



GM Energy Management & Savings Opportunities

Al Hildreth

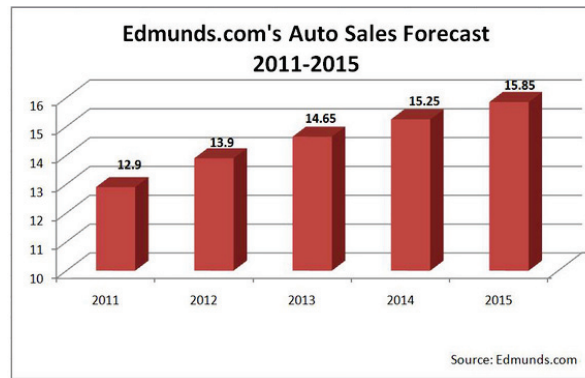
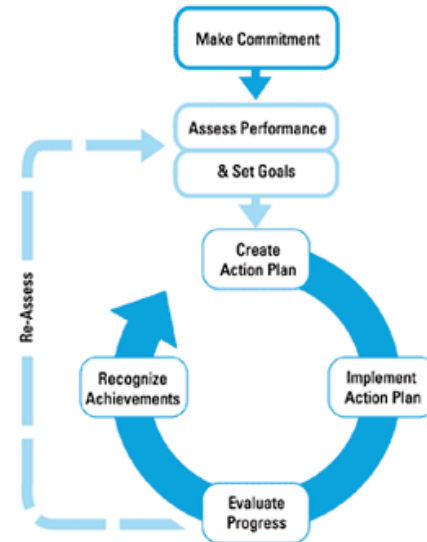
General Motors

Company Energy Manager

11-January-2012

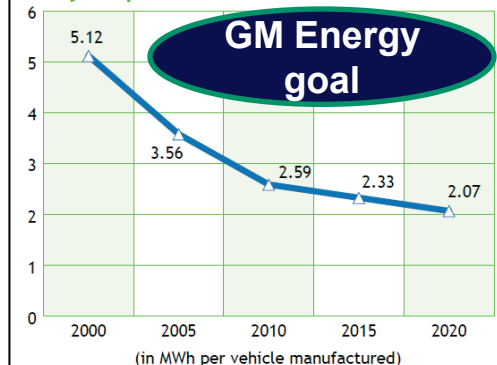
Elements of Successful Energy Management

1. Commitment
2. Assess Performance & Set Goals
3. Action Plan
4. Evaluate Progress
5. Recognize Achievements
6. Continuous Improvement



Forecasted 23% increase in US

1. Reduce energy intensity from facilities by 20 percent.*



Includes all manufacturing and nonmanufacturing facility energy use, normalized by vehicle production (correlates to CO₂ scopes). This data includes data from some GM JVs.

~ \$ 1 Billion
annual spend

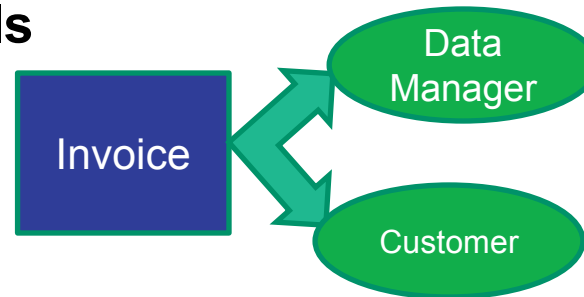


Elements of Successful Energy Management

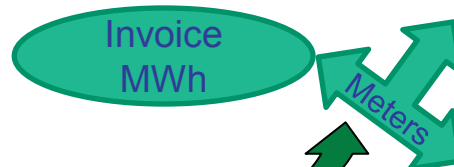
GM2100 GLOBAL UTILITIES INFORMATION SYSTEM

Assess Performance & Set Goals

- Measure
 - Energy, Water, Carbon data
- Normalize – Vehicles, Engines...
- Benchmark internal / external
- Set Monthly / Annual Intensity goals
 - MWh/Vehicle
- Interval Meter data
 - Manage hourly

