

OIL AND GAS ARTIFICIAL INTELLIGENCE – OGAI 2.0

The Application of Geospatial Information and Big Data Analytics



The structure of this presentation

Part One. OGAI 1.0. Operational applications of AI - an overview

- **Upstream**
- **Midstream**
- **Downstream**

Part Two. OGAI 2.0. Market analysis and geospatial information

- **Who is collecting geospatial information**
- **Who is using geospatial information**
- **Market analysis based on regional data**
- **Market analysis based on leading indicators**
- **Market analysis based on proxy data**
- **Integrating various types of data**

Conclusions

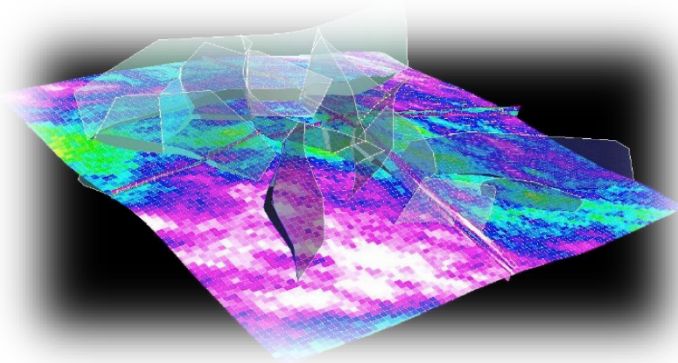
Operational applications of AI

Upstream — exploration



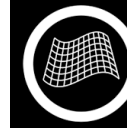
AI in Geological surveys

- ☐ Reservoir analysis
- ☐ Seismic data acquisition
- ☐ Seismic data processing
- ☐ 3-D seismic imagery



AI in Exploratory drilling

- ☐ Well planning
- ☐ Automation of drilling rigs
- ☐ Monitoring of drilling
- ☐ Real-time drilling optimisation
- ☐ Well testing using intelligent sensors
- ☐ Prediction of failure of equipment



AI in Appraisal

- ☐ Management of geological and geophysical data
- ☐ Well log digitising
- ☐ Well log interpretation
- ☐ Calculation of appraisal drilling parameters
- ☐ Reservoir modeling
- ☐ Reservoir characterisation

Operational applications of AI

Upstream — field development and production



AI in field development

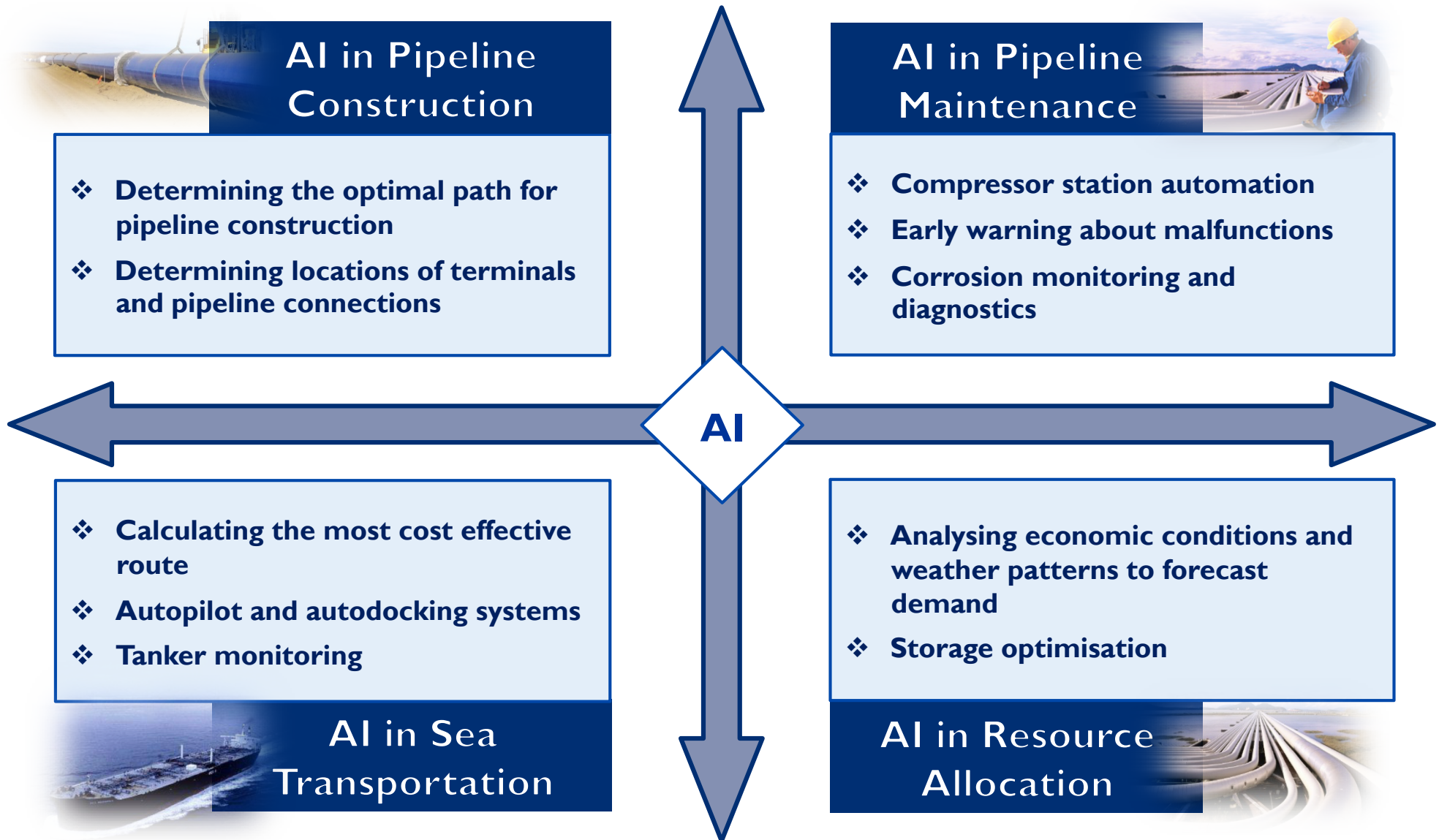
- ☐ Field surveillance
- ☐ Placement of well pads
- ☐ Optimisation of well location and design
- ☐ Wells controlling
- ☐ Access to field equipment and diagnostics
- ☐ Improving the rate of penetration
- ☐ Automated Manufacturing Execution System
- ☐ Wireless Sensor Networks



