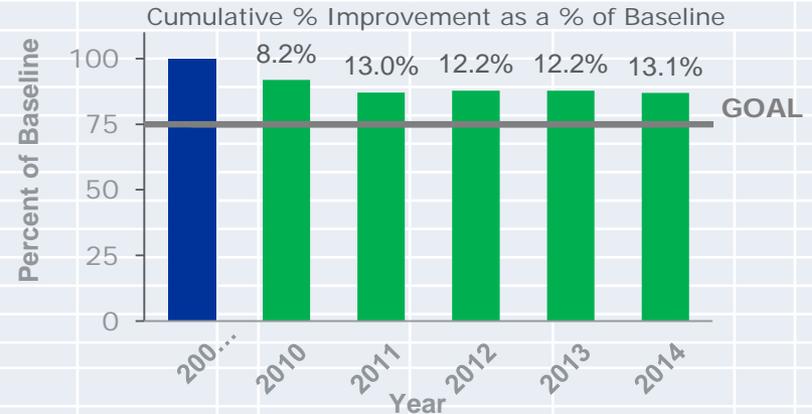


# GM ENERGY GOALS

## 2014 DEPARTMENT OF ENERGY BETTER BUILDINGS

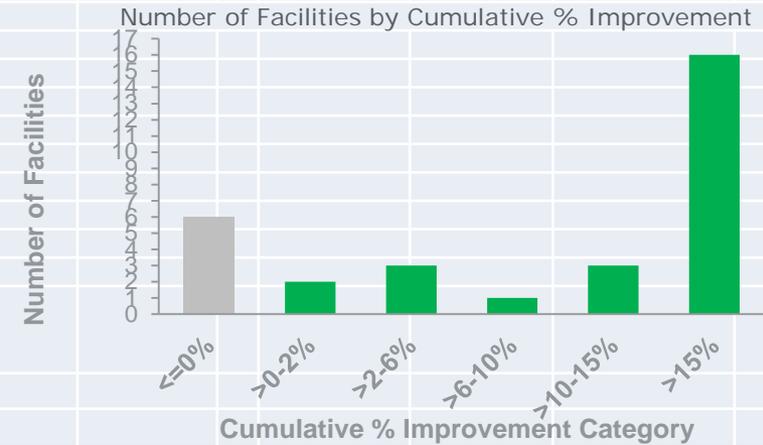
### Portfolio Energy Performance

Better Buildings, Better Plants Challenge partners strive to decrease portfolio-wide source energy use intensity (EUI), and to increase the percent improvement compared to a set baseline. GM's portfolio consists of 31 plants as of 2014. GM's energy management program emphasizes innovative technology solutions, replication of best practices and non-production shutdowns. With an energy intensity improvement of 13.1% since its baseline year of 2008, GM is on track to meet its 25% reduction in energy intensity target by 2019. GM has shared its energy efficiency practices with its global industrial partners and planning to do the same through DOE's Better Plants Challenge Program.



### Energy Performance by Facility

Looking at the percent improvement in energy performance across all facilities can provide insight into how an organization is saving energy. Over half of GM's facilities participating in the Challenge have improved energy performance by >10% since the baseline year of 2008. A number of actions taken by GM at the facility level since 2008 have contributed to its overall energy efficiency improvement, including: direct centrally-managed energy reduction projects, energy performance contracting, direct product program changes (which are product driven but reduce energy), and locally-managed reduction projects/behavior changes (low cost with quick payback). Six of GM's 31 facilities have experienced no improvement or an increase in energy intensity, indicating the company still has room to improve on its already significant energy efficiency accomplishments.



### Method for Calculating Energy Performance

# GM ENERGY PROJECTS

- GM commits funding and resources continuously to reduce energy, water and carbon emissions.
- We work with stakeholders to reduce energy and related costs
- Common desire to save the most amount of energy at the least amount of cost and as quick as possible
- Budgeting and scheduling of work are the some of the greatest obstacles to industrial energy reduction.
- Committed to working with energy reduction stakeholders/partners to continuously reduce consumption responsibly

