

An Overview of Offsets from Mine Methane Capture and their Role in California Cap-and-Trade

June 19, 2014



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Agenda

- Introduction & Overview of Project Type
- Project Eligibility
- Monitoring and Reporting Requirements
- Important Deadlines for Early Action and Compliance Projects
- Guest Speaker:
 - Ron Hughes, Solvay Chemicals, Inc.
CAR 629 Green River Trona Mine Methane Destruction & Utilization Project
- Questions

A cautionary note from our lawyers



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Much of this presentation is based on the Climate Action Reserve's understanding of the California Cap and Trade Regulation and the Mine Methane Capture Protocol. As the implementation of the Regulation is the responsibility of the California Air Resources Board, you should be aware that anything presented here may be interpreted or applied differently by the Board.

Moreover, this presentation does not constitute legal advice. Information presented here should be regarded as informational and does not have a legally binding effect.

Introduction to the Climate Action Reserve



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- The largest, most experienced, and best known carbon offset registry in North America with over 52 million offsets issued from 15 different project protocols
- Independent NGO, serving both voluntary and California compliance carbon markets since 2001
- Accredited in California as both an Offset Project Registry (OPR) and an Early Action Offset Program
- Depth of knowledge & established procedures
- Attentive, high-quality customer service & competitive pricing

Introduction to the Climate Action Reserve



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Extensive experience in Mine Methane:

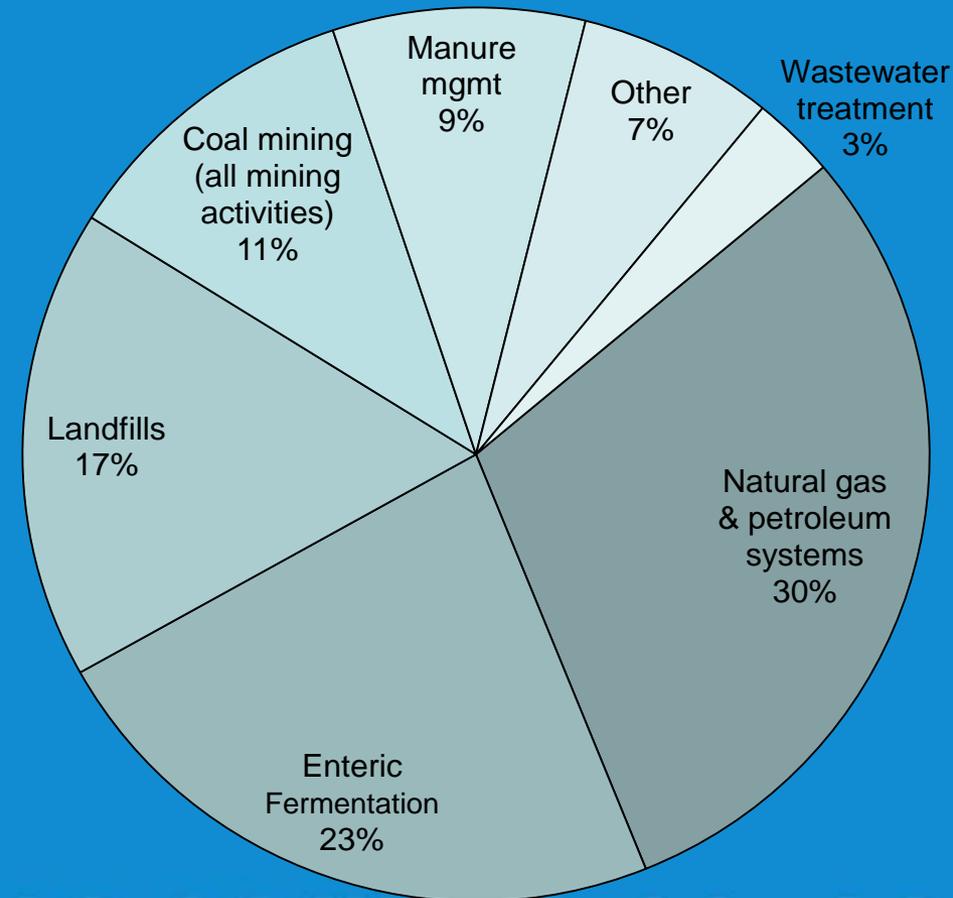
- Developed and implemented the Climate Action Reserve Coal Mine Methane Protocol
 - First adopted in October 2009
 - Versions 1.0 and 1.1 approved for Early Action in California's Compliance Program
 - Reserve's CMM Protocol informed ARB's Mine Methane Capture (MMC) Compliance Offset Protocol
- Staff participated in ARB's Technical Working Group to support MMC Protocol development
- Staff attended ARB's Verification Training for MMC Protocol
- Reserve has issued 529,843 CRTs for the CMM protocol from 3 CMM projects (2 VAM, 1 Drainage)
- 3 additional new or listed CMM projects with the Reserve

