

International Association of Drilling Contractors



IADC Advanced Rig Technology Committee
09.00-11.00 Thursday, 5 May 2022
Hybrid meeting
IADC Headquarters, Crown 1 Conference Room
3657 Briarpark, Ste 200
Houston, TX 77042

In Attendance:

Abdullah Al Jabr, Saudi Aramco
Andrea Ardoin, Patterson-UTI Drilling Company
Andy Westlake, Seadrill
Assaad Mohanna, NOV
Axel Janson, Esgian
Bronson Ekre, Pason Systems
Carter Miller, HDI Instruments
Dimitrios Pirovolou, Weatherford
Gabriel Felipe, Petrobras
Hans Schmidt, Frank's International
Jaro Aarseth, Esgian
Joel Thigpen, Wartsila
John Rigg, TDE Petroleum Data Solutions
Joseph Effinger, Transocean
Juan Arias

Karma Slusarchuk, Parker Wellbore
Konstantin Puskarskij, Maersk Drilling
Lee Womble, Schlumberger
Majid Moosavinia, Icate
Martin Kershman, Teqnisolutions
Md Mustafizur Rahman, Precision Drilling
Paul Pastusek, ExxonMobil
Peter Nguyen, Valaris
Pradeep Annaiyappa, Nabors Drilling
Robin Macmillan, Data Gumbo
Tim Burnett, Wartsila
Tony Eschete, Caterpillar
Victor Yung, Volant Products
Linda Hsieh, IADC
Stephanie Carling, IADC

ART Chair Assaad Mohanna, NOV, made welcoming remarks. Stephanie Carling gave a safety briefing, and Linda Hsieh briefed the group on IADC's anti-trust policy.

Several updates on ongoing ART projects were provided.

- 1) Energy Efficiency Subcommittee Co-Chairs Konstantin Puskarskij, Maersk Drilling, and Mike Party, Hess, provided updates on three previously mentioned proposed projects that the EE Subcommittee received go-ahead to start working on in March.
 - a) Mike Party is heading up the [Emissions Forecasting and Reporting Workgroup](#). Kick-off meeting was held on 20 April 2022, with 14 of 20 workgroup members in attendance. Contractors represented are Ensign, Diamond Offshore, Nabors, Noble, Patterson-UTI, Precision Drilling, Transocean and Valaris. It's believed that additional operator representation is needed, preferably one with heavy offshore operations and one focused on shale operations. ExxonMobil said they could possibly have someone join. It was also suggested that a Europe-based operator like Equinor, Shell or AkerBP could be invited to join. Anyone interested in participating in this group (not just operators) is still welcome to join. Focus of group will remain on technical side of emissions forecasting/reporting, not on defining which emissions "belong" to which companies.

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- b) Konstantin Puskarskij is heading up the [Emissions Reduction Recommended Practices for Drilling Operations](#) group. Kick-off meeting held 25 April, with 19 people in attendance. Contractors represented are Ensign, KCA Deutag, Maersk Drilling, Patterson-UTI, Parker Wellbore, Seadrill, Stena Drilling, Transocean and Valaris. A skeleton document and a Teams site was set up. Next meeting will be in late May.
 - c) No progress so far on [Alternative Fuels Report](#), unless an industry volunteer can step up to lead the project.
 - d) Anyone in the drilling industry is welcome to participate in these projects on the [IADC website](#). Please make sure to indicate which group(s) you want to join.
 - e) It was asked if anyone knows of companies offering to install emissions monitoring kits for free on drilling rigs. Seadrill and Maersk said they are starting to look at upgrading/retrofitting its rigs to get real-time emissions monitoring.
- 2) DCS Vice Chair Andy Westlake, Seadrill, provided an update for the Data, Controls and Sensors (DCS) Subcommittee as DCS Chair Nathan Moralez, BP, has decided to step down from that role. Anyone who might be interested in taking on a leadership position with the DCS Subcommittee is welcome to contact Linda Hsieh at linda.hsieh@iadc.org.
- i) The IADC Rig Sensor Stewardship Guidelines are now live on the [IADC Bookstore](#).
 - ii) DCS Subcommittee met on 20 April 2022 to discuss pivoting the group toward a new direction focusing on human interaction with automation/robotics. The subcommittee may consider setting up a new workgroup to aggregate existing information/training guidelines to prevent issues like automation complacency and bias. It was mentioned that SPE DSATS is also looking at human factors, so the two groups should coordinate their efforts. Also suggested that DSATS and ART could collaborate more on interoperability to define standards and allow machines to plug and play.
- 3) Paul Pastusek, ExxonMobil, provided an update on the IADC Dull Bit Grading Revamp project:
- a) Draft Word document compiled
 - i) 4 groups – Bits, BHAs, Case Studies, Data Storage and Retrieval
 - ii) ETA for Q3 2022
 - b) Cutter Damage Categories (16)
 - i) IADC site being set up
 - ii) Collection of photo examples for SMEs to grade
 - iii) Come to consensus
 - c) Scanner and photo app demonstrations – 20 min each
 - i) Technology,
 - ii) Business model
 - iii) Time frame
 - d) In-Person trial of new Grading system

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- i) SMEs, scanners, photo apps to be invited
 - ii) Houston area
 - iii) Hold the date July 13th
- 4) Stephanie Carling then provided a preview of the upcoming 2022 IADC ART Conference to be held 30-31 August in Austin, Texas. Please see [website](#) for up-to-date information.

The committee then heard presentations from 3 guest speakers:

- Robin Macmillan, Chief Sales Officers, Data Gumbo (see slides)
- Joel Thigpen, General Manager, New Build Sales, and Tim Burnett, General Manager, Market Innovation, Oil & Gas, Wartsila (see slides) Note: It was confirmed post-meeting that the carbon capture technology discussed will be engine agnostic and fuel agnostic, and can be used on gas turbines.

Assaad Mohanna then reminded participants to sign up for the next ART meeting, which will be held 2-4pm on Monday, 29 August 2022, in Austin, Texas. Register here: <https://www.iadc.org/event/iadc-art-committee-14/> He then adjourned the meeting.



