

# Converting Challenges into Opportunities: Software for Distributed Methane Abatement

California Air Resources Board  
Symposium on Methane Emissions from Natural Gas Systems  
**Cap-Op Energy**



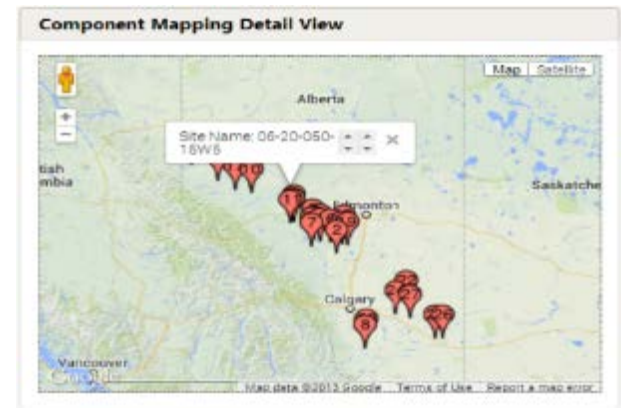
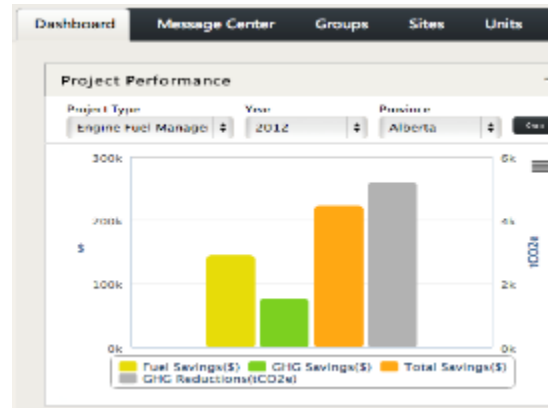
# Making Sustainability Profitable... for California

- Objective:
  - Reduce carbon intensity of natural gas delivered to California
- Sector Requirements
  - Tools to streamline planning and implementation (MAP)
  - Site access and proven technologies
  - Robust quantification tools (DEEPP)

# About Cap-Op Energy

*Sustainability  
Made Profitable*

Mission: To simplify sustainability in the energy sector with *intelligent tools* and *strategic thinking*.



Cap-Op Energy has developed the premier energy efficiency platform for the oil & gas industry to automate and standardize the quantification of greenhouse gas credits (carbon offsets) from data acquisition through to verification and reporting. It offers significant savings and risk reduction to customers by coupling the power of cloud computing and project aggregation with years of industry expertise and best practices.

# The Challenge

Mandate: 45% reduction in methane emissions from O&G by 2025 (National and sub-national)

- 45% of what? Small emission sources not well documented, but contribute significant proportion of methane venting
- Compliance (abatement) costs will range from **\$2/t CO<sub>2</sub>e to \$160/t CO<sub>2</sub>e (10 year)**
- Distributed methane abatement solutions available to address massive hi-bleed fleet
- Costs and information are the barriers - finding and scoping small projects is challenging

# Scope of Opportunity

GHG Emitting Equipment	Total Alberta Equipment Count	Estimated Eligible Alberta Equipment Count	GHG Efficient Alternatives	Average Emissions Reduction (annual)	Average Capital Cost (Installed)	Estimated Total GHG Reduction Potential (over 10 years)
High-bleed instruments	369,067	115,000	Low-bleed instruments	40 tCO <sub>2</sub> e	\$1,000 - 2,500	46,000,000 tCO <sub>2</sub> e
Pneumatic Pumps	172,302	150,000	Low/No-bleed pumps	75 tCO <sub>2</sub> e	\$10,000 - 25,000	112,500,000 tCO <sub>2</sub> e
Solution Gas Venting	19,000	8,000	Well site vent gas capture	500 tCO <sub>2</sub> e	\$20,000 - \$60,000	40,00,000 tCO <sub>2</sub> e
Vent gas (Engines)	31,968	10,000	Vent gas capture	1000 tCO <sub>2</sub> e	\$50,000 - \$250,000	100,000,000 tCO <sub>2</sub> e
Natural gas combustion engines	31,968	6,000	Air-fuel ratio controllers	600 tCO <sub>2</sub> e	\$150,000 - \$300,000	36,000,000 tCO <sub>2</sub> e
Total						335 million tCO <sub>2</sub> e
<div> <div></div> "Lowest Hanging Fruit" (Current Opportunity) <div></div> "Next Best" (Opportunity for Future Expansion) </div>						

Sourced from Alberta's Upstream Oil & Gas Assets Inventory Project – Opportunities to Reduce GHG Emissions. 2013.