Emissions from Coal Mining



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- Methane (CH_4) is the second largest source of greenhouse gas in the US, after CO_2
- CH_4 is a potent short-lived climate pollutant (GWP of 21)
- Coal mining is the 4th largest source of human-related methane emissions in the US (11%)



*US Methane Emissions by source 1990-2011
(source US EPA)*



Emissions from Coal Mining

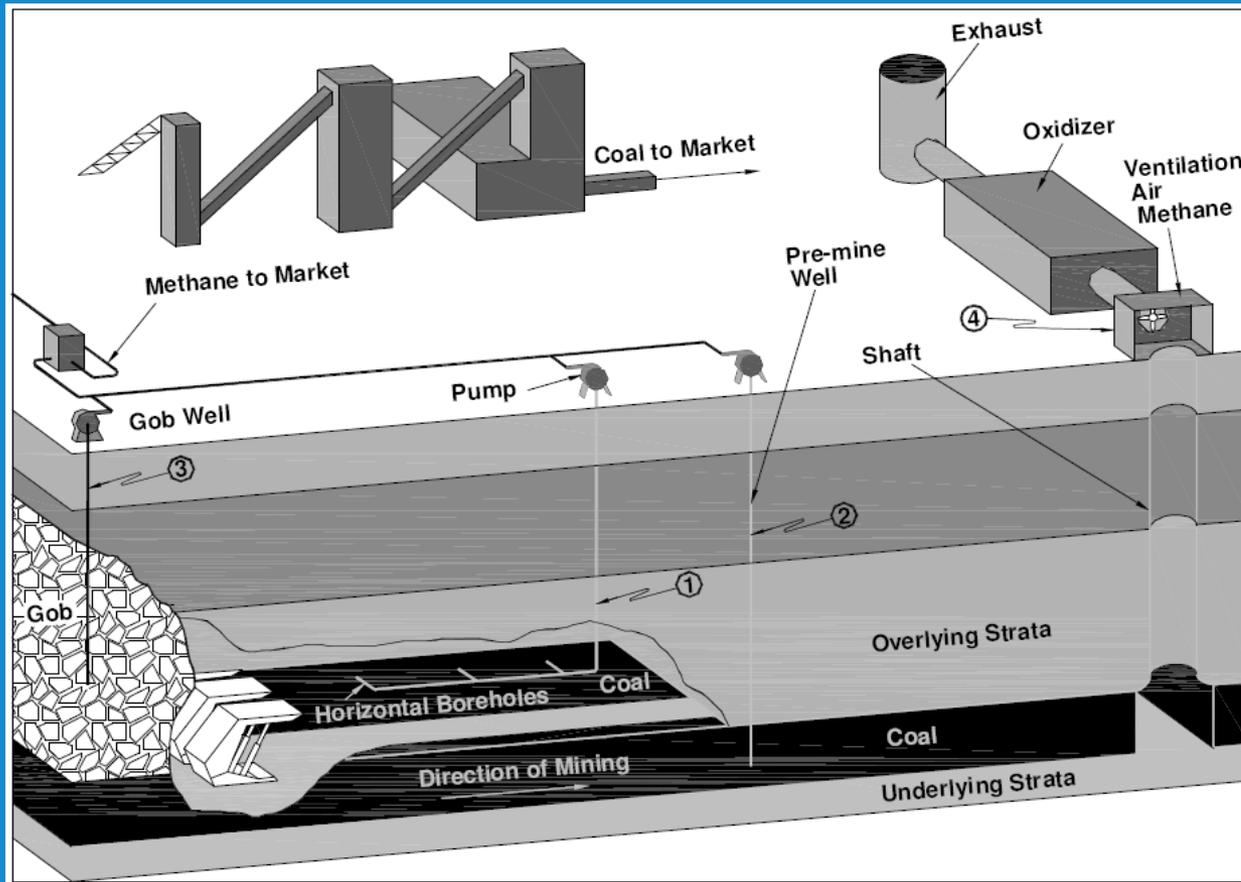
Coal mine methane is emitted from five sources:

