# Unlocking Carbon's Value

## *Turning Liabilities into Assets in the Mining Sector*

September 24, 2008

# Who We Are

*Founders experienced in global carbon markets…*

*…with financial backing from leading institutional investors*

**Founders**

- Founded by former executives from Climate Change Capital
- Experience developing projects around the world as part of $1B carbon fund
- Offices in Washington, Austin, and Denver

**Investors**

Cargill

BLACK RIVER™

WOLFENSOHN & COMPANY

# Our Team of Advisors

Verdeo group

*Advisors help navigate industry as well as legislative issues*

## Industry

- **Gerry Spindler—**Former CEO of UK Coal and Pittston Coal
- **Mark Savit**—Managing Partner for Patton Boggs' mineral rights practice, former MSHA inspector; Denver office
- **Henry Chajet –**Managing Partner for Patton Boggs' mineral rights practice
- **Les Silverman—**Former head of McKinsey's global energy practice
- **Bill Bumpers** –Partner, Baker Botts Energy Practice

## Policy

- **Roger Martella—**Former Chief Counsel at EPA under George W. Bush
- **Roger Ballantine—**Former policy advisor on White House Climate Change Task Force
- **Mack McLarty**—Former Chief of Staff to President Clinton

# Systems Integrator Approach

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*Partners provide unique engineering and technology expertise*

| Phase | Technical Solutions |
|---|---|
| Extraction | **Methane Buster**<br>Exclusive partner of leading technology solution to remove large quantities of methane from gob areas & degas vertical boreholes |
| Engineering & Power | **Harworth Energy**<br>Partner with leading mine methane engineering services company, implemented flare, power, & oxidizer projects around the world.<br><br>**Clarke Energy**<br>Work closely with leading  global turnkey power project developer working with highly variant quality gases, ranging from syngas to coal mine methane (leading Jenbacher/GE manufacturer's representative). |
| VAM & Oxidization | **Biothermica & MEGTEC**<br>Verdeo works closely with the two leading oxidation technology providers MEGTEC and Biothermica |
| Pipeline Gas | **Molecular Gate**<br>Verdeo has experience implementing pipeline quality fuel projects using Molecular Gate technology |

Molecular Gate

# Overview of Cap & Trade

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*A Cap & Trade system for CO2 has its roots in US SOX & NOX regulation*

<u>Carbon Market Evolution</u>

1995 — US launches SOX and NOX markets to address acid rain issue

In 1997, NOX trading peaks at 6M tons

1997 — ERT launches first private GHG emissions registry

By 2002, SOX emissions are reduced by 40% vs. 1980 levels

2005 — Europe launches cap & trade system for CO2

In 2006, EU ETS reaches 1B tons of CO2e in trading volume

2009 — First regional US cap & trade system scheduled to launch (RGGI)

2012 — US Federal cap & trade program likely to launch

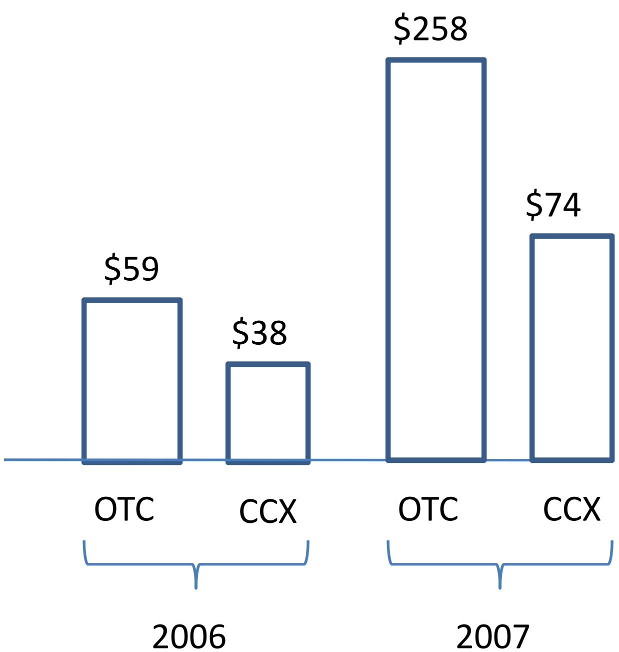
## The Purpose

The goal of cap & trade is to put a price on GHG emissions so that the economic and environmental impacts of emitting GHGs are included in the costs of capital investments and business transactions.

