Long Lake and Kinosis Oil Sands Project Scheme Approval 9485, as amended

Annual Performance Presentation

This presentation contains information that complies with the Alberta Energy Regulators' Directive 054 – Performance Presentations, Auditing, and Surveillance of In Situ Oil Sands Schemes



June 30, 2022

Agenda







Section 1 - Introduction



Corporate Ownership



• CPNA is a wholly-owned subsidiary of the China National Offshore Oil Company Limited (CNOOC).



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Long Lake Scheme Description

- Located approximately 40 km southeast of Fort McMurray.
- An integrated SAGD and Upgrader oil sands project producing from the Wabiskaw-McMurray deposit.

	Design (LLK)				
	m³/d	bbl/d			
Bitumen	11,130	70,000			
Steam	37,000	233,000			
SOR	3	.3			

	Design (K1A*)				
	m³/d	bbl/d			
Bitumen	3,180	20,000			
Steam	9,540	60,000			
SOR	3	.0			

*K1A – First 20K of 70K which is Phase 1A of Kinosis



Long Lake Scheme History



Year	Activity
2000	EIA and regulatory submissions for the commercial Long Lake Facility (LLK)
2003	Regulatory approvals for the commercial LLK Facility
2003 - 2007	Production at the Long Lake SAGD Pilot Plant
2004	Construction begins for the commercial LLK Facility
2007	Start of commercial bitumen production for the Long Lake Facility
2009	Regulatory approvals issued for Kinosis Project (formerly Long Lake South), Start of operation of the LLK Upgrader
2012	Regulatory approvals and construction begins for Pads 14, 15 and K1A Pads 1 and 2
2013	Increased production from LLK well pads, begin circulation at Pad 14
2014	K1A Pads 1, 2 and Pads 14, 15 start production
2015	Diluent Recovery Project start up; Pipeline leak ceases production at K1A; 7N Infills on production
2016	Hydro-Cracker Unit (HCU) Incident; Wildfire shut down Long Lake operations for ~2 months
2017	Commenced drilling infills on Pads 5 and 8
2018	Pads 5, 8 Infills on production; Drilling commenced on Pad 3,6 Infills & LLSW SAGD well pairs
2019	Pad 1,3,5,6,13 Infills on production; D&C completed on LLSW SAGD well pairs
2020	Completed construction of LLSW sustaining pads
2021	LLSW Pad 16 on production; LLNW Pad 19 DA & PA expansion filed

2021 Summary



- Began construction of replacement disposal line
- Achieved 1st oil on LLSW sustaining pads
 - Bringing online Pad 16
- Redrilled 3 LLK wells
- K1A Recovery Project
 - Continued to progress construction on Boiler Feed Water (BFW) & Produced Emulsion (PE) lines
 - Commenced facility re-start commissioning and inspections
- Upgrader Partial Re-Start Project
 - > Initiated cleaning, inspection and repair works in conjunction with detailed engineering



Sections 2 to 7- Subsurface





Section 2 – Scheme Performance



Production History







Section 3 – Development Maps







Development Area with Drainage Patterns







SAGDable Bitumen-In-Place (SBIP) Pay Isopach – Long Lake

SBIP ISOPACH (C.I.=5m)

CTIVE : RE-DRILL HORIZONTAL

ACTIVE : INFILL HORIZONTAL

----- DEVIATED WELL PATH (DRILLED)

NOT PRODUCING - SOLID LINER

ACTIVE HORIZONTAL

--- ACTIVE : PULLED BACK

SUSPENDED

----- ROAD ACCESS

ZERO EDGE

- RAII



- 5m contour interval
- SBIP with resource cut-off
 - Colour-fill cut-off at minimum 12m thickness



SBIP Pay Isopach - Kinosis





Long Lake Gas Interval in Communication with Pay



- 5m contour interval
- Gas defined by neutron-density porosity cross-over
- Gas associated with SBIP Interval;
 - Directly in contact with top water or top of SBIP interval
 - Colour-fill clipped to area in communication with SBIP pay

ACTIVE HORIZONTAL ACTIVE : PULLED BACK

SUSPENDED

ROAD ACCESS

HIGHWAY

ZERO EDGE

- RAIL

ACTIVE : RE-DRILL HORIZONTAL ACTIVE : NOT PRODUCING - SOLID LINER

ACTIVE : INFILL HORIZONTAL

DRILLED : LLSW HORIZONTAL

DEVIATED WELL PATH (DRILLED)

