Financing Oil & Gas Sector Gas Recovery and Flare Reduction Projects
Monterrey 28 January, 2009
Topics

- Global Gas Flaring Reduction Partnership (GGFR)
- Flaring in Mexico
- Carbon finance and flaring reduction projects
- Carbon finance activities in GGFR
- GGFR and Mexico
Global Gas Flaring

- An estimated 150-170 bcm of gas is flared globally (about 25% of US consumption)

- Adds more than 400 million tons of carbon dioxide into the atmosphere each year

- 75% of global flaring occurs in fewer than 10 countries

- Major flaring areas are: Russia, Gulf of Guinea and the Middle East

- Flaring levels remain constant despite increased oil production
Where Gas is Flared?

Europe: 3 bcm
Central and South America: ~12 bcm
North America: 5-7 bcm
Middle East: 30 bcm
Asia: 7-20 bcm
CIS: 15-60 bcm
Africa: > 45 bcm
Partner country gas flaring from satellite data

Gas flared, bcm

Flaring intensity, m3/bbl

- Gas flaring
- Flaring intensity
Why so much flaring - usual barriers

“Soft” causes:

✓ Limited frameworks and complex commercial situations
✓ Supporting fiscal terms
✓ Underdeveloped domestic market

“Hard” causes:

✓ Lack of infrastructure
✓ Risks of gas re-injection in oil reservoir
✓ Distance from significant gas markets
✓ Reliability of supply from associated gas
US Gulf of Mexico

(Bar height indicates volume)

Source:
J. Michael MELANCON, MMS, Gulf of Mexico OCS, Region U.S. Dept. of Interior
Barrier overcome - Recovery Pipeline Network

Pipeline Infrastructure

Source
J. Michael MELANCON, MMS, Gulf of Mexico OCS, Region U.S. Dept. of Interior
World Bank-Led Public & Private Partnership

**Countries/NOCs**
- Algeria (Sonatrach)
- Angola
- Cameroon (SNH)
- Chad
- Ecuador
- Equatorial Guinea
- Indonesia
- Kazakhstan
- Khanty Mansiysk (Russia)
- Nigeria
- Gabon
- Azerbaijan (Socar)
- Uzbekistan
- Iraq

**IOCs**
- BP
- Chevron
- Conoco Phillips
- ENI
- ExxonMobil
- Marathon Oil
- Shell
- Statoil Hydro
- Total

**Donors**
- Canada
- European Union (as of 2008)
- France
- Norway
- USA

**Multilateral Organizations**
- The World Bank
- OPEC Secretariat

**Goal:** Reduce Global gas flaring

**Basis:** collaborative effort between Governments, IOCs and NOCs and other stakeholders
GGFR Scope of Work

• Facilitation
  - In the Gas Flaring Reduction Committee in Nigeria
  - In Russia, bilateral discussions with GoR and stakeholders
  - In Equatorial Guinea, Gabon,…

• Best Practice dissemination activities
  - Global Forum, Regional Conferences, Workshops, Best Management Practice (sharing best operational practices among operators)

• Technology
  - Global Forum on Flare and Vent Reduction, Amsterdam, December 2008

• Country Implementation Plans
  - GGFR is facilitating some CIPs to eliminate flaring
  - Helping countries to implement flaring policies: Nigeria, Algeria, Gabon,…

• Carbon Finance
  - Technical assistance, leverage of Kyoto Clean Development Mechanism
  - Scaling up under new World Bank funds
  - Demo projects
Gas Flaring in Mexico

- Mexico reported flaring 9.5 bcm in 2008 (until Sept.) – 70% increase
- A valuable resource for Mexico - Equal to 51% of imports (2007)
- Significant opportunity for mitigating country GHG emissions
  - 2-4% of national GHG
  - At current rate of 1231 MMscfd (up to Sept 08), CO2e could reach 22 million tons annually

Barries
- Insufficient infrastructure (gathering, processing, treating and compressing)
- Operational conditions (e.g. nitrogen reinjection and AG composition)
- Focus on oil production maximization
- Fiscal regime neutral to flaring and venting
- Institutional setting surrounding oil & gas operations (e.g. restricted access to CAPEX)

