Methane Project Development Cycles and the Role of Finance

World Bank Methane Finance Study Group: 2nd Meeting

U.S. Environmental Protection Agency
Agenda

- Overview of Methane Project Cycle and Related RBF Considerations
  - Agriculture
  - Coal Mining
  - Landfills
  - Oil and Natural Gas Systems
  - Wastewater
Livestock and Agro-Industrial Waste – Project Cycle

**Project Identification**
- **Key Activities (Cost)**
  - Thru program marketing
  - Screen project (L) applications
  - Identify project type
  - Notify applicants (L)
- **Stakeholders**
  - Industry
  - Facility owner/operators
  - GMI delegates
- **Barriers (Importance)**
  1. Financial access to initial capital
  2. Past technical failures and/or reluctance
  3. Utility rates and inter-ties

**Design, Emissions and Financial**
- **Key Activities (Cost)**
  - Preliminary design (M)
  - Project Plan (M)
  - Identify costs and revenues (L)
  - Develop C/B analysis (L)
  - Verify commitment (L)
- **Stakeholders**
  - Facility owners
  - Design technicians
  - GMI Delegates
- **Barriers (Importance)**
  1. Finance unavailable
  2. Credible design/service industry missing
  3. Owner may balk
  4. Regulation adds cost/burden

**Project Construction**
- **Key Activities (Cost)**
  - Construction/Operation (H)
  - Secure material and equipment (H)
  - Excavate (H)
  - Build (H)
- **Stakeholders**
  - Facility owner
  - Designer/equipment suppliers
  - Regulators
- **Barriers (Importance)**
  - Owner/operator insists on design changes (M-H)
  - Adds animals substrate

**Project Start-up, shake down, and operational training**
- **Key Activities (Cost)**
  - Start-up and Operation (H)
  - Operation training and support (L-M)
- **Stakeholders**
  - Facility owner
  - Designer/equipment suppliers
  - Regulators
  - Program/GMI administration
- **Barriers (Importance)**
  - Owner/operator changes system operation (H)
  - Does not meet regulatory standard (m-H)

**Project Maintenance**
- **Key Activities (Cost)**
  - O&M
  - General maintenance (L)
  - Engine maintenance (M)
  - Monitor; report; verify (L)
- **Stakeholders**
  - Facility owner
  - Designer/equipment suppliers
  - Regulators
  - Program/GMI administration
- **Barriers (Importance)**
  - Owner/operator changes system operation (H)
  - Does not meet regulatory standard (m-H)
  - Equipment supplier and developer unsupportive (L-M)
Livestock and Agro-Industrial Sector: RBF Considerations- Q&A

- Profitability of projects

**Relative profitability of projects without carbon credits:**
- Utility issues, rates, grid access, and operating modes can affect financial performance of medium-large scale projects. (H)
- LPG costs effect small scale projects. (H)

**Average cost of projects:**
- Medium-large scale projects
  - with engines (power production ~$.5-1.5 million.
  - Without power production ~$ .3-. 8 million.
- Small scale projects
  - ~$300-1,500

**Average payback period:**
- In open and fair energy market
  - 4-8 years
- In a barrier energy market
  - >10 or no payback

**Typical basis for payback: (ie. carbon credits, gas value, electricity value)**
- Carbon credit of $10/ton can trigger profitability across all sectors
- Energy rates of ~$.10/kWh can be profitable or breakeven point
- LPG costs of $20/50 kg. tank can be profitable
Livestock and Agro-Industrial Sector: RBF Considerations – Detailed (cont.)

• Multiple interconnected barriers, particularly 1 and 2 impede project development as follows:

**PROJECT DEVELOPMENT**

**Barrier 1:** Access to *large initial investment*. Banks do not understand the technical side and see as high risk;

**Barrier 2:** Technical *quality /reliability* such as overestimating and oversizing gas use equipment while digesters are commonly undersized.

  ➢ Leads to project under performance, higher costs, and financial and/or technical failure.
  ➢ Owner/operators at times operate the project beyond the design basis which also leads to similar outcomes.