# US Regulatory Environment

*Voluntary carbon markets are alive and trading…*

US Voluntary Systems
*(Volume traded in $MM)*




*…while the first US mandatory markets go into effect in 2009*

US Mandatory Systems

| Name | Geographic Region | Effective Date |
|---|---|---|
| Regional Greenhouse Gas Initiative (RGGI) | CN, DE, ME, MD, NH, NJ, NY, VT, NH | Jan 2009 |
| Western Climate Initiative (WCI) | AZ, CA, CO, NW, OR, UT, WA plus BC, Manitoba and Quebec | TBD |
| Midwest Regional GHG Accord | IL, IA, KS, MI, MN, WI, Manitoba | TBD |
| California Climate Action Registry (CCAR) | CA | 2011 |
| Federal cap & trade system | US | 2012 (est.) |



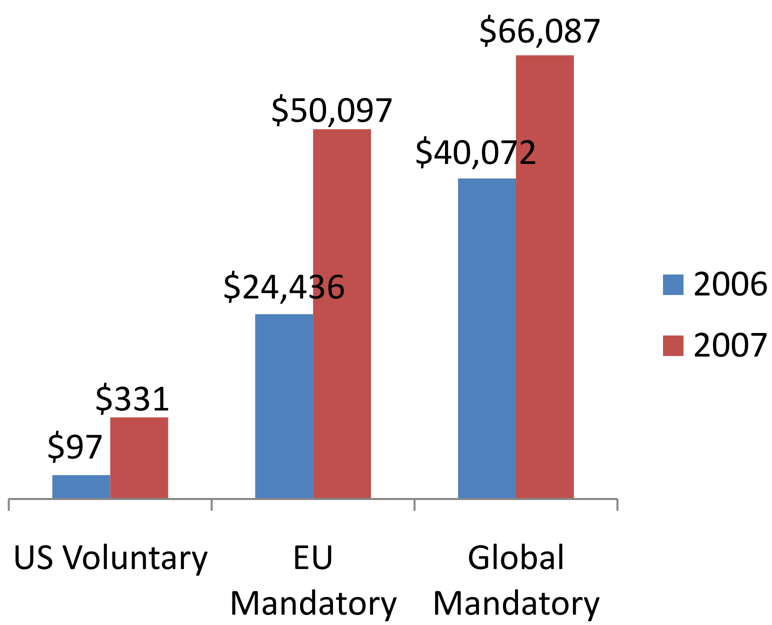
Note: OTC = Over The Counter and CCX = Chicago Climate Exchange
Source: Ecosystem Marketplace, *State of the Voluntary Carbon Markets 2008*

# US Carbon Market Poised for Growth

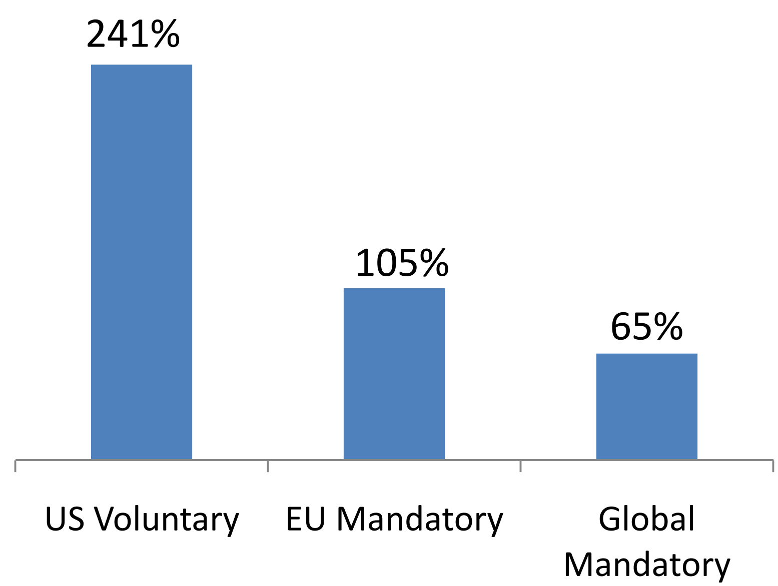
*While the US market is still small relative to Europe…*

