



First Digital Drilling Analytic and Advisory Service in **Pertamina**:

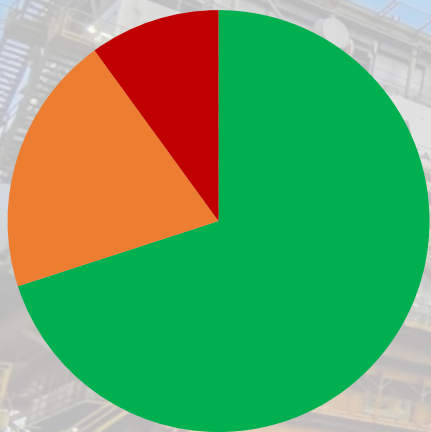
The Journey to Reduce Invisible Lost Time on Pertamina Hulu Kalimantan Timur Offshore Drilling Campaign

Ramadhana Aristya

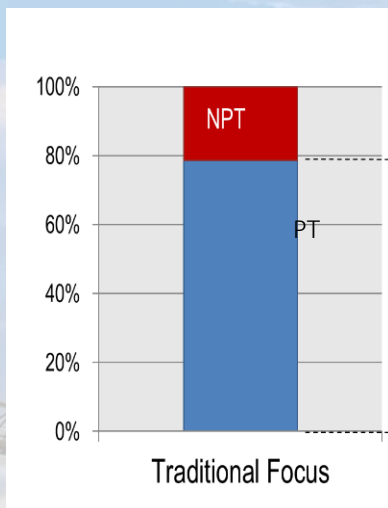
Drilling Engineer - Pertamina Hulu Kalimantan Timur
(R3Z10)

Background

New Focus



- ILT (Invisible Lost Time)
- NPT (Non Productive Time)
- Technical Limit



- NPT : Non Productive Time
- PT : Productive Time
- ILT : Invisible Lost Time / Hidden Downtime

East Kal Block handover from Chevron to Pertamina in 2018

Drilling campaign acceleration
 Limited drilling personnel resources
 Drilling campaign accelerated for 2019 – 2022

Necessity to apply quick learning curve in drilling

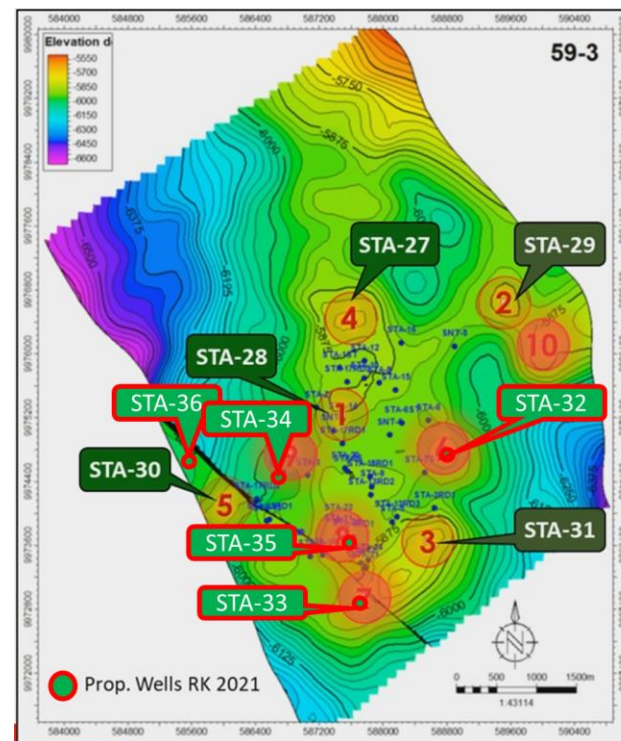
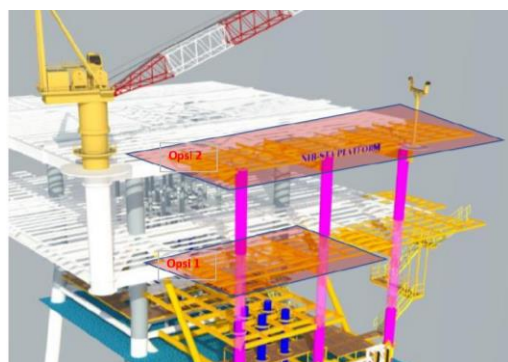
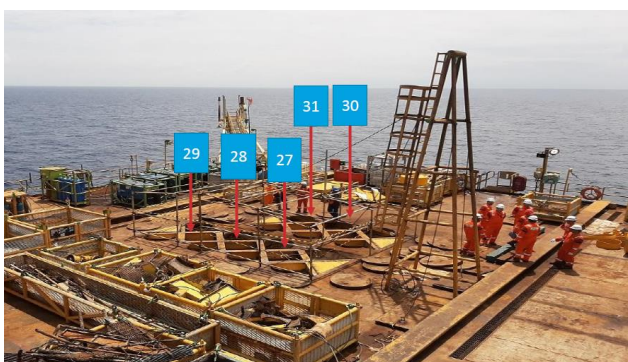
	Casing	Tripping	Drilling
Connection Time	Connection Time	Connection Time	Connection Time
Running In	Tripping Up / Down	Reaming	
...	...	Circulation	

SANTAN (STA) Drilling Campaign: Phase 1 & 2



STA Phase 1 campaign (STA-27 to STA-31) was drilled and completed in 2020 using AE-1 Rig: many issues encountered related to equipment & personnel performance.

STA Phase 2 campaign (STA-32 to STA-36) planned to be drilled using same rig in 2022.



