

Biothermica



VAMOX[®] Projects at Walter Energy's Coal Mines

GMI Methane Expo
Vancouver | March 14, 2013



Agenda

- 1. Biothermica**
- 2. VAMOX[®] carbon project at
Walter Energy Mine No.4, Alabama, USA**
- 3. Moving forward – upcoming projects**



Biothermica

What we do

- Canadian group founded in 1987
- Develop **patented technologies** applied to industrial emissions control and methane destruction/utilization
- Finance, build, own and operate **carbon credit** and **energy** production facilities
- Based on destruction/utilization of **methane** from **landfills** and **coal mine** ventilation systems





Industrial Emissions Control



BIOTOX[®] Technology

Regenerative Thermal Oxidation (RTO)

Non-conventional industrial emissions

> 10 industrial processes since 1990

9 patents

Award winner from the U.S. AWMA



BIOTOX[®] unit

Presque Isle, Maine, USA

Food industry

100,000 cubic feet per minute (cfm)

COC¹ emissions

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¹ Condensable Organic Compounds



Landfill Methane Selected Projects



Gazmont 25 MW Power Plant
Montreal landfill (Canada)
Finance, Build, Own, Operate
2 billion kWh of electricity since 1996



El Salvador CDM Project
Nejapa landfill
Finance, Build, Own, Operate
100% equity
215,000 carbon credits over 2006-2008
Major interest in project sold in 2008
MIGA insurance



**Multilateral Investment
Guarantee Agency**
World Bank Group



VAM Project Development Natural Evolution



**Industrial Emissions
Expertise**

**Landfill Methane
Project Development**



VAM Project Development



**VAMOX[®] unit at Walter Energy No. 4 Mine
Alabama, USA**

Finance, Technology, Build, Own, Operate

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**WALTER
ENERGY™**

- **Leading producer and exporter of metallurgical coal**
- **Headquartered in Birmingham, Alabama (USA)**
- **Operations in the U.S., Canada and the UK**
- **2012 revenues of \$US 2.4 billion**
- **Over 4,000 employees**

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Walter Energy Global Operations

BRITISH COLUMBIA, CANADA

Western Coal

Wolverine Mine

Brule Mine

Willow Creek Mine

ALABAMA, USA

Corporate Headquarters

Walter Coke

Blue Creek Energy No. 1 Mine

Jim Walter Resources

No. 4 Mine

No. 7 Mine

North River Mine

Walter Minerals

Choctaw Mine

Reid School Mine

Swann's Crossing Mine

Walter Black Warrior Basin &

Black Warrior Methane

(Natural Gas Division)

WEST VIRGINIA, USA

Western Coal

Maple Mine

Gauley Eagle Mine

WALES, UK

Western Coal

Aberpergwm Colliery





VAMOX[®] Project Overview

- JWR Bleeder shaft 4-9, No. 4 Mine, Brookwood, AL
- First of its kind (MSHA) at active U.S. coal mine
- Financed by Biothermica, 100% equity
- **Objective 1:** Demonstrate VAMOX[®] RTO technology
- **Objective 2:** Assess key factors for financial viability
- Full operation over March 2009 – February 2013
- Registered with the Climate Action Reserve