*…it is growing at twice the speed*

**Carbon Market Volume**
*(US$ Millions)*




**Carbon Market Growth Rate**
*(2006 vs. 2007)*





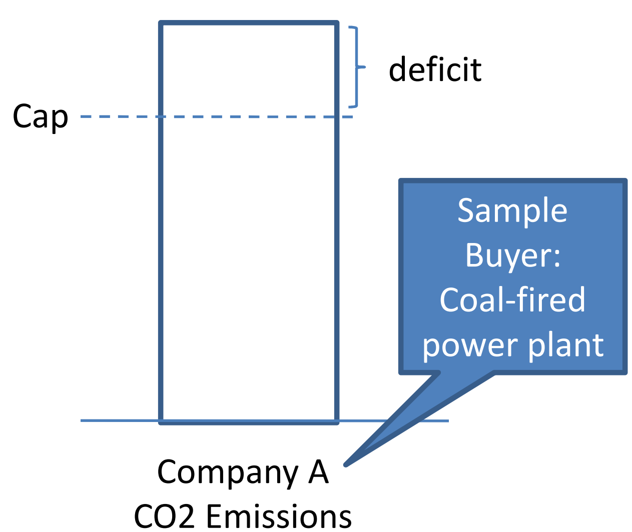

Source: Ecosystem Marketplace, *State of the Voluntary Carbon Markets 2008*

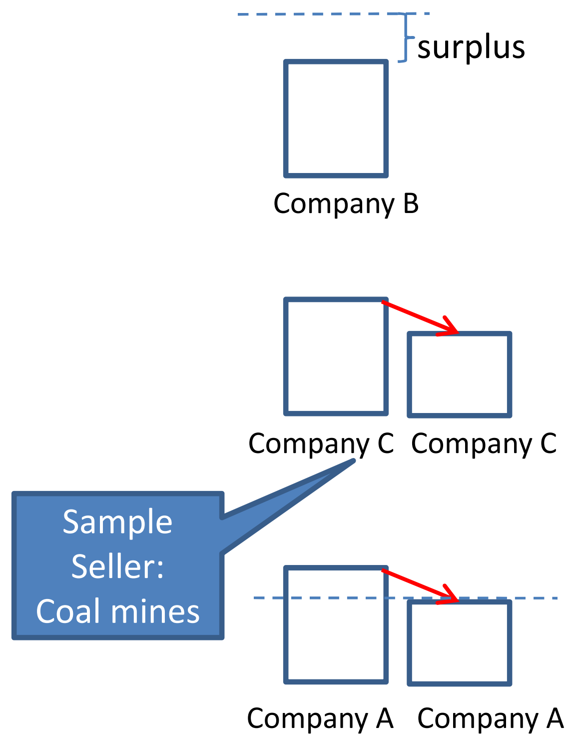
# How the Carbon Markets Work

*A capped entity that exceeds its allocation of allowances…*

*…has several options for meeting their cap*

**<u>Capped Entities</u>**




**Option 1—Buy Allowances**
Buy additional allowances from a capped entity that has a surplus or from the regulators directly