Digital Enablement – RigHour + Advisory

Multi well drilling performance analysis tool to compute and compare drilling KPIs

Surface sensor data is transformed into valuable performance information



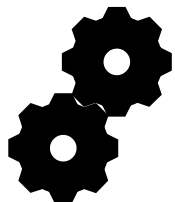
Google Chrome and mobile browser

ASCII Time and DDR processing and analysis

Daily Report, Section Report, End of Well Report

Operational Efficiency Methodology

Analyze and identify the problem



Analyze entire well construction data

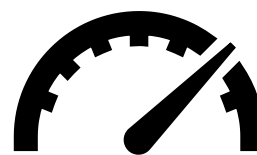
Set the benchmark



Estimate best composite time per activity and well

Capture lesson learnt & set target for campaign

Performance Monitoring



Measure, quantify and monitor improvements

Prioritize operations to focus

Continuous Improvement



Evaluate entire rig fleet and transfer lessons learned for next well

Planning

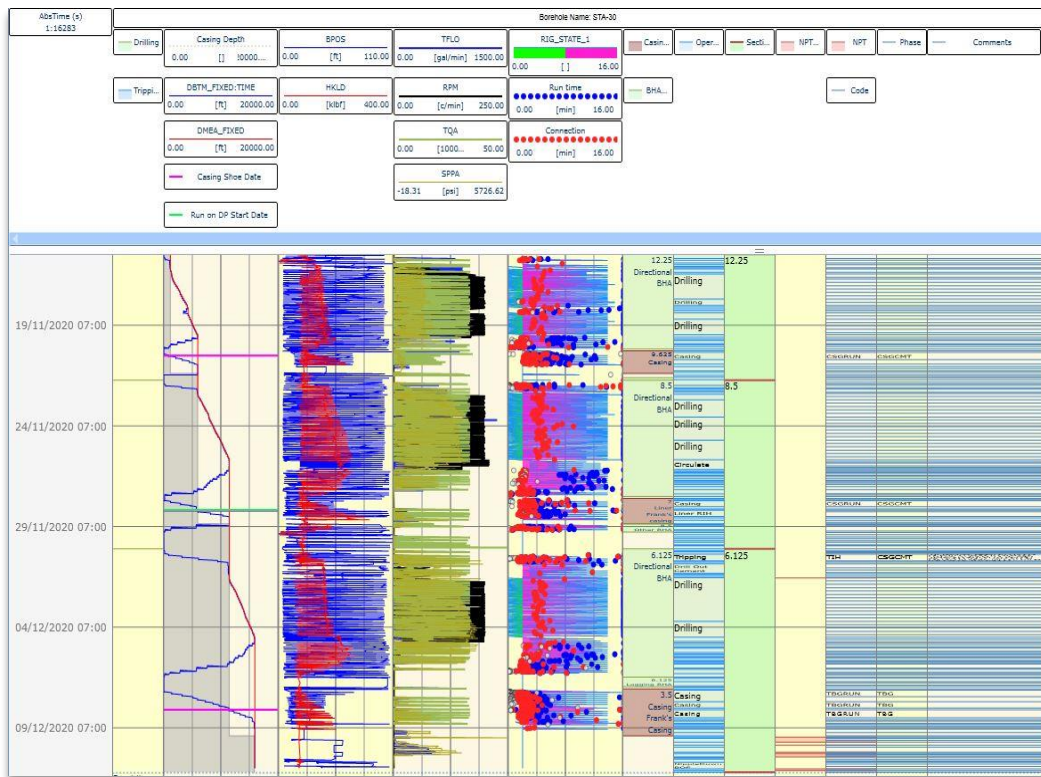
Execution

Planning – KPI

Surface Operation	BHA Handling	Tripping	Drilling	Running Casing	Completion
<ul style="list-style-type: none"> • N/U Diverter • N/U Wellhead • N/U BOP • Pressure test BOP • N/D BOP 	<ul style="list-style-type: none"> • M/U Drilling BHA • Racking back BHA • L/D Drilling BHA 	<ul style="list-style-type: none"> • Average Speed Tripping in cased hole • Average Speed Tripping in open hole • Average Speed Tripping out open hole • Average Speed Tripping out cased hole 	<ul style="list-style-type: none"> • Drilling Weight to Weight (Pre-connection, Connection and Post Connection • On Bottom ROP • Average ROP 	<ul style="list-style-type: none"> • Casing Average Speed Tripping in cased hole • Casing Average Speed Tripping in open hole • Cement job Casing/Liner 	<ul style="list-style-type: none"> • Tubing Average Speed Tripping in cased hole • Tubing Average Speed Tripping in open hole • Tubing cementing job • Wellbore clean out • N/D BOP in completion • Wellbore Clean Out

