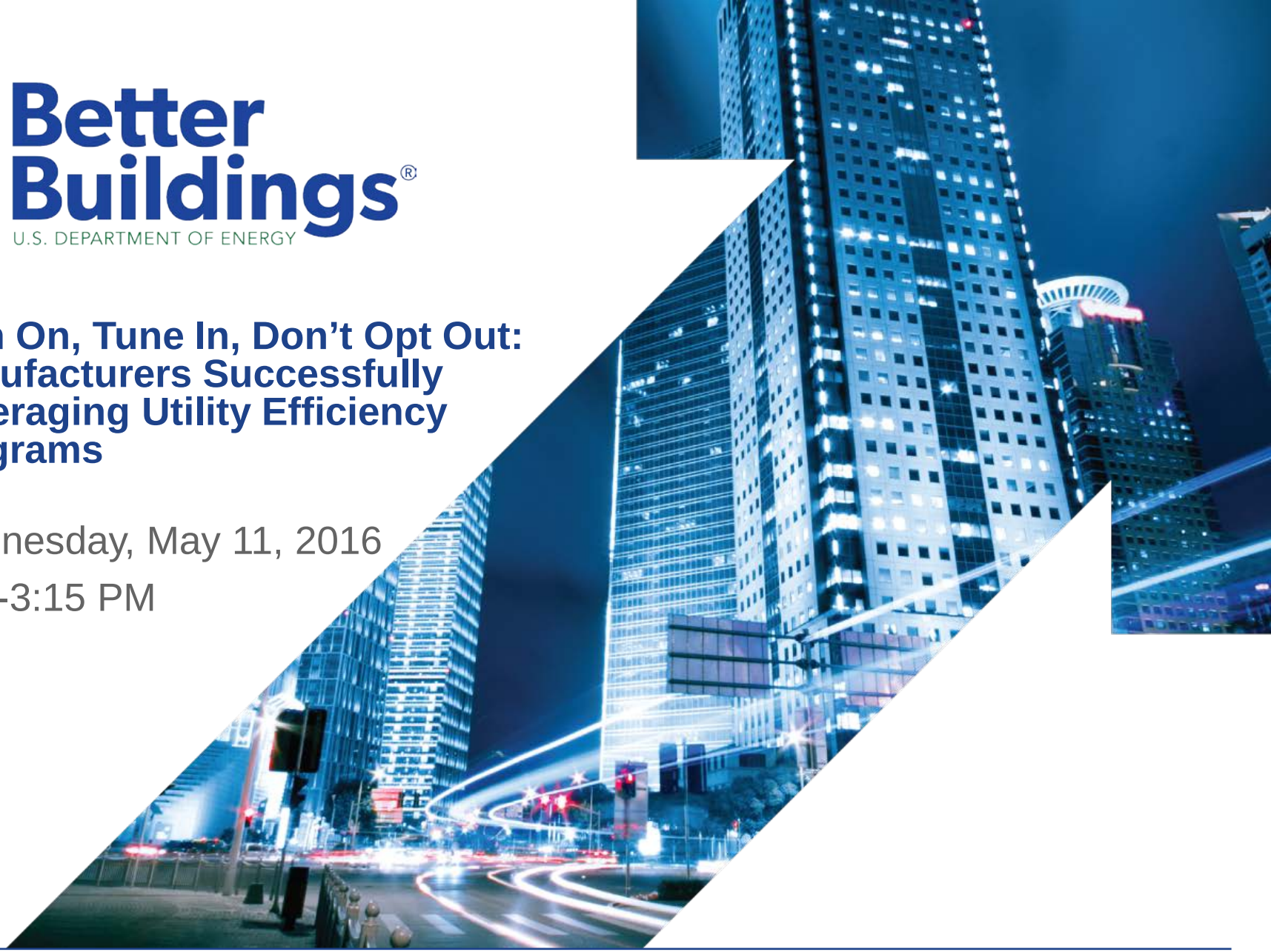
Better Buildings®
U.S. DEPARTMENT OF ENERGY

Turn On, Tune In, Don't Opt Out: Manufacturers Successfully Leveraging Utility Efficiency Programs

