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USERS CONFERENCE 2013

The Power of Data

THRIVING IN A WORLD OF CHANGE

Operational Excellence in Today's Dynamic Global Energy Market

IHS Keynote Address

OSIsoft User Conference

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April 17, 2013

Information Management Mega-Trends

Information "Volume"

Information "Relevance"

Supply Chain "Convergence"

IHS is focused on *converging* Information, Analytics and Industry Expertise to decisions

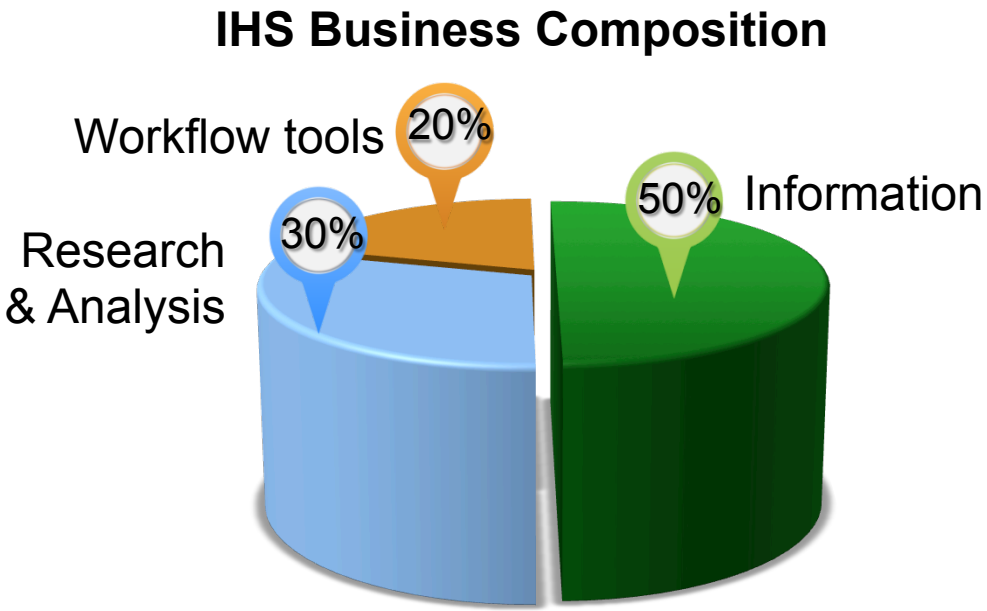
Must-have **information** sourced/created, processed and delivered

Advanced **research & analytics** tied to information

Industry **expertise** that drives information and analytics to decisions

Real-Time Information driving Operational Excellence

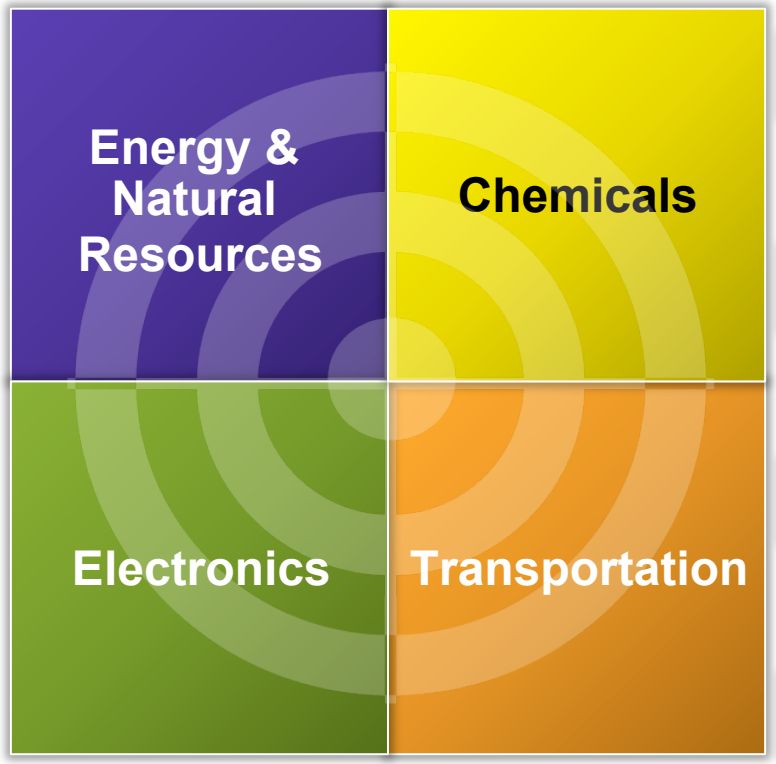
Connecting deep operational information, workflow tools and technology with analytics and industry expertise



