



BLUE SKIES FOR  
OUR CHILDREN

**Joanna Bambeck**

***NA Region Environmental (Green Factory) Leader***

- NA Region Environmental Strategy & Planning – Manufacturing  
Lead and support projects developed to achieve Honda's ENV Vision
- EMS (ISO)
  - Environmental Compliance
  - Performance Improvement (energy, water, resource utilization)

# Honda Motor Vision – Environmental 2030



## Honda Motor Company Vision

-Lead efforts to realize  
a Clean Society

-Be a Company  
Society Wants to Exist

Serve people worldwide with the “joy of  
expanding their life’s potential”

*Realizing the joy and freedom of mobility and a sustainable  
society where people can enjoy life*

Global Vision, Themes &  
Targets

## NA Region Direction

Contribute to the realization of a Sustainable  
Society

NA Region Common  
Initiatives & Targets

## NA Manufacturing Environmental Goal

Reduce environmental impact while creating  
value with improved resource efficiency and  
Green recognition

Company Specific  
Business Plan Themes &  
Targets

2020: Reduce fleet-average CO2 emissions from its products by 30%

2030 : 2/3 global vehicle sales from electrified vehicles

2050 : Reduce total company CO2 emissions by 50%

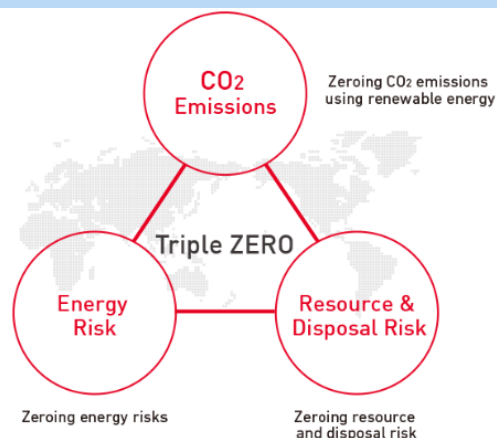
*-Lead efforts to realize  
a Clean Society*

*-Be a Company  
Society Wants to Exist*

## Strive to achieve Triple Zero Initiatives

Honda's Triple ZERO Concept is designed to unify its three zeroing efforts that can positively affect climate change issues by addressing:

- **CO<sub>2</sub> emissions** – work to eliminate CO<sub>2</sub> emissions in products and business activities
- **Energy Risks** – strive to eliminate energy risks such as those caused by a dependence on fossil fuels.
- **Resource and Disposal Risk** – efficient use of resource, eliminate risks throughout the product lifecycle, from resource procurement to recovery and disposal.



**ROBECOSAM**  
We are Sustainability Investing.

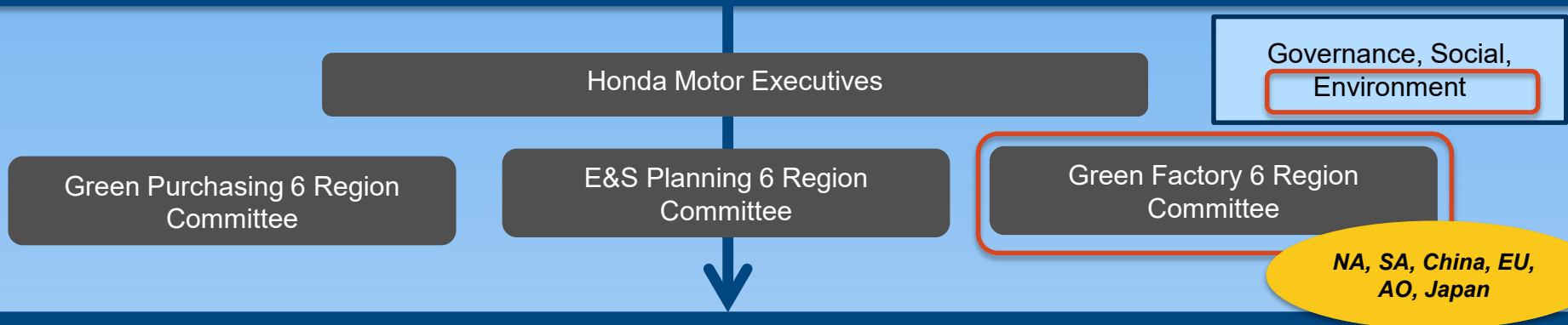
Corporate • September 21, 2017  
Honda Added to the Dow Jones Sustainability World Index

DJSI – used by investors to measure a companies sustainable business practices  
Governance, Social, Environmental

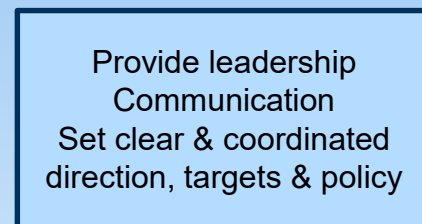
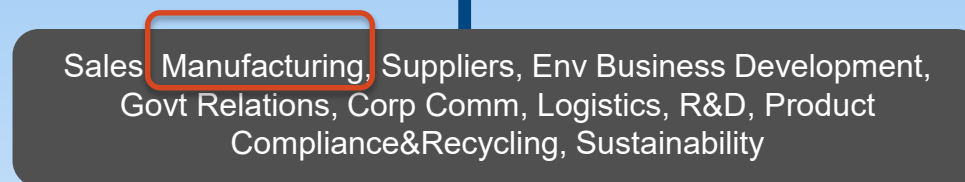


**Honda Motor targets to meet Honda vision**

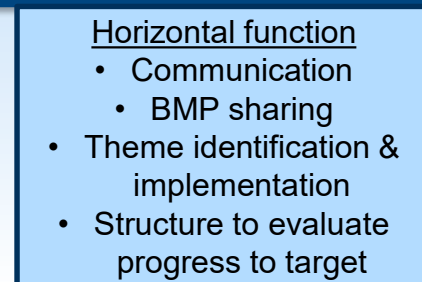
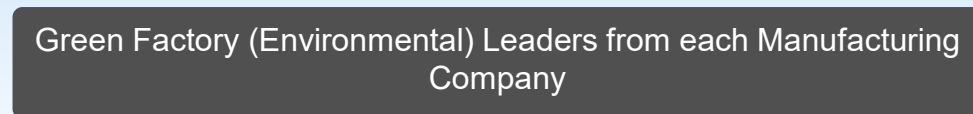
## Honda Motor Sustainability Committee



## NA Region Environmental Committee



## NA Green Factory Committee



# NA Region Green Factory Committee

## Ohio

Honda of America Mfg., Inc.

- Marysville Auto Plant
- East Liberty Auto Plant
- Anna Engine Plant
- Performance Manufacturing Center

Honda Transmission Mfg. of America, Inc.

## Indiana

Honda Manufacturing of Indiana, LLC

## Alabama

Honda Manufacturing of Alabama, LLC

## Georgia

Honda Precision Parts of Georgia, LLC

## North Carolina

Honda Power Equipment Mfg., Inc.

Honda Aircraft Company, LLC

Honda Aero, Inc.

## South Carolina

Honda of South Carolina Mfg., Inc.

## Canada

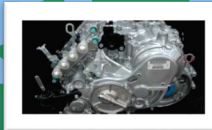
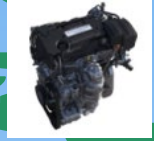
Honda of Canada Mfg.

- Plant 1
- Plant 2
- Engine Plant

## Mexico

Honda de Mexico S.A. de C.V

- Guadalajara Motorcycle/Parts Plant
- Guadalajara Auto Plant
- Celaya Auto Plant



- Communicate
- BMP share
- Theme identification & implementation
- Target achievement evaluation

**NA Region team and Green Factory Leaders at each Company collaborate**

Each NA Region business team develops regional Environmental “Business Plan themes”



**Development** – Focus on creating products that reduce environmental impacts throughout their life cycle.

**Purchasing** – Reducing the impact of shipping parts, especially CO<sub>2</sub> emissions, is an effort of increasing focus.