- Degasification (or “drainage”) systems at underground coal mines
 - Ventilation air from underground mines
 - Abandoned or closed mines
 - Surface mines
 - Fugitive emissions from post-mining operations
-
- Ventilation systems required at all underground coal mines for safety
 - VAM typically contains <1% methane, but is largest source of CMM emissions in US (60% of CMM emissions from active underground mines)
 - In a recent survey of 50 of the gassiest mines in the US, 23 of them utilize Drainage; and 14 of the 23 already recover some or all of methane drained
 - Some mines have over 1 million metric tons CO₂e/year potential from implementing an MMC project

Coal Mine Degasification



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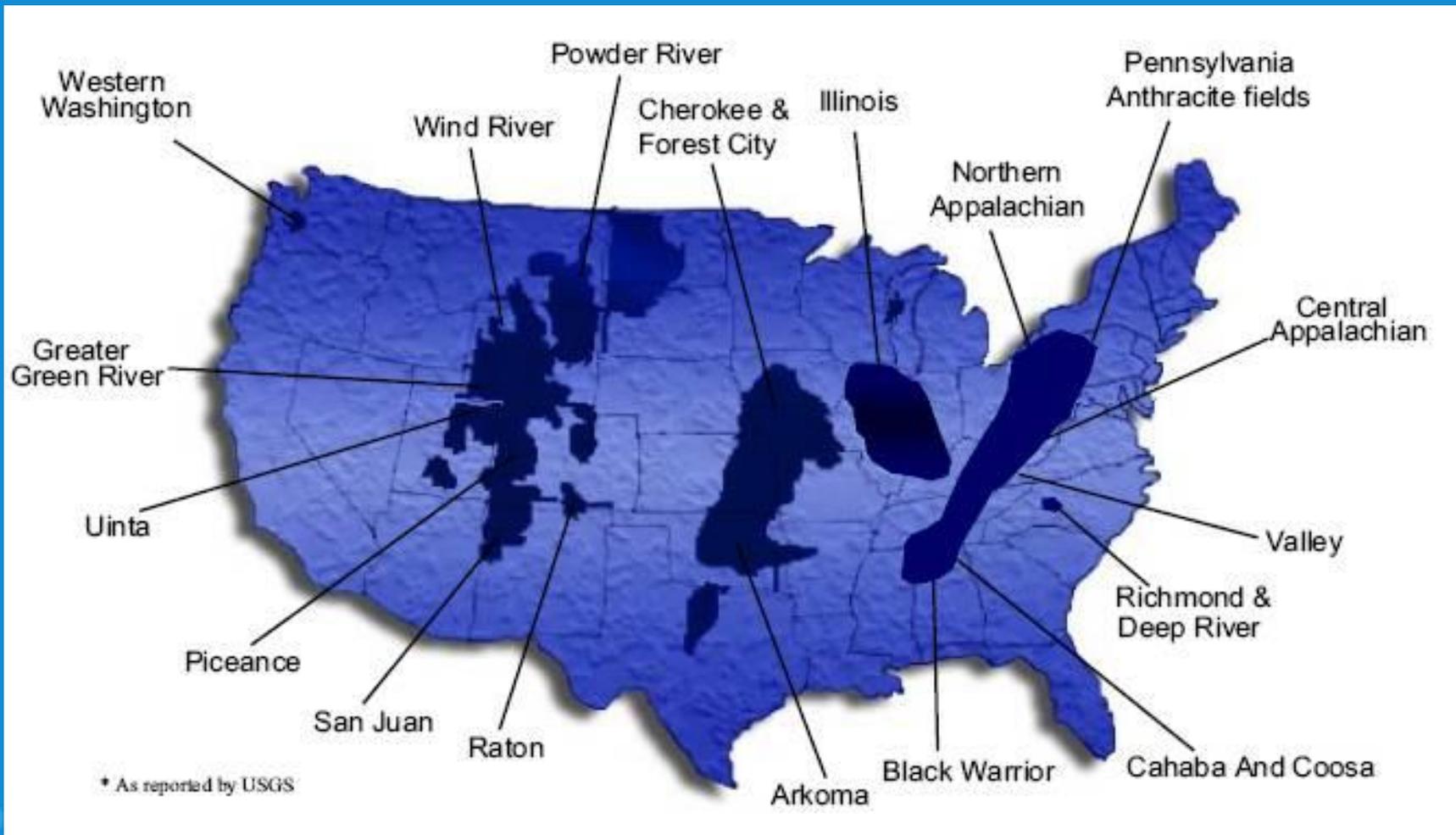
1. Horizontal pre-mining
2. Surface pre-mining
3. Post-mining
4. VAM