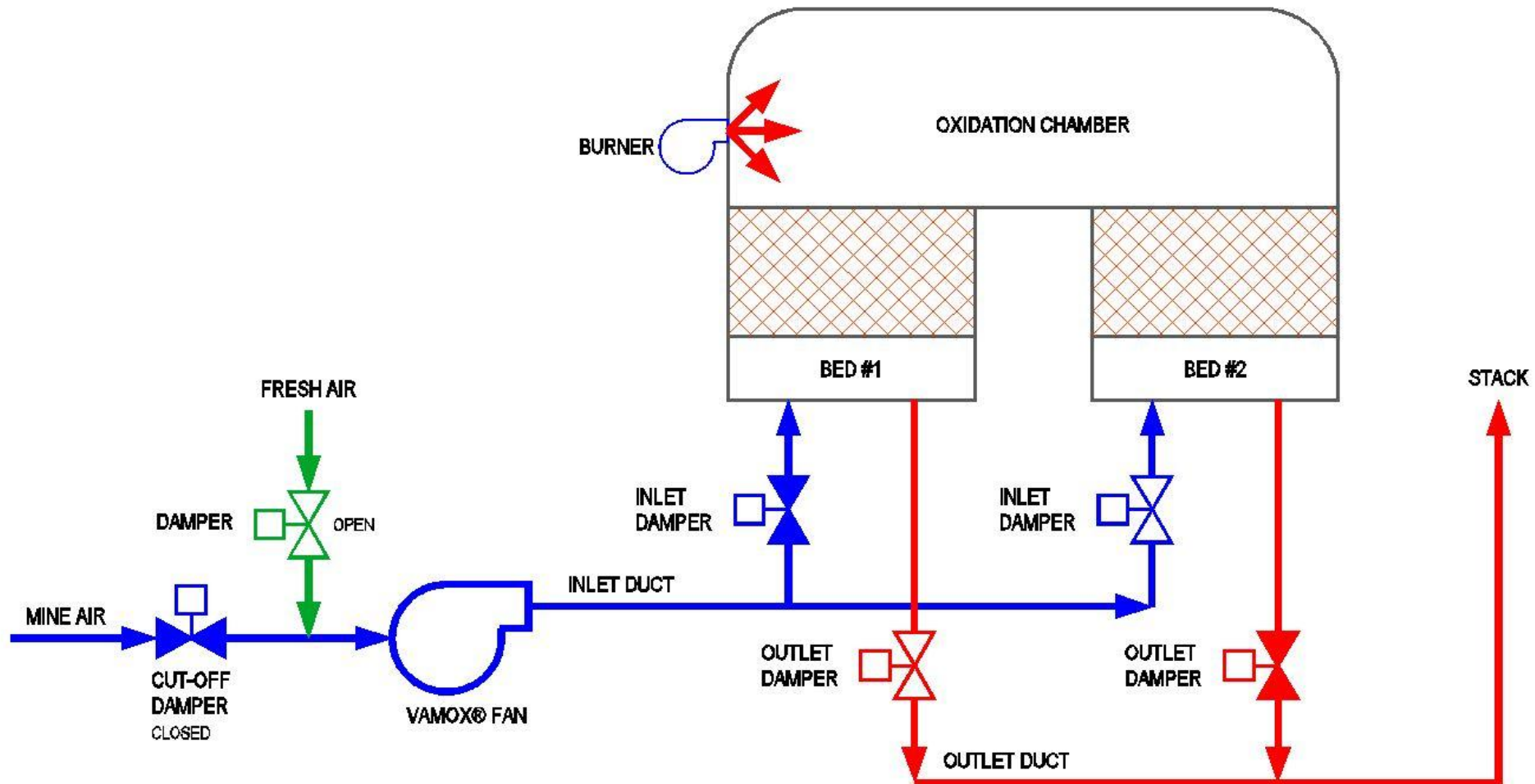
VAMOX[®] Project Specifications

- 2 ceramic bed RTO
- Medium size unit - 1,400 ft² footprint (40*35)
- 30,000 cfm nominal flow rate, 10% of VAM flow
- 0.3% - 1.2% range of CH₄ level accepted
 - Dilution with fresh air if incoming VAM > 1.2%
- VAM destruction only
 - Revenues from carbon credit generation