**Manufacturing** – Globally, manufacturing accounts for roughly 10% of the CO<sub>2</sub> emissions of an auto, and is a major focus.

**Sales and Service** – Focus on reducing emissions from shipping product to dealers and cutting waste from packaging and storage.

**In-Use** – Emissions from fuel consumption are the greatest environmental impact of Honda products. Improving fuel efficiency and powertrains, and using alternative fuels, can lower emissions.

**End-of-Life** – Design easy-to-recycle products, and reduce harmful substances from the waste stream after disassembly.

**Align NA Region BP Themes with Honda Motor vision and targets**



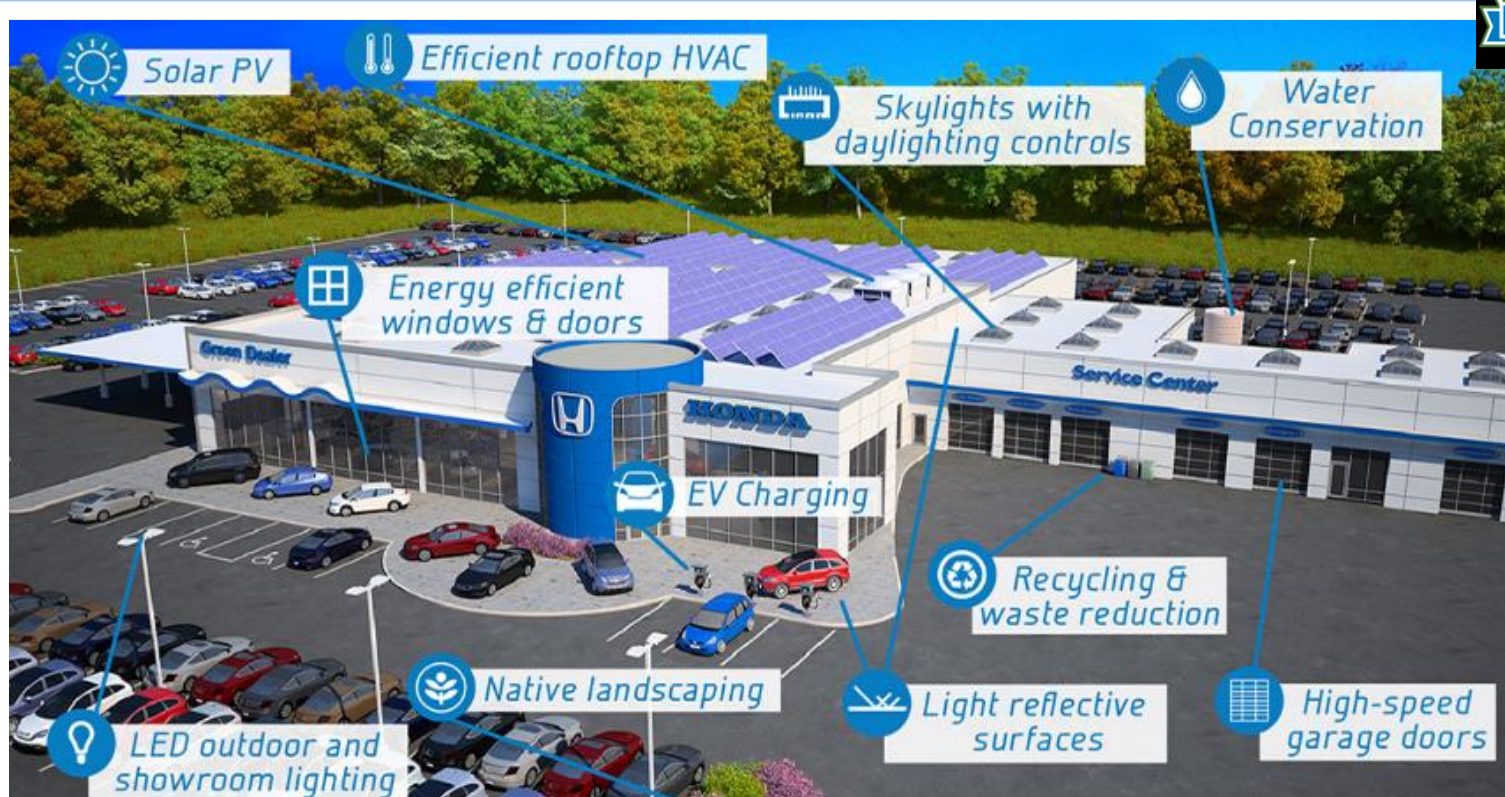
# NA Region Environmental Themes – Sales

## Develop & Implement Honda's "Green Dealer" Guide & Program

- Roadmap for all Honda and Acura dealerships across the US to reduce energy and water consumption.
- Rewards dealers for implementing sustainable practices - Silver, Gold and Platinum award levels.

## Results:

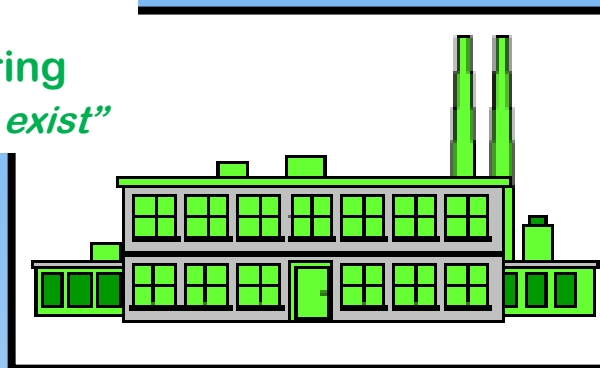
- Reduce annual CO2 emissions by 12,500 tons
- Reduce annual operating costs by > \$2,500,000



# NA Region Environmental Themes - Mfg

**“GREEN FACTORY”**  
**Sustainable Manufacturing**  
*“A company society wants to exist”*

A Green Factory has 2 Pillars  
and an Environmental  
management system as its  
foundation



Environmental Compliance

Environmental Performance

Implement Compliance Programs

- \*Protect Environment
- \*Reduce Environmental Impact
- \*Reduce Risk
- \*Protect image

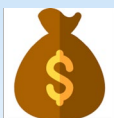
Implement Performance Programs

- \*Reduce Environmental impact (footprint)
- \*Improve Resource Efficiency
- \*Enhance image

