



FLNG and the Cow

Dr. James Holbeach

APAC Flow Assurance and Process Simulation Manager
Wood Group Kenny Australia

e:james.holbeach@woodgroupkenny.com

p:+61 417 553 757

Safety &
Assurance

Relationships

Social
Responsibility

People

Innovation

Financial
Responsibility

Integrity





Assurance

Relationships

Responsibility

People

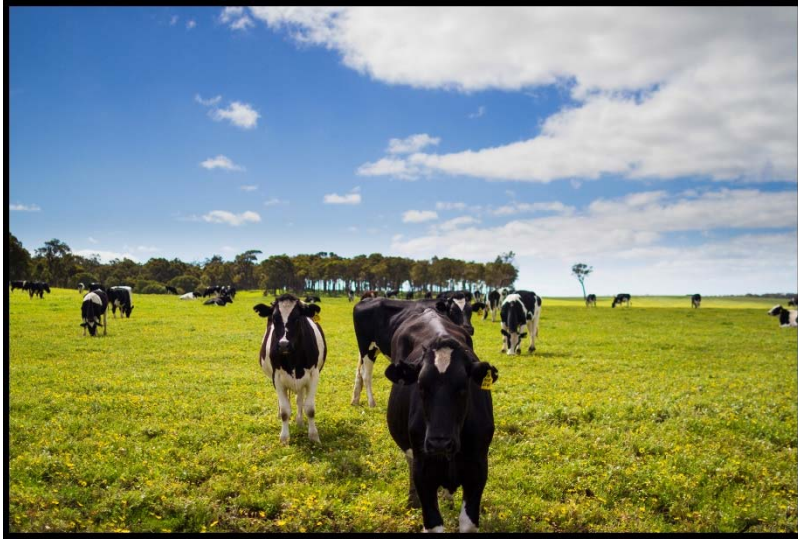
Innovation

Responsibility

Integrity



Background - Cows



Background FLNG



4 - Wood Group Kenny



Background - Disclaimer

Gorgon Stage 2

Browse FLNG

Confidential 2

Abadi

Bonaparte

Bayu- Undan

Cash Maple

Gorgon

Crux

QCLNG

Browse JPP

Bonaparte

Ichthys

Pluto / Xena

GLNG

Gorgon Expansion

Wheatstone

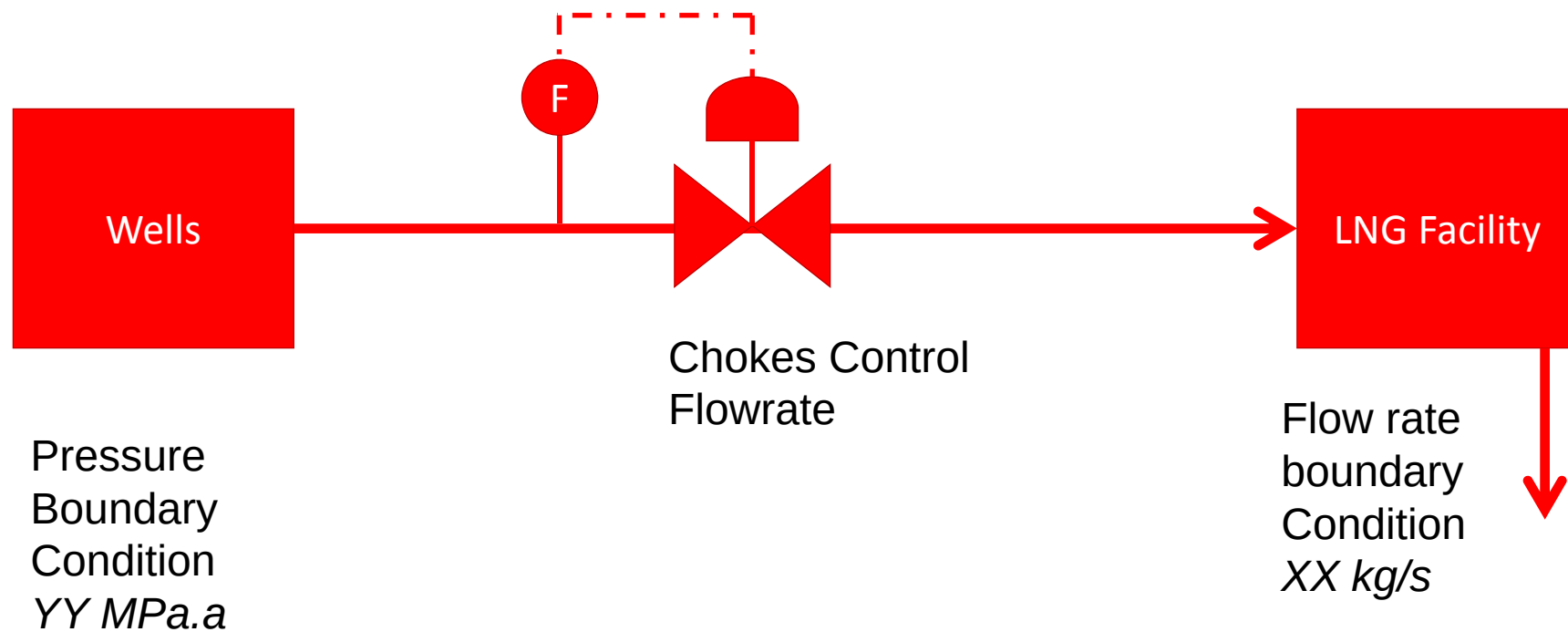
NWS Infrastructure

Confidential 1

Prelude



Background LNG Operations (All)

