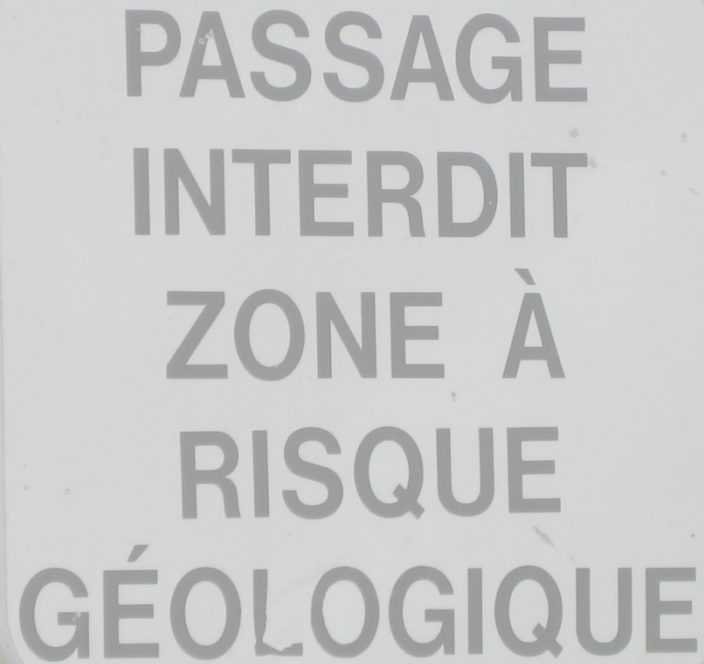


Prospect Appraisal: Learning from past performance



**PASSAGE
INTERDIT
ZONE À
RISQUE
GÉOLOGIQUE**

Risk Coordinator Workshop, Denver, June 2015

U. Möller, Wintershall Holding GmbH

Prospect Appraisal: Learning from past performance

Agenda



- Introduction
- 2000 - 2006 Exploration Performance
- Exploration Performance Study
- 2007 - 2009 Exploration Performance
- 2010 - 2014 Exploration Performance
- Prospect Appraisal Team

Prospect Appraisal: Learning from past performance

Risk and Uncertainty

Doubt is not a pleasant condition, but certainty is absurd
Voltaire (1694 - 1778)

