

Meeting the new future of subsurface digitalization with innovative workflows and digital solutions on complex and data rich fields on Norwegian Continental Shelf

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About Lundin Norway

400

Employees at Lundin
Norway

75-95

Expected oil production in
Mboe per day

79

Licences on the Norwegian
Continental Shelf

20

Billion NOK tax income to
the Norwegian State from
the Edvard Grieg field

Lundin Norway | A Growing Star

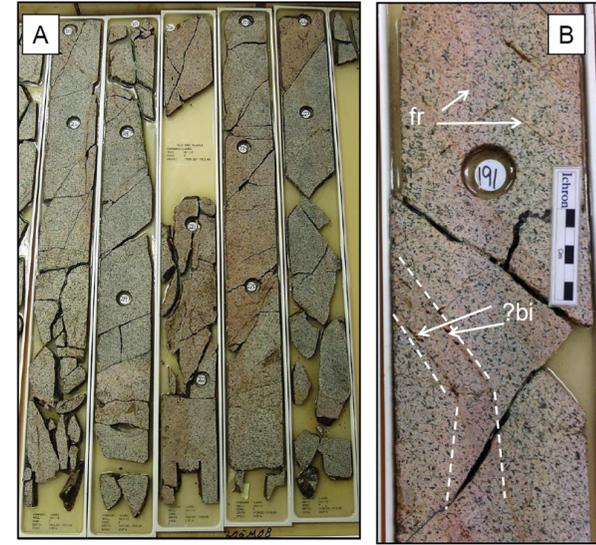
Based on experience, driven by ambitions

- **Edvard Greig** – jackpot on first well
- **Johan Sverdrup** – an elephant in the modern world
 - World class reservoir
 - **Alta/Gohta** – Offshore carbonate reservoirs
- **Rolvsnes** – Fractured/Weathered Porous Granite Basement
 - First time on the NCS

Key to success

- Extensive data acquisition programs
 - >20 DSTs last 10 years
- Extended Well Test (60 days) on Alta
- Extended DST (+14 days) in Granitic Basement
 - Innovative solutions

16/1-12: Fractured Granodiorite Basement (436ma)