PARK AREA

WELL PADS

lah : 30.5



Kinosis Gas Interval in Communication with Pay





Long Lake Top Water in Communication with Pay



- 5m contour interval
- Top water defined as:
 - \blacktriangleright Effective water saturation >50% and,
 - \blacktriangleright Volume Shale <30%
- Top water associated with SBIP Interval;
 - Colour-fill clipped to area in communication with SBIP pay

TOP WATER 5m CONTOUR

-ACTIVE : INFILL HORIZONTAL

— DRILLED : LLSW HORIZONTAL

— TOP WATER 5m CONTOUR

ZERO BITUMEN EDGE

DEVIATED WELL PATH (DRILLED)

ACTIVE : RE-DRILL HORIZONTAL

ACTIVE : NOT PRODUCING - SOLID LINER

- Low : 1

-ACTIVE HORIZONTAL

SUSPENDED

HIGHWAY

- RAII — ROAD ACCESS

- ACTIVE : PULLED BACK



Kinosis Top Water in Communication with Pay





Long Lake Bottom Water Isopach

BOTTOM WATER ISOPACH (C.I.=5m)

ACTIVE : RE-DRILL HORIZONTAL

- ACTIVE : INFILL HORIZONTAL

- DRILLED : LLSW HORIZONTAL

DEVIATED WELL PATH (DRILLED)

ACTIVE : NOT PRODUCING - SOLID LINER [

ACTIVE HORIZONTAL
 ACTIVE : PULLED BACK

SUSPENDED

ROAD ACCESS
ZERO EDGE

HIGHWAY

- RAIL



- 5m contour interval
- Bottom water defined as:
 - \succ Effective water saturation >50% and,
 - Volume Shale <30%</p>



Kinosis Bottom Water Isopach







• No Additional Geomechanical data acquisition in 2021 over Long Lake or Kinosis

Pads 14/15 Geomechanical Anomalies



 No changes to geomechanical anomalies over Pads 14/15 in 2021



Seismic Acquisition



 No additional seismic acquisition in 2021 over Long Lake or Kinosis







Section 4 – Representative Cross-Sections



Representative structural cross-section of the West Side of Long Lake (South - North)



Representative structural cross-section of the East Side of Long Lake (South - North)



Representative structural cross-section of K1A

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Section 5 – OBIP and Recoverable Tables





- Pay cut-offs:
 - Top of pay interval is a 2m shale with > 30% Vshale
 - Focus on low Vshale intervals with thinner and fewer shale beds
 - Account for standoff from bottom water or non-reservoir
- Top of SADGable (SBIP) and Exploitable Bitumen in Place (EBIP) Pay Interval:
 - Single shale interval (> 30% Vshale) of 2m
 - Cumulative shale interval (> 30% Vshale) of 4m
- Base of SBIP Pay Interval:
 - Base of bitumen pay/reservoir rock
- Base of EBIP Pay Interval:
 - Depth of an existing or planned horizontal well pair (EBIP pay base = producer well depth)
 - Stand-off from bitumen/water contact or non-reservoir
- Gas Interval(s) Associated with EBIP/SBIP Pay Interval
 - Gas identified by neutron/density crossover
- High Water Saturation Interval(s) Associated with EBIP/SBIP Pay Interval
 - ➤ > 50% Swe (effective water saturation) and < 30% Vshale</p>
- EBIP will be calculated from a hydrocarbon pore volume height (HPVH) map.
 - Minimum EBIP HPVH and Pay Interval Contour (3m³/m² EBIP HPVH = 12m EBIP Pay Interval)

Pay and Bitumen-in-Place Mapping Methodology





- SBIP Pay Interval:
 - < 30% V_{shale}
 - < 50% S_{we}
- May have associated:
 - gas interval(s)
 - high water saturation interval(s)
- Primary zone defined as the thickest pay interval <u>unless</u>:
 - an existing (or planned) horizontal well pair is within an interval
 - geologists have interpreted continuity of an interval across an area
- Reservoir Rock:
 - Sand
 - Breccia
 - IHS with < 30% Vshale



- Base of EBIP Pay Interval:
 - > Depth of an existing or planned horizontal well pair (EBIP Pay Interval base
 - = producer well depth)
 - > 3m stand-off if no bottom water (minimum shale of 2m thickness)
 - 5 m stand-off if in contact with bottom water (minimum bottom water thickness of 2m)





