The way forward

NTNU BRU21, Better Resource Utilization in the 21st Century
Roy Ruså, Vice President Technology, Petoro AS
Large potential – dependent on competitive business opportunities

Good HSE
- Cost efficiency
- Reduce subsurface uncertainty
- Healthy supply chain
Well costs and time halved from 2014 to 2016

10 fixed installations in five major, mature oilfields in the SDFI portfolio

Cost (MNOK) & days

Average cost  
Average days
Opex reduced with 24%, 280 mill USD, since 2013 in five major fields

Field cost five major fields

-24% from 2013-2016

-9% from 2015-2016
Need for more: Recoverable reserves per well declines (example, five large, mature fields)
Need for more: The "bank" of discoveries on the NCS are generally "small"
Early wins delivered

- Improved cash flow
- Quarterly results

Early wins
- Simplification
- Best practices
- Planning
- Performance measurement
- Renegotiating of rates

Strong cost increase
Only innovation will deliver radical change

**Strong cost increase**
- Improved cash flow
- Quarterly results

**Early wins**
- Simplification
- Best practices
- Planning
- Performance measurement
- Renegotiating of rates

**Transformation**
- Radical goals
- 2-5 year horizon
- New technology
- Co-operation culture and co-operation forms
- Industry cooperation

**Improved competitiveness**
OG21 – THE NATIONAL TECHNOLOGY STRATEGY FOR THE PETROLEUM INDUSTRY

OG21

Secretariat

Board members from the industry

Energy efficiency and environment
Exploration and increased recovery
Drilling, completions and intervention
Production, processing and transport

OG21-members

Academia  Authorities  Oil company  Supplier/services
PRIORITIZED TECHNOLOGY NEEDS

- Improved energy efficiency
- Zero carbon emissions
- Protection of the environment
- Subsurface understanding
- Drilling efficiency and P&A
- Production optimization
- Improved subsea and unmanned systems
- Enhanced oil recovery
- Digitalization
- High North technologies

Details provided under each technology group (TTAs)

See strategy at www.og21.no
Digitalization - a necessity for doing business in the future

Drivers for faster implementation:

- Market drive
- Availability and maturity of key technology elements
- Good field examples
- Strategic programs in key oil and gas companies
- New business models on its way
"Digitalization" – a vague and undefined term

Reduce well costs

DATA:
- Real time
- Historical
- Structured
- Unstructured
"Digitalization" – it starts with the problem

Reduce well costs

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- Real time
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- Unstructured
The devil is in the details...

The way forward

Improve regularity

Reduce NPT

Utilize actual capacity

Increase maximum potential

Reduce turnaround

CBM Operating practices

Automatic chemical dosing

Slug control

Production start up

Alarm handling

Meetering/well management

Sand prod. management

Best practices Dynamic model

Real time:
- Inlet pressure
- Outlet pressure
- Temperatures
- Fluid properties
- ...

IT infrastructure
- Formats
- Quality
- Availability

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The devil is in the details …

Improve regularity

Reduce NPT
- Utilize actual capacity
- Increase maximum potential
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CBM
- Operating practices
- Integrity monitoring

Automatic chemical dosing
- Slug control
- Production start up
- Alarm handling
- Meetering/ well management
- Sand prod.

Best practices
- Dynamic model
- Descriptive models
- Predictive models
- Prescriptive models
- Automation
- Autonomous systems

IT infrastructure
- Formats
- Quality
- Availability

Real time:
- Inlet pressure
- Outlet pressure
- Temperatures
- Fluid properties
- …
- Own experience
- Others experience
- R&D

DATA:
- Real time
- Historical
- Structured
- Unstructured
The road map

Value

Decision support, Model based

Reporting, decision support: History matching and "what happens"

Decision support: Prediction

Decision support: Suggest action and effect

Automation

Cognitive technologies

Cooperation on- and offshore

Visualization

Making data available

Present operating models

R&D

Others experiences

Own experiences

The way forward
Realization of the value potential are contingent on work processes and organization-specific factors

Factors include:

- The degree of executive sponsorship, support and accountability
- A "translator" appointed to manage and coordinate between operations, technical disciplines, IT and procurement
- Willingness to experiment, pragmatic approach to business plan, but measuring performance for continuous improvement
- A focused and “purpose built” redesign of work processes
- Co-operating across companies
"Sharing anxiety"

What can we co-operate on?

What shall we compete on?
Culture defines "co-operation"

- Prescriptive/requirement – "do what I say…"
- Formal/measuring on the bottom line

- Communication/information exchange
- Joint problem solving
- Flexibility
- Avoid use of power
Continued innovation creates winners

Project competitiveness = NCS competitiveness = Supplier competitiveness