Managing Smart Assets

Training Needs for Collaborative Decision Making

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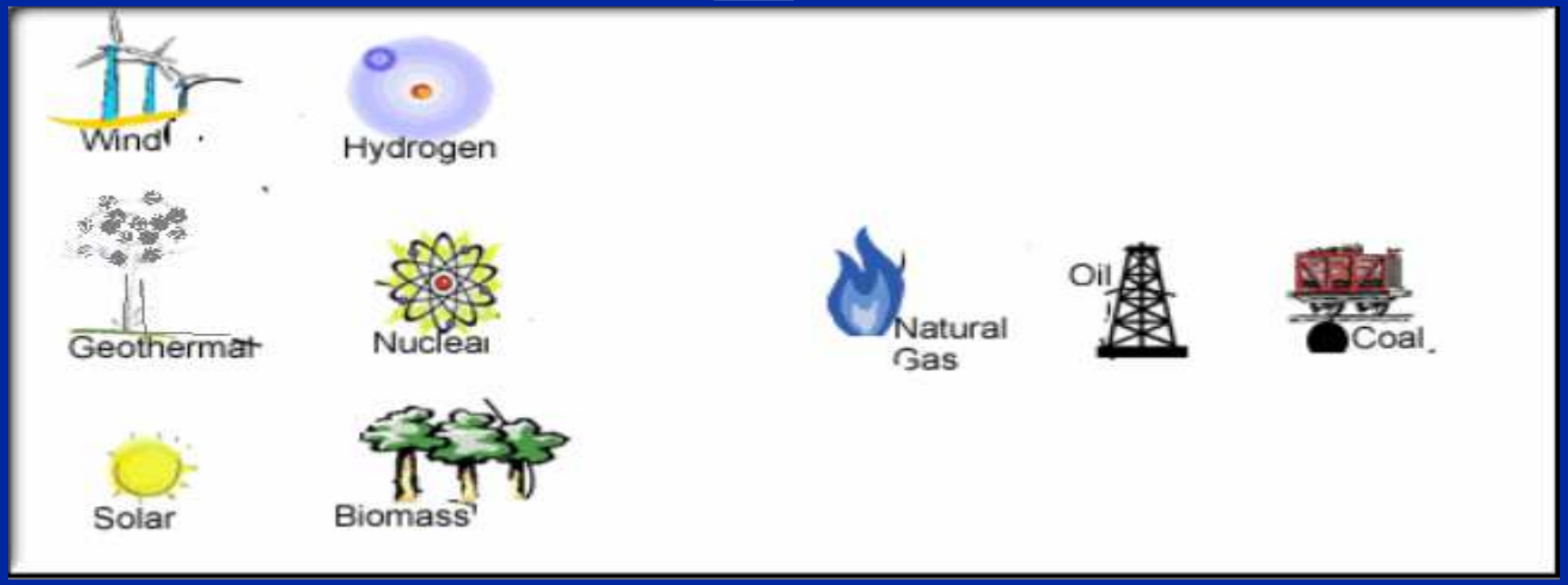
Expectations from Energy Industry