		Cumulative	EBIP	SBIP SBIP Reservoir Par			Parameters	arameters		
Project Area	Development Area	Production, YE 2021 (e6m3)	(e6m3)	(e6m3)	Current RF (%)	Avg Thickness (m)	Avg Porosity (%)	Avg Eff Sw (%)	Permeability: Kmax/Kvert (mD)	
ake	Long Lake	25.9	105	131	20%	22	0.31	0.32	4470/2270	
Long L	LLSW	0.0	31	37	0%	24	0.32	0.26	3730/2320	
	Kinosis	0.2	205	239	0%	23	0.31	0.23	4030/2340	



Section 6 – Well Pad Parameters and Performance



Well Pad Parameters and Performance



				Cumulativo	EUR	EBIP	SBIP	SBIP	Reservoir Parameters		rs		
Project Area	Development Area	Existing Pad	Well Count	Production, YE 2021 (e6m3)	(e6m3)	(e6m3)	(e6m3)	Current RF (%)	Avg Thickness (m)	Avg Porosity (%)	Avg Eff Sw (%)	Permeability: Kmax/Kvert (mD)	Area (ha)
		LL-001*	5	1.7	2.1	2.8	3.4	51%	33	0.32	0.34	4470/2270	35
		LL-002NE	6	1.0	1.2	2.5	3.2	31%	23	0.30	0.30	4470/2270	52
		LL-002SE	5	0.3	0.4	1.2	1.5	21%	18	0.30	0.40	4470/2270	39
		LL-003*	10	1.8	2.2	3.3	4.0	45%	28	0.31	0.33	4470/2270	49
		LL-004	2	0.1	0.1	0.1	0.2	61%	14	0.31	0.33	4470/2270	25
		LL-005*	10	2.5	3.1	3.5	3.6	70%	35	0.31	0.32	4470/2270	42
		LL-006N*	9	1.3	1.7	4.0	4.2	30%	30	0.30	0.27	4470/2270	60
		LL-006W*	9	1.1	1.3	2.4	2.7	39%	16	0.31	0.31	4470/2270	67
	ke l	LL-007E	7	1.0	1.8	2.3	2.7	36%	21	0.30	0.35	4470/2270	60
	Га	LL-007N*	9	3.0	3.4	4.4	4.4	69%	36	0.30	0.25	4470/2270	50
đ	פר	LL-008*	10	2.5	3.4	4.2	4.9	52%	36	0.29	0.32	4470/2270	59
ž	-o	LL-009NE	5	0.3	0.4	1.2	1.9	16%	15	0.30	0.41	4470/2270	47
a	_	LL-009W	5	0.6	0.7	1.9	2.0	30%	25	0.29	0.28	4470/2270	39
		LL-010N	8	0.5	0.7	2.7	3.7	15%	14	0.31	0.28	4470/2270	96
-		LL-010W	5	1.4	1.9	3.0	3.2	45%	46	0.31	0.46	4470/2270	39
<u>S</u>		LL-011	10	1.9	2.4	2.9	3.2	61%	36	0.32	0.35	4470/2270	41
		LL-012	9	1.5	2.1	3.6	4.8	32%	32	0.32	0.30	4470/2270	50
0		LL-013*	15	2.1	2.8	3.8	4.9	44%	31	0.32	0.32	4470/2270	50
		LL-014/15E	6	0.5	0.6	1.3	1.9	26%	19	0.32	0.20	4470/2270	27
		LL-014N	3	0.4	0.6	1.5	1.8	25%	30	0.33	0.21	4470/2270	19
		LL-0155	2	0.2	0.4	0.8	0.9	26%	20	0.31	0.20	2720/2220	12
		LL-0165	/ F	0.0	2.0	3.6	4.5	0%	24	0.32	0.24	3730/2320	63
	S S	LL-016W	5	0.0	1.5	2.7	3.0	0%	28	0.33	0.30	3730/2320	42
	Ľ		0	0.0	2.0	4.2	6.0	0%	20	0.32	0.24	2720/2220	00
		LL-018N	9	0.0	3.1	0.1	0.0	0%	33 28	0.32	0.32	3730/2320	04
			3	0.0	1.0	1.0	5.6	0%	20	0.33	0.20	4020/2340	64
	Sis		9 8	0.0	2.0	4.0	5.0	0%	33	0.33	0.24	4030/2340	42
	OL OL	K1A-C	0 8	0.0	3.0	5.9	4.5	2%	<u> </u>	0.32	0.23	4030/2340	42
	Σ	K1A-D	11	0.0	3.0	5.6	6.7	1%	33	0.33	0.20	4030/2340	64