**FINANCIAL**

**Barrier 3:** Regulatory *compliance* such as a discharge standard

**Barrier 4:** Access to *energy markets* – rates, inter-connect and operation

**Barrier 5:** Time line of registering a project with the UNFCC can be years at high expense. PoA’s included and additionality - addressed in the Philippines (see *GMI Philippine Livestock Additionality Report* (2010)).
Project Cycle: Coal Sector

**Project Identification**

- **Key Activities (Cost)**
  - Identifying potential projects (L)
  - Outreach to mine operator/NDA (M)

- **Stakeholders**
  - Project developer
  - Mine mgmt
  - 3rd Party (EPA, etc)

- **Barriers (Importance)**
  - Lack of reliable data (L)
  - Experience/technical expertise (L)

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**Preliminary Project Analysis**

- **Key Activities (Cost)**
  - Pre-feasibility study (L)
  - Gas audit/resource characterization (M)
  - Onsite measurement (M)

- **Stakeholders**
  - Developer
  - Mine mgmt
  - Consultant
  - 3rd party (EPA, etc)

- **Barriers (Importance)**
  - Data accuracy (H)
  - Cost (M)
  - Experience/technical expertise (H)

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**Comprehensive Project Analysis**

- **Key Activities (Cost)**
  - Full-scale, comprehensive feasibility study (H-M)
  - Identify financing (L)

- **Stakeholders**
  - Developer
  - Mine mgmt
  - Consultant
  - Vendors/suppliers
  - 3rd Party (EPA, etc)

- **Barriers (Importance)**
  - Cooperation with Mine (H)
  - Experience/technical expertise (H)
  - Data quality (M)

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**Project Implementation**

- **Key Activities (Cost)**
  - Raise capital (H)
  - Design project (M)
  - RFP to suppliers (L)
  - Install project (H)
  - Offtaktes (M)

- **Stakeholders**
  - Developer
  - Mine mgmt
  - Consultant
  - Vendors/suppliers
  - Investors
  - Regulator

- **Barriers (Importance)**
  - Cooperation with Mine (H)
  - Integration with mine (H)
  - Technical expertise (H)
  - ER markets (H)
  - Utility policies (M)

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**Project Maintenance & MRV**

- **Key Activities (Cost)**
  - Regular O&M (M)
  - MRV ERs & other commodities (M)
  - Monetizing ERs and other commodities (L)

- **Stakeholders**
  - Project Developer
  - Mine mgmt
  - Off takers
  - 3rd Party
  - Regulator

- **Barriers (Importance)**
  - Availability of funding (H)
  - Integration with mine (H)
  - Technical expertise (H)
  - ER markets (H)
  - Utility policies (M)
  - Etc.
Coal Sector – RBF Considerations

• Profitability of projects
  ▪ Relative profitability of projects without carbon credits: L
  ▪ Average cost of projects: gas drainage = $1-10 mln; VAM = $6-10 mln
  ▪ Average payback period: 5-10 years
  ▪ Typical basis for payback: Carbon credits, electricity value, gas value, heating value

• Considerations that affect RBF
  ▪ Large barriers to actual project implementation that RBF (being a “back-end” income stream) may not ease
    ▪ Successful integration with the coal mining operation
    ▪ Limited support and inconsistent cooperation from mine management
    ▪ Large up-front investment required
  ▪ New or upgraded subsurface drainage can significantly increase total project costs
  ▪ The length of time between project investment and RBF payout
  ▪ Regulatory and policy framework - Investor concern over reliability and predictability of regulatory-driven synthetic environmental markets
  ▪ Gas quality and quantity which directly impact the generation of emission reductions are often outside the control of emission reduction project
Project Cycle: Landfill Sector

**Project Identification**

**Key Activities (Cost)**
- Identify candidate sites (L)
- Obtain commitment of site owner (L)

**Stakeholders**
- Landfill owner
- Third party (EPA, project developer, development bank)

**Barriers (Importance)**
- Lack of reliable data (L)
- Lack of technical expertise/experience (L)

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**Preliminary Project Analysis**

**Key Activities (Cost)**
- Desktop evaluation (L)
- Pre-feasibility study (M)
- Onsite inspection/visit (L)

**Stakeholders**
- Landfill owner
- Third party
- Consultant

**Barriers (Importance)**
- Historical and accurate data (M)
- PFS is a sunk cost (M)
- Experience/technical expertise (M)

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**Comprehensive Project Analysis**