# PROJECT EXECUTION IS ONE KEY WAY TO REDUCE GM ENERGY PROJECTS

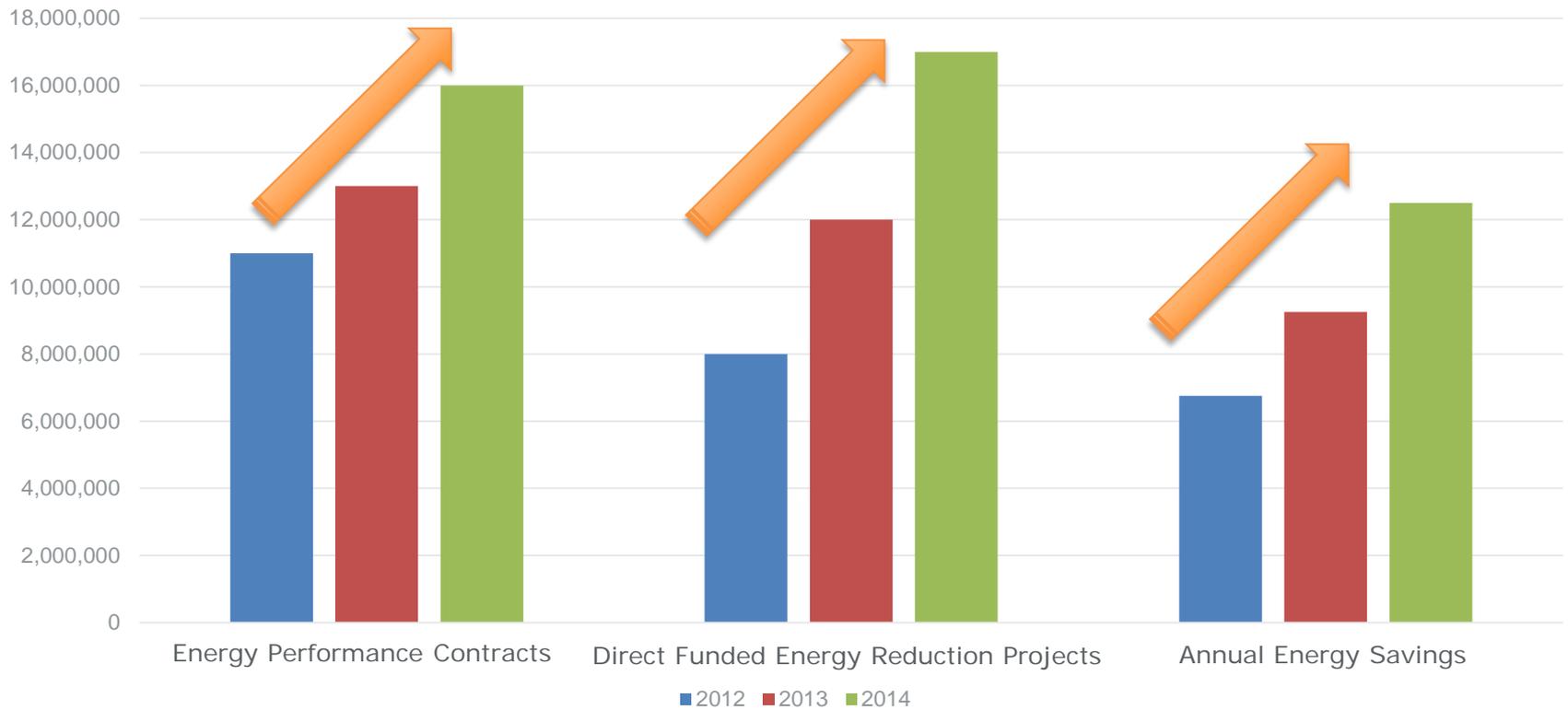
Projects are classified by investment and involvement required to execute

- Direct centrally-managed energy and water reduction projects (2 year or less payback)
- Energy performance contracting (2-5 year payback)
- Direct product program changes (which are product driven but reduce energy)
- Locally-managed reduction projects/behavior changes (low cost projects with quick payback)

# GM ENERGY PROJECT INVESTMENT HISTORY

## ENERGY PERFORMANCE CONTRACTS AND DIRECT FUNDED PROJECTS

GM North America Increases Energy Investment and Savings  
(ORDER OF MAGNITUDE)



## WHY SELF FUNDED PROJECTS ARE PREFERRED OVER ENERGY PERFORMANCE CONTRACTS

- Less paperwork
- No contract – little to no involvement of legal, company treasury office, and finance group
- Less risk
- Quicker to execute – less delays
- Easier measurement and verification

## WHY ENERGY PERFORMANCE CONTRACTING

- Longer payback terms are generally permitted
- Company doesn't have to front the cash (capital)

# GM ENERGY PERFORMANCE APPROACH

- The subject contract will utilize a shared savings model of performance contracting.
- This is a pay for performance model, not a structured finance approach for GM.
- GM has no direct relationship with any financing company.