Wednesday, May 11, 2016

2:00-3:15 PM



U.S. DEPARTMENT OF ENERGY

RATE PAYER BASED UTILITY INCENTIVES

2016 U.S. Department of Energy Better Buildings Better Plants

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

May, 11 2016

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

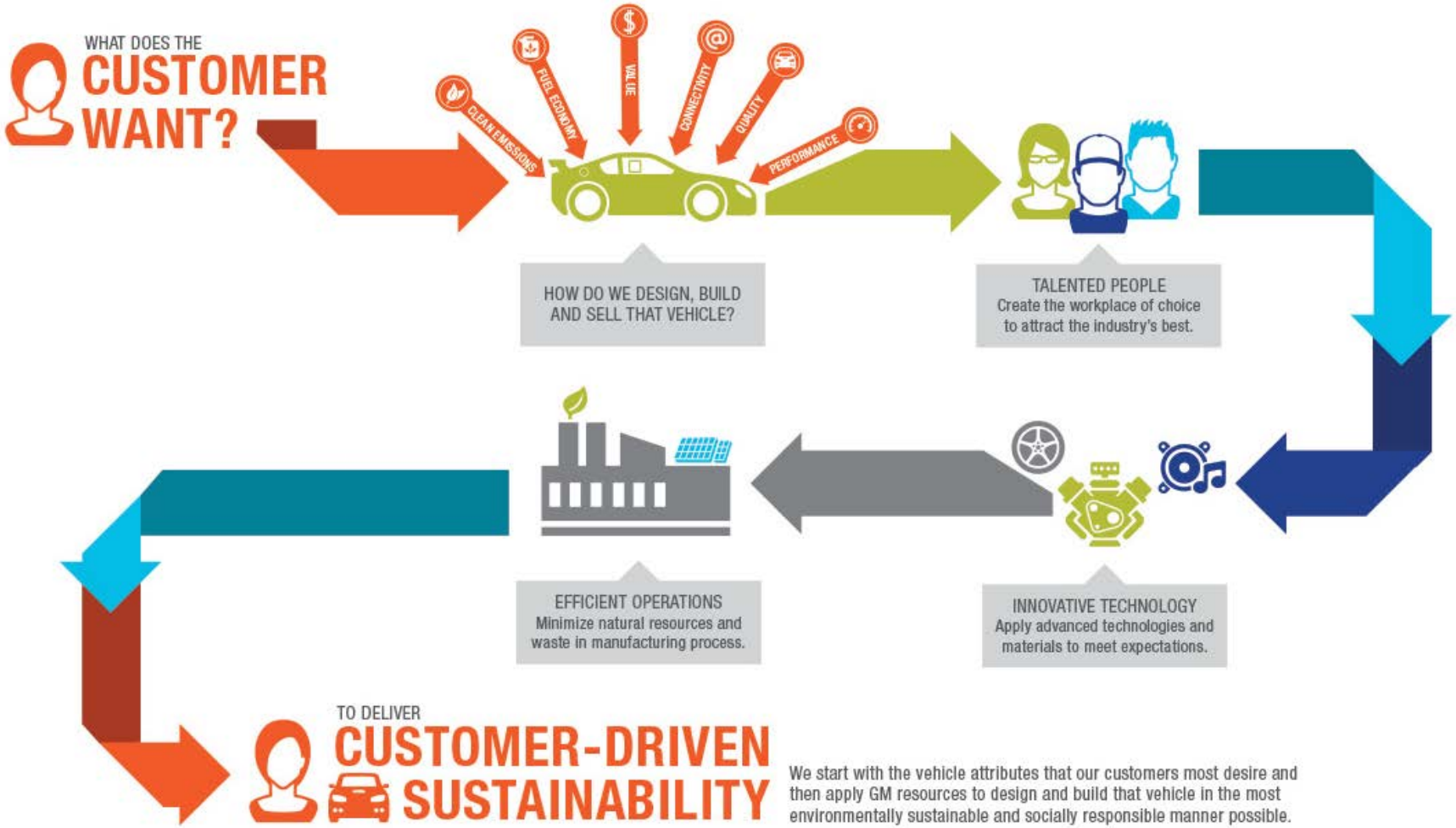
Build 10 million vehicles per year= $1 billion in energy

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-DRIVEN SUSTAINABILITY FOCUS



We start with the vehicle attributes that our customers most desire and then apply GM resources to design and build that vehicle in the most environmentally sustainable and socially responsible manner possible.

ENERGY USE REDUCTION AT GLOBAL FACILITIES

28%

FROM 2005 – 2010

3.34M

METRIC TONS
GREENHOUSE GAS
EMISSIONS AVOIDED

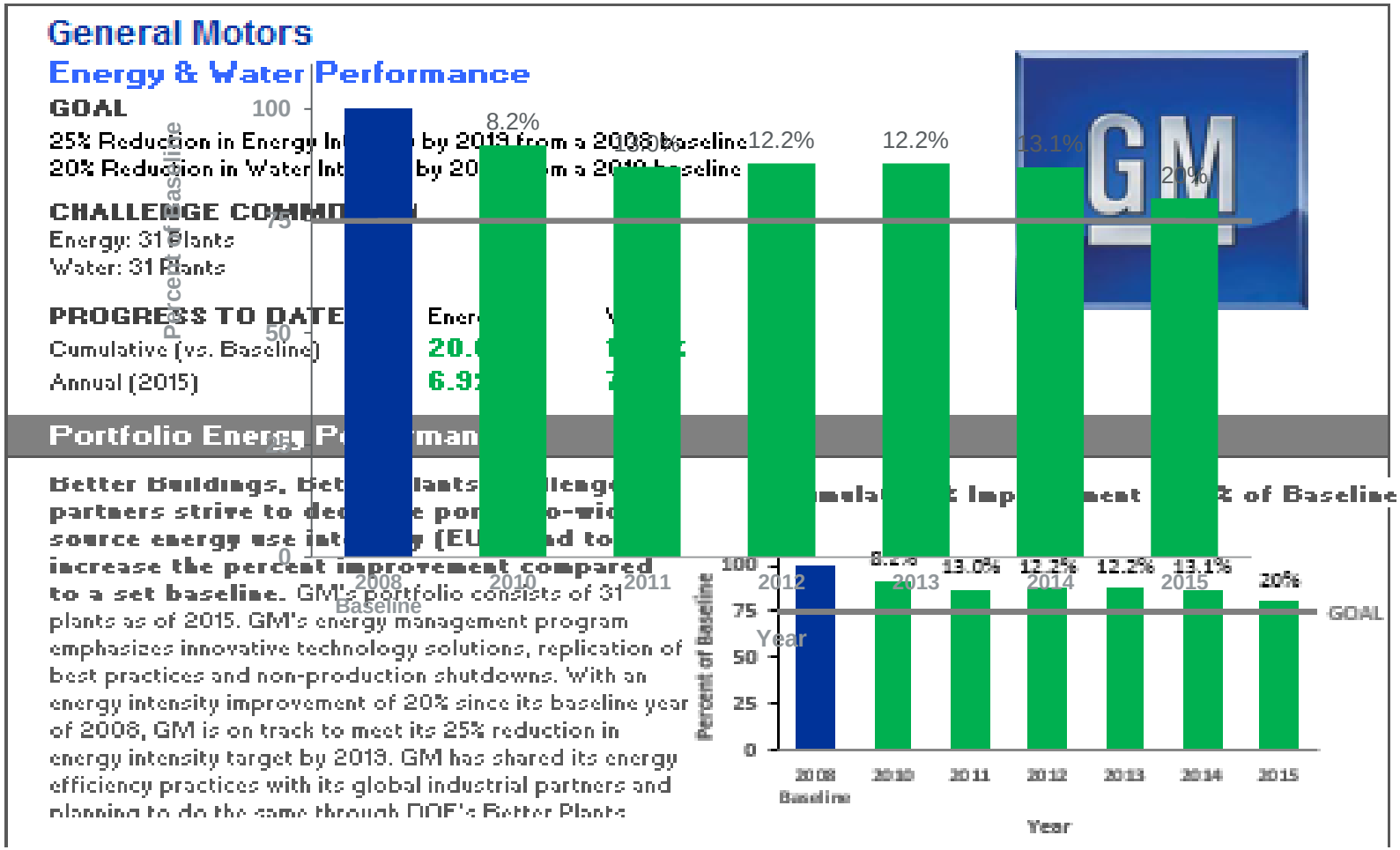
11%

FROM 2010 – 2014

GENERAL MOTORS

GM ENERGY GOALS

2014 DEPARTMENT OF ENERGY BETTER BUILDINGS



US DOE CASE STUDY

Case study on rate-payer funded energy efficiency programs.