Information Volume + Relevance + Expertise =

Enhanced Operational Decisioning

Capital intensive industries are huge stakeholders in information lead excellence



Large — *$41T revenue annually*

Growing — *Above-market long-term growth* *(high single to double digit)*

Interdependent — *Embedded in each other's supply chains*

Vertical depth — *Complex and high risk operational processes*

Energy is at the front end of supply chains: *Global Energy Demand Trends*

Today

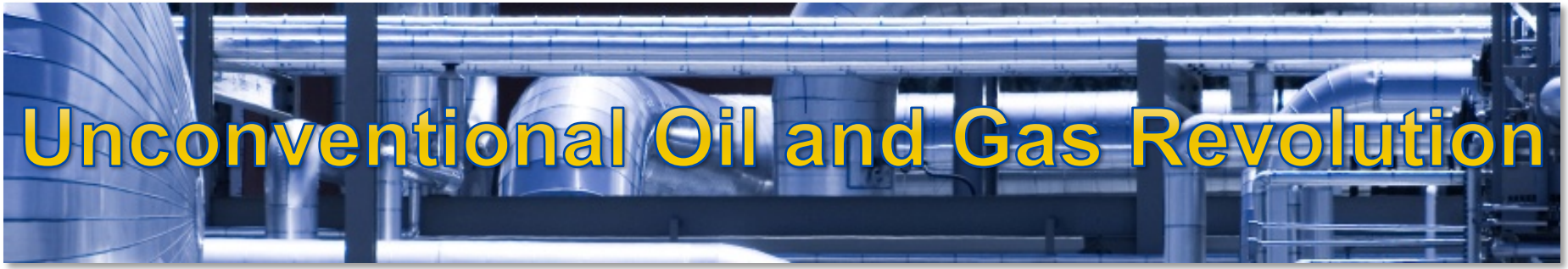
- Dynamic energy markets
- Supply interruptions are challenge in emerging economies
- 1.3B people lack access to electricity

By 2040

- Population growing from 7 to 9B
- Economic output will double
- Global energy demand rising 35%

The landscape is shifting dramatically: *Global Energy Supply Trends*

- Oil from challenging environments:
  - Deep water
  - Arctic
  - Oil sands
- Global Liquefied Natural Gas (LNG) infrastructure
- Nuclear slow down
- Renewables costs - efficiencies
- Shale revolution - North America



Unconventional Oil and Gas Revolution

$238B to GDP today,
1.7M jobs today;
3.5M jobs by 2035

+

Increased
energy
independence

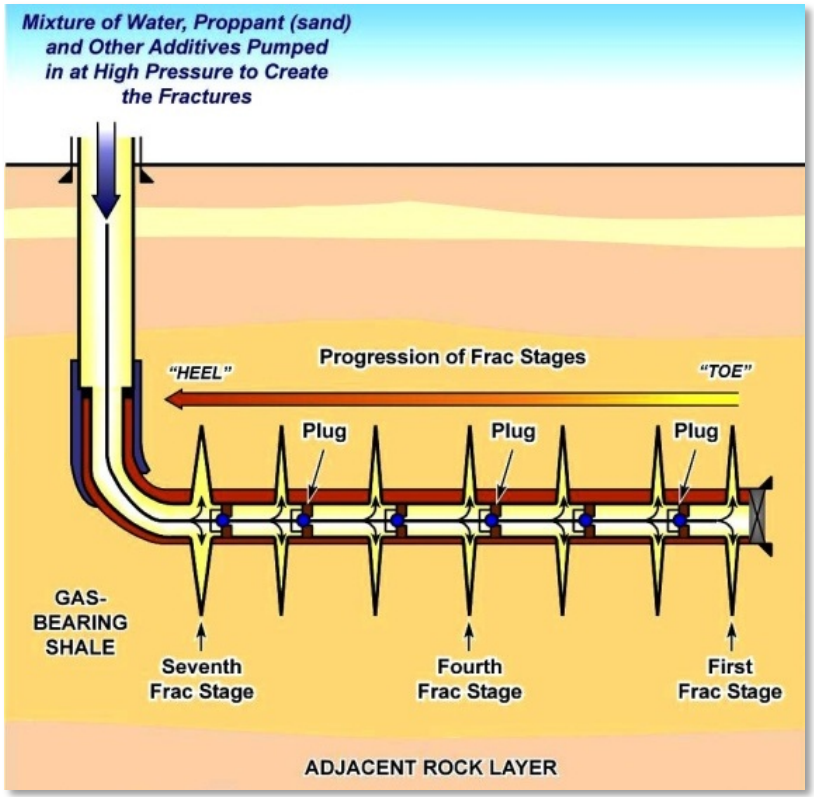
+

Manufacturing
renaissance

= Transformation of Global Energy Economy

Unconventional reservoirs and hydraulic “fracking”