# GM ENERGY PERFORMANCE APPROACH

**SERVICES AND PLANT IMPROVEMENTS WILL BE IMPLEMENTED THROUGH AN ENERGY PERFORMANCE CONTRACT WHICH:**

- Incurs no capital costs (as defined by GM finance) by ESCO, with an option for GM to provide initial capital if desired. Lighting and control systems are typically classified as expense retro-fits by GM and are not capital assets.
- Achieves significant long-term cost savings
- Maintains consistent and reasonable levels of occupant comfort meeting GM company standards.
- Maintains consistent levels of building functionality

# GM ENERGY PERFORMANCE APPROACH

## SERVICES AND PLANT IMPROVEMENTS WILL BE IMPLEMENTED THROUGH AN ENERGY PERFORMANCE CONTRACT WHICH:

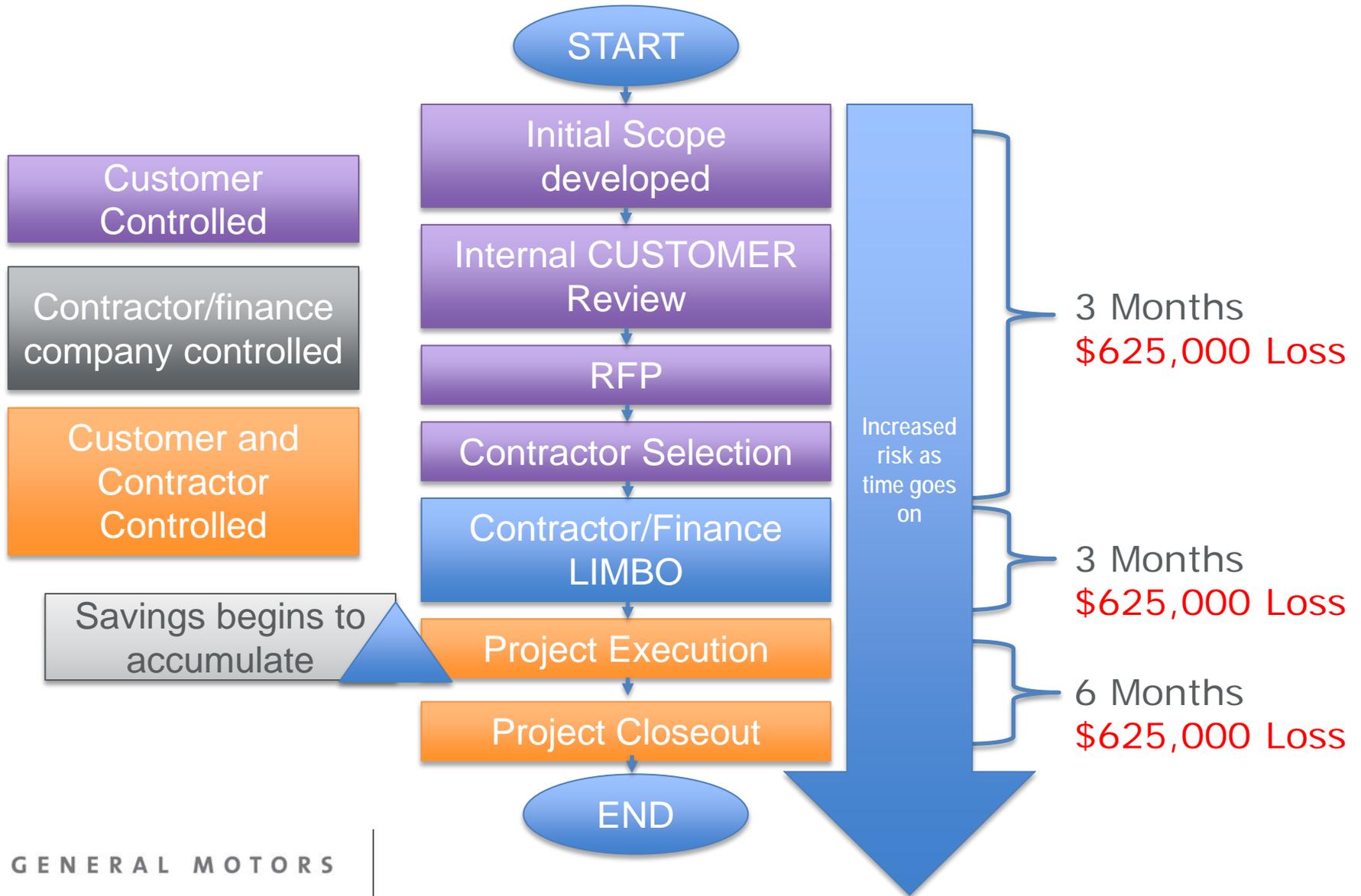
- Captures additional benefits that may directly result from energy-related services and capital improvements, such as:
  - environmental protection
  - hazardous materials disposal or recycling
  - improved occupant comfort
  - reduced maintenance needs
  - improved indoor air quality
  - additional building improvements, etc.
- Has a term of 5 years or less.
- Maintains positive cash flow to General Motors
- Meet the definition of an Operating Lease as classified by the Financial Accounting Standards Board (FASB) Standard 13.