**Key Activities (Cost)**
- Full-scale, comprehensive feasibility study (H)
- Identify roles and financial responsibilities of project partners (L)
- Initial project design (M)

**Stakeholders**
- Landfill owner/Gas rights owner
- Third party
- Consultant

**Barriers (Importance)**
- Determination of gas rights owner (M-H)
- Cost (H)
- Experience/technical expertise (M)

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**Project Implementation**

**Key Activities (Cost)**
- Issue RFP (M)
- Award contract (L)
- Final project design (M)
- Secure financing (M)
- Install project (H)

**Stakeholders**
- Landfill owner/Gas rights owner
- Project developer
- Investors
- Vendors
- Offtakers

**Barriers (Importance)**
- Success of RFP process (H)
- Costs/Avail of financing (H)
- Energy/Utility policies (M)
- Low carbon prices (H)

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**Project Maintenance & MRV**

**Key Activities (Cost)**
- Regular O&M (M)
- Monitor, report, and verify ERs (M)

**Stakeholders**
- Project developer/Vendors
- Regulators
- Offtakers
- Landfill operator

**Barriers (Importance)**
- Carbon markets (H)
- Experience/technical expertise (H)
- Poor O&M of regular landfill operations (H)
Landfill Sector – RBF Considerations

• Profitability of projects
  ▪ Relative profitability of projects without carbon credits: L
  ▪ Average cost of projects: $8-10 million USD (5 MW project)
  ▪ Average payback period: 5-10 years
  ▪ Typical basis for payback: carbon credits, electricity value

• Considerations that affect RBF
  ▪ Large barriers to actual project implementation that RBF (being a “back-end” income stream) may not ease
    ▪ Complications of municipal government RFP process
    ▪ Poor landfill conditions (open dump, no leachate management)
    ▪ Successful integration with normal landfill operations (project developer and landfill owner are separate)
  ▪ The length of time between project investment and RBF payout
  ▪ Large up-front investment in gas collection system required – makes mostly just large projects viable
  ▪ Combining project with other necessities such as installing leachate management system or capping and closing the landfill significantly increases total project cost
  ▪ Inherent uncertainty of gas recovery estimates – increases project risk
Project Cycle: Oil and Gas Sector

**Project Identification**

**Key Activities (Cost)**
- Research project options (L)
- Consider project applicability to operations (L)

**Stakeholders**
- Oil and gas co.
- 3rd party (EPA)
- Consultant

**Barriers (Importance)**
- Co. interest (M)
- Awareness of emissions levels (M)
- Awareness of project options (L)

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**Emissions Analysis**

**Key Activities (Cost)**
- Desktop emissions study (L-M)
- Measurement study (M)

**Stakeholders**
- Oil and gas co.
- 3rd party (EPA)
- Consultant
- Service provider

**Barriers (Importance)**
- Access to service providers/technical expertise (L)
- Cost of studies (L-M)

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**Mitigation Project Analysis**

**Key Activities (Cost)**
- ID tech solutions (L)
- Econ/tech/engin’g analyses (L-M)
- Technology & vendor selection (L)
- Secure capital (L)

**Stakeholders**
- Oil and gas co.
- Consultant
- Service/technology provider

**Barriers (Importance)**
- Tech. expertise (M)
- Avail of capital (M-H)

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**Project Implementation**

**Key Activities (Cost)**
- Install equipment/implement processes (L-M-H)

**Stakeholders**
- Oil and gas co.
- Consultant
- Service/technology provider

**Barriers (Importance)**
- Proper maintenance (L-M)
- MRV burden (??)

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**Project Maintenance & MRV**

**Key Activities (Cost)**
- Conduct maintenance (L)
- Monitor ERs & econ results (L-M)
- Report (??)
- Verify (??)

**Stakeholders**
- Oil and gas co.
- Consultant
- Service provider
- 3rd party verifier

**Barriers (Importance)**
- MRV burden (??)
Oil & Gas Sector – RBF Considerations

- Profitability of projects
  - Relative profitability of projects without carbon credits (H/M/L): H
  - Average cost of projects: $30,000 to $675,000 (<$1 to $6/tCO2e reduced)
  - Average payback period: 6 months – 2 years
  - Typical basis for payback: value of natural gas (for sales or fuel)