Planning – Data Gathering & BCT Analysis

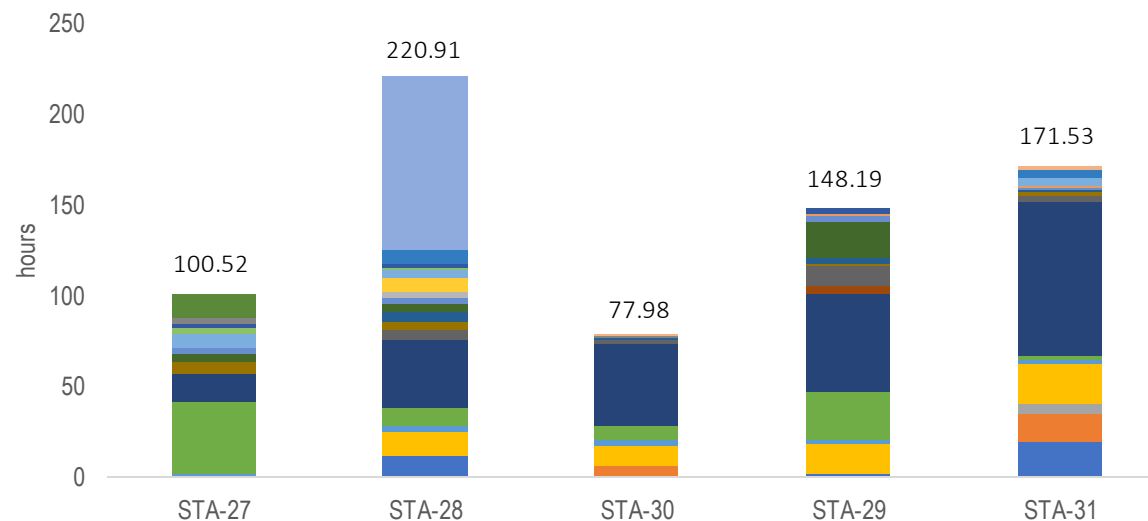
Data Gathering and Upload



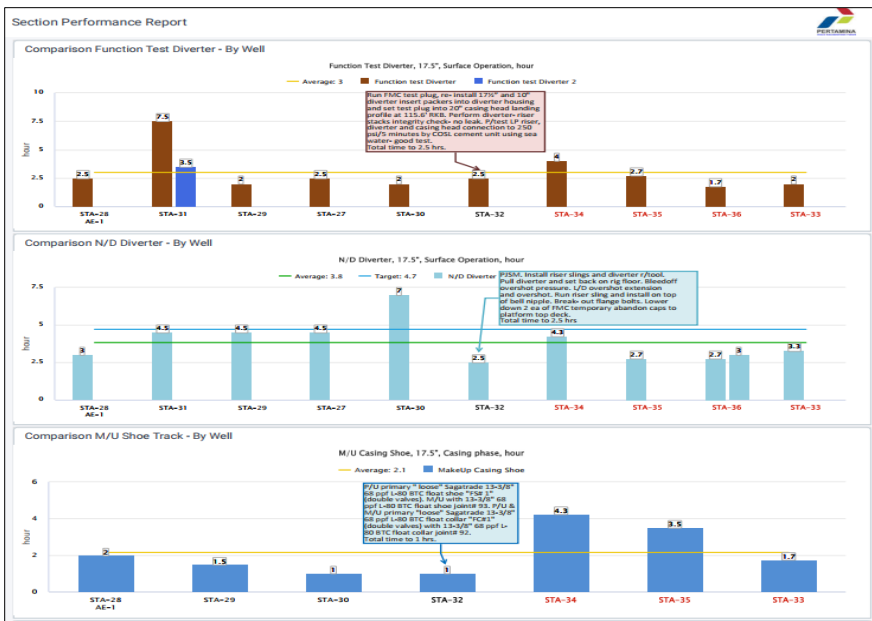
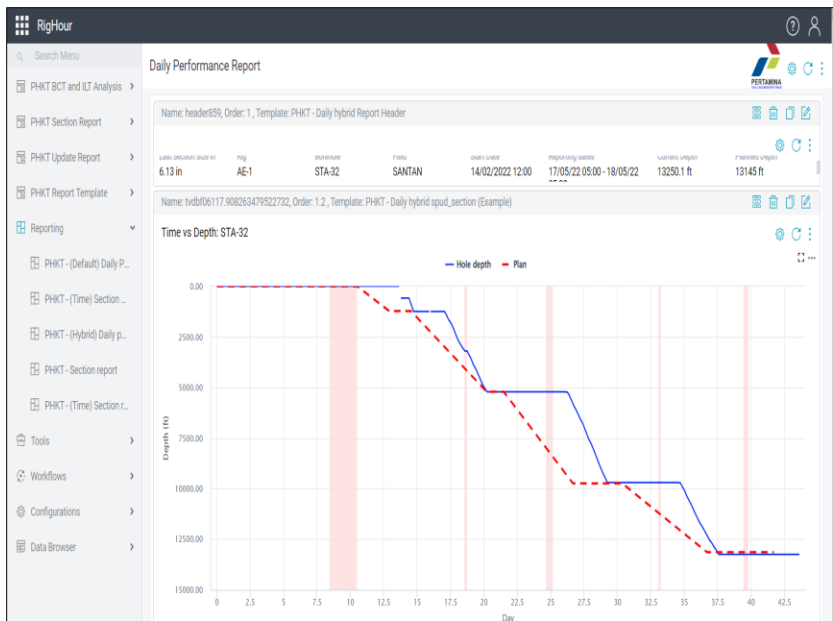
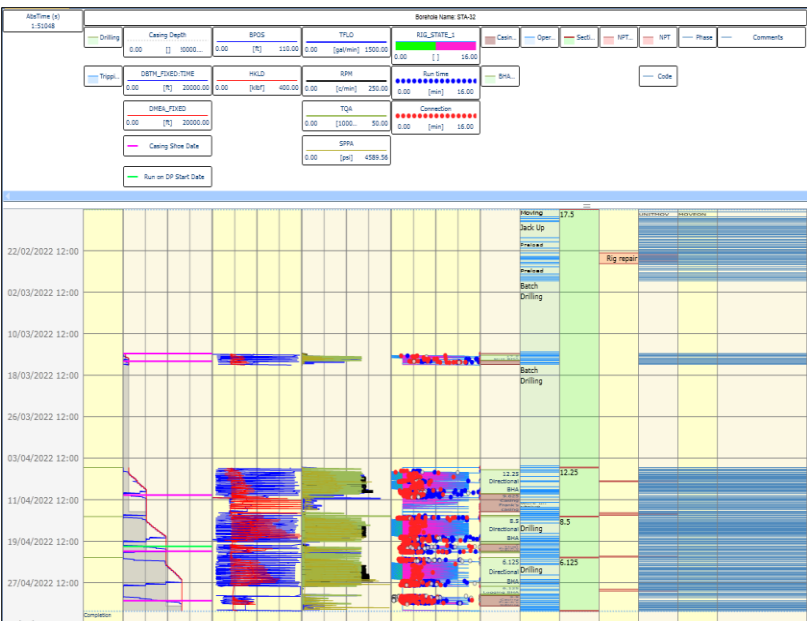
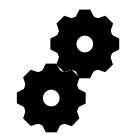
BCT and ILT



- Rig Preparation
- P/U, M/U & RIH BHA to TD
- POOH, L/D BHA
- RIH CSG to TD
- Test BOP
- Rig Maintenance
- Poolh Liner Running Tool
- Cementing Plug
- Diverter Work
- DOC/Drill Out Shoe
- Wellhead works
- Cement CSG/LNR
- LOT/FIT
- Wireline Logging
- Press Test Casing
- Cement TBG
- Diverter Test
- Drilling to CSG Point
- Wellhead
- BOP Works
- Logging Pipe
- Run Liner
- RIH Tbg
- Well Monitor and Slickline