DUE OUT WITHIN THE NEXT COUPLE OF WEEKS

Study that engaged industrial stakeholders, and utility stakeholders

GM, General Mills, Simplot, Intel and Ford

Case Studies of Energy Efficiency Programs in Large US Corporations and the Role of Ratepayer-funded Support

March 7, 2016
First Draft

Executive Summary (first draft)

Today, most large manufacturing companies in the US have some sort of energy efficiency program. The primary reason for pursuing energy efficiency in such companies is cost reduction, though reputational concerns are gaining in prominence as the public pays a greater degree of attention to issues such as global warming. In the most energy-intensive companies, where energy costs are over 10% of total costs, the cost-cutting rationale for pursuing energy efficiency is most obvious. However, the case for pursuing energy cost reduction is often still compelling when energy is only a small percentage of total costs because energy is often one of the largest variable costs. Moreover, the net financial benefits of operating cost saving projects such as EE projects also directly impact the bottom-line profitability of companies, as opposed to revenue-generating initiatives, such as growth projects, which contribute only to the gross revenue top line.

Despite the proliferation on energy efficiency programs and the strong rationale for pursuing energy efficiency, significant EE potential remains untapped. Many companies are pushing to opt-out of ratepayer-funded energy efficiency resource acquisition programs because they do not see how such programs can provide them with benefits exceeding the costs of program participation. In this report, the authors seek to determine the primary factors that produce successful EE programs at large industrial companies, as well as the that role ratepayer-funded programs can play in supporting EE at such companies. Towards this end, we examine the cases of four large industrial companies with robust EE programs who have interacted with many different ratepayer-funded programs across several US states. The companies examined are:

- **Simplot**, the largest producer of frozen french fries in North America. Simplot operates 13 large industrial facilities in Idaho, Wyoming, Utah, Nevada, California, Oregon, Washington, and North Dakota, with these facilities involved in phosphate mining, fertilizer production, agribusiness, and food processing industries. These facilities interact with 22 different electricity and natural gas utilities, including public utilities associated with the Bonneville Power Administration, Idaho Power, and Rocky Mountain Power
- **General Motors**, the second largest automobile manufacturer in the world, producing brands such as Chevrolet, Cadillac, GMC, and Buick. GM has over 30 manufacturing facilities in the United States, primarily in Michigan, but also in states such as Ohio, Indiana, New York, Texas, Missouri, and Maryland. The utilities covering the largest numbers of GM plants are Detroit Edison (DTE) and Consumer Energy, both in Michigan.
- **General Mills**, one of the largest grain and cereal processors in North America, producing brands such as Cheerios and Pillsbury. They produce cereal, yogurt, flour, and other food products at approximately 25 plants in New York, Illinois, Minnesota, California, Tennessee, Iowa, Ohio, Missouri, New Jersey, and Georgia. Major utilities for General Mills include National Grid and ComEd.
- **Intel**, the largest semiconductor manufacturer in the world. They have manufacturing facilities in Oregon, California, Arizona, and New Mexico. Ratepayer-funded programs that they

GM ENERGY PROJECTS

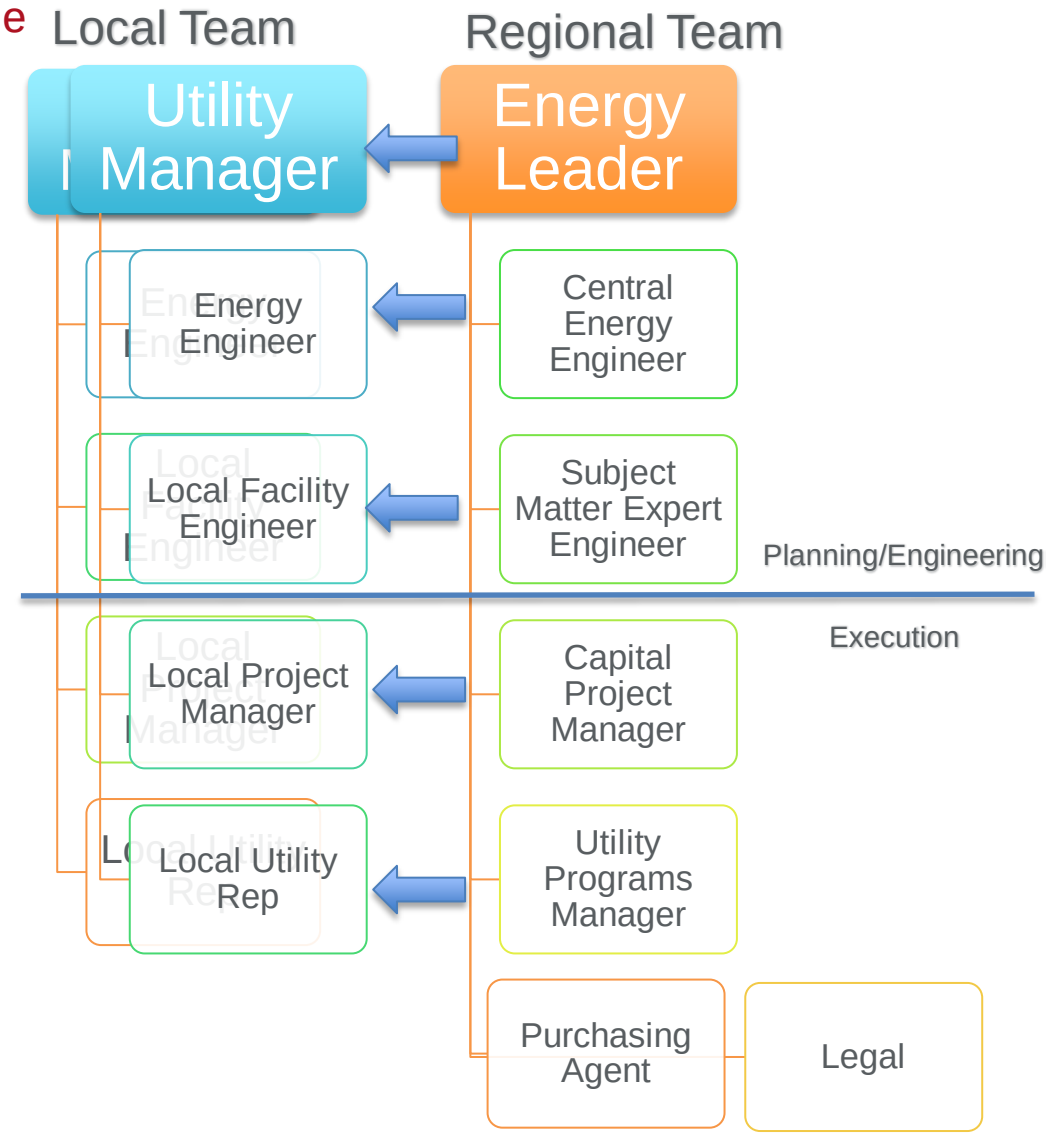
- GM commits funding and resources continuously to reduce energy, water and carbon emissions
- We work with stakeholders to reduce energy and related costs
- Common desire to save the most amount of energy at the lowest cost as quickly as possible
- Budgeting and scheduling work are some of the greatest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

