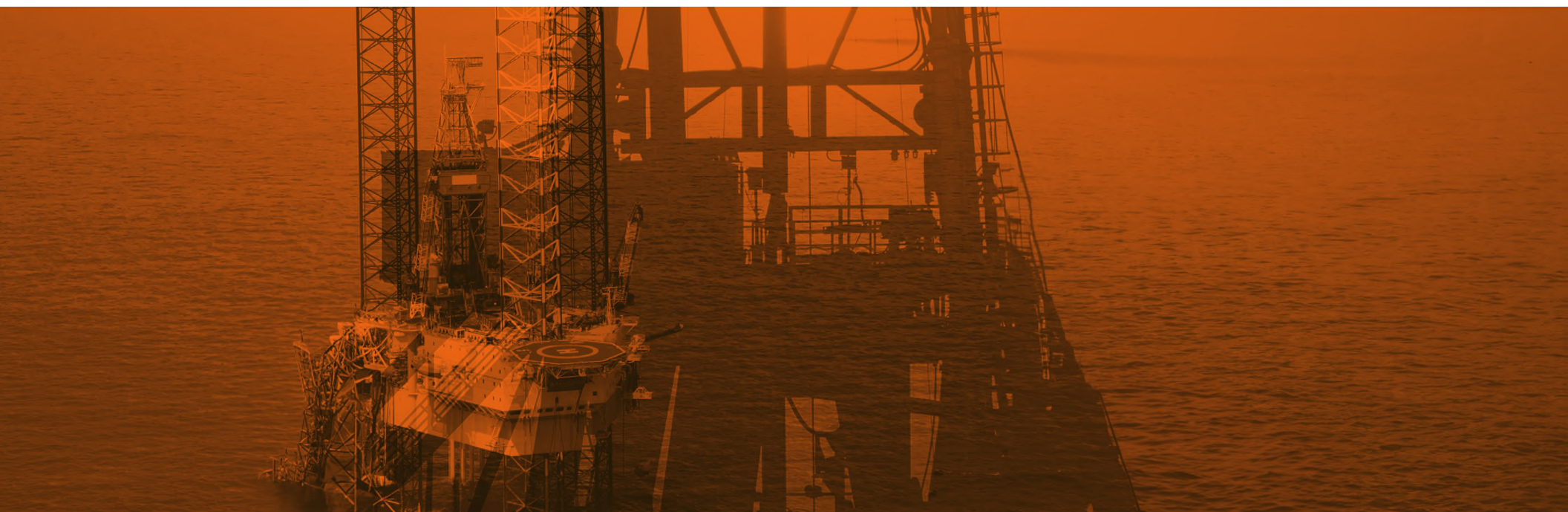




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Delivering Australia's Biggest Frac: A Step Change in Sand Logistics and Automated Bulk Handling Systems in the Remote Beetaloo Basin - EP25243

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Reliable.
Experienced.
Engaged.



Company Overview

Founded in 2012, inGauge Energy is a Well Engineering and Project Management company based in Brisbane, Australia.

With a technical expertise that covers all aspects of well engineering we at inGauge Energy are currently providing services to industry from design and feasibility studies right through to one-stop-shop full program execution. Our team has a breadth of experience that includes conventional oil and gas, geothermal, HPHT, and unconventional developments. By combining our direct knowledge of the Australian basins, local industry contacts and understanding of the unique challenges each field presents; we have the skills to deliver projects successfully.

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Projects Completed

Over the past 14 years, inGauge has established itself as Australia's largest well engineering project management firm, having completed:



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Agenda

01. Why Beetaloo Logistics Matter
02. History – Wells Drilled & Frac'd
03. C3H Frac: Setting the Benchmark
04. C5H Frac: The Numbers Behind the Biggest Frac
05. C3H vs C5H – Step Change in Scale
06. Sand Logistics: Distance, Volume & Storage
07. Last-Mile Sand Handling: From Bags to Bulk
08. Sand Tracking Performance: Proving System Accuracy
09. Equipment & Infrastructure: Site Setup and Operational Efficiency
10. Path Forward – Scaling Sustainably
11. What Comes Next: Zipper Fracturing and the 12 Stages/Day Target