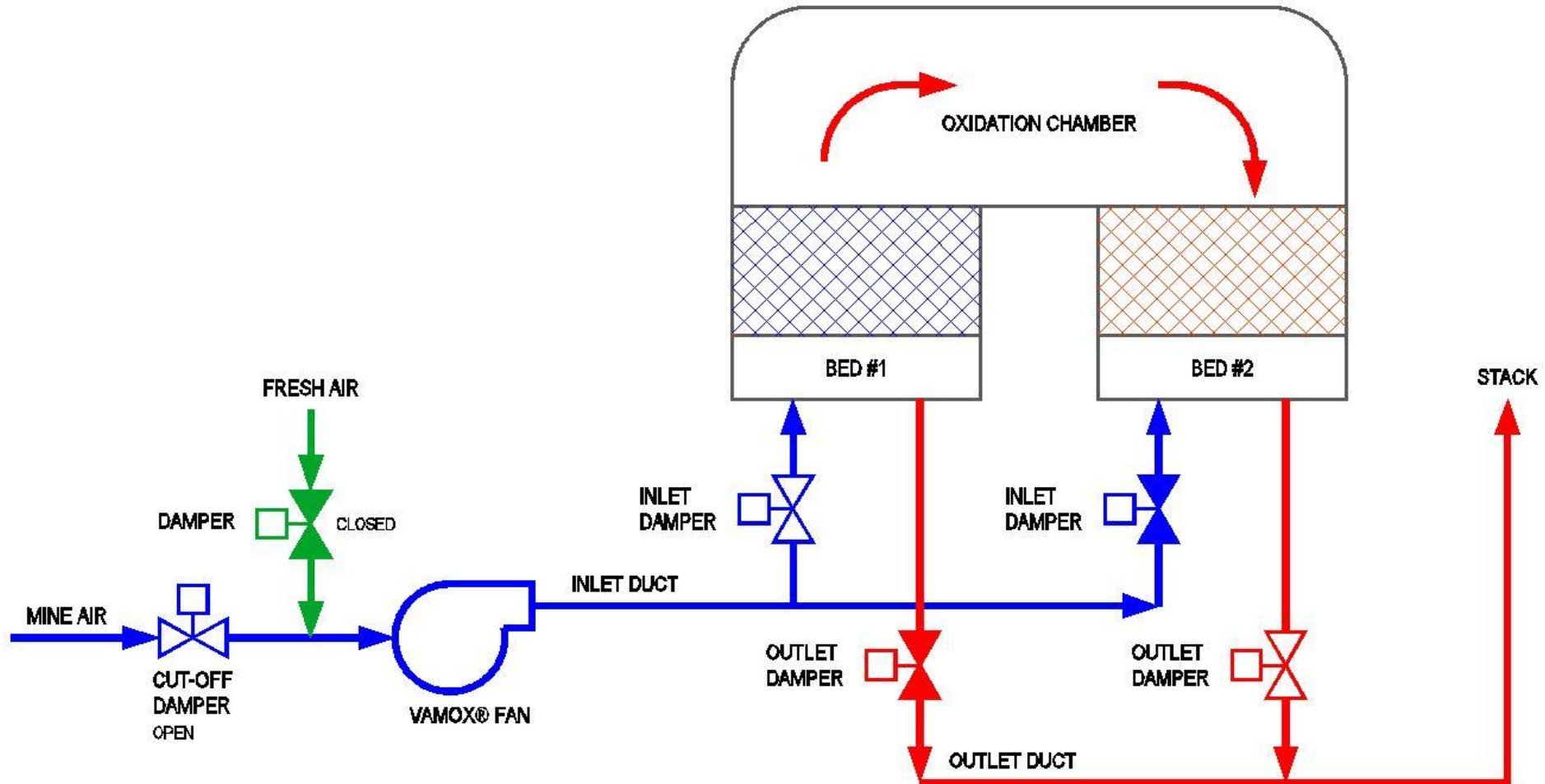
Operating Principle

Start-up



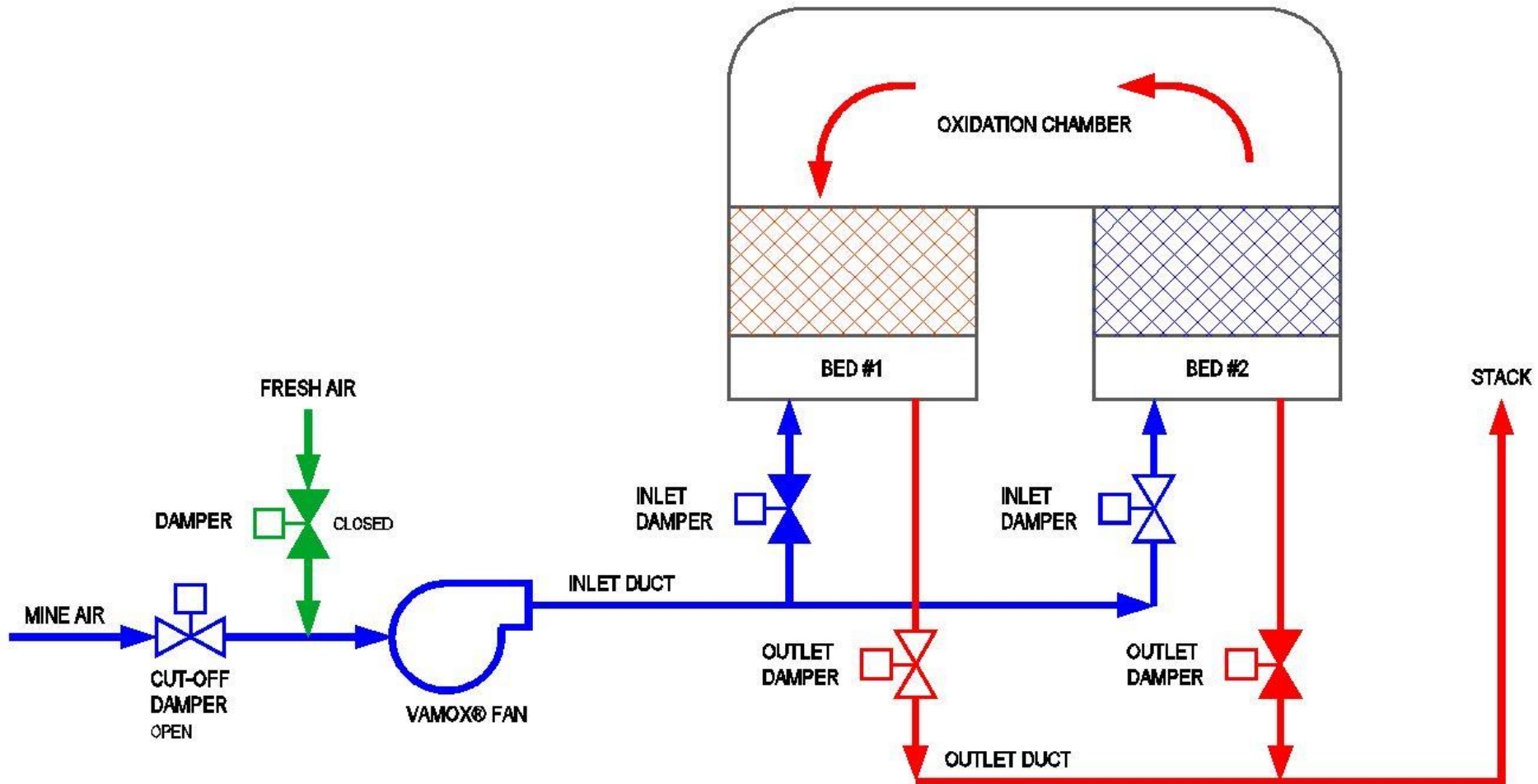