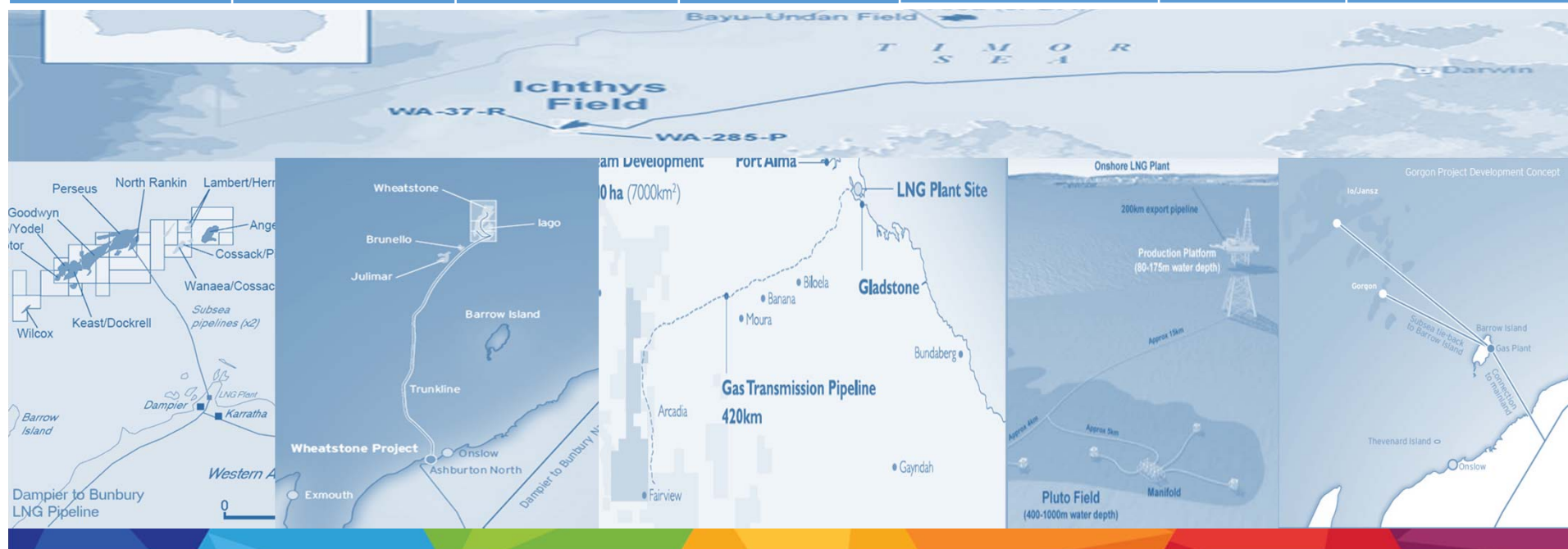


The Biggest Difference

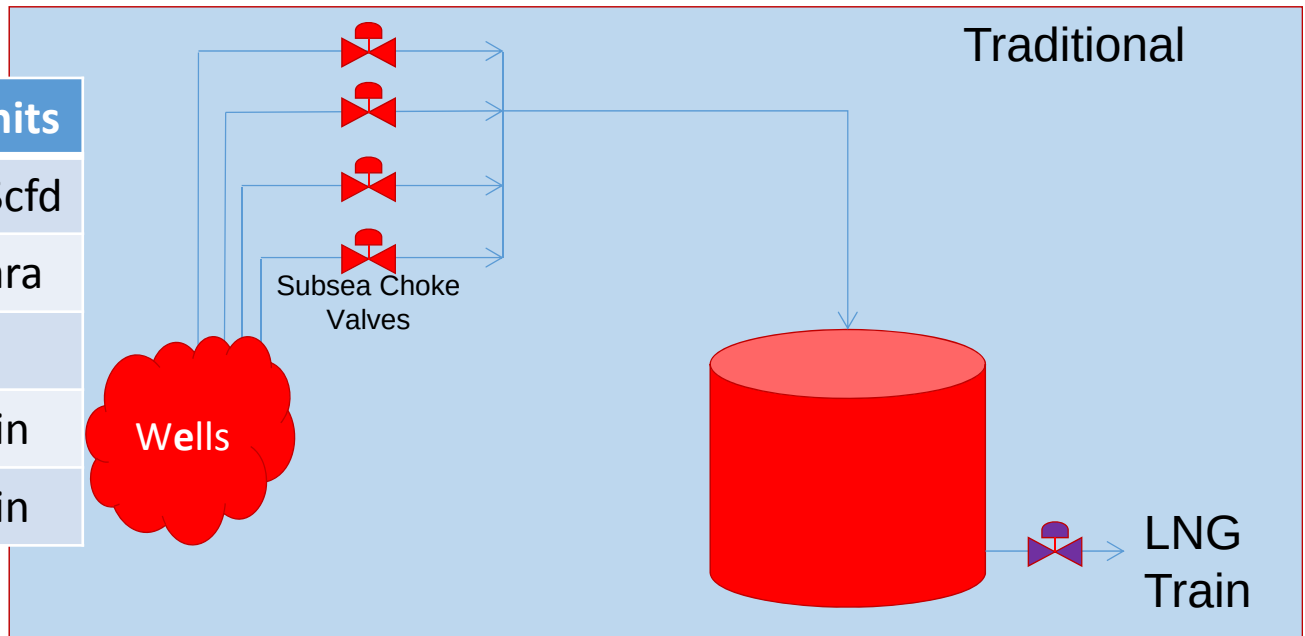
What is the biggest difference between a traditional LNG and Floating LNG?