Smart Contracting

IADC recognizes that it can be challenging for drilling contractors to receive prompt payment for services. Smart contracting offers an opportunity to shorten the length of time from invoice to payment, with a process that can be tailored for daily review and approval.

Smart contracting defined: self-executing contract where terms of agreement between buyer and seller are directly written into lines of code across a private, permission-based blockchain network. The code controls the execution and transactions are trackable and irreversible.











SWIPE AND GO





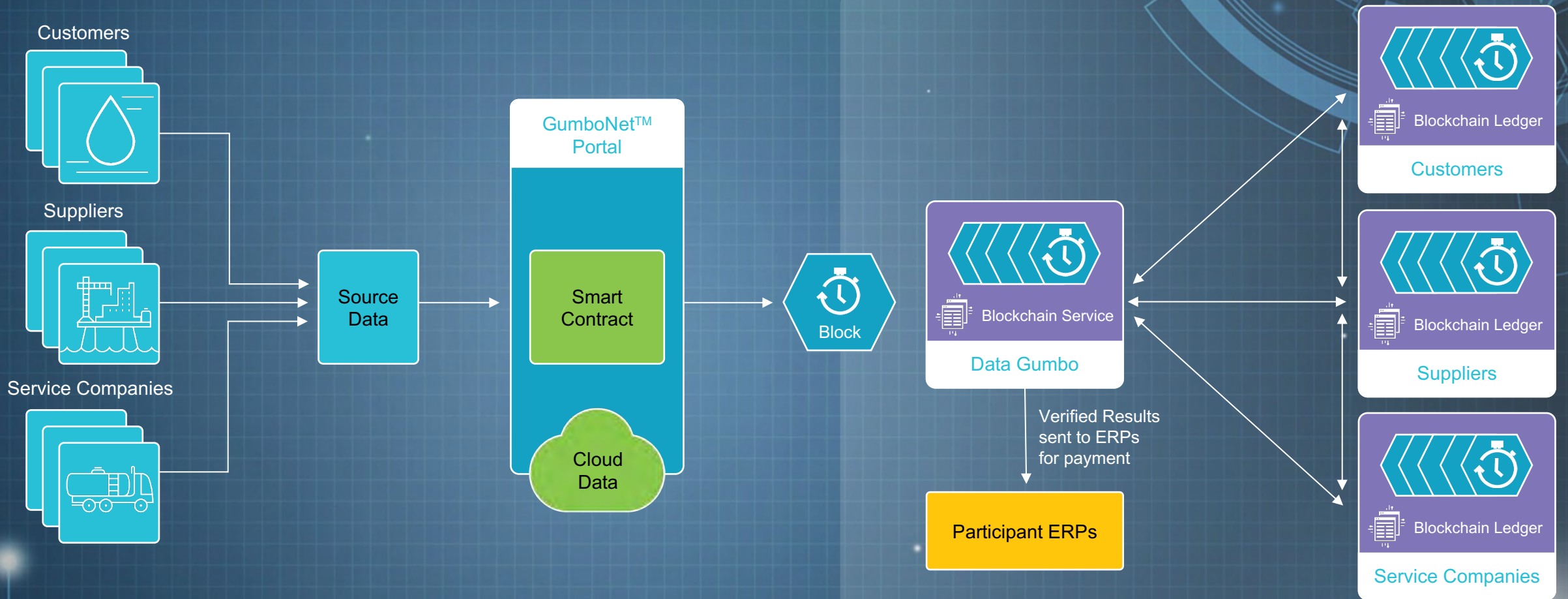
B2B Spend
\$15T

O&G
Drilling
\$2.1T

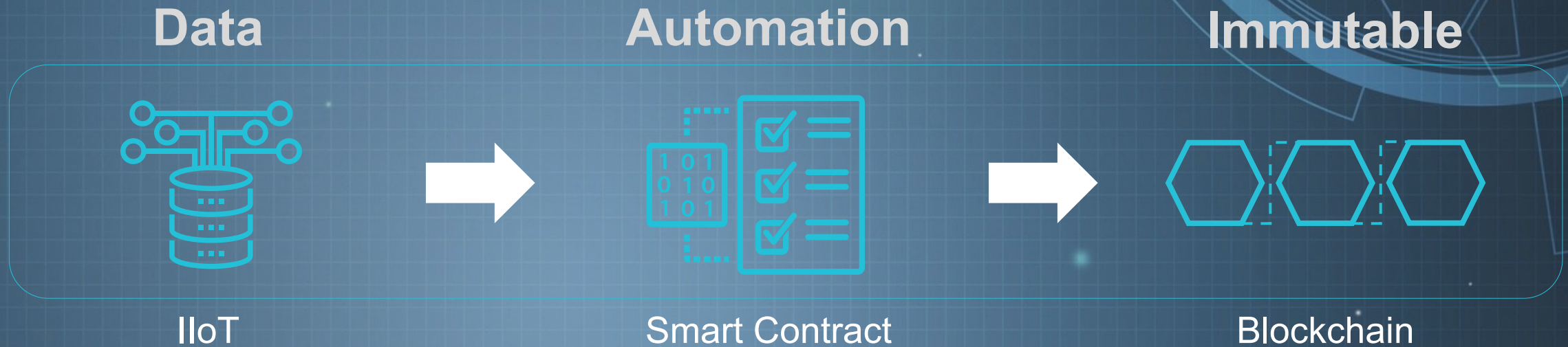