Execution - Current Journey



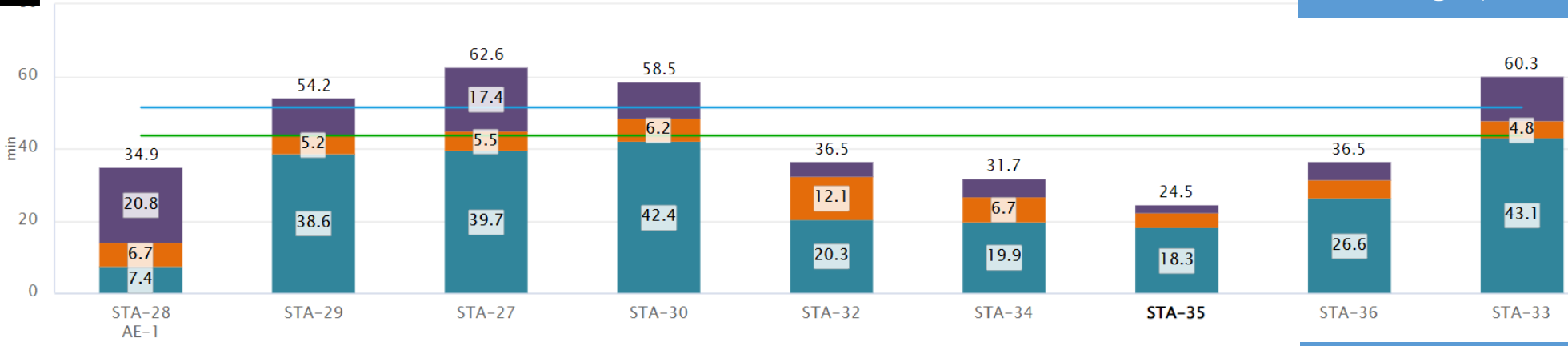
Execution – 17-1/2” Hole Section Drilling W2W



Weight-to-Weight time, 17.5", Drilling, min

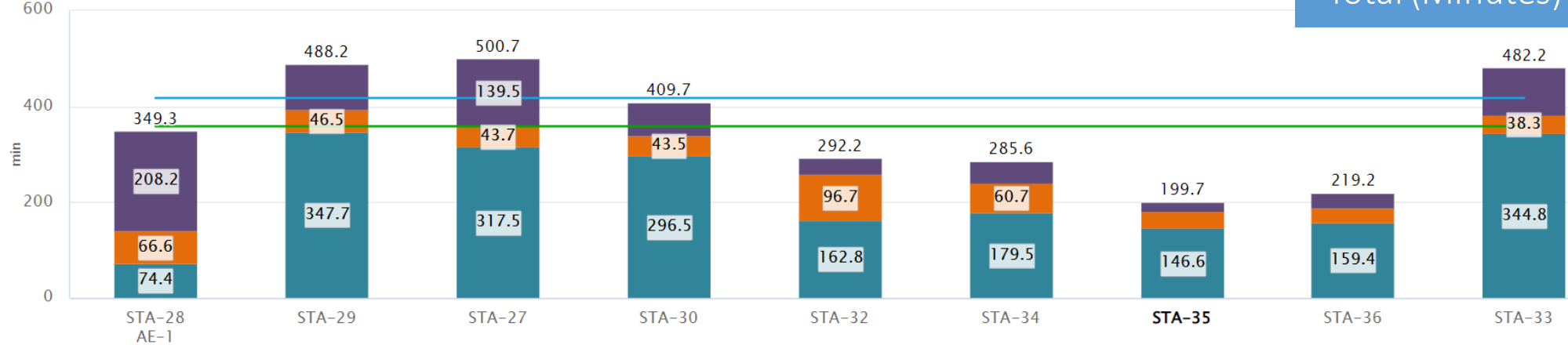
Average: 43.6 Target: 51.4 Pre connection time Connection time Post connection time

Average (Minutes)



Average: 358.5 Target: 417.6 Pre connection time Connection time Post connection time

Total (Minutes)



Improvement STA-35:
295 mins /
4.91 hrs /
0.20days

Inc.: 0.05 deg

Inc.: 17.67 deg

Inc.: 14.72 deg

Inc.: 14.99 deg

Inc.: 27.83 deg

Inc.: 17.93 deg

Inc.: 9.02 deg

Inc.: 36.3 deg

Inc.: 6.03 deg

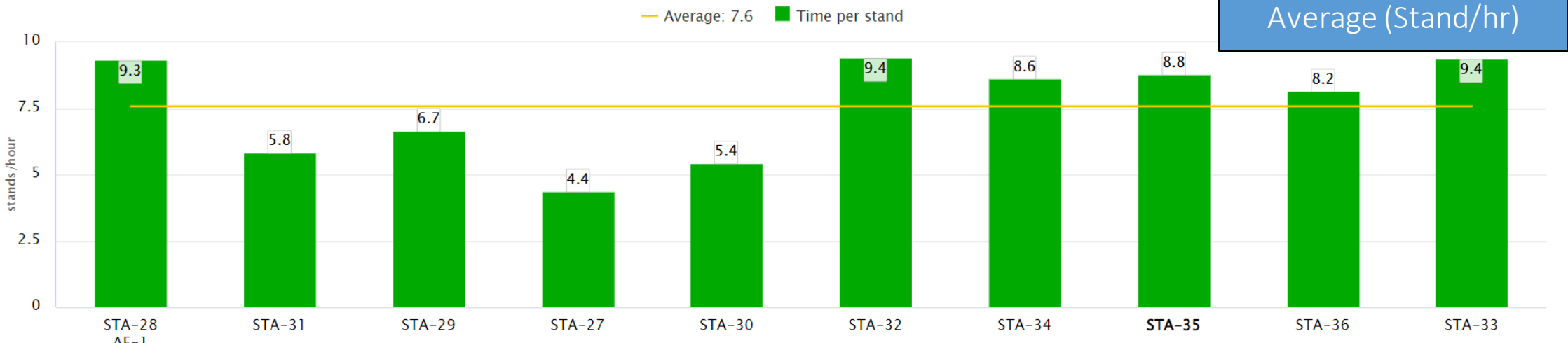
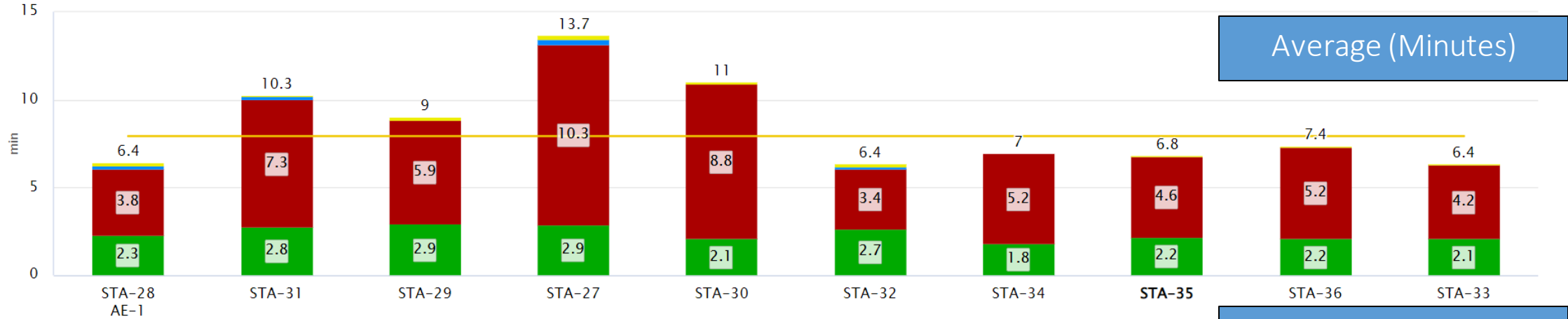
Execution – 8-1/2” Hole Section Trip Out OH



