Strategy Session - HSSE

April 2018

L48 HSE Performance – 1Q 2018 YTD

data through end 1Q18

	2017 Full Year	1Q2017 YTD	**1Q2018 YTD**
Major Incidents and HiPos			
HiPos - All severity	4	1	**0**
L48 Managed Personal Safety*			
DAFWC	1	0	**0**
RI (RIF)	6 (0.53)	4 (1.36)	**1(0.39)**
Work hours (millions)	2.3	0.6	**0.5**
Contractor Managed Personal Safety*			
DAFWC	5	1	**0**
RI (RIF)	18 (0.75)	2 (0.36)	**4 (0.74)**
Work hours (millions)	4.8	1.1	**1.1**
Process Safety			
PSE Tier 1	5	1	**1**
PSE Tier 2	22	6	**4**
LOPC (A-G)[1]	122	38	**40**
Oil Spill > 1 bbl	15	3	**3**
Fire / Explosion	11	3	**0**
Well Control Events	10	2	**1**
Leading Indicators			
Dropped Objects	26	7	**4**
Drops Frequency (DO/Rigs)[2]	2.8	0.7	**0.35**

RI L48 (1)

- Fingers injured during pump maintenance

RI Contractor (4)

- Finger laceration while handling compressor engine head
- Turned ankle while descending work platform
- Finger laceration while making up suction line
- Finger caught between manifold cap and piping

PSE Tier 1 (1)

- Low pressure gas release from compressor on NAPI Compressor Facility

Well Control Events (1)

- Level 2 – Unable to close safety valve when well flowed up tubing; closed blind shear rams to secure the well

* Differentiates work performed under L48 versus Contractor Safety Management Systems

1 30 of the 40 LOPC (A-G) in 2018 are hung dump valves

2 Avg count of rigs: FY16-3.8; FY17-9.4; YTD18-11.4

Safety Improvement Plan

2018 Safety Improvement Focus

- Three focus areas to improve L48 Safety (Personal and Process) performance in 2018 are:
  1. High Risk (D+) Contractor HSE Management Program
  2. L48 Energy Isolation Refresh
  3. Hazard Identification and Barrier Management Program

Program	Activity	Completion Date
Contractor Management	Assign contractor activity owner for contractors performing high risk activity.	2Q
Contractor Management	Commence verification activity higher risk work performed by contractors.	2Q
Energy Isolation	Conduct L48 training and complete competency assessments for L48 isolation authorities.	2Q
Energy Isolation	Complete competency assessments for contractor isolation authorities and perform targeted	3Q
Hazard Identification	Develop Hazard Identification and Barrier Management training for L48 employees.	3Q
Hazard Identification	Complete training for L48 employees.	4Q

- Other enabling safety programs to be completed in 2018 are:
  1. Back to Basics refresh for all L48 employees; leaders trained leaders (100% completed by March 2018)
  2. Company wide Safety week held in the Business Units in January
  3. Rollout and training of all L48 employees on use of Observation / Verification capture tool Safety+ 3.0 (2018 ACB metric)
  4. Continuation of Dropped Objects program (2017 ACB metric)
- Completed Florida River and Bayfield Plant Process Safety Management (PSM) Audit with no deficiencies that equated to a business level finding across the fifteen PSM elements