Operating Principle Cycle 1





Operating Principle Cycle 2



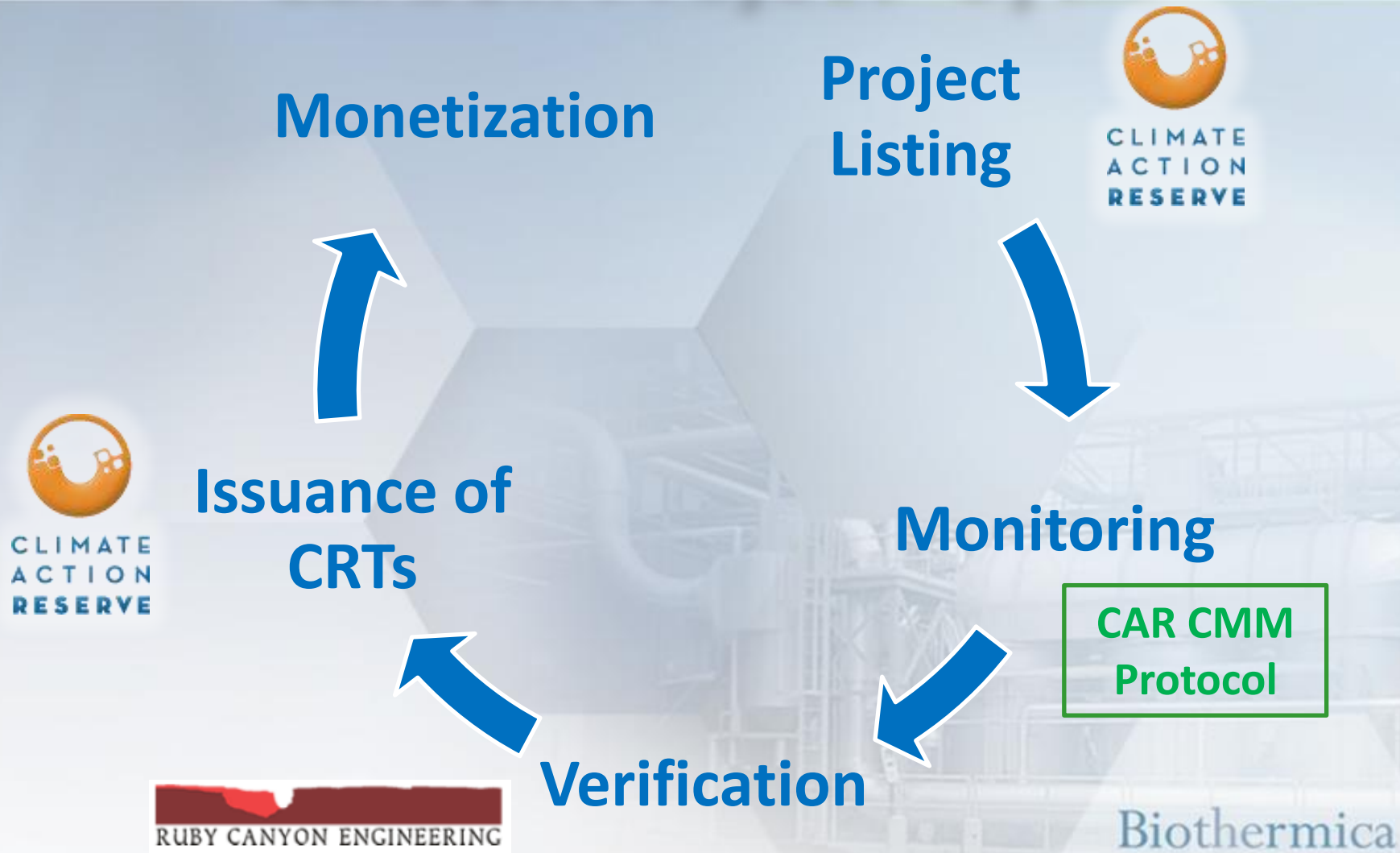






VAMOX[®]

