

# Near Surface Leakage Monitoring for the Verification and Accounting of Geologic Carbon Sequestration Using a Field Ready $^{14}\text{C}$ Isotopic Analyzer

## CCS Public Outreach: Pathway to Tradable CCS Securities

**DEFE 0001116**

Bruno D.V. Marino PhD

CEO, Founder

Planetary Emissions Management, Inc.

One Broadway, 14<sup>th</sup> Floor

Cambridge, MA 02142

[bruno.marino@pem-carbon.com](mailto:bruno.marino@pem-carbon.com)

[www.pem-carbon.com](http://www.pem-carbon.com)

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U.S. Department of Energy

National Energy Technology Laboratory

Carbon Storage R&D Project Review Meeting

Developing the Technologies and Building the

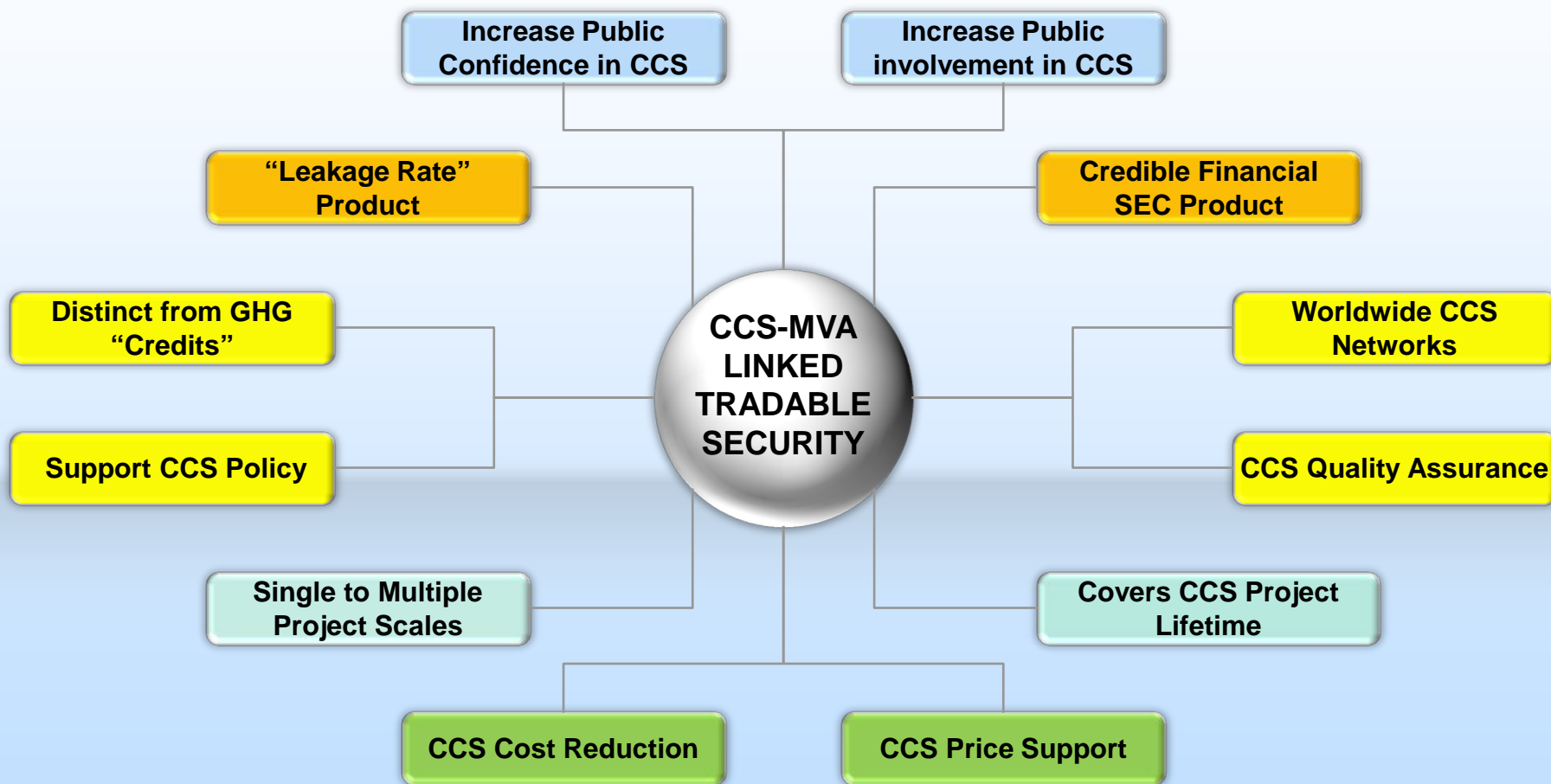
Infrastructure for CO<sub>2</sub> Storage