AI in production

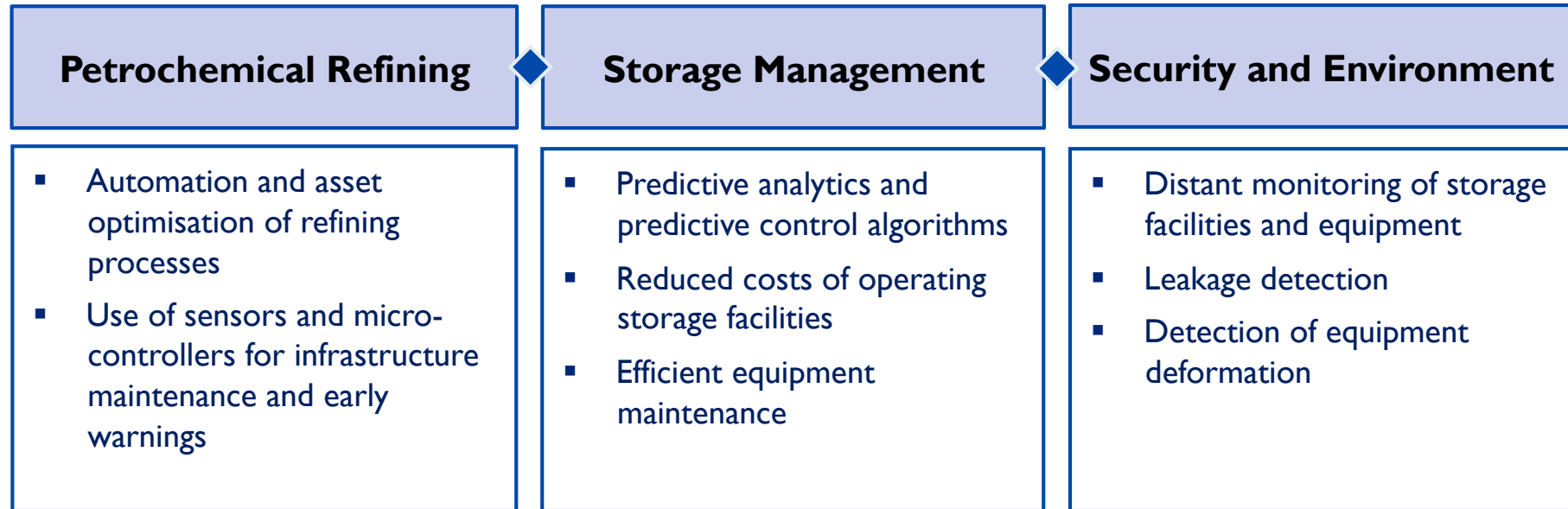
- ☐ Optimisation of production throughout its various stages
- ☐ Flow measurement in wellheads
- ☐ Automated production control
- ☐ Reservoir pressure maintenance
- ☐ Enhancing recovery
- ☐ Operational troubleshooting
- ☐ Safety control
- ☐ Forecasting behavior of a layer depending on its current state