GM ENERGY / WATER PROJECTS OVERVIEW

Functional Project Team Structure

(FUNCTIONAL RELATIONSHIPS)

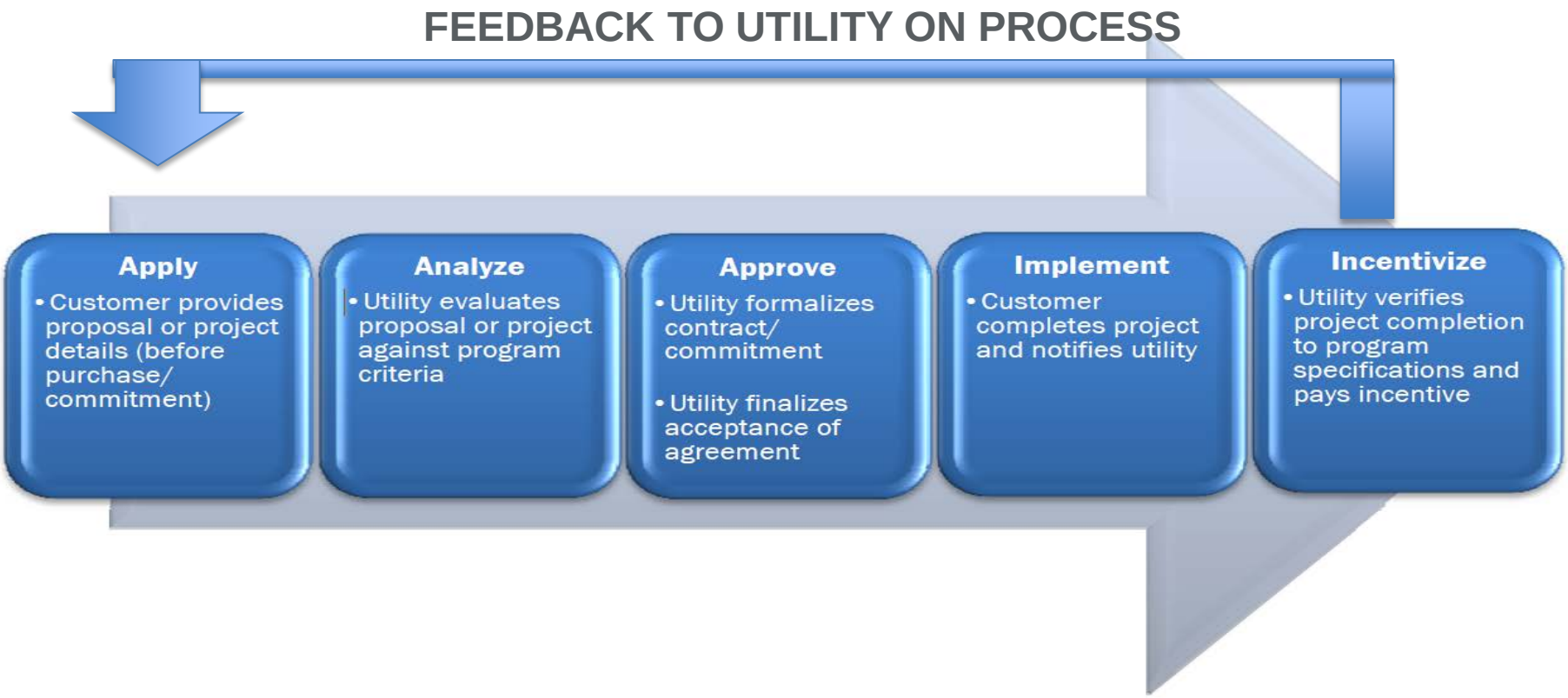
Larger Projects with High Investment and Complexity



Project Team Advantages

- Coordination with program owners
- Projects are planned to maximize incentive/investment
- Technical assistance is greatly increased
- Utilities and GM are able to plan long-term

GM ENERGY/WATER PROJECTS OVERVIEW
STEPS REQUIRED TO USE UTILITY INCENTIVES



Source: Greengrid.org

UTILITY BASED INCENTIVE PROGRAM

Advantages:

- Direct source of supplemental funding for energy projects
  - Offset capital investment in business planning
- Business planners have shorter “paybacks”
  - Longer paybacks limit investment and energy saved

Opting Out:

- Attractive depending on the economics
- Always reduce the amount of energy projects performed if concerned with ROI
- Economics generally NOT accounted for in ROI calculations