- Sustainable Base
- Environmentally Clean Operation

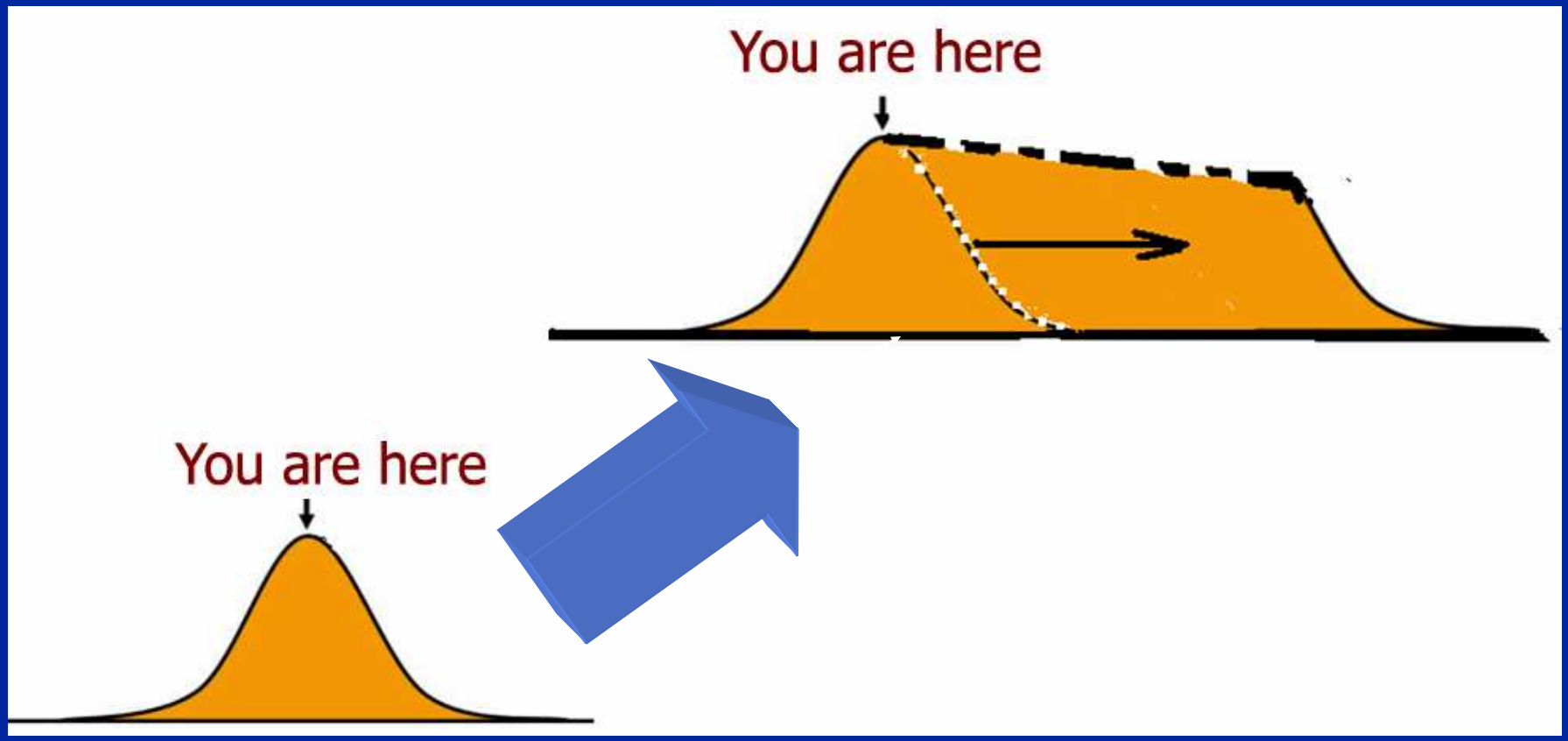
During The Next 100 Years With Carbon Management Initiatives Fossil Fuels Will Still Continue As Major Sources for Global Energy Supplies

Alternatives

Fossil Fuels



For Oil and Gas: What is needed to push the Peak Production to the Future?



Roadmap

- Find New Feedstock
- Improve Economics
  - Invest in New Smart Technologies
  - Invest in Manpower Development

Feed stock for Oil and Gas Resources?

- Extend Recovery Factors in Mature/New Fields

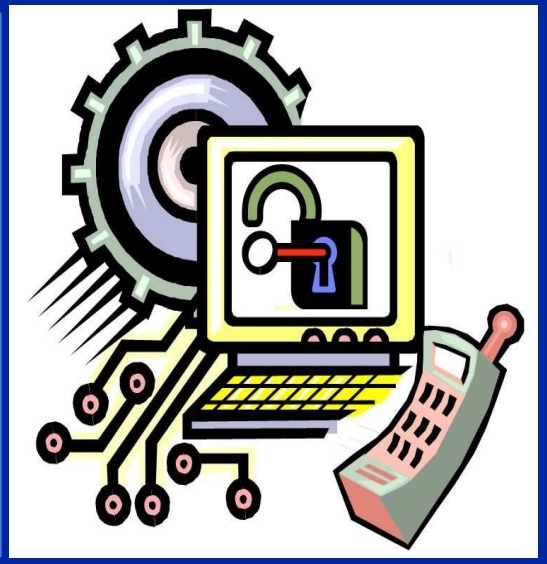
- Explore and Produce From Harsh Operating Environments

- Invest in Unconventional HC Resources

Improve Economics and Extend Life of Current Assets

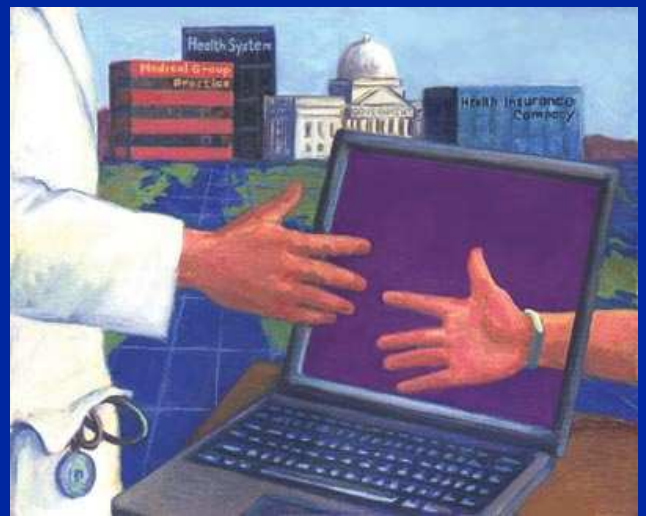
- Slow Decline From Mature Fields
  - Invest in Information Technologies
- Invest in Smart Oilfield Operations
  - Improve Reliability/Uptime
  - Reduce Re-entry
  - Standardize- Plug and Play Engineers
  - More Assets with Limited Workforce
  - Implement New Collaborative Training and Decision Support Systems