Composite Stand Time, POOH, 8.5", min

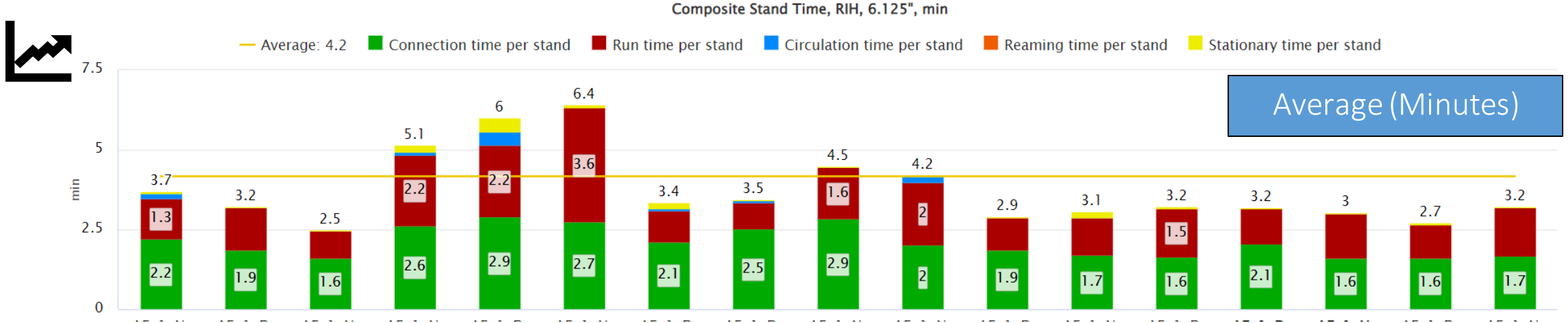
☰ ...

— Average: 7.9 ■ Connection time per stand ■ Run time per stand ■ Circulation time per stand ■ Reaming time per stand ■ Stationary time per stand

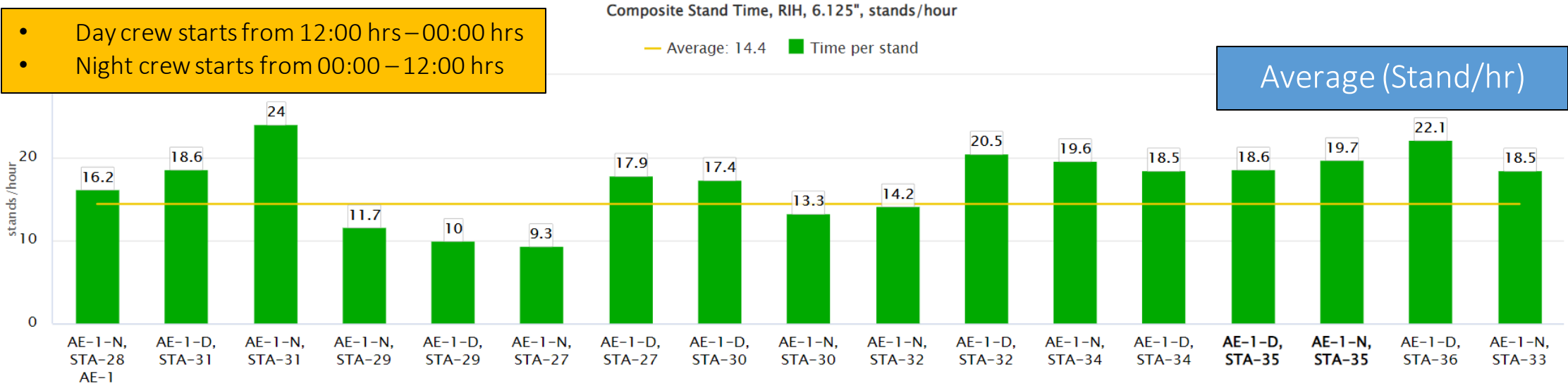


Inc.: 62.97 deg Inc.: 19.83 deg Inc.: 21.9 deg Inc.: ?? deg Inc.: 46.99 deg Inc.: 32.62 deg Inc.: 10.44 deg Inc.: 19.85 deg Inc.: 41.66 deg Inc.: 44.21 deg

Execution – 6-1/8” Hole Section Trip In CH (with Crew Comparison)