GM ENERGY / WATER PROJECTS OVERVIEW

Noted differences in incentives across utility sector

- Program annual caps
- Facility caps
- Experience in large projects
- Third party M&V
- Pay for engineering on large projects
- Difficulty with commitments between fiscal calendar years
- Short implementation windows
- Flexibility, willingness to implement meaningful energy projects within program rules
- Program rules change year-to-year

GM PROJECT APPROVAL

GM prioritizes energy and water reduction projects based on:

- Strategic goals
- Financial considerations
  - Simple payback (cost savings)
  - Complex payback (cost-incentives/savings)
- Risk and timing
  - Possible change in incentive
  - Meeting commitment dates
  - Annual incentive caps

OPPORTUNITIES FOR IMPROVEMENT

Implementation windows for projects present risk for customers

Utilities that require a project to be executed within 90 days of incentive approval insert risk into the financial and planning part of project approvals. Most utilities offer extensions, however when a project is complex and lengthy, getting [illegible] companies at risk of [illegible] execution.

Engineering on large projects is costly and risky

Engineering is often required to execute large energy and water reduction projects. Sometimes the engineering reveals projects are technically or economically [illegible] risk and slows down [illegible] example of an engineering based assistance program is NYSERDA's Flextech program, which is [illegible] projects.

Fiscal [illegible] for customers

Projects are planned continually at many customers. Although spending is managed year to year, prioritization and scheduling occurs continuously. Utilities that will not approve projects in the last quarter of the year delay execution of first quarter projects.

Annual [illegible] by company and by facilities

This has the [illegible] aggressive energy projects financially impractical. Large aggressive projects at one location is the best use of utility rebate dollars, company investment dollars and resources to achieve the highest possible savings in the shortest amount of time.

Increased certainty

Increased accommodation for large projects

RESULTS IN MICHIGAN

Through customer feedback, changes have been made over the past several years to the Michigan-based utility rebate programs.

- Construction utility rebates have been streamlined and expanded
- Made in Michigan utility incentive has been implemented
- Continuous planning is now part of the utilizes goal and conditions have improved
- Facility CAPS have been lowered and in most cases eliminated

NEW TRENDS AND OPPORTUNITIES GM IS SEEING

Simplification of incentives

- Construction incentive has been simplified
- Applications have been simplified
- Time to award incentive is getting longer due to project complexity increasing

Water-based incentives

- GM, like many other industrial customers, is striving to reduce water consumption
- There are no known water savings incentives in any area where GM operates
- GM is working with the DOE on a water consumption reduction program similar to the DOE Better Buildings, Better Plants program. GM is also working with the US EPA, however incentives for reduction in water use are virtually not existent.
- Water reductions at the facility level have a great potential to save energy and resources upstream and downstream, yet utilities do not offer any incentive or assistance to accomplish this. This is an area of innovation that needs to be studied further.

SUMMARY

- When ROI and business case-based, utility incentives increase the number and complexity of projects performed
- Maximizing utility incentives requires coordination and a great degree of planning
- Opting out of incentive programs makes sense to accounts financially but reduces the energy one can save
- Business planners require certainty when approving projects that the economics will not change
  - If incentive outlook is unclear the project will not use incentives in business case and some will not be completed
- Utility-based energy efficiency incentive programs need to work for all project types and sizes

QUESTIONS / ANSWERS

General Mills Utility Programs

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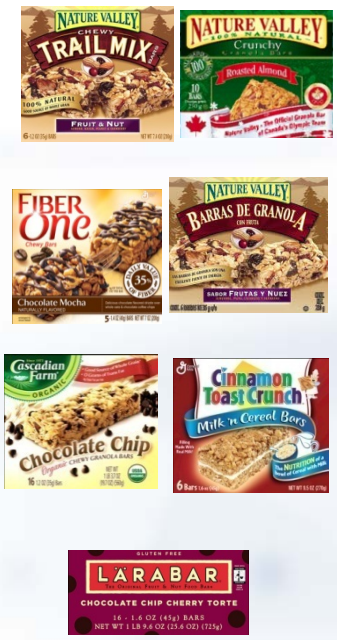
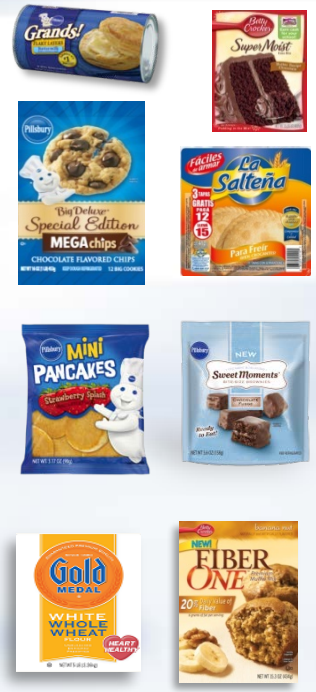
GENERAL MILLS