*includes infills/redrills



Section 7 – Co-Injection

Co-injection Projects Update

PAD 7E NCG:

- Application approval 9485R received in Q3 2012
 - Natural gas injection started Q4 2014 at 7P7 7P9
 - Gas injection suspended after 2015 turnaround
 - \circ No NCG injection through 2020
 - Re-start of NCG injection planned for Q1 2022

PAD 7N NCG:

- Application approval 9485CC received in Q2 2014
 - Construction of co-injection surface facilities complete Q2 2015 on 5 well pairs planned
 - Short term NCG injection around 2015 facility turnaround
 - NCG injection reinstated Q2 2021

Pad 7N NCG Injection Results

- Injection Strategy to maintain target down-hole operating pressure
- Positive impacts of steam savings and SOR reduction; no negative impacts observed at this time on bitumen rates or recovery

Sections 8 to 12 - Surface

Section 8 – Surface Infrastructure

Long Lake Facilities Map

Kinosis Facilities Map

• K1A is currently shut-in

	OFF-LINE AREA	TRANS	PORTATION	WATER	RBODY / HYDROLOGY
	WELL PAD		HIGHWAY		PERENNIAL
	K1A PIPELINE ROW 60m		LONG LAKE MAIN ACCESS		NONPERENNIAL
	FACILITY AREA		FACILITY ROADS		PERENNIAL
	LONG LAKE LEASE		COMMUNITY TRAIL		NONPERENNIAL
			RAIL		

Annual Operational Rates vs Design

Section 9 – Historical and Upcoming Activities

- No abandonments at Long Lake
- The following Wells were suspended in 2021:
 - ➢ 2S04
 - ➤ 2S07
 - ➢ 3P04INF
 - ➢ 3P05 INF
 - ➢ 6P04

Well Pattern / Drainage Area	Suspensions	Abandonments
LL-002NE	02S04	-
LL-002SE	02S07	-
Pad 3	03P04INF & 03P05INF	-
LL-006N	06P04	-

• Lessons

Robust and effective COVID-19 management plans necessary for Long Lake site and Calgary Office

• Successes

- > Fully ramped-up base well production in conjunction with oil price recovery
- Achieved 1st oil at LLSW November 22, 2021
- Plant continues to have high reliability performance
- Continue to reduce non-compliance events
- Failures
 - LLSW valve failures, start-up delayed
- Pilots
 - > None
- Major Technical Innovations
 - > None

Planned Development - Next 5 years

mil.

Section 10 – Regulatory and Operational Changes

Regulatory Applications/Approvals (Scheme 9485)

Application No.	Registered	Description	Approved
1932329	Feb 22, 2021	Upgrader (Remove Reporting Requirements)	Mar 20, 2021
1933485	Jun 28, 2021	Sidetracks for Pads 5 and 8	Jul 8, 2021
1933529	Jun 30, 2021	Pad 14 and 15 Expansion Project	Nov 25, 2021
1934199	Sep 2, 2021	LLNW (Pad 19) Addition	TBD
1934799	Nov 3, 2021	Partial Upgrader Restart (re-instate reporting requirements)	Apr 13, 2022
1935317	Dec 16, 2021	LLSW FUSE start-up Pads 16, 17, 18	Withdrawn

Summary of 2021 Events Material to Performance

- Started construction of replacement disposal line
- Significant progress made on construction of K1A pipelines (BFW & PE)
- Began inspections/commissioning of K1A facility
- LLSW 1st steam and 1st oil achieved
- 3 redrills completed
- Upgrader initiated cleaning, inspection and repair works in conjunction with detailed engineering

