OVERVIEW OF GM MANUFACTURING

- Design, build and sell the world’s best vehicles
- Building 10 million vehicles per year = $1.2 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 has a commitment to the environment and sustainability that applies to every part of our business – from our supply chain, to product manufacturing, to the vehicles we put on the road.

We’re continually assessing our environmental impact and taking steps to reduce it.
WE STRIVE TO REDUCE EMISSIONS AND PETROLEUM DEPENDENCE BY BEING MORE ENERGY EFFICIENT.

Energy Star® Certified
- 2 Assembly
- 5 Warehouses
- 1 Office

Reduce Use
Renewable Energy
Fuel Switching

2014
11% less energy since 2010

Energy Intensity*

Carbon Intensity*

RESULTS SINCE 1995 PARTNERSHIP BEGAN

GENERAL MOTORS

ENERGY STAR® CERTIFIED

$435 MILLION
41% Carbon emissions intensity reduction

163 MILLION TREES
Equivalent carbon storage

875 THOUSAND HOMES
Equivalent annual electricity use

Energy cost avoidance

40% Energy intensity reduction

11% less energy since 2010

 GENERAL MOTORS
RENEWABLE ENERGY – 125 MW

We believe in harnessing the power of renewable and alternative energy and we’re one of the leading users in the manufacturing sector.

Solar

Biomass

Landfill Gas

SOLAR POWER – UNITED STATES
- Named “Solar Champion” for promoting renewable energy
- More U.S. solar installations than any other automaker
- Ranked top 25 of all commercial solar energy users in U.S.

SOLAR POWER – ZARAGOZA, SPAIN
- Our Zaragoza assembly plant was the world’s largest industrial rooftop solar installation until 2012.
PRESERVE NATURAL RESOURCES

WE PRESERVE NATURAL RESOURCES AND ENHANCE HABITATS SURROUNDING OUR FACILITIES.

Reduce Water Use
Habitat Enhancement
Watershed Education

Global Water Intensity

<table>
<thead>
<tr>
<th>Year</th>
<th>Water Intensity (L/Vehicle)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>4.84</td>
</tr>
<tr>
<td>2011</td>
<td>4.69</td>
</tr>
<tr>
<td>2012</td>
<td>4.62</td>
</tr>
<tr>
<td>2013</td>
<td>4.39</td>
</tr>
<tr>
<td>2014</td>
<td>4.31</td>
</tr>
<tr>
<td>2020</td>
<td>4.09</td>
</tr>
</tbody>
</table>

Habitat Enhancement

40 sites certified by: WILDLIFE HABITAT COUNCIL

GM GREEN WATERSHED EDUCATION - 25 YEARS -

5,000 acres dedicated
WASTE REDUCTION – REDUCE, REUSE, RECYCLE

GM’s 122 LANDFILL-FREE FACILITIES

![World map showing GM’s 122 landfill-free facilities across North America, Asia Pacific, Europe, South America, and Africa.]

North America: 55
Asia Pacific: 35
Europe: 23
South America: 8
Africa: 1

85% MANUFACTURING WASTE RECYCLED

1 TRASH BAG = More waste than GM’s 122 facilities combined

Buick Verano
Recycled cardboard used in headliner

GMC Sierra
Plastic caps and shipping aids used in radiator shrouds

Chevrolet Volt
Old tires used in air and water filters

43% total waste reduction from 2000-2010
23% total waste reduced from 2010-2013
73% of non-recycled waste reduced since 2000
COMMUNITY ENGAGEMENT

Shipping Crates = Raised Urban Garden Beds

1,200 shipping crates from Orion Assembly turned into raised beds

Provides nearby residents and soup kitchens with nutritious, locally grown food

4,000 yards of sound absorption material donated from production of Malibu and Verano sedans

Empowerment Plan coats that transform into sleeping bags for the homeless.

CHEVROLET CARBON REDUCTION PROJECT
U.S. 5-Year Clean Energy Projects

GOAL
8 MILLION METRIC TONS CO₂ REDUCTION

= Emissions from 1.9 M Chevrolet's sold from 11/18/10 - 12/31/11

INVESTMENT
$40 MILLION
GREENER VEHICLES – FUEL ECONOMY

WE’RE BUILDING FUEL-EFFICIENT VEHICLES THAT FIT OUR CUSTOMERS’ NEEDS AND LIFESTYLES.