B2C
Spend
\$3T



SMART CONTRACTS



Trust and Transparency



TRANSACTION



ESG



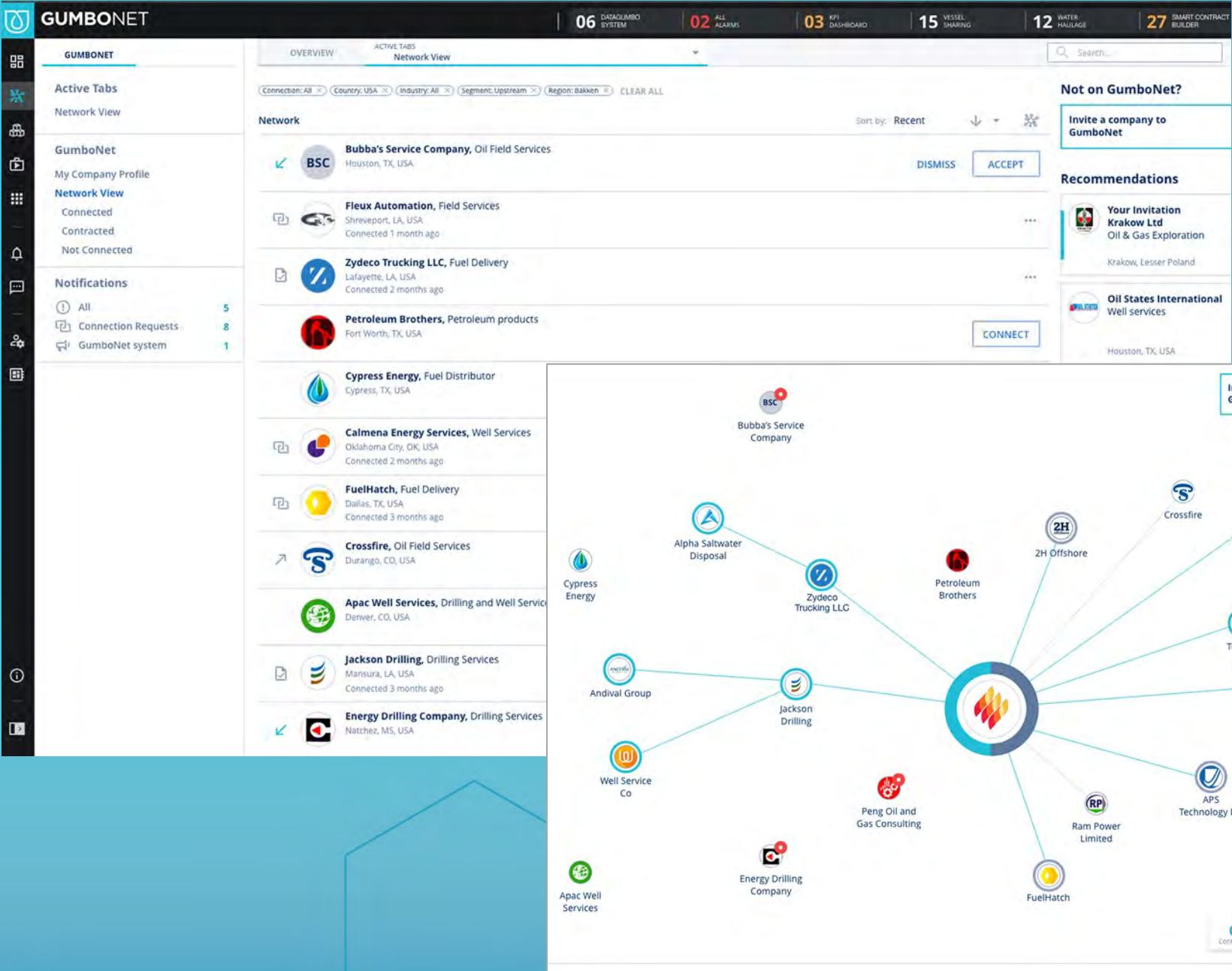
TRACK TRACE



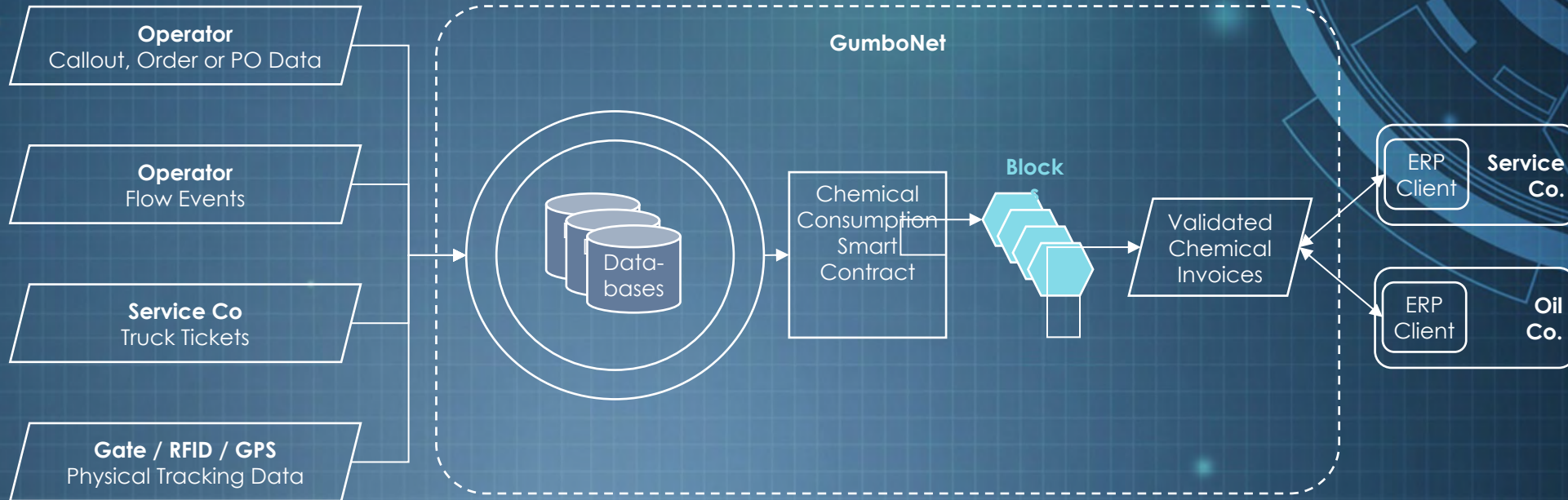
Timeline Efficiency



Building a
smart contract
network



Chemical Delivery & Consumption



Problem

Paying for delivery / lack of real time visibility to chemical use

- There is little operator validation
- Many companies have audit red flags
- Chemicals are over delivered – pay for more than needed, more than used due to loss to atmosphere
- No real time financial visibility
- No inventory visibility – resulting in expiration evaporation



Solution

Utilize electronic measurement from field automation:

- Smart Contracts automate execution of commercial terms of contracts
- Enable new contract models such as pay for consumption / performance
- Realtime evaluation of different programs
- Product Adjustment remotely via automation
- Higher uptime
- Less downhole tubular loss

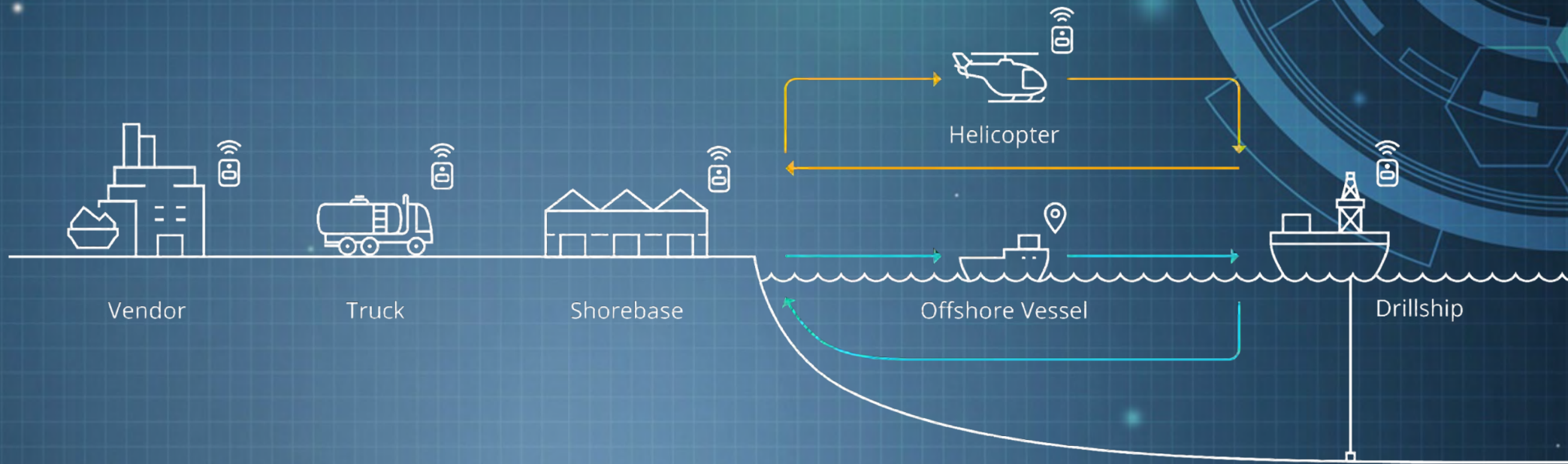


Value

- Only pay for what is actually utilized
- Reduction in back office expenses
- Access to early pay discounts
- Daily visibility to financial exposure
- Single solution for all commodities
- Access to new contract models such as pay for consumption
- Inventory Reduction
- Standard Order Process
- Quicker Product Changes



Integrated Drilling & Well Services



Problem

Contractual terms are buried in a complex legal contracts of little utilization in operations:

- There is little operator validation
- Overpayment for consumables and services
- No access to early pay discounts / performance terms
- Data needed for audit in multiple 3rd party systems
- High back-office expenses
- No real time financial visibility

Solution

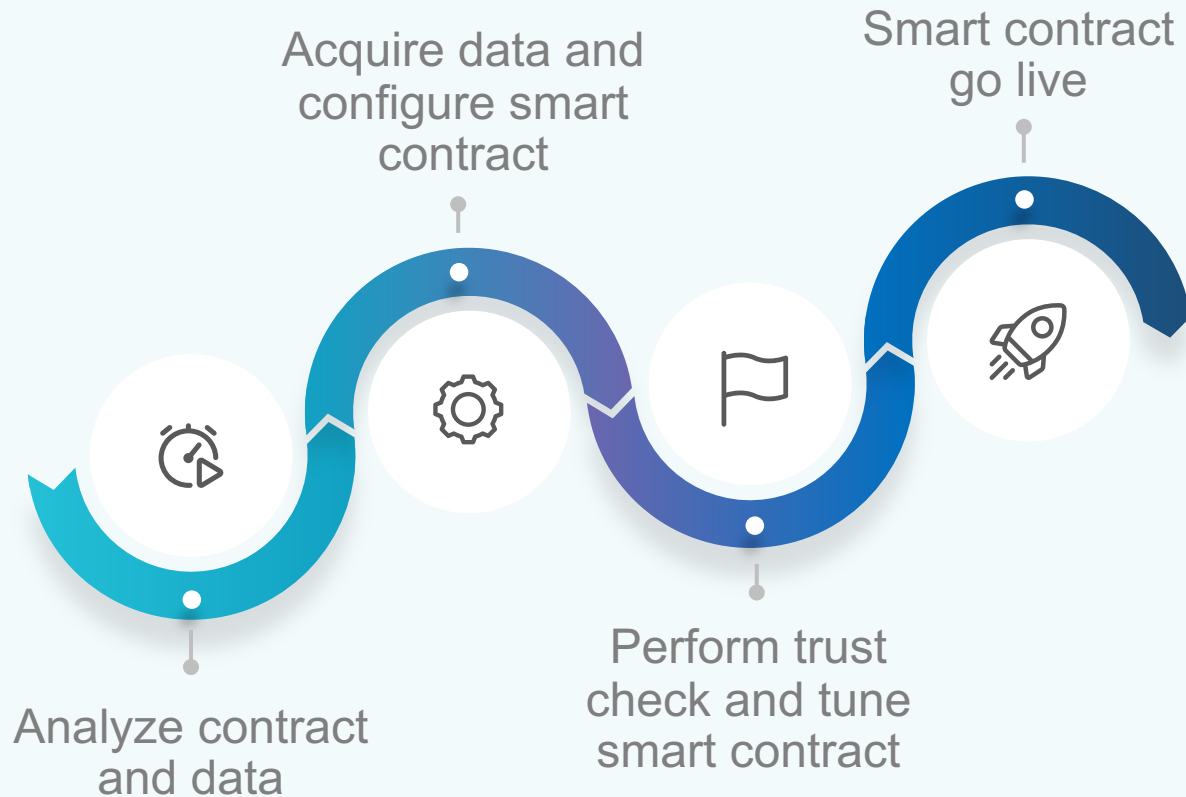
Utilize electronic measurement from actual operations:

- Capture inventory management and logistics systems data to process rental rates for equipment, consumables and personnel
- Auto-reconcile multiple data sources to generate pre-approved payments based on contract terms

Value

- Guarantees agreed pricing
- Autonomous administration and execution of contract terms
- Both sides get a complete record of what assets / equipment moved where / when
- Removes doubt and increases trust
- Daily visibility into financial position
- Audit capabilities across multiple vendor sources
- Multi source contract terms validation

B2B Process



1. Agree on scope of Pilot (contracts, use case, success objectives)
2. Pilot with one counterparty and smart contract
3. Identify all required data and their sources
4. Define / Document contract logic for executable terms
5. Obtain historical data to accelerate smart contract configuration
6. Establish automated data acquisition and run smart contract for test period
7. Execute test with historical data – then compared to actual invoices
8. Evaluate Pilot results and define rollout plan with customer success
9. Execute SaaS agreement for full scope and begin rolling out



+ Add filter

Chemical Name Filters

Select an option below

Select...

Apply changes

Cancel changes

Total Transactions Value

135,781.26

Currency

USD

1

Ledger(s)

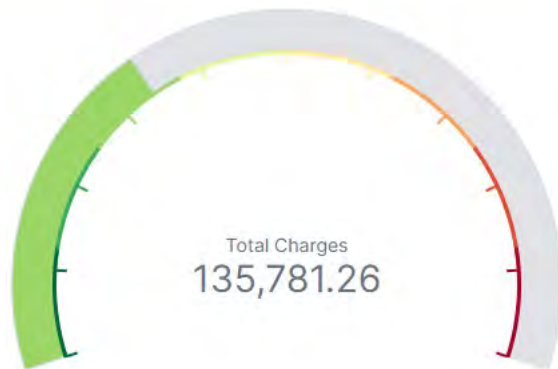
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Contract(s)

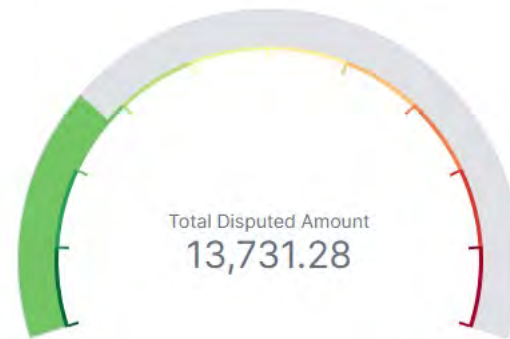
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Counterparty(ies)

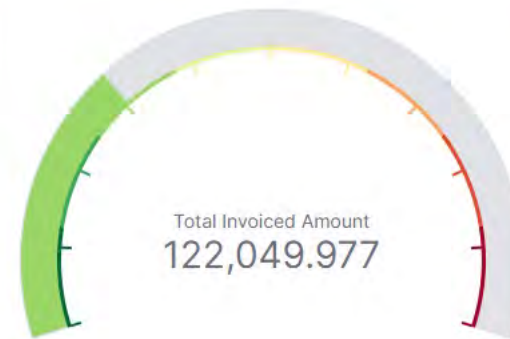
Total Charges per day (all chemicals)

Total Charges
135,781.26

Total Charges

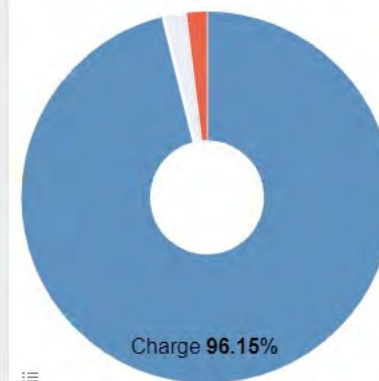
Total Disputed Amount
13,731.28

Total Disputed Amount

Total Invoiced Amount
122,049.977

Total Invoiced Amount

Block Type Distribution



Charge 96.15%

52

Total Blocks

Contract

1

Block(s)

Charge

50

Block(s)

Invoice

1

Block(s)

Charge Adjustm...

0

Block(s)



Last 110 days

Show dates



Refresh



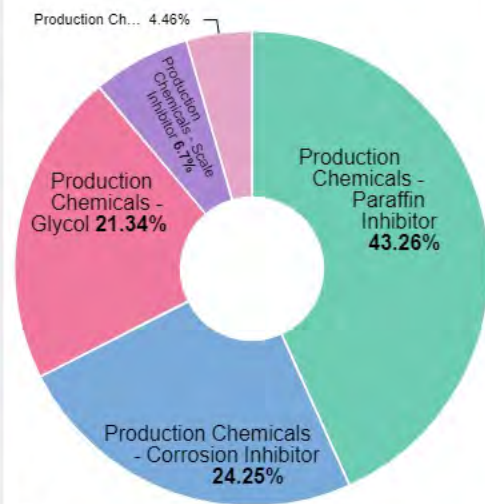
Total Charges per day per Chemical Name



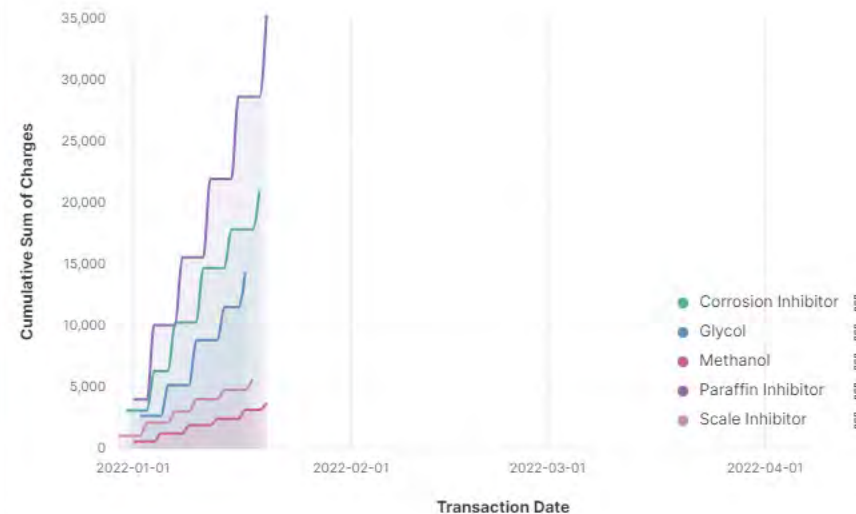
Total Vol. / Wt. per day per Chemical Name