August 20-22, 2013

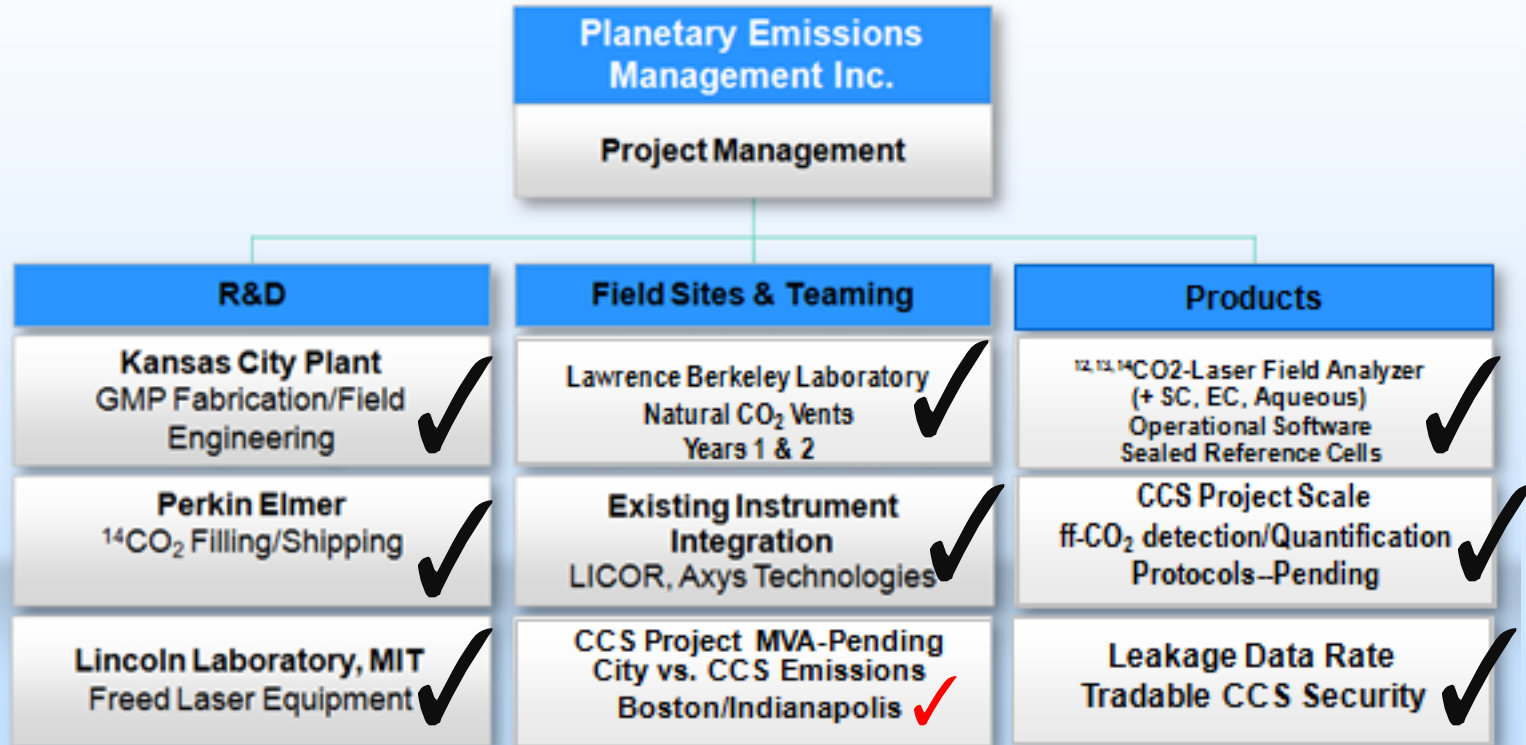


# Benefits: Public Outreach

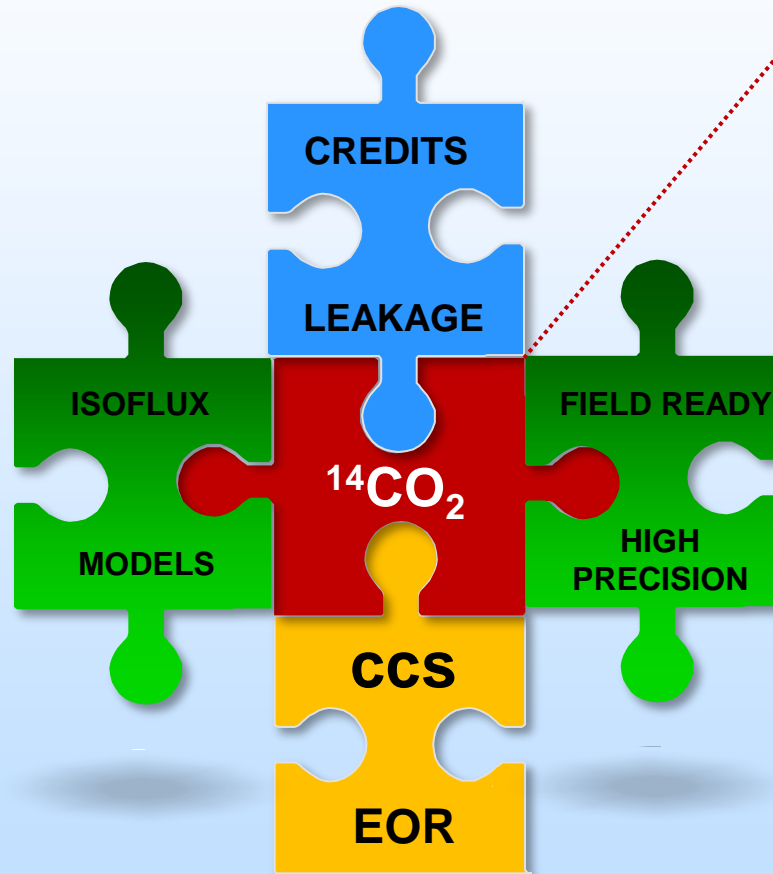
PROGRAM GOAL: TRADABLE CCS SECURITY



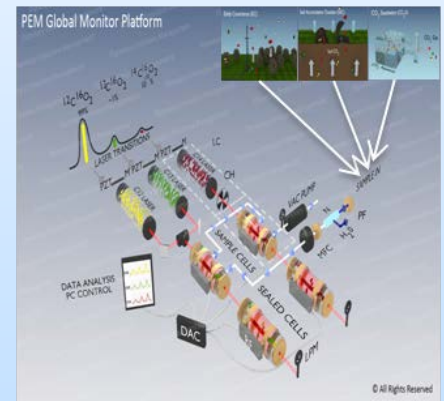
# Organization, Status & Accomplishments