Manage by implementing EMS  
ISO 14001



Protect  
Environment



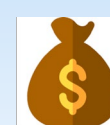
Prevent  
Fines \$

**HONDA**

Protect Brand  
Image



Reduce Energy, Water, Waste



Reduce  
Cost

**HONDA**

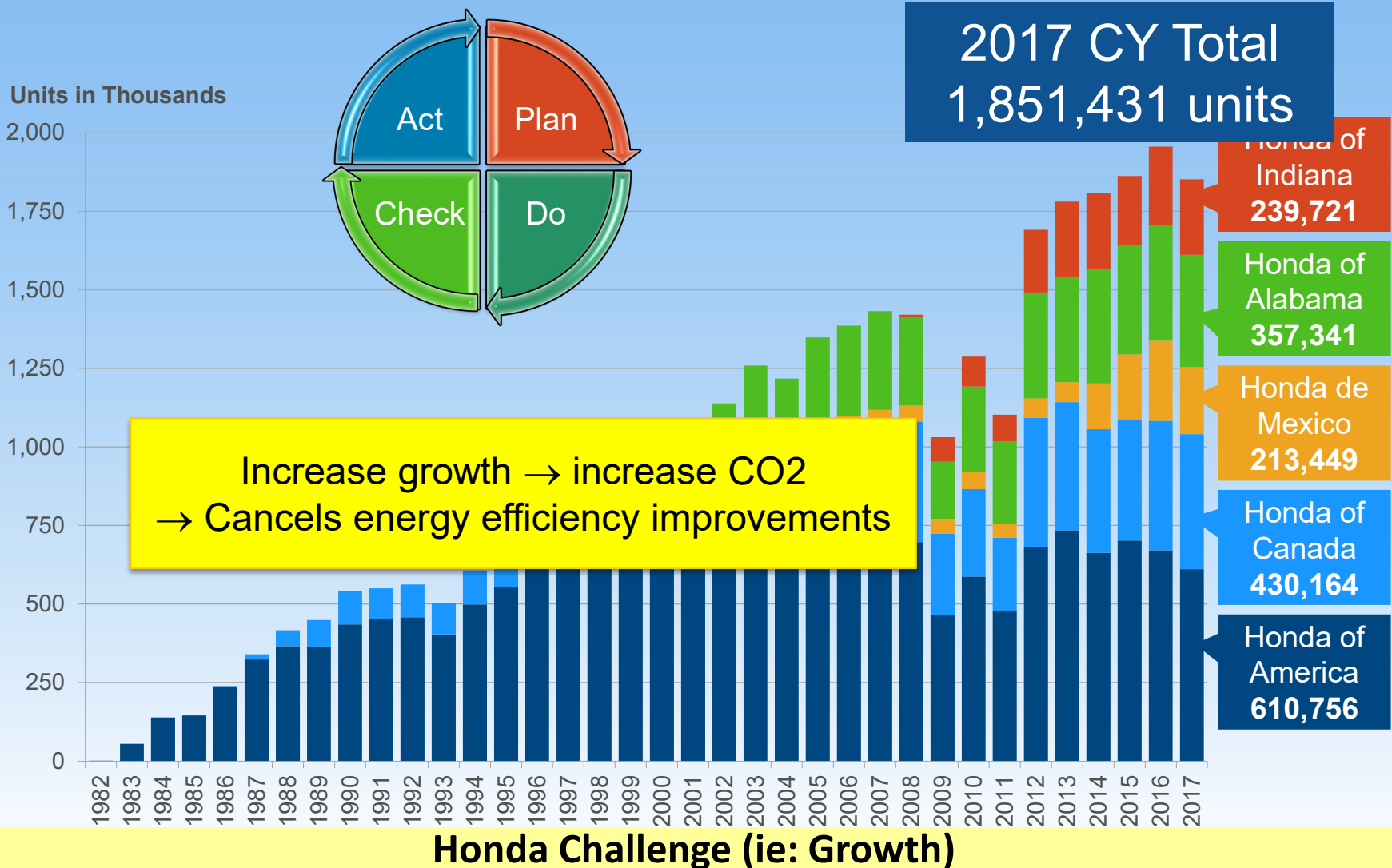
Enhance  
Brand Image

**Goal: Reduce environmental impact while creating value with improved resource efficiency and Green recognition**

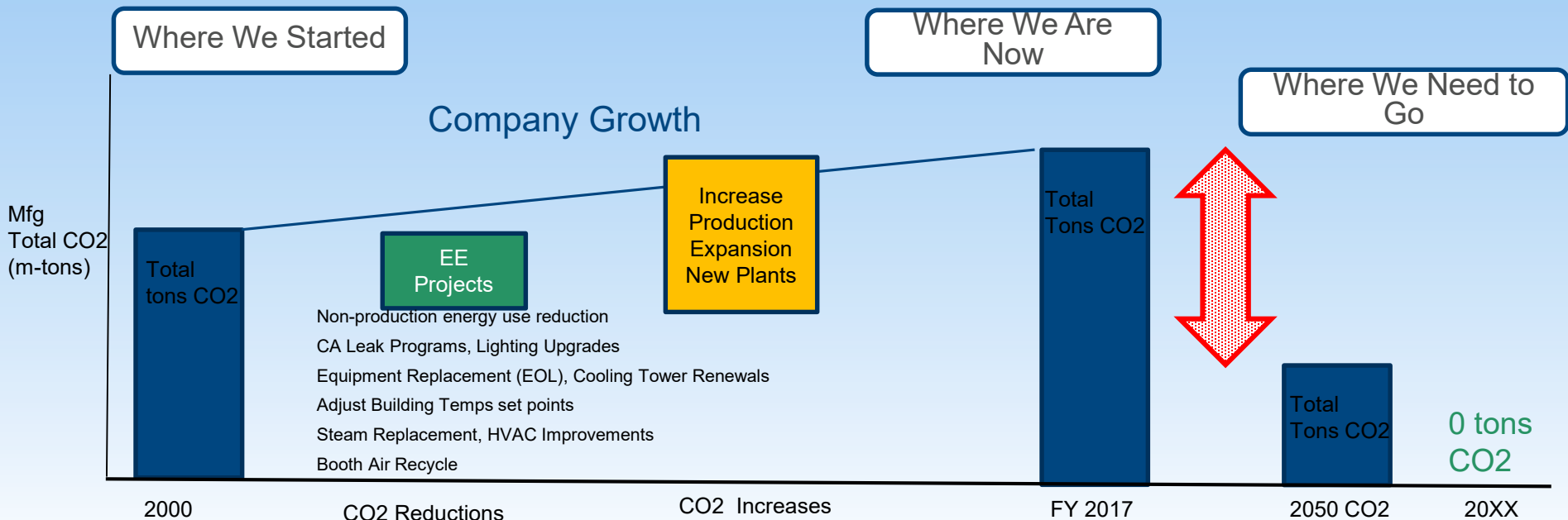


# NA Region – Challenges: Growth

Auto production facilities have combined  
to produce 34.3 million automobiles since 1982