## COST OF DELAY

- Energy Performance Contracts take an average 18 months to complete (DOE). The CUSTOMER BEARS this cost.
- GM averages about 12 months
- EXAMPLE:
  - \$10 million project with a payback of 4 years generates \$2.5 million in savings annually (or \$208,000 per month)

$\$208,000/\text{month} \times 18 \text{ months} =$   
 $\$3,750,000$  potential loss of savings

# TIMING BREAKDOWN



# THE OBJECTIVE

## SPEED UP THE IMPLEMENTATION OF ENERGY PROJECTS

- As GM executes more projects we begin to gain confidence in our ability to execute and manage energy performance contracts.  
Internal GM review is speeding up
- As contractors work with GM and financial institutions on energy performance contracts they too are beginning to speed up and LIMBO time is beginning to shrink
- As contractors become more familiar with executing EPC's at GM, execution is getting faster

## FROM THE PERSPECTIVE OF THE CUSTOMER

- Implementation of energy performance contracts **must speed up** at GM and across the industry.
- The needs of the customer, the contractor and finance institution are **difficult to balance**
- A **lack of contracting standards** for SHARED SAVING off BALANCE SHEET energy performance contracting makes it difficult for most companies to accomplish energy performance contracting.
- **Familiarity** with a process will speed up implementation

# QUESTIONS / ANSWERS

Department of Energy  
2015 Better Buildings Summit

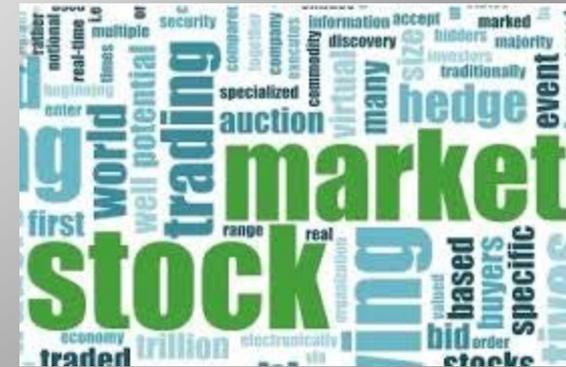
Ending the Tyranny of 2-year Payback

**Bob Bechtold**



# Assumption:

Most Fortune 500 Companies have between 1 and 2 year ROI requirements for determining if a project or equipment purchase will be funded, insuring maximum potential for their invested funds which is considered wise business practice.



Smaller companies like *HARBEC* can sometimes use 2 to 3 year ROI for project financial metrics and usually find that banks expect this for loan justification and approval



# Proposal:

There is a potential exception to this practice that can offer the company excellent long term advantages and not impair liquidity, profits or growth potential



at *HARBEC*...

We refer to this alternative as  
'Eco-economic Decision Making'

Energy in our type of  
manufacturing = 4% to 6%  
cost of doing business

At *HARBEC* we have learned how to  
'leverage our consumption'

# This has allowed us to develop the *HARBEC* Energy Management Strategy

- **Combined Heat and Power (CHP)**= reduced energy cost through efficiency (by using the other 65% to 75%)
- **Renewable on site generation** = fixed energy cost for 25 years (no constantly escalating fuel cost)
- **Green power from utility** = free energy storage, low cost energy insurance, cost effective renewable energy credits



# Facts of Life...

(the things we can do little or nothing about)

- **HARBEC** needs  $> 3$  million kWh/year to operate
- 3 million kWh costs \$420k/year (\$0.14/kWh)
  - **HARBEC** pays \$xx for taxes
  - **HARBEC** pays \$xx for insurance

Ask 10 business owners what their utility bill was last month



???



We believe there are two pockets of potential

Pocket #1



## Typical Project ROI

Good business practice demands ROI be limited to 1 to 3 years depending on company size and stock holder status...

And...



Pocket #2

## ENERGY PROJECT ROI

If the dollars you use to pay for an energy project come from the **Energy Bill (tax/insurance bill) Pocket** you had to spend them anyway...

If you choose to buy an **asset** that generates an electron with the same dollars, at the end of the payments you have a continuing revenue potential instead of **spent electrons**.

# Examples Over the Last Fifteen Years

## Opportunities...

- 2000-2001 Banked and Built CHP
- 2002/3 250 kW wind turbine installed
- 2007 Lighting upgrade
- 2008 CHP project - paid off
- 2009 Barrel insulation installed
- 2010 Wind turbine project - paid off
- 2012/13 850 kW Wind Turbine installed
- 2013/15 CHP Upgrade Project
- 2014 /15 LED Lighting Upgrade Project

**Future Opportunities...2015...2016...** Biofuels to  
Blueflame...500kW Solar...Rankine Cycle...WISP...

also...Energy Saving Manufacturing Alternatives, Processes  
and Sustainable Bio-origin Materials

# Times are Changing

- Banking for wind turbine #1
  - From 1999/2001 turned down by more than **30** banks from New York to Ohio.
- Banking for wind turbine #2
  - Less than 30 days to get 4 financing opportunities from my office.
  - Options included... No out of pocket required for discounted electricity with 10 year lock in.



