

Partner Experience: Equatorial Guinea

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Marathon Equatorial Guinea Production Limited (MEGPL)

Natural Gas STAR Implementation Workshop




Marathon

Equatorial Guinea: Alba Field



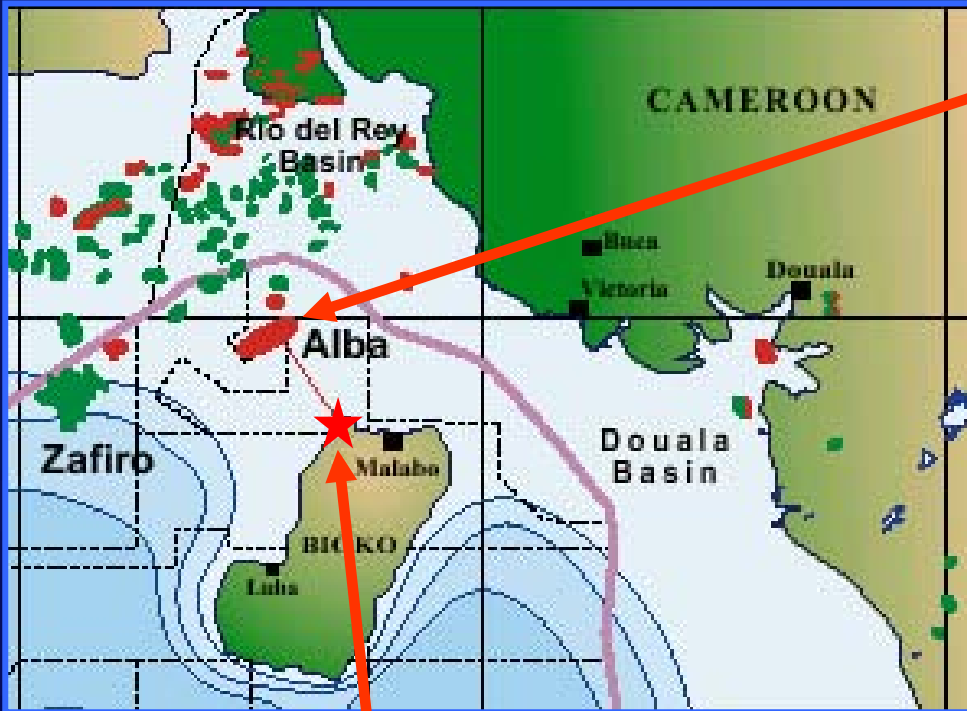
- ◆ Four offshore production platforms
- ◆ Onshore gas/condensate processing facilities
- ◆ Current production (gross)
 - 945 mmscf/d gas
 - ~60,000 bpd condensate
- ◆ Currently re-injecting 20 mmcf/d (normal operations)