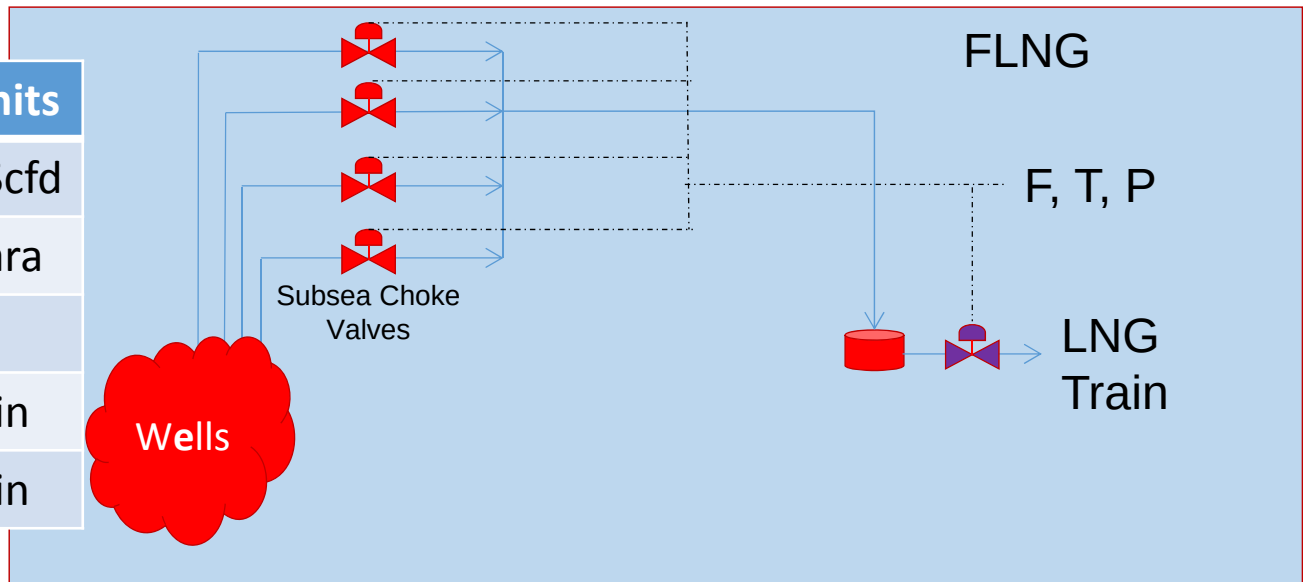
Project	Type	Pipe length	Diameter	Volume* [m ³]	Size [MTpa]	Volume to Size [m ³ /MTpa]
Gorgon / Jansz	Wet Gas	70 km 70 / 80km	34" 30 / 34"	114,000	15	7600
Pluto	Dry Gas	180 km	36"	118,000	4.3	27500
Wheatstone	Dry Gas	220 km	44"	216,000	8.9	24200
NW Shelf	Dry gas	135 km	40/42"	230,000	16.3	14000