Why Beetaloo Logistics Matter

The Beetaloo Basin is extremely remote, and planned frac jobs are **larger than anything previously done in Australia.**

- **Limited Infrastructure:** Nearest oilfield supply bases are ~3 days away by truck. Long supply lines and minimal local services make operations complex.
- **Seasonal Challenges:** Tropical wet seasons **flood roads for months**, halting access. Timing and planning around the weather are critical.
- **High Stakes:** Successfully scaling operations here could **unlock a major gas resource** to help alleviate Australia's energy needs, making logistics a matter of strategic importance.

History – Wells Drilled & Frac'd



Carp-1 Drill & Frac

DRILL Spud Sept 2020 | SLR183 Rig | **Vertical** to 1,915 m | 30 days

FRAC Jun 2021 | 4 stages | **1.4 MM lbs**

- Targets: Velkerri A, Intra A/B, B & C Shale
- Confirmed commercial gas in Velkerri B
- Baseline remote ops procedures established

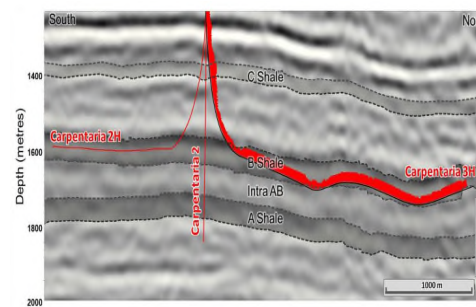


Carp-2H Drill & Frac

DRILL Spud Nov 2021 | SCD40 Rig | 3,150 m MD / **1,345 m lateral**

FRAC Jul–Aug 2022 | 21 stages | **6.3 MM lbs** | ~1,430 lbs/ft

- First horizontal well in the Beetaloo Basin
- Largest frac in Beetaloo at the time
- Flowback & production tested



Carp-3H Drill & Frac

DRILL Spud Oct 2022 | SLR185 Rig | 4,460 m MD / **2,632 m lateral** | <40 days

FRAC Dec 2022–Jan 2023 | 40 stages | **12.9 MM lbs** | 1,956 lbs/ft

- Doubled C-2H in scale
- 2–3 stages/day | conventional bag method | 35-day campaign
- Flowback & production tested



Carp-5H Drill & Frac ★

DRILL Spud Nov 2024 | Ensign 965 | 5,310 m MD / **3,310 m lateral** | 34 days

FRAC Early 2025 | 67 stages | **22.0 MM lbs** | 2,295 lbs/ft

- Longest shale lateral in Australia – nearly doubled C-3H
- First automated wet-sand conveyor in Australia
- First sustained 24-hour campaign | 20 days | Zero HSE

C3H Frac: Setting the Benchmark

2,632 m Lateral | Australia's Largest Frac at the Time | 12-Hour Campaign | SLB Frac Spread

12.9 MM

lbs proppant placed

~80

bbls/min pump rate

2–3

stages/day (peak 3)

1,956

lbs/ft intensity

~20 ML

total fluid

35 days

12-hour operations

- **Sand handling:** Conventional 1-tonne bags – crane-intensive, 24-hour loading crews required throughout campaign
- **Logistics:** Single SA supplier – 100+ triple-trailer loads over ~2,700 km, ~540,000 km cumulative road travel
- **Crane cycles could not keep pace:** limited to 2–3 stages/day despite 24-hour operations – sand handling was the rate-limiting step
- **Result:** New Australian record at the time | on time, under budget, zero HSE incidents



C5H Frac: The Numbers Behind the Biggest Frac

67 Stages | 3,310 m Lateral | Velkerri B Shale | 20-Day, 24-Hour Campaign | Halliburton Frac Spread

22 MM

lbs proppant placed

>105

bbls/min pump rate

>5

stages/day (peak 6)

2,295

lbs/ft intensity

85 ML

total fluid (GW + PW)