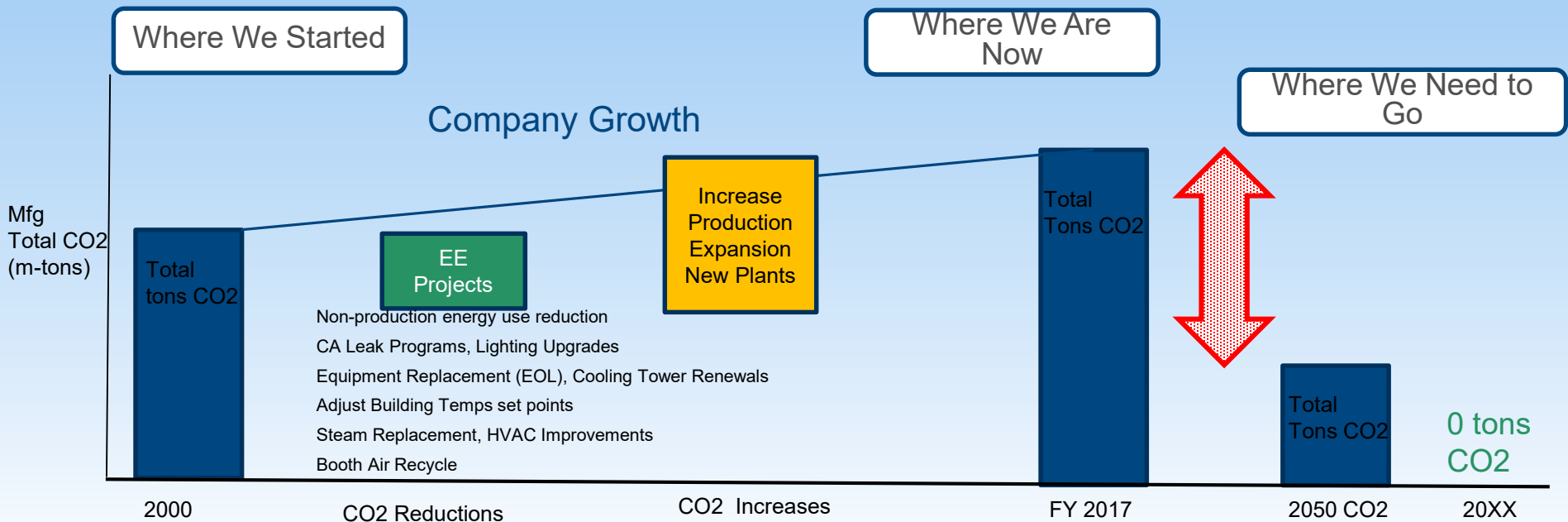
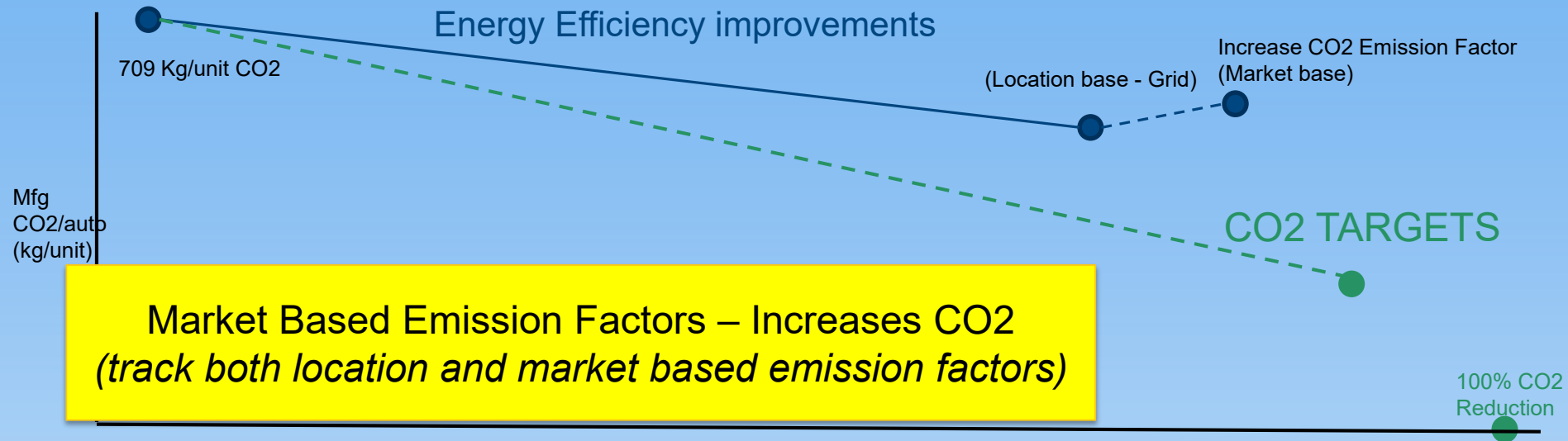


# NA Region – Challenges: Growth



**Growth increased total CO2, but Improved efficiency reduced CO2/unit**

# NA Region – Challenges: Power Supply



**Limited control of Power Supply Fuel Mix**

# NA Region – Challenges: Growth

## Waste from Manufacturing Operations

### SOLID WASTE FROM MANUFACTURING IN NORTH AMERICA

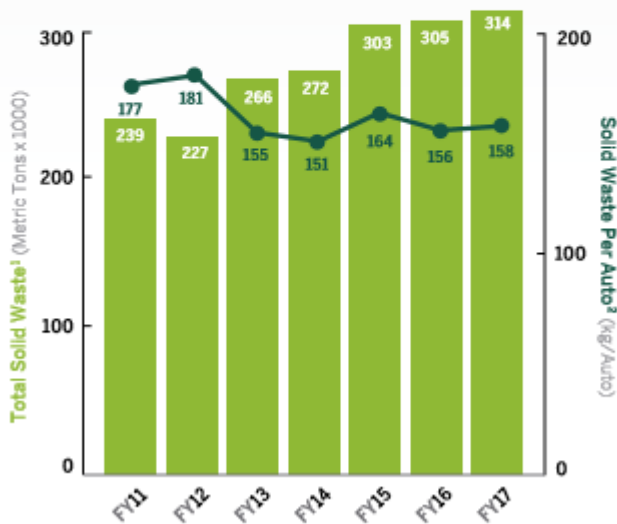
#### FY17 RESULTS

##### Total Solid Waste:

⬆️ 3.0% increase vs. previous year

##### Solid Waste Per Auto:

⬆️ 0.1% increase vs. previous year



## Honda Zero Waste to Landfill Initiative

### LANDFILL WASTE FROM MANUFACTURING FACILITIES IN NORTH AMERICA

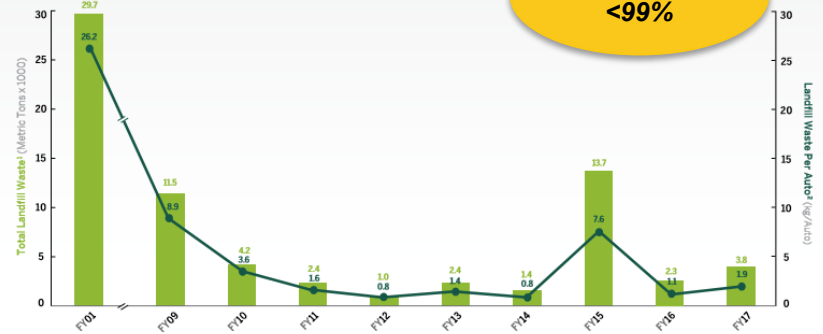
#### FY17 RESULTS

##### Total Landfill Waste:

⬆️ 87% decrease vs. baseline (FY01)  
⬆️ 65.3% increase vs. previous year

##### Landfill Waste Per Auto:

⬆️ 93% decrease vs. baseline (FY01)  
⬆️ 72.7% increase vs. previous year



<sup>1</sup> Total landfill waste includes all automobile, powersports, power equipment and aviation manufacturing operations in North America. Land fill waste at the Guadalajara, Mexico plant is allocated between automobile and motorcycle production based on sales value.

<sup>2</sup> Landfill waste per auto includes all automobile-related manufacturing operations; it does not include powersports, power equipment and aviation manufacturing operations. Landfill waste at the Guadalajara, Mexico plant is allocated between automobile and motorcycle production based on sales value.

### WATER USE IN NORTH AMERICAN MANUFACTURING FACILITIES

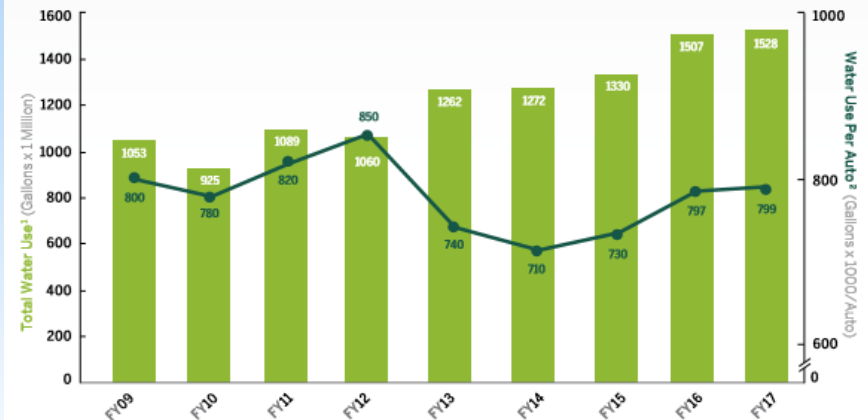
#### FY17 RESULTS

##### Total Water Use:

⬆️ 1.4% increase vs. previous year

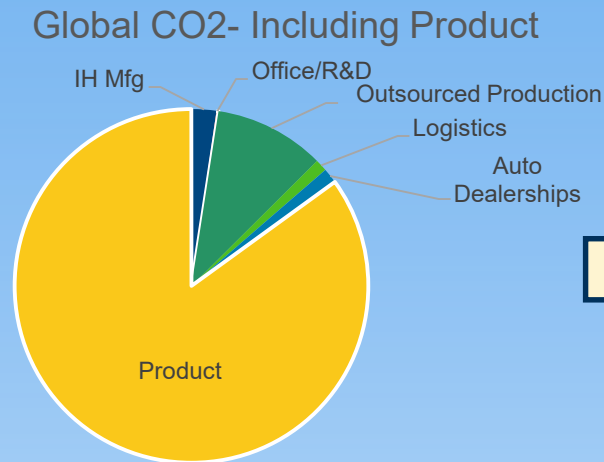
##### Water Use Per Auto:

⬆️ 0.3% increase vs. previous year

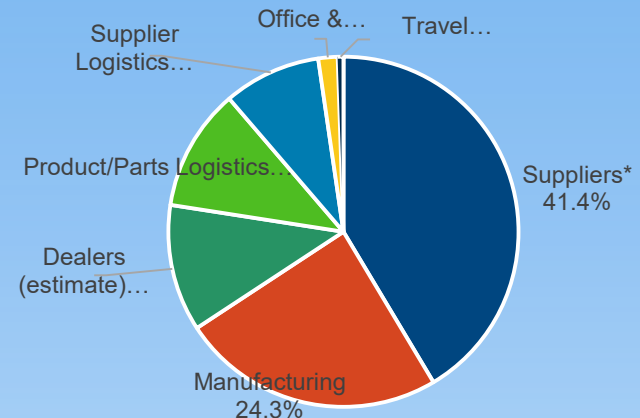


Impact of Growth on Water and Waste

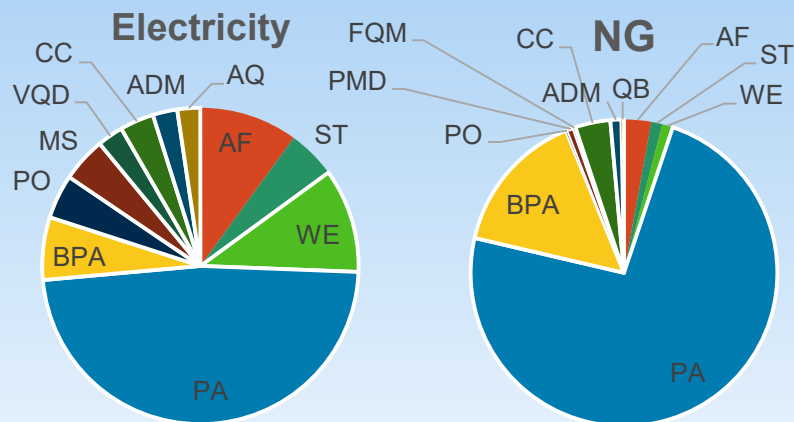
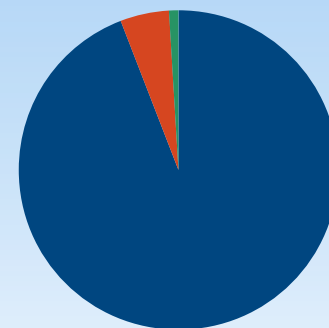
# NA Region – Results



NA Region GHG Emissions by Area  
(Excluding Product)