Source: various reports from Pemex
**Management and Regulatory Setting**

- **Pemex announced efforts**
  - New 2008-2012 operational efficiency program (PEO)
    - E&P to sustainly reduce gas venting and flaring
    - Pemex Gas to improve efficiency of gas processing operations

- **Regulatory conditions**
  - New “Programa Sectorial de Energía” (Prosener)
    - Line of action: give priority to AG recovery over oil production, and gas flaring reduction
    - Associated Gas Utilization Rate Goal

<table>
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<th>Venting and Flaring Reduction Goals</th>
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Carbon Finance Basics

Methodologies required for:

- Determination of Baseline Emissions
- Monitoring CDM Project Emissions
- Calculation of Emission Reductions
Key concept: ADDITIONALITY

- 1 CER = 1 more ton CO2 emitted in Annex 1 countries
- Only emission reductions that are ADDITIONAL to emission reductions that would have occurred without CDM
  ➔ Not all “Emission Reductions” are eligible to CDM
  Ex: least cost hydro may or may not be eligible

Additionality established on the basis of:
- Financial Analysis: Additional cost, lower IRR, etc…

  OR:
- Barriers preventing the “clean” project to take place:
  - Difficulties to achieve financial closure (*no long term commercial loans*)
  - Technology Risk: first of kind in the country (*high pressure boilers Cogen*)
  - Social / market acceptability (*scavengers resettlement for landfill gas to power*)
  - *Etc.*
Steps to Developing Gas Flare CDM Projects

- Identify key flaring projects and establish methodology
- Do initial assessment of potential projects (PINs)
  - Establish alternative uses for the gas
  - Feasibility of Physical Implementation
- Develop PDDs on high priority projects (e.g. based on Gas Utilization program)
  - Establish Baseline based on historical flaring
  - Determine Additionality (bases on alternative uses)
  - Establish a solid Monitoring Plan (*very important!!!*)
- Approval by DNA and Register with UNFCCC
- Implement and Monitor

Source www.eneos.co.jp/
Economics of Gas Flare CDM

- By-product of gas/NGL project
- Improves cash flow by 20% to 30% (or more depending on gas usage and content)
- Major improvement in project profitability
  - No additional capital investment
  - Very low operating costs
  - High margins
Economics of Gas Flare CDM

Revenue stream from emission reductions

Emission reductions created when a specific project (e.g. flare reduction) is implemented and operational
Economics of Gas Flare CDM

Source: Sindicatum Carbon Capital
GGFR and Carbon Finance

• To help initiation of government body (DNAs) in GGFR partner countries (e.g. Angola, Nigeria, Indonesia, Algeria, and Russia)
• To facilitate flaring reduction projects earn carbon credits and achieve results
• To make a GHG mitigation difference: projects offer large, real, measurable ERs
• To motivate industry, which is engaged but not strongly linked with emerging carbon mechanisms
• Do to the few # of projects back then (and still now)
• Limited (and limiting) associated gas utilization methodologies (AM 0009 & 37 upstream and AM 0055 for downstream)
• Due to the actual sustainable development benefits: from small to large scale projects
Carbon Finance demonstration projects

Afram Gas Integrated Project
- Grid connected IPP (650 MW)
- New developed methodology
- tCO2e potential: 700,000 /y
- Start up: 1Q/2008

Danilovsk gas recovery project
- Grid connected IPP (36MW)
- Operating / under validation
- tCO2e reduced: 162,000 /y
- Start up: Dec. 2005

Afam Gas Integrated Project
- Grid connected IPP (650 MW)
- New developed methodology
- tCO2e potential: 700,000 /y
- Start up: 1Q/2008

LNG Plant
- AG commercialization (6.8 mill m3/y)
- Dropped as CDM activity
- tCO2e potential: 1.5 M/ y
- Start up: 2012

TFT gas recovery project
- AG processed and marketed
- Project document drafted
- tCO2e reduced: 200,000/y
- Start up: ?

