

TRANSLATING STRATEGIES INTO REALITIES

أرامكو السعودية
Saudi Aramco



A SUPERIOR ENERGY EFFICIENCY PROGRAM



By: Fahad S. Al-Dossary



OUTLINE

Introduction

Energy Intensity Strategic Goal

Energy Intensity Strategy

ShGP Energy Efficiency Program

Energy Efficiency Performance

Summary



INTRODUCTION

- You can buy a used airplane for about the same price as a new sports car



What's the main difference between the sports car and the airplane?



INTRODUCTION

If you speed up the sports car to about 75 miles per hour and pull back on the steering wheel, nothing very interesting happens.



- No Ideal Controls. The Pilot's Duties is to Control Speed & Altitude by Move Levers.
- Speed & Altitude Cannot be Controlled Separately.

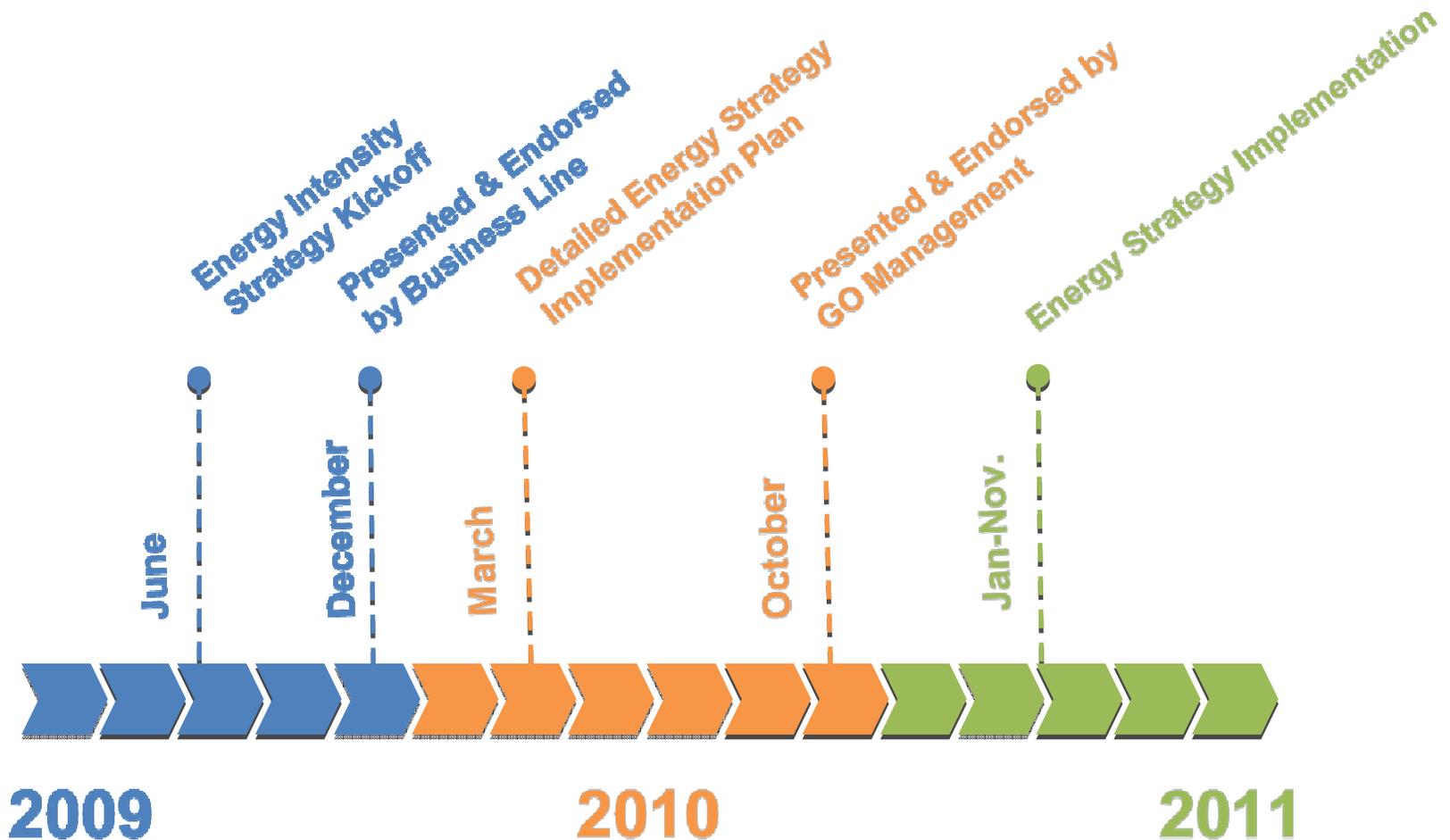


ENERGY INTENSITY

$$EII = \frac{\text{Energy Consumption (MMBTU)}}{\text{Plant Feed (MBOE)}}$$



BACKGROUND





E&P ENERGY FOCUS TEAM

MEMBERS

Member	Position
S. A. Shahrani	Chairman Manager, Gas Operations
B. M. Zayed	Manager, Oil Operations
A. S. Ajmi	Manager, Oil Operations
M. A. Said	Manager, Abqaiq Plant
K. A. Abdulqadir	Division Head, Oil Operations
A. H. Qahtani	Consultant, Eng. Services
S.A. Qahtani	Consultant, Eng. Services
M. H. Ghamdi	Eng. Supervisor, Oil Operations
F. S. Dossary	Eng. Supervisor, Gas Operations
B. J. Qahtani	Engineer, Oil Operations
R. K. Gunther	Consultant, Gas Operations
T. M. Shehri	Engineer, Power Distribution
P. H. Issa	Consultant, Oil Operations
K. D. Usail	Specialist, Oil Scheduling & Planning