# The Opportunity

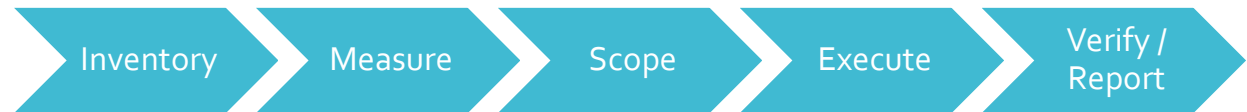
Our data confirm **pneumatic device conversions** are the \$2/t to \$10/t projects - and there are *hundreds of thousands to do*

- Cap-Op is working to help companies abate distributed methane emissions
  - Planning tool for low-cost execution
  - Robust emissions quantification
  - Carbon-backed project financing
- Regulatory framework can drive work
  - Carbon pricing drives economics
  - Upstream -> across jurisdictions
  - End-use in CA, benefits to CA

# Distributed Methane Abatement Workflow

## Carbon-Backed Project Financing

(Innovating on Funding)



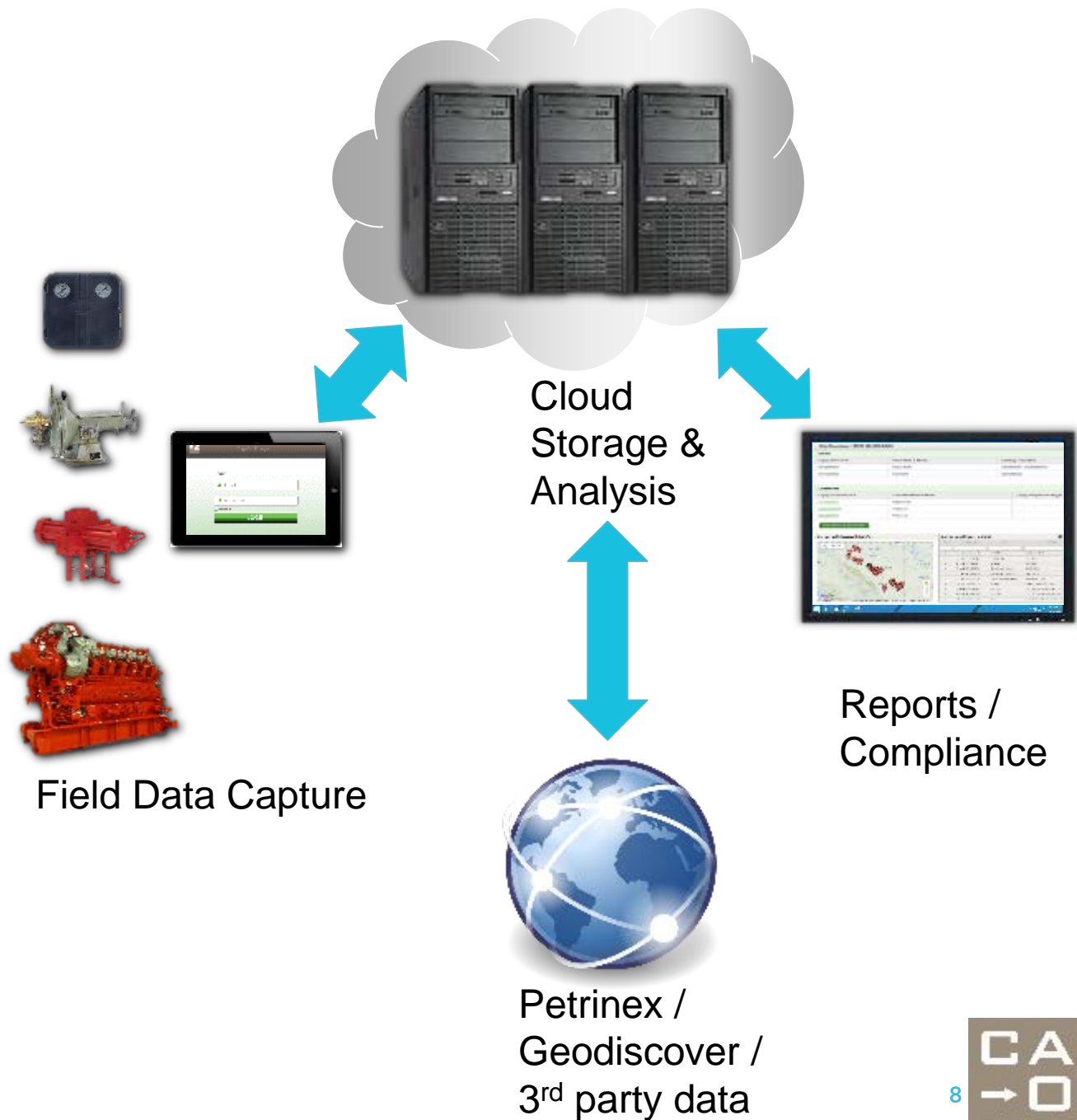
**MAP**

(User Engagement & Software Development Underway)

**DEEPP**

(Operational)

# Methane Abatement Platform





# MAP: Field Data Collection

The image displays three overlapping screenshots of the Cap-Op Energy field data collection app interface. The top screenshot shows the main menu with the Cap-Op Energy logo, user name 'Super User', and a 'Logout' button. Below the header, it says 'Beta 2.2'. The main content area is titled 'Enter NTS to Create a New Site or Return to an Existing Site'. It features a toggle for 'NTS' (selected) and 'LSD'. A green status bar indicates '# of Entries Not Synced: 7' with a 'Sync' button. Below this, there are several dropdown menus for site information: Quarter Unit (A), NTS Exception (Select), Unit (01), Block (A), Series (082), Area (A), and Sheet (01). The middle screenshot shows a 'New Valve & Controller' form. It has a 'Valve' section with fields for Actuator Make, Actuator Model, Actuator Serial #, and Actuator Benchset (with a 'Take Valve/Actuator Photo' button). Below this is the 'Cap-Op Valve ID #' field (VSS700001) and 'Valve Make' and 'Valve Model' dropdowns. The bottom section is for 'Valve Serial #' and 'Actuator and/or Valve Notes'. The rightmost screenshot shows a 'Site Overview: A-01-A/082-A-04' page. It includes an 'Edit Site' button and three tables: 'Valves', 'Controllers', and 'Pumps'. Each table has columns for ID, Make & Model, and Sample Tracking #, with links to 'Add Controller to Valve' or 'Add Pump'. The 'Valves' table lists V800003 (Fisher D4) and V800025. The 'Controllers' table lists C500003 (Fisher 548), C500004 (Fisher 4150), and C500007 (Antek 1001). The 'Pumps' table lists P500018 (Arrow 1250).

Cap-Op Energy  
Super User Logout  
Beta 2.2

Enter NTS to Create a New Site or Return to an Existing Site

NTS LSD # of Entries Not Synced: 7 Sync

Quarter Unit : A  
NTS Exception : Select  
Unit : 01  
Block : A  
Series : 082  
Area : A  
Sheet : 01

Cap-Op Energy  
Beta 2.2

New Valve & Controller

Valve

Actuator Make: Select Actuator Make  
Actuator Model: Select Actuator Model  
Actuator Serial #:   
Actuator Benchset: to Units  
Take Valve/Actuator Photo  
Cap-Op Valve ID #: VSS700001  
Valve Make: Select Valve Make  
Valve Model: Select Valve Model  
Valve Serial #:   
Actuator and/or Valve Notes:

Site Overview: A-01-A/082-A-04 Edit Site

Valves

Capop Valve ID #	Valve Make & Model	Existing Controllers	
V800003	Fisher D4	C500003, C500004, C500007	Add Controller to Valve
V800025			Add Controller to Valve

Controllers

Capop Controller ID #	Controller Make & Model	Capop Sample Tracking #	
C500003	Fisher 548		
C500004	Fisher 4150	EVENT000003	
C500007	Antek 1001		

Add Valve & Controller

Pumps

Capop Pump ID #	Pump Make & Model	Pump Sample Tracking #	
P500018	Arrow 1250	EVENT000011	

