

Empirical Energy: Scaling Alternative Energy

A Case Study Featuring PureWest Energy and Gunvor Group

CleanConnect.ai
Visual Automation

Downstream Buyers Want Certified Bio-Methanol, Bio-Plastics, Blue Hydrogen, LCFS, Low-Cl LNG

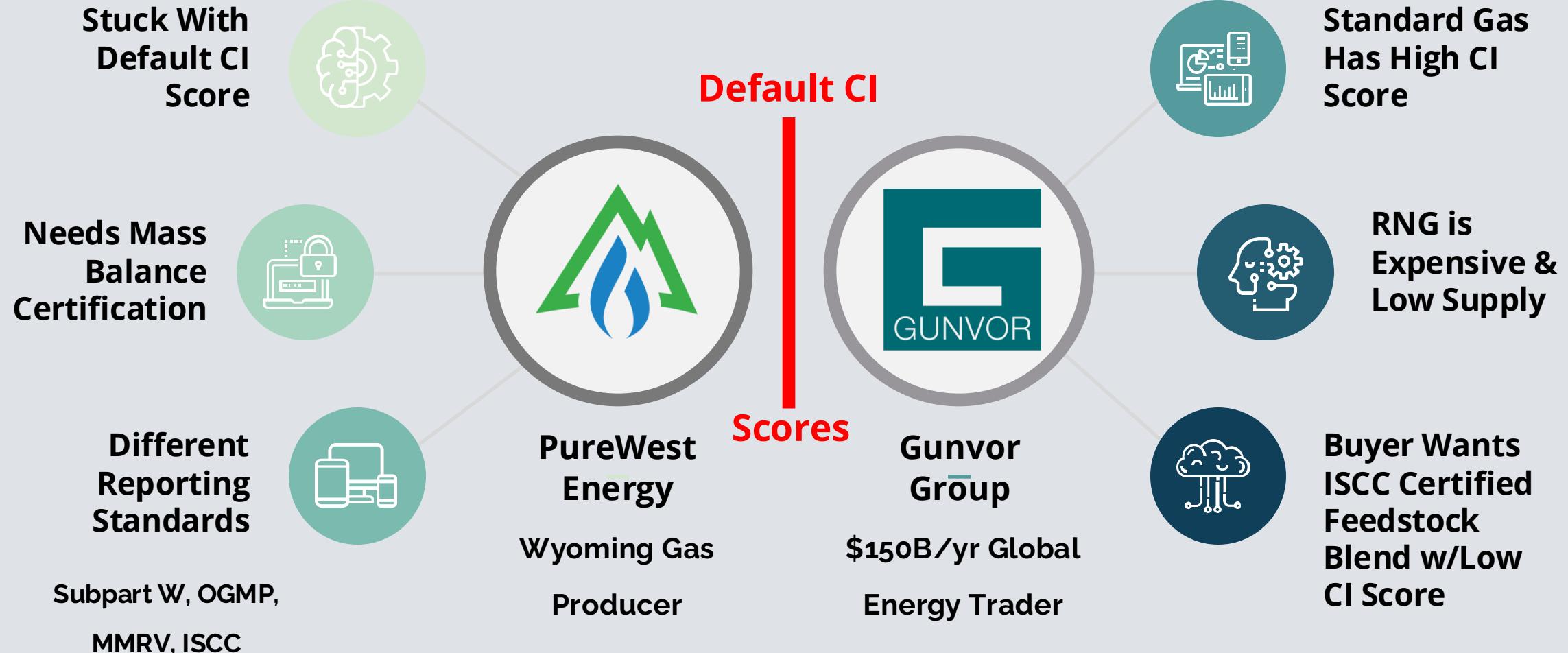


*As of November 2024, 52 of the Members have given consent for displaying their logos.
A complete list of all ISCC Association Members can be found on the [Membership List](#) web page.

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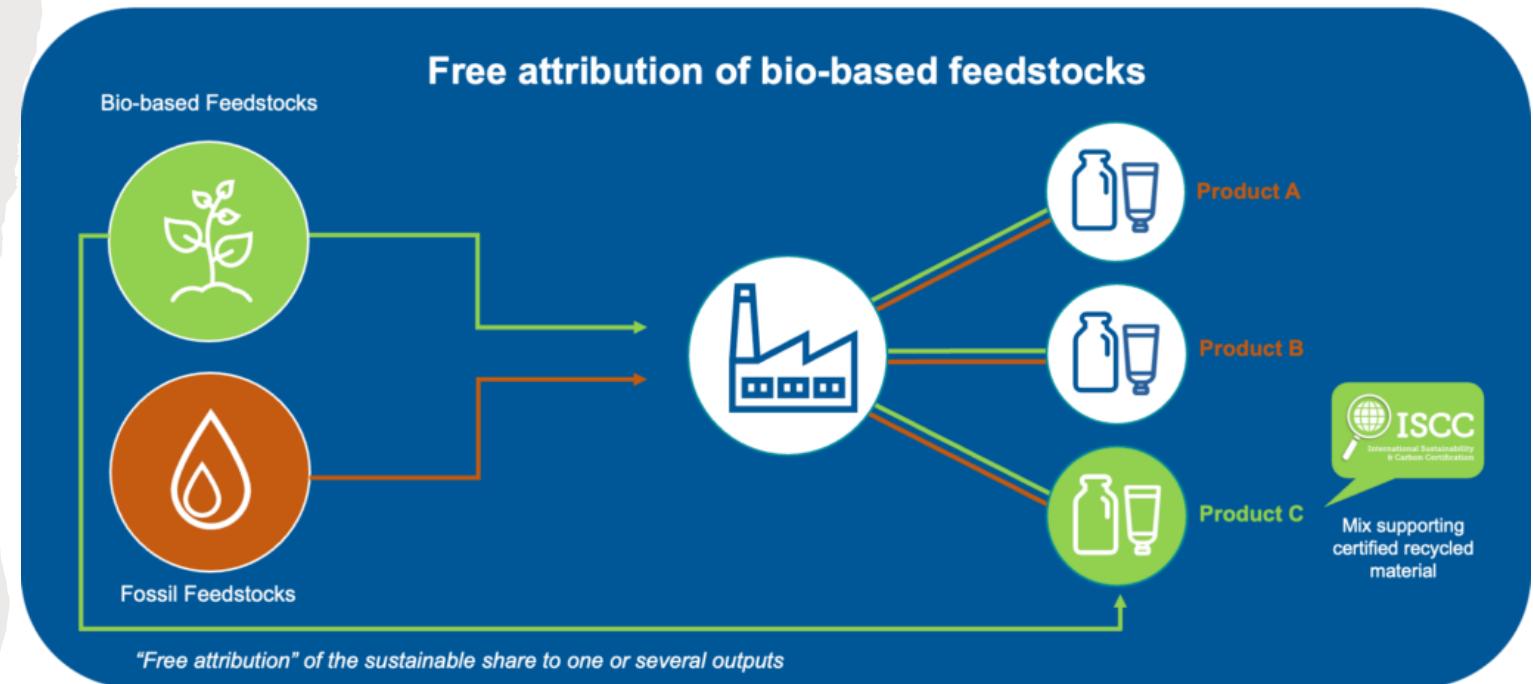
Challenges Between PureWest & Gunvor