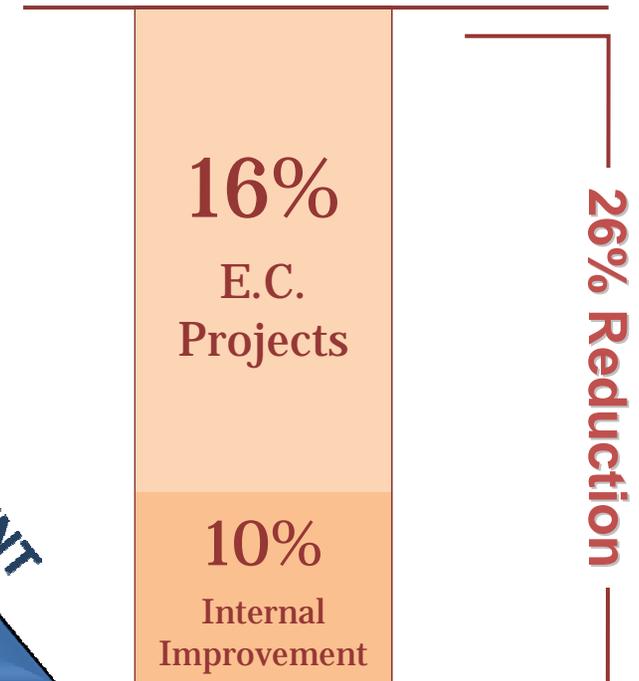


ENERGY EFFICIENCY STRATEGY ELEMENTS



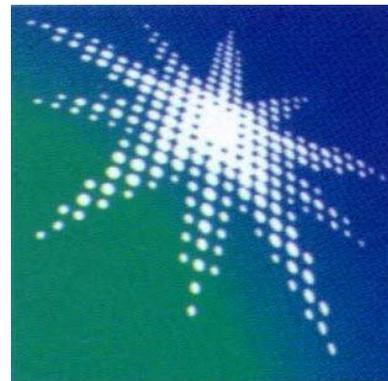
ENERGY EFFICIENCY ENABLERS

Gas Operations Energy Intensity





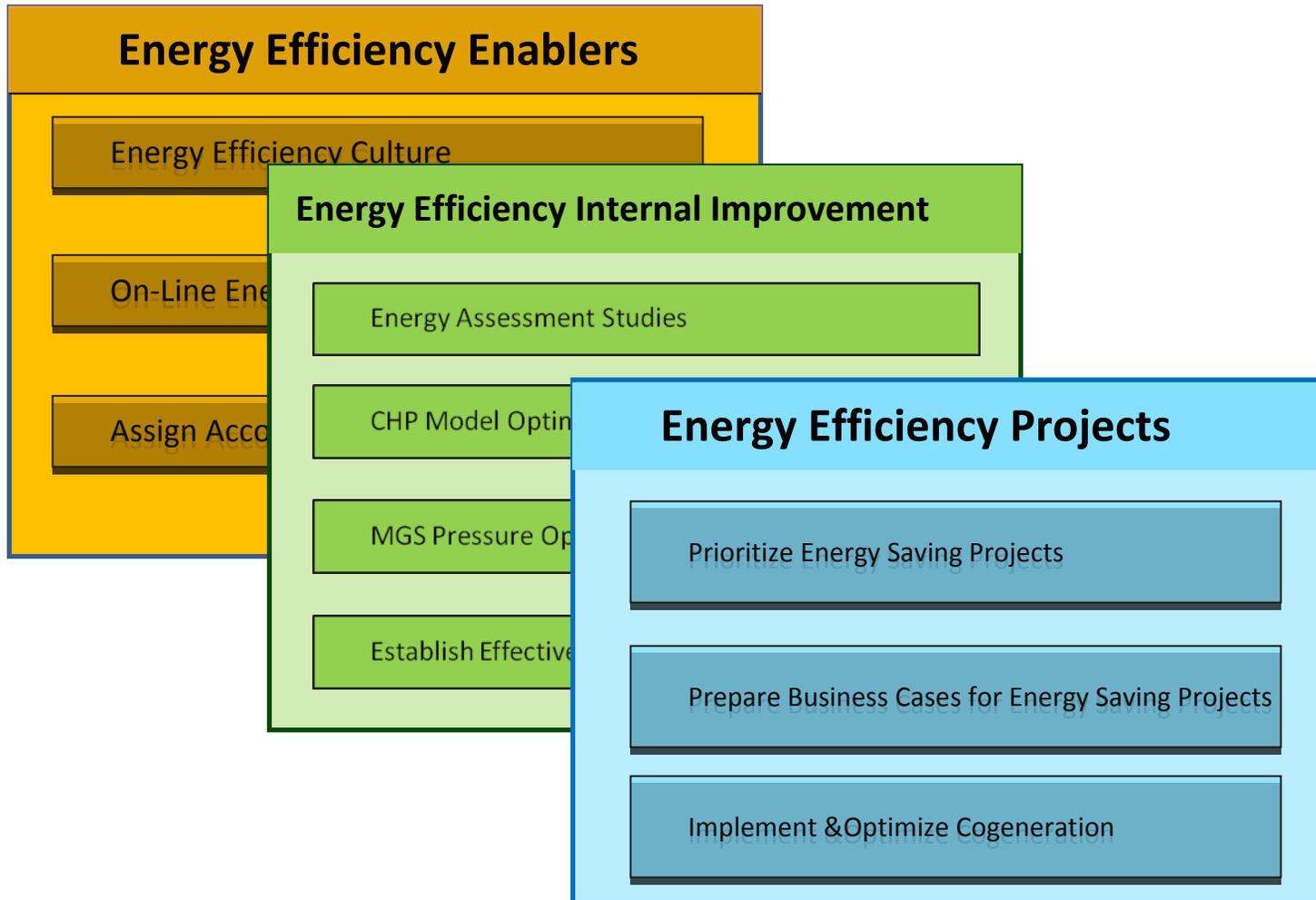
INDUSTRIAL ENERGY EFFICIENCY PROGRAMS



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ENERGY EFFICIENCY STRATEGY ELEMENTS





SHGP ENERGY EFFICIENCY PROGRAM ELEMENTS

Making Commitment



Establishing Performance Baseline



Setting Goals & Action Plan



Knowledge Sharing



Evaluating Progress



Recognizing Achievements



SHGP ENERGY EFFICIENCY PROGRAM ELEMENTS

Making Commitment



Energy Engineer Appointment

Monitor & optimize the plant energy consumption

Evaluate the plant equipment efficiency

Perform energy assessment studies

Benchmark the plant performance to similar facilities

Develop business case and conceptual engineering E. Projects

Evaluate New Tech. with Supporting Organizations

Coordinate and directing the overall energy program

Point of Contact for Energy Initiatives & Accomplishment



SHGP ENERGY EFFICIENCY PROGRAM ELEMENTS

WEEK#4 ENERGY EFFICIENCY REPORT

MONTHLY SUMMARY

The average energy intensity of the plant for the month of January is 211 MBtu/Boe. Despite the fact it is lower than our 2011 target (214 MBtu/Boe), January intensity fell short of its target (203 MBtu/Boe). This is mainly attributed to the low average plant loading compared to the forecasted load. Additionally, the plant energy intensity could have been improved through the missed opportunities that have been highlighted on weekly basis.