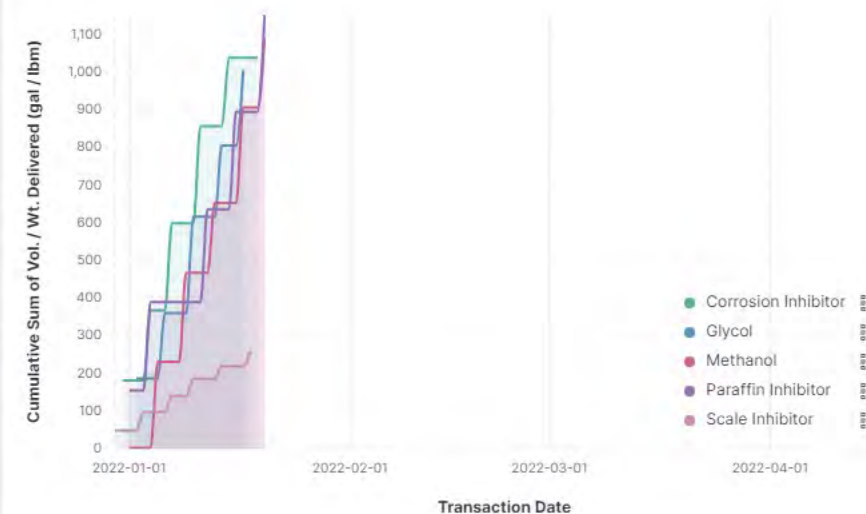
Charge Amount Distribution by Chemical Name



Cumulative Sum of Charges over Time (per day)



Cumulative Sum of Vol. / Wt. over Time (per day)



Value

- Cost reduction – Time/people/office space
- Correct billing +/-
- Fast payment (discount?)
- Faster process eg approvals automated
- Working Capital not tied up
- No accruals required
- Immutable record
- Audit efficiency
- Timely AFE closure
- TAX compliance – correct time period, correct location
- 'Stickiness' with customer - integration, trust, transparency, fewer disputes
- Mutually beneficial KPIs = Collaborative vs Adversarial contractual relationship
- Fewer legal wrangles and expense
- Performance contracts enabled
- Balance of power – gives smaller suppliers a level playing field



SAVE \$250M
BY AUTOMATING
CONTRACT EXECUTION

SAMPLE CUSTOMER SAVINGS

ONE-YEAR PROJECT RETURNS (Customer Provided Data)

Reduced Drilling Engineer time	\$ 40,000
Reduction in Invoice Handling Labor Cost	32,000
Reduction of time coding reviews	32,000
Reduction in Over billing	2,450,000
Reduction in processing fees	20,000
Fast Pay Discount	980,000
Gross Annual Savings	\$3,554,000

7.25% Savings on Annual Customer Spend

ONE-YEAR PROJECT RETURNS (Customer Provided Data)

Reduction in Invoice Handling Labor Cost	\$1,947,115
Reduction in processing fees	67,500
Reduction in Over billing	1,839,600
Fast Pay Discount	635,040
Gross Annual Savings	\$4,489,255

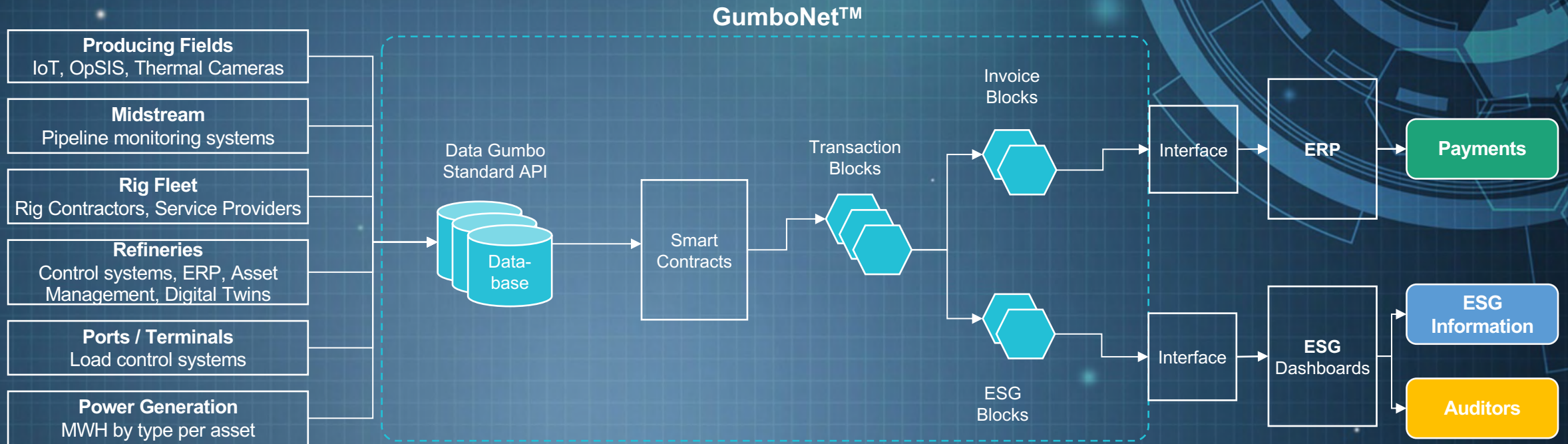
11% Savings on Annual Customer Spend

ONE-YEAR PROJECT RETURNS (Customer Provided Data)

Reduction in Invoice Handling Labor Cost	\$1,060,200
Reduction in Over billing	5,880,000
Fast Pay Discount	2,352,000
Gross Annual Savings	\$9,292,200

4% Savings on Annual Customer Spend

ESG Portfolio Reporting



Inputs

1. Internal company control systems and IoT data
2. Additional measurement as a service solutions
3. Vendor data
4. 3rd Party data (IE logistics, satellite)