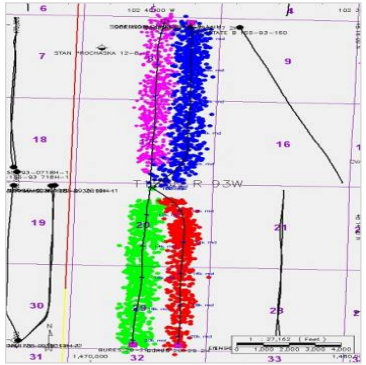
- Nothing new in enhancing production
- A required catalyst to produce
- Water/sand/chemical mix injected under high pressure
- Creates flow pathways for gas/oil
- Is the “revolution” in “unlocking” hydrocarbons from extensive global reservoirs



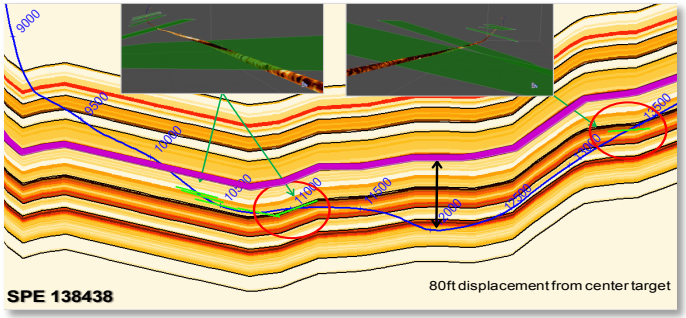
Source: IHS

The Unconventional Revolution is information intensive – *the subsurface is just the beginning!*