Carbon Project Cycle





Project results

Since March 2009

> 27,500 hrs
Operation hrs

93%
availability¹

> 80,000
tCO₂e emission
reductions

70,387
CRTs issued

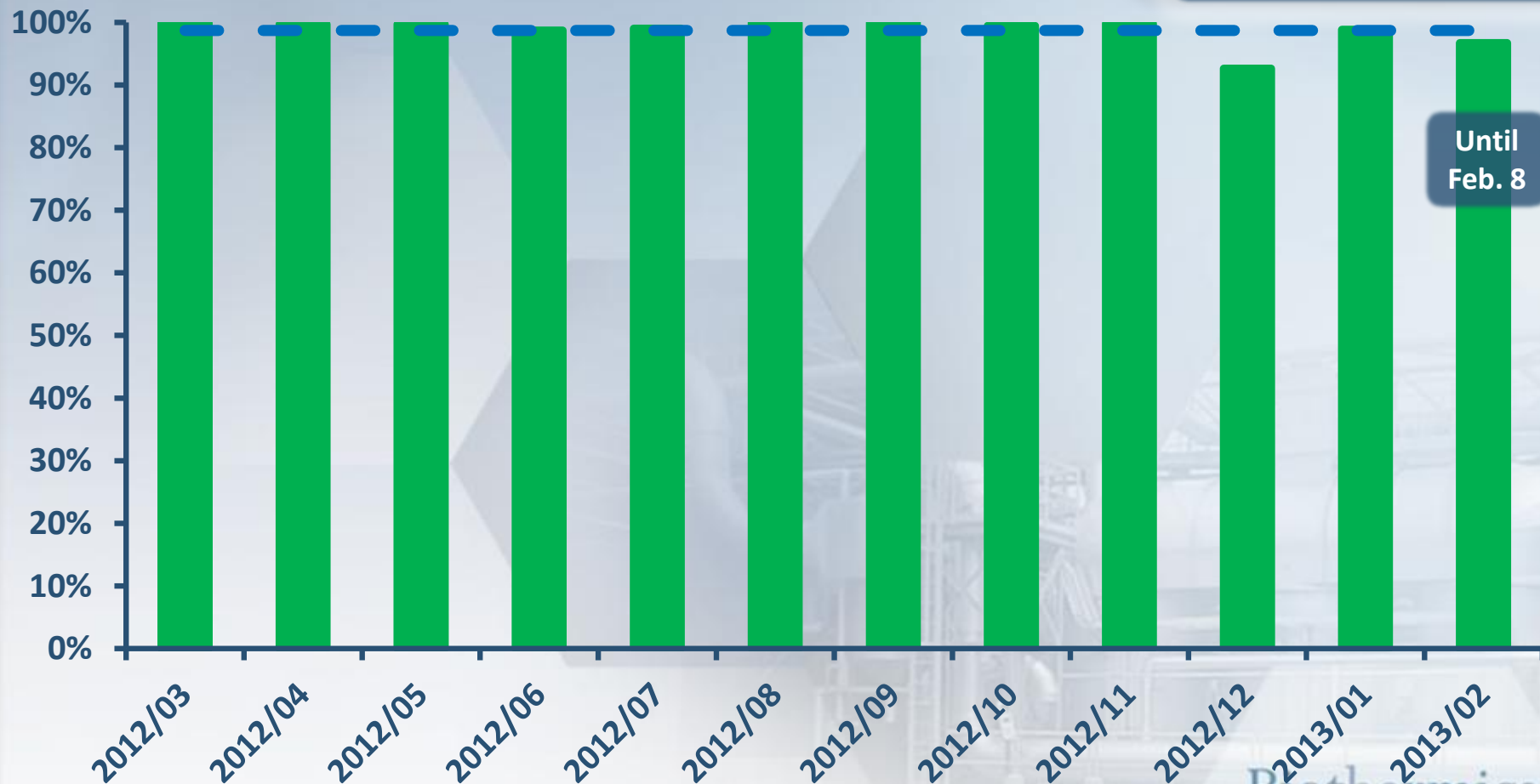
¹ Excluding external events such as Electricity supply outages or [CH₄] < 0.3%