Evidently, many of the missed opportunities were not captured due to the unavailability of some key equipments, such as some Utility steam drivers (steam turbines) and LRU regeneration gas compressors. Another major uncaptured opportunity is improving the efficiency of the SRU air and acid gas preheaters, furnaces. These opportunities have had the potential to reduce our energy intensity to 206 MBtu/Boe, much closer to our targeted value.

	Unit	Forecast	Actual
Energy Intensity	MBtu/Boe	203	211
Associated gas	MMSCFD	1252	1176
Khuff Gas	MMSCFD	650	561
Sales Gas	MMSCFD	1134	1064
NGL	MBD	322	271

In January, we had three major captured opportunities: the shutdown of one sales gas compressor, shutdown of two propane compressors, and SRU#5 reaction furnace optimization. All the captured opportunities accounts for a reduction of 1.74% reduction in our energy intensity. Without these captured opportunities, the plant's energy intensity would have been 215 MBtu/Boe.

Focus Areas for Next Month:

1. Improve plant's equipments availability
2. Optimization of Sulfur Furnaces and Utility boilers
3. Exploitation of Opportunities at Cogeneration

WEEK #4 ENERGY PERFORMANCE

The energy efficiency of the plant was reviewed during the 4th week of 2011 covering the period between January 19, 2011 and January 25, 2011. The plant energy intensity (EI) is 212.7 MBTU/BOE. Following the shutdown of the HPDGA, an average of 90 MPPH has been observed as excess 75# steam. Our next week target is to minimize excess steam condensing through the following:

- Running motors instead of steam turbines: under such plant condition, it is more energy efficiency and economical to operate motor-driven equipments than steam driven ones.
- Optimizing plant's inlet pressure: increasing the plant's inlet pressure decreases FGC steam consumption and eventually eliminate excess steam condensing

Indices	Value	Weekly Saving/Revenue
Plant Energy Intensity	212.7 MBTU/BDoe	---
Cogen % Utilization	100%	---
Plant's power export	3.68 GWh/day	
Total Captured Opportunities Last Week	2	\$ 87M
Total Missed Opportunities Last Week	2	\$ 27M

CAPTURED ENERGY SAVING OPPORTUNITIES LAST WEEK:

OPPORTUNITY	EII IMPACT	WEEKLY COST SAVING (\$)	YTD SAVING (\$)
SRU #5 un-optimized reaction furnace operation.	0.13%	3,300	1,000
Shutdown of the propane gas compressor K-261A.	0.44%	59,600	85,000
Shutdown of the sales gas compressor K-002A.	0.76%	102,800	132,000
Shutdown of unneeded fin fan at excess steam condenser.	0.008%	800	250
Shutdown of KM-501C in SRU #5 to utilize the steam letdown	0.10%	6,600	2,000
Total	1.88%	\$ 233,000	\$ 314,000

MISSSED ENERGY SAVING OPPORTUNITIES LAST WEEK:

OPPORTUNITY	ENERGY INTENSITY IMPACT (%)	HURDLES PREVENTING OPPORTUNITY CAPTURE
Startup of Boiler #5 and Shutdown of another boiler.	0.25%	FD fan is under testing (Maint.)
High excess Oxygen at SRU preheaters	0.33%	Better draft air control (Operations)
Unnecessary steam condensing in excess steam condenser.	1.0%	Fluctuating control at PCV-100 (Eng.)
Total	2.1%	

NEXT WEEK FORECASTED ENERGY CONSERVATION OPPORTUNITIES:

OPPORTUNITY	COST SAVING (\$)
Operating boiler F-105 to utilize excess steam	12,000
Optimize all air and acid gas preheaters at SRU	8,000
Minimize excess steam condensing at the Utility excess steam condenser.	17,000
Assess shutting down one LRU to coincide with HPDGA shutdown.	13,000
Total	\$ 56,000



SHGP ENERGY EFFICIENCY PROGRAM ELEMENTS

Making Commitment



Establishing Performance Baseline



Setting Goals & Action Plan



Knowledge Sharing



Evaluating Progress



Recognizing Achievements



SHGP ENERGY EFFICIENCY PROGRAM ELEMENTS

Making Commitment



Establishing Performance Baseline



2010 Lost Energy
Opportunities

4-5%

Detailed Energy
Assessment Study

22%



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Knowledge Sharing



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SHGP ENERGY BRAINSTORMING SESSION