Operational applications of AI Midstream



Operational applications of AI

Downstream



**Cost
reduction**



**Improved
efficiency**



**Increased
safety**



**Enhanced
output**



**Environmental
compliance**

Who is collecting geospatial information

Selected companies

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GENSCAPE™

- Real-time data from land, sea and satellite monitors. Part of the Daily Mail Trust.



- Real time shipping data, including tankers. Global maritime map.



- Shipping and storage data. Special focus: drilling activity and rig counts.



- Satellite imagery analysis of maritime activity. Forecasting tonnage availability.



- Combining commodity shipments data with satellite feeds and governmental databases.



- Data from public and commercial geospatial imagery providers.



ORBITAL INSIGHT

- Inventory data derived from satellite images of external floating roof tanks (EFRT).



- Well monitoring, crude storage and refineries data from satellite feeds.

Who is using geospatial information

- Hedge funds
- Traders
- Refining & marketing
- Chief economists and strategy divisions of oil companies
- Shipping companies
- Shipbroking service firms
- Governments of oil exporting countries
- Think tanks and research centres
- International organisations



ExxonMobil
Refining & Supply



SHELL SCENARIOS



TEEKAY CORPORATION

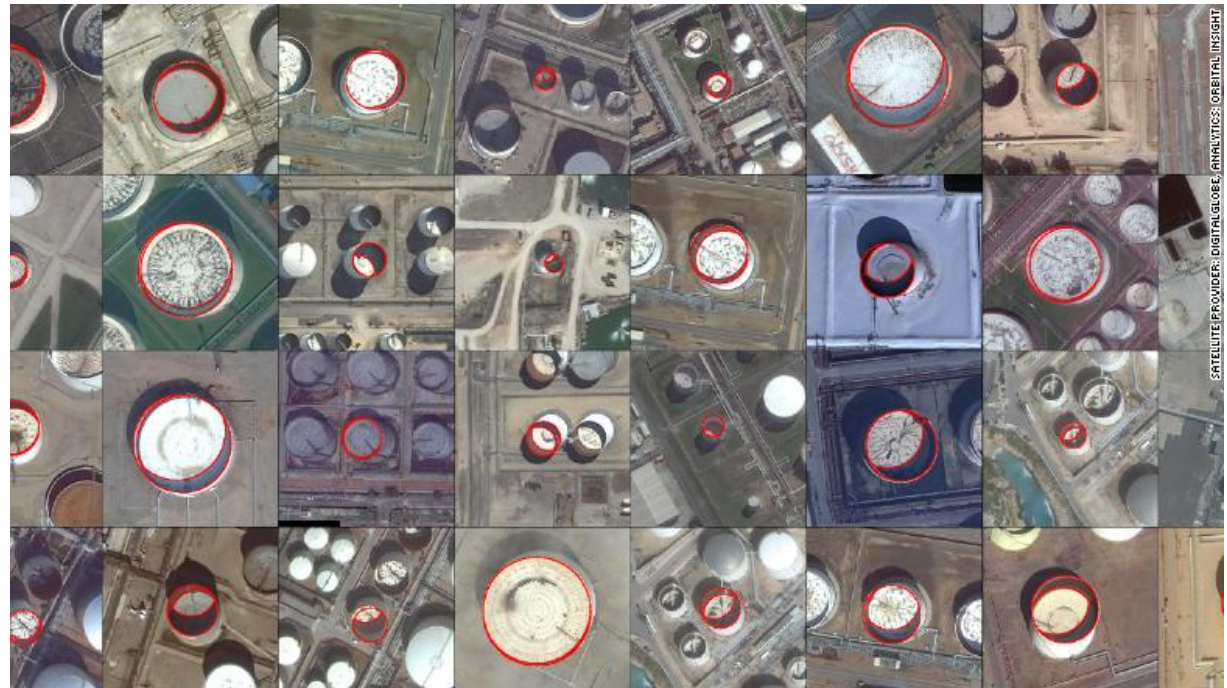


Market analysis based on regional data

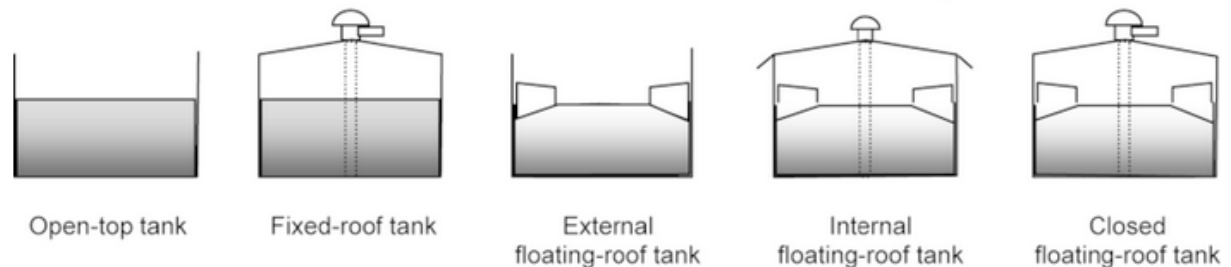
Monitoring tank farms and refineries

- Target audience: traders and downstream analysts.
- Case study:** *Orbital Insight* uses satellite images of external floating roof tanks (EFRT).
- The level of liquid can be measured based on the **thickness of the shadow on the roof**.
- Using AI algorithms to measure stocks in specific tank farms, regions, countries or globally.

Satellite images of external floating roof tanks — Orbital Insight



Types of oil storage

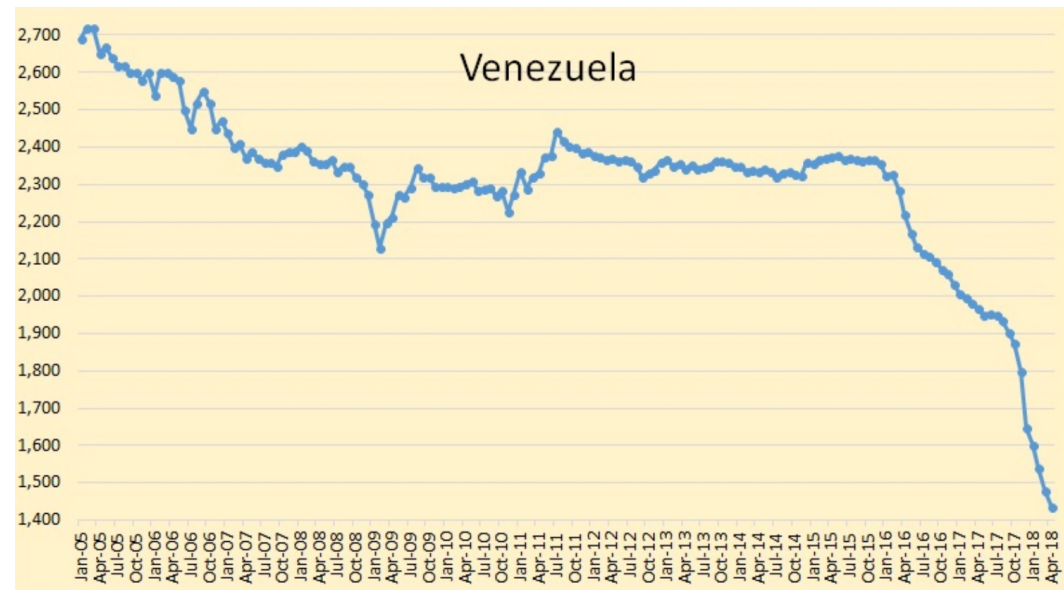


Market analysis based on regional data

Using inventory data as a proxy

- Inventory data can be used for the purposes of downstream competitor intelligence.
- Another application: identify trends in crude supply.
- Changes in stocks serve as **proxies for oil production trends** in key “trigger countries” i. e. Venezuela, Iran, Iraq etc.
- Official data reflecting crude production in those countries is unreliable.

Crude production in thousand barrels per day



Data source: OPEC

- **Example:** The extent of Venezuela’s crash in oil production was largely unforeseen by analysts.
- 0.5 mln b/d was taken off the market in 6 months.
- One of the main factors behind the oil price rise in 2017-2018.