General Mills is one of the largest food companies in the world

- **40,000 employees; 100 countries; $18 billion sales**

Cereal	Snacks	Baked Goods	Meals	Dairy

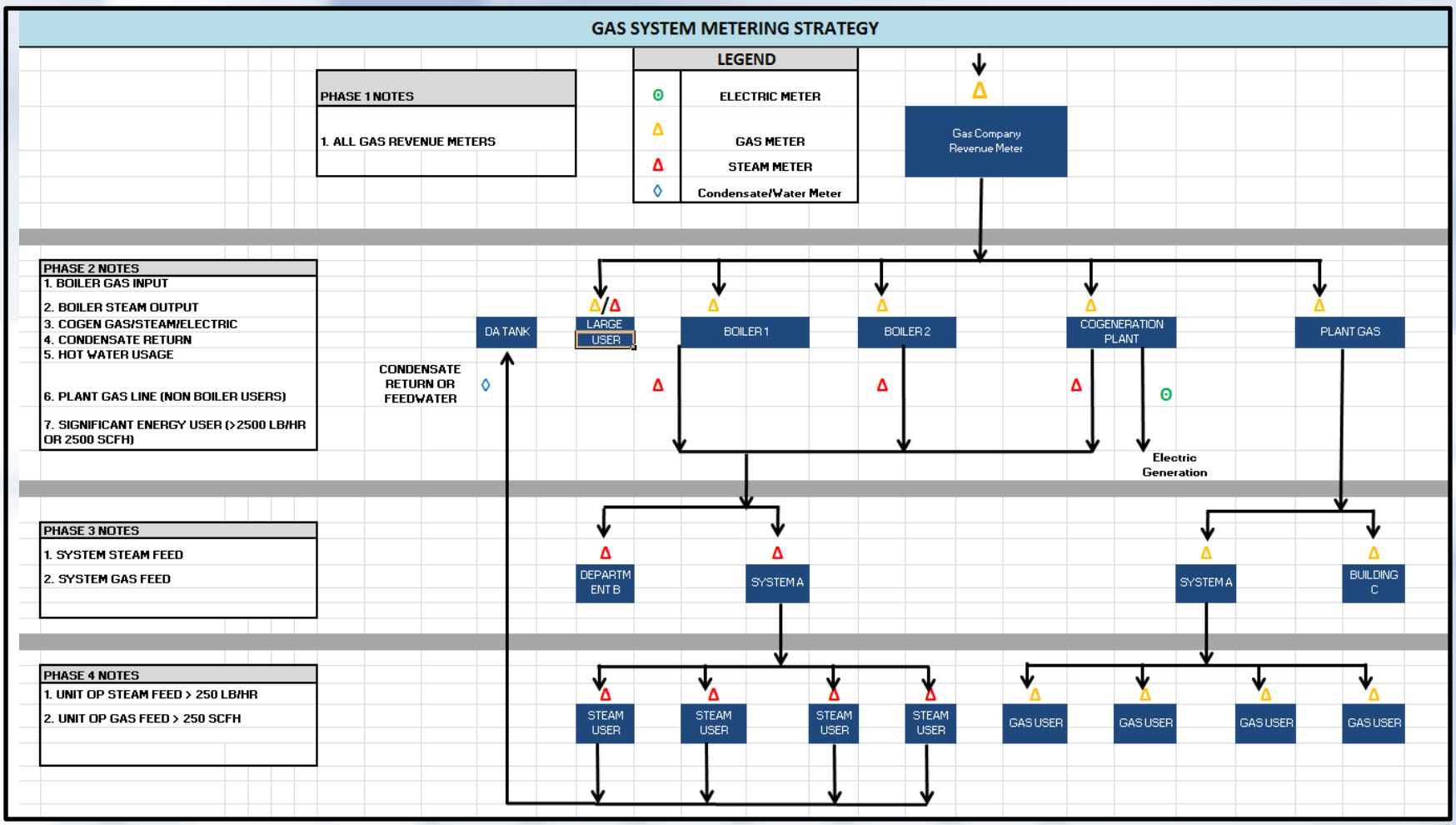




General Mills has Made Significant Progress in Energy Reduction

- $20 million saved in 4 years
- 11% BTU/lb reduction in 3 years
- Energy Engineers in 15 sites
- Developed Internal Continuous Improvement Energy Management Process and technical solutions

The plant commits an engineer to be the Energy lead, beginning with a metering strategy



Where is the energy used?

	% Total Energy
Electrical Allocation	61.6%
Lighting	6.0%
Compressed Air	11.0%
Refrigeration	17.0%
Utility Support Equipment	1.0%
HVAC	7.5%
Process Fans	3.0%
Pumps	4.6%
Production System 1	3.0%
Production System 2	2.0%
Large Unit Op 1	3.0%
Large Unit Op 2	3.5%
Gas Allocation	38.4%
Hot Water	6.0%
Boilers	12.3%
Ovens	7.0%
Production System 1	3.0%
Production System 2	2.0%
Large Unit Op 1	3.3%
Large Unit Op 2	3.8%
Building Heat	1.0%
Total Energy	*100.0%*

Understanding usage by unit op and product

Product/Unit Op	Energy/lb*
Cheerios	**70**
Cookers	10
Pellet Dryers	20
Forming	30
Finish Dryer	10
Honey Nut Cheerios	**85**
Cookers	9
Pellet Dryers	18
Forming	28
Finish Dryer	30

*These are not the actual numbers

Energy loss tools developed for all significant energy users in GMI

Question					Savings		
Does the boiler have an economizer to recover heat from exhaust gases to pre-heat feed water?	Boiler #	Projected Outlet Gas Temp	Heat Make Up Air?		MMBTU saved	$/yr saved	*Capital
	Example	260	0		24,700	$ 135,850	$ 60,000
Do boilers operate at optimum oxygen levels (1.5 to 3.0%)?	Boiler #	Future Excess Oxygen %			MMBTU saved	$/yr gas savings	*Capital
	Example	3.0%			10,833	$ 59,583	$25,000
Can boiler blowdown % be improved with an RO or water chemistry improvements? Does boiler have a blowdown system without automatic conductivity control?	Could boiler blowdown be reduced to?			Gallons Water Reduction	MMBTU saved	Total Savings	*Capital
	1.50%			2,271,938	5667	$40,254	$ 90,000
For multiple boiler operations, have boilers been optimized for overall steam generation efficiency? Are any boilers operating at less than 30% load?	Current efficiency loss due to poor boiler loading				MMBTU saved	$/yr gas savings	*Capital
	3%				7,800	$ 42,900	$0
Are boilers left hot when not in use?	Idle boiler scfh	Hours idle			MMBTU saved	$/yr savings	*Capital
	1000	6000			6,000	$ 33,000	$5,000
Reduction in Steam Usage (Demand Side)							
Conduct an IR scan of the entire steam system including boilers (for refractory replacements or improve insulation), all steam lines and valves.	Total MMBTU/yr savings				Steam lb/yr loss reduction	Total $ saved	*Capital (also from program)
	15,000				11,538,462	$ 97,886	$100,000
Are steam traps checked every 6 months? Do you use thermostatic or inverted bucket traps in process applications instead of Float & Thermostatic (F+T)? What is your steam trap failure rate?	Failure % on last trap audit	Average Time Elapsed Between Audits (yr)		lb/yr of loss steam saved	MMBTU savings	$/yr savings	*Capital
	9%	2		12,000,000	15,600	$ 101,801	$10,000
Is your deaerator (DA) running less than 6 psi and the steam exhaust vapor cloud is no more than 4 feet high?	Steam flow to DA			lb/yr of loss steam saved	MMBTU savings	$/yr savings	*Capital
	2500			18,396,000	23,914.80	$ 156,061	$10,000
Do condensate receivers vent flash steam to atmosphere without recovering waste heat? Looking at a roof will quickly answer this question.	% flash steam savings			lb/yr of loss steam saved	Total MMBTU saved from project	$/yr savings	*Capital
	13%			15,895,648	20,664.34	$ 134,849	$200,000