Source: US EPA *Identifying Opportunities for Methane Recovery at U.S Coal Mines* 2009

Major U.S. CBM Basins



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Source: US DOE, cited in US EPA, *Coal Mine Methane Recovery: A Primer*, 2009

Overview of the MMC Compliance Offset Protocol



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- ARB Compliance Offset Protocol Mine Methane Capture Projects (MMC)
 - Adopted April 25, 2014
 - Currently under review by Office of Administrative Law
 - Expected effective date: July 1, 2014
 - Also approved three Early Action Protocols

Purpose: to quantify greenhouse gas emission reductions associated with the capture and destruction of methane that would otherwise be vented into the atmosphere as a result of mining operations at active underground and surface coal and trona mines and abandoned underground coal mines

Overview of the MMC Compliance Offset Protocol



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Protocol includes four mine methane capture activities:

- Active Underground Mine Ventilation Air Methane (VAM)
 - Active Underground Mine Methane Drainage
 - Active Surface Mine Methane Drainage (SMM)
 - Abandoned Underground Mine Methane Recovery (AMM)
- Both coal and trona mines are eligible for these project types, except abandoned mines, where only coal mines are eligible

Excludes (for all project types):

- Coal bed methane
- Mines that use fluid/gas to enhance MM drainage



Early Action Protocols

Three early action protocols approved (all 4 project types):

- Climate Action Reserve Coal Mine Methane Project Protocol versions 1.0 and 1.1
 - Two project types: Active Underground Mine Methane Drainage and Active Underground Mine Methane Ventilation
- Verified Carbon Standard:
 - VMR0001 Revisions to ACM0008 to Include Pre-drainage of Methane from an Active Open Cast Mine as a Methane Emission Reduction Activity Methodology, v1.0
 - VMR0002 Revisions to ACM0008 to Include Methane Capture and Destruction from Abandoned Coal Mines Methodology, v1.0

Projects with EAOCs generated from fossil fuel reductions from either VCS methodology may require revision for conversion to compliance

Active Underground Mine Ventilation Air Methane (VAM)



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Protocol applies to MMC projects that install a VAM collection system and qualifying device to destroy the methane in VA otherwise vented into the atmosphere through the return air shaft(s) as a result of underground coal or trona mining operations.

- Methane sources eligible for VAM activities include:
 - Ventilation systems
 - Methane drainage systems from which mine gas is extracted and used to supplement VA. Only the mine methane sent with ventilation air to a destruction device is eligible.
- Destruction of VAM via any end-use management option is eligible
- Applicable to active coal and trona mines

Active Underground Mine Methane Drainage



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Protocol applies to MMC projects installing equipment to capture and destroy methane extracted through a methane drainage system otherwise vented into the atmosphere (section 2.2)

- Methane sources eligible for Active Underground Drainage activities include:
 - Pre-mining surface wells
 - Pre-mining in-mine boreholes
 - Post-mining gob wells
- Destruction of MM via any end-use management option is eligible, *except for the pipeline injection of mine methane*
- Applicable to active coal and trona mines

Active Surface Mine Methane Drainage (SMM)



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Protocol applies to MMC projects installing equipment to capture and destroy methane extracted through a methane drainage system otherwise vented into the atmosphere (section 2.3)

- Methane sources eligible for SMM Drainage activities include:
 - Pre-mining surface wells
 - Pre-mining in-mine boreholes
 - Existing CBM wells otherwise shut-in and abandoned
 - Re-activated abandoned wells
 - Converted dewatering wells
- Destruction of SMM via any end-use management option is eligible
- Applicable to active coal and trona mines
- Mines using mountaintop removal mining methods are NOT eligible

Abandoned Underground Mine Methane Recovery (AMM)



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Protocol applies to MMC projects installing equipment to capture and destroy methane extracted through a methane drainage system otherwise vented into the atmosphere as a result of previous underground mining operations (section 2.4)

- Methane sources eligible for AMM activities include:
 - Pre-mining surface wells, pre-mining in-mine boreholes and post-mining gob wells drilled into the mine during active operations
 - Surface wells drilled after active mining operations have ceased
- Applicable to abandoned underground coal mines only
- Must not occur in flooded mines or flooded sections of mines
- Mine must be classified by MSHA as abandoned or abandoned and sealed to be eligible

Abandoned Underground Mine Methane Recovery (AMM)