Monthly Availability

Reporting period # 4

Average¹: 98.7 %



Until
Feb. 8

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¹ Excluding external events – most essentially [CH₄] < 0.3%



Methane Level At Shaft Since March 2009

Min: 0.2 %

Max: 1.5 %

Operational experience over wide range of
fluctuating concentrations



Financial Viability

Key Factors

COSTS

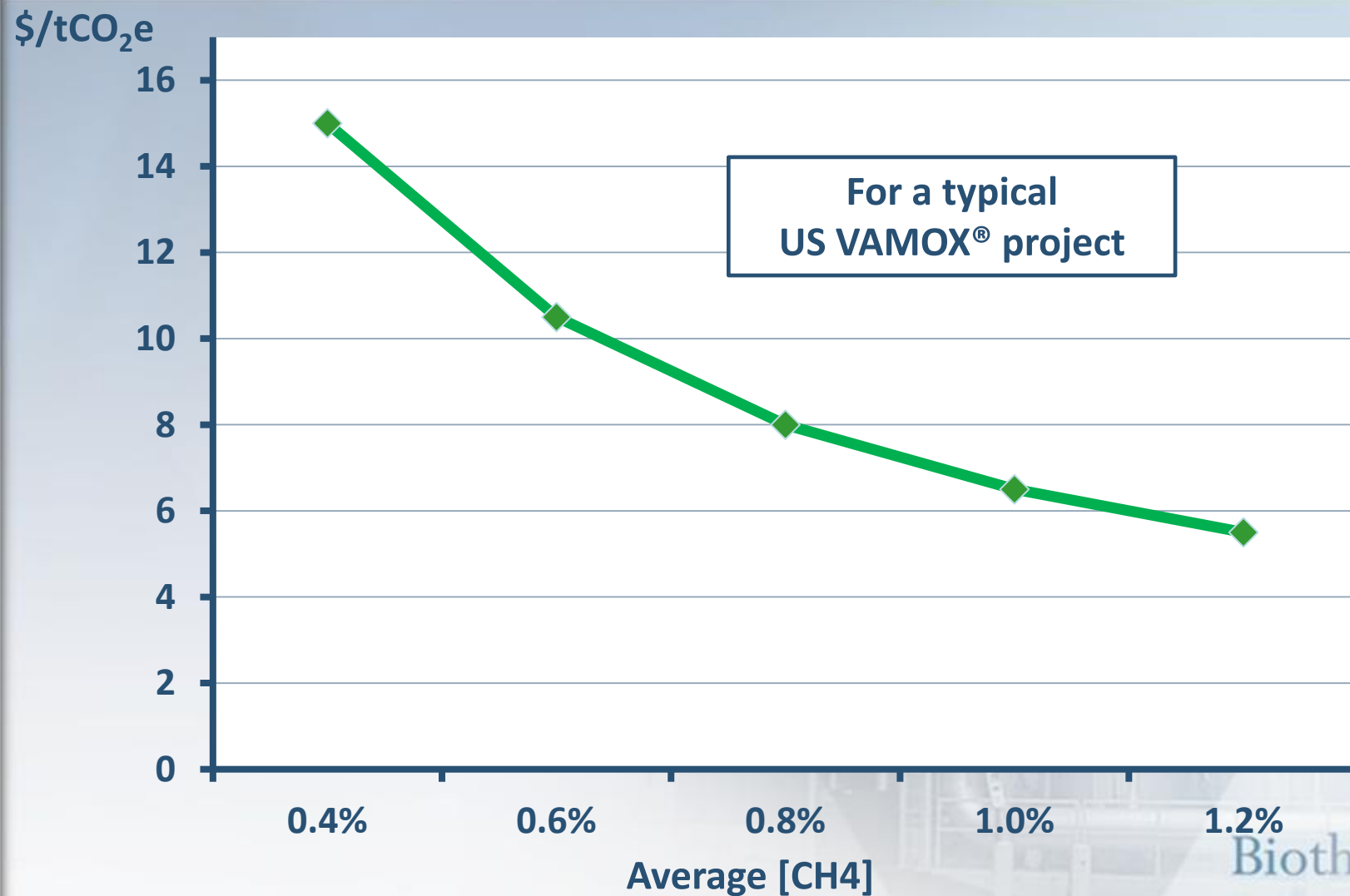
- CAPEX
- Electricity
- Operation & Maintenance

REVENUES

- VAM concentration
- Carbon credit price
- VAM flow rate
- System availability
- Destruction efficiency



Carbon price triggers





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Moving Forward

- Partnership with  **WALTER ENERGY™**
- Long term commitment to VAM
- Mitigate VAM from all economically suitable shafts