20 days

24-hr operations

- **Plug-and-perf methodology:** 67 dissolvable plugs (composite plug at heel)
- **Variable cluster design:** 6, 7, and 8-cluster stages
- **Pre-stimulation verification:** CBL + casing pressure tests to 11,000 psi confirming integrity
- **One of Beetaloo's first sustained 24-hr fracturing operations:** enhanced crew rotations, lighting, night safety protocols
- **Proppant blend:** 100-mesh + 40/70-mesh, concentrations ramped per stage for near-wellbore conductivity



Carp-3H vs Carp-5H

Step Change in Scale



SLB Frac Spread on C3H

Carpentaria-3H Frac 2023 (Biggest at the time)



Halliburton Frac Spread during C-5H Frac

Carpentaria-5H Frac 2025 (Australia's biggest frac to date)

Metric	C3H	C5H	Improvement
Total Proppant	12.9 MM lbs	22.0 MM lbs	+70%
Max Pump Rate	~80 bbls/min	>105 bbls/min	+31%
Avg Stages/Day	2-3 (peak 3)	>5 (peak 6)	+2×
Proppant Intensity	1,956 lbs/ft	2,295 lbs/ft	+17%
Campaign Duration	35 days / 12-hr ops	20 days / 24-hr ops	-43%
Sand Method	1-tonne bags/crane	Bulk stockpile/conveyor	First in AU

C5H placed 70% more proppant in 43% less time — the bulk conveyor removed sand as the constraint and doubled daily stage rates

The image features a solid orange background. On the right side, there is a complex geometric pattern of concentric, slightly offset circles or arcs, creating a sense of depth and movement. The pattern is composed of thin, light-colored lines.

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From Scale to Execution:
The Logistics Behind
Australia's Biggest Frac

Sand Logistics: Distance, Volume, Sourcing

Sand Supply – The True Bottleneck in Scaling Beetaloo Fracs

22 MM lbs

C5H proppant placed
(vs 12.9 MM lbs C3H)

~175 loads

triple-trailer road trains
(vs 100+ for C3H)