Location of Alba Field

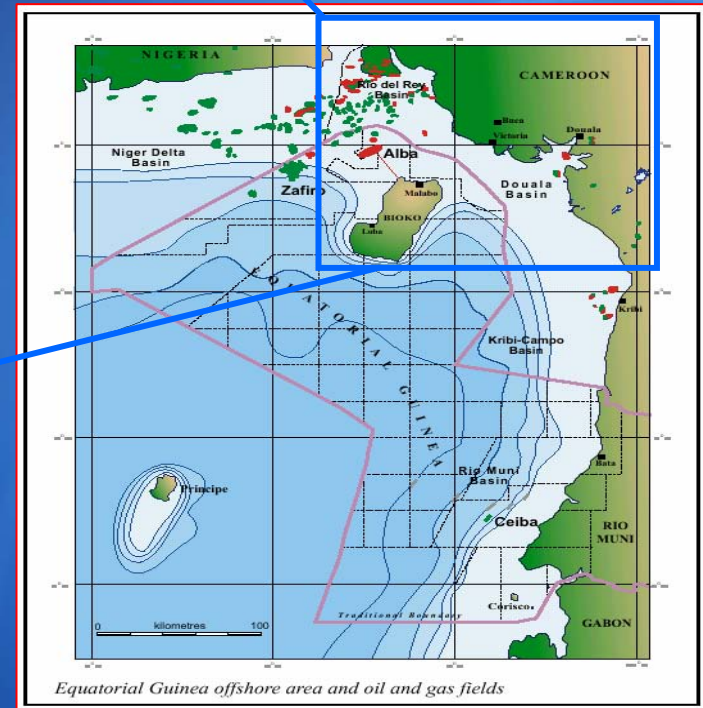


Regional Map

18 miles northwest of Bioko Island



Punta Europa Gas/
Condensate Processing
Facilities



Location of Punta Europa Facilities

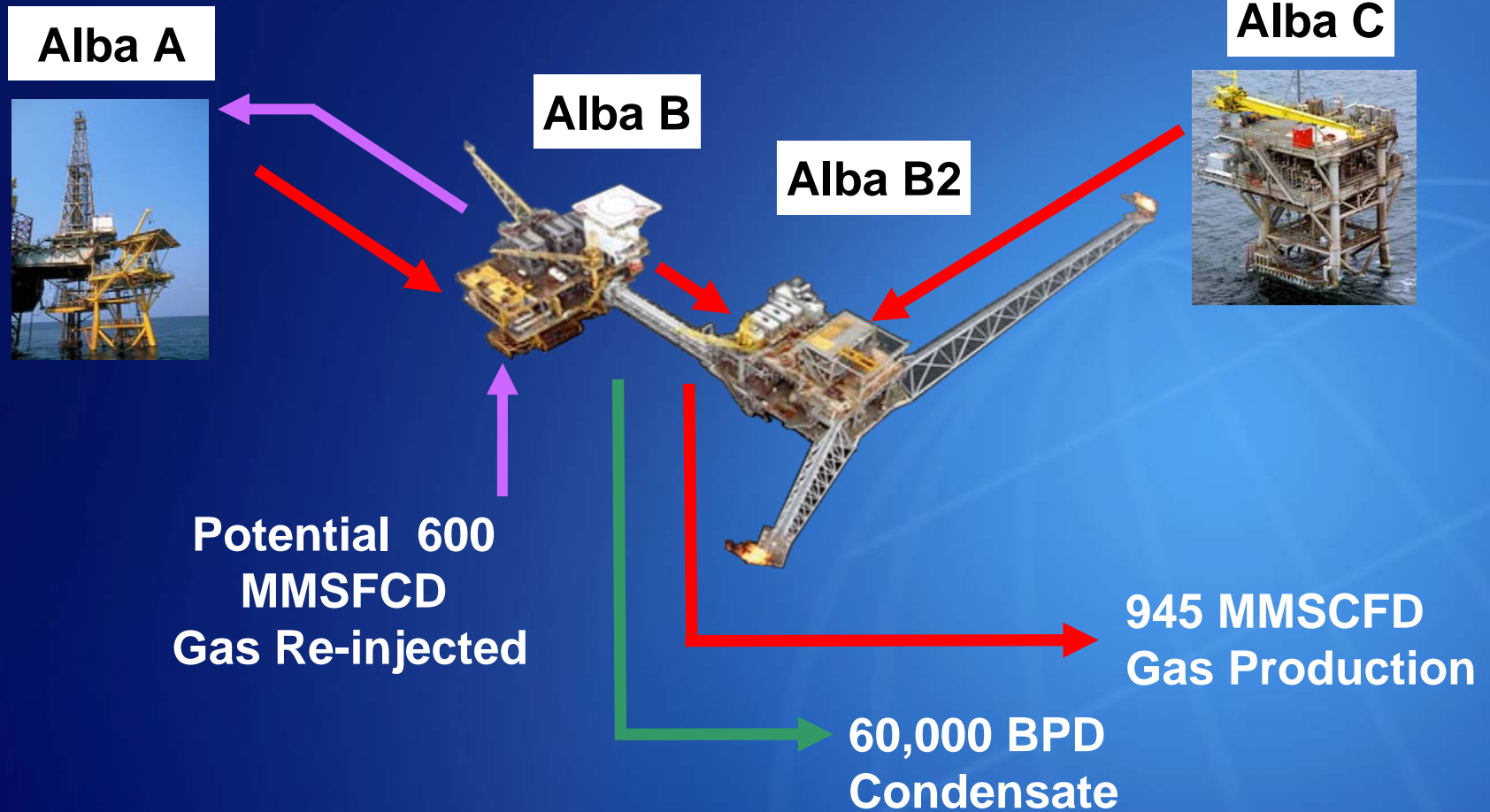


Equatorial Guinea
LNG Operations S.A.
(EG LNG)

Marathon Equatorial
Guinea Production
Limited (MEGPL)

Atlantic Methanol
Production
Company LLC
(AMPCO)

Alba Platform Operations



Punta Europa Processing Facilities



Condensate



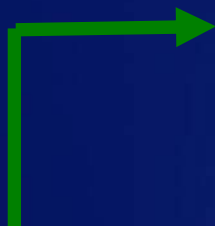
LPG Plant

MEGPL

EG LNG



AMPCO



Alba Field – History of Operations



- ◆ April 1984 Discovery well 13B1-1X drilled
- ◆ December 1991 First Production (A platform: Alba 2, Alba 3)
- ◆ November 1996 LPG Plant construction complete (2,400 bpd)
- ◆ September 2000 Phase 1 Development
Offshore re- injection of gas commences
- ◆ February 2001 Methanol production begins
- ◆ January 2002 Marathon acquires Alba assets
- ◆ October 2004 Phase 2A Complete
Continuous flaring ceases
- ◆ May 2007 LNG Plant begins production