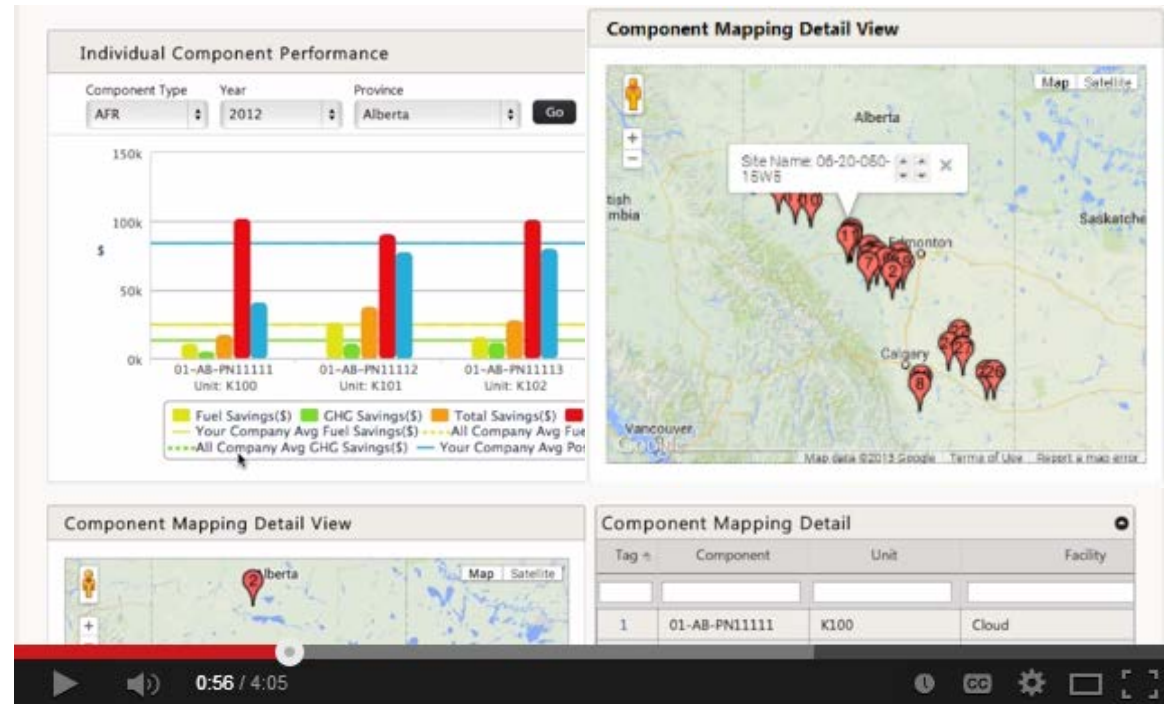
Add Pump

- The field app syncs with the server using a WIFI or cellular data connection.
- We use a packet-level data arrival confirmation system to handle flakey signals.

# MAP: Back-end Tools

- Utility Analysis:
  - Gas pipelines / Co-op lines (conservation)
  - Disposal and storage wells (abatement / conservation)
  - Electricity lines (conservation via power generation or electrification)
- Clustering Analysis:
  - Methane destruction and conservation opportunities
  - Simple communication among diverse stakeholders
- Campaign Planning:
  - Route optimization
  - Equipment and tools available
  - Tracking and accounting progress (no double conversions)

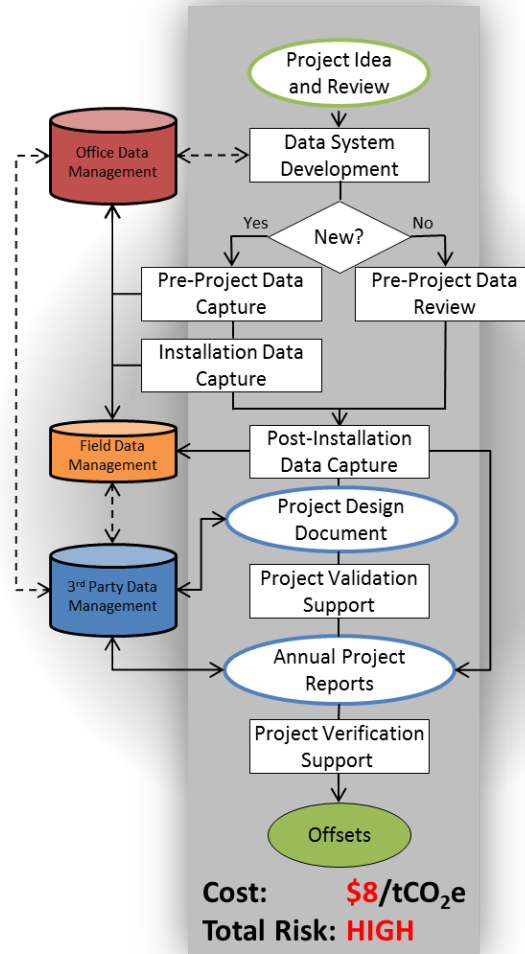
# Distributed Energy Efficiency Project Platform (DEEPP)



Cap-Op Energy Distributed Energy Efficiency Project Platform (...)