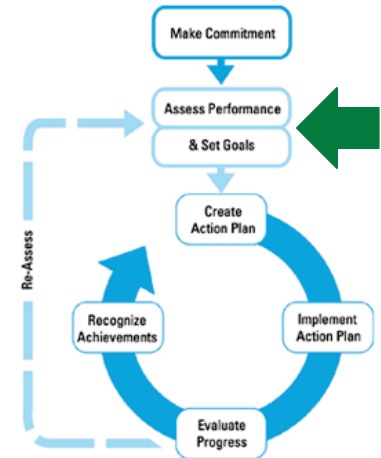


- Scan Invoices
- Validate
- Extract data
- Track production



Dept A

Dept B



Measure
Energy Use

Benchmark

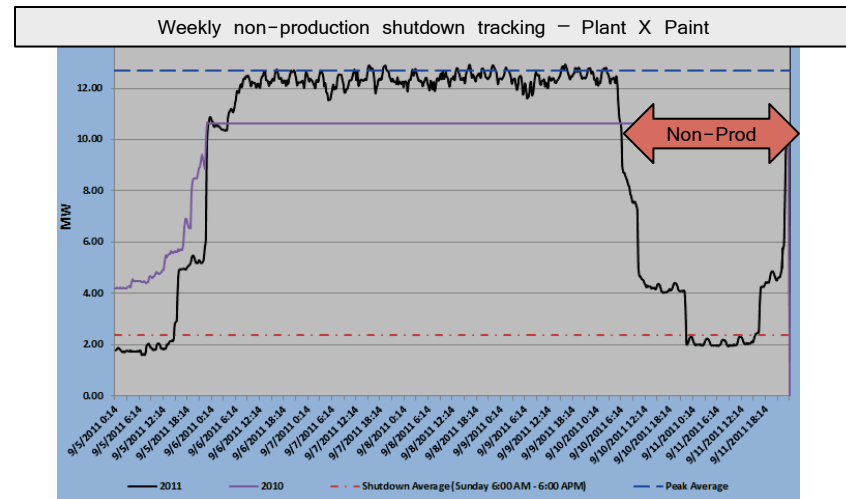
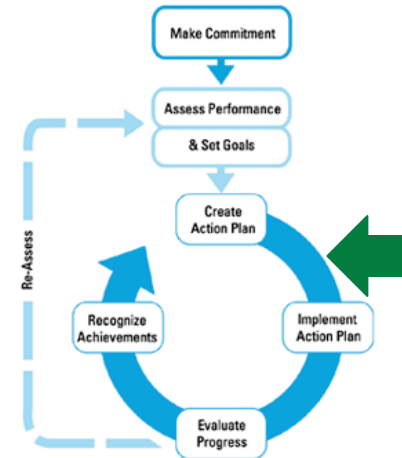
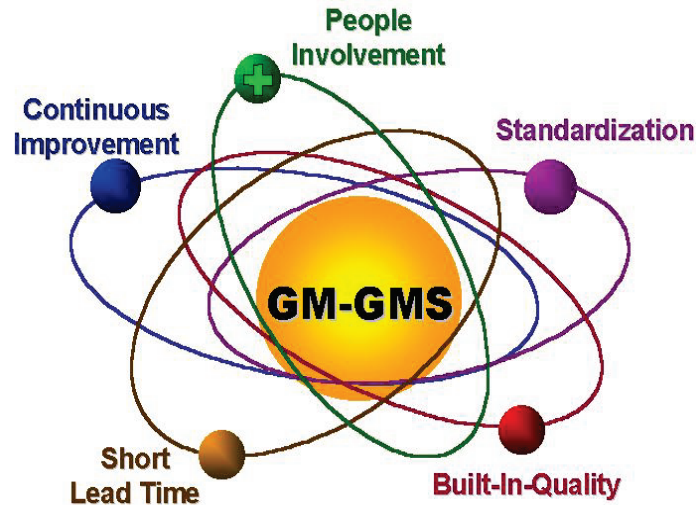
Set Intensity Goals



Elements of Successful Energy Management

Action Plan

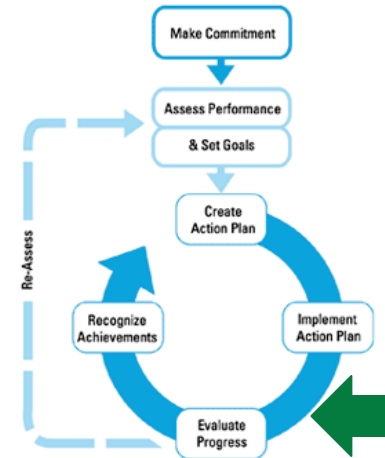
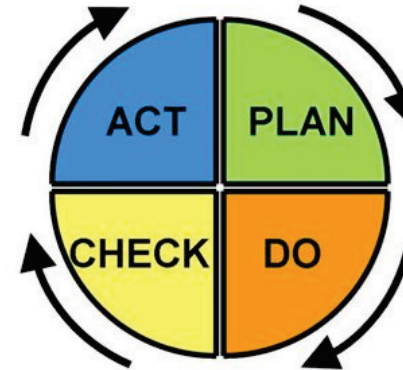
- Integrate into Business Plan
(Plan, Do, Check, Act)
- Set Objectives to meet goals
 - Energy Efficiency projects
 - Conservation initiatives
 - Effective shutdown
 - Eliminate Waste
 - Employee involvement