Natural Gas STAR Partnership



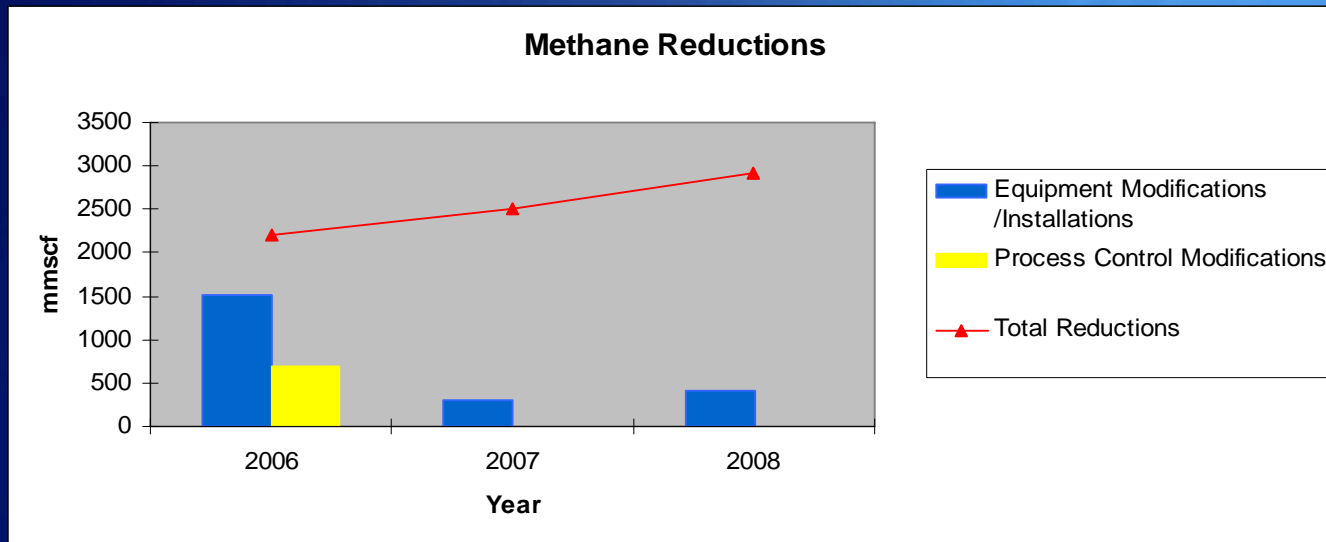
- ◆ U.S. Natural Gas STAR Partner – 1994
- ◆ International Gas STAR Partner – 2006
- ◆ MOC was a charter member of both the U.S. and International Natural Gas STAR programs.
- ◆ Awarded Production Partner of the Year – 1997 and 2006
- ◆ Cumulative methane reductions of 51.6 Bcf between 1994 and 2007