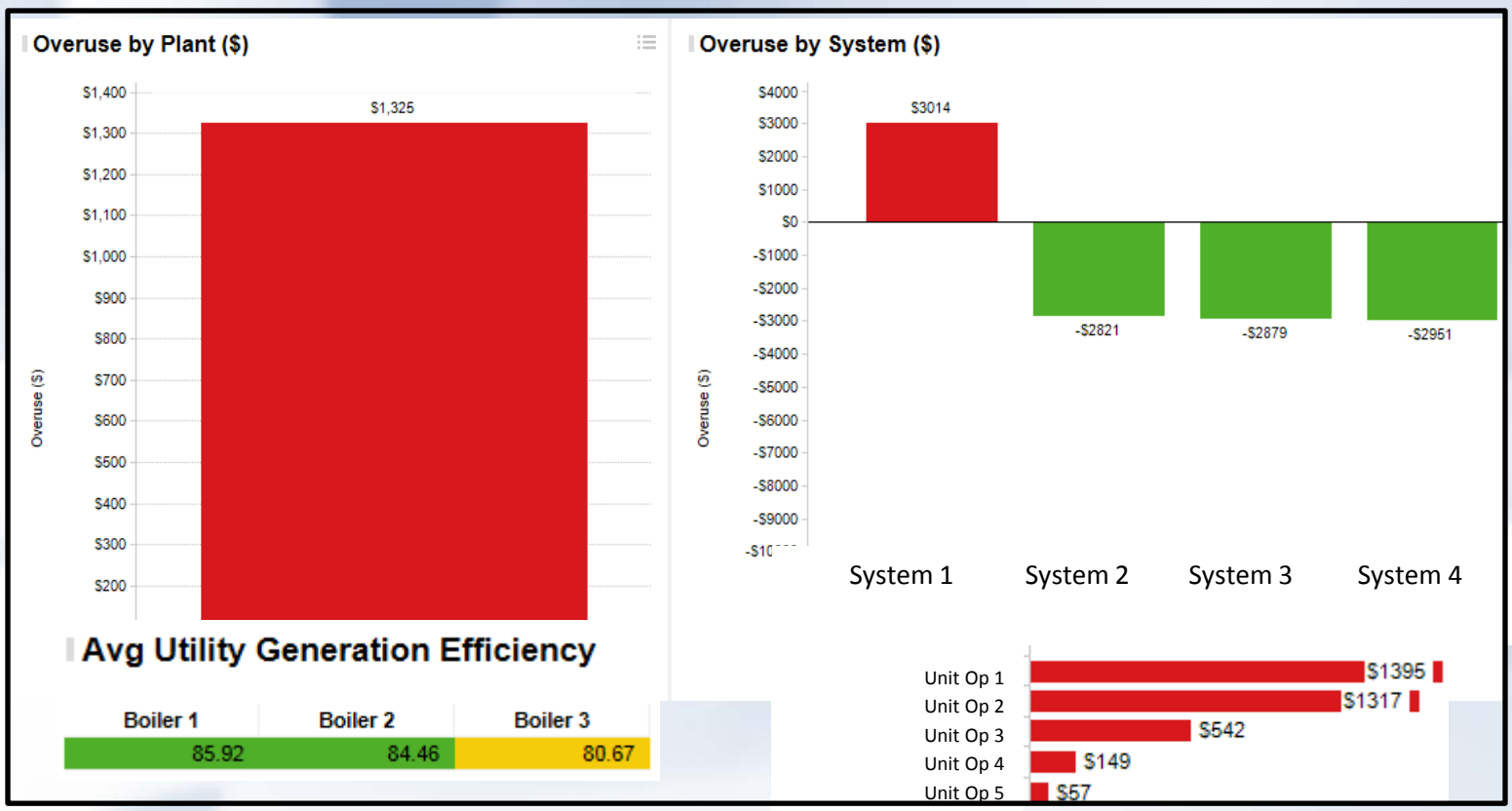
Energy Usage Details: Identifying Targets and Troubleshooting Losses

system_name	metername	prod_start	product_name	activity	shiftstart	Activity Time	% of Target	MQIS Lbs	Temp	Actual MMBTU/hr	Overuse ($)	Target MMBTU	Actual MMBTU
Example	Example	12/14/2014 12:27:00 AM	Example 1	NP	12/17/2014 5:00:00 AM	12:0	113 %	Examples	50.25	2.15	$23	22.80	25.83
					12/17/2014 5:00:00 PM	12:0	111 %		47.17	2.12	$20	22.80	25.39
					12/18/2014 5:00:00 AM	12:0	92 %		46.66	1.76	-$13	22.80	21.07
					12/18/2014 5:00:00 PM	12:0	105 %		48.66	2.00	$10	22.80	24.05
					12/19/2014 5:00:00 AM	10:44	104 %		49.41	1.98	$7	20.39	21.26
		12/19/2014 3:45:00 PM		CO	12/19/2014 5:00:00 AM	1:15	1000 %		49.52	1.97	$19	0.00	2.46
					12/19/2014 5:00:00 PM	5:0	1000 %		49.66	0.95	$36	0.00	4.74
		12/19/2014 10:01:00 PM		NP	12/19/2014 5:00:00 PM	6:59	103 %		50.34	1.96	$3	13.27	13.66
					12/20/2014 5:00:00 AM	12:0	114 %		50.53	2.17	$25	22.80	26.05
					12/20/2014 5:00:00 PM	1:40	121 %		49.06	2.28	$5	3.17	3.83
		12/20/2014 6:41:00 PM	Example 2	CO	12/20/2014 5:00:00 PM	10:19	1000 %		48.83	0.25	$20	0.00	2.60
					12/21/2014 5:00:00 AM	9:40	1000 %		49.00	0.57	$42	0.00	5.53
		12/21/2014 2:41:00 PM		NP	12/21/2014 5:00:00 AM	2:19	97 %		48.94	1.84	-$1	4.40	4.26
					12/21/2014 5:00:00 PM	12:0	108 %		49.59	2.06	$14	22.80	24.69