Downstream Buyers Want Certified Bio-Methanol, Bio-Plastics, Blue Hydrogen, LCFS, Low-CI LNG



ISCC-PLUS

- Certified entity is allowed to handle certified feedstocks
- Each certified feedstock must be ISO 14067 with mass balance
- The entire supply chain must have data tracking, tracing and transparency
- The ETH blockchain and NFT's fit this data handling criteria



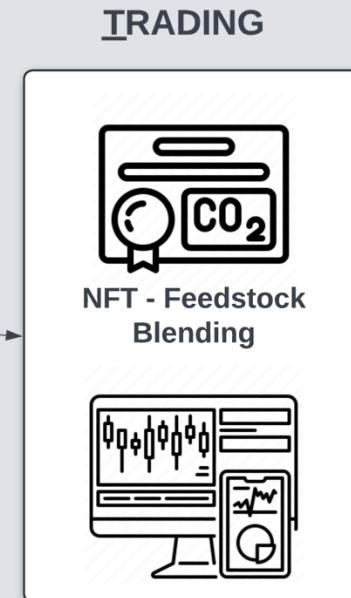
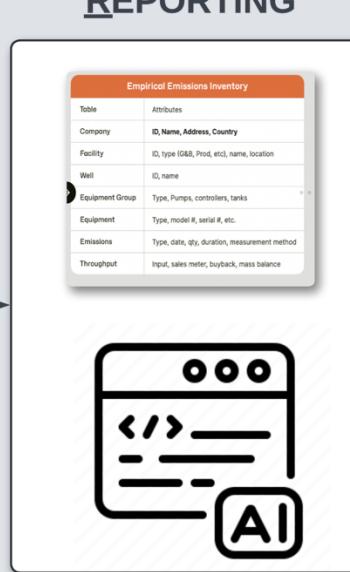
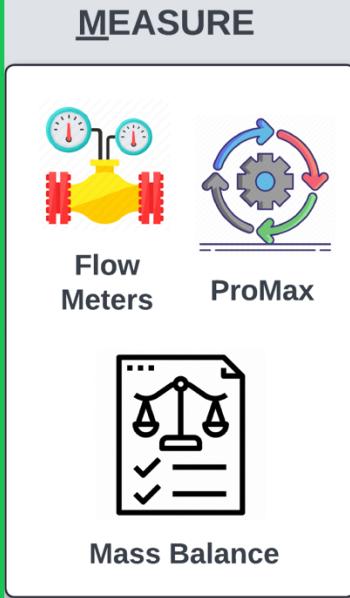
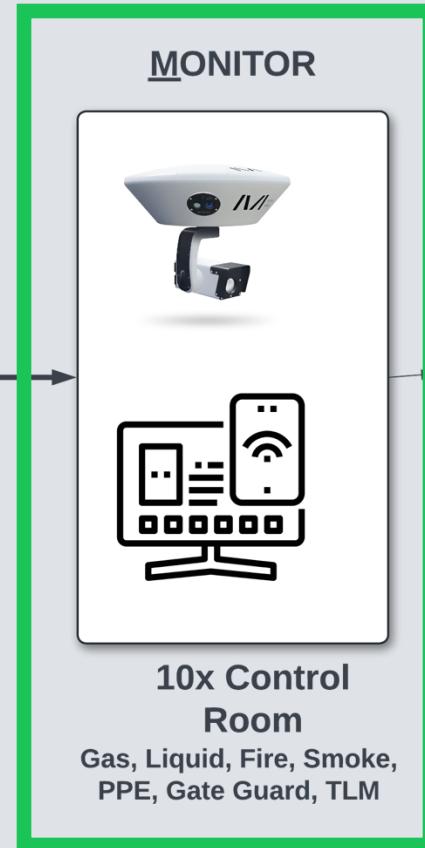
Empirical Energy Platform

Transforming Emission Factors into Empirical Energy



Producer
(seller)