PATENT
Research & Development

Fuel Economy

Energy Diversity

Goals to reduce CO2e from vehicles per mile
- US – 15% reduction by 2016
- EU – 27% by 2020

CHEVROLET VOLT
World’s first mass-produced vehicle with extended-range capability
- 38 Miles Battery Electric Driving
- 342 Miles Extended Range Driving

FUEL EFFICIENCY
Improvement since 1970s
- 180% FOR CARS
- 93% FOR TRUCKS
What is needed to be successful?
- Top leadership support
- Resources (dedicated people and budget)
- Establish Energy as a pillar of business plan

Tool kit for implementation
- Benchmarking*, Goals, and Scorecards
- Meter data, dashboards
- Continuous commissioning
- Budgeting and forecast
- Energy Savings Project Implementation Process
- Recognition

GM has been an Energy Star® partner for 20 years
### GM’S GLOBAL MANUFACTURING SYSTEM

**Plan, Do, Check, Act aligns with Energy Star® guidelines**

Each of the 5 GM-GMS Principles is supported by key elements. There are 29 GM-GMS Elements.

#### People Involvement
1. Vision, Mission
2. Health & Safety
3. Qualified People
4. Team Concept
5. Engagement
6. Open Communication
7. Shop Floor Management

#### Standardization
8. Workplace Organization
9. Management By Takt Time
10. Standardized Work

#### Built-In Quality
11. Quality Standards
12. Process & Product Validation
13. In-Process Control & Verification
14. Quality Feedback/Feedforward
15. Quality Management System

#### Short Lead Time
16. Simple Process Flow
17. Pull Systems
18. Lean Containerization
19. Level Scheduling & Fixed Period Orders
20. Controlled External Transportation
21. Scheduled Shipping / Receiving
22. Temporary Material Storage
23. Supply Chain Management

#### Continuous Improvement
24. Business Plan Deployment
25. Problem Solving
26. Lean Design
27. Andon Concept/Process
28. Total Productive Maintenance
29. Continuous Improvement Process

### GOALS

<table>
<thead>
<tr>
<th>Specific OBJECTIVES</th>
<th>Clear &amp; Measurable TARGETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SMART Targets: Specific, Measurable, Aligned, Realistic &amp; Timed</td>
</tr>
</tbody>
</table>

A scheduled **METHOD** to reach the targets

### In GMS, E-Metric or Environmental / Energy is managed along with our Business Plan in “Continuous Improvement”

- **S** Continue Safety Leadership
- **P** Engaged & Qualified Work Force
- **Q** Segment Leaders by 2012
- **R** Meet Customer Demand
- **C** Regain Profitability
- **E** Industry Leader in Environmental Systems

**Goal**

<table>
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<tr>
<th>S</th>
<th>Continue Safety Leadership</th>
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<tr>
<td>P</td>
<td>Engaged &amp; Qualified Work Force</td>
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<tr>
<td>Q</td>
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<tr>
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<tr>
<td>E</td>
<td>Industry Leader in Environmental Systems</td>
</tr>
</tbody>
</table>

**MWh/Unit**

**Why – Vision & Mission**

**What – Goals & Objectives**

**Where – Focus on where value is added**

**When – Schedule and Control points**

**How – Methods**

**Who – Responsible & Support**
PRIORITIZE ASSEMBLY & PAINTING OPERATIONS

Painting: 50% of energy & 70% water use

- Recycle air to automated zones
- Design in efficiency—fans, pumps
- Three-wet paint process
- Automated shutdown

PAINT OPERATIONS ARE 70% OF ASSEMBLY ENERGY

Energy Percentage in Manufacturing

- Assembly: 69%
- Machining: 15%
- Foundry: 9%
- Parts, Stamping: 3%

GALENT MOTORS
ENERGY & CARBON FACILITY STRATEGY

**Renewable Energy**
- 125 MW
- Hosting
- PPAs

**Fuel Switching**
- Steam elimination or reduction using direct fired gas
- Convert boilers to eliminate coal – Wentzville (52,000) tons CO2e
- Purchase steam – Hamtramck (57,000) tons CO2e, (35%) adds 16 MW renewable

**Energy – Efficiency/Conservation**
- Design in efficiency – lean design engineering guidelines
- SMEs on new project teams
- LEED principles as guidance
- Dedicated budget for energy projects and Performance Contracting – $30M or 5%
- Targets set for plants to meet public goals, ($ and MWh/vehicle)
- Sufficiency plans to meet target
- Hourly, daily dashboard
- Monthly scorecards
Identified important energy metrics and targets:

- Heat/Cool Energy
- Fan Energy
- Outside Air Index and Rate
- Run Times
- Set Points
- Supply Air Index and Rate
- Energy Metrics

Roll-up to company-wide data or drill down to air handling unit.