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- Destruction of AMM via any end-use management option is eligible
- Pipeline injection of mine methane is an eligible end-use management option only if pipeline injection was not taking place prior to the project
- AMM recovery activities at multiple mines with multiple mine operators may report and verify together as a single projects, if:
 - A single Offset Project Operator is identified and emission reductions are credited to that Operator
 - Methane recovered is metered at a centralized point prior to destruction
 - Offset Project Operator meets all monitoring, reporting and verification requirements
 - All mines are in compliance with regulations



General Eligibility

Offset projects that use this protocol must:

- Involve a qualifying methane capture and destruction device, or set of devices
 - “Qualifying Device” means a destruction device that was not operational at the mine prior to offset project commencement, except as specified in section 2.4(b) & was not used to combust mine methane via an ineligible end-use management option
 - Non-qualifying devices must be monitored and accounted for
- Capture methane that would otherwise be emitted to the atmosphere
- Use an eligible end-use management option to destroy the captured methane (per Section 3.4)



Who can be the OPO / APD

Offset Project Operator s (OPOs) or Authorized Project Designees (APDs) must:

- Have legal authority to implement the offset project
- Be either the entity owning or leasing the equipment used to capture and destroy methane or the mine operator
 - “Mine operator” defined as any owner, lessee, or other person who operates, controls, or supervises a coal or other mine or any independent contractor performing services or construction at such mine; the operating entity listed on the state well drilling permit
- Be responsible for project listing, monitoring, reporting and verification

Eligibility Rules



<p>Location</p>	<p>Project must be located in the US.</p> <p>Eligible projects include those at mines:</p> <ul style="list-style-type: none"> • Located on Indian or tribal lands (with waiver of sovereign immunity, meeting other requirements) • Located on federal lands
<p>Project Commencement</p>	<p>For Compliance Protocol: Date when the project’s mine methane capture and destruction equipment becomes operational upon completing an initial start-up period of up to 9 months</p>
	<p>For Reserve Protocol: Start date is self-defined, but no more than 3 months after methane first destroyed.</p>
<p>Crediting Period</p>	<p>For Compliance Protocol: 10 reporting periods (w/ initial RP of up to 24 months), renewable once. Must be after December 31, 2006</p>
	<p>For Reserve protocol: 10 years, renewable once</p>
<p>Regulatory Compliance</p>	<p>Compliance with all applicable laws</p>



Eligibility Rules: Additionality

- Performance standard evaluation
 - Assessed once at beginning of crediting period
 - Based on end-use management option:
 - All VAM projects are eligible
 - All SMM projects are eligible
 - Active Underground Drainage projects: any end-use management, except pipeline injection
 - AMM: any end-use management including pipeline injection, except if the mine employed pipeline injection while active
- Legal Requirement Test
 - Assessed once at beginning of crediting period
 - Must exceed legal requirements



Quantifying Emission Reductions

- Emission reductions from an MMC project are quantified by comparing actual project emissions to project baseline emissions at the mine
- Protocol provides four sets of activity type-specific calculation methods to determine baseline and project GHG emissions

Baseline emissions

- Emissions from methane destruction of non-qualifying devices (if any)
- Methane released into atmosphere

Project emissions

- Emissions from additional energy consumed to capture & destroy methane
- Emissions from destruction of captured methane
- Emissions from uncombusted methane



Monitoring and Metering

VAM projects

- Continuous flow and CH₄% recorded every 2 minutes, hourly destruction device operation

Drainage projects

- Continuous flow and CH₄% recorded every 15 minutes, hourly destruction device operation
- Flow, CH₄%, T, and P of mine gas from each methane source (i.e. surface wells, boreholes) must be monitored separately before being interconnected and sent to the destruction device(s) → different from Reserve's CMM V1.1 requirement of each drainage system



QA/QC Requirements

- Quarterly inspections: Must document “as found/as left”
- Calibration check:
 - Required each reporting period (~annually)
 - Must take place no more than 2 months before or 1 day after the end of the Reporting Period
- Full calibration:
 - Required every 5 years or per manufacturer’s guidance
 - No calibration necessary, if explicitly stated in manufacturer’s guidance



Reporting & Verification

- Project records kept for at least 15 years
- Initial reporting period can be 6 – 24 months in length, with all other reporting periods of up to 12 consecutive months
- Crediting period is 10 reporting periods, which can be renewed one time
- The Offset Project Data Report (OPDR) must be submitted to the OPR (i.e. the Reserve) within four months of the end of each reporting period and prior to the commencement of verification.
- Each reporting period must be verified by an ARB accredited offset verification body



Listing a Project

Early Action

- Open a Project Developer account with the Reserve
- Complete and upload a CMM Project Submittal Form
- Reserve will review; if approved, the project is listed