Johan Sverdrup – The New Gigant on the NCS



Lundin Norway | Subsurface Digitalization

- **Why?**

MORE EFFICIENT WORK PROCESSES

IMPROVED DECISION MAKING

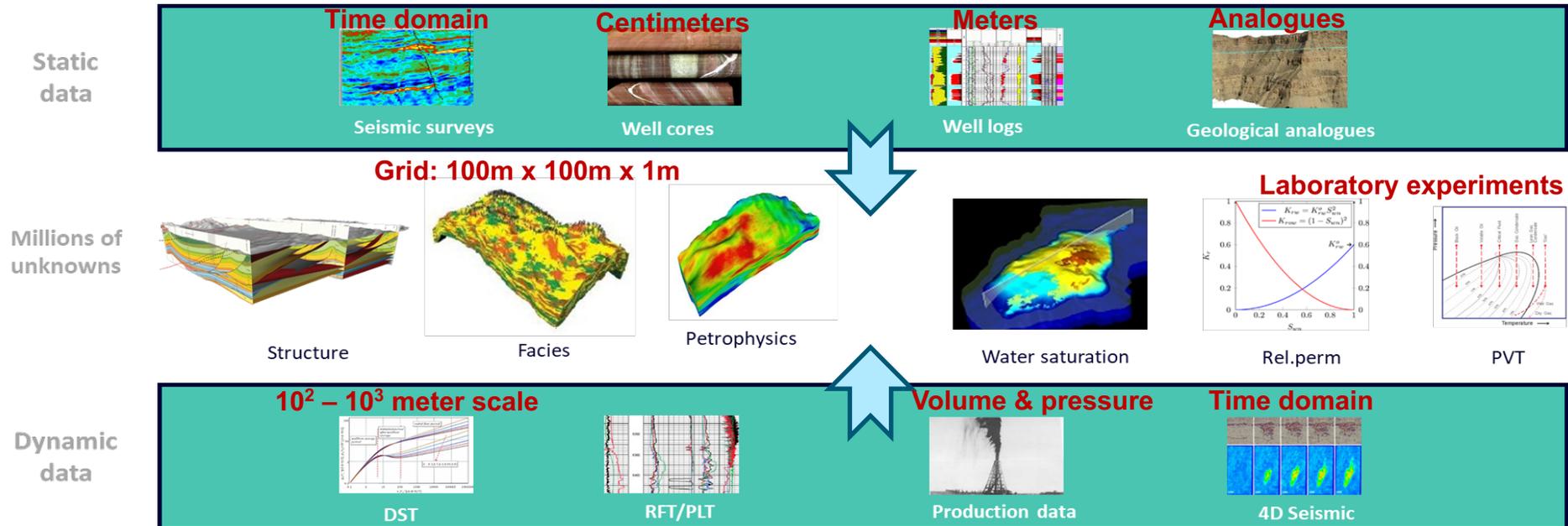
MAXIMIZING VALUE

DIFFERENT DATA TYPES, SCALE, TIME & FORMATS

- **How do we digitize the subsurface?**

INTEGRATED WORKFLOW BETWEEN DISCIPLINES

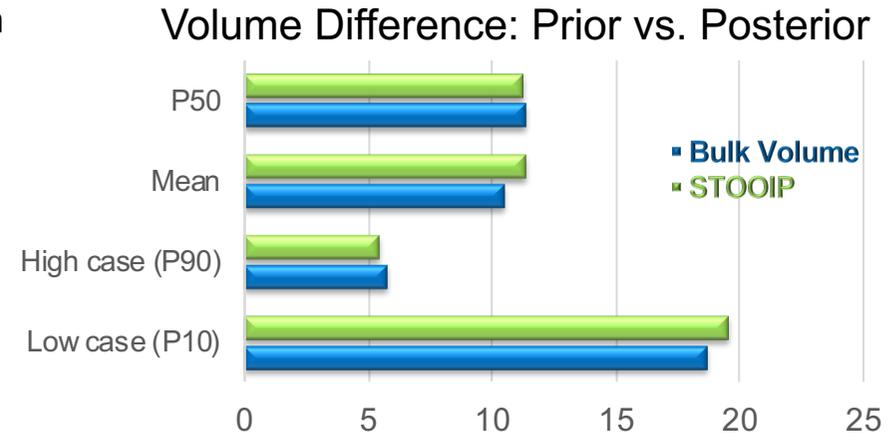
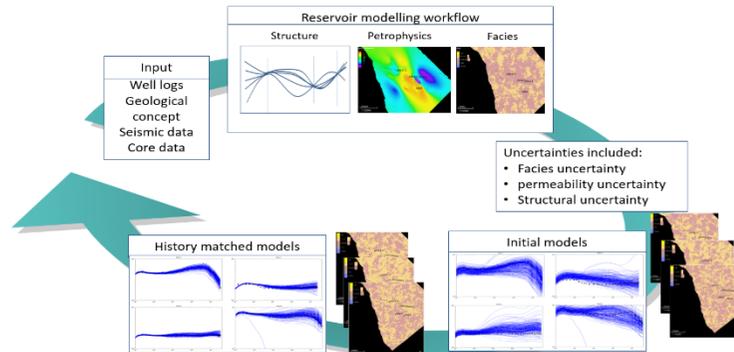
ENSAMBLE BASED MODELLING



Lundin Norway | Early Adoption

"It is better to be APPROXIMATELY right, than PRECISELY wrong"
- Warren Buffett

- Early version of ResX by Resoptima (2013)
 - Consistent integration of static & dynamic data
 - Robust quantification of uncertainty
 - Influencing the development
- Ensemble based assisted history matching of DSTs on Johan Sverdrup(*)
 - Significant value for securing technical arguments in unitization process