Elements of Successful Energy Management

Evaluate Progress

- Measure and Communicate Energy use
 - Hourly dashboard
 - Weekly shutdown results
 - Monthly Intensity compared to target
 - Scorecard – Green, Yellow, Red
- Develop countermeasures for Yellow or Red



	Energy per Unit Production (MWh/Unit)						Water per Unit Production (M³/Unit)					
	Monthly Energy			YTD Energy			Monthly Water			YTD Water		
	Actual	Target	Status	Actual	Target	Status	Actual	Target	Status	Actual	Target	Status
GMNA Total	1.236	1.282	●	1.517	1.579	●	2.182	2.327	●	2.138	2.212	●
Assembly	0.812	0.824	●	0.968	1.004	●	1.661	1.819	●	1.671	1.738	●
Plant 1	0.786	0.787	●	0.842	0.840	▲	1.876	2.078	●	1.557	1.984	●
Plant 2	1.850	1.905	●	2.589	2.687	●	5.192	4.803	✗	5.487	5.427	▲
Plant 3	0.354	0.443	●	0.553	0.616	●	1.008	1.349	●	1.127	1.305	●
Plant 4	0.606	0.678	●	0.753	0.788	●	1.823	1.749	▲	1.651	1.749	●
Plant 5	0.774	1.006	●	1.415	1.488	●	2.115	2.258	●	2.362	2.432	●
Plant 6	0.591	0.669	●	0.890	0.912	●	1.390	1.392	●	1.561	1.435	✗
Plant 7	2.877	4.850	●	3.755	4.180	●	10.443	12.047	●	6.574	6.787	●
Plant 8	0.540	0.582	●	0.672	0.688	●	1.269	1.334	●	1.358	1.349	▲
Plant 9	1.526	1.215	✗	1.816	1.809	▲	2.410	1.782	✗	2.236	2.060	✗
Plant 10	0.621	0.887	●	1.010	1.147	●	1.586	1.783	●	1.818	1.683	✗



GM is Transforming its Facilities

Our facilities are demonstrating **environmental stewardship** through...

Continuous
Improvement

- **Energy Efficiency & Renewable Energy Use**
- **Resource Conservation**
- **Waste Reduction**

Did You Know?

- Over half of GM's manufacturing facilities are landfill free.
- Avoided 3.8 Million metric tons CO2



Driving Energy Efficiency



26% Less carbon **emissions**
between 2005 and
2010*

28% Less **energy use**
globally between
2005 and 2010*

\$40 Million USD toward clean
projects to reduce
8 million metric tons of CO₂

*On a per vehicle
produced basis

Did You Know?

GM's global energy conservation efforts for the last 5 years have saved enough electricity to power **1.3 MILLION homes.**



Methods to achieve energy savings

Strategic:

Use capital equipment investment for long term improvements

- \$600 Million re-tool Orion Assembly to make small cars

- ☐ New Energy efficient, high quality Paint facility

- ❖ Efficient paint technology – 3 wet, eliminates an oven
- ❖ Eliminated steam heat, use direct fired gas
- ❖ Energy efficient building systems – lighting, controls

Tactical:

- Integrate energy management into business processes
- Annual expense spending, including utility incentives - \$15M
 - ☐ Heating ventilation improvements and controls
 - ☐ Efficient lighting, variable frequency drives for pumps...



Less CO₂

- Energy
- Fuel
- Renewable



Renewables - Solar Power, Landfill Gas

- We're one of the leading users of renewable energy in the manufacturing sector.
- In the U.S. alone, 1.4% of our U.S. energy consumption comes from renewable resources.
- We house nearly 30 megawatts of solar power at seven facilities, with plans to double output to 60 megawatts by 2015. We are the home of:
 - California's first "large" rooftop solar array
 - The world's largest industrial rooftop installation in Zaragoza, Spain
 - The largest photovoltaic solar array in Southeast Michigan at Detroit Hamtramck Assembly.
 - Seven facilities have solar charging canopies on their grounds.



Turning Trash into Energy

- **We're the second largest industrial user of landfill gas in the United States.**
- **Four of our manufacturing facilities use it as an energy source, generating \$5 million in savings in 2010.**
 - **At Orion Assembly, landfill gas saves GM \$1.1 million a year in energy costs, while cutting greenhouse gases, sulfur dioxide and nitrogen oxides.**
 - **Boilers converted from coal**
 - **Regenerative Thermal Oxidizer**