Emission
Factors

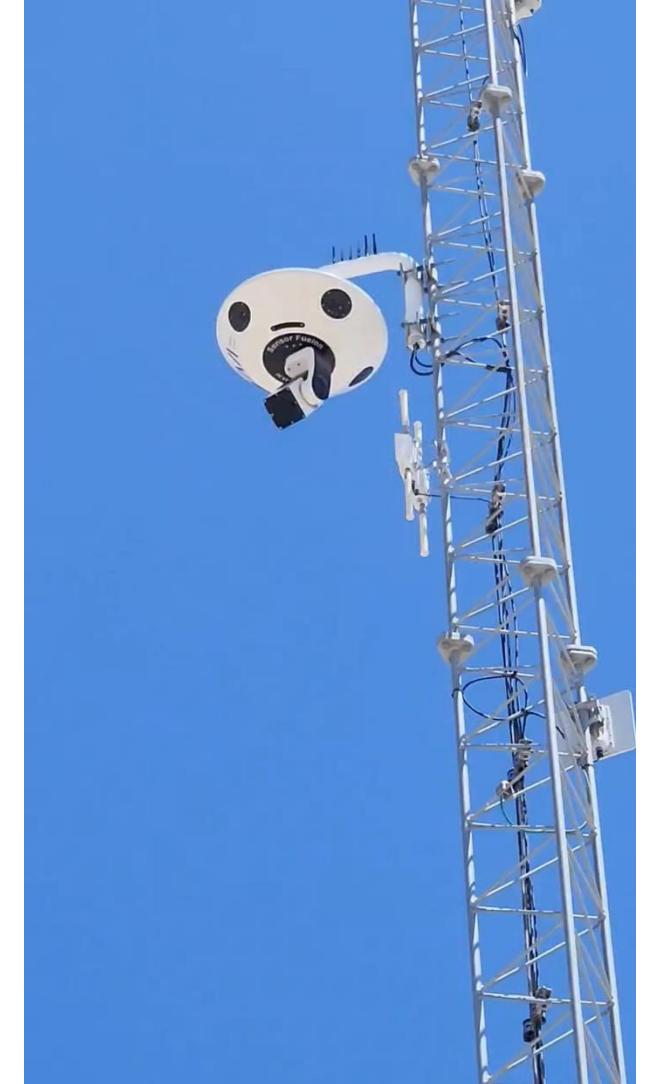


Empirical
Energy
Buyer

Empirical Energy Management Platform

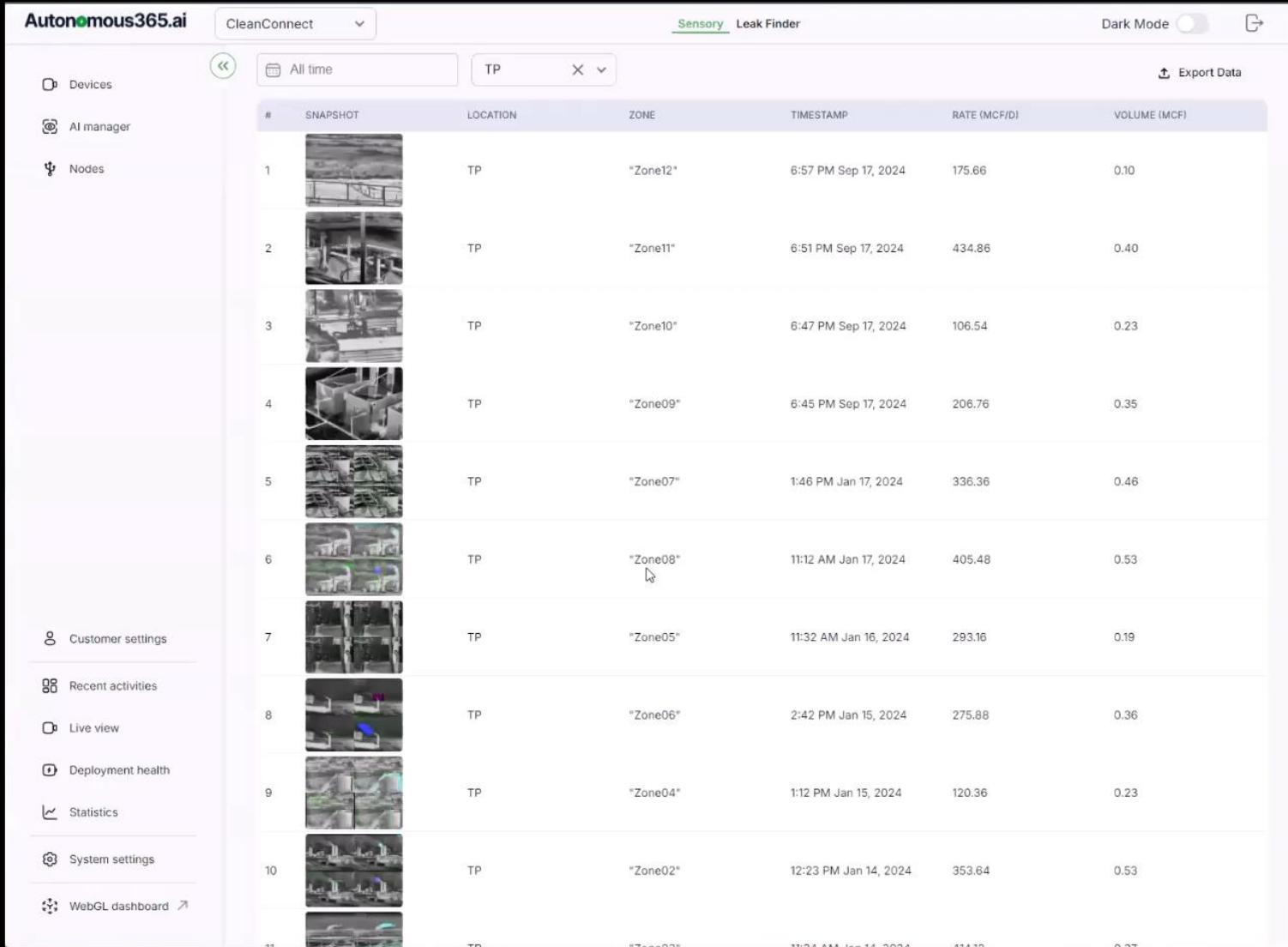
Minerva Camera Deployment

- Cameras installed by certified installers
- Camera placed on tower – 35-45 feet above site
- Connect via power-over-ethernet (POE)
- Configuration file sent to camera from digital twin
- Ready to start monitoring in minutes