2,700 km

max haul (South Australia)
~1,800 km from QLD

Dual-Source

SA + QLD supply chain
First time in Beetaloo

0

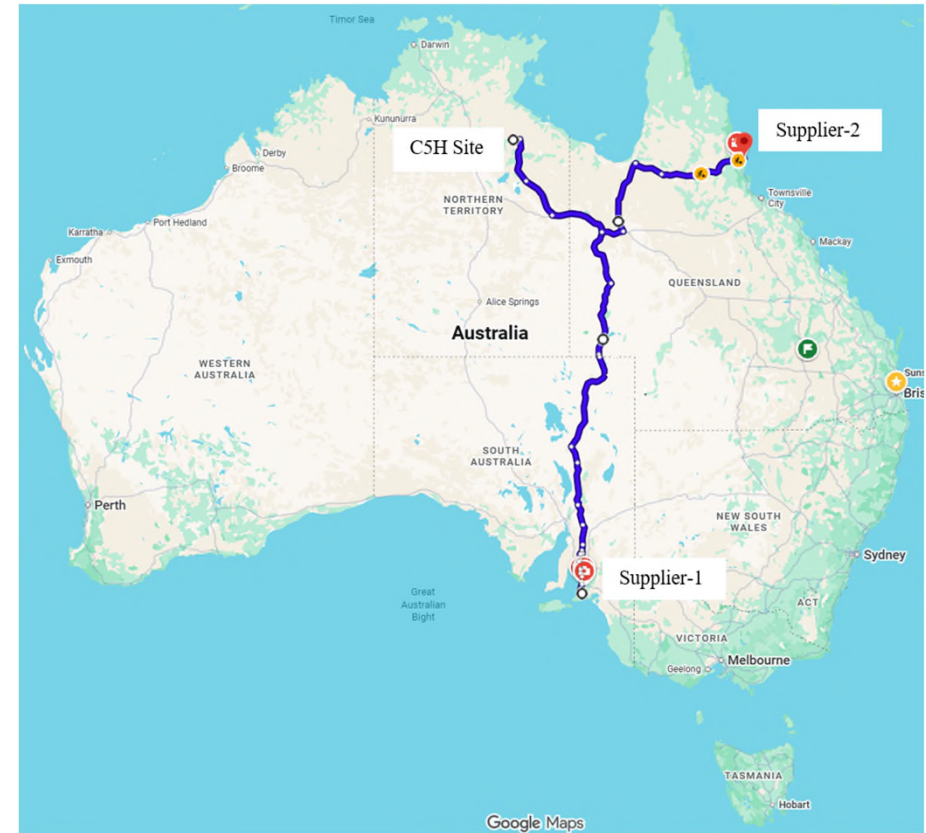
Incidents

all sand delivered
and placed without disruption

NT Local Sand

under active exploration
Biggest cost reduction opportunity

- **C5H required ~175 triple-trailer loads:** cumulative road travel across both supply chains exceeded 400,000 km; carefully coordinated with Traditional Owners and pastoralists along every corridor
- **Dual SA + QLD supply eliminated the single-source concentration risk from C3H:** critical redundancy when operating at nearly double the previous record volume
- **Transport is a substantial portion of delivered proppant cost:** NT in-basin sourcing under active industry exploration; would dramatically reduce both cost and supply chain risk



Last-Mile Sand Handling: From Bags to Bulk



Carpentaria-3H (Conventional Bag Method)

- Sand was **delivered in 1-tonne bulk bags**, each lifted by crane and cut open into hoppers that fed the blender.
- Required **constant crane operation**, with operators cutting and handling hundreds of bags over the campaign.
- **Pad space was consumed** by rows of stacked sandbags, often extending onto adjacent leases.
- Exposure to **wet-season** rain meant tarped sandbags risked saturation, clumping, and **handling difficulties**.
- The method was **reliable at smaller scales** but became a rate-limiting step at mega-frac volumes, as crane cycles could not keep up with the pumping schedule.



Carpentaria-5H (Bulk Stockpile & Conveyor System)

- Sand was **stockpiled on mats** in large piles on site, eliminating the need for thousands of individual bags.
- A **conveyor system** fed sand continuously from the stockpile into Halliburton's big-box conveyor, integrated directly with the frac system.
- Enabled **real-time feed** to the blender tub in line with pump rate demands (>100 bbl/min), supporting 24-hour frac operations.
- **Reduced manual handling**, crane hours, and safety exposures while freeing pad space for equipment.
- First successful **deployment of an automated wet-proppant** conveyor delivery system in Australia, proving critical to achieving >5 stages/day.