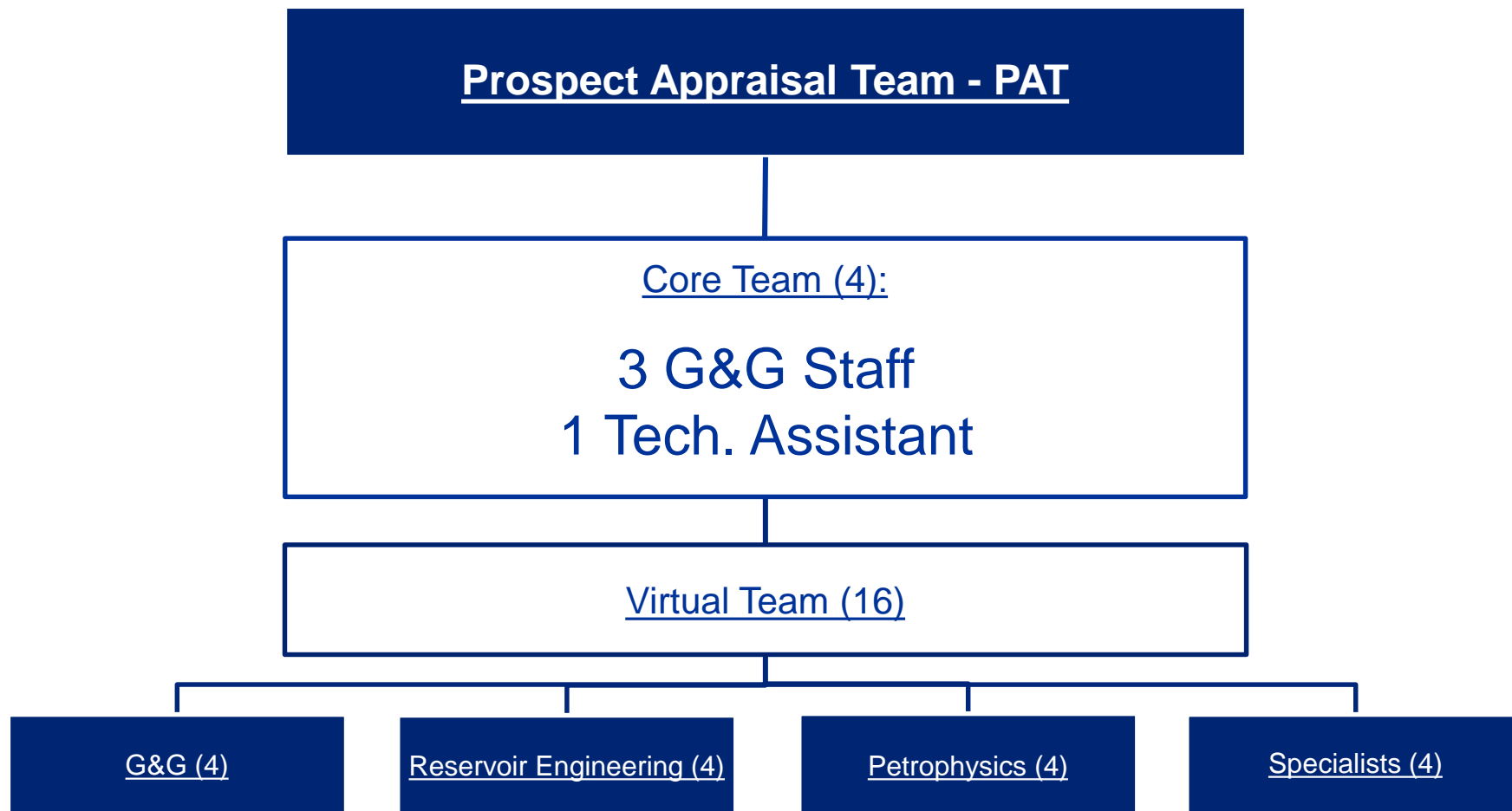


Prospect Appraisal: Learning from past performance

Executive Summary



- Prospect Appraisal Team (PAT) as part of subsurface governance responsible for implementing and safeguarding prospect evaluation standards
- Volume and Risk Analysis performed according to industry standards / Best Practice
- Guidelines and Standards ensure consistent, comparable, standardized evaluations
- Look-back analysis shows post-drill performance in agreement with pre-drill predictions

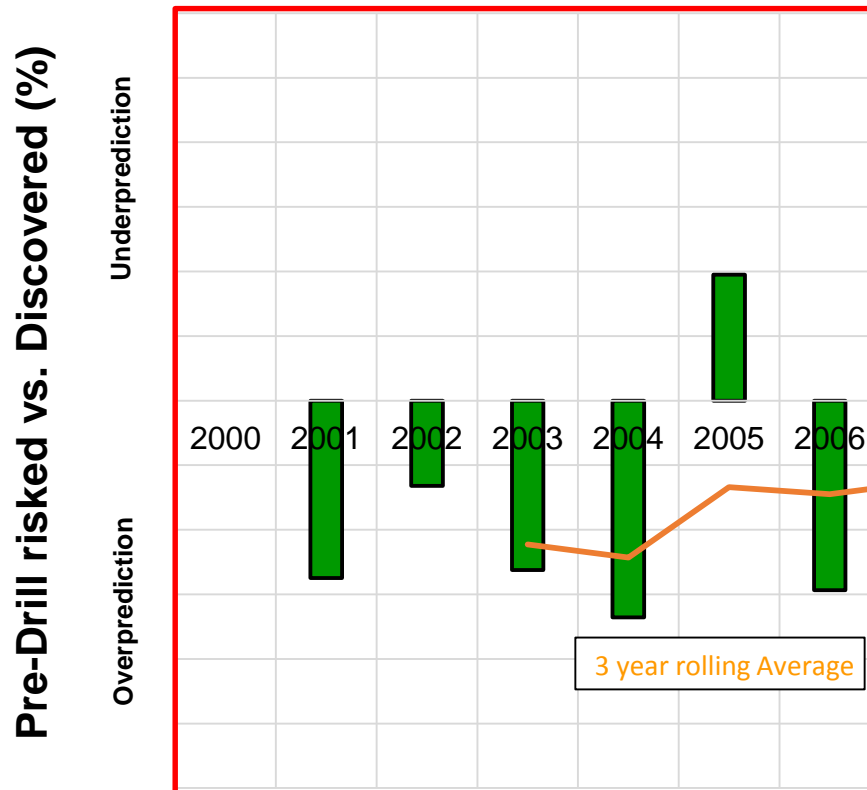


Prospect Appraisal: Learning from past performance

2000 – 2006 Volume Prediction



Predicted versus Actual Volumes



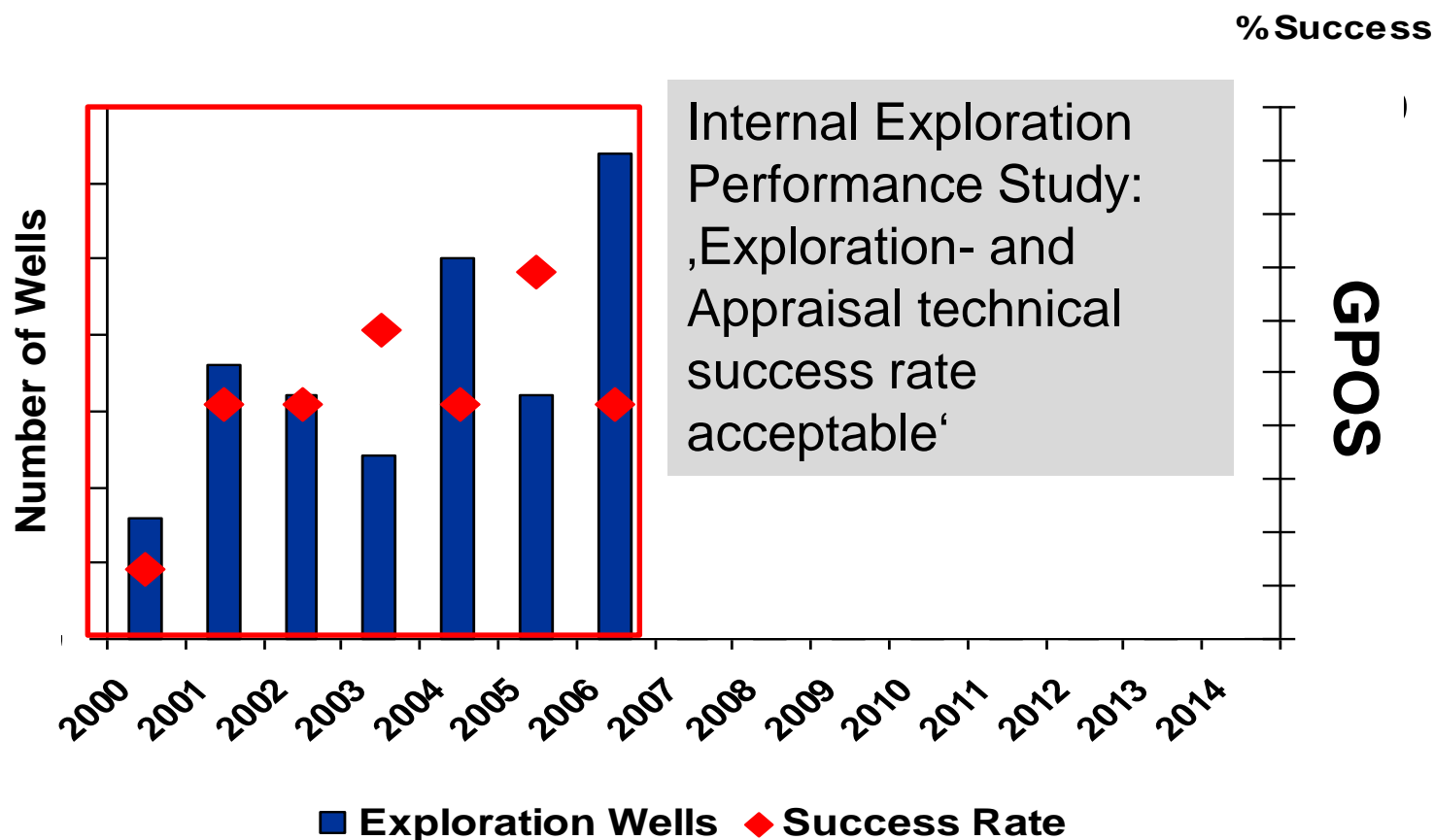
Internal Exploration
Performance Study:
,Subsurface evaluation
consistently overpredicts
volumes‘

Prospect Appraisal: Learning from past performance

2000 – 2006 Technical Success Rate



Number of Wells and Success Rate



Prospect Appraisal: Learning from past performance

2007 – Exploration Performance Study



Internal Study Results

- ...
- Exploration- and Appraisal technical success rate acceptable
- Subsurface evaluation consistently overpredicts volumes
- ...

Recommendations

- ...
- Establish technical **workflows** to improve volumetric prediction
- Implementation of new **tools**
- Exploration **Organization**
- Corporate exploration strategy to enable balanced portfolio
- Central portfolio management to improve exploration efficiency
- Interaction with Approval Process
- ...

Prospect Appraisal: Learning from past performance Workflows



- PAT Guidelines
 - Systematic documentation
 - Formal framework for pre- and post-drill analysis
 - Yearly updates to incorporate learnings from the past
- Performance Tracking started in 2008
 - Carried out yearly by PAT Group

Wintershall Prospect Appraisal Standard



GLOBAL-EXP-ST-001 M

INTERNAL

Wintershall Prospect Appraisal Standard

| | |
|---------------------------------------|----------------------------------|
| Issue | 15.04.2015 |
| Commitment category | Mandatory |
| Application region | Global - Wintershall all regions |
| Function code | Subsurface |
| Type | Standard |
| Discipline | Exploration |
| Aligned with | Global |
| Source language | English |
| Published in | Wintershall Intranet |
| Application by | Employees of Wintershall |
| Replaces | |
| Replaced by | |
| Latest review / next scheduled review | |
| Author / contact person | Ulrich Moller, ESGP |
| Further Contact Person | |



- Training
 - Rose & Associates Training course 'Quantification of Geological Risk for Prospect and Play Analysis'
- PAT Review Day
 - To discuss last years results, identify areas of improvement, share learnings and agree on way forward



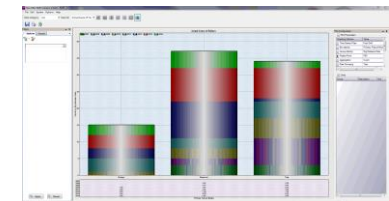
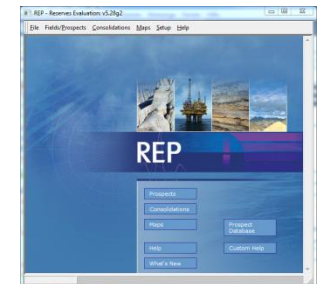
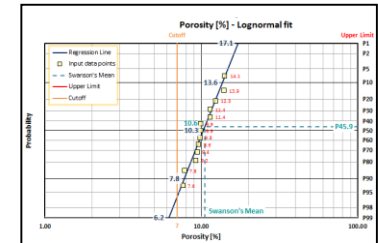
A subsidiary of BASF – The Chemical Company

Prospect Appraisal: Learning from past performance

Tools



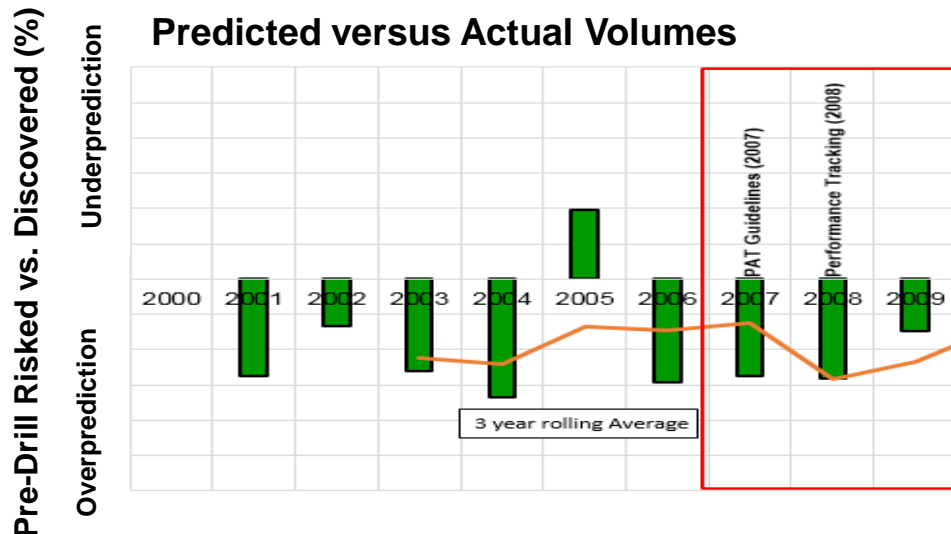
- REP Input Tool
 - Allows for creation of unbiased input for REP
- REP (Reserves Evaluation Program by Logicom EP)
 - State-of-the-art commercial software tool for evaluation of risks and uncertainties in leads and prospects
- RAPT (Risk Analysis Portfolio Tracker by 3esi)
 - Performance tracking to identify systematic bias in exploration
 - Provides standardized result summaries based on pre-versus post-drill data



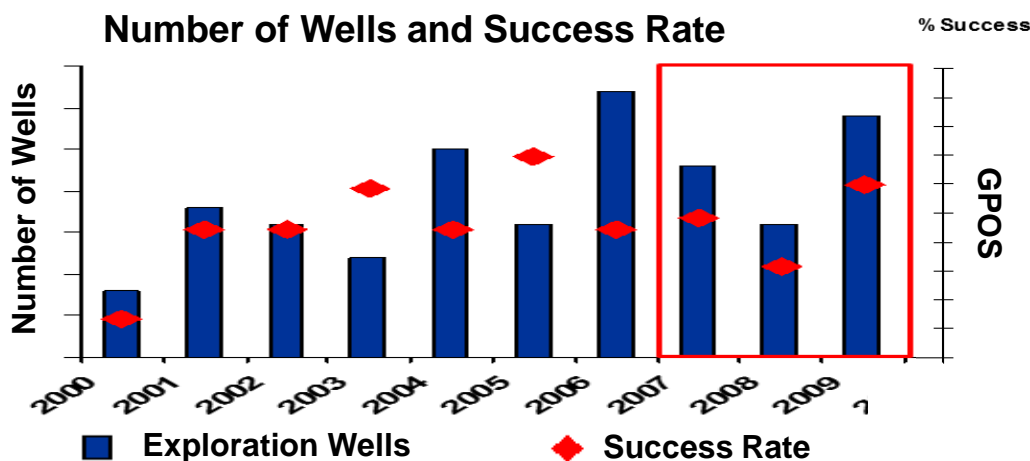
⇒ **Workflows and Tools aim towards a consistent, comparable, standardized evaluation**

Prospect Appraisal: Learning from past performance

2007 – 2009 Performance



First effects of measures can be seen in 2009 after implementation of PAT Guidelines (2007) and Performance Tracking (2008).



Technical success rate remains stable

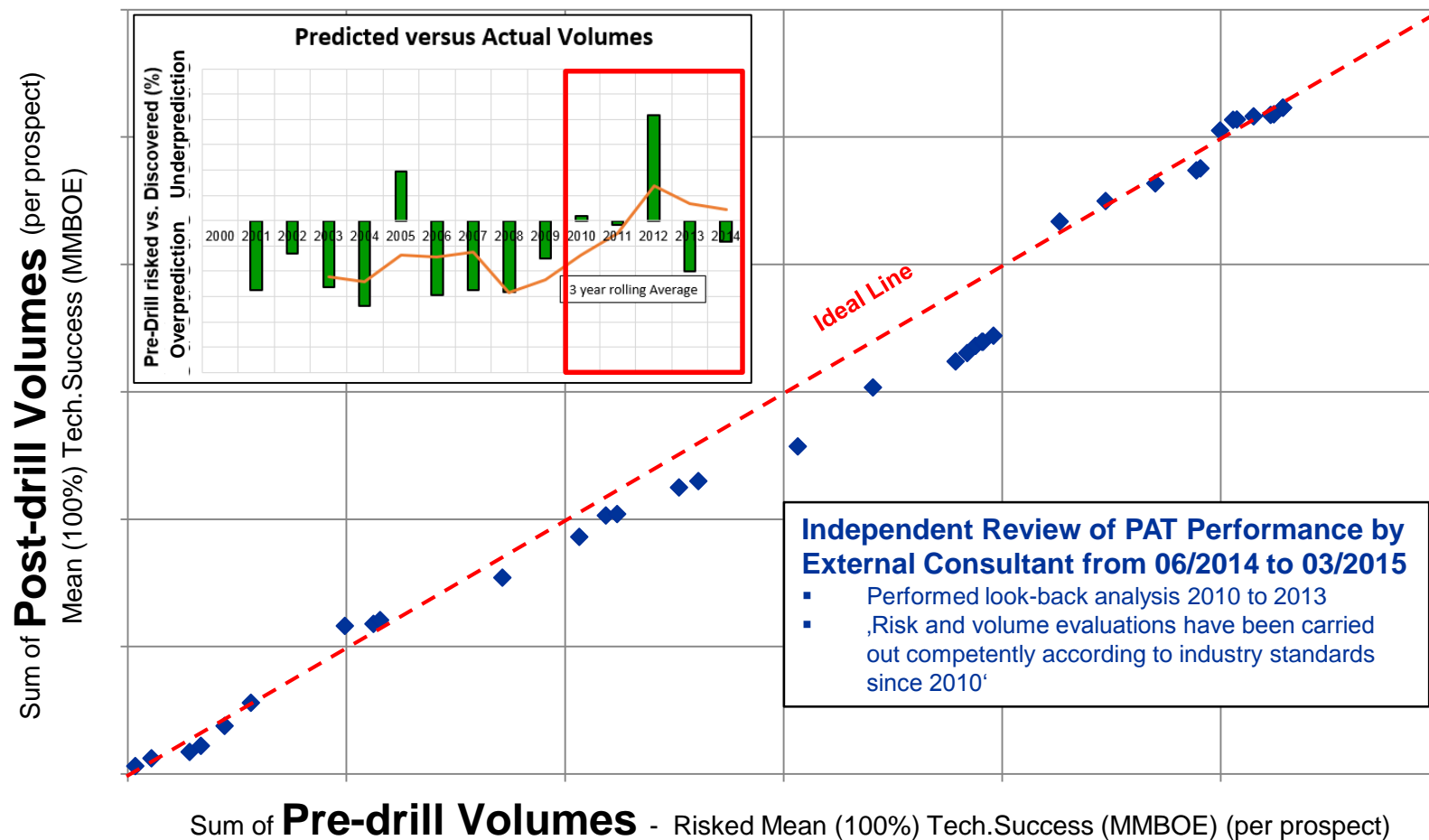
Prospect Appraisal: Learning from past performance 2010 - 2014



- Independent Review of PAT Performance by External Consultant from 06/2014 to 04/2015
 - Performed look-back analysis 2010 to 2013
 - ,Risk and volume evaluations have been carried out competently according to industry standards since 2010‘
 - Support PAT Team in update of PAT Guidelines
 - Support in GeoX Implementation

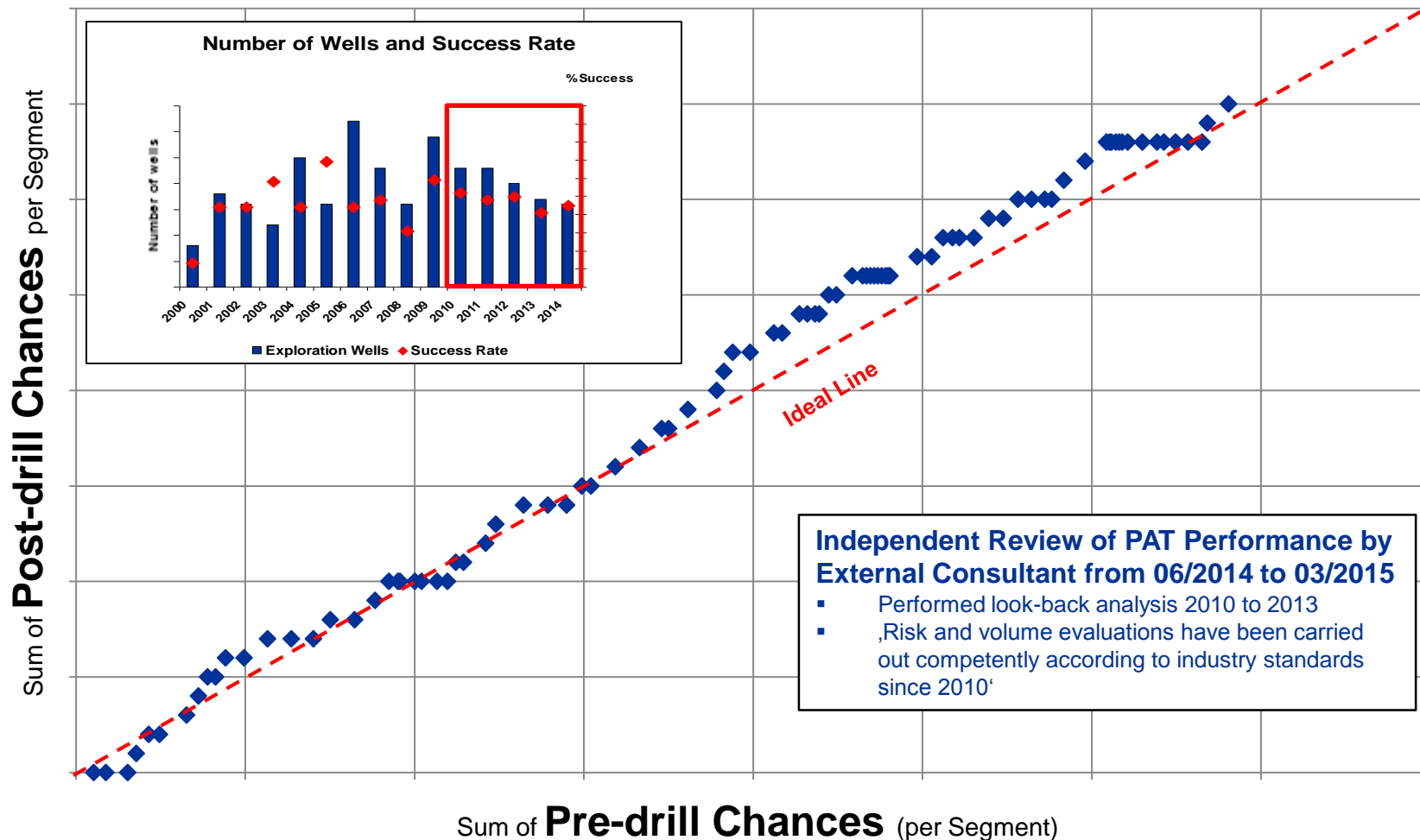
Prospect Appraisal: Learning from past performance

2010 – 2014 Volume Prediction



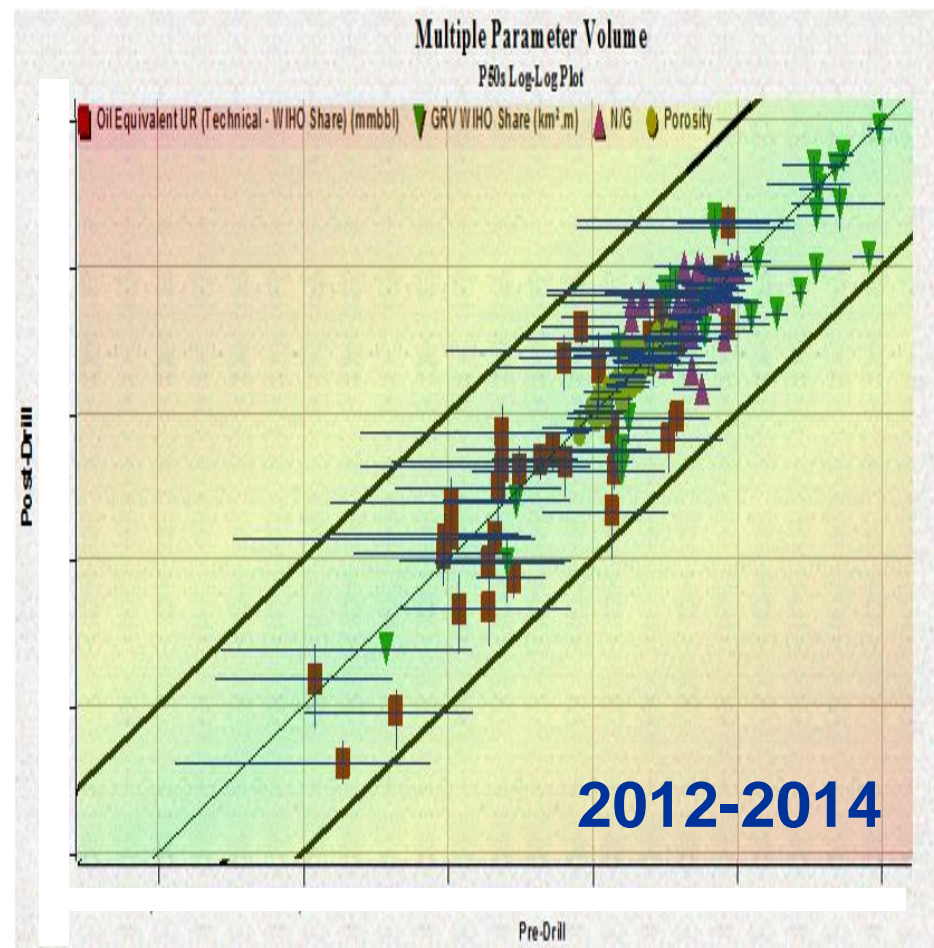
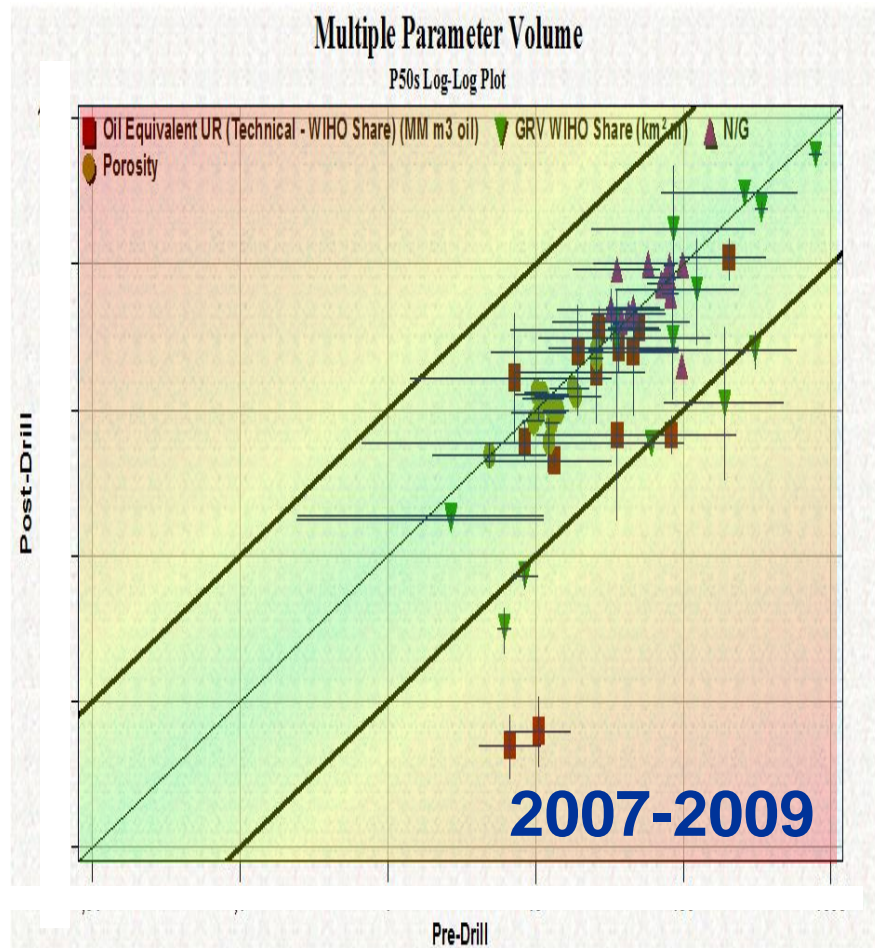
Prospect Appraisal: Learning from past performance

2010 – 2014 Risk Evaluation



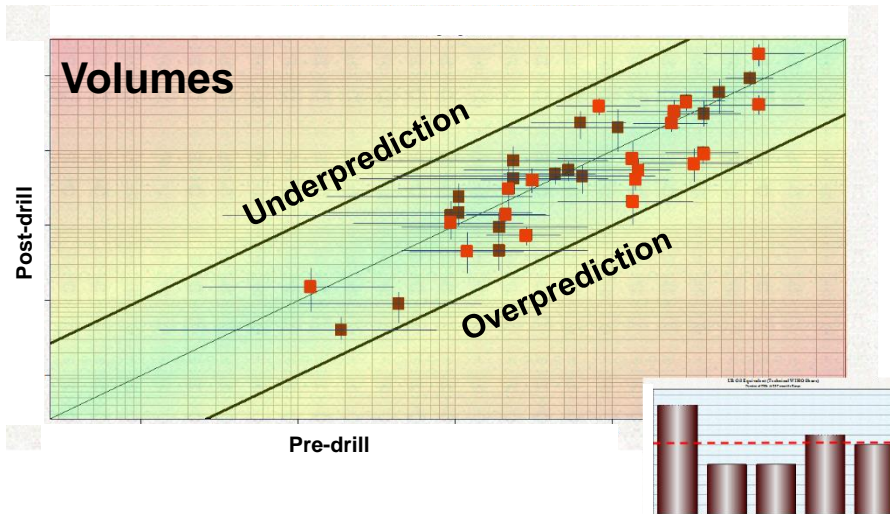
Prospect Appraisal: Learning from past performance

Multi Parameter Charts

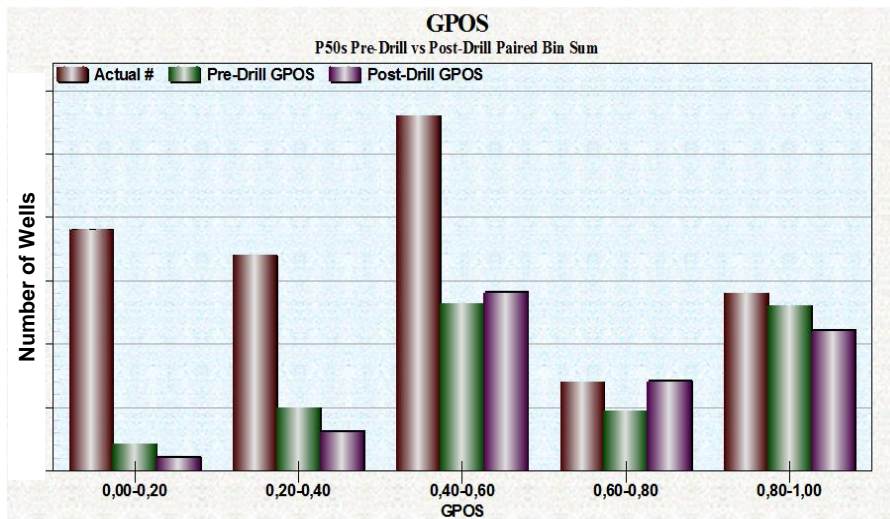
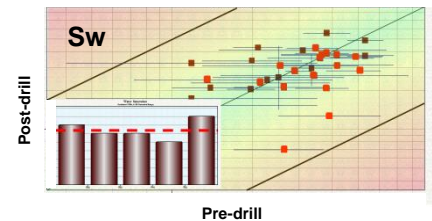
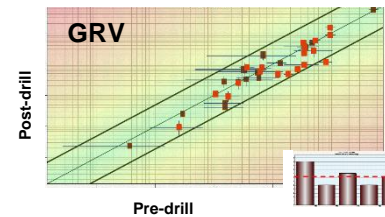


Prospect Appraisal: Learning from past performance

2012-2014 Performance Tracking

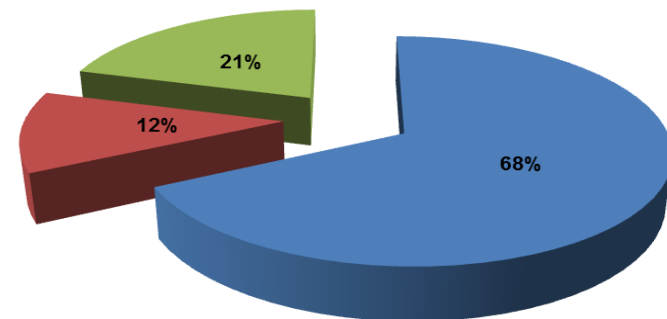


- Good performance overall and in individual parameter prediction
- GPOS prediction in line with pre-drill expectations
- Risk profiles / Failure reason prediction good



Prediction of Failure reasons 2012-2014

■ Primary right ■ Secondary right ■ Both wrong

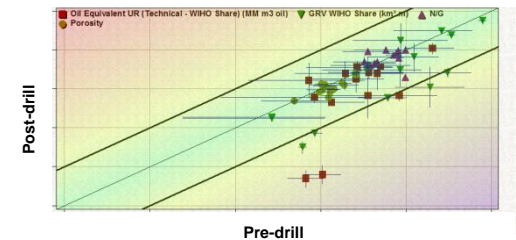
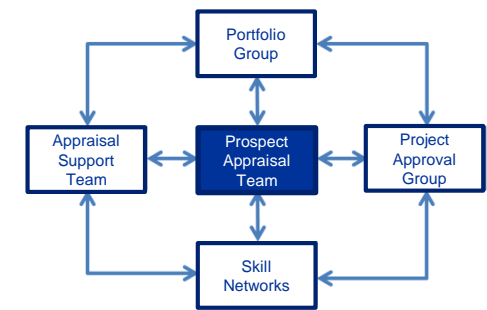
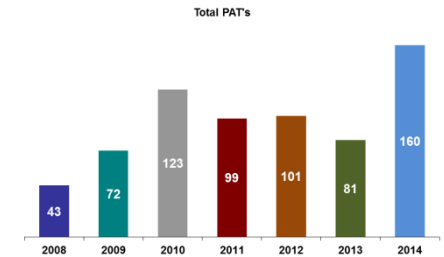


Prospect Appraisal: Learning from past performance

PAT Group – Tasks and Targets



- Perform Pre-PAT / PAT / Post-PAT sessions as requested
- Inform, align and communicate with Portfolio Group, Project Approval Group, Skill Networks and Appraisal Support Team
- Keep PAT Guidelines up-to-date
- Perform Look-back analysis
- Governance to safeguard Prospect Appraisal



Prospect Appraisal: Learning from past performance

PAT Group – Initiatives



■ Time-Depth Conversion

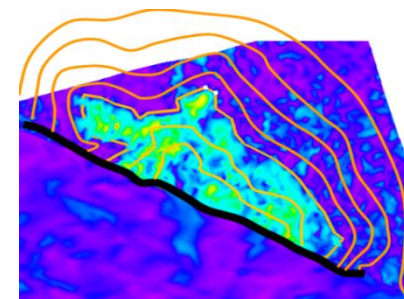
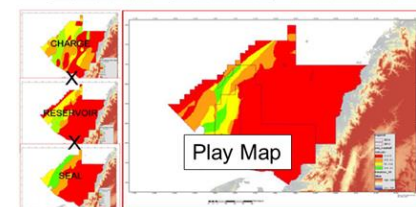
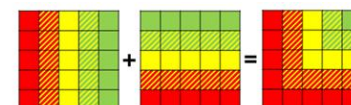
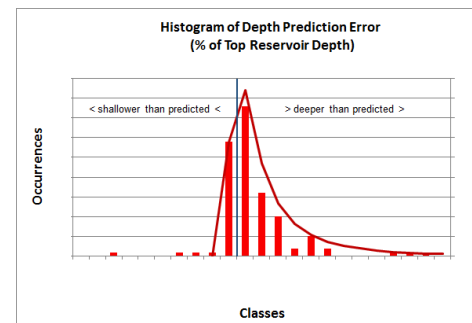
- Initiated by PAT Team assessing past TDC performance.
- Increased training efforts and TDC best practice document.

■ Play Based Exploration

- Supported by PAT team to enable sustainability and growth of the Wintershall exploration portfolio by selecting the most prospective areas (sweet spots) for future exploration activities
- Provide Play Assists to technically support and review play map generation and Yet-to-Find analysis

■ DHI supported Prospects

- Study performed by Geophysics Skill Network
- Results incorporated in PAT Guidelines



Prospect Appraisal: Learning from past performance

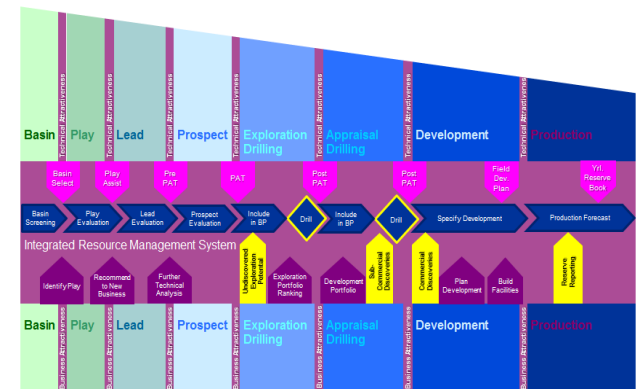
Challenges ahead



- Maintain high predictability in terms of volume and risk prediction
- GeoX as a new evaluation tool
 - Part of and actively supporting the GeoX implementation team
 - Introduction of new software
- Embed Play Based Exploration into the Wintershall exploration process



GeoX 6.2



Prospect Appraisal: Learning from past performance

Summary

PAT is

- A governance tool to safeguard prospect appraisal
- An enabler for exploration success



END