- Considerations that affect RBF
  - Duration of project approval may not fit oil and gas project timelines
  - Profitability of projects; RBF more successful where there is no gas value
    - Natural gas transmission and distribution company projects
    - Stranded gas with market/infrastructure barriers
  - Large barriers to actual project implementation that RBF may not ease
    - Low EH&S budgets, competition for limited resources
    - Opportunity cost for methane project investment (i.e. vs. production)
    - Inability of corporate accounting to recognize economic value of saved gas/added revenues
    - Limited availability of service providers, success stories in-country
    - Industry perception of venting as “minimal” and gas as a “waste product”
    - Resistance to implementing change in operations
Project Cycle: Wastewater Sector

**Key Activities (Cost)**
- Outreach to WWTP operators (L)
- Screening of WWTP(s) for project viability (L)
- Assess need for pre-feasibility study based on screening (L)

**Stakeholders**
- Professional organization(s)
- WW utility/utilities
- Consultant(s)

**Barriers (Importance)**
1. Lack of reliable data (M)
2. Awareness of options (L)

**Key Activities (Cost)**
- Pre-feasibility assessment / gas modeling / end-use options (L)
- Assess availability of financing (L)
- Preliminary design based on analysis (M)

**Stakeholders**
- WW utility
- Consultants

**Key Activities (Cost)**
- Full-scale feasibility study (M)
- Identify financing (L)

**Stakeholders**
- WW utility
- Developer
- Consultant(s)
- Financial institutions

**Key Activities (Cost)**
- Raise capital (H)
- Design project (M)
- RFP to suppliers (L)
- Construction (H)
- Start-up and Operation (H)

**Stakeholders**
- WW utility
- Developer
- Consultant(s)
- Financial institutions
- Financial institutions

**Barriers (Importance)**
1. Financial (H)
2. Technical feasibility (M)
3. Utility rates and interconnects (H)

**Barriers (Importance)**
- Communications with WW utility (H)
- Data (M)
- Past tech. experience (M)

**Barriers (Importance)**
- ER markets (H)
- Utility policy (M)
Wastewater Sector – RBF Considerations

• Profitability of projects
  ▪ Relative profitability of projects without carbon credits: H/M
  ▪ Average cost of projects: 20-60 million USD
  ▪ Average payback period: 6 to 10 years
  ▪ Typical basis for payback: Gas sales; offset energy costs to WW utility through self-generation

• Considerations that affect RBF
  ▪ Large barriers to actual project implementation that RBF may not ease
    ▪ Relatively large project risks and/or project risks outside the control of project developers
    ▪ Relatively large up-front investment required
  ▪ Technical and policy and institutional barriers.
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Livestock and Agro-Industrial Waste – Development of Country Plan

Preliminary Country Assessment

Key Activity (Cost)
- Desk top analysis of livestock and agro-industrial data identify potential sectors for mitigation (L)

- Used to make “go” or “no go” decision to conduct a Resource Assessment (RA)

**All parts done with:**
1. Industry
2. Government
3. Coordinating entities (if programmatic)
4. GMI delegates

Detailed Country Resource Assessment

Key Activities (Cost)
- Based on industry visitation (statistically based)

- Characterizes waste management processes according to scale and sector (swine, dairy, cassava, potato etc) (H)

- Conduct a simultaneous capacity assessment to identify technical industry capacity equipment/material availability.

**Barriers (all parts)**
- Industry reluctance or avoidance
- Large countries are typically more difficult and expensive

Program Development

Key Activities (Cost)
- Based on RA and CA findings. Two objective requirements for a sustainable program.

1. Mature and reliable AD industry in place (market supply) and a driver to create market demand for AD's such as program policy etc.

2. Implement activities to meet objectives. Typically low term and intensive.

3. Phase out as country demonstrates ability to run on its own

4. This environment causes projects to come to you.

Program implementation

Key Activities (Cost)
- Not all countries are the same.

- Implementation is based on cost and reduction potential and/or other co-benefits; rural sanitation and health; rural development and employment; energy, odor management’ point and non-point source pollution control etc.

- Develop appropriate commercial scale demonstration. (H)

- Implementation requires 1) targeted program marketing and 2. customized skills and technology transfer activities.