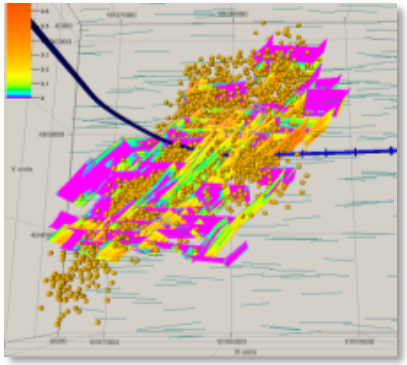
Micro-seismic Monitoring



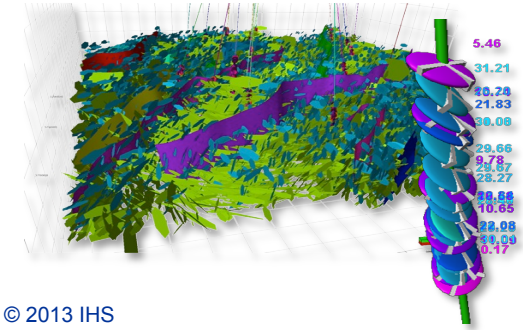
Drilling Optimizations



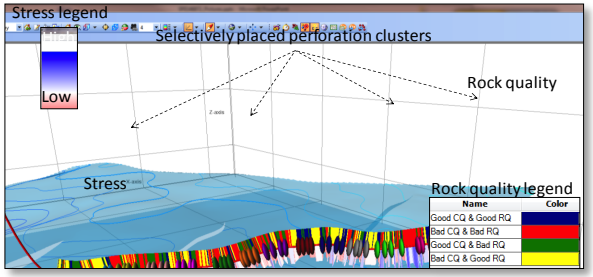
Hydraulic Fracture Models



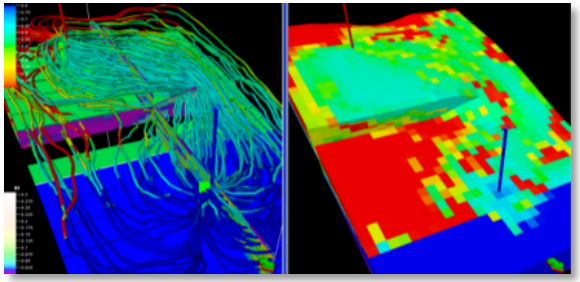
Fracture Detection



Staging & Perforating



Reservoir Simulation

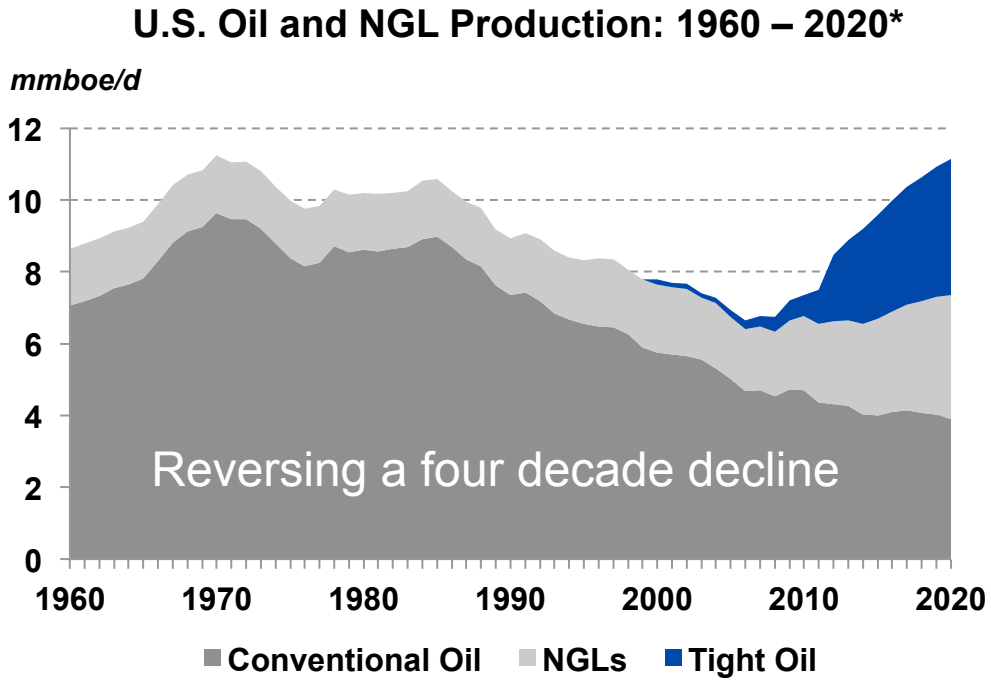


Unconventional gas production increases is creating a low cost 100 year U.S. gas supply

Source: IHS + EIA

Notes: NGL = natural gas liquids.

Liquids production could exceed 1970s peak, by 2020 and will attract $1.35T in capital

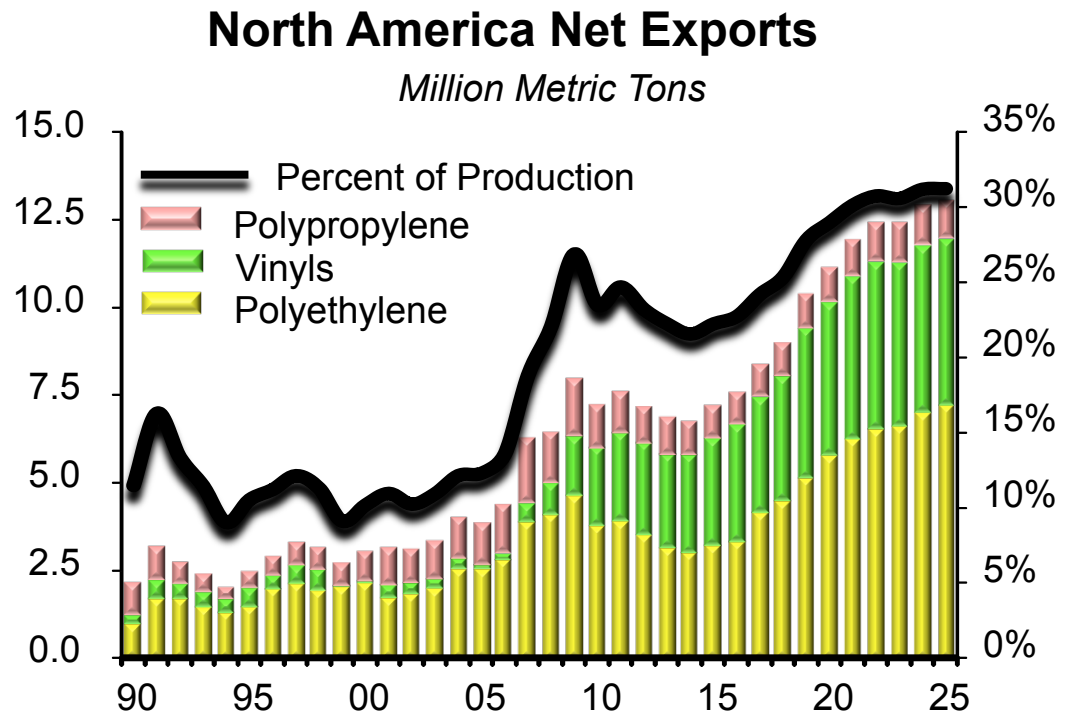


- Production could reach >11 mmboe/d by end of decade
- By 2020, tight oil production will account for 35% of U.S. total
- By 2030 tight oil production will account for 50% of U.S. total
- Total capital expenditure required will be $1,350B