Section 11 – Compliance History

Incident Type	Reference #	Date	Approval/ Directive	Description	Corrective Actions/Follow-up
Venting	AER EDGE 375433	January 24, 2021	Directive 060	Multi-tank venting event resulted in estimated volume of gas release of 47,807 m3.	Internal investigation completed. AER conducted a site visit in relation to this event and issued a Satisfactory Inspection report on February 3, 2021.
Casing Failure	Submission ID 2091387	March 14, 2021	Directive 087	Casing failure that was identified through logging on observation well 100/12-28-085-06W4.	An extension (no. 2) was received and repair to be completed by March 31, 2023.
Release	AER EDGE 378860 AER FIS 20211091	May 12, 2021	EPEA	Release of 2297 m3 of natural gas from drain tank associated with pipeline (Licence No. 60120).	On June 22, 2021, the AER issued a Satisfactory inspection report to close out the Pipeline Incident Review (Inspec. ID 511333).
Spill	AER EDGE 0381169 AER FIS 20211581	July 13, 2021	EPEA	Release of 4 m3 produced emulsion resulting from valve failure. Contained on lease.	Spill impacted area immediately cleaned- up and final report submitted on December 14, 2021.
Casing Failure	Submission ID 2118416	October 23, 2021	Directive 087	Casing failure was identified through logging on well 103/09-28-085- 06W4/00.	Repair/remediation completed on March 13, 2022.
Pressure Exceedance	Unassigned	December 17, 2021	Scheme Approval No. 9485	Pressure exceedance at observation wells 104/02-32-085-06W4M (104/2-32).	Investigation undertaken and SIR response with RT log results submitted on May 16, 2022, confirming there is no gas in Upper McMurray.

No Voluntary Self Disclosures during reporting period.

Incident Type	Reference #	Date	Approval/ Directive	Description	Corrective Actions/Follow-up
Industrial Run- off	FIS 20210643 EDGE 0377059	March 16, 2021	EPEA	Failure to have industrial run-off samples analyzed by laboratory (field screen only) from Kinosis stormwater pond.	Updated industrial run-off sampling and release procedure, forms, map and additional training provided for personnel.
Industrial Run- off	FIS 20210642 EDGE 0377058	March 17, 2021	EPEA	Failure to have industrial run-off samples analyzed by laboratory (field screen only) from LLK CPF.	Updated industrial run-off sampling and release procedure, forms, map and additional training provided for personnel.
Venting	FIS 20210749 EDGE 0377469	March 24, 2021	EPEA	Multi-tank venting event from CPF tank farm resulting in 861.2 m3 of gas released to atmosphere.	Venting immediately remediated and process variables on DCS were changed to reduce load VRU.
Unsatisfactory Inspection (Low Risk)	Inspection ID 513867	August 31, 2021	Directive 055	Two storage deficiencies - tears in the tank farm secondary containment liner and chemical totes without secondary containment.	Deficiencies addressed by September 30 compliance deadline and AER Satisfactorily closed report on October 15.
Unsatisfactory Inspection (Low Risk)	Inspection ID 515338	October 20, 2021	Directive 017	Failure to show most recent calibration on tags of MARP steam flow meter on pad	Calibration records provided and paint markers to be used to label going forward.
Unsatisfactory Inspection (Low Risk)	Inspection ID 515341	October 20, 2021	Directive 017	Failure to show most recent calibration of tags MARP steam flow meter on pad.	Calibration records provided and paint markers to be used to label going forward.
Unsatisfactory Inspection (Low Risk)	Inspection ID 515340	October 20, 2021	Directive 017	Failure to show most recent calibration of tags MARP steam flow meters on pad.	Calibration records provided and paint markers to be used to label going forward.
Unsatisfactory Inspection (High Risk)	Inspection ID 515991	November 3, 2021	Directive 050	Failure to properly dispose of drilling cement returns from historical program.	Site clean-up undertaken and site handover process with sign-off has been put in place.

Section 12 – Future Plans

Future Plans

2022 Planned Activity

- Continue LLSW start-up and production (Pads 16, 17, 18)
- LLK Redrill program (Pads 2, 6-7, 12-15)
- Reinstate NCG on Pad 7E
- Initiate clearing and site development for LLNW (Pad 19)
- Drill and complete Pad 14/15 expansion wellpairs; first steam in 2023
- Complete construction of K1A replacement pipelines, transition to commissioning and start-up
- Complete commissioning/inspections and begin start-up of K1A facility
- Begin partial Upgrader re-start

Future applications to be submitted:

- GMP amendment
- LLNW observation wells
- LLNW pad wells & PL licensing
- LLK Redrill program

THANK YOU

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