Autonomous365 Dashboard Demo

- Gas Leak
- Liquid Leak
- Fire/Smoke
- Hard hat
- Tank-level monitoring
- Method 22
- Gate Guard
- Live View



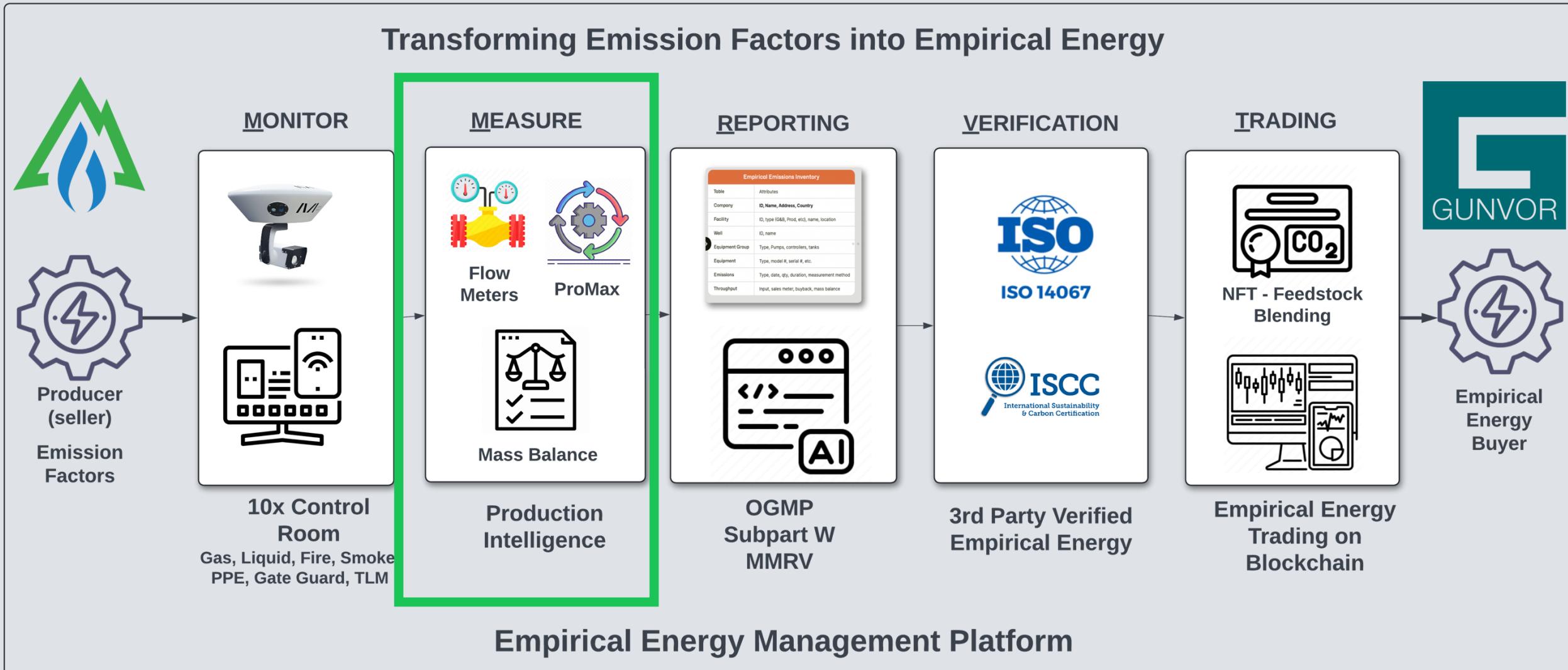
The screenshot shows the Autonomous365 Dashboard interface. The top navigation bar includes 'Autonomous365.ai', 'CleanConnect', 'Sensory' (which is underlined in green), 'Leak Finder', 'Dark Mode' (with a toggle switch), and 'Export Data'.

The left sidebar contains links to 'Devices', 'AI manager', 'Nodes' (with a sub-section for 'TP' showing 11 items), 'Customer settings', 'Recent activities', 'Live view', 'Deployment health', 'Statistics', 'System settings', and 'WebGL dashboard'.

The main content area is titled 'Sensory' and shows a table of detected leaks. The columns are: #, SNAPSHOT, LOCATION, ZONE, TIMESTAMP, RATE (MCF/D), and VOLUME (MCF). The data is as follows:

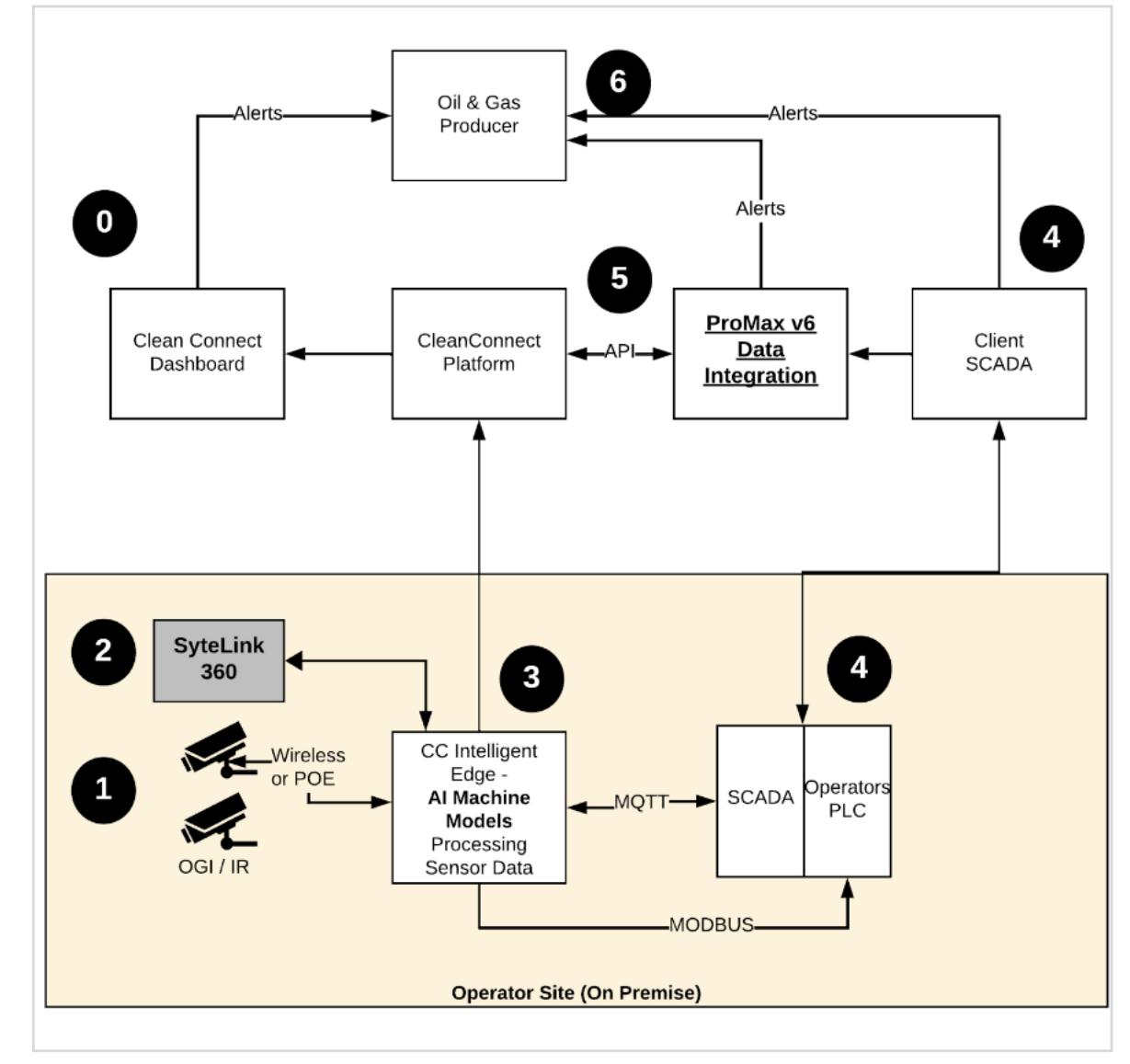
#	SNAPSHOT	LOCATION	ZONE	TIMESTAMP	RATE (MCF/D)	VOLUME (MCF)
1		TP	"Zone12"	6:57 PM Sep 17, 2024	175.66	0.10
2		TP	"Zone11"	6:51 PM Sep 17, 2024	434.86	0.40
3		TP	"Zone10"	6:47 PM Sep 17, 2024	106.54	0.23
4		TP	"Zone09"	6:45 PM Sep 17, 2024	206.76	0.35
5		TP	"Zone07"	1:46 PM Jan 17, 2024	336.36	0.46
6		TP	"Zone08"	11:12 AM Jan 17, 2024	405.48	0.53
7		TP	"Zone05"	11:32 AM Jan 16, 2024	293.16	0.19
8		TP	"Zone06"	2:42 PM Jan 15, 2024	275.88	0.36
9		TP	"Zone04"	1:12 PM Jan 15, 2024	120.36	0.23
10		TP	"Zone02"	12:23 PM Jan 14, 2024	353.64	0.53
11		TP	"Zone03"	11:24 AM Jan 14, 2024	311.12	0.27

Empirical Energy Platform



System Architecture

1. OGI cameras send raw data to edge
2. Optional: SyteLink360 sends data to edge
3. Edge device processes computer vision models
4. Integrated with SCADA via MQTT / Modbus
5. Data pushed/pulls from SCADA to Promax 6, then to Clean Connect platform
6. Alerts sent to O&G producer



Empirical Energy Platform

Transforming Emission Factors into Empirical Energy



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(seller)

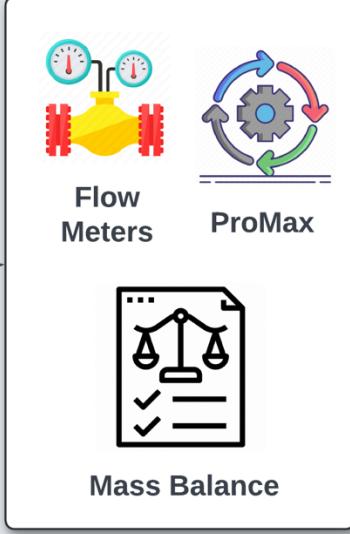
Emission
Factors

MONITOR



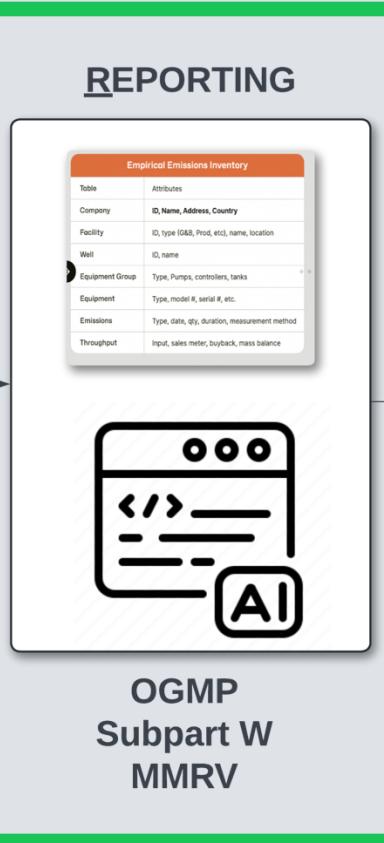
10x Control Room
Gas, Liquid, Fire, Smoke,
PPE, Gate Guard, TLM