Methane Reduction Projects



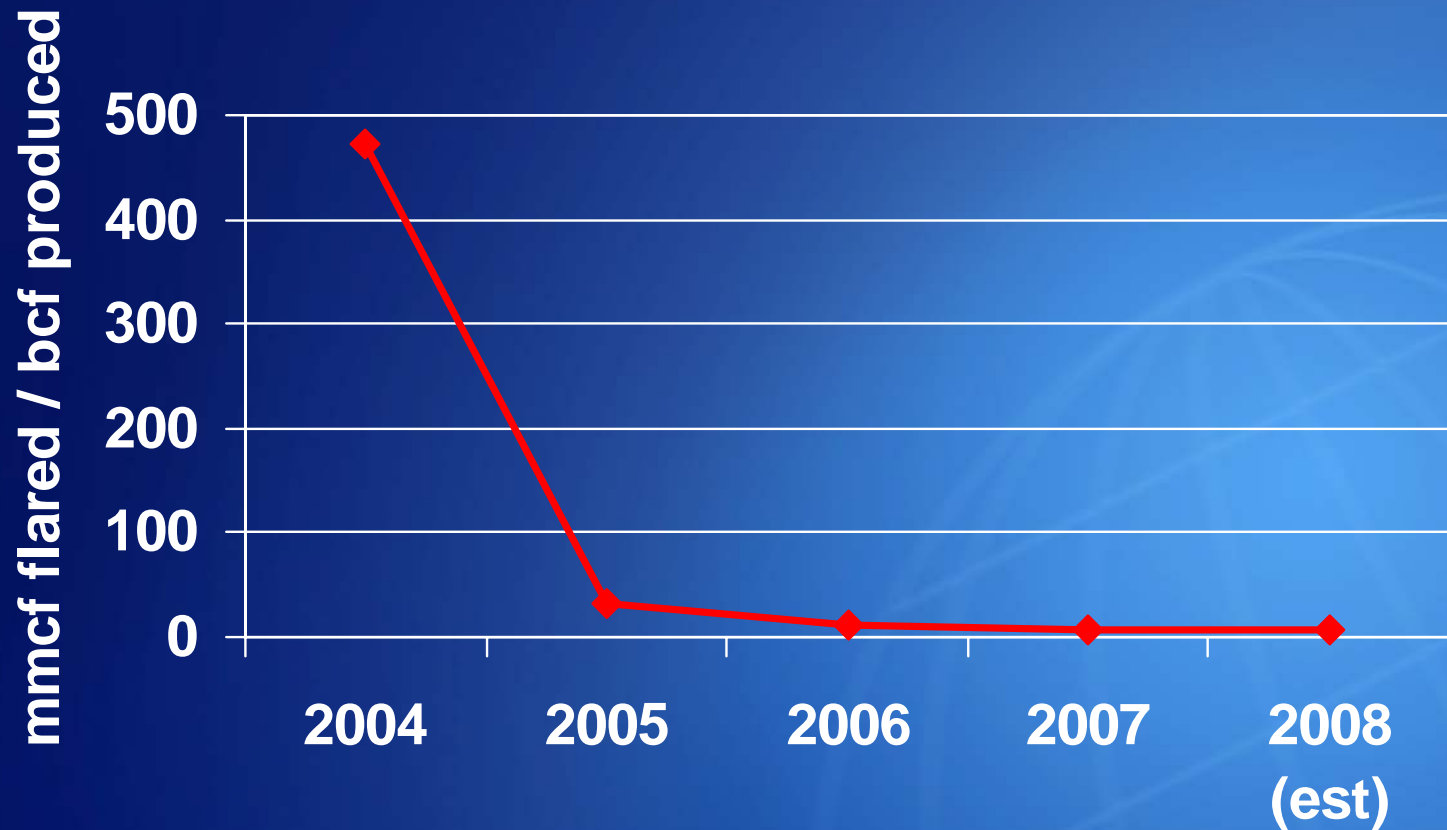
- ◆ Two categories of projects – all relate to reductions in flaring of natural gas
 - Process Control Modifications
 - Equipment Modifications/Installation



Flaring Reductions



Flare vs Gas Production Ratio



Process Control Modifications



- ◆ Reviewed emergency shutdown (ESD) settings – too high/low
- ◆ Eliminated single-point failure controls (where possible) – reduces affect of “false” data in controls
- ◆ Reviewed interconnected controls – allows for quicker/automatic load transitions between redundant equipment

Equipment Modification/Installation



- ◆ **Installed redundant equipment – increases capacity to allow for maintenance without product loss**
- ◆ **Re-routed vapors away from the flare and back into the process where feasible**
- ◆ **Installed pump to improve water handling capabilities**
- ◆ **Overhead compressors re-routed scrubber liquid to a closed drain system (from pressure process vessel)**

Methane Reduction - Economics



- ◆ **Natural gas is low value commodity for MEGPL under it's present supply contracts**
- ◆ **Project economics are typically driven by lost production or value of liquid recoveries from the gas**

Lessons Learned:



- ◆ **Improve the quality of data used for emission calculations – lack of meters, documentation, etc. You need to know where your losses are!**
- ◆ **Capture “low hanging fruit” – review ESD set points, control logic, etc**
- ◆ **Operations and maintenance need to be engaged – not just an environmental issue.**
- ◆ **Moving from construction to operation mentality takes time and effort.**

MEGPL – Government Interaction



- ◆ Limited environmental regulations – don't address air emissions/greenhouse gases
- ◆ Proactive – prepare a “Flaring Philosophy” document each year for review with the Ministry of Mines, Industry and Energy (MMIE)

MEGPL - Social Responsibility



- ◆ **Malaria Control Project – public/private partnership to reduce malaria rate.**
 - Eliminated 95% of disease transmitting mosquitoes and reduced infection rates by 45% reduction in malaria



- ◆ **Education Scholarships – Texas A&M and University of South Carolina**
- ◆ **Malabo Landfill – Construction of landfill used for waste generated on island. Operation of landfill by Malabo City Hall**
- ◆ **Books for Bioko – employee driven program to provide school supplies for local schools**