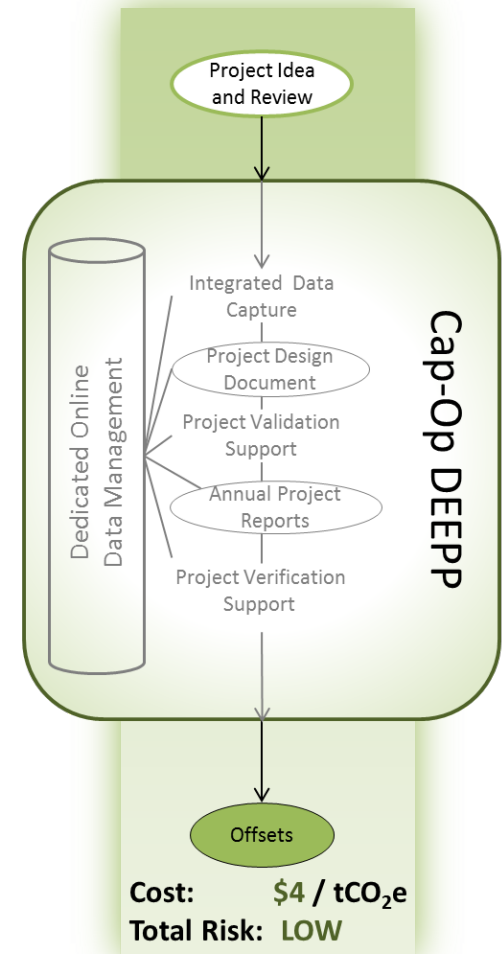
# DEEPP Process

## Conventional Process



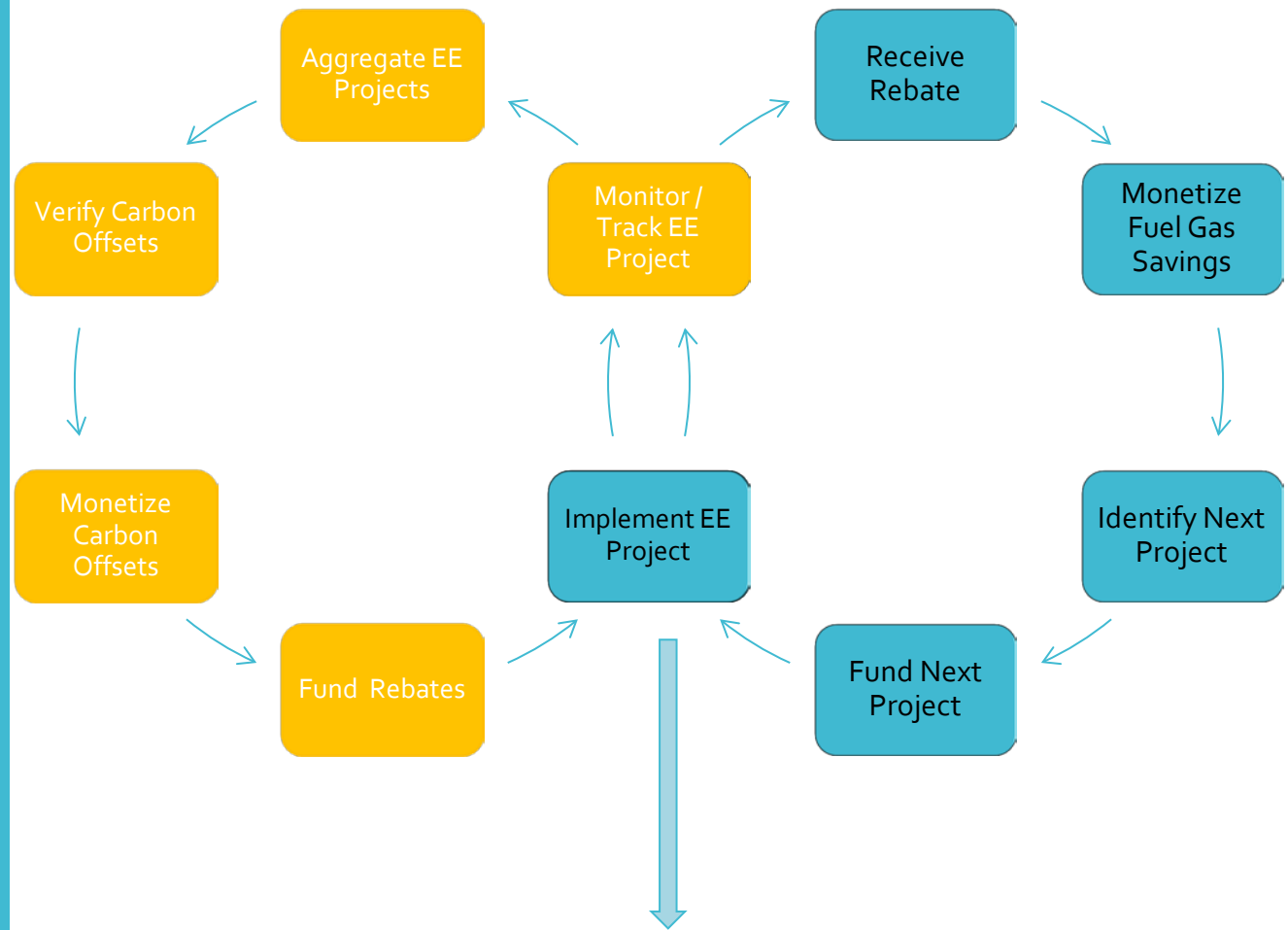
- x Inefficient
- x Expensive
- x High Risk