Sand Tracking Performance: Proving System Accuracy

InGauge Scales vs. Halliburton Blender – Stage-by-Stage Verification

0.26%

delta on 100-mesh sand

1.06%

delta on 40/70-mesh sand

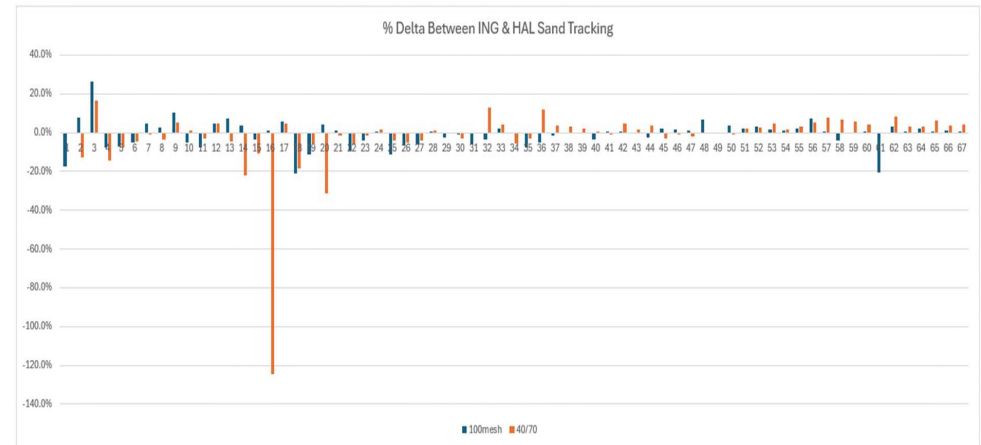
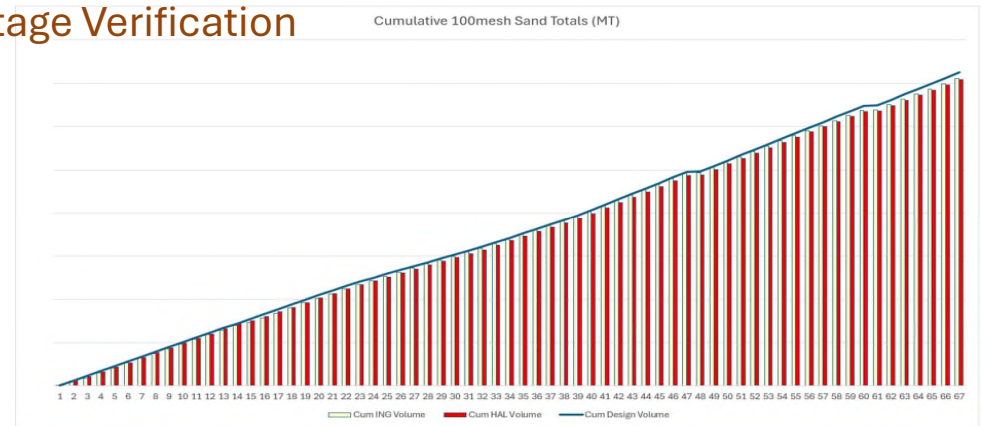
98%

system uptime

2.9%

total storage losses

- Tracking via integrated scales on feeder belts + Halliburton blender density readings – **multiple cross-verification points every stage**
- Higher 40/70 uncertainty (1.06%) attributed to software calibration for coarser sand + moisture variation from 6-month early delivery
- Bunker system successfully contained two separate sand grades with zero cross-contamination; **0 hours of sand-related NPT**
- Confirmed **system can accurately feed complex multi-grade designs** – ready for zipper frac dual-well operations



Equipment & Infrastructure: Site Setup and Operational Efficiency

Building Capacity to Enable Continuous Operations

- **Mobilization Challenge:** With the nearest oilfield hubs days away, we had to **pre-plan and mobilize a large frac spread and support equipment well in advance**. High HHP pumps, blenders, coiled tubing, wireline unit, etc., were staged on site with backup parts due to long re-supply times.
- **Frac Fleet Coordination:** Australia's frac equipment is limited and often idle due to distance and crew constraints. For 5H, we secured a high-horsepower fleet through long-term scheduling and contingency planning (accounting for wet season delays).
- **Site Layout & Storage:** Massive operations need massive space. The Carpentaria-3H pad plus a neighboring lease were packed with sand *big-bags*. Every corner was used. For 5H, with nearly double the sand, we implemented **on-site bulk sand storage** solutions (stockpiles on mats and conveyor feed) since tarped bags were insufficient in tropical weather.
- **Building Local Capacity:** To sustain operations, we are continuing to establish **permanent field infrastructure**: e.g. all-weather roads, an on-site camp for crews, and local supply bases. The goal is to enable efficient, year-round operations and reduce reliance on distant support.



Path Forward – Scaling Sustainably



Turning Mega-Fracs into Standard Practice

- **Local Supply Chains:** Develop **local sand mining** and regional material hubs in the NT to slash transport distances. Sourcing proppant and other materials in-basin will cut costs and logistic risks dramatically.
- **Year-Round Operations:** Invest in **permanent infrastructure** – all-weather roads, continuous camps, and long-term service contracts – to enable drilling & fracking outside the short dry season. Continuous operations justify local supply development and improve efficiency.
- **Logistics Innovation:** Embrace new technologies for handling and transport. For example, consider field conveyor systems for sand (even long-distance conveyors, like mining uses), greater **automation** in material handling, and real-time logistics tracking to eliminate downtime.
- **Collaboration & Capacity-Building:** Work closely with NT government, Traditional Owners, and local communities to align infrastructure upgrades (roads, permits) and ensure operations benefit locals. Encourage **in-basin service providers** to grow (water treatment, trucking, etc.), creating a supporting ecosystem.
- **Continuous Improvement:** Apply lessons from each campaign to drive down well costs and cycle times. The ultimate goals: **cheaper wells, faster gas to market, minimal environmental impact, and a thriving local industry** to unlock the Beetaloo's full potential.