Making Commitment



Establishing Performance Baseline



Setting Goals & Action Plan



Knowledge Sharing



- Brainstorming Sessions
- Energy Efficiency Campaign
- Energy Efficiency Conferences & Events



SHGP ENERGY BRAINSTORMING SESSION



Management
Support & Involvement



SHGP ENERGY BRAINSTORMING SESSION





SHGP ENERGY BRAINSTORMING SESSION



**Capture Easy Picking Energy
Initiatives**



SHGP ENERGY BRAINSTORMING SESSION



Multi-Disciplinary & Cross-Organization Members



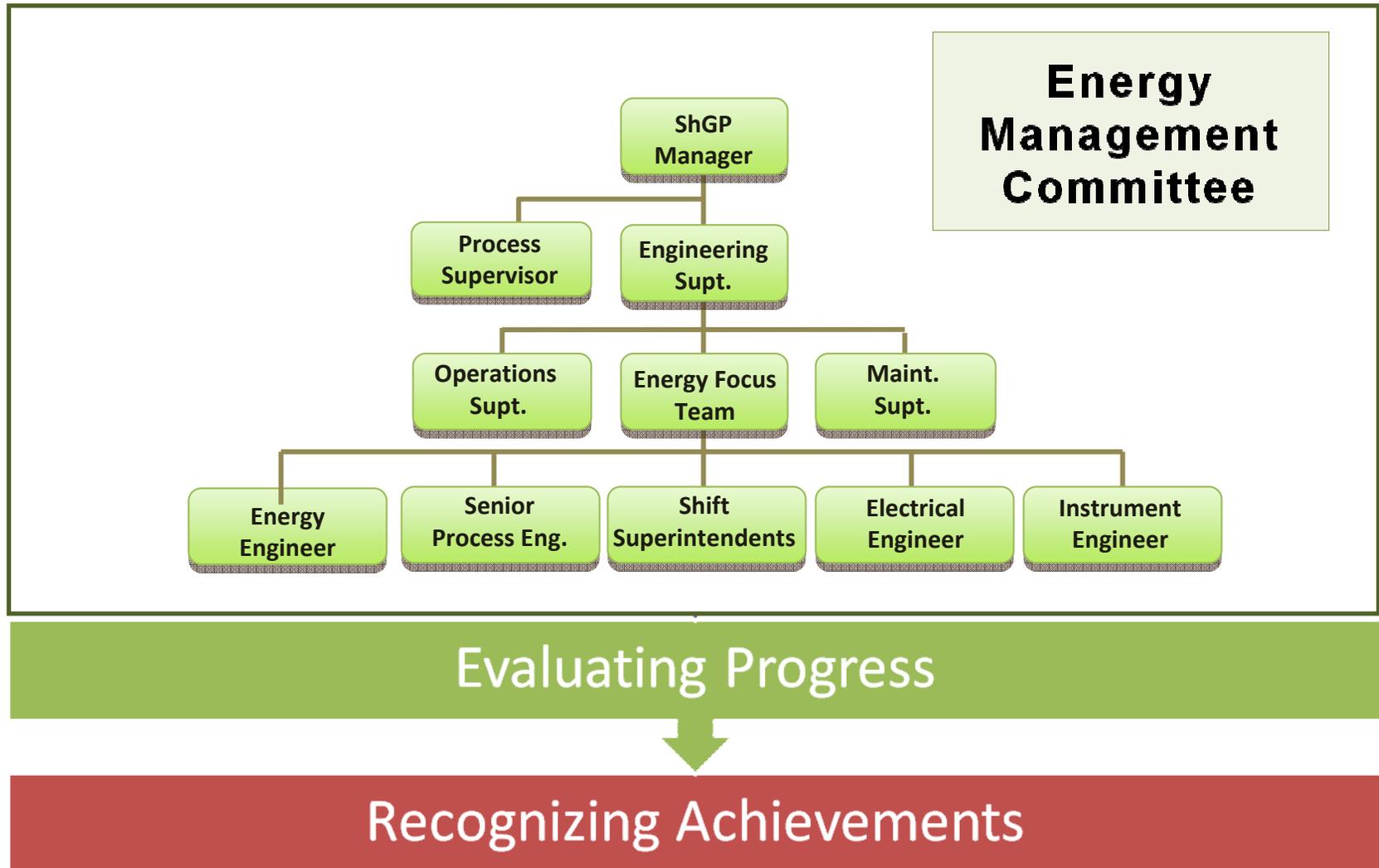
SHGP ENERGY BRAINSTORMING SESSION



**One Approved & Planned Idea
with \$ 1MM Annual Saving**



SHGP ENERGY EFFICIENCY PROGRAM ELEMENTS





SHGP ENERGY EFFICIENCY PROGRAM ELEMENTS

Making Commitment



Establishing Performance Baseline



Setting Goals & Action Plan



Knowledge Sharing



Evaluating Progress



Recognizing Achievements

SHGP ENERGY IDEAS OF THE YEAR CONTEST

Sheddum Gas Plant

2011 ENERGY Ideas of the Year

Sheddum Gas Plant

2011 ENERGY Ideas of the Year

Sheddum Gas Plant

2011 ENERGY Ideas of the Year

Mind Power... Saves Energy

Save Energy
Protect the Environment
Get Recognized

Many Birds... Your Innovative Idea is the Stone

Visit Sheddum Gas Plant website @ SHARE1 to participate and win valuable prizes.