# 2000-2001 Banked and Built CHP

## Combined Heat and Power CHP

- 25 CNG fueled 30kW Microturbine Generators
- 750 kW max potential provides:
  - 500 kW for **HARBEC's** max electric load requirement
  - 250 kW redundancy for back-up and maintenance

### Thermal Advantages

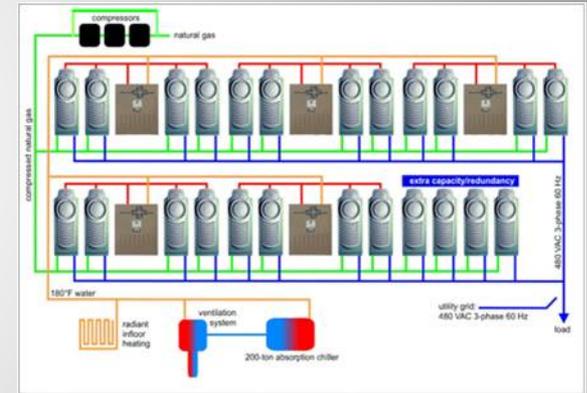
Heating and A/C almost energy (fuel) free

### No Magic

We just use the 65 - 75% that Utilities throw away

By using the thermal energy from exhaust, we heat and air condition 9000 sq.ft. molding area with 25 injection molding machines and a 17,000 sq.ft. manufacturing/warehouse space

\$\$\$ 7 Year ROI paid for with energy dollars not spent \$\$\$



## 2002/3 250 kW wind turbine installed

- Installation of 250 kW wind generator to accomplish wind/microturbine hybrid
- Slightly better than Class 3 wind site
- Projected energy production is 300,000 kWh +/- 10% per year, or about 10 to 15 % of the total **HARBEC** annual energy requirements.



- Displaces retail value electricity, which is \$.15 per kWh
- Electric savings provides >\$45,000/year revenue stream
- **8-10 year ROI on \$400k project originally**
- ROI is shortened as electric costs rise
- **Allows us to predict 10% of our energy costs 20 to 25 years into the future \$\$\$\$**



# 2007 Lighting Systems Upgrade -

High efficiency: fixtures, ballasts, and sensors

## Complete lighting upgrade was installed the end of 2007

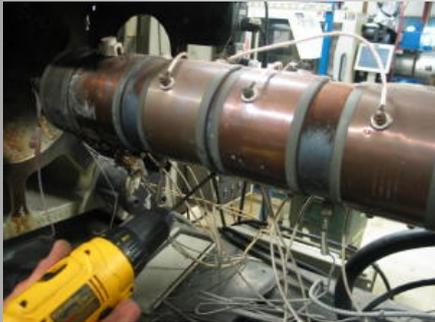
- Replaced every fixture and ballast plus high bay sodium with new T-8 type fluorescent bulbs and reflectors
  - Total cost \$65,000
- Quality of light was improved by using fuller spectrum bulbs
- Lighting energy consumed was decreased by 48% on average company wide
- Bulbs have longer life which reduces replacement cost
  - **Total annual electric savings \$38,000...+...+**
  - **NYSERDA Grant \$16,000**
  - **Direct Federal Tax credit \$8,000**
  - **Contractor secured financing package**

**\$\$\$ ROI 1.5 years \$\$\$**



# 2009 Molding Machine Barrel Heater Insulation Project:

- Replace heater bands and install insulation covers
- Install metal cover to contain and protect insulation



- Reduced electrical consumption of molding machines by 40% per year (324,000kWH) due to increased efficiency of barrel heaters so reduces energy costs by \$44,000.
- Containing heat reduces amount of excess heat in room which lowers the load on the A/C system by 12 Tons per hour. (or ~12 kWh per hour of operation)
- Exploring screw designs for additional energy efficiency potentials
- Reduction of electricity consumption reduces amount of Green House Gases by 243 tons of CO<sub>2</sub>. (324k kWh x 1.5)
- Significant GHG reduction including NO<sub>x</sub> and Sox
- Reduction of demand on A/C system energy saving
- Amount of non-renewable limited resources being consumed is reduced significantly.