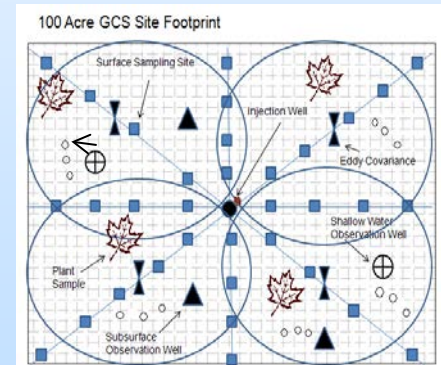
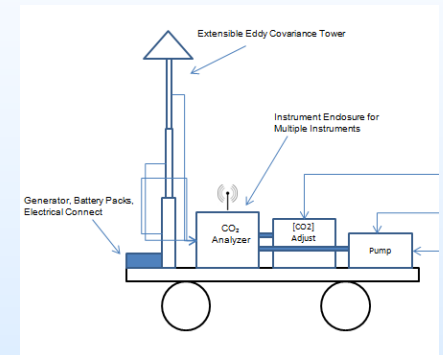
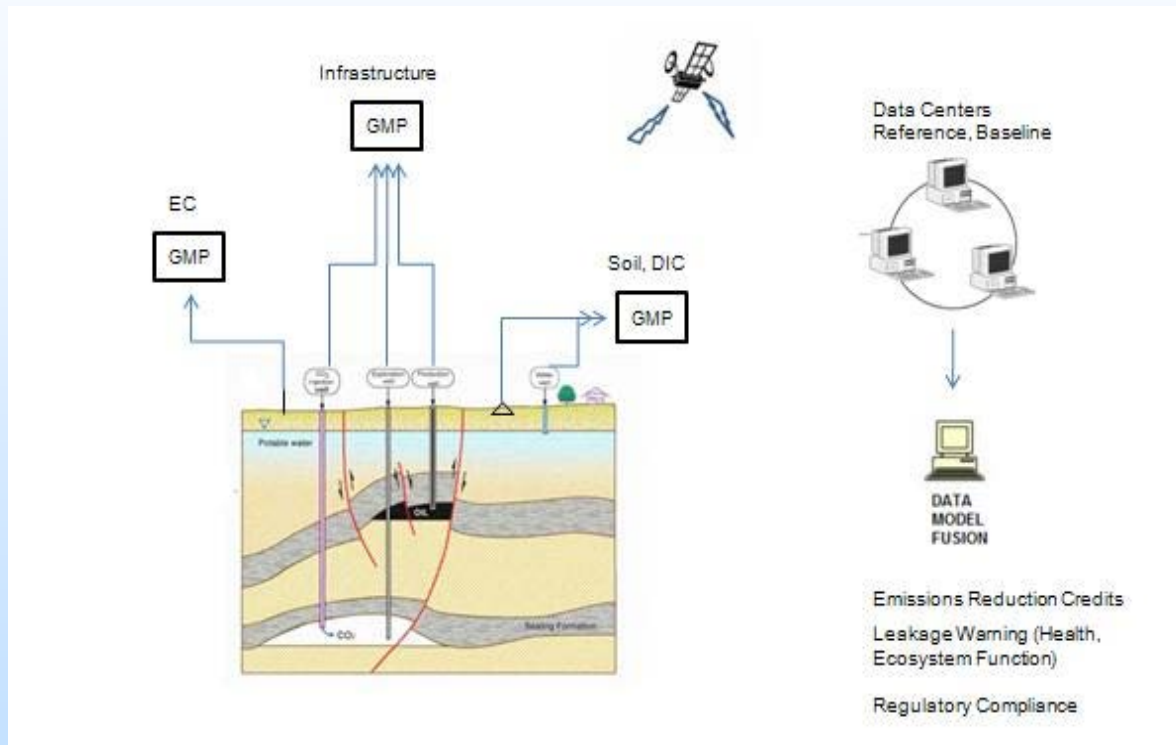
# Project Overview & Objectives



Ideal FF- $\text{CO}_2$  Tracer  
Large  $\Delta$  (~1050 ‰)  
Large  $\Delta$  vs. Troposphere  
Use natural radiocarbon  
Project lifetime MVA  
Avoids transient tracers  
Internal precision, ~1 ‰  
External precision ~50-75 ‰