**Option 2—Buy Offsets**
Buy offsets from an non-capped entity that reduces its emissions

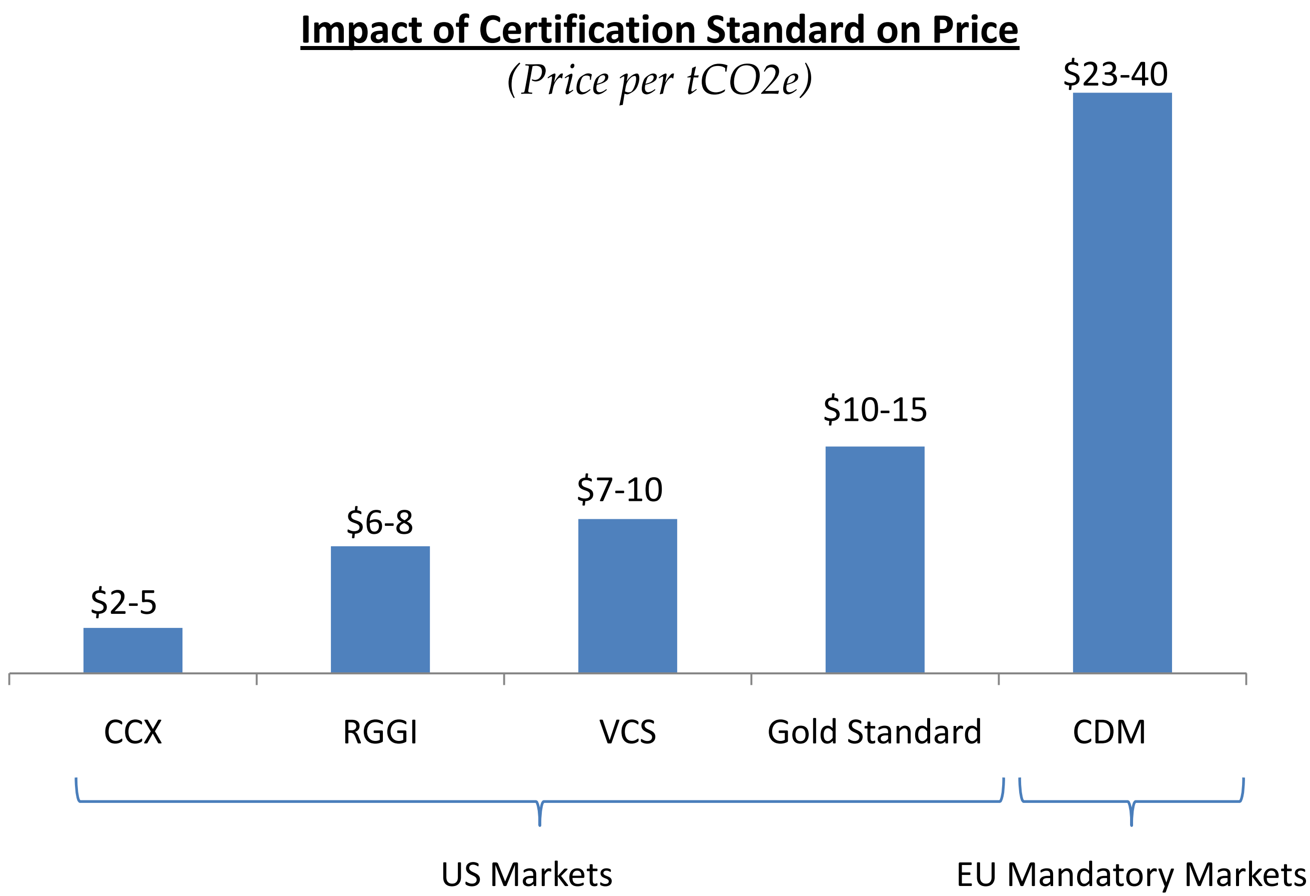
**Option 3—Reduce Emissions**
Invest in internal emission reduction projects