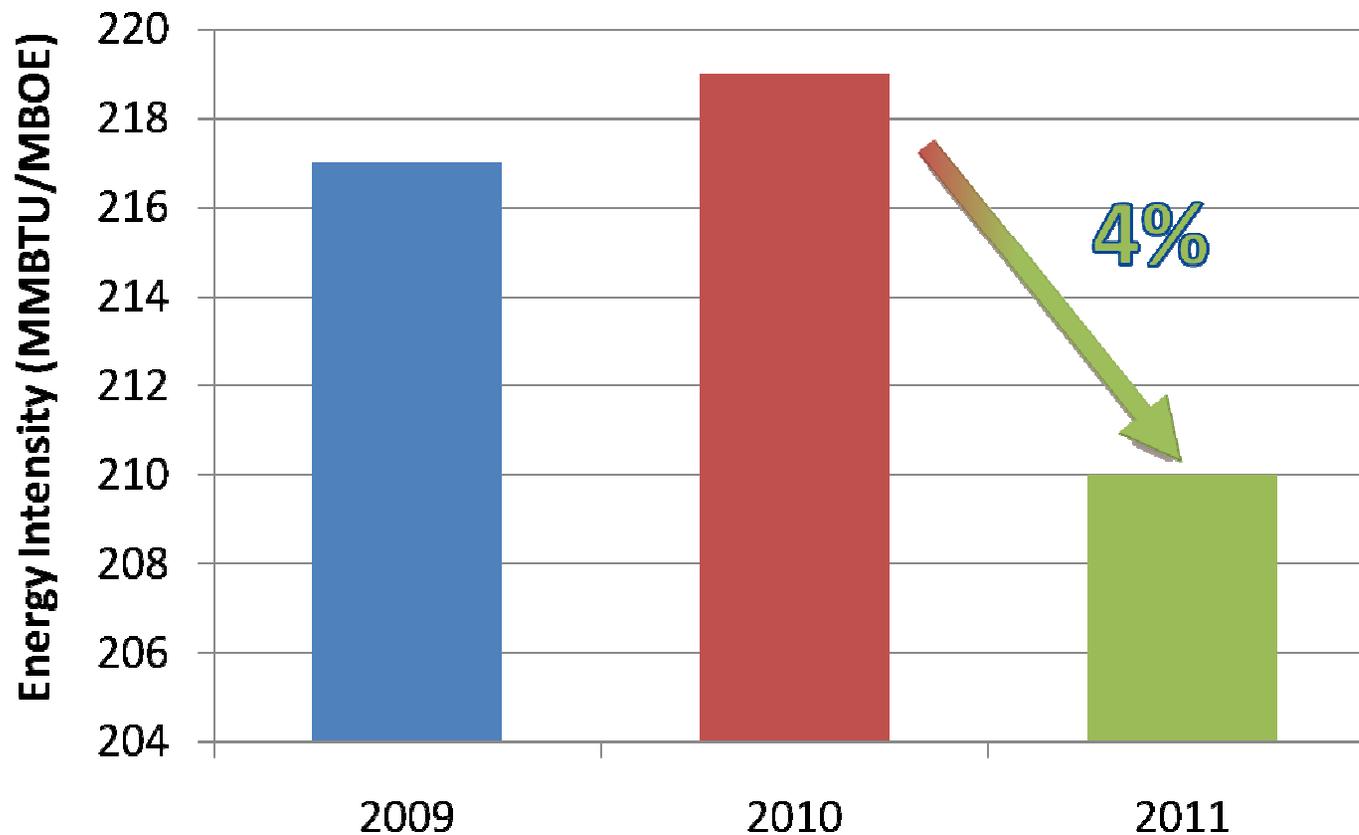
WORKSHOPS & CAMPAIGN

70 TO 75 TO 80 TO 85 TO 90 TO 95 TO 100 TO 105 TO 110 TO 115 TO 120 TO 125 TO 130 TO 135 TO 140 TO 145 TO 150 TO 155 TO 160 TO 165 TO 170 TO 175 TO 180 TO 185 TO 190 TO 195 TO 200 TO 205 TO 210 TO 215 TO 220 TO 225 TO 230 TO 235 TO 240 TO 245 TO 250 TO 255 TO 260 TO 265 TO 270 TO 275 TO 280 TO 285 TO 290 TO 295 TO 300 TO 305 TO 310 TO 315 TO 320 TO 325 TO 330 TO 335 TO 340 TO 345 TO 350 TO 355 TO 360 TO 365 TO 370 TO 375 TO 380 TO 385 TO 390 TO 395 TO 400 TO 405 TO 410 TO 415 TO 420 TO 425 TO 430 TO 435 TO 440 TO 445 TO 450 TO 455 TO 460 TO 465 TO 470 TO 475 TO 480 TO 485 TO 490 TO 495 TO 500 TO 505 TO 510 TO 515 TO 520 TO 525 TO 530 TO 535 TO 540 TO 545 TO 550 TO 555 TO 560 TO 565 TO 570 TO 575 TO 580 TO 585 TO 590 TO 595 TO 600 TO 605 TO 610 TO 615 TO 620 TO 625 TO 630 TO 635 TO 640 TO 645 TO 650 TO 655 TO 660 TO 665 TO 670 TO 675 TO 680 TO 685 TO 690 TO 695 TO 