*Forecast numbers are production capacity

 **Assumes recent high oil prices above $80/bbl are maintained throughout forecast period

The Unconventional Revolution is a revolution for petrochemicals and U.S. manufacturing



- Core feedstock costs in U.S. have fallen 250% *(ethane)*
- Low cost U.S. feedstock will drive $95B in new capacity investment to 2020
- Energy and petrochemical cost advantages will drive cost advantages and new investment across the manufacturing value chain

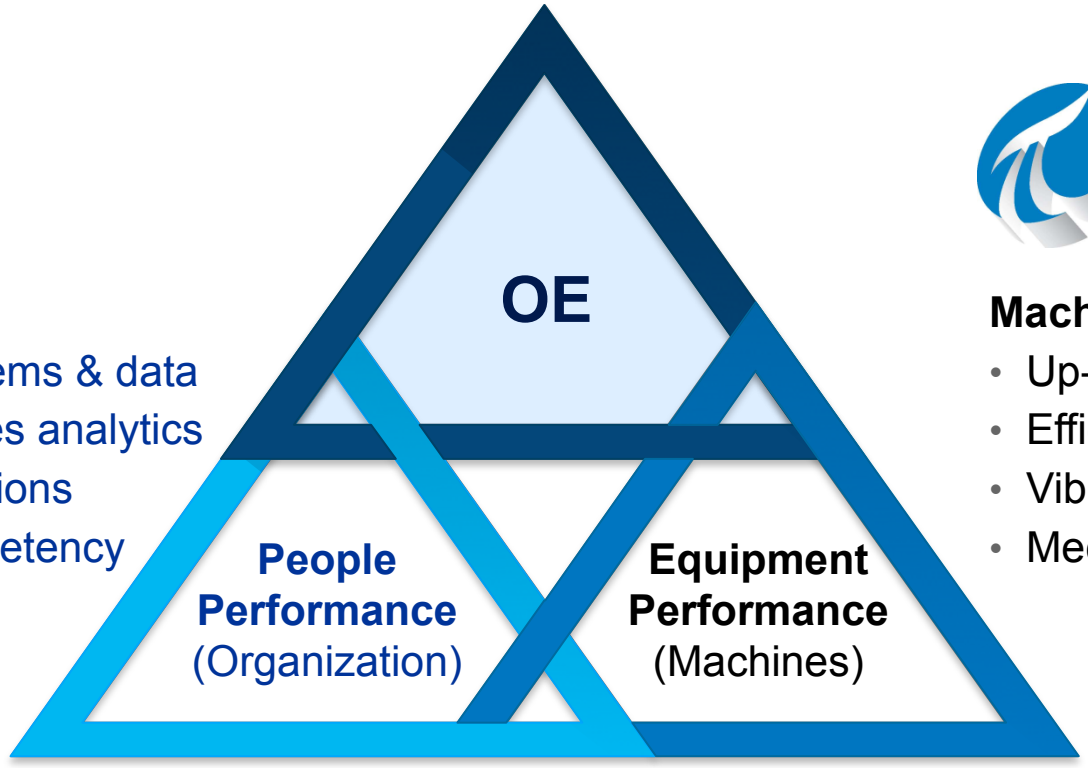
Observations

- **Innovation:** Combinations of innovations have made shale gas revolution possible
- **Speed and agility**: Real-time information flows and decisions
- **Risk management**: Huge value at risk; communication in minutes not days
- **Convergence**
  - Innovation, speed, and risk management require combination of Information, Insight and Analytics
  - New tools, analytics and decision processes are required across the supply and decision chain

Operational Excellence Concept: *Perfect OE = people + machines performing perfectly*

Decision Data

- Management systems & data
- Business processes analytics
- Emergency operations
- Training and competency



Machine Data

- Up-time
- Efficiency
- Vibration
- Mechanical integrity

Value at risk with unplanned events

- **License to operate / Political risk:** Pipeline infrastructure
- **Project execution:** LNG projects in Asia costing $200M/ week
- **Shareholder value:** Failures = billions of losses in market capitalization and revenues
- **Operational interruptions**: Tremendous financial cost
- **Market access:** Producers lose access to large projects

Example: Energy industry risk matrix

Risk	Likelihood	Severity	People	Machines
*Environmental	H – acute	H	Y	Y
*Safety	H – acute	H	Y	Y
*License to Operate	M – acute	H	Y	Y
*Crew Change	H – chronic	M	Y	Y
*Infrastructure	M – chronic	M	N	Y
*Natural Disasters	M – acute			
Political	M – chronic	H	n/a	n/a
Regulatory	M – chronic	H	n/a	n/a
Pricing	Varies	Varies	Y	Y