GLNG	Dry Gas	420 km	42"	375,000	7.8	48100
Ichthys	Dry Gas	889 km	42"	795,000	8.4	94600
FLNG (Large)	Wet Gas	3 x 6 km	12"	1,300	6	200



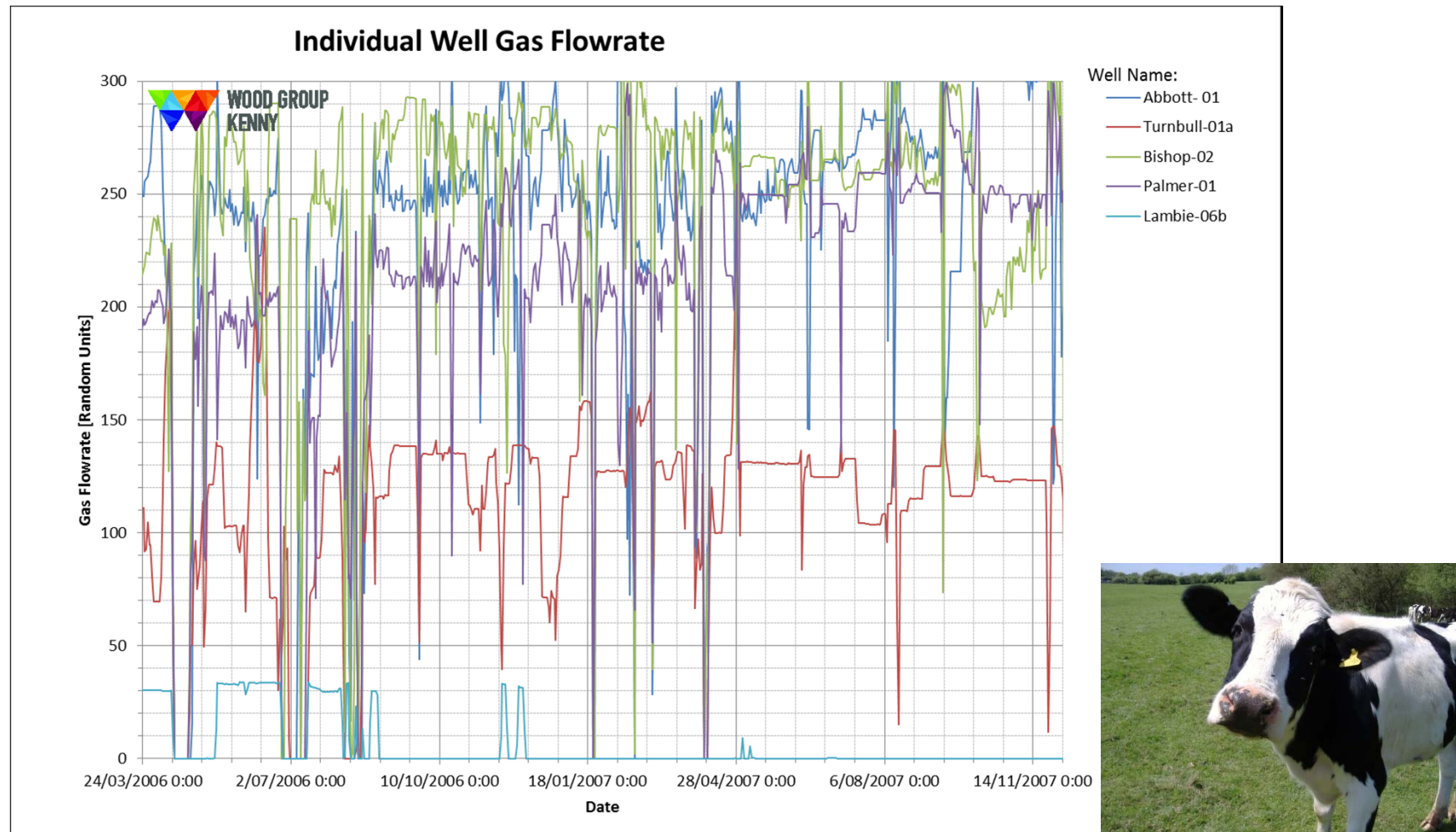
Parameter	Low	High	Units
Flowrate [BScfd]	1.1	1.5	BScfd
Pressure (Arrival)	60	65	Bara
Temp (Arrival)	10	15	°C
Ullage (75%)	120	600	min
Restart Time	0	360	min