# 2012/13 – Renewable Wind Energy- II

- Installation of **850 kW** wind generator to accomplish wind/microturbine hybrid
- Slightly better than **Class 3** wind site
- Projected energy production is **1,500,000 kWh +/- 10%** per year, or about 50% of the total **HARBEC** annual energy requirements.
- $300\text{k- kWh} + 1.5\text{MM kWh} = 1,800,000 \text{ kWh}$

- **6 - 7 year ROI on \$2.1M project originally**
  - ROI is shortened as electric costs rise

**Allows us to predict ~ 50% of our energy costs  
20 to 25 years into the future \$\$\$\$\$**

**Total energy from Renewable is ~ 60%**



# 2013/15 – CHP – Upgrade Project

## Combined Heat and Power CHP

- 10- CNG fueled 30kW Microturbine Generators –Refurb
- 8- 65kW Microturbine Generators = 520 kW
- Increase to 820 kW max potential provides:
  - 500 kW for **HARBEC**'s max electric load requirement
  - 320 kW redundancy for **WISP** and maintenance

By using the thermal energy from exhaust, we heat and air condition 9000 sq.ft. molding area with 25 injection molding machines and a 17,000 sq.ft. manufacturing/warehouse space and soon 14,000 sq.ft. of shop and office

6-8 Year ROI paid for with energy dollars not spent



# LED Lighting Systems Upgrade – 2014/15

## – Direct Replacement / Ballast Compatible Bulbs

- New LED tubes that are magnetic or electronic ballast compatible means:
  - No rewiring of fixtures
  - No fixture replacement cost
  - 50k hour bulb life
  - 45% Lighting energy reduction (from 32w to 18w)
- **Complete Facility 1280 bulb replacement project:**
  - \$32,000 total cost
  - 50% RG&E grant = \$16k
  - Lease option for no upfront cost
  - < One year payback w/grant...< Two year payback no grant
  - \$22k annual savings



# Industrial Efficiencies

## Eco-Economic equipment and systems purchase decisions

- Over seven year time span, replaced all standard hydraulic type equipment with all-electric injection molding machines
- Electric machines do not use power when they are in static state, which is a significant portion of the time.
- Capable of doing the same or better job than the hydraulic machine, using as much as 50% less energy



- Use of exhaust heat for absorption A/C means reduction of moisture in plant air which **reduces** the need for use of electric material **dryers** by as much as **75%**.



- Use of inverter drives and soft starts on all motors 10 hp. and greater saves energy due to more efficient motor starting.



# More Industrial Efficiencies

## Eco-Economic Equipment and Systems Purchasing Decisions

- Replacing standard screw-type air compressor with variable speed unit greatly increases efficiency and reliability.

\$\$\$\$\$ **Reduced electrical consumption** due to increased efficiency, lowers energy costs. (<3 yr. payback)

- Maintenance requirements and costs are reduced due to lower operating stress and temperatures. \$\$\$\$\$



## Eco-economic conclusions about Sustainable Manufacturing Opportunities

- \*Control operating costs
- \* Improve competitive pricing
- \* Insure power reliability ~ No Blackouts
- \* Provide fixed energy costs decades into the future
- \* Improved operating efficiency through thermal utilization

# ENERGY PROJECT ROI



## Most Energy Projects

The equipment and asset life span outlast the ROI period by  $> 2$  or  $3$  times  
Often they can be refurbished or rebuilt for a fraction of the original project cost

If you choose to buy an **asset** that generates an electron with the same dollars, at the end of the payments you have a continuing revenue potential for many years instead of **spent electrons**.

# Eco-Economic Results of Cumulative Energy Efficiency Measures

- From 2005 to 2008, each year **HARBEC** increased sales and profits

...YET...

- EPA Green Power Partnership Yearly Report:
  - 2005 total electric consumed= 3,627,000 kWh
  - 2008 total electric consumed= 2,402,000 kWh
  - Reduction of total electricity = 1,225,000 kWh
    - Electric consumption reduced by 35%
    - @ .145/ kWh = \$177,625
    - 1.5 lb/kWh = 1,837,500 lb. = 919 tons GHG