Carbon Roadmap

Upstream Methane Plan - L48 Actions

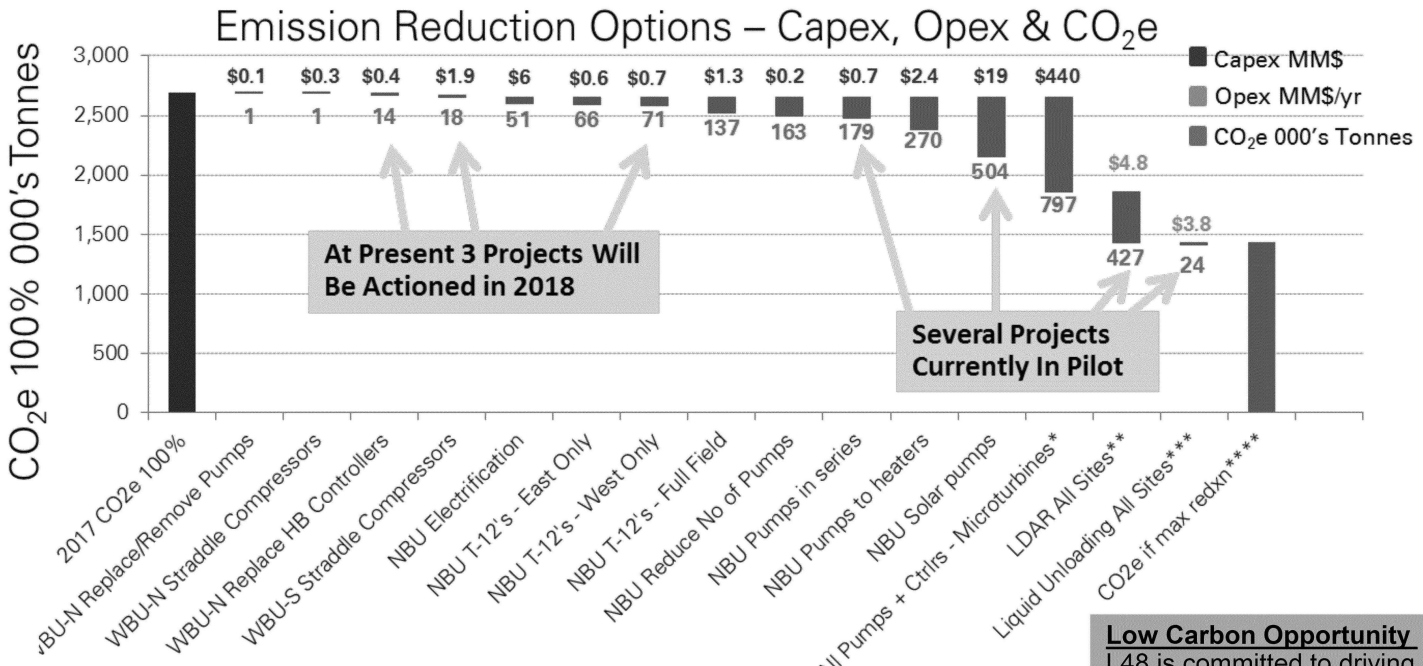
Guiding Principle	Action #	Action	Year	Owner	Responsible
GP-1 Continually Reduce Methane	**1**	**Real Sustainable Reduction - Methane** 25% Reduction - 350,000 MT methane as CO2e by end 2019; 350,000 MT CO2e between 2020 and 2025.	2019+	Dave Lawler	Brian Pugh/ Kola Fagbayi
	2	**LDAR** Focus on find and fix LDAR. Implement LDAR prioritized on 30% of production in 2018/19, 60% of production in 2019/20, and 100% of production by 2020/21. Perform LDAR utilizing existing technology and continue trials to identify efficient and effective alternative means to accomplish LDAR aligned with L48 IO mission.	2018/19/20	Dave Lawler	Brian Pugh
	3	**Remote Power** Initiate further evaluation in 2018 of additional remote power options for L48's dispersed facilities for pneumatic controllers and pumps.	2018/19	Dave Lawler	Kola Fagbayi
	4	**High Bleed Controller Replacement** Replace all HB's in L48.	2018	Brian Pugh	Will Burton
	5	**NBU Pneumatic Pumps (Heat Trace Pumps)** Install identified technology (T12 temp switches) in west area of NBU.	2018	Brian Pugh	Kevin Lanan
	6	**NBU Pneumatic Pump & Liquid Unloading Trials** Continue ongoing trials, solar pumps, routing pump vents to location fired equipment, removing select pumps, placing pumps in series and Project Kelvin.	2018/19	Brian Pugh	Kevin Lanan
	7	**Select and Implement Trialed Technology** Select technologies to be implemented L48 wide and execute successfully piloted technologies for pneumatic pumps, liquids unloading and LDAR.	2019+	Dave Lawler	Brian Pugh
	8	**Crowd Source Pneumatic Solution** Use crowd-sourcing or other creative ways to find solutions to the big problem, e.g. pneumatics.	2019	Dave Lawler	Kola Fagbayi
	9	**L48 Facility Design Manual (FDM)** Update FDM to incorporate design focus on reducing methane emissions from new & modified facilities as appropriate.	2019	Dave Lawler	Kola Fagbayi
GP-2 Advance strong methane performance across the gas value chain	**1**	**API Environmental Partnership** Take a leading role in driving forward the Environmental Partnership and identifying natural gas value chain partners to join the program.	2019	Dave Lawler	Kola Fagbayi
	2	**L48 NOJV's** Build NOJV and other business partners into L48 Carbon Road Map.	2020+	Dave Lawler	Kola Fagbayi