MEASURE



Production
Intelligence

REPORTING

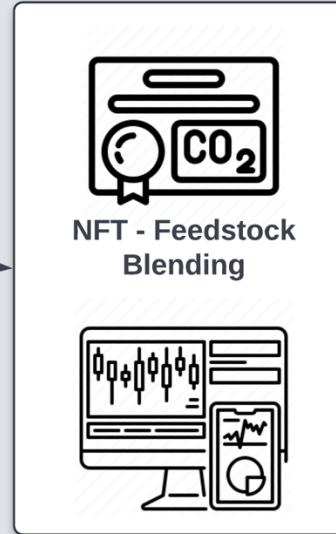


VERIFICATION



3rd Party Verified
Empirical Energy

TRADING



Empirical Energy
Trading on
Blockchain



Empirical
Energy
Buyer

Empirical Energy Management Platform

Comparing GHG Emission Inventories

DIFFICULTY

Feature	Empirical Subpart W Waste Emission Charge	OGMP 2.0 Level 4/5	MMRV	ISCC
Prerequisite Compliance	Mandatory Reporting Rule Subpart W	Local Govt	Local Govt.	Local Govt.
Source-level Measurements	Method 1-5 (1=more accurate, 5=factors)	TBD	TBD	TBD
Site-level (Top-down) measured	n/a	Site & Source-level reconciliation required for Level 5	Site & Source-level reconciliation required for Level 5	Site & Source-level reconciliation required for Level 5
Baseline	<ul style="list-style-type: none"> Upstream: 0.2% CH4 intensity Midstream: 0.11% CH4 intensity Down: 0.05% CH4 intensity 	0.2% CH4 intensity (OGCI numbers)	0.2% CH4 intensity (OGCI numbers)	Empirically Measured Feedstock Determines CI Score
Fee (tax) for not hitting baseline	<ul style="list-style-type: none"> \$900/mT CH4 (2024) \$1200/mT CH4 (2025) \$1,500/mT CH4 (2026) 	None	EU CBAM	n/a
Annual Emissions Inventory Audit	TBD	By OGMP	n/a	n/a
Methodology Audit		By OGMP	ISO 14067 / 14064-3	ISO 14067 / 14064-3
Data Audit / Standard	Yes. 3 rd party. / TBD	Yes. OGMP/ TBD	ISO 14067 / 14064-3	ISO 14067 / 14064-3
Supply Chain Attestation / MMRV			ISO 14067	ISO 14067 w/Mass Balance
Data Requirements	Upload to EPA portal	Upload to OGMP portal	TBD	Tracking, Tracing, Transparency e.g. Blockchain / NFT

Empirical Energy Platform

Transforming Emission Factors into Empirical Energy



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(seller)

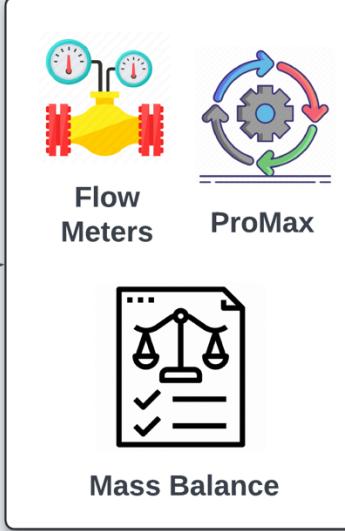
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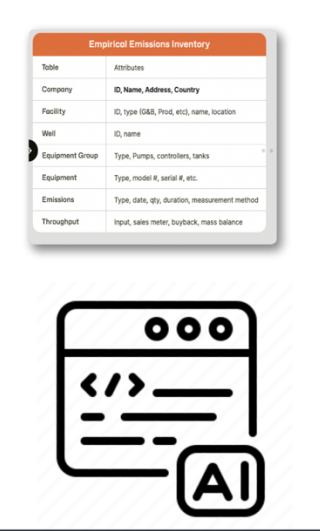
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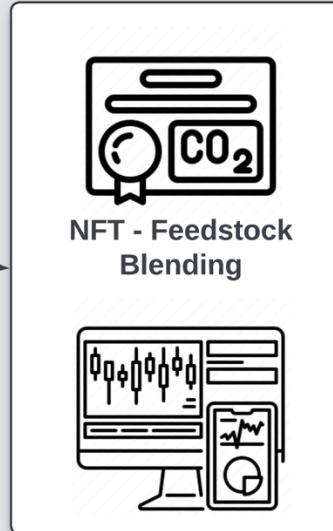
OGMP
Subpart W
MMRV

VERIFICATION



3rd Party Verified
Empirical Energy

TRADING



Empirical Energy
Trading on
Blockchain



Empirical
Energy
Buyer

Empirical Energy Management Platform

Feedstocks

Biobased Feedstocks

Agricultural Biomass
Forest Biomass
Waste and Residues
(including agricultural, aquaculture, fisheries and forestry residues)
Ligno-cellulosic Materials
Non-food cellulosic Materials

Recycled Carbon Feedstocks

Liquid and solid waste streams of non-renewable origin or waste processing and exhaust gas of non-renewable origin

Non-biological Renewables

Energy derived from renewable sources other than biomass

Market Applications

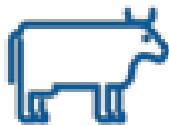
Food

Agricultural Biomass for the Food Production



Feed

Agricultural Biomass for the Feed Production



Industrial Applications

- Chemicals
- Packaging
- Plastics
- etc.