Process

- Identify focus metrics (Scope 1, 2, 3 Emissions, Water, Chemicals, Safety, Spills)
- Write ESG and Emissions requirements into contracts
- Automate contracts with Smart Contracts and use the ESG data in reporting
- Engage auditors to review data underlying reports and sign off on ESG claims and progress
- Tie improvements to service provider compensation

Outputs

- GRI / GHG Protocol / SASB reports
- Auditable, provable progress on set goals and metrics
- Automated contract execution with vendors

An aerial view of a dense city skyline, likely New York City, with numerous skyscrapers and buildings. Overlaid on the image is a network diagram consisting of several yellow circular nodes with white centers, connected by thin, white, curved lines. The nodes are positioned at various points across the city, and the lines represent connections between them. A large, solid blue triangle is positioned on the right side of the image, pointing towards the center. The overall color palette is dominated by the blue of the sky and the blue triangle, with the city's colors (grays, browns, and greens) visible through the semi-transparent overlay.

Thank you

robin@datagumbo.com

713 805 2954

OUR ROAD TO NET ZERO

JOEL THIGPEN – GM NEW BUILD SALES

TIM BURNETT – GM MARKET INNOVATION, OIL & GAS

WÄRTSILÄ

IADC ART MEETING – 5 MAY 2022

AGENDA

1

Who are we?

4

Future Fuels

2

Hybrid Power

5

Offshore Energy Hub

3

Carbon Capture

6

Q&A

FOUNDED IN 1834

GLOBAL LEADER

in sustainable solutions for the marine and energy markets

COMPARABLE OPERATING
RESULT

357 MEUR

ORDER INTAKE

5,735 MEUR

NET SALES

4,778 MEUR

OPERATIONS IN OVER

200 LOCATIONS

OUR PERSONNEL APPROX.

17,800

NATIONALITIES

139

Financials are for fiscal year 2021. Location, personnel and nationalities figures are approximations based on the status in December 2020.

Who are we?



Utilizing inductive charging
before Apple



Compete with Tesla for
largest amount of battery
storage capacity in North
America



Hands free shipping along
the Cuyahoga River



Remote operation of an OSV
in the North Sea, from San
Diego California

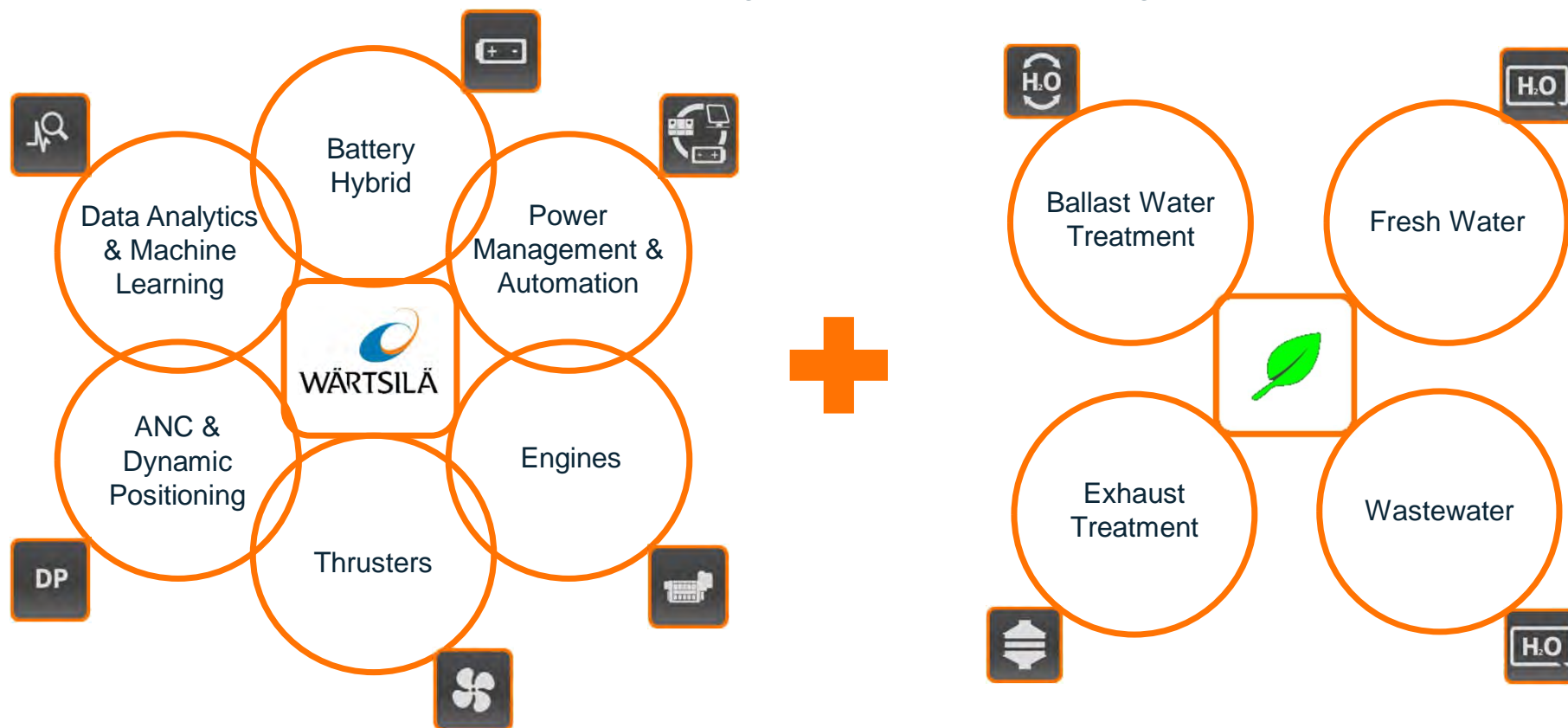


Our Core

An **Integrated** Power & Marine System



The most complete power and marine offering to the offshore drilling market in the world



Hybrid Battery Systems

Since 2007 Wärtsilä has developed, manufactured and delivered sophisticated battery/hybrid systems. These systems include energy management control, power electronics and battery integrations.