## DEEPP Process



- ✓ Streamlined
- ✓ Cost Effective
- ✓ Low Risk

# Carbon-Backed Project Finance

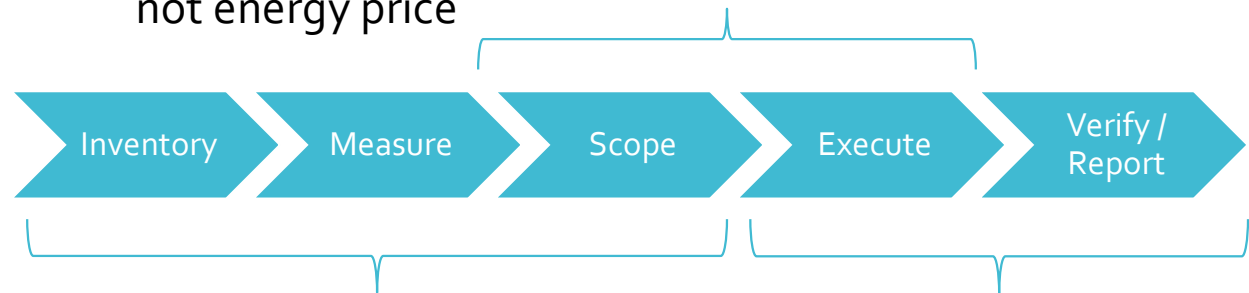


***Enhanced Performance: Corporate Environmental Stewardship + Low Cost Production and Reliability + Returns to Investors***

# Cap-Op Tools Support Low-Carbon Natural Gas

## Carbon-Backed Project Financing

- Accelerate projects based on carbon price, not energy price
- Leverage 3<sup>rd</sup> party funds for project capital



### MAP

- Improve accuracy of methane emission reporting / carbon intensity estimates through enhanced granularity
- Decision support tool for identifying, evaluating and prioritizing methane abatement programs

### DEEPP

- Robust quantification of distributed emissions
- Aggregated verification of emission reductions
- Project management and performance tracking
- Industry benchmarking

# Making Sustainability Profitable... for California

- Objective:
  - Reduce carbon intensity of natural gas delivered to California
  - Mitigate risk of capital flows out of the state.
- Sector Requirements
  - Tools to streamline planning and implementation (MAP)
  - Site access and proven technologies
  - Robust quantification tools (DEEPP)
  - Supportive regulatory framework (carbon pricing / incentive)

# Contact Information

Keith Driver, M.Sc., P.Eng., MBA

Founder and Director

Cap-Op Energy Inc.

403.860.8623

[kdriver@capopenenergy.com](mailto:kdriver@capopenenergy.com)

Calgary – San Francisco

[www.capopenenergy.com](http://www.capopenenergy.com)