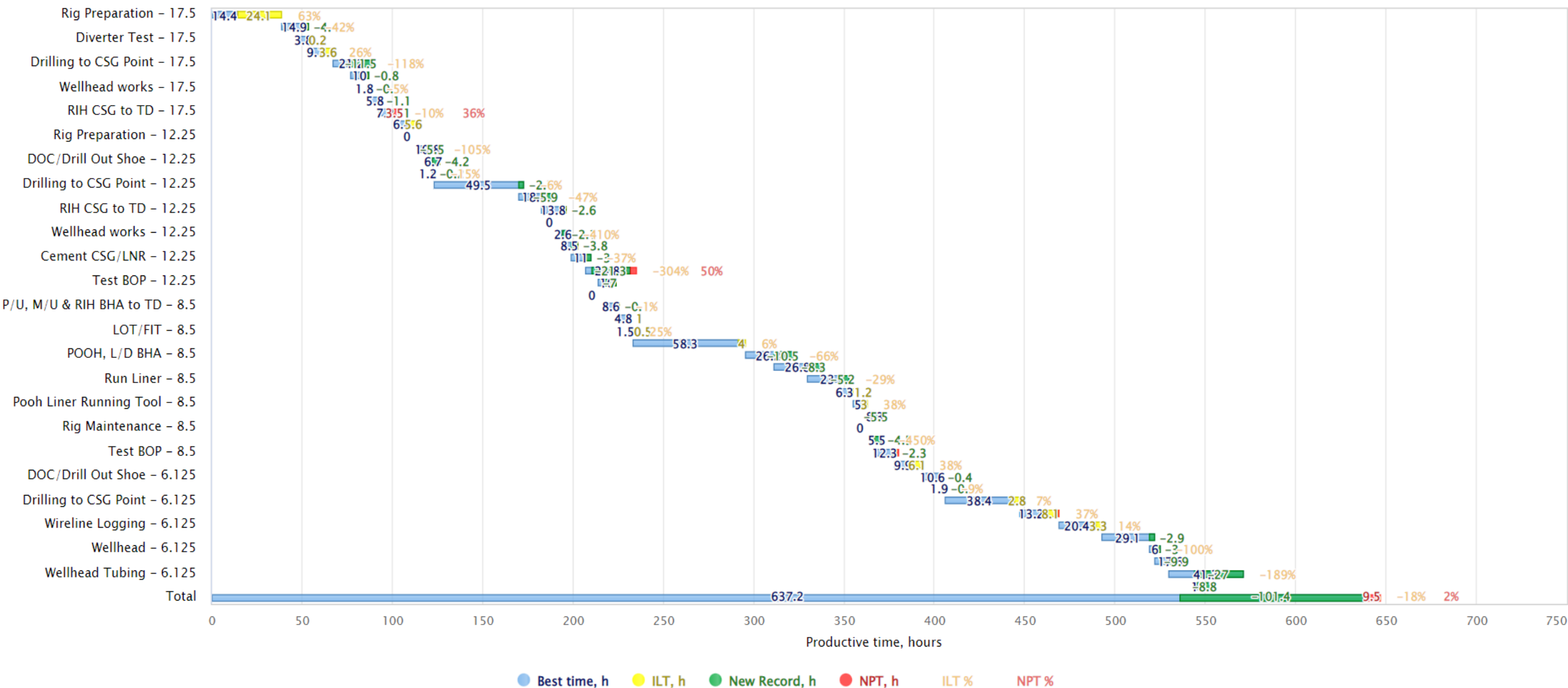
- Day crew starts from 12:00 hrs – 00:00 hrs
- Night crew starts from 00:00 – 12:00 hrs



- Inc.: ?? deg
- Inc.: 19.47 deg
- Inc.: 8.06 deg
- Inc.: 47.97 deg
- Inc.: 33.15 deg
- Inc.: 11.73 deg
- Inc.: 20.0 deg
- Inc.: 33.55 deg
- Inc.: 32.91 deg

Execution – BCT Well Opportunity Analysis

Well: STA-34. Best, ILT, NPT

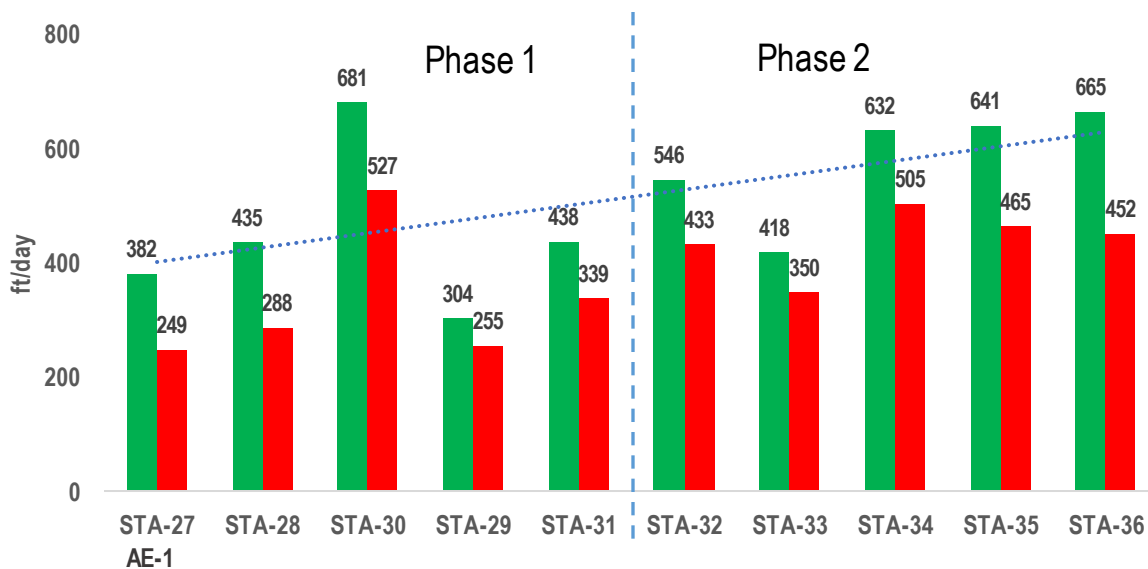


Execution – Monitoring and Advisory

Monitoring



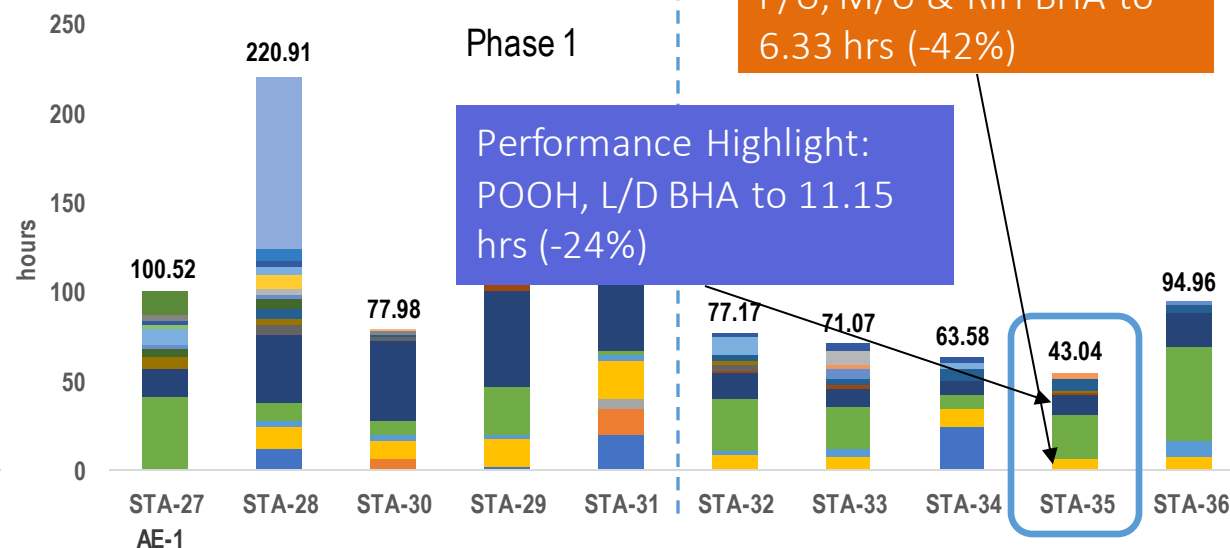
- Footage per day per borehole: Spud to TD & Spud to Rig Release, ft/day
- Footage per day per borehole: Spud to TD
- Footage per day per borehole: Spud to TD & Spud to Rig Release, ft/day
- Footage per day per borehole: Spud to RR