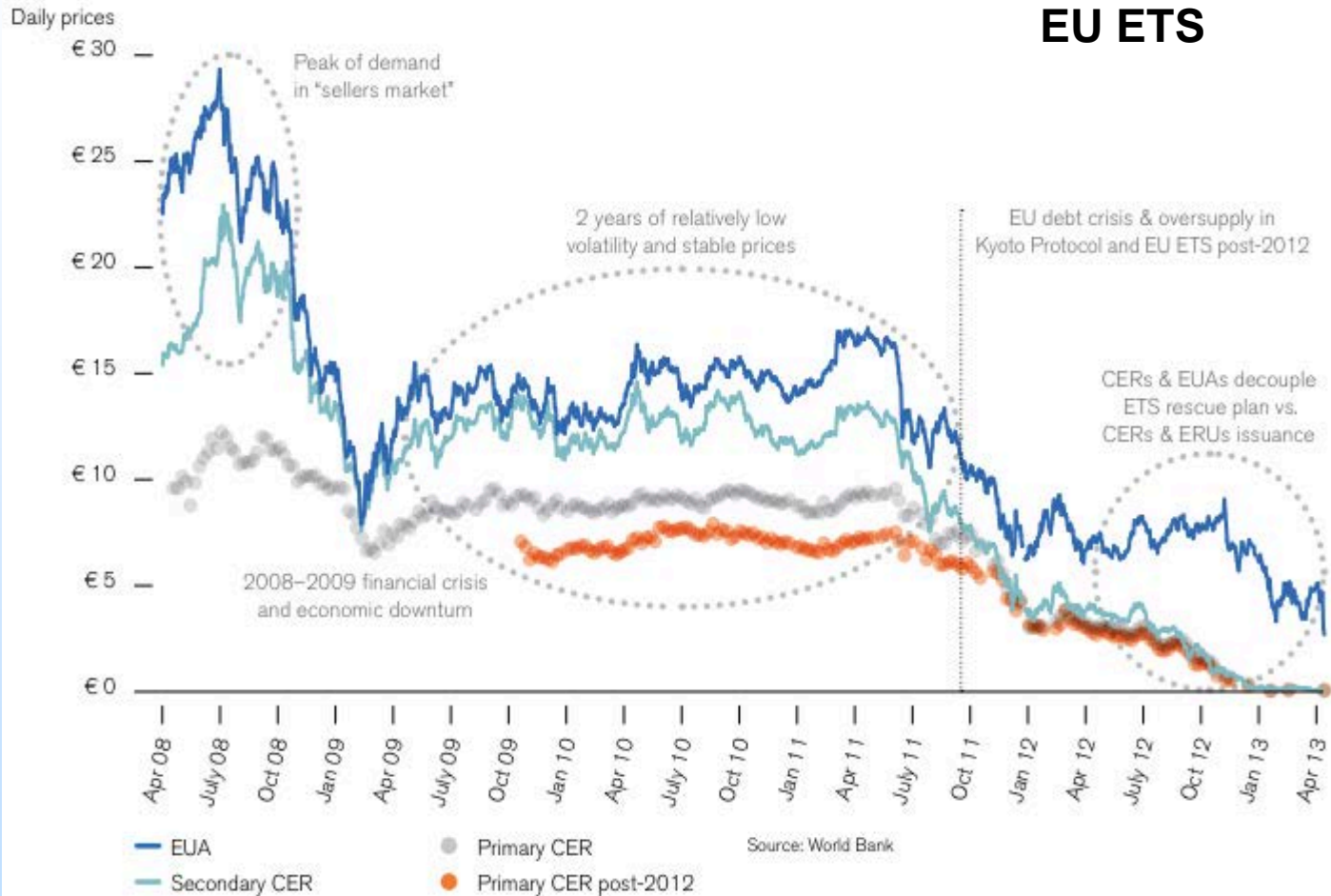
# GMP CCS Application



Manuscript in Preparation, Do Not Cite

# Requirements for “Credits”

Figure 4: EUA and CER prices (2008–2013)



# Project Architecture: MVA\*S

## Accounting

ISOFlux Measurements Across Scales (time, space)  
Data & Model Fusion  
Quantification (e.g., metric tons carbon)