700 TO 705 TO 710 TO 715 TO 720 TO 725 TO 730 TO 735 TO 740 TO 745 TO 750 TO 755 TO 760 TO 765 TO 770 TO 775 TO 780 TO 785 TO 790 TO 795 TO 800 TO 805 TO 810 TO 815 TO 820 TO 825 TO 830 TO 835 TO 840 TO 845 TO 850 TO 855 TO 860 TO 865 TO 870 TO 875 TO 880 TO 885 TO 890 TO 895 TO 900 TO 905 TO 910 TO 915 TO 920 TO 925 TO 930 TO 935 TO 940 TO 945 TO 950 TO 955 TO 960 TO 965 TO 970 TO 975 TO 980 TO 985 TO 990 TO 995 TO 1000

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EMAILS & EDUCATIONAL

2009-2011 SHGP ENERGY INTENSITY



$$EII = \frac{\text{Energy Consumption (MMBTU)}}{\text{Plant Feed (MBOE)}}$$



CONCLUSION





Q & A



ENERGY PERFORMANCE MONITORING

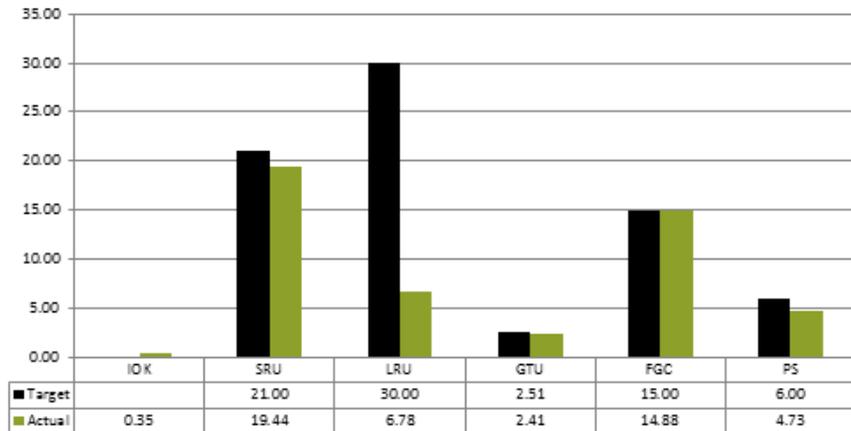
IOK				
	Unit	Target	Actual	Deviation
EII	MMBTU/MBDOE		0.35	0.0%
Opportunity	USD/H		0.00	
Total energy consmp.	MMBTU/hr		1.36	
Power consumption	Kw		400.00	
Feed	MMSCFD		824.62	
Production	MMSCFD		500.00	
Utilization	%		1031%	