Advisory

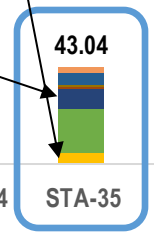


- Rig Preparation
- DOC/Drill Out Shoe
- Wellhead
- Test BOP
- Wireline Logging
- RIH Tbg
- Wellhead Tubing
- Diverter Work
- Drilling to CSG Point
- RIH CSG to TD
- LOT/FIT
- Run Liner
- Cementing Plug
- Completion BOP
- Diverter Test
- POOH, L/D BHA
- Cement CSG/LNR
- Logging Pipe
- Pool
- Cement
- P/U, M/U & RIH BHA to TD
- Wellhead works
- BOP Works
- Rig Maintenance



Performance Highlight:
P/U, M/U & RIH BHA to
6.33 hrs (-42%)

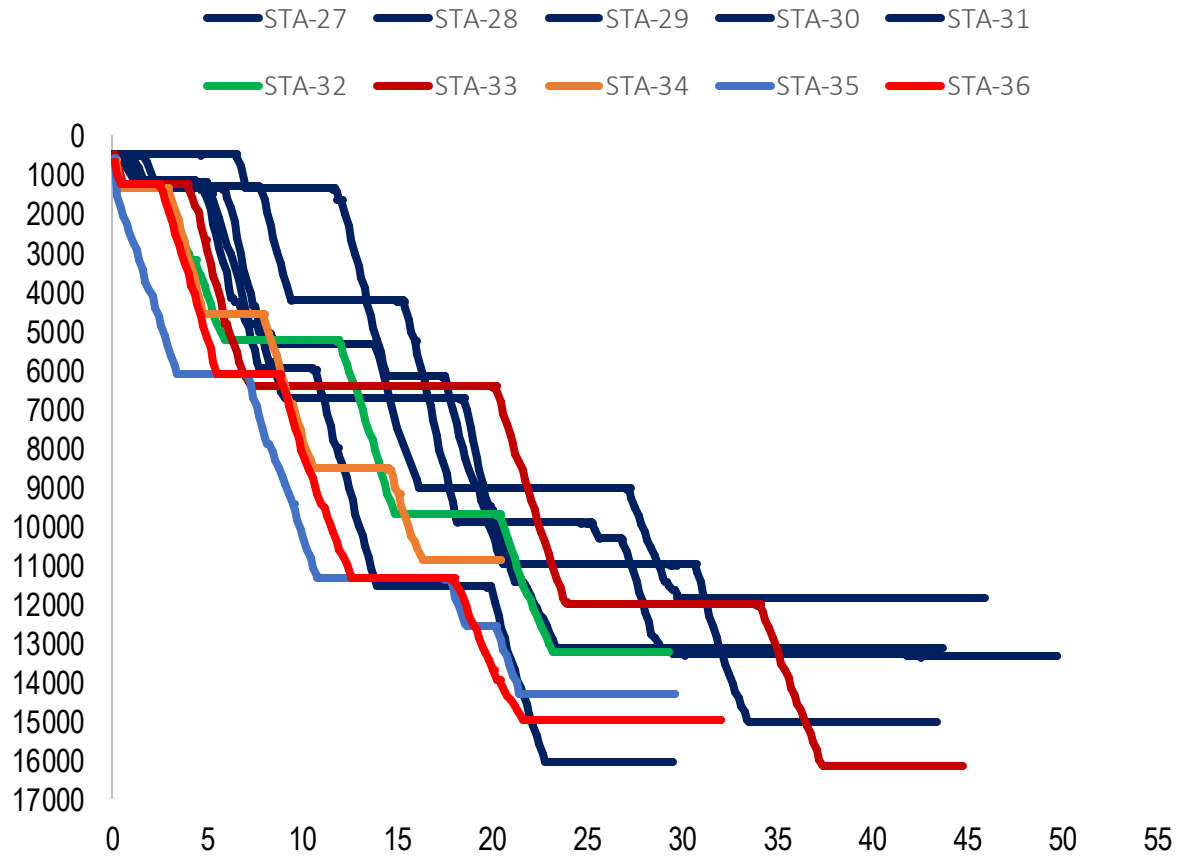
Performance Highlight:
POOH, L/D BHA to 11.15
hrs (-24%)