NA Region CO2 – In-house Mfg



Paint Dept is Largest User of Energy

Study Results to Identify Opportunities



# NA Region – Solutions



Loss Reduction

Energy Efficiency

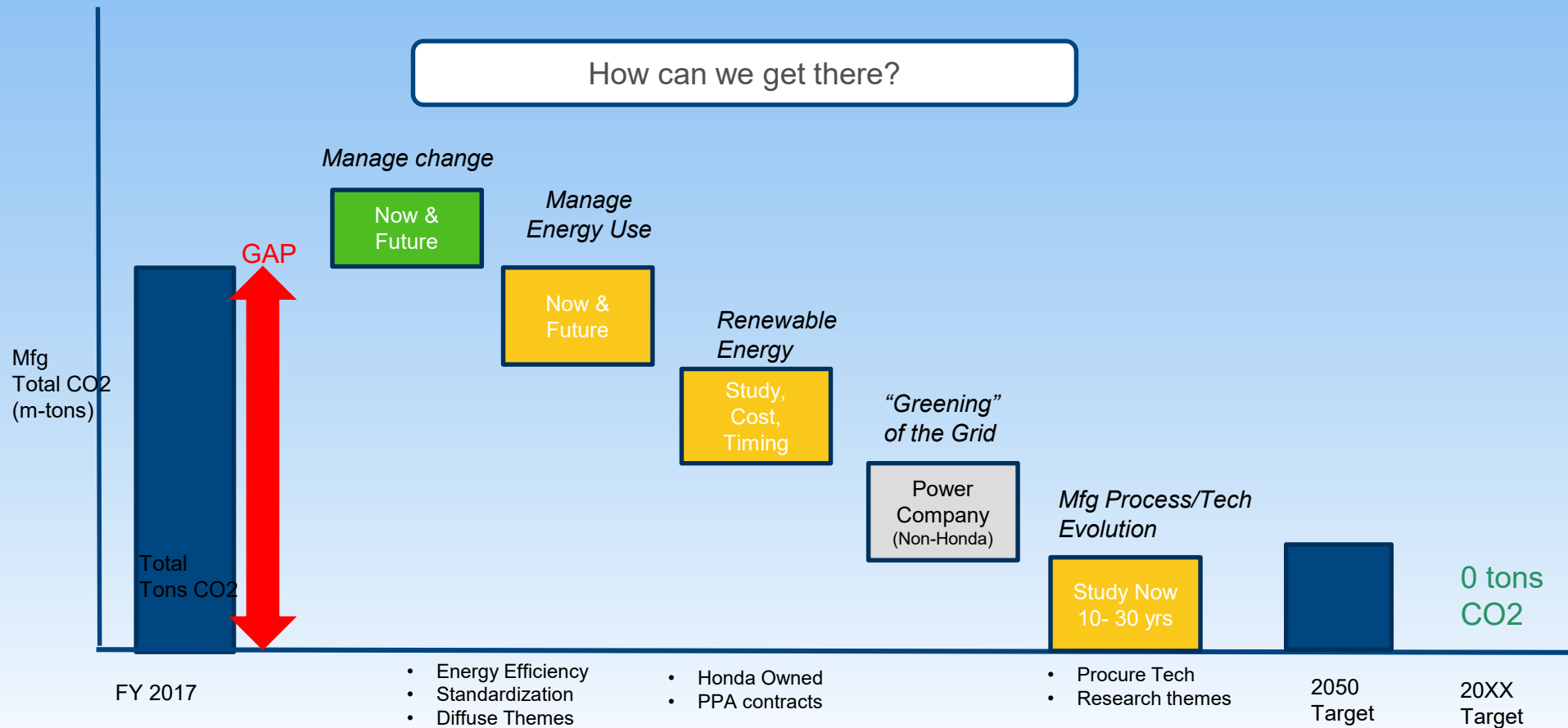
Energy Optimization

Renewable Energy

Manufacturing  
Evolution

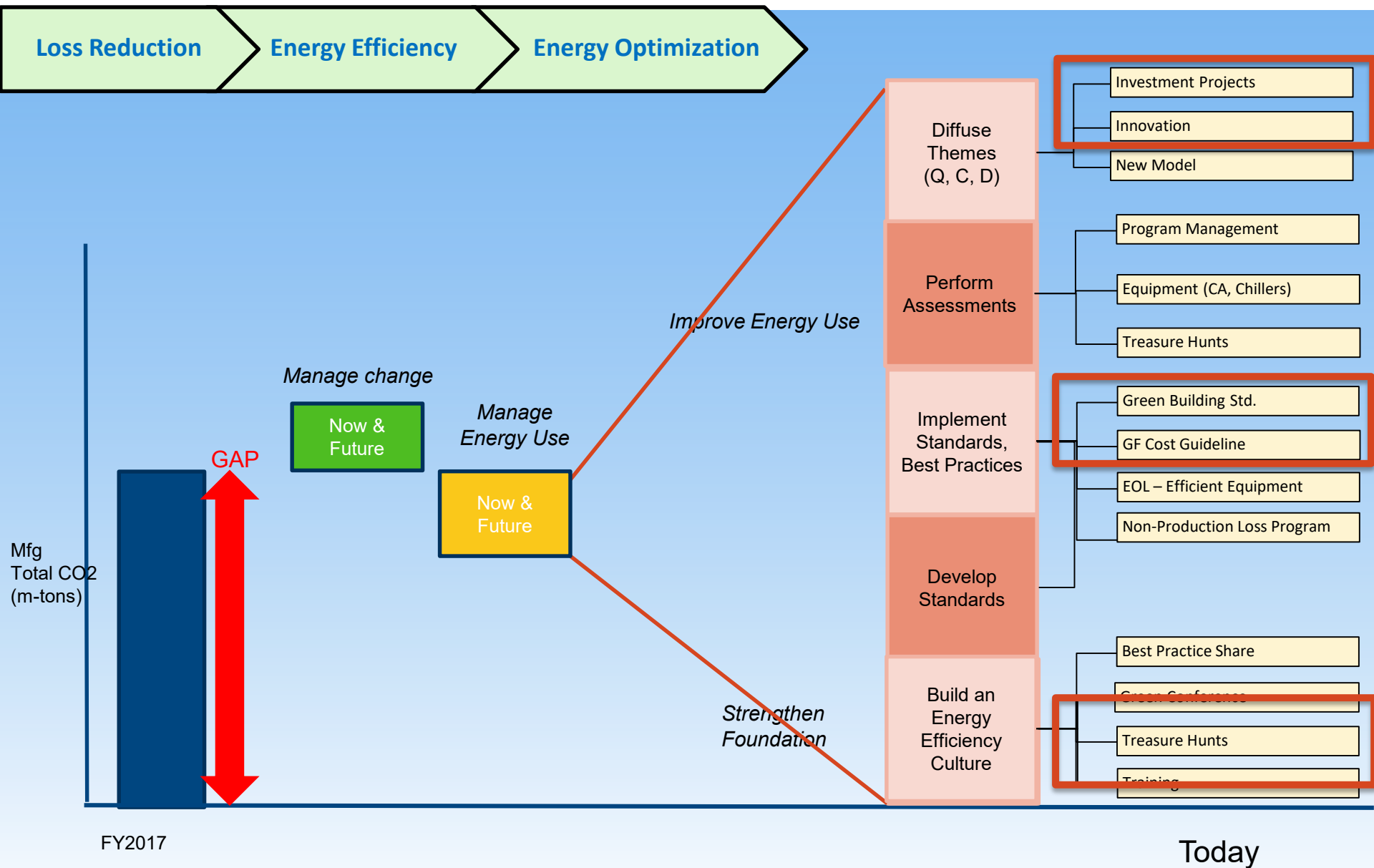
Where We Are Now

How can we get there?



**Strategy to Achieve CO2 Targets**

# NA Region – Solutions



**What can we do Today?**

# Treasure Hunts

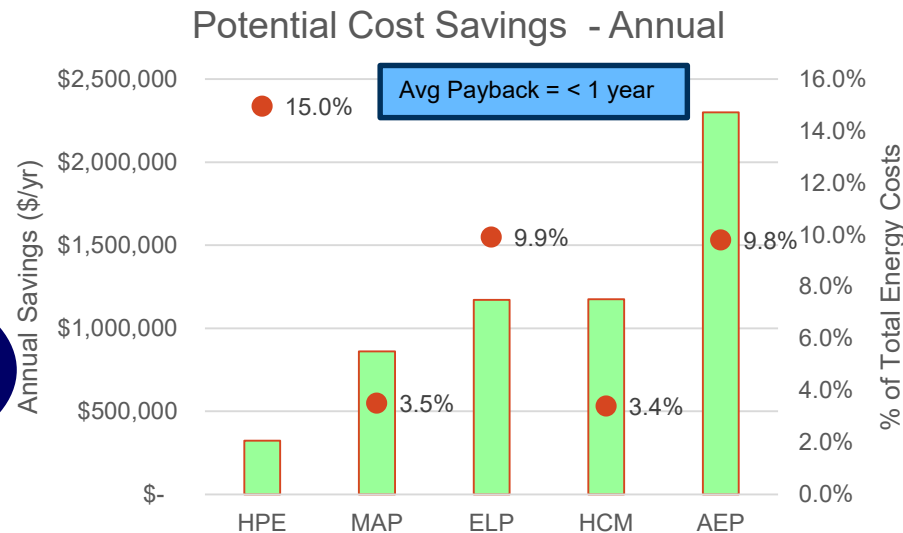
## Treasure Hunt Objectives:

- Identify energy and water saving opportunities
  - ❖ *low cost, no cost*
- Develop an energy efficiency culture
  - ❖ *Teams of associates perform hunts*

Collaboration  
Across  
Companies

### Treasure Hunt – NA “E” Companies

E-Co	Regional Support
HPE	HPE, HAM, HSC, HNA, HRA, H
MAP	HAM, HPE, HNA, HCM
ELP	HAM, HMIN, HTM, HNA, Navistar
HCM	HAM, HNA, HNA-NAP
AEP	HCM, HNA, ELP, MAP, HNA-NAP



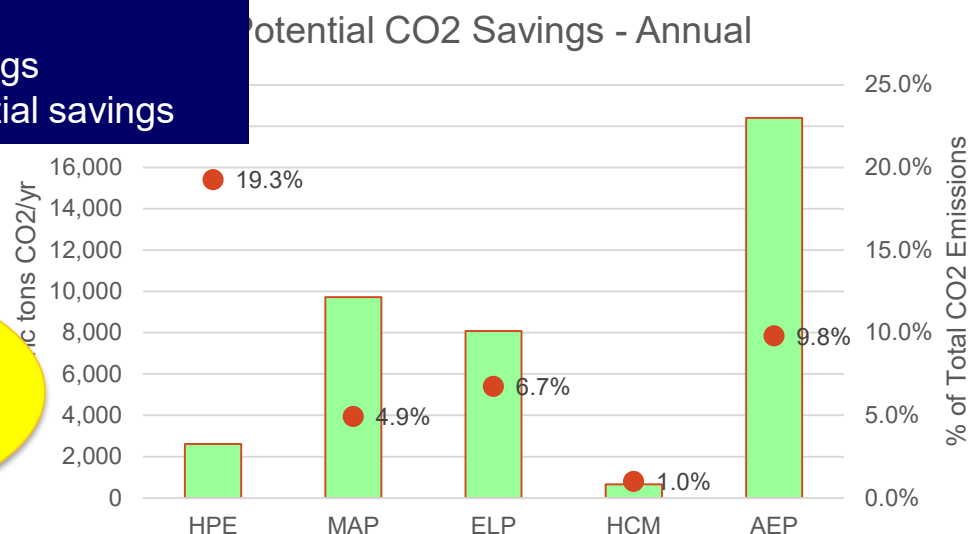
## 3 days each plant (5plants)

- Total: \$5.8 MM/yr Potential savings
- Total: >39,000 mt /yr CO2 potential savings

Challenge:  
Implementation  
(3 days is just the start)

### Treasure Hunt – NA “E”

E-Co	93ki	94ki		
HPE	X			
MAP		X		
ELP		X		
HCM		X		
AEP		X		
HTM			X	
HMIN			X	
HMA		X		
HSC			X	
HDMG				
HDMC				
HACI				
HAI				



**Method to Meet Reduction Targets: Perform Assessments**

# Treasure Hunts – Example Findings

## Team 4: Paint Non-Production HVAC

Four Paint HVACs were left on during the weekend. Can be reduced to two HVAC units left on during non-production hours for shop pressurization and humidity control.