Catch up with the use of Information Technologies



Electronic Warfare

Medical Fields

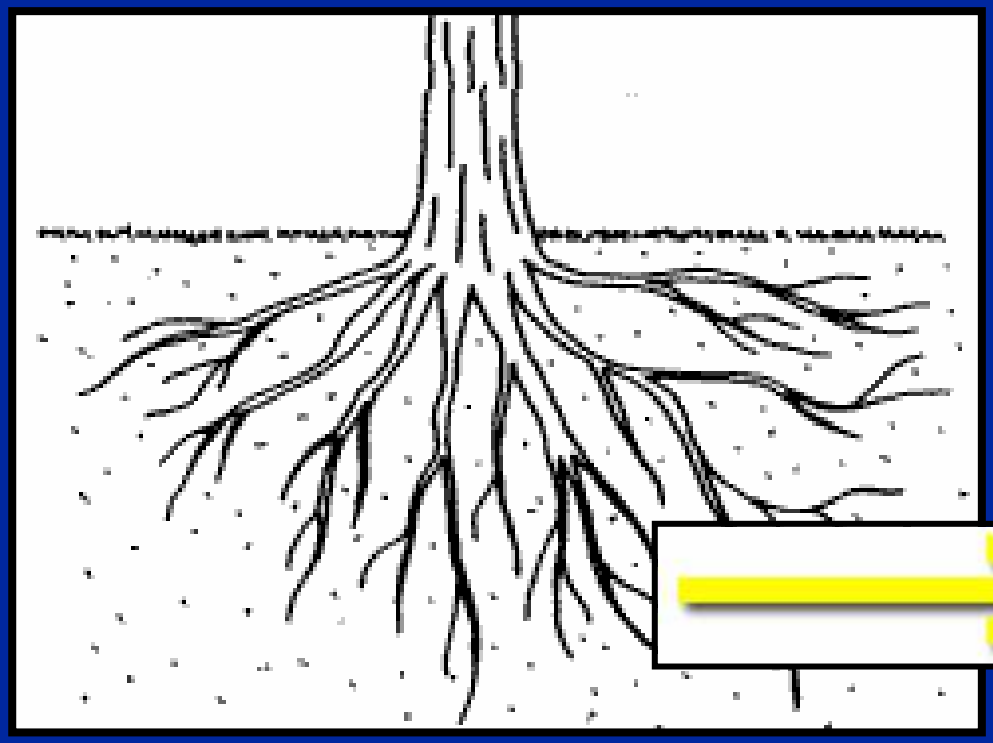


Space Missions

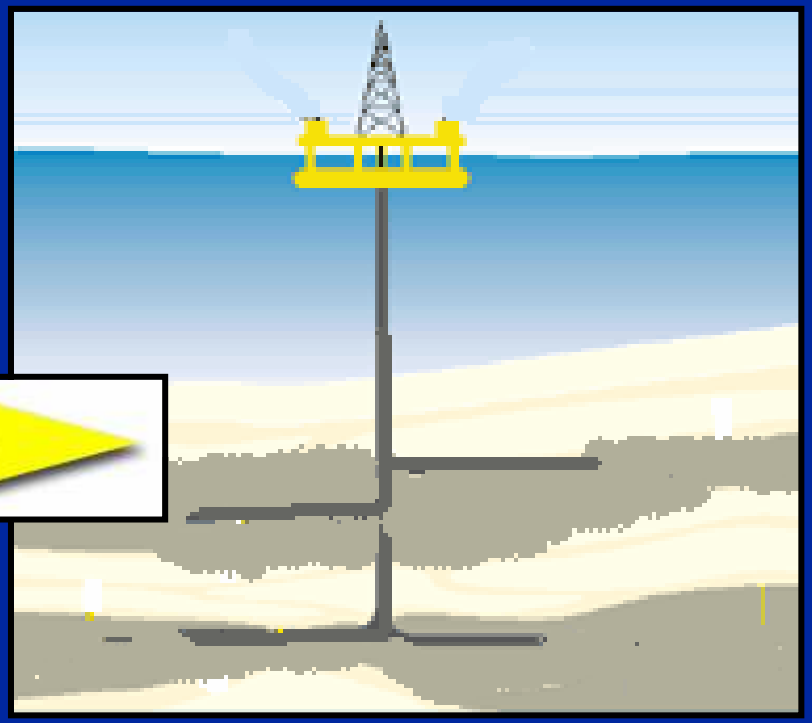
Invest in Smart Oilfield Technologies

Smart Oilfields
Smart Wells
Real Time Operations
Fuzzy Logic
Subsea Robotics
Real Time Remote Operations
Sensor Nets
Intelligent Completion
Immersive Visualization
Data Mining
Grid Computing
……..
……..