*** Starred items have a business operations focus**

OE from the wellhead to the burner tip

Performance and emissions management

OE Response:
Technologies to reduce emissions during fracking, real-time monitoring

Local site management and protection

OE Response:
Performance monitoring, tracking and compliance reporting

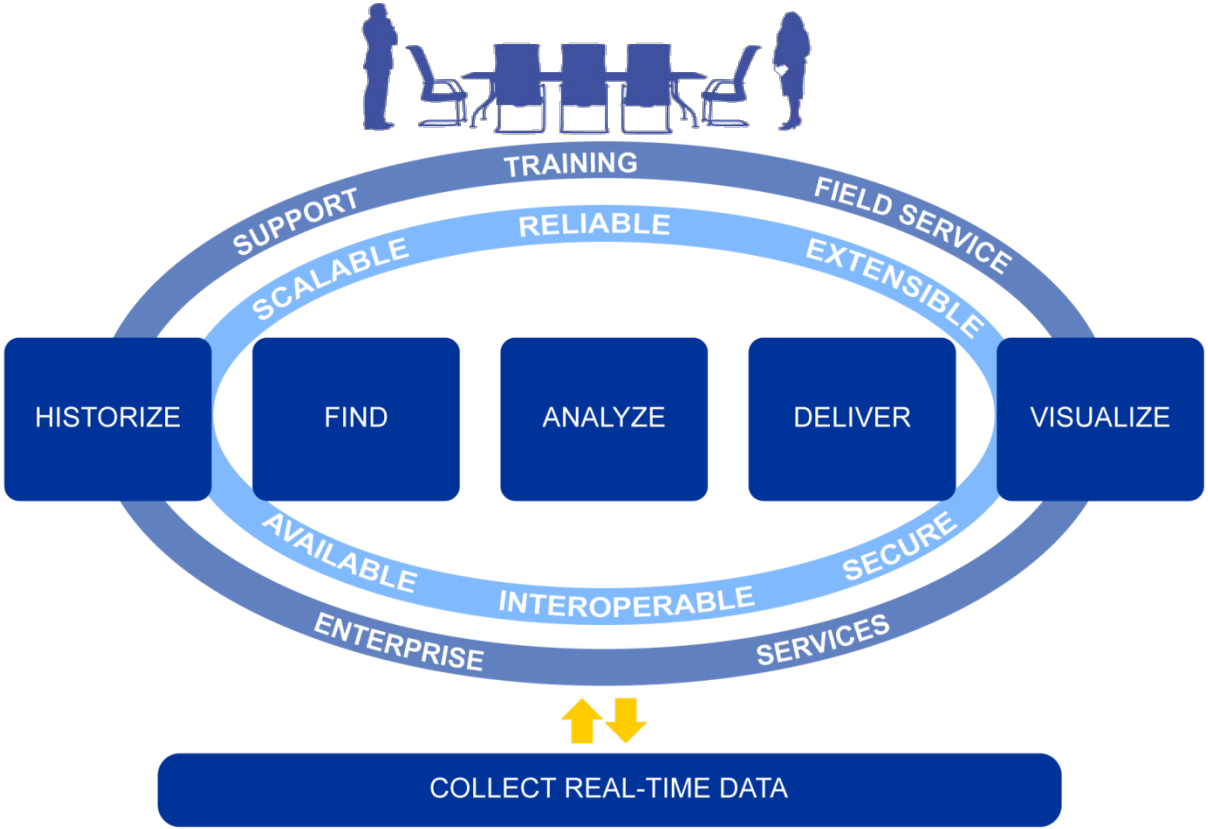
Distribution systems management

OE Response:
Pipeline/Rail integrity measures, with real-time measurement