Compliance

- Open a CITSS account with ARB
- Open a Project Developer account with the Reserve
- Complete and upload ARB's listing form (not yet posted) and the APD designation form, if applicable
- Reserve will review and ARB will confirm CITSS info

Deadlines for Early Action Projects



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- Early Action MMC projects must be listed with the Early Action Offset Program (i.e. the Reserve) prior to Jan. 1, 2015
- EAOCs (i.e. CRTs) may be generated on emission reductions taking place between Jan. 1, 2005 and Dec. 31, 2014
- EA projects must list as a *compliance* project by Feb. 28, 2015, be verified under EA by Sept. 30, 2015, and convert EAOCs to ARBOCs by Aug. 31, 2016
- Conversion process entails a desktop re-verification of emission reductions by an ARB accredited verifier

Solvay Chemicals, Inc. Green River Wyoming

Ron Hughes

Executive Vice President, Sodium Technologies

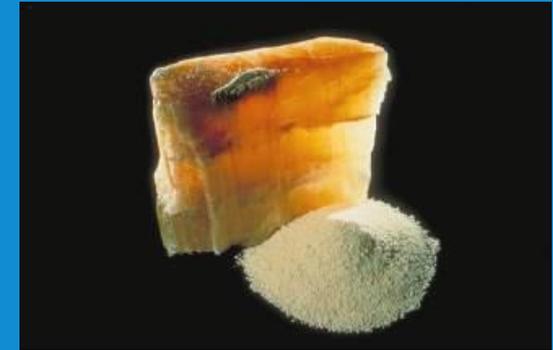


Mining Operation Fundamentals



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- 4.5 million tons trona annually
 - 1,600 feet depth
 - Longwall, bore miners, solution
 - MSHA Class III gassy mine
- 3.1 million tons finished products
 - 2.6 million soda ash
 - 0.5 million other products
- 460 employees
- ~7 million ACF daily waste methane emissions
- ~2 million ACF captured presently
- Expansion to ~4 million in fall 2014



Waste Mine Methane Capture



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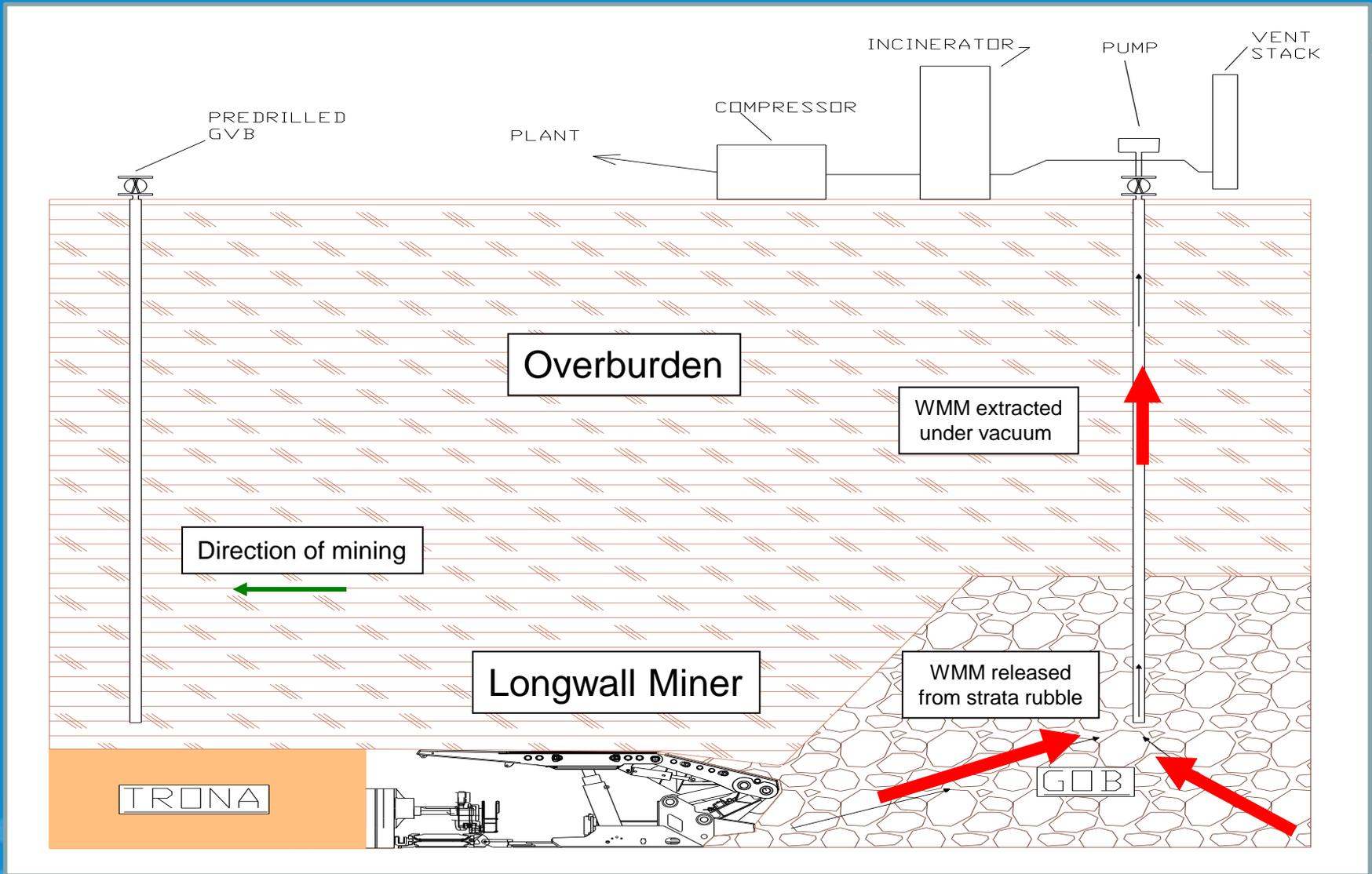
- Project listed with Climate Action Reserve 2009
 - 251,666 CRT's registered to date
 - Additional ~130,000 in verification
 - Will apply for early action credits in California system using CAR as our registry
- Phase I
 - Mine gas incinerator
 - Commissioned May 2010
 - ~1 million ACF capacity
- Phase II
 - Compression / dehydration station
 - Expanded GVB network
 - 4 mile pipeline to refinery
 - Dryers and calciners added as incineration devices
 - Commissioned July 2012
 - ~2 million ACF capacity
 - Expansion to ~4 million ACF