Market analysis based on leading indicators

Drilling activity, rig counts, car counts, construction

- Some examples of leading indicators:
 - **Offshore storage** in tankers
 - **Drilling activity** (especially in the US lower 48)
 - **Pipeline capacity** and throughput (especially in the Permian basin).
 - **Construction activity**
 - **Cell phone data**
 - **Car counts** around oil and gas sites.



- **Case study:** car counts data is a valuable tool for retail analytics.
- Also a **lead indicator for oil demand** on a regional or global level.

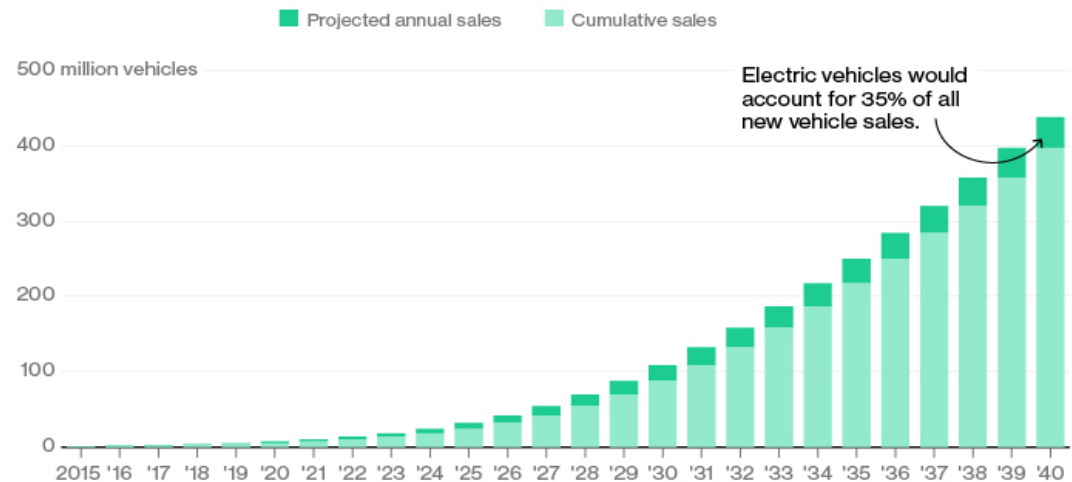
Market analysis based on proxy data

Renewables and EVs

- Trends in renewable energy and EVs contribute to **peak oil demand**.
- Even small changes in those factors are **trend indicators**. They have an impact on today's oil price.
- Most models are currently reliant on **3-d party forecasts** of renewables and EVs.
- Need for data sourced from real observations (e. g. **solar farms**).

The Rise of Electric Cars

By 2022 electric vehicles will cost the same as their internal-combustion counterparts. That's the point of liftoff for sales.



Sources: Data compiled by Bloomberg New Energy Finance, Marklines

Bloomberg

- **Example:** Bloomberg forecasts that electric cars will make up 35% of new vehicles sales by 2040.
- Several OECD countries are planning to ban the sale of new petrol and diesel cars by 2040.
- This could reduce global oil demand by 8mln b/d.

Integrating various types of data

Future steps. Working with various analytical tools

SUPPLEMENTING ECONOMETRIC MODELS

- 3-d party expert forecasts
- Price volatility (GARCH models)
- Market sentiment data

SCENARIO AND INTERVAL FORECASTING

- Interval forecasting in addition to “point forecasts”.
- Price movement scenarios



RESEARCHING MARKET SENTIMENT

- Semantic analysis of news events and other open sources
- Commodity market sentiment and «appetite for risk»

ARTIFICIAL INTELLIGENCE METHODS

- Neural networks, fuzzy logic etc.
- Combining econometric models and AI

Conclusions

- **OGAI 1.0** focused on operational applications: upstream (both exploration and production), midstream and downstream.
- **OGAI 2.0** will focus on market research, corporate strategy and planning.
- **Two approaches** in market analytics: niche data vs. entire value chain.
- **Subscribers:** hedge funds; traders; IOCs and NOCs; shipping / shipbroking firms; government research centres; international organisations.
- **Three major analytical routes:**
 - 1) Market analysis based on regional data
 - 2) Market analysis based on leading indicators
 - 3) Market analysis based on proxy data.
- **Integrating various types of data:**
 - 1) Multi-factor forecasting models
 - 2) Maps of price drivers.

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