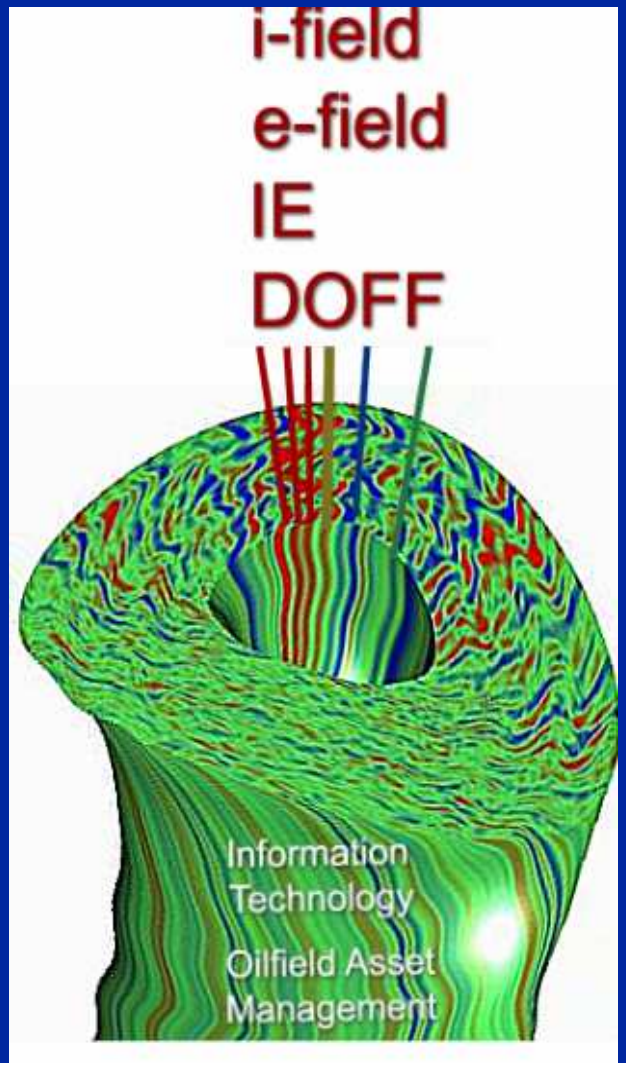
Focus on Maximum Contact Wells



Multi-Laterals



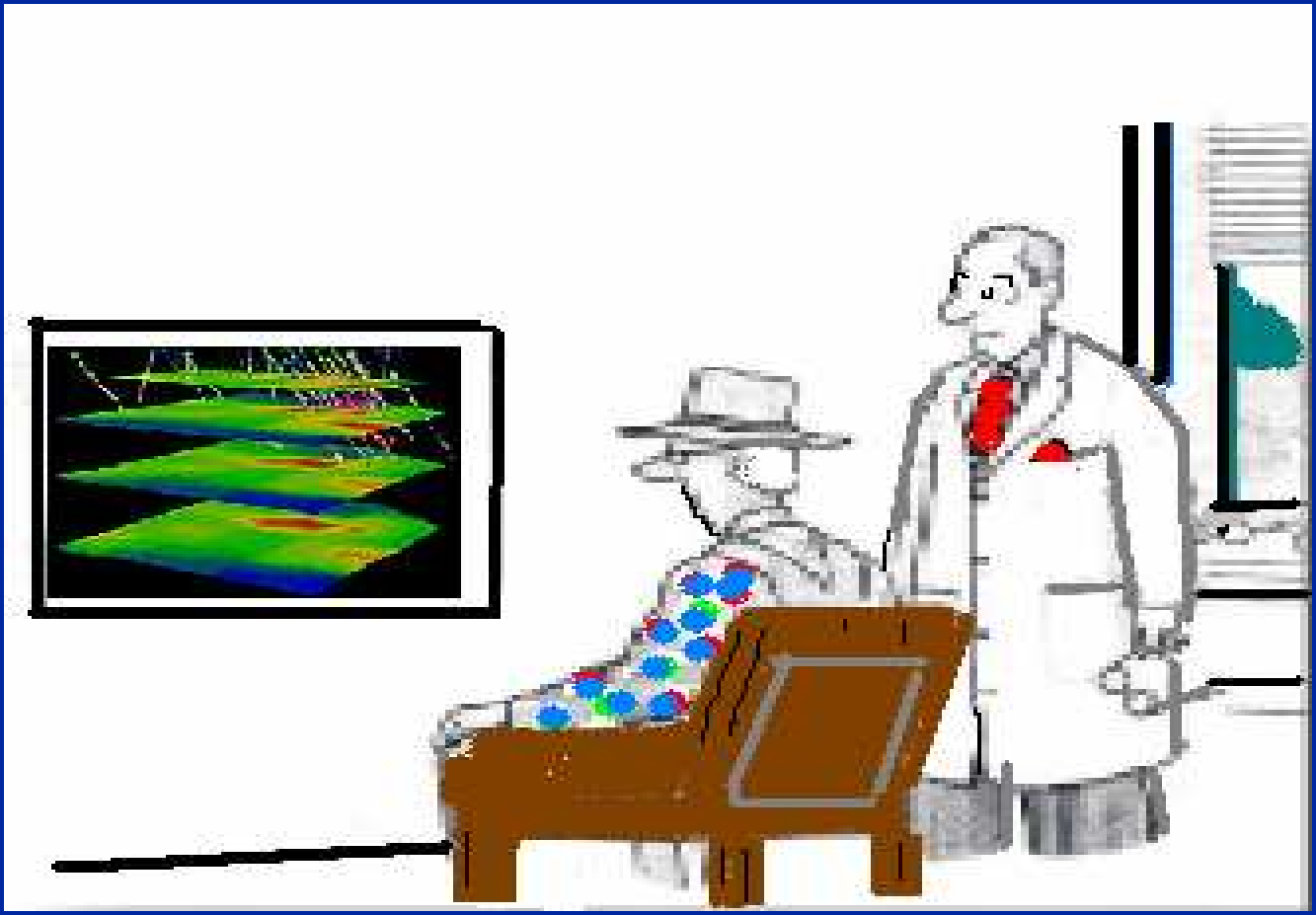
Digital Oil/Gas



Join the Evolving Paradigm of

Smart Asset Management

Take Remedial Steps To Solve The Problem Of The Aging Workforce



Manpower Issues

- Recruiting Top Talents
- Training for Adaptation of Information Technologies
- Conducting Operations in Collaborative Fashion

Improve Oil Industry's Image

- Past Practices
- Low Tech Reputation

Eliminate Low Tech Practices

- Inefficient Operations:

  Abandoned fields after 15-30% recovery factor
- Poor Preventive Maintenance
- Poor Data Management
- Disconnected Decision Support Systems