Upstream Methane Plan - L48 Actions

Guiding Principle	Action #	Action	Year	Owner	Responsible
GP-3 Improve accuracy of methane emissions data	**1**	**L48 Emission Inventory Improvement** Hold peer assist to review L48 internal GHG calculation approach (inventory, emission factors, calculation methodology). Implement annual review of internal GHG approach and emissions by L48 RCE Mgr.	2018	Kola Fagbayi	Bob Chou
	2	**Leak Detection & Quantification Trials** Continue current and proposed expanded leak detection and quantification trials (mAIRsure, Providence, drones, satellites, Rebellion). Continue evaluation and decision through L48 governance of emerging technology.	2018	Kola Fagbayi	Kirk Steinle
	3	**Peer Benchmarking** Develop benchmarking approach to understand peer performance and best practices in methane management.	2019	Dave Lawler / Gordon Birrell	Kola Fagbayi (US) and Liz Rogers (Global)
	4	**GHG Reporting - Data Improvement** Ensure accuracy of data in L48's systems of record that are used as inputs to emissions calculations; including equipment inventory, production data, operational runtime, and episodic events (i.e. liquid unloading).	2019	Brian Pugh	Will Burton
GP-5 Increase transparency	**1**	**Communicate Externally on L48 Actions** Report on L48 historical and current actions to proactively reduce methane emissions through the Group Sustainability Report & US/ L48 External Communications Plan (C&EA).	2019	Dave Lawler	Kola Fagbayi

Redacted - First Amendment

L48 Priority Emission Sources 2025 RSR Options



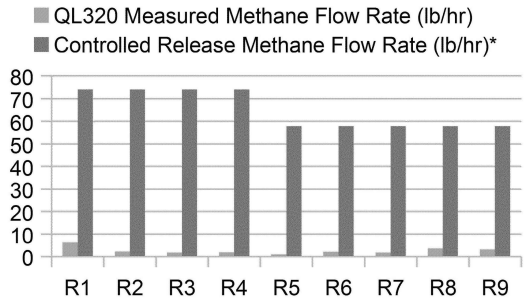
Low Carbon Opportunity
L48 is committed to driving Carbon / Methane footprint down by ***25% (700 kMT CO_2e) by 2025***

* Capex assumes 1 microturbine each x 8000 sites @ $55k per turbine
** Basis: 2017 emissions, assume 1% leak rate; Opex assumes handheld OGI for 8000 sites
*** Basis: 2017 emissions, assume 25% emission reduction; Opex based on Project Kelvin $425/well/yr x 9000 wells
****North BU Options not additive, West BU Options are additive

Ongoing Leak Detection/Quantification Trials

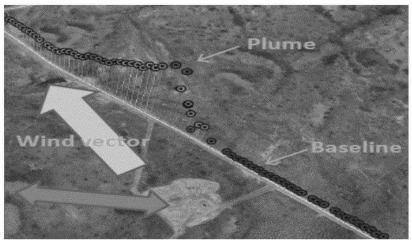
Providence Photonics QL320 with FLIR camera

- QL320 under predicting controlled emission rate
- Continuing work to further optimize pilot
- Collaborating with Upstream Technology on their pilot



BP DIO & L48 vehicle mounted laser-based sensors (mAIRsure)

- 4 sensors are mounted on trucks
- Methane concentration data is flowing from trucks
- Continue to integrate data analytics to improve emission estimates
- Too early to draw conclusions



Precision Hawk Drone

- Added leak detection to existing operations use cases
- Tests conducted in West BU in February
  - Drone mounted sensor readings agreed well with ground sensors
  - Additional pilots occurring in other L48 operating areas in March/April
- Early results are promising