## Monitoring

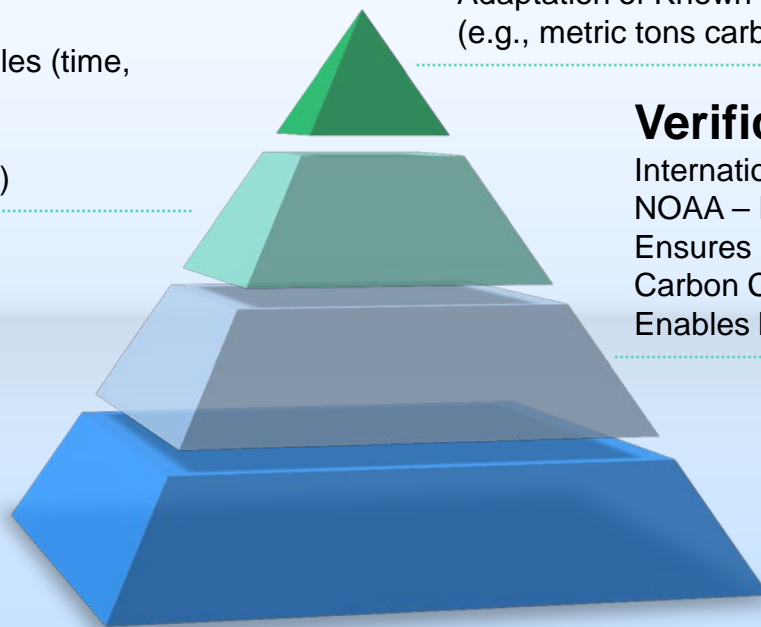
$^{12,13,14}\text{CO}_2$   
(Measurement)  
Global Monitor Platform  
Multi-isotopic Field Analyzer

## Securities

Adaptation of Known Security Structures to Carbon Flux  
(e.g., metric tons carbon sequestered/hectar)

## Verification

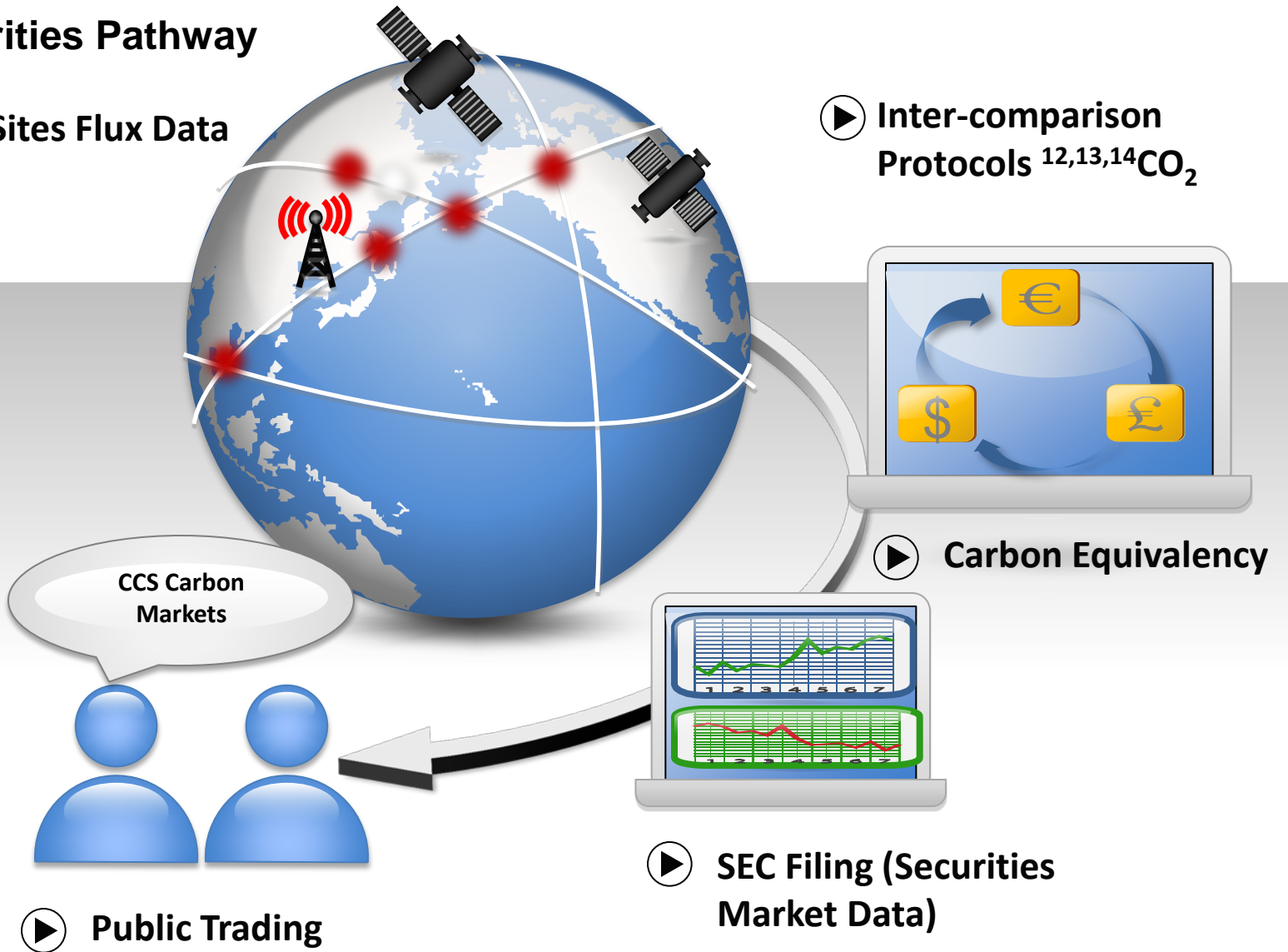
International Reference Gas Standards  
NOAA – Linked  
Ensures Measurement Comparability  
Carbon Currency Equivalency  
Enables local-to-global Networks