Savings: \$65,474/Year  
Implementation: \$0  
Payback Period: 0 Year



## Team 2: Air Leaks

We found a total of 50 air leaks in the lower level of Paint Plant 2. The majority of these will not take any additional material to repair, just identifying the areas and leaks to maintenance.

Savings: \$73,600/Year  
Implementation: \$4,000  
Payback Period: 0.05 Years



## LED Plant Lighting Conversion

Change out 3,172 metal halide plant lighting fixtures to LED over 3yrs. 205 wattage savings per fixture

Savings: \$440,000/Year  
Implementation: \$1.2 Million  
Payback Period: 2.75 Yrs after completion



Current Fixture  
360 watt



New LED Fixture  
155 watt



Plant Lighting on During non Production

## Team 1: Boilers

Currently, our 3 boilers run at a 200 degree set point no matter what the temperature is outside. Proposed operation will be to change the set point from 200 to 170 degrees in shoulder months (Fall/Spring).

Savings: \$320,399/Year  
Implementation: \$500  
Payback Period: .001 Years



**Common Findings: HVACs & Lighting left on, CA leaks, LED upgrades**

# NA Green Building Standard

Minimum Green Factory standards for new/existing/renovated buildings, including expansions and significant renovations (factories, warehouses, offices)

Honda North America  
Green Building Program



- Building envelope
- HVAC systems
- Lighting
- Energy and water metering
- Commissioning
- Irrigation
- Waste reduction
- Landscaping
- Commissioning Agent >25,000ft<sup>2</sup>

- Conformance Checklist must be completed with every project
- Basis: ASHRAE 90.1 - 2013

## ASHRAE 90.1 State Bldg Codes

HMA	2013
HAM, HTM	2010
HMIN	2007
HSC	2010
HPE, HACI, HAI	2010
HPPG	2010

## % of Total Project

Cost

Estimate

3-5%

Actual NAQC

2%

Commissioning Cost

0.5 – 1.5%

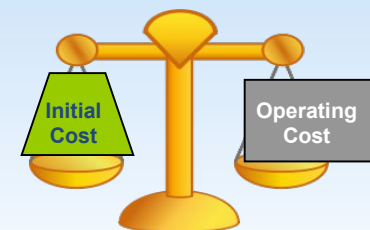
0.6%

Challenge:  
First Cost  
Mentality

Honda NA Green Building Conformance Checklist										
Select Climate Zone for Project Location (Above) Before Proceeding										
Category	Required or Recommended Measure	Design Measure Description	Required Design Condition	Actual Design Condition	Conformance	Description of Alternate Design Measure (If non-compliant w/ green building requirements)				
E1. Energy Modeling	Required	Designate if an energy model is used to: 1) demonstrate compliance with Sections E.2-E.6 using the Energy Cost Budget (ECB) method, or 2) evaluate cost performance of individual ECMs		ECB Compliance Analyze ECMs No Energy Model	<div><div></div><div></div><div></div></div>					
E2. Building Envelope	Required	Roof: (Select applicable types below)	Assembly Max. U-Value Insulation Min. R-Value	Assembly Max. U-Value Insulation Min. R-Value	Yes or No					
		Insulation entirely above deck (min R-value)	Select Zone	Select Zone	No					
		Metal building (min R-value)	Select Zone	Select Zone	No					
		Asph and Other (min R-value)	Select Zone	Select Zone	No					
		Minimum solar reflective index (SRI) for low-sloped roofs, over cooled conditioned spaces for Climate Zones 2 and 3. Provide SRI values for roofs located in other	64		N/A					
		Above Grade Exterior Walls: (Select applicable types below)	Assembly Max. U-Value Insulation Min. R-Value	Assembly Max. U-Value Insulation Min. R-Value	Yes or No					
		Masonry (min R-value)	Select Zone	Select Zone	No					
		Metal building (min R-value)	Select Zone	Select Zone	No					
		Structural frame (min R-value)	Select Zone	Select Zone	No					
		Exterior Opaque Doors: (Select applicable types below)	Assembly Max. U-Value Insulation Max. SHGC	Assembly Max. U-Value Insulation Max. SHGC	Yes or No					
		Swinging doors	Select Zone	Select Zone	N/A					
		Non-swinging	Select Zone	Select Zone	No					
E2. Building Envelope	Required	Metal framed entrance door	Select Zone	Select Zone	No					
		Loading Dock Doors:	Yes or No	Yes or No	Yes or No					
		Equip loading dock doors with weather seals	Yes	Yes	No					
		Use dock levelers with brush type seals	Yes	Yes	No					
		Use inflatable or foam-type hinge seals	Yes	Yes	No					
		Windows: (Select applicable types below)	Assembly Max. U-Value Assembly Max. SHGC	Assembly Max. U-Value Assembly Max. SHGC	Yes or No					
		Fixed non-metal framing	Select Zone	Select Zone	No					
		Fixed metal framing	Select Zone	Select Zone	No					
		Operable metal framing	Select Zone	Select Zone	No					
		Skylights:	Assembly Max. U-Value Assembly Max. SHGC	Assembly Max. U-Value Assembly Max. SHGC	Yes or No					
		All glazing types:	Select Zone	Select Zone	No					
		E2. Building Envelope	Recommended	Use energy modeling to optimize building orientation to reduce cooling/heating	Yes	Yes	No			
Optimize shading features on the building exterior to reduce solar heat gain	Yes			Yes	No					
Target 50% lighting energy reduction using daylighting and photocells	Yes			Yes	No					
AC Unit Type: (select all equipment types that apply)				SEER	SEER	SEER	SEER	Yes or No		
Select Equipment Type								No		
		Select Performance Type						No		

Resource  
Availability

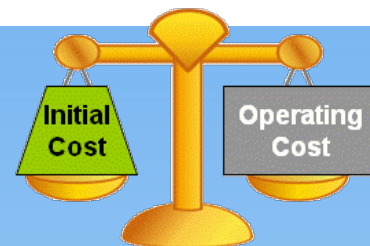
First Cost Mentality



Method to Meet Reduction Targets: Develop Standards



# NA Green Factory Cost Guideline



- Evaluates proposed building and equipment changes with higher first investment cost against their lower operating costs
- It is often difficult or impossible and costs more to retrofit efficiency into buildings and major equipment

*Balances business benefit with long-term greenhouse gas reduction target achievement*

Challenge:  
Educate  
Direction

\$120,000 (Investment Project Cost Difference \$)

\$16,000 (Annual Operating Cost Savings \$)