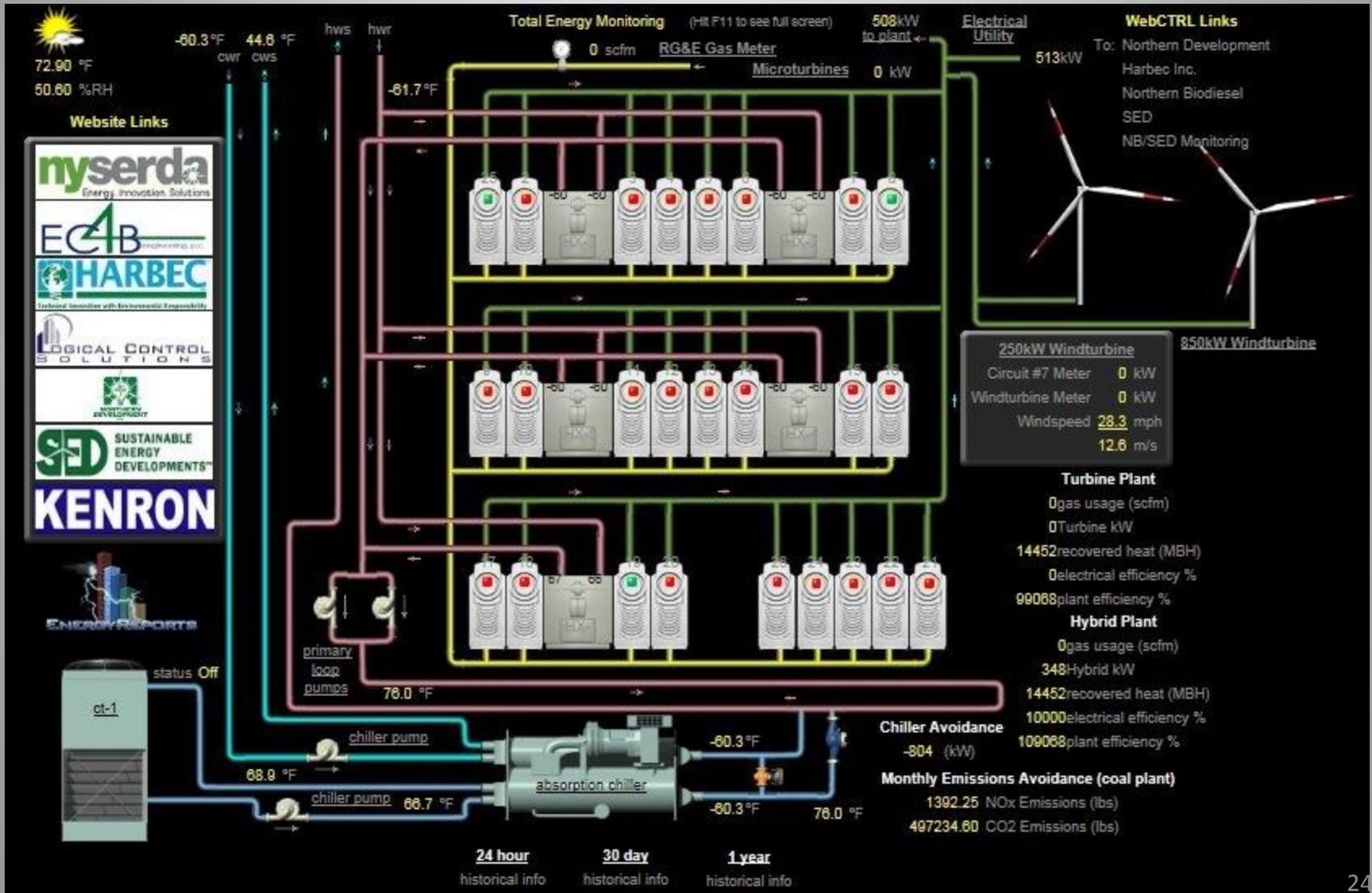
Lesson Learned: If you want to make an environmental impact, and save money, use energy efficiency!

# Another Way to Look at the opportunity for positive impact to **bottom line**...

- Energy = 5% cost of doing business for manufacturing
- **Example Company** is \$10MM sales ~ \$500K annual energy cost
- 35% energy cost reduction = \$175k/year to bottom line
- .....
- If (5% to 10% is average profit) = \$700k
- \$175k is 30% of \$700k
- Would require (30%) ~\$2MM to \$3MM additional sales for equal impact on overall annual profitability
- .....
- **Would a normal manufacturing company pursue an opportunity to increase sales by 30% ??**