Fuels

- **Biofuels, Bioliquids and Biomass Fuels**
Including:
 - Low iLUC-risk fuels
 - High iLUC-risk fuels
 - Advanced Biofuels (produced from feedstocks listed in Annex IX of the RED II)
- **Recycled Carbon Fuels**
- **Renewable liquid and gaseous Transport Fuels of non-biological Origin (RFNBOs)**



ISCC Systems

ISCC PLUS

Applicable to

Food
Feed
Industrial Applications

Energy and Fuels outside the EU (not regulated by the RED II)

ISCC EU

Applicable to

Energy inside the EU
(fuels, electricity, heating, cooling)
(regulated by the RED II)

ISCC EU confirms compliance with the Sustainability and GHG Saving Criteria of the RED II

Empirical Energy Platform

Transforming Emission Factors into Empirical Energy



Producer
(seller)

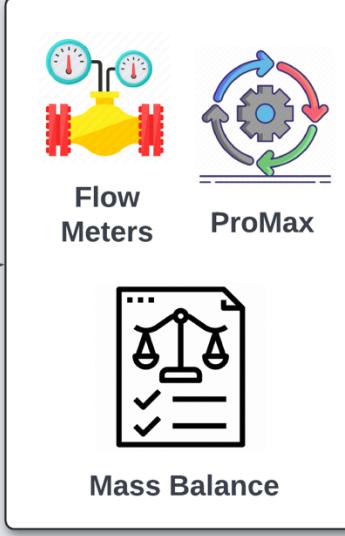
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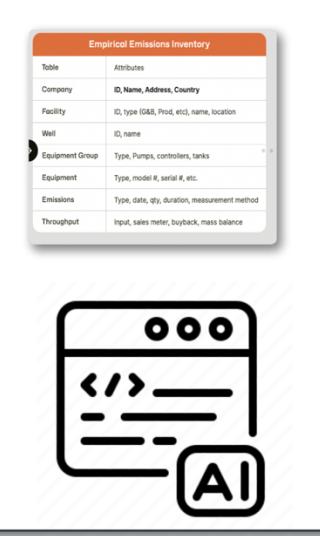
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MEASURE



**Production
Intelligence**

REPORTING



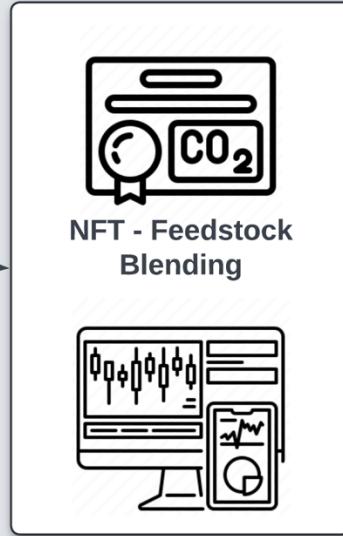
**OGMP
Subpart W
MMRV**

VERIFICATION



**3rd Party Verified
Empirical Energy**

TRADING



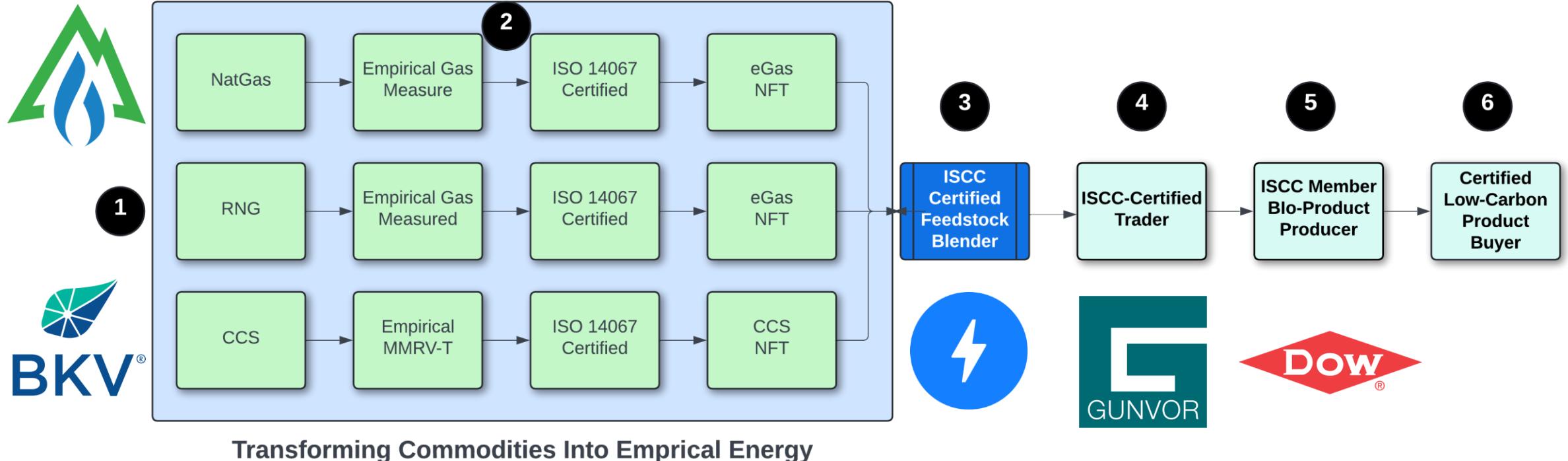
**Empirical Energy
Trading on
Blockchain**



Empirical
Energy
Buyer

Empirical Energy Management Platform

Feedstock Blending Example



ProveZero Energy Trading Platform w/Feedstock Blending

The image shows two screenshots of the ProveZero platform. The left screenshot displays a list of feedstocks in the 'Blended' tab of the 'Gunvor Register'. The right screenshot shows the 'New collection: GG-12344' interface for creating a blended collection.