**Base HVAC Unit Option**

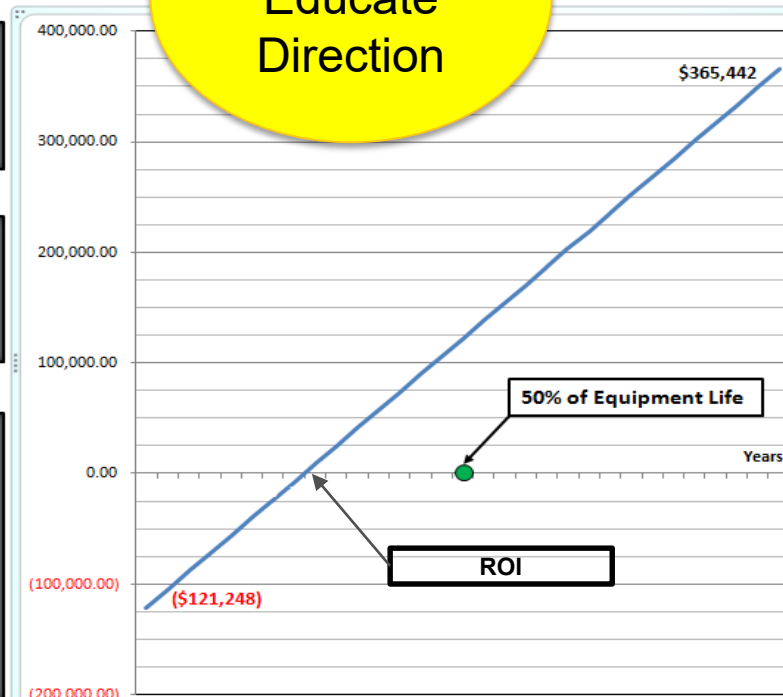
- Equipment Cost: \$111,850
- Project Cost: \$601,765
- Annual Operating Cost: \$41,584
- Annual CO<sub>2</sub> Generation (kg CO<sub>2</sub>): 399,353

**Heat Recovery HVAC Unit Option**

- Equipment Cost: \$218,772
- Project Cost: \$723,013
- Annual Operating Cost: \$25,361
- Annual CO<sub>2</sub> Generation (kg CO<sub>2</sub>): 252,239

**Savings & ROI Information**

- Equipment Cost Difference: \$106,922
- Project Cost Difference: \$121,248
- Annual Operating Savings: \$16,223
- Annual CO<sub>2</sub> Reduction (kg CO<sub>2</sub>): 147,114
- Heat Recovery Unit Premium ROI: 7.47 Years
- Expected Equipment Lifetime: 30 Years
- Heat Recovery Unit Lifetime Savings: \$486,690
- Heat Recovery Unit Lifetime CO<sub>2</sub> Reduction (kg CO<sub>2</sub>): 4,413,420



Simple Payback = 7.5 yr payback (<50% of asset life) ✓

Life of Equipment = 30 yrs

50% of asset life = 15 years ✓

Lifetime Savings = \$365,442

CO<sub>2</sub> reduction = 4,413 m-tons

**1. The simple payback is less than 50% of the asset life**

**2. The improvement results in an immediate reduction in operating cost per unit (CPU)**

**Install equipment IF payback <50% of the asset life**

# MAP New Parts Center - Hydrogen PIVs (powered industrial

vehicles ie: forklifts, tuggers)



## Traditional Approach PIVs powered by

- Batteries requiring large charging stations and
- Propane creating emissions removed by HVAC systems (required 100% outside air circulation)



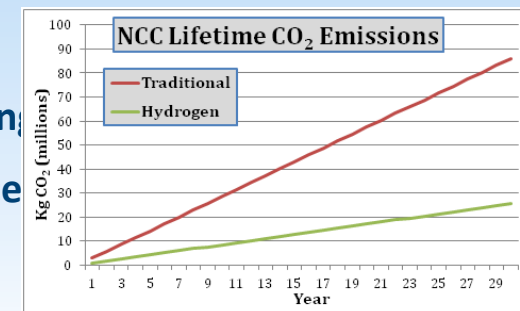
## New Approach:

- Utilize hydrogen fuel cell PIVs to eliminate the onsite generation of CO<sub>2</sub>
- With no onsite emissions, the HVAC system needed was smaller, less expensive & consumes less energy (requires < 20% outside air circulation)
- Fleet of 19 Forklifts & 32 Tow motors of H<sub>2</sub> fuel cells



## Impact:

- Reduced CO<sub>2</sub> (70% CO<sub>2</sub>/unit avoidance) – HVAC, Forklift, Battery Charging
- Reduce Cost (12% operation cost savings + ~\$1MM investment avoidance
- Reduced manpower (less battery charge time)

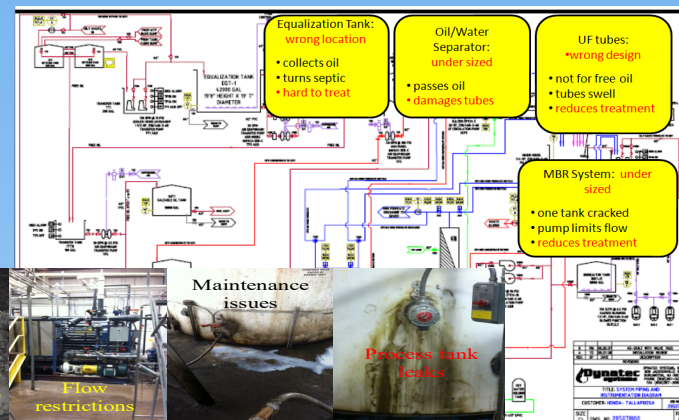


**Method to Meet Reduction Targets: During Investment Projects**

# HPPG Wastewater Recycle – Zero Discharge

## Situation WWT Plant 3rd party owned & operated

- Over capacity, off-site treatment (cost/risk)
- No potential for future growth
- Not meeting performance requirements



## Objective:

- Modify equipment to address capacity and performance concerns, but go one step further.....
- Install treatment equipment designed to **Recycle** the treated wastewater back into the plant....**“Zero Discharge”**

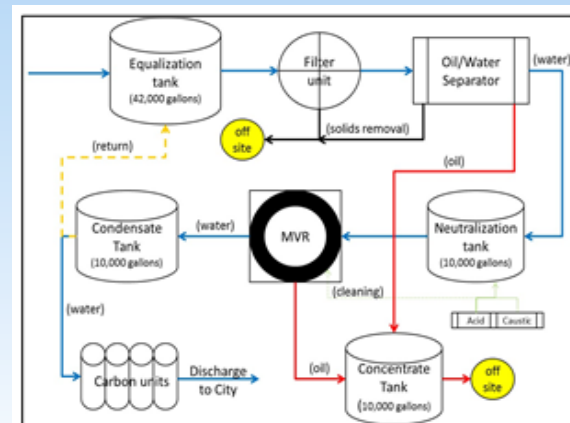


## Method:

**Mechanical Vapor Recovery (MVR) Evaporation – MVR mfg’s 1<sup>st</sup> industrial WW application**

## Impact:

- Reduces risk, allows for future growth
- Compact design (vs traditional evap) – lowers energy usage (20%)
- Saves 3,000,000 gallons/yr
- Reduce Cost (\$170,000/yr) – water, O&M, Offsite treatment



**Method to Meet Reduction Targets: During Investment Projects**



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## Final Thoughts: Keys to an Successful Environmental Program

1. *Collaboration between Corporate (global, regional) and the Manufacturing Plants (Plants GF Leaders) results in the most effective & best solutions to challenges*
2. *Always look for ways to improve telling and selling the environmental story to Management (they want to do the right thing, but they need to also see the positive impacts to the business)*
3. *Identify and implement change, but remember, it takes work to maintain. (If the program or solution are too complex, is it sustainable?)*



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## Questions?

<http://csr.honda.com/environment/>

<http://world.honda.com/sustainability/>

<http://world.honda.com/environment/>