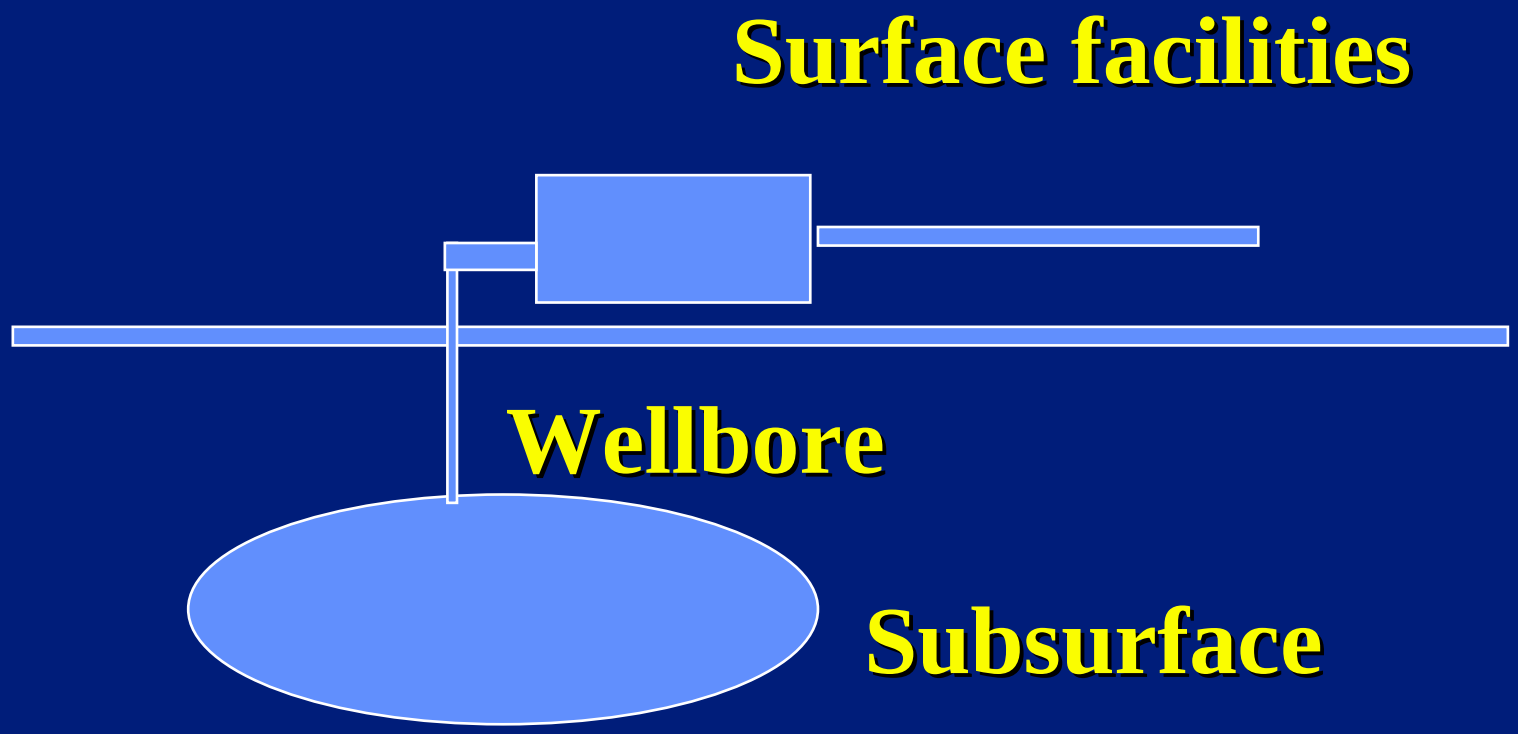
Incentives for Change

- Reduce Human Error
- Reduce Re-entry cost
- Reduce Cost
- Implement Automation
- Improve **Decision Making**