Energy efficiency and GHG/Carbon Management

OE Response:
real-time equipment measurement and performance management

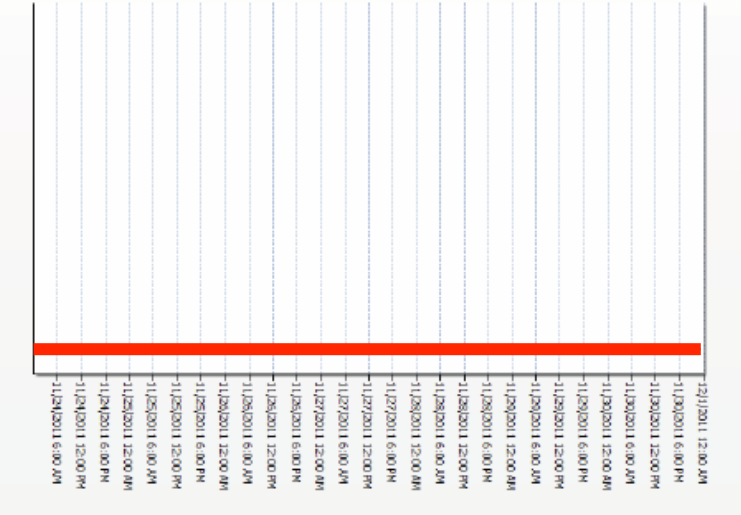
OE requires bottoms-up data



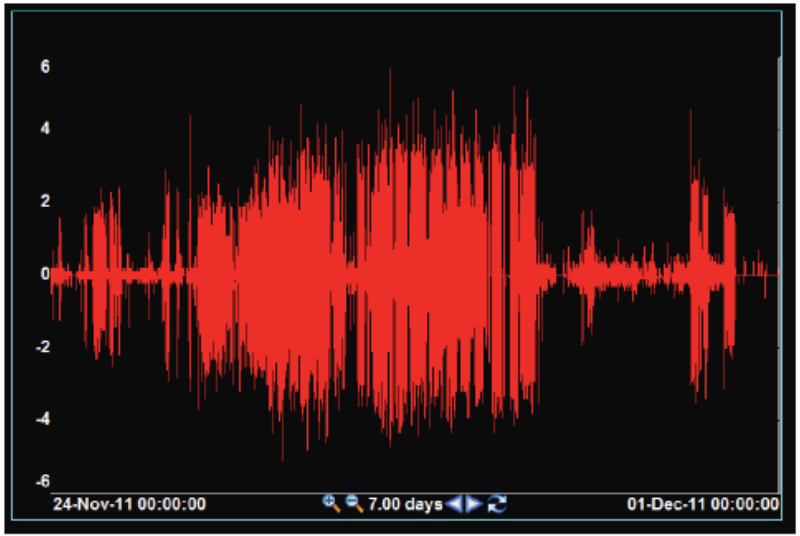
OE in Operations: *Real-time data increases visibility & performance*

10 minute drive train vibration data vs. 1 second data…

SCADA:

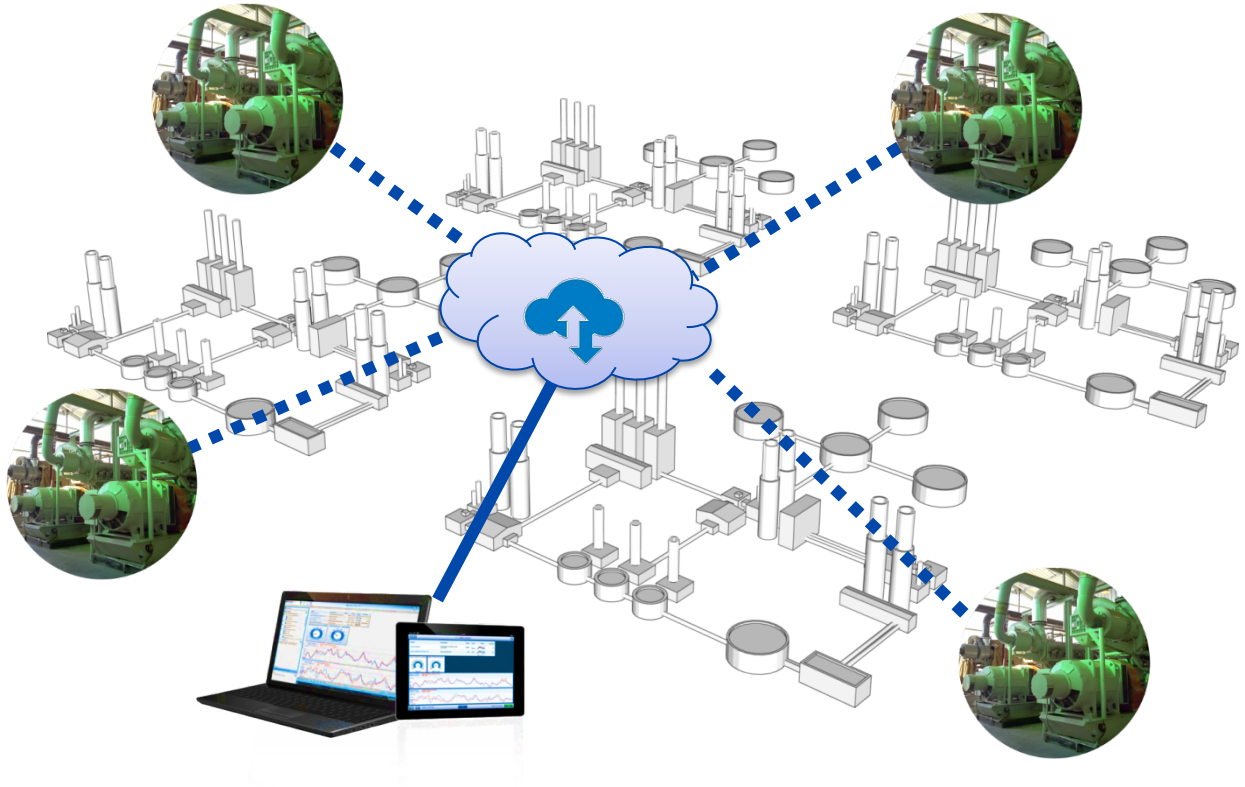


PI System:



 Source: Suzlon Wind Energy Corporation, OSIsoft User Conference 2012

OE at the Business Unit: *Drives best practice and efficiencies*



OE for the Corporation: *Drives returns, reputation, brand and shareholder value*

Sustainability Information Must Now Be Managed with the Same Rigor as Financial Accounting Information

Ceres

Global Reporting Initiative

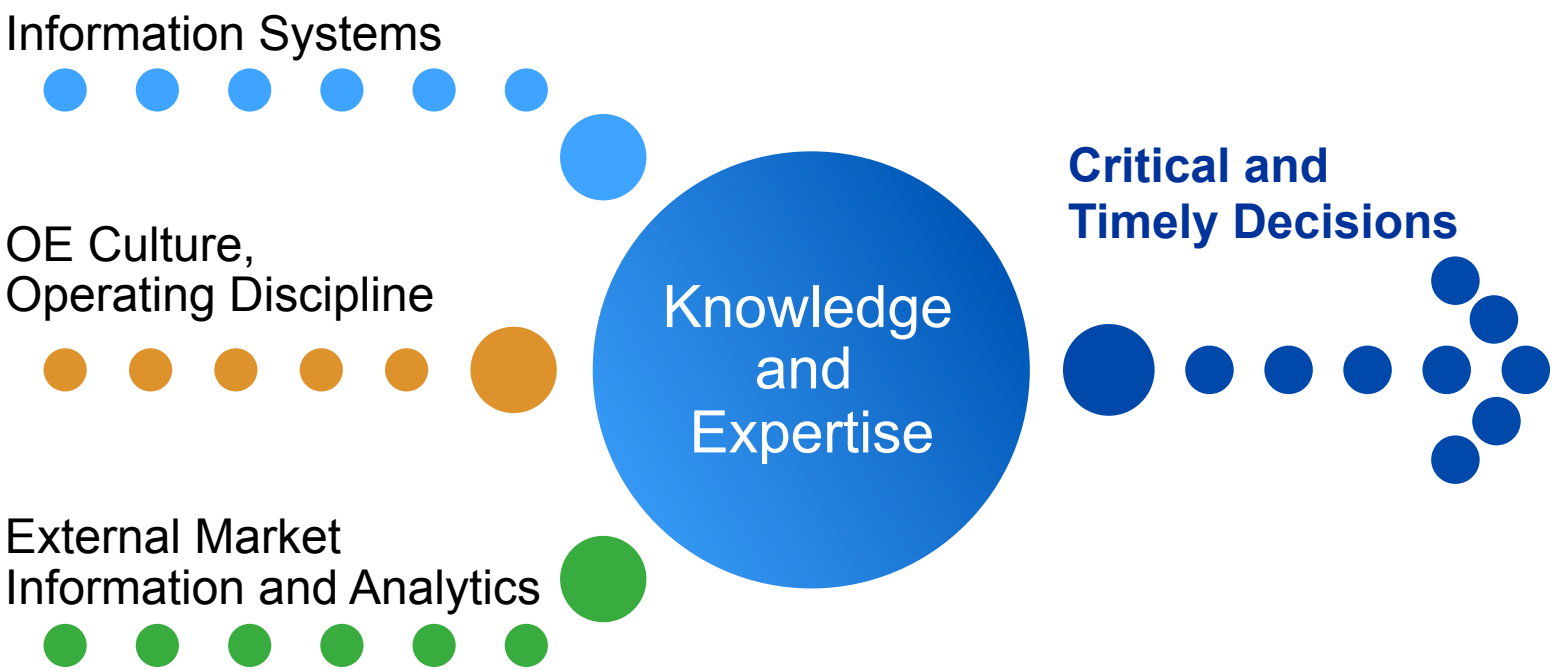
Dow Jones Sustainability Indexes

CARBON DISCLOSURE PROJECT

OE in the Connected Supply Chain

- $Trillions in energy assets *($827B invested since 2003)*
- $Billions in new Petrochemical Capital investment *($95B to 2018)*
- $Billions in finished goods and manufacturing opportunity
- A fully interdependent supply chain requiring Operational Excellence in every link

Decision-making in an OE-enabled organization



THANK YOU