VAMOX[®] standard unit

- **130,000 cfm nominal flow rate**
- **5,000 ft² footprint (100*50)**
- **Design optimized based on proprietary model**
- **Designed for facilitated relocation**
- **0.3% - 1.2% range of CH₄ level accepted**
- **Fully automated operation**
 - Auto-adjustment of operating conditions



Upcoming Project

- **Bleeder shaft of Mine No. 7**
- **Shaft: 300,000 cfm, $\geq 1\%$ CH₄**
- **VAMOX[®] systems**
 - **2 large scale standard units**
 - **Air flow processed: 260,000 cfm**
 - **$\pm 400,000$ tCO₂e/yr**



Walter Energy Mine No. 7 Bleeder Shaft





Project Status Summary

- **Design completed**
- **Approved by MSHA District 11 (May 2012)**
 - As addendum to mine ventilation plan
- **Green light when framework certainty (California)**



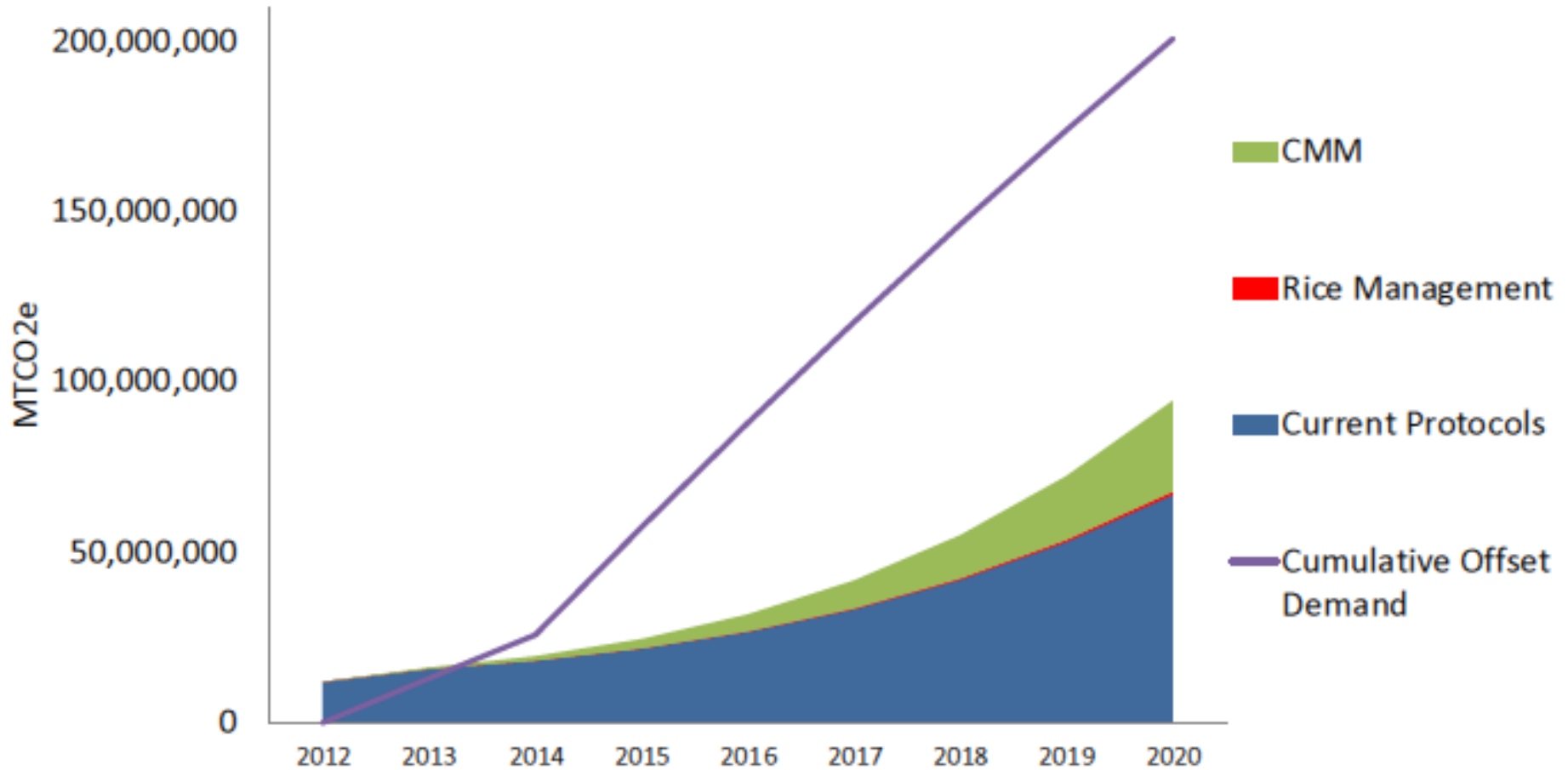
California Regulatory Status

- **December 2010: Cap & Trade Regulation adopted**
- **4 Offset Protocols currently adopted + Early Action**
 - ODS¹, Forestry, Urban Forests and Livestock
- **CMM Offset Workshop on March 28, 2013**
- **Adoption of CMM Protocol expected by end of 2013**