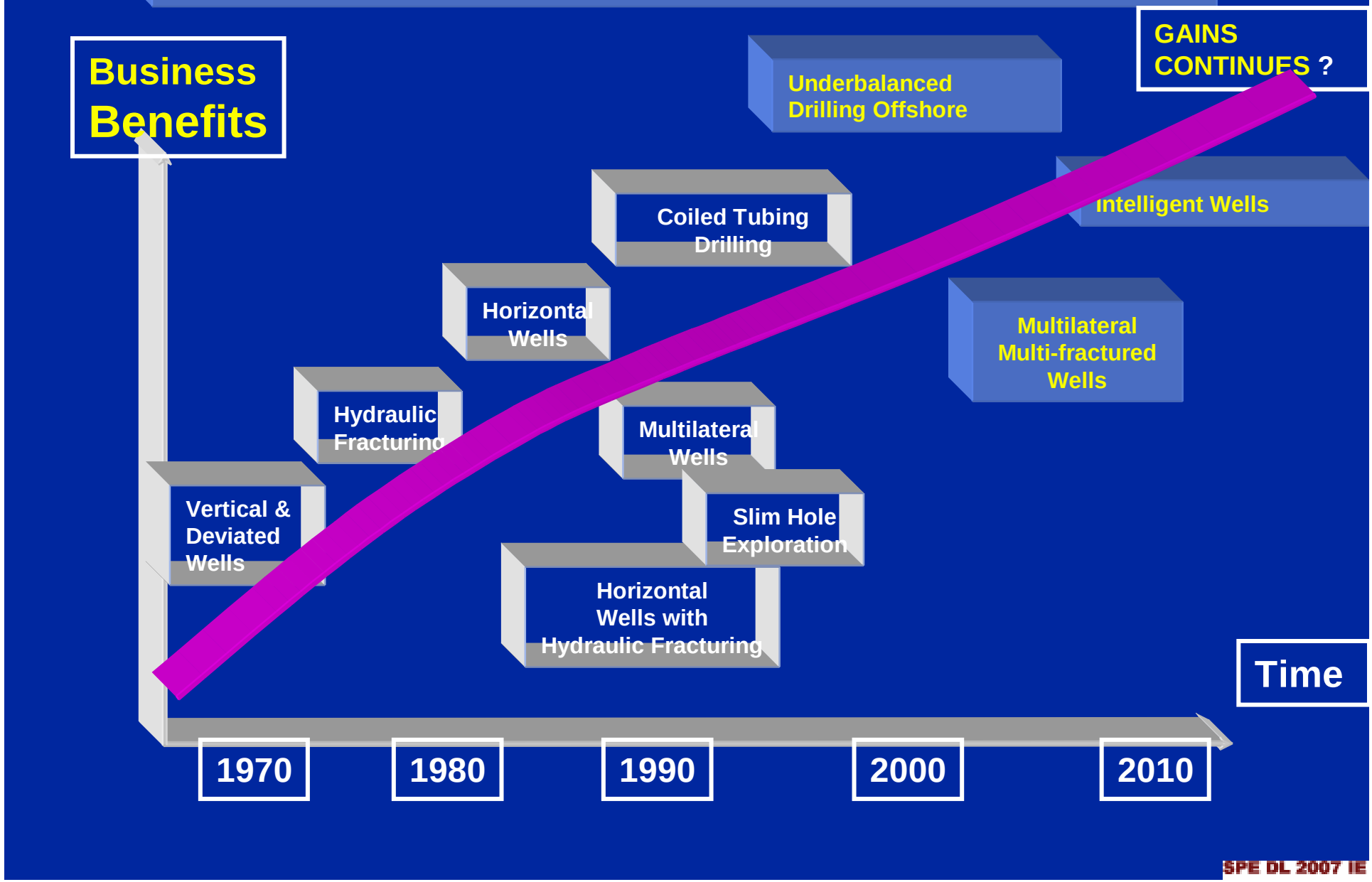
Integrated Oil and Gas Assets

- Upstream
  - Subsurface
  - Wellbores
  - Surface
- Transportation
- Processing
- Marketing

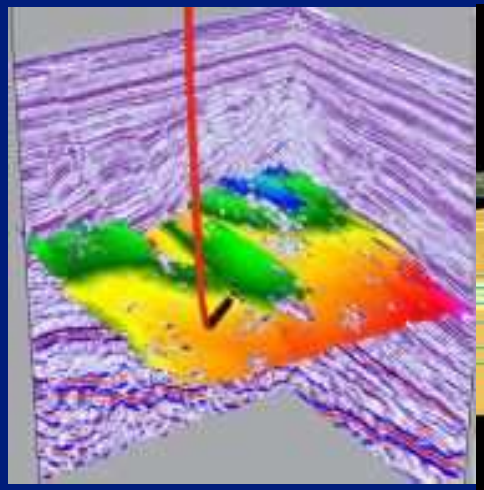
Integration

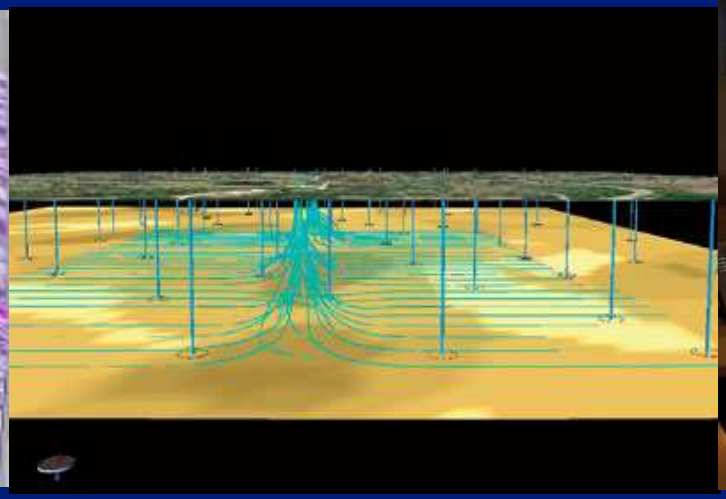


New Well Technology S Curve Evolution