Note: see handout for detailed definitions of key terms

# Standards Matter

*Prices differ greatly depending on the certification standards employed*

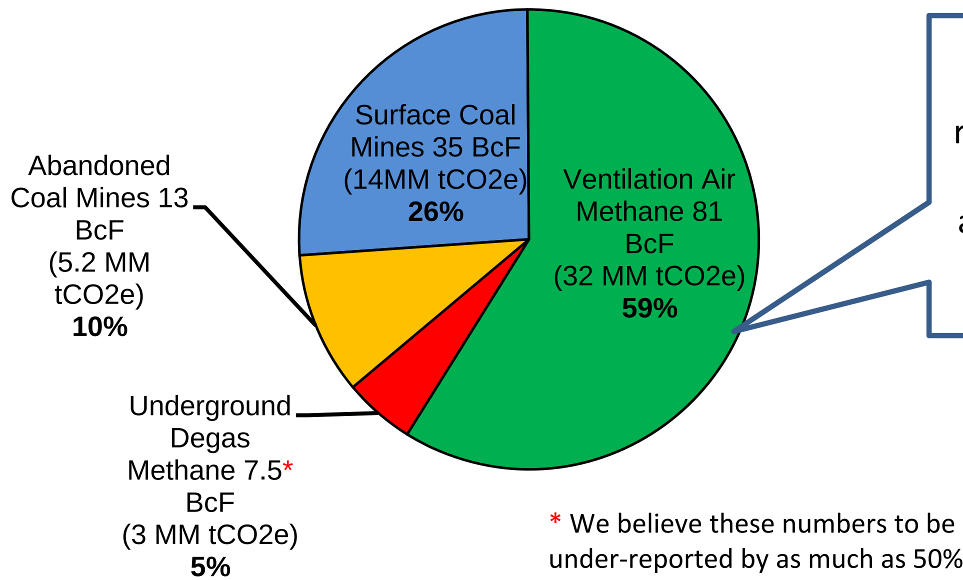


# Mine Methane Opportunity

*Buyers are looking for large volume, credible, third party certified carbon credits*

**Annual Emissions from Coal Mines, US**

*(EPA 2006)*




Methane from mines represents 1% of overall US greenhouse gas emissions and 10% of all US methane emissions.

* We believe these numbers to be under-reported by as much as 50%

## Impact of Pending Regulation

Current consensus on pending federal regulation is that mines will not be regulated, and thus will be an important source of offset credits.

# What Does This Mean For Mines?

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*Mines with methane reserves have an opportunity to create new revenue streams and minimize regulatory and safety risks*

| Opportunity 1 | Opportunity 2 | Opportunity 3 | Opportunity 4 |
|---|---|---|---|
| **New Revenue Stream** | **Cost Avoidance** | **Risk Mitigation** | **Safety Improvements** |
| If properly designed, projects that reduce methane emissions can create a 7+ year revenue stream from carbon credits and/or gas production | If properly conditioned, methane extracted by degas operations can be used to offset purchases of natural gas | Early action to reduce methane emissions reduces the cost of compliance if mining proves to be a covered entity in future legislation | Revenue from carbon credits can be used to fund improvements in degas operations that improve mine safety |

## Corporate Preparedness

Regardless of whether an entity is covered in future legislation, early action enables firms to capture revenue in the short-term while minimizing regulatory risk and reducing compliance costs (if they are covered) in the long-term.

# Project Options

*Technology proven in the US and abroad to effectively reduce methane emissions*

| De-gas Projects | | VAM Projects |
|---|---|---|
| **Abatement** | **Utilization** | **Abatement** |

### Case Study 1

Destruction of methane gas through combustion in a enclosed stack flare

**UK Coal** Ricall Mine**,** 5 x 1,200 CFM, Enclosed Stack Flares

### Case Study 2

Conditioning low quality gas to create natural pipeline quality gas

**Cambria** (PA) 2.0 MM SCF/Day, Molecular Gate

### Case Study 3

Oxidation used to destroy low concentration ventilation air methane

**BHP Billiton** Illawara Coal, West Cliff Colliery, Australia, 150,000 CFM, 0.9% $CH_4$, 6 MW Power

# Anatomy of a Project

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*A phased approach to project implementation…*

**Phase 1:**
**Design & Permitting**
Months 0-9

**Phase 2:**
**Creation of Carbon Credits**
Years 2-10

**Phase 3:**
**Utilization of Gas**
Years 3+

*…generates carbon revenue to finance CapEx investments*

**Financial Returns (Illustrative)**

| Assumptions | | Financial Returns | |
|---|---|---|---|
| Flow Rate<br>Gas Production | 1,600 CFM (3 x MB units; Yrs 0 – 3)<br>530,000 MCF p.a. (Yrs 4 – 10) | **IRR** | **65%** |
| Methane purity | 70% | **NPV** | **$11.5M** |
| CapEx | $8.5M | | |
| OpEx | $100K/year | | |
| Carbon Price | $7-10/tCO2e | | |

# Barrier 1: Mineral Rights

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*Lack of clarity in ownership of gas rights complicates project development opportunities*

**Summary Table of CBM/CMM Ownership**

| State | Coal Lessee | Gas Lessee | Comment |
|---|---|---|---|
| Alabama | ✓ | | |
| Illinois | ✓ | | In coal seam or mine void only |
| Federal Lands | | ✓ | |
| Kentucky | | ✓ | |
| Montana | ✓ | | |
| Pennsylvania | ✓ | | |
| Virginia | | ✓ | |
| West Virginia | | | Ownership is decided on a case-by-case basis |
| Wyoming | | ✓ | |

# Navigating Ownership Issues

*Gas rights complicate the project options, but abatement projects are likely to be viable opportunities regardless of ownership*

**Gas Rights Maze**

Do you own the gas?