¹ Ozone Depleting Substances

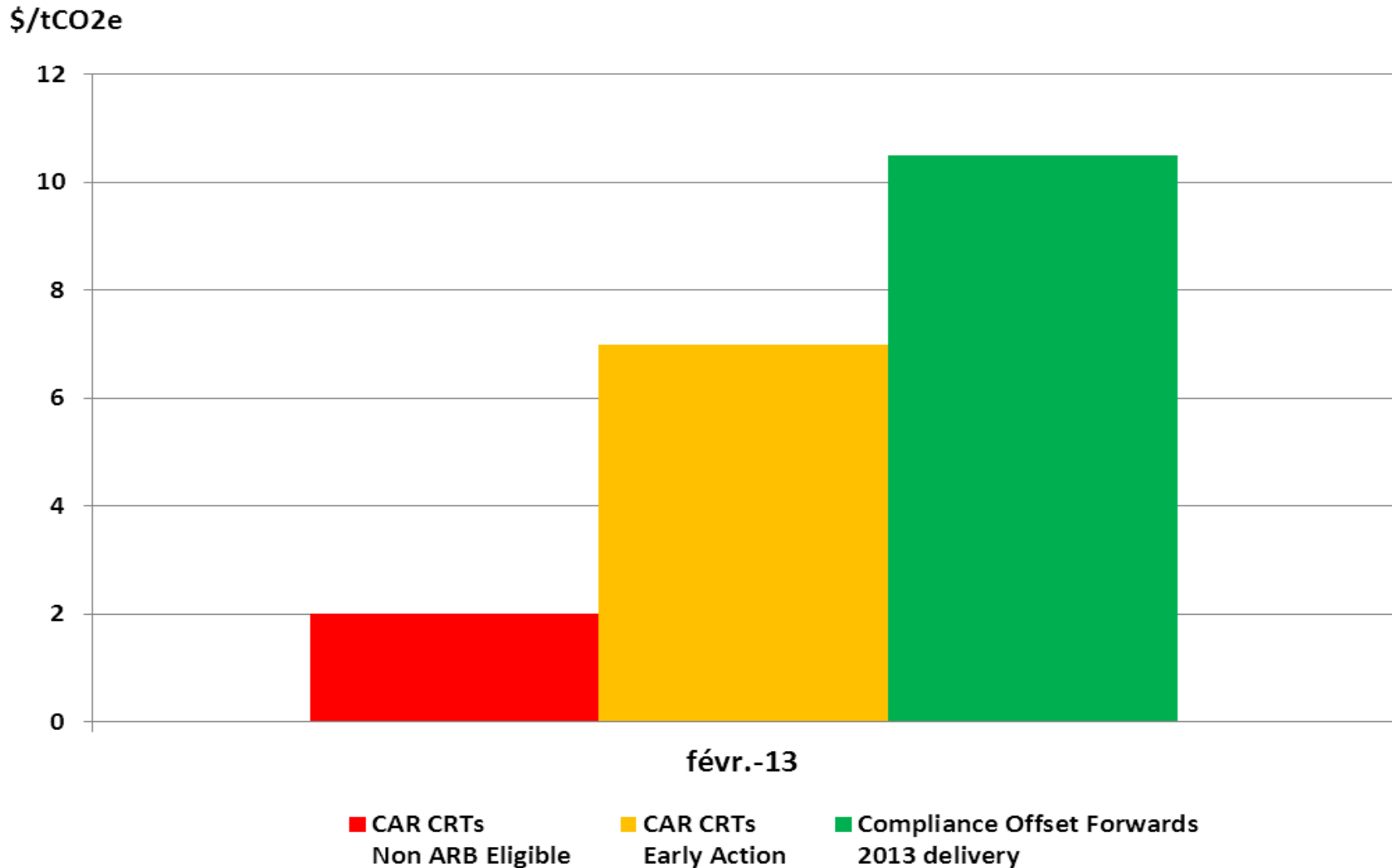


FORECAST OFFSET SUPPLY: Compliance + Rice + Coal Mine Methane (CMM)





Carbon Offset Prices California Market





Thank You

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