Cross Section of Conceptualized Waste Mine Methane Capture Process



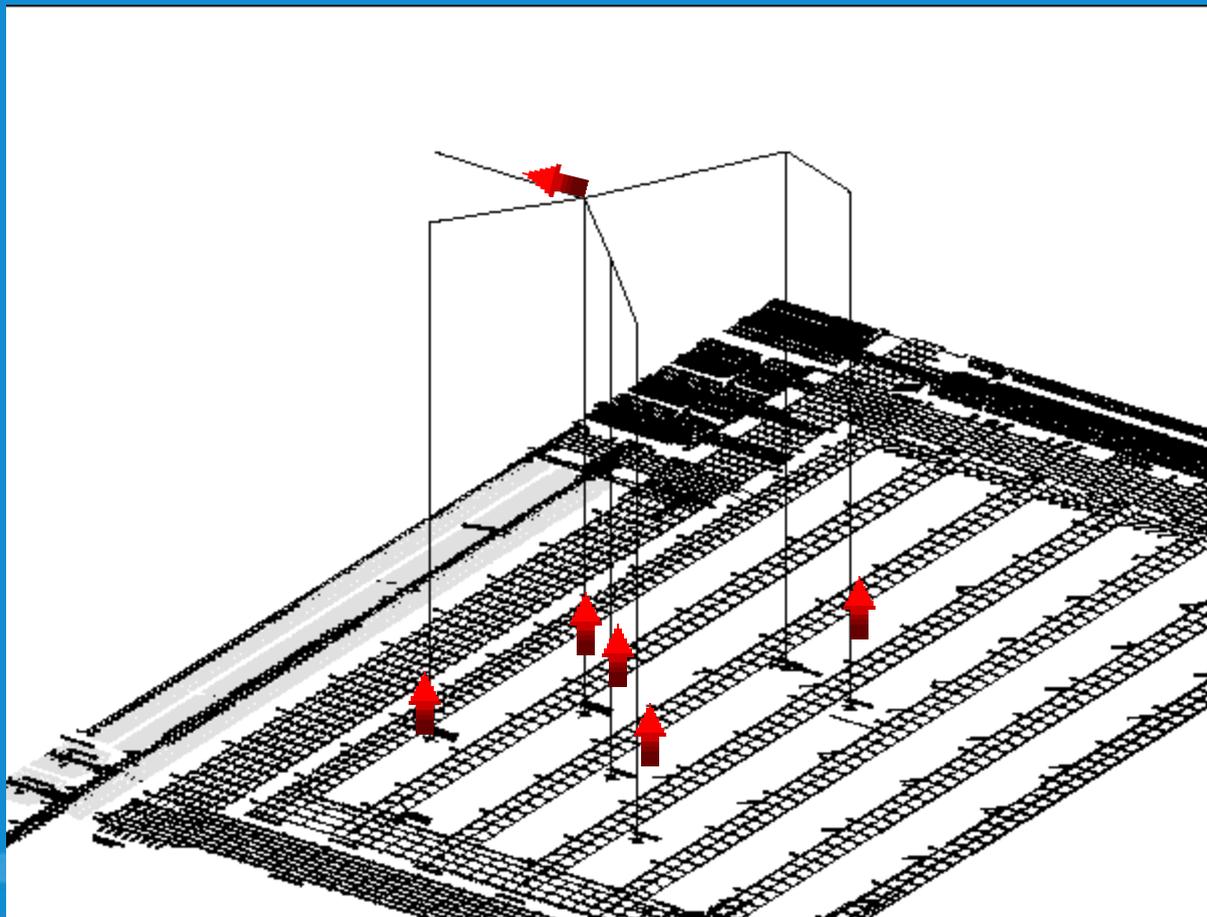
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Waste Mine Methane Collection



