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CONFIDENTIAL PRESENTATION

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Confidential Portion of BPXA's Testimony Prudhoe Oil Pool Major Gas Sales Presentation to the AOGCC by BPXA as an individual Prudhoe Bay Unit working interest owner

27 August 2015

Objectives

- Support Rule 9 Application for amendment of CO 341D Rule 9 for the Prudhoe Oil Pool (POP)
  - Technical justification for increasing the maximum allowable gas offtake from 2.7 to