First Steps in Industry's Response





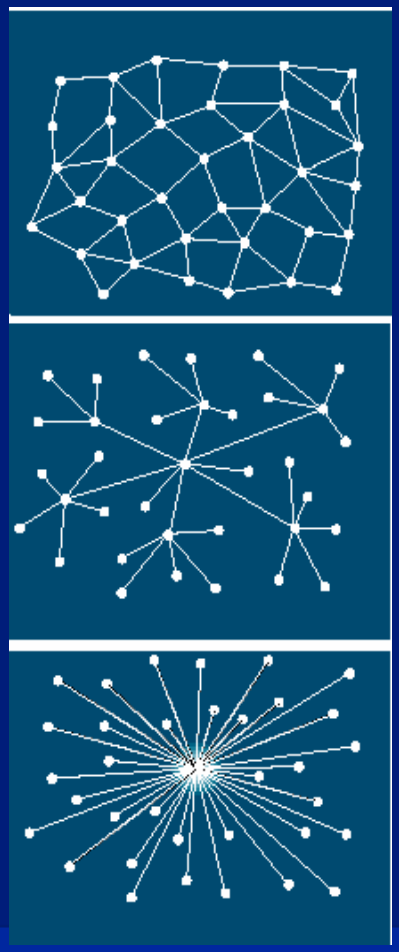
Reservoir Oriented Viz Rooms

Information Technology

- Visualizing By-Passed Oil
- Integrated Asset Management
- Small Foot Print
- Multidisciplinary Collaboration

Upstream Decision Support Systems

Are we behind?