Parameter	Low	High	Units
Flowrate [BScfd]	1.1	1.5	BScfd
Pressure (Arrival)	60	95	Bara
Temp (Arrival)	-20	120	°C
Ullage (75%)	0	10	min
Restart Time	0	360	min



The Cow: Production is never simple



What happens when there is a cow on the road?

Traditional LNG

Onshore LNG trip results in a 50% turndown in required gas flowrate

Operators take NO action – only automation is around compressor control loop

Flowrate onshore will drop immediately

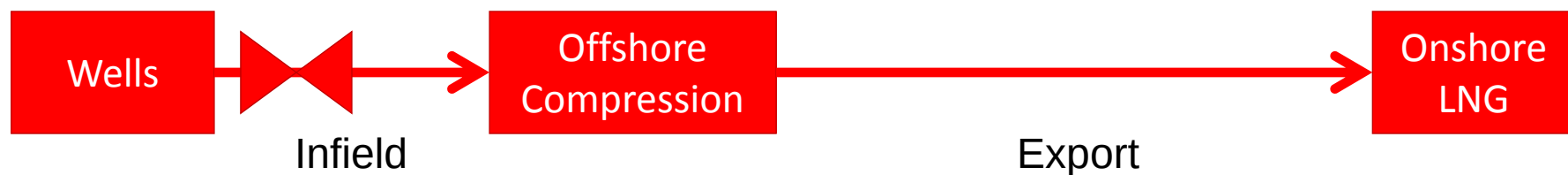
Offshore compressor on pressure control so flowrate will drop slowly

Infield system will begin to pack (increase in pressure)