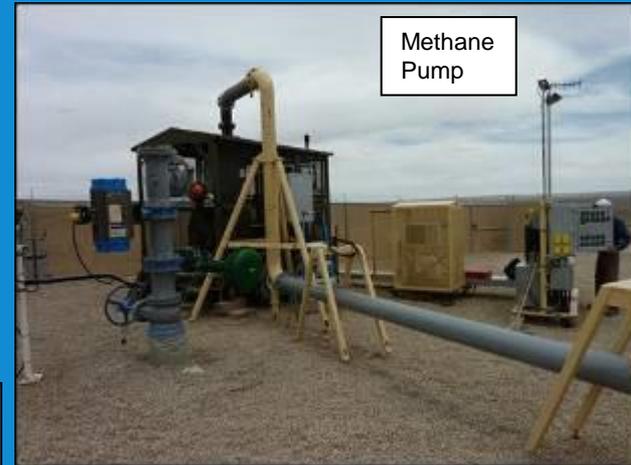
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Phase I WWM Incineration Process



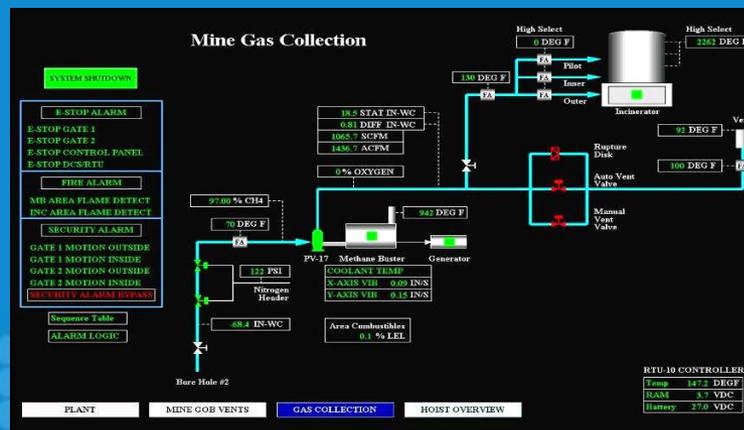
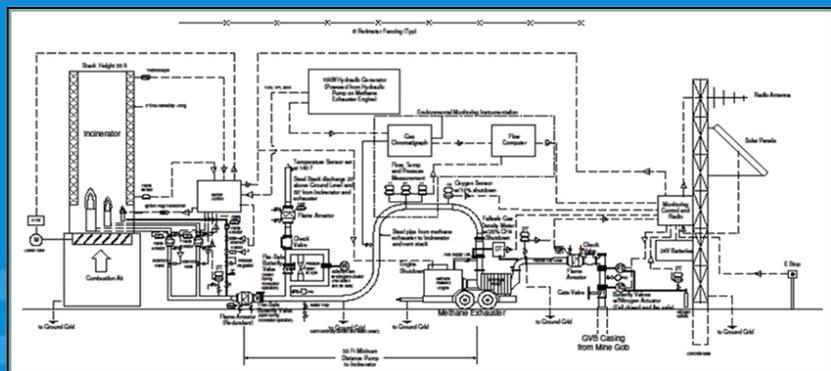
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Phase II Compression, Transmission, Combustion



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Completed Compression & Transmission Facility



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WMM Destroyed Via Combustion in Process Kilns



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