What Comes Next: Zipper Fracturing and the 12 Stages/Day Target

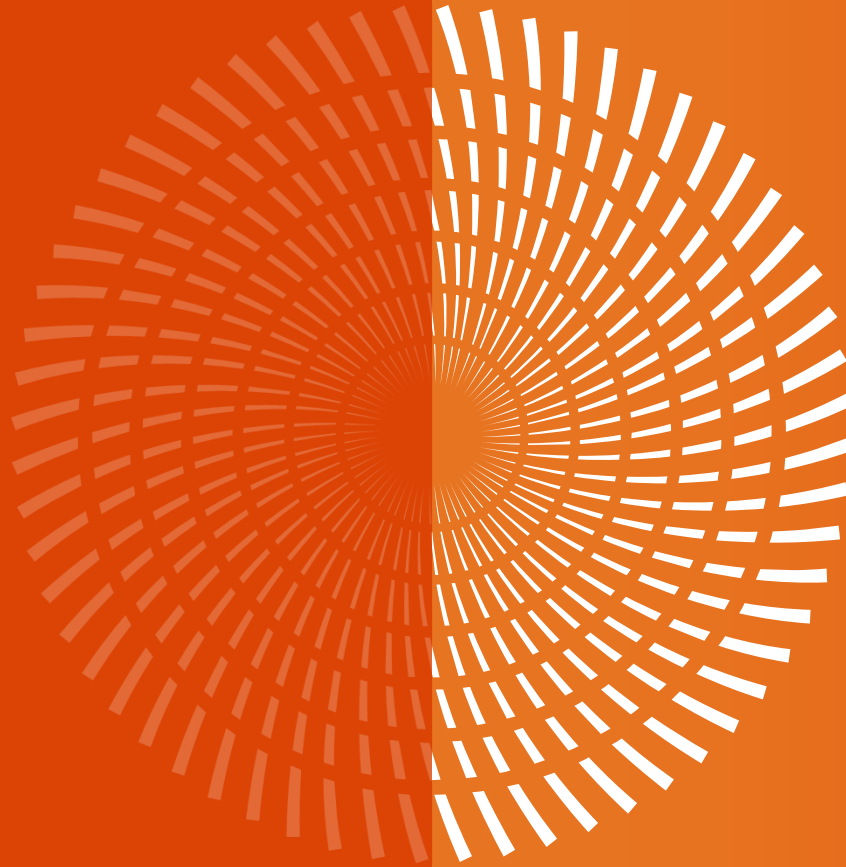
C5H Proved the Enablers — Now the Constraint Shifts from Sand to Wireline Wait Time

10-12 Stages/Day Target for Beetaloo Multi-well Pads via Zipper / Simul-Frac Operations

- **Zipper fracturing:** alternating pumping and wireline between two pad wells – keeps the pump crew in near-continuous operation
- **Eagle Ford (Patel et al. 2016):** stage rates increased from 3–4 to 6–8 stages/day by eliminating wireline idle time
- **Permian Basin simul-frac (SLB):** 60% more stages/day, 35% more sand/day, ~30% time saving vs conventional zipper
- **C5H already delivered the enablers:** >8,000 lbs/min conveyor, 24-hr ops proven, C5H positioned 450 m from C2H for multi-well pad access
- **Next constraint is wireline wait time** – zipper removes it; path from 5 to 10–12 stages/day requires no new technology
- **Local sand sourcing** – NT sources under active exploration; eliminating 2,700 km hauls is the single largest remaining cost reduction

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Thank you

Toseef Ahmad | Senior Well Engineer

Kelvin Wuttke | Principal Engineer/Director

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