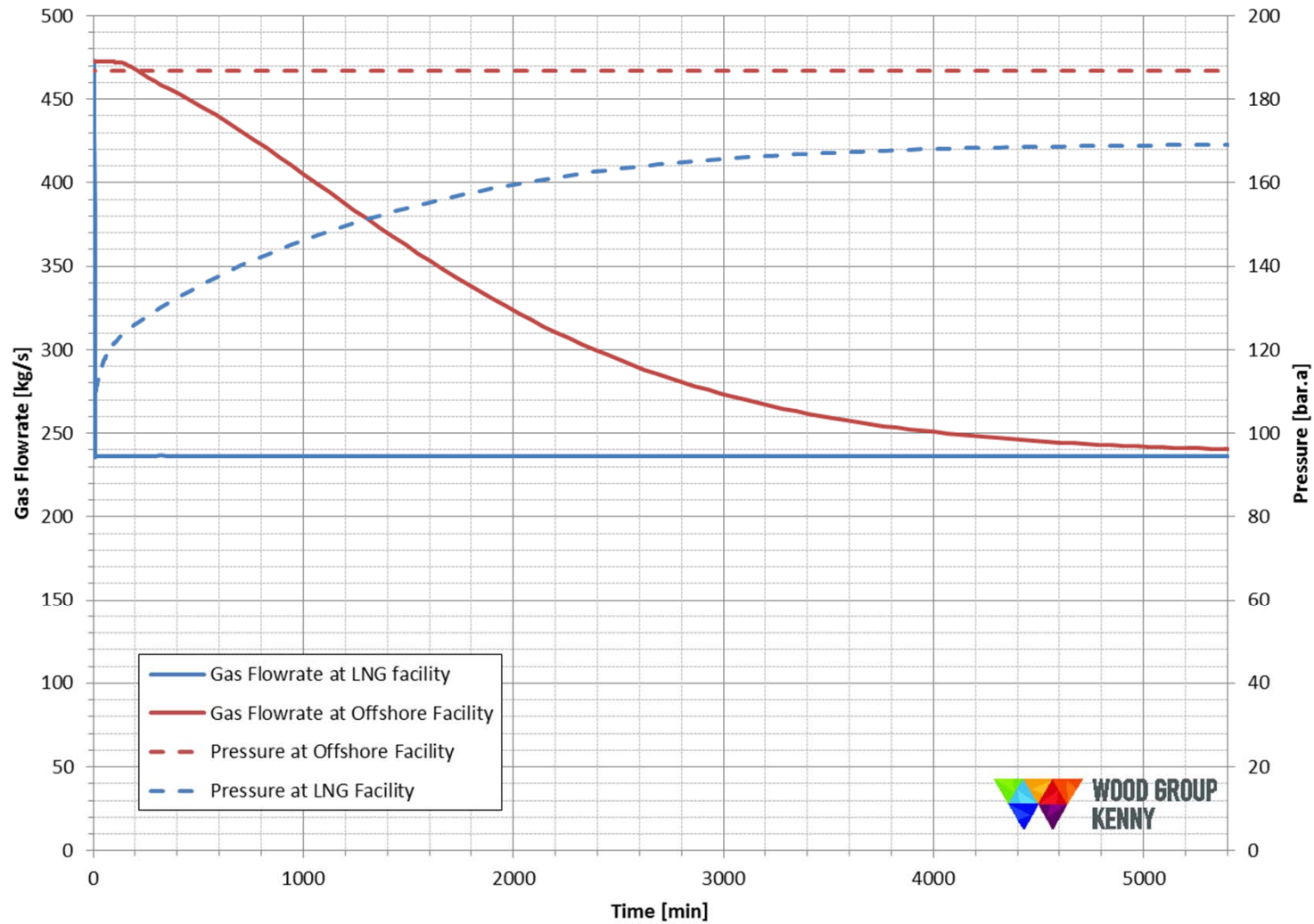
Compressor will switch to suction pressure control and export flowrate will increase