SRU				
	Unit	Target	Actual	Deviation
EII	MMBTU/ton	21.00	19.44	7.4%
Opportunity	USD/H			
Total energy consmp.	MMBTU/hr		374.65	
Power consumption	Kw		0.00	
Steam consumption	MMBTU/hr		192.29	
Steam Production	MMBTU/hr		0.00	
Fuel consumption	MSCFD		3569.53	
Feed	MMSCFD		61.84	
Production	th		19.27	
Utilization	%		19%	

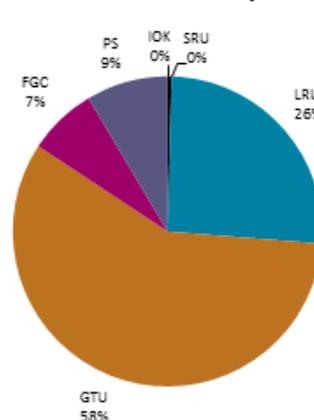
LRU				
	Unit	Target	Actual	Deviation
EII	MMBTU/MBDOE	30.00	6.78	77.4%
Opportunity	USD/H		459.87	
Total energy consmp.	MMBTU/hr		88.21	
Power consumption	Kw		24413.12	
Steam consumption	MMBTU/hr		60.16	
Steam Production	MMBTU/hr		55.25	
Feed	MMSCFD		1200.00	
Production	MBDOE		312.27	
Utilization	%		86%	

GTU				
	Unit	Target	Actual	Deviation
EII	MMBTU/MBDOE	2.51	2.41	4.0%
Opportunity	USD/H		421.72	
Total energy consmp.	MMBTU/hr		3681.05	
Power consumption	Kw		54785.57	
Steam consumption	MMBTU/hr		3494.12	
Feed	MMSCFD		2000.00	
Production	MBDOE		302.08	
Utilization	%		80%	

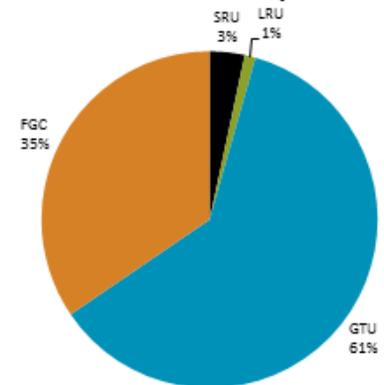
Energy Intinsity Index (EII)



Power Consumption



Steam Consumption



BACK



COMBINED HEAT & POWER MODEL

Input Values:

HP	62 Klb/h	Elec.PwrDem
MP-1	5 Klb/h	215 MW
MP-2	99 Klb/h	Ambient T.
LP	2671 Klb/h	90 F

ST-Mech.	110 MW
Motors	207 MW
STG BP	0 MW
Process	797 MW
Heat/Pwr (f	2.52

Operating cost

Quant.	unit	Cost	Unit
Fuel Cost	4510	MMBtu	3.65 \$/MMBTU
Total Power Gen.	304	MW	
Export Power Gen.	89	MW	
Dimin Water	204.9	Klb/h	1 \$/Klb

Init. Set-up	Set-up	Base-case
Condensate return %	95%	Dist. end point
Min Strm.Res	660	Klb/h
Act. Strm. Reserve	909	Klb/h

12 K\$/hr	Net operating cost per hour
11 Half/MWh	Marginal Electricity Cost

Tot. OC MM\$/yr	100
Energy Intensity	204 Btu/Bbl

ShGP Total Feed	420 MBDoe
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Optimize Develop Base-case Summary

Balance Error Index

Negative flow	OK
Bal.	OK
MinRes.	OK

Balance Error	Loc.
0 Klb/h	BFW
0 Klb/h	HP
0 Klb/h	MP-1
0 Klb/h	MP-2
0 Klb/h	LP
0 Klb/h	Balance