Kwale gas recovery project
- Grid connected IPP (480MW)
- Operating / under verification
- tCO2e reduced: 1.4 M/y

PetroEcuador screening
4 small scale project ideas drafted:
- AG to power
- AG recovery for LPG
- AG for fuel switch

Medco Kaji LPG project
- AG for LPG
- Under validation
- tCO2e reduced: 123,000/y
- Start up: 2004
Nigeria - Kwale associated gas recovery

- **Project**: capture and utilization of flared AG for independent power generation (480MW)
- **Status**: registered (verification)
- **Partners**: JV NNPC (60%), Agip (20% and operator) and ConocoPhillips (20%)
- **Alternatives** -> flaring, venting, on-site use, re-injection, AG recovery (project activity)
- **Carbon reduction**: approx. 1.5 M tCO2/year (10 years)
- **Start up**: 06/2005
- **Project economics**
  - IRR 13% to 15% range ante tax (below minimum investment return for Nigeria)
- **Sustainable development contribution**:
  - Increase energy and electricity supply
  - Reduced local pollution in highly vulnerable and unstable Delta region
  - Potential displacement of small diesel power widely used in Nigeria
Vietnam - Rang Dong oil field

- **Project**: Recover and use of associated gas from off shore field (140 Kms)
- **Status**: Verified - 4 Million CERs generated
- **Partners**: Petrovietname, JVPC, and ConocoPhillips
- **Alternatives** -> venting; flaring (BL); onsite consumption; re injection; recovery; or process and transport (project activity)
- **Carbon reduction**: aprox. 677,000 tCO2/year (10 years)
- **Start up**: 4Q/2001
- **Sustainable development contribution**: Additional source of clean gas, Cleaner power (displacement of diesel), Reduced pollution, Reducing gas imports
Nigeria - Afam Integrated Gas & Power

- **Project**: Grid connected IPP (650 MW) combined cycle plant with AG and non-associated gas
- **Status**: NM208 rejected
- **Partners**: JV NNPC (60%), Shell (40%)
- **Alternatives** -> off grid diesel, existing on grid power, new open cycle plant, new CCT (project activity)
- **Carbon reduction**: aprox. 700,000 tCO2/year (7 years)
- **Start up**: 1Q/2008
- **Additionality**
  - Barrier analysis
- **Sustainable development contribution**:
  - Flaring reduction in Delta region
  - Cleaner power (displacement of small diesel)
  - Reducing capacity deficit
  - Increase electricity reliability

Figure 3 - Current and historical on-grid and off-grid generation capacity in Nigeria

Source: NEPA, Tulet-E, Off-grid diesel baseline study, 2003
Current GGFR CF Activities

- Carbon Finance assistance to Cameroon, Gabon, Qatar, Indonesia, and Azerbaijan
  - Project screening and identification
  - Early project preparation
- Leading effort to create an independent CDM Methodology Workgroup (under evaluation)
- Looking into potential gas flaring reduction program under new WB Carbon Partnership Facility
  - Post 2012 carbon fund to focus on sectors (not project by project)
    - Oil & Gas: flaring reduction, cogeneration, etc.
• Ongoing dialogue based on potential participation of Mexico into GGFR

• Support offered on:
  – Economic and technical feasibility of gas recovery project
  – Development of Associated Gas Recovery Plan (AGRP) for Pemex
  – Regulatory advice on key elements of flare and vent policy (implementation of Global Voluntary Standard)
  – Best practice sharing, e.g. flare and vent gas measurement
  – Support in leveraging carbon finance for gas recovery
Opportunities in Pemex?

GHG reductions. Opportunity areas in PEMEX 2005-2008

PEMEX has identified projects in each opportunity area:

- Cogeneration
- CO2 injection
- Energy efficiency
- Fugitive emissions reductions
- Gas flaring reductions
- Fuel substitution
- Vapours
- Carbon sequestration

Total projects: 75

Estimated reduct. MtCO₂/year: 5,814, 3,794, 447, 84, 1,519

GGFR’s Vision is...

Thank you!

Further information:

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www.worldbank.org/ggfr
Back Up
Project by project vs programmatic approach

- **Project by project approach:**
  - Higher transaction costs
  - Lower predictability for project owners
  - “Individual” impact on emissions

- **Programmatic approach:**
  - Larger scale of activities
  - Better planning environment for project owners
  - Transformational impact on emission trend