(*)SPE-181352-MS Jon Sætrum

Lundin Norway | Going Full Field

- **Brynild** – small, but complex field

Motivation:

- Few wells, limited production data
- Various geological theories
- Mismatch model vs. actual data

Result:

- "Perfect" match

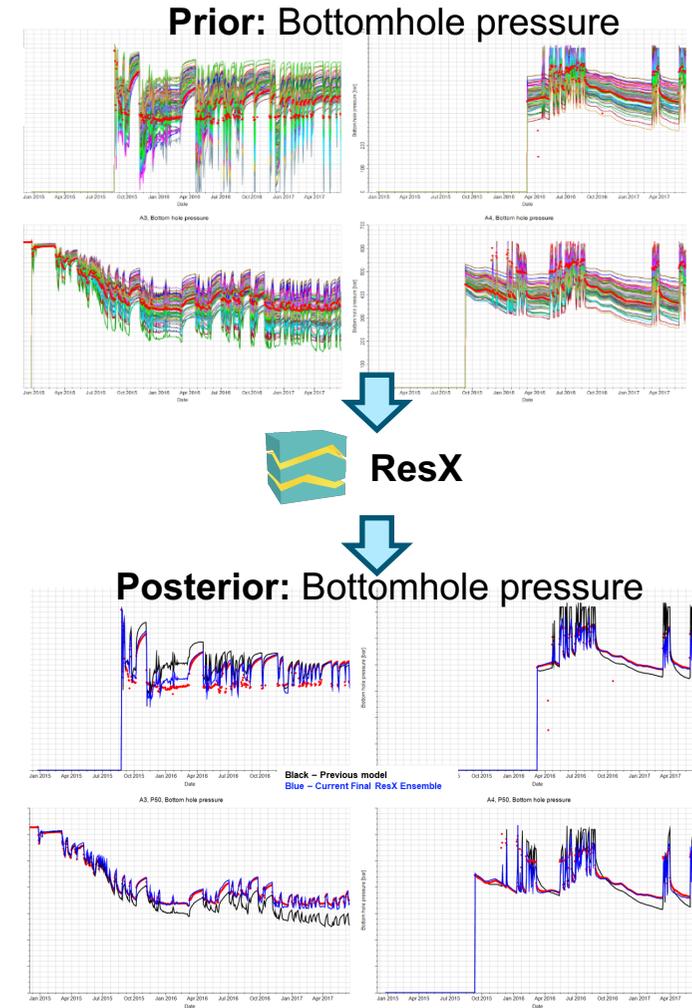
- **Edvard Grieg** – never stops surprising

Motivation:

- Major company asset
- Consistent integration of **ALL** valid data
- Reference model adjusted regularly

Result:

- Ensemble of models supporting decisions
- Discipline integration & work efficiency greatly improved



Lundin Norway | Changing Gear

Lundin Norway has been a co-pilot pushing for improvements, testing the software and exploring INTERSECT capabilities