Future

Present

Past

Integrated Asset Management

Global Scale

Local Scale

The Changing Face of the Industry
The High Tech Oil Industry

- New **Biz Drivers**
- Focusing on Technology **Gaps**
- **Urgency**
- Implementation Pathway
- Role of **Universities, Professional Societies, and Companies**
- **Improved Prospects in Environment, Security, Safety monitoring**

For	Against
◆ Improved Productivity	◆ Cost
◆ Quick Access To Data	◆ Job Security
◆ Reduced Mundane Work	◆ Chances of Failure
◆ Reduced Human Error	◆ Disruption

Integrated Decisions Support System

Combine

- Technical Feasibility
- Economic Feasibility
- Environmental Feasibility
- Social Feasibility

Incentives

- Minimize and Reduce Uncertainty
- Provide Real Time Access To all Data
- Make Decision in an Real Time Integrated Environment

Eliminate Silo Style Decision Making

- Fuzzy Expectations
- Decision with Missing Information
- Hasty Elimination of Options
- Lack of Integration

Technology Enablers…

Transformational Technologies

- Smart Hardware
- Information Technologies

Real Time Decision Support System

- Data Mining
- Immersive Visualization
- High Performance Computing

Providing Integrated Decision Support System Training

- Role of Universities
- Role of the Operating Companies
- Role of Service Companies
- Role of Professional Societies

Current SPE Standards Needs Augmentation: Competency for Petroleum Engineers

- *Petroleum engineering sub-disciplines:*
  - drilling,
  - completion/
  - production/facilities,
  - Formation evaluation
  - Reservoir
  - Economics.

Breadth
Depth

Managing the Manpower Problem

- Engineering Isolationism
- Interdepartmental Disconnects
- Multidisciplinary Participation
- Core Competencies

Need for Hybrid Petroleum Engineers

Operating and Designing New Systems

Innovating New Solutions

Building Default Systems

Working Collaboratively and Globally

Thinking in Non-Traditional Ways

Skills of The Hybrid Petroleum Engineer

- Well Versed in Information Technologies
- Knows how to Defines the Solution at the Right Level
- Can Operate in Asset Decision Environment

What Do we Need?

- **Managing Resources with Immersive Visualization, transparency and Control**
- **Employing Integrated Asset Management**

Emerging Hybrid Curriculum

- Modeling of Virtual Environments
- Visualization of Huge Data Sets
- Asset Modeling Training
- Collaborative Working over Distance
- Integrated Virtual Reality and Haptics
- Decision Support with Continuous Feedback

Case for Collaboration

Cannot Expect Adequate Solutions from:

- **a single individual,**
- **a single discipline or,**
- **disconnected multi skilled experts**

Step 1-Introduce Remote Learning

- Virtual Classrooms
- Decision Support Centers (Local-Global)
- Internship on Remote Operation
  - Cultural Issues
  - Reliability
  - Risk

Step 2-Collaboration

- Expand the Comfort Zone of Verbal And Written Communication
- Expect Working on a Common Intellectual Effort
- Expect Working with Others Who May Not Be Immediately Connected

Goals for Collaborative Training

- Building Collective and Core Competencies
- Faster Problem Solving worldwide
- Implementing Best Practices
- Accessing Remote Experts for Problem Solving

Manpower Planning- Operators

- Identifying and Empowering **Champions**
- Mentoring New Recruits
- Re-Training the **Experienced**
- Emphasizing on **Team Building**
- Educating Staff on Working With **All Data**
- Educating Staff on Working With **Risk Based Decisions**

Culture Change

- Communicate and Learn from Mistakes
- Align Objectives
- Promote Trust in Integrated Systems

CiSoft's Model

- Educational Opportunities in Smart Oilfield Technologies
- MS in Smart Oilfield Technologies
- Certificate Education for Experiences Engineers
- CiSoft Academy for Summer Interns

http://cisoft.usc.edu

Modules

- Collaborative Decisions Support Systems
- Remote Sensing
- Remote Operations and Control
- Work Process Definition and Automation
- Immersive Visualization
- Data Management

USC's Program

Smart Oilfield Technologies

- PTE 586

Intelligent and Collaborative Oilfield Systems Characterization and Management

- PTE 587

Smart Completions, Oilfield Sensors and Sensor Technology

- PTE 588

Smart Oilfield Data Mining

- PTE 589

Advanced Oilfield Operations with Remote Visualization and Control

Summary

- Need For Joint Efforts By SPE/Universities/Companies To Augment PTE Curriculum With Smart Oilfield Technologies
- Need For Training New Engineers In Collaborative Decision Support Centers