Export pipeline will pack until trip pressure is reached

System shuts down



Response to 50% turndown - Traditional LNG



What happens when there is a cow on the road? **FLNG**

FLNG trip results in a 50% turndown in required gas flowrate

Operators take NO action – no automation

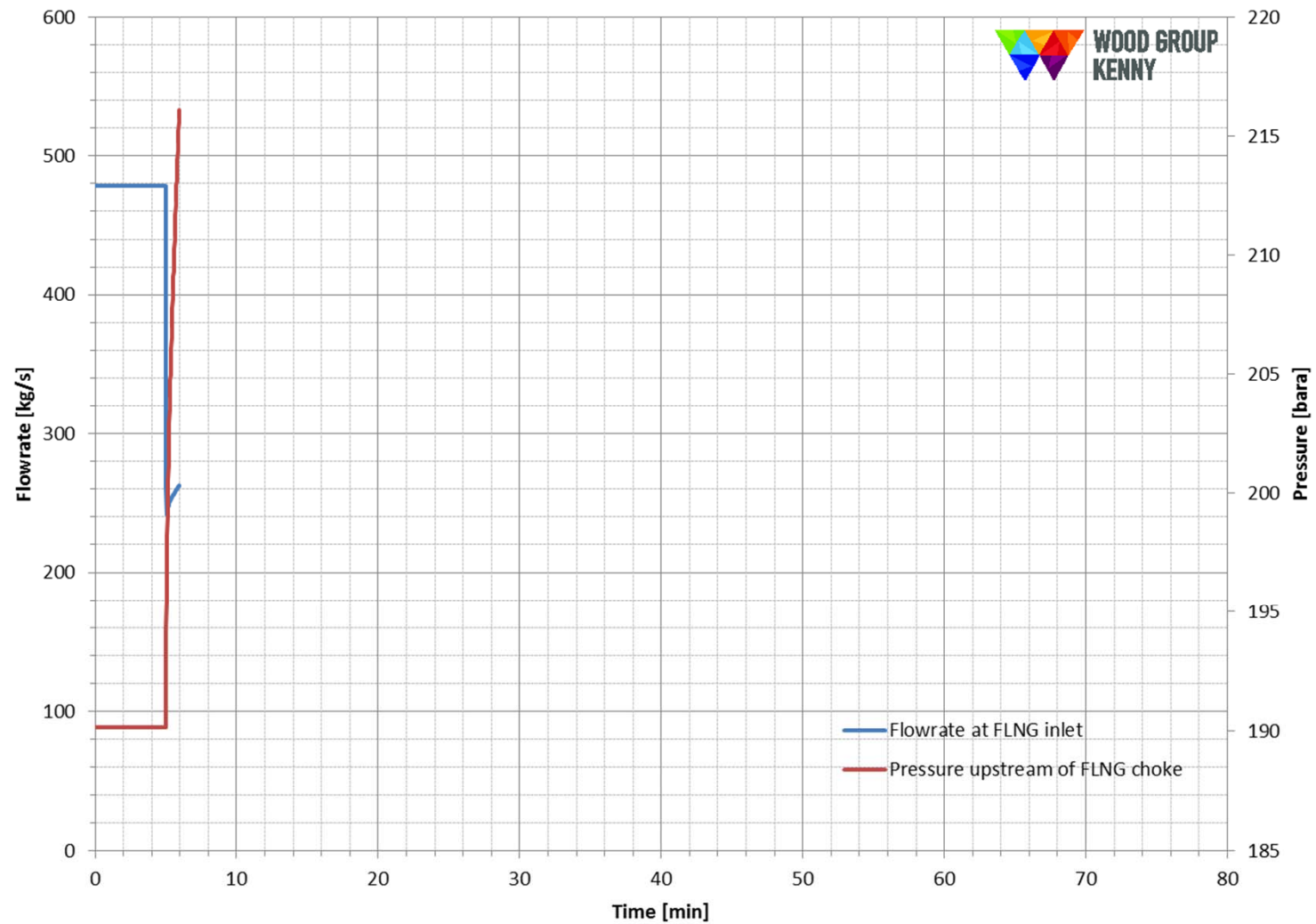
Flowrate to FLNG will drop immediately

Infield System Packs

Field Shuts down on High Pressure trip at topside



Response to 50% turndown - FLNG



Accept the fact you'll hit the cow?