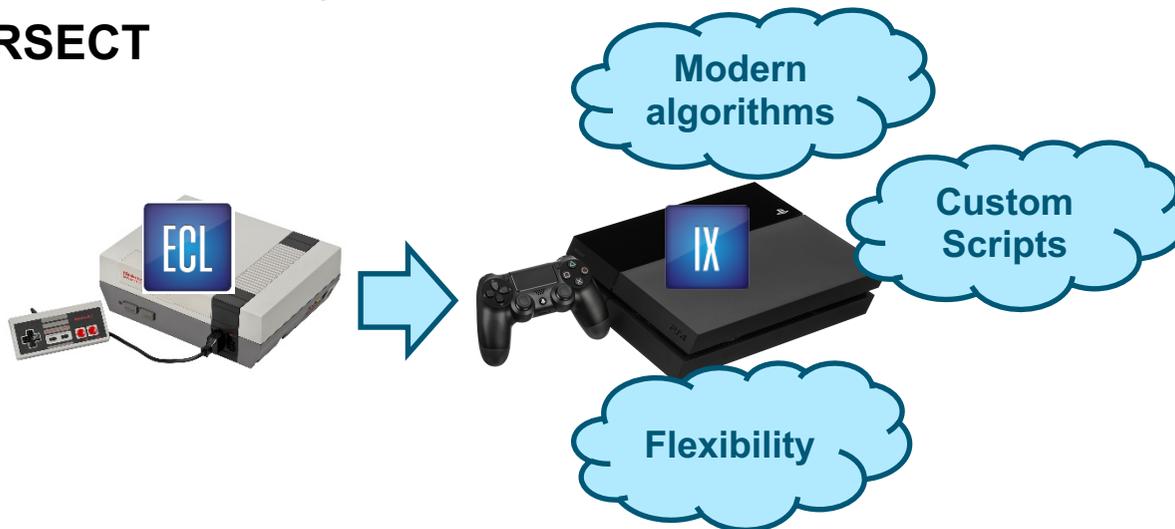
Larger & more complex models

Management expectations & shorter deadlines

Single based to ensemble based modelling

ECLIPSE → INTERSECT

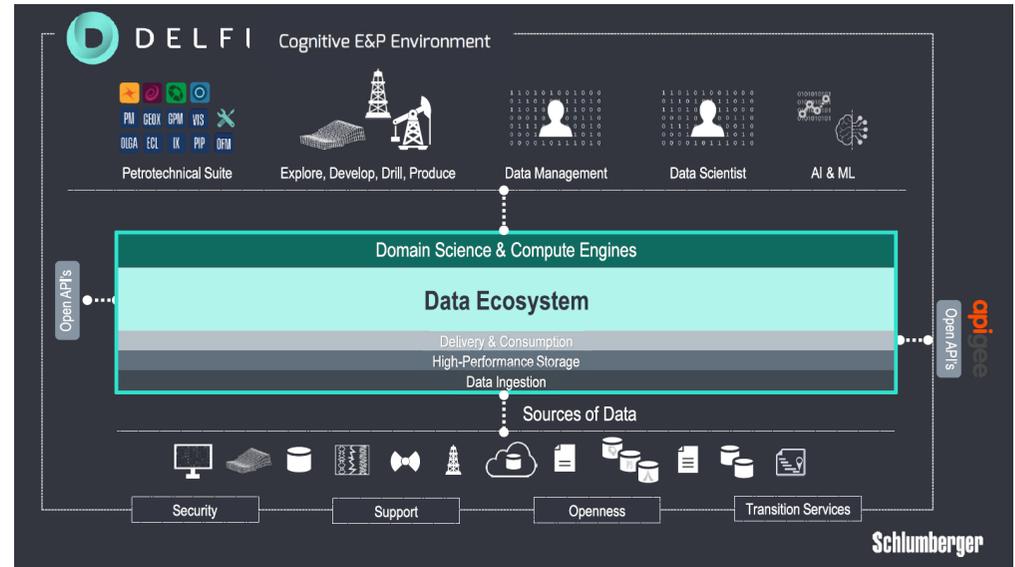
- Days to minutes
- Fortran to Python



Lundin Norway | The Cloud



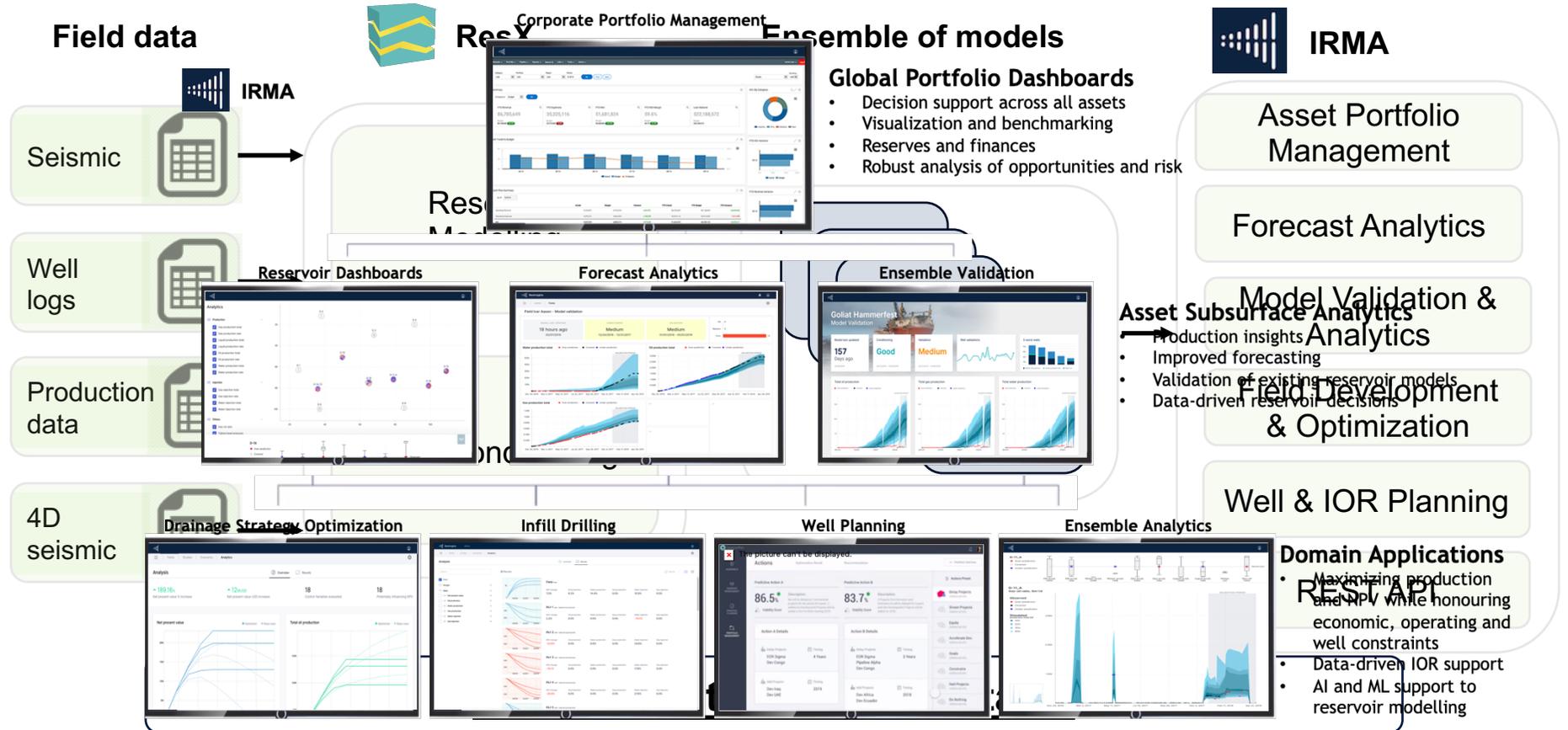
- **DELFI** cloud based RE solution
 - Petrel - anywhere & anytime
 - Data management
 - "Infinite" computational power
 - Machine learning
- **DELFI On Demand** – one click away from the cloud
 - Reduced investments
 - Seamless use of cloud based simulation
 - Identical single model run time
 - Ensemble based studies completed in 2 hours vs. a week.



Lundin Norway | Closing The Loop



INTEGRATED DRILLING, RESERVOIR MANAGEMENT AND ANALYTICS



Lundin Norway | The End?

DIGITALIZATION OF THE SUBSURFACE discipline is simply that data we already have is used in a more modern way utilizing new technology.

Lundin Norway has successfully demonstrated that:

- **EARLY ADOPTION** has its benefits of influencing development
- **GOING FULL FIELD** with ensemble based modelling enhances subsurface understanding
- **CHANGING GEAR** by implementing new technology improves work efficiency
- **THE CLOUD** is not the limit
- **CLOSING THE LOOP** by digitalization of the subsurface data in a new and revolutionary way

This is not **THE END** of the journey