GENERAL MILLS

Shiftly Energy Management Summary:

>200 Plant Energy Meters Prioritized in 5 Seconds



Key Takeaways: The plant overused $1,300 in energy, driven by the System 1, and Unit Op 1 and 2. Boiler 3's efficiency needs to be investigated.

Process for utility incentive approval

- **Pre application**
- **Approval**
- **Pre Measurement & Verification (M&V)**
  - >2 weeks
- **Execute project**
- **Post M&V**
  - >2 weeks to 6 months

Utility Rebate Benefits

- **>$1 million in rebates**
  - More money than put into the programs
- **Many projects executed that would not have been if not for incentives**
- **Incentive ranges from negligible to $0.12/kWh and $15/MMBTU or 50% of engineering studies or projects**

Utility Rebate Program Challenges

- Facilities without dedicated energy resources generally do not take advantage
- Several incentive programs are not impactful enough, leading to a “cherry on top” vs. driving incremental projects
- Commercial has more prescriptive than industrial
  - Programs can be confusing and plants don’t take full advantage of opportunities
- General utility funded audits are not detailed enough to add value in industrial
  - Report back what we told them were opportunities
  - Studies on specific energy opportunities were more impactful
- Rebate timing can vary from weeks to over a year

M&V Challenges

- Always a negotiation
- Plan changes throughout process
  - Additional loggers become required
- Savings normalized by weather and entire plant production instead of the production line improved
- A lot of work
- Past pay outs of less than preapproval leads to challenges in approving projects
- Premeasurement data logger reliability can delay project execution

Recommendations

- Build strong relationships with representatives
- Opt In vs. Opt Out vs. Self Direct depends on pipeline of projects
- Utility providers need to develop clearer CHP incentives

Questions?

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Providing Value to Large Industrial Customers through Ratepayer-funded Energy Efficiency Programs

Bob Taylor
Senior Advisor, IIP
2016 U.S. DOE Better Buildings Summit
Washington D.C. May 11, 2016

Institute for Industrial Productivity

A new study of EE programs in selected large companies will be released soon…..

- Based on case studies of J.R. Simplot Company, General Motors, General Mills and Intel, as well as discussion with many interested parties.
- Completed by the Institute for Industrial Productivity with support from the US Department of Energy
- Plans for publication and dissemination through the State and Local Energy Efficiency Action Network (SEE Action Network)

Focus of the study and today's presentation

How do large companies organize to improve energy efficiency? What are their key challenges in this work?

How can ratepayer-funded energy efficiency programs best help them to meet those challenges?

Companies as organizations

Key corporate roles relevant to the EE agenda :

- Corporate management
- Finance
- Personnel
- HQ energy management
- Energy procurement
- New production asset design and construction
- Plant management
- Plant maintenance, utility service operation (may include EE)
- Production line operational management

Three requirements for successful corporate EE programs

Successful corporate EE programs require good organization, time and money. More specifically, they require:

- Senior management commitment
- Assignment or engagement of key plant staff or experts to identify, prepare, and implement key energy efficiency measures
- Efficient and clear internal systems for financing EE projects

Why bother with EE?

While there are many good reasons for companies to promote energy efficiency, departments and staff are typically pressed with other concerns.

Senior management needs to signal the importance of achieving cost savings and reputation benefits through energy efficiency, and to hold people accountable for achieving results.

Who can do the work?

Preparing and implementing EE improvements usually falls as a fifth, sixth or seventh level priority for a busy plant maintenance manager. Who within the plant can allocate the time for identification of EE measures, preparation of projects, herding projects through the approval process and then implementing projects?

Strategies include new staff assignments, using outsourced expertise, or reliance on seconded staff, where possible.

How can EE projects be financed efficiently?

Current internal EE project financing processing systems range from….

….ad hoc systems with no EE-specific project application practice or precedence and highly variable outcomes

to....

...systems operating within an annual EE budget agreed in advance with financial departments, clear application guidelines and hurdle rates, and clear expectations about what is required for project approval.

Clear, predictable and efficient systems greatly improve the prospects for generating robust EE project pipelines.

Roles for ratepayer-funded EE programs

Companies assess participation in ratepayer-funded EE programs as business propositions. What are the costs and benefits to the company of participation?

EE programs need to provide services that best help companies overcome the challenges they are facing to generate and implement robust EE project pipelines.

:

Suggestions for ratepayer-funded EE programs (1)

Industrial sector programs are now yielding the lowest cost delivery of verified energy savings for many ratepayer-funded programs. But achievement of these savings requires upfront program investment in design and implementation of strong industrial EE programs that can attract high industry participation. Some common requirements include:

- Development of multiple-year relationships to identify and implement multiple projects with the same client.
- Assignment of dedicated program staff or trusted contractors to work as account managers with key clients.
- Both custom and prescriptive project incentives, with flexibility to structure offerings to match client needs.
- Technical capacity to work with industrial systems.

Suggestions for ratepayer-funded EE programs (2)

Some specific suggestions relating to large industrial customers include:

- Consider strategic partner recognition programs
- Listen for specific needs for technical assistance
- Consider programs for seconding staff to facility sites, and/or financing placement of facility EE engineers
- Cater assistance to match and support the project development, approval and implementation procedures of key clients.
- Strive for maximum flexibility to structure and size incentives to help good projects overcome corporate hurdles.
- Consider SEM and/or behavioral EE program support
- Consider programs to support EE in new asset investments

Thank you!

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