Low Hanging Fruit

- Advantages
 - Proven technology that is currently available
 - Fewer engines installed/running – Running engines at optimal loads
 - Reduced fuel consumption, emissions and maintenance costs
 - Increased redundancy and improved blackout recovery
 - Can be applied to new build or existing rigs
- Challenges
 - ROI
 - Battery life
 - Space available in current designs
 - Safety

Carbon Capture

Wärtsilä CCS investment

Wärtsilä has launched a multi-million Euro investment program for developing CCS technology for the maritime industry.

We have designed and installed a 1 MW pilot plant in our test facility in Moss, Norway in order to test our CCS technology in a range of scenarios and conditions.

We have been able to confirm the design assumptions and have been operating the system successfully since January 2022 achieving consistent CO₂ capture rates of above 65%.

First pilot project agreed upon with a European tanker owner for a 7MW application on a tanker – 2023.



Carbon Capture

The technology is quickly evolving, but how long will it take for this to become an industry standard?

How long until we have a solution that can be applied to an offshore drilling application?

Challenges and Questions

- ROI
- New and unproven technology (outside of a lab)
- Space and Weight requirements in current rig designs
 - How will changes impact efficiency?
- Can we capture 100%?
- What do we do with the captured carbon?
- How do we monitor and calculate emissions reductions for carbon tax?



Future Fuels

What comes after diesel?

Ammonia

Bio-fuels

Ethanol

Hydrogen

LNG

Methanol

It is too soon to tell, but... We are preparing for all of them

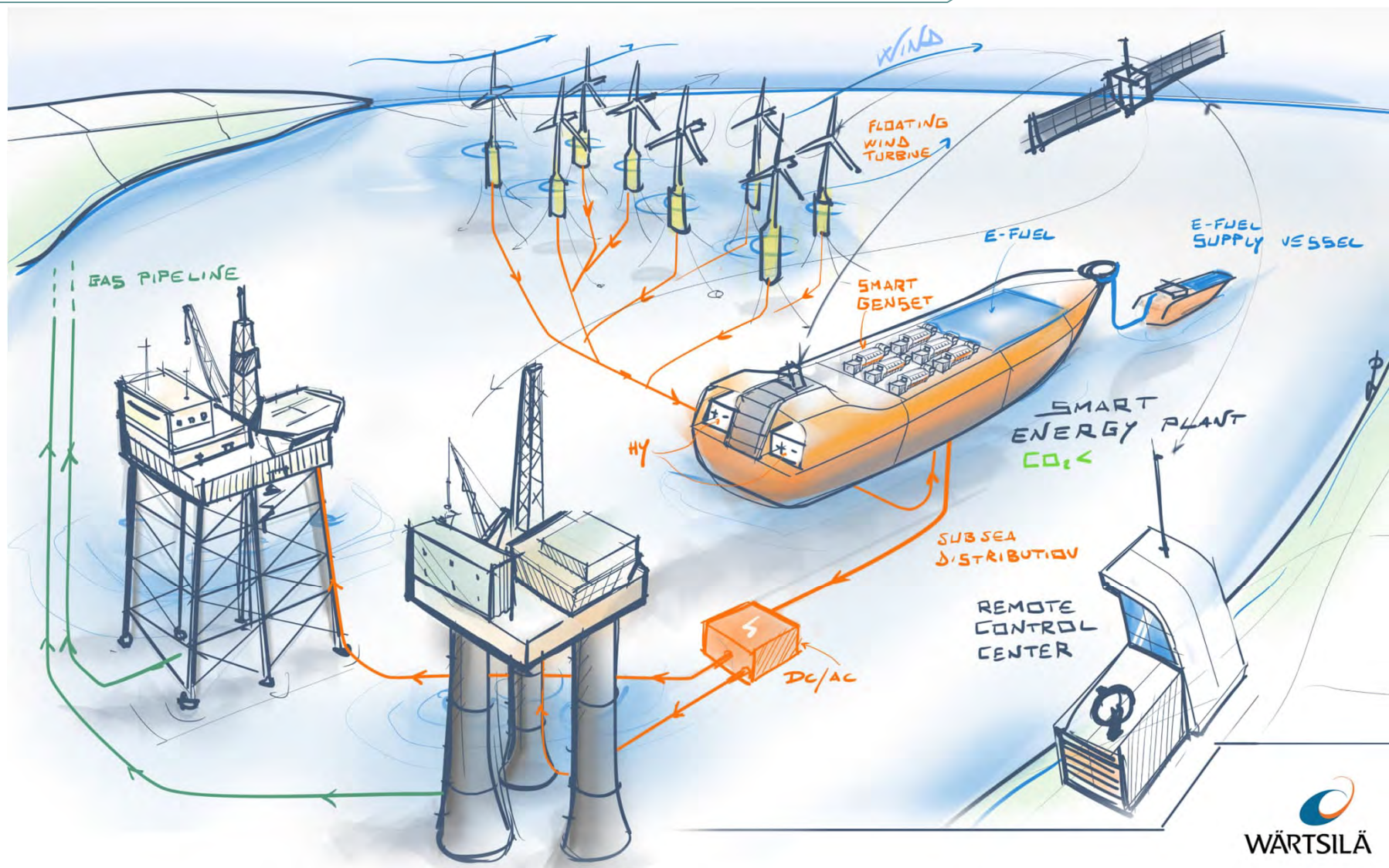
Our Current Focus

- Methanol
 - W32 engine currently available with first delivery Q1 2023*
 - W20 engine commercially available Q4 2023 with delivery of Q4 2024*
- Ammonia
 - 4 engine types commercially available Q4 2023 with delivery of Q4 2024*
- Challenges and Questions
 - Global supply availability and standardization
 - ROI
 - Energy density and storage
 - Bunkering
 - Safety
 - Operator and Class approval

Corresponding retrofit packages will be available for first delivery a few months later

**Disclaimer: Subject to sufficient technology progression and quality, while ensuring maximum safety in these developments, the following indications in development have been made. It should be noted that both engine model and timeline remain subject to change based on market demand and other influencing factors.*

STEP CHANGE: OFFSHORE ENERGY HUB CONCEPT BASED ON PROVEN TECHNOLOGY





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