- **Yes**
  - **Gob Gas** → Methane Buster connected to flare and/or gas conditioning / power generation
  - **VAM Gas** → Oxidizer connected to vent shaft
- **No**
  - **Abate only** → *Argument:* If you can liberate the gas you can abate the gas (good Samaritan principle)
  - **Utilize** → *Argument:* possession is 9/10 the law (seek royalty payment arrangement with the gas owner as compromise)

# Barrier 2: Permitting Challenges

*Permitting challenges have not prevented these projects from being successful in the US and abroad*

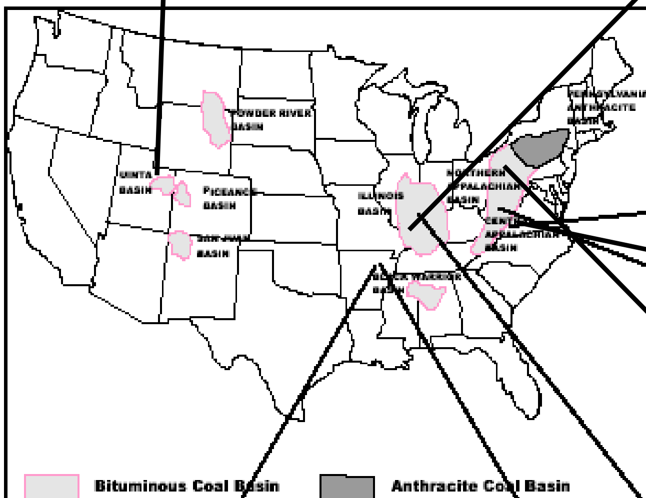
**Permitting Challenges by Project Type**

| Project Type | Status | Examples |
|---|---|---|
| Enclosed Stack Flares | Proven in comparable regulatory environments to US (UK) | UK Coal, Riccal Mine |
| Ventilation Air Methane | Proven in US and abroad | JWR, BHP Billiton (Australia), Consol |
| Utilization (pipeline gas, power) | Few permitting challenges | Consol, JWR, Foundation, Cleveland Cliffs, Drummond, Murray/Aberdeen |

# Projects Are Happening All Over the US

**BLUE TIP/ABERDEEN MINE**
Cryogenic plant converts abandoned coal mine methane into pipeline quality gas

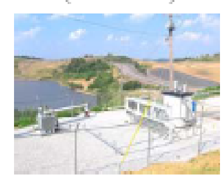
**DTE - Corinth**
Cryogenic plant converts abandoned coal mine methane into pipeline quality gas




**CONSOL**
**VP and Buchanan Mines**
Integrated CMM projects: pipeline, 88 MW power plant, coal drying

**CONSOL**
Windsor abandoned coal mine, RTO, VAM Abatement (MEGTEC)

**CONSOL**
**Bailey Mine**
Microturbine (70 kW)



**Pinnacle Mine**
Pipeline injection project uses surface directional drilling to maximize gas production

**Shoal Creek and Oak Grove**
Natural gas pipeline injection

**JWR Blue Creek Mines**
BCCK Cryogenic plant converts gob gas into pipeline quality gas

**CAMBRIA**
Abandoned coal mine, converts methane into pipeline quality gas using Molecular Gate technology

**JWR Blue Creek Mines**
40,000 CFM, RTO, VAM abatement (Biothermica)

# Summary

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- Voluntary carbon markets are growing quickly
- Imminent Federal cap & trade legislation is likely to significantly increase the value of carbon
- Mines are positioned to be key suppliers to this market
- Early action to reduce methane emissions unlocks new revenue streams and reduces regulatory risk
- Designing the carbon credits into the project following recognized market standards ensures maximum financial return

# Contact Information

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