# CCS Securities Pathway

▶ CCS Sites Flux Data

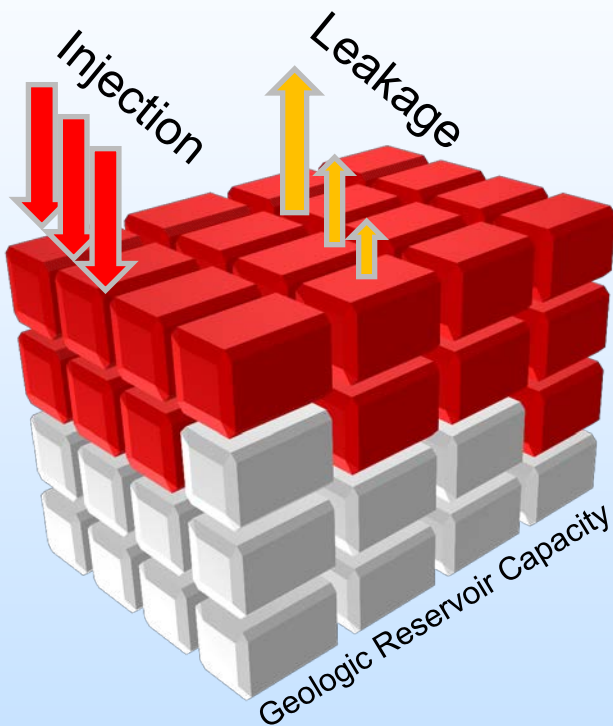
▶ Inter-comparison Protocols <sup>12,13,14</sup>CO<sub>2</sub>



**CCS Public Involvement is Critical to CCS Success**



# CCS Security Structure



- Employ well known securities types (e.g., closed-end fund) as basic structure
- “Map” security onto the CCS reservoir
- Define carbon rights and create appropriate legal contracts
- Employ SEC filing structures to create tradable security and offer for sale
- Manage CCS projects (injection, post closure) and define trading rules
- Ultimate value(risk) of CCS shares is related to project details and leakage

# Summary

1

Effective public outreach is needed for advancement of CCS worldwide providing a viable means of ensuring energy production while reducing C emissions.