# The HARBEC CHP Project

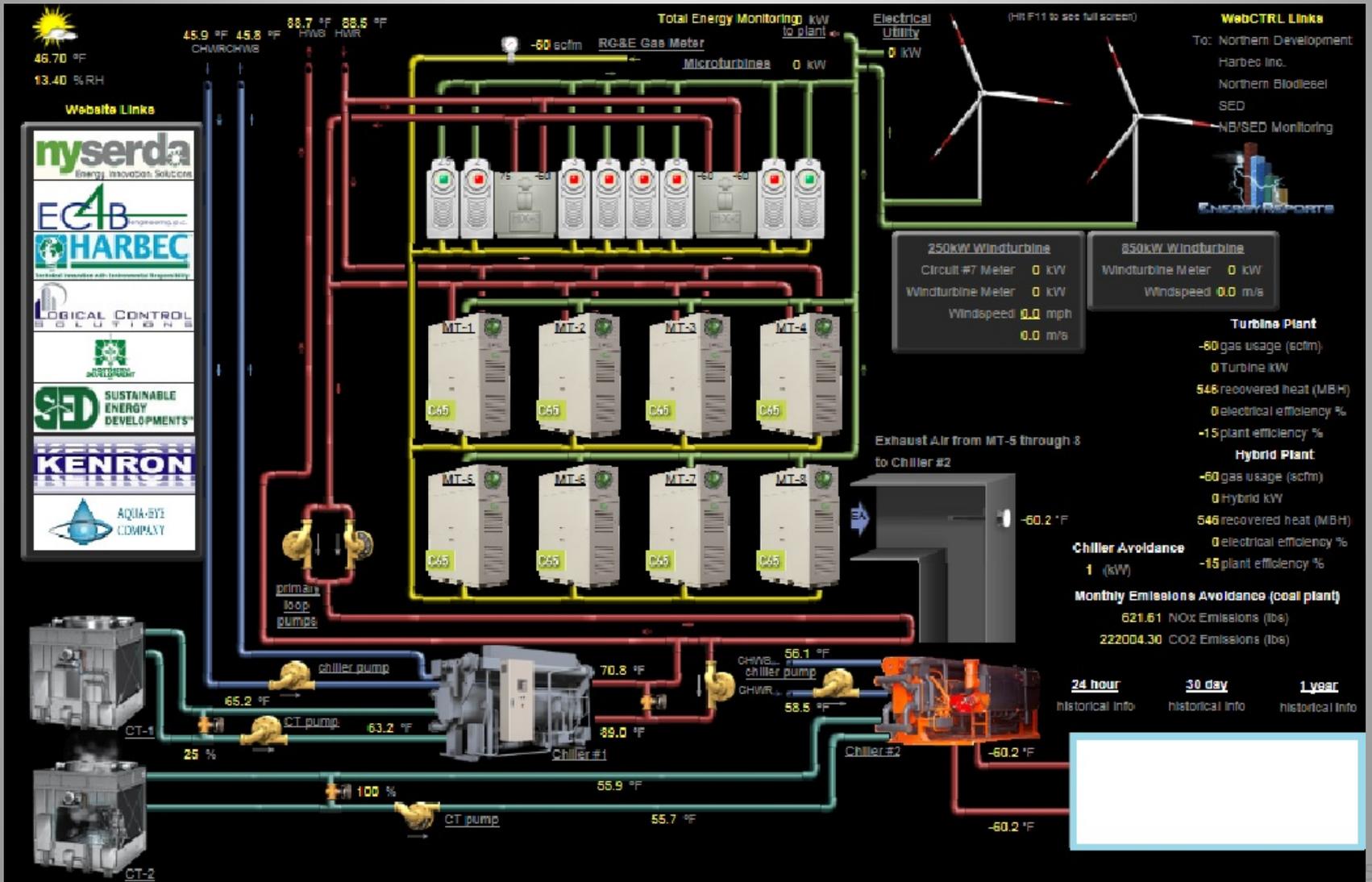
www.northerndevelopment.com



Coming soon...

# The NEW HARBEC CHP Project

www.northerndevelopment.com



## *HARBEC Conclusion...*

When it comes to energy project ROIs

**Don't...**



# HARBEC conviction to Eco-economic Sustainable Manufacturing

At **HARBEC** we regard Eco-economic Sustainability as absolutely critical to the future of our business, and we believe that our success in the pursuit of it, will improve our competitive advantage by insuring our efficiency.



**A Carbon Neutral  
manufacturing company**

Striving to be  
**Water Neutral by 2015**



**ISO 50001/SEP Platinum Nov. 2013**

**DOE - Better Plants – Challenge Jan. 2014**

**HARBEC, Inc.**  
**585-265-0010**

**Thank You**

**Ontario, NY**  
**www.harbec.com**

# Energy Efficiency Financing Solutions

## PROPERTY TYPE / SECTOR

PRODUCT / SOLUTION	MUSH	Federal/DOD	Single Family	Multifamily	Commercial	Corporate
Large Single Project	Yes Detroit SL	Yes	N/A	Yes	Yes	Yes
Pooled Asset Deal	Yes Green Campus	Yes	Yes Kilowatt; WHEEL	Difficult HPET	Difficult	Yes
ESCO/ESA Two Factor	Yes	Yes	N/A	Difficult	Difficult	Yes Citi London
PACE	Yes	N/A	Yes-On Hold?	Yes	Yes	Yes
On-Bill (OBR)	Yes Hawaii GEMS	N/A	Yes NYSERDA	Yes	Yes	Yes
Stranded Cost Tariff	Yes	N/A	Yes	Yes	Yes	Yes
Green Bond	Yes Massachusetts	N/A	N/A	N/A	N/A	Yes Unilever
Sustainable Energy Utility	Yes Delaware	N/A	N/A	N/A	N/A	N/A
Microfinance	N/A	N/A	Yes Mongolia	N/A	Yes	N/A