2.5 million data points each minute into perspective.

Monthly Energy, GHG, & Water Scorecard

- Too late to react
- Need daily/hourly feedback

Continuous Commissioning HVAC provides saving $4M for (6) month payback.

Daily pro-rated information for 07/29/2013:

<table>
<thead>
<tr>
<th>Resource</th>
<th>Daily Actual</th>
<th>Daily Target</th>
<th>MTD Actual</th>
<th>MTD Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>0.46</td>
<td>0.61</td>
<td>0.77</td>
<td>0.61</td>
</tr>
<tr>
<td>Heating</td>
<td>0.32</td>
<td>0.83</td>
<td>0.44</td>
<td>0.83</td>
</tr>
<tr>
<td>Total</td>
<td>0.78</td>
<td>1.44</td>
<td>1.21</td>
<td>1.44</td>
</tr>
</tbody>
</table>
GM ENERGY PROJECT FUNDING METHOD

Less than 2 year Payback

- Dedicated fund each year
  - $15-20M average
- Net the payback with utility incentives
  - Averaging $4M
- Prioritize on quick payback
- Remove savings in next year's budget

Greater than 2 year Payback

- Energy Performance Contracting (shared savings)
  - $15-20M per year
- Life Cycle cost savings on new installations
  - Product programs
  - Asset sustainment
## NATURAL CAPITAL - VALUE OF ENERGY SAVINGS PROJECTS
### 2014 GM GLOBAL INITIATIVES

<table>
<thead>
<tr>
<th>Activity type</th>
<th>Description of activity</th>
<th>CO2e savings, Tons</th>
<th>Monetary savings, USD</th>
<th>Investment required, USD</th>
<th>PAYBACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral change</td>
<td>Reduce pre-start time for plant operations prior to production, repair air leaks, and improve cold shutdown.</td>
<td>24,049</td>
<td>$1,740,905</td>
<td>$5,000</td>
<td>0.0</td>
</tr>
<tr>
<td>Process emissions reductions</td>
<td>De-humidification of hot blast air for a cupola to reduce coke use.</td>
<td>6,858</td>
<td>$316,000</td>
<td>$150,000</td>
<td>0.5</td>
</tr>
<tr>
<td>Low carbon energy installation</td>
<td>Converted 3 boilers from coal to natural gas, install pipeline to purchase steam from renewable source and decommission coal fired boilers, and install PV system for building.</td>
<td>53,735</td>
<td>$5,003,702</td>
<td>$5,518,810</td>
<td>1.1</td>
</tr>
<tr>
<td>Energy efficiency: Processes</td>
<td>Install direct fired gas burners on paint booth air supply units to replace steam, process pump VSD controls, automate process shutdown controls...</td>
<td>86,846</td>
<td>$10,844,417</td>
<td>$14,157,656</td>
<td>1.3</td>
</tr>
<tr>
<td>Energy efficiency: Building fabric</td>
<td>Infiltration reduction and increasing R-values in building roof, windows, and walls.</td>
<td>6,298</td>
<td>$664,778</td>
<td>$911,267</td>
<td>1.4</td>
</tr>
<tr>
<td>Energy efficiency: Building services</td>
<td>Lighting upgrades to LED with controls, VSDs on motors, HVAC controls, and conversion from steam to natural gas heat.</td>
<td>148,444</td>
<td>$31,993,697</td>
<td>$83,120,992</td>
<td>2.6</td>
</tr>
</tbody>
</table>

**Carbon Equivalent Savings**
- 45,000 Homes electric
- Hiawatha National Forest, MI

**Monetary Savings**
- $104M @ 2 Year payback
BENEFITS OF PARTNERSHIP RECOGNITION

External Recognition

- Best practice sharing
- Lessons learned
- Industry experts

- GM - 73 plants met Challenge
- Partner of the Year award – 4 years in a row
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Global Energy Manager
alfred.j.hildreth@gm.com