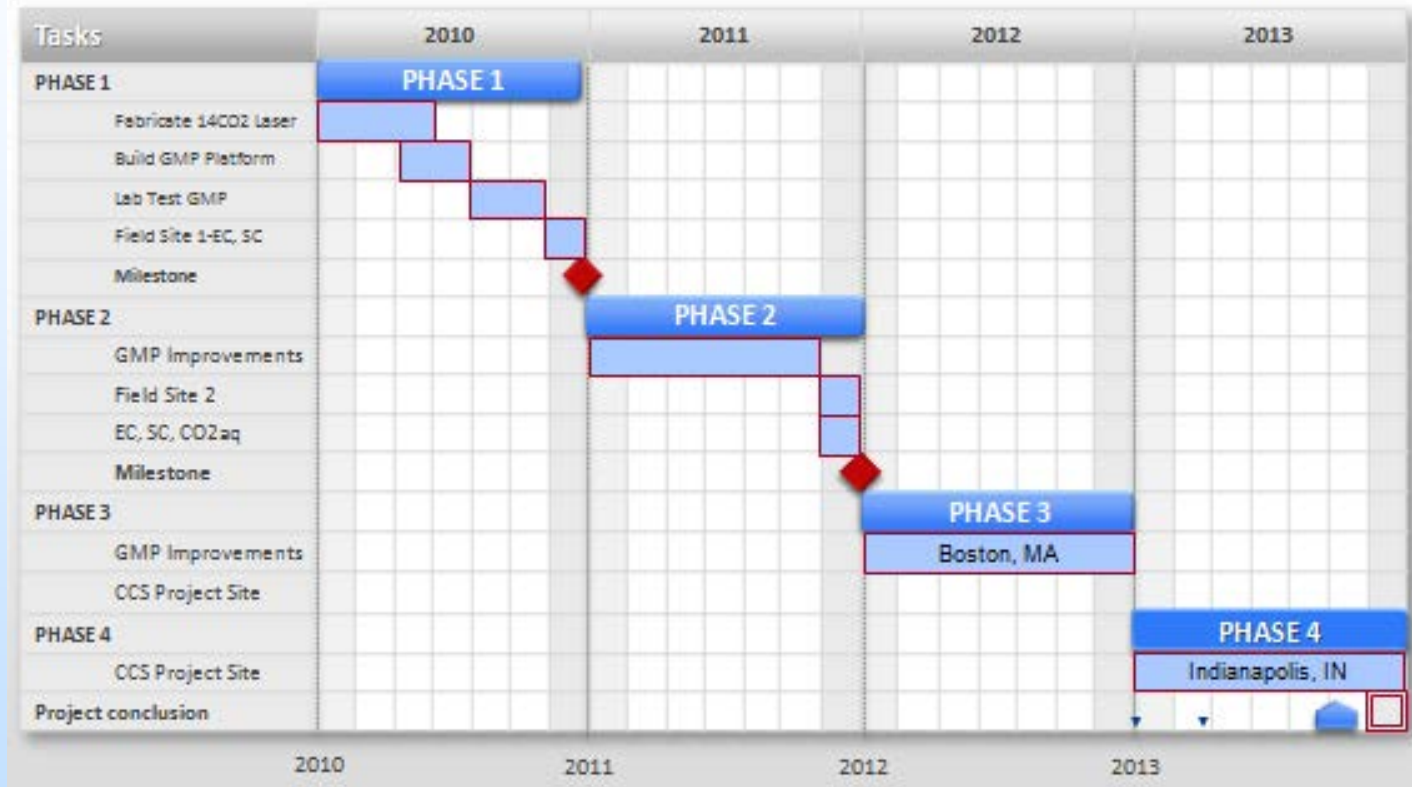
2

A combination of science based metrics, verifying C sequestration, and a common securities structure, offers a pathway to widespread stakeholder participation.

3

PEMs CCS security approach is achievable in the near term with CCS partnerships.

# Appendix I: Gantt Chart



# Appendix II: Bibliography

Lewicki, J.L., Hilley, G.E., Dobeck, L., McLing, T.L., Kennedy, B.M., Bill, M., and Marino, B.D.V., 2012, Geologic CO<sub>2</sub> input into groundwater and the atmosphere, Soda Springs, ID, USA. *Chemical Geology, In Press, Corrected Proof, Available online 30 June 2012.*

Lewicki, J.L., Hilley, G.E., Dobeck, L., and Marino, B.D.V., 2012, Eddy covariance imaging of diffuse volcanic CO<sub>2</sub> emissions at Mammoth Mountain, CA, USA. *Bulletin of Volcanology*, v 1 (1), p. 1-7.

Marino, B.D.V., Bright, M., Gronniger, G., 2011, Design and package of a 14CO<sub>2</sub> field analyzer: the Global Monitor Platform (GMP). *Proceedings of SPIE*, v 8156, p. 81560E

# Appendix III: Benefits of a $^{14}\text{CO}_2$ Field Analyzer to DOE MVA Program Goals