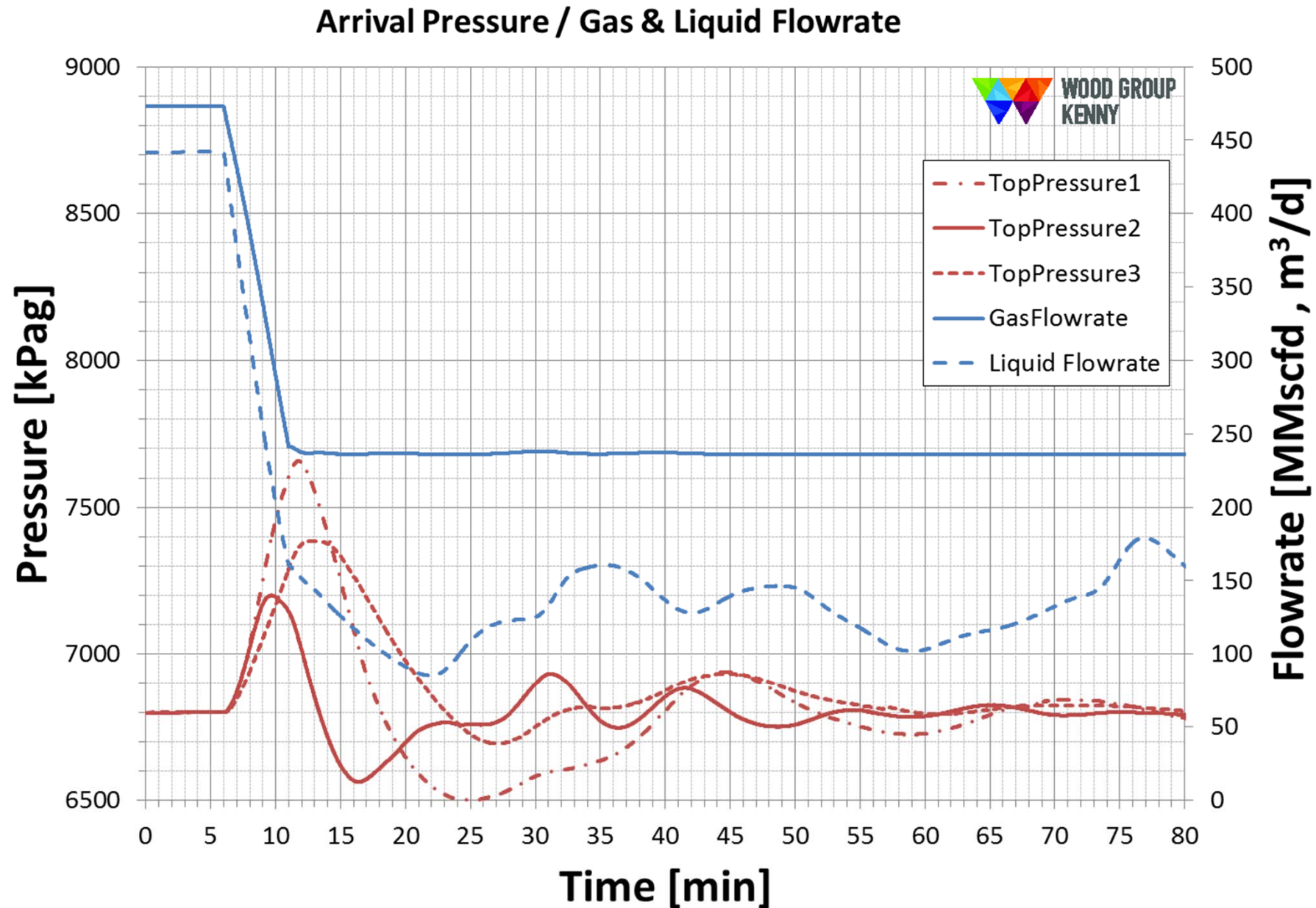
What happens when there is a cow on the road? Solutions ... FLNG

FLNG trip results in a 50% turndown in required gas flowrate

- Could automatically control flowrate on FLNG choke
 - Low temperatures
 - Hydrates
- Could Automatically control flowrate on Subsea Choke
 - Slow response
 - Lag
- Could do both
 - Complex response but possible



It is possible to make it work!



Automation

“The factory of the future will have only two employees, a man and a dog. The man will be there to feed the dog. The dog will be there to keep the man from touching the equipment.”

Warren Bennis



Thank you!





WOOD GROUP
KENNY



Safety &
Assurance

Relationships

Social
Responsibility

People

Innovation

Financial
Responsibility

Integrity