Left Screenshot: Gunvor Register - Blended Tab

Header: ProveZero, Gunvor Register, Private Register, Transaction History, EnerGPT

Filter: All, Purchased, Blended, Not assigned, Assigned, Closed Deals, Burned

Search: Multiple-choice, Volume 2000, CI Score 100

Sort: Sort by: Date (DESC), Group by: None

Supplier	Quantity	Emmision rate	Methane intensity	Location
MN-12343 (i)	100	2.0336e-07 MCF	0.21%	USA
Supplier	Quantity	Emmision rate	Methane intensity	Location
Mangrove	10,000 MMBTU	2.0336e-07 MCF	0.21%	USA
Supplier-1	1802 MMBTU	2.0336e-07 MCF	0.21%	USA
S1-12343 (i)	100	2.0336e-07 MCF	0.21%	USA
Supplier	Quantity	Emmision rate	Methane intensity	Location
Supplier-2	10,000 MMBTU	2.0336e-07 MCF	0.21%	USA
S2-12343 (i)	96	2.0336e-07 MCF	0.21%	USA
Supplier	Quantity	Emmision rate	Methane intensity	Location
S3-12343 (i)	96	2.0336e-07 MCF	0.21%	USA
Supplier	Quantity	Emmision rate	Methane intensity	Location

Total MMBTU 25,000 | Clear All

Right Screenshot: New collection: GG-12344

Header: Data blending, Step 2: Data Certification, Summary

Blended collection details

Item	Quantity
MN-12343 (i)	10,000 MMBTU
S2-12343 (i)	1,000 MMBTU
S3-12343 (i)	1,000 MMBTU

Total MMBTU 12,000

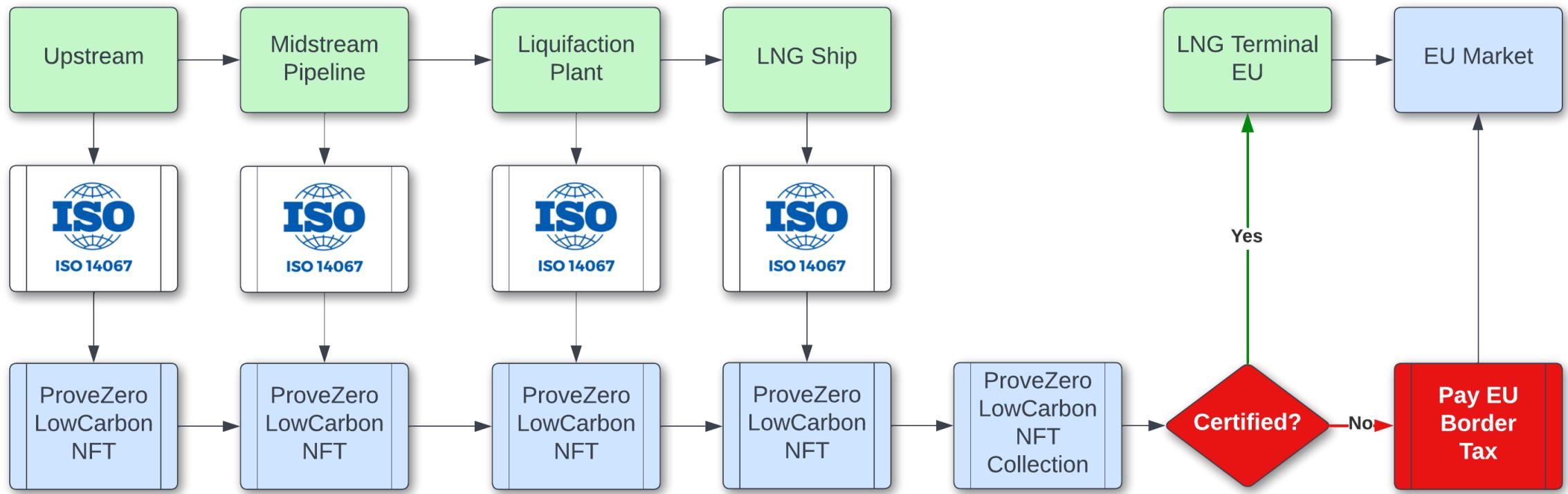
Data Certification Link | Edit

Back | Create blended collection

ProveZero

Use Case: LNG Trading

18-Countries Are Working on an MMRV framework for empirically measuring gas across the LNG supply chain



ProveZero Trading Platform

Benefits to Gunvor

- Help with earning ISCC Certified trader status
- Access to certified feedstock
- Automated feedstock blending – certificate collections
- Built-in trading settlement system
- Built-in automated 3rd party verifier roles
- Integrates with CleanConnect.ai producer features/platform



Testimonial: The Empirical Energy Platform Benefits ALL PureWest's Stakeholders



Engineering

- Permits
- Site updates
- Digital Twin 2.0



Compliance

- Subpart W Reporting
- OGMP 2.0 Level 4|5
- OOOOb/c Autonomous LDAR



Operations

- Gas & liquid leak detection
- Autonomous Gate Guard
- Fire/smoke detection
- PPE Detection
- Tank level monitoring



Sustainability

- Tradeable tokenized energy
- ISO 14067 Certified
- SCS-115 Low-Cl Certified
- ETH blockchain
- MMRV Trading



Marketing

- Premium Pricing
- Differentiated
- Certified
- Feedstock blending