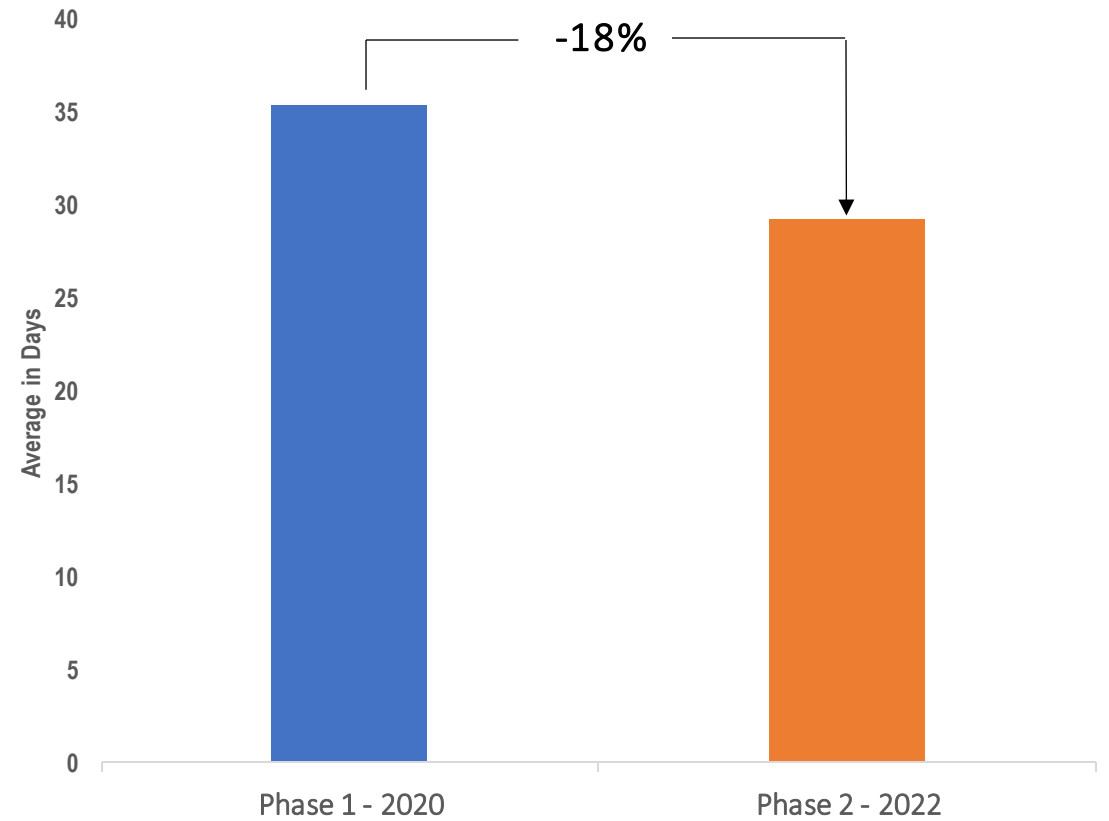
Results



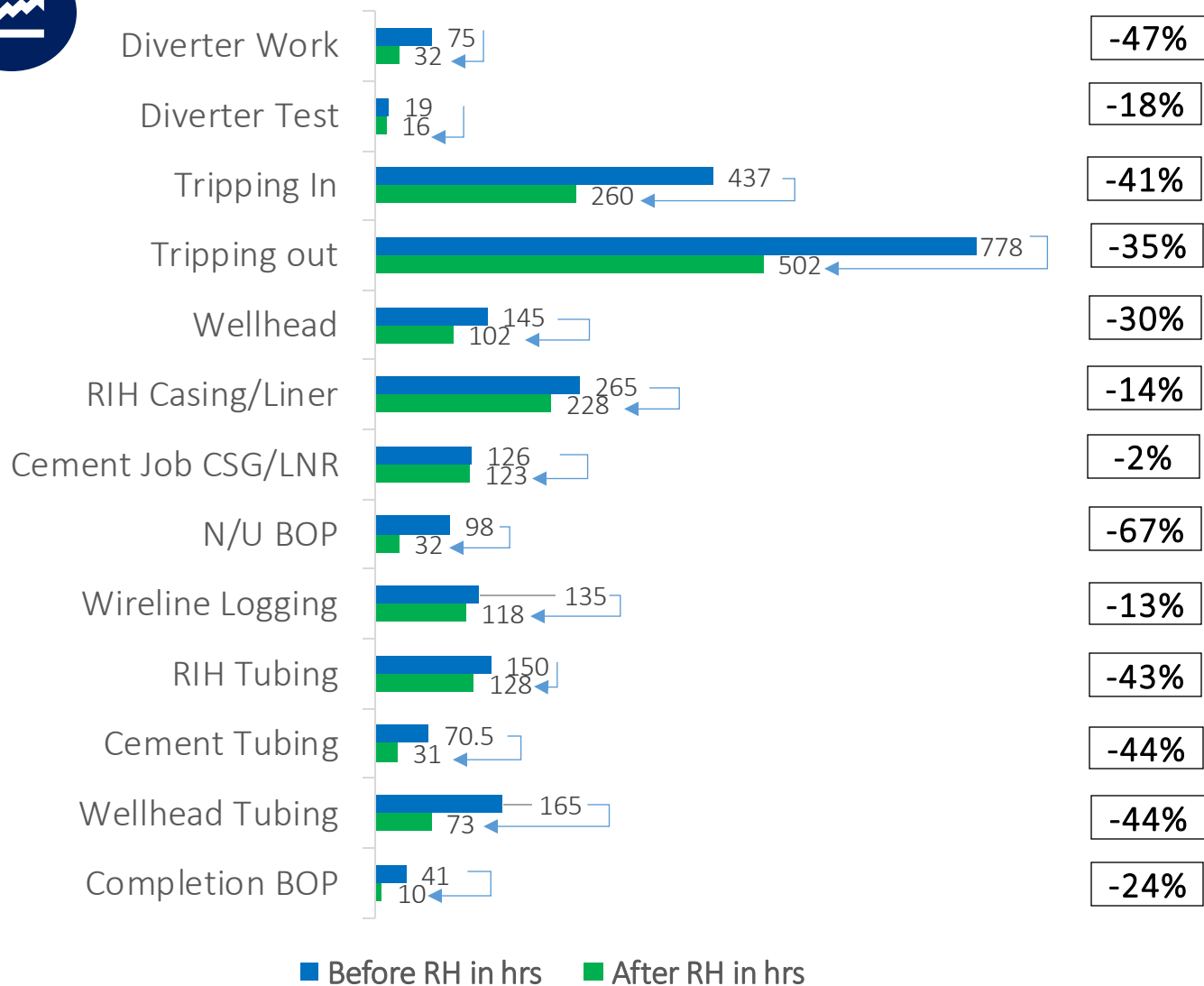
DVD Chart



PHKT Drilling Performance (Phase 1 vs Phase 2)



Continuous Improvement to Reduce ILT – Phase 1 vs Phase 2



Average Target - Moderate

~ 30 days savings

~ \$ USD 9.2 Million savings

Next journey: STA Phase 3 Drilling Campaign

Summary

- **RigHour** performance analysis + advisory service, combined with frequent performance review with Engineers, Superintendent, & Field personnel successfully reduce drilling days & cost on STA Phase 2 drilling campaign compared to Phase 1 drilling results.
- Reduction on well days and cost accomplished through identification of BCT (Best Composite Time) and ILT (Invisible Lost Time) in planning and monitoring phase.
- Room for improvement on some drilling KPI remains and requires commitment from all parties for better output – to be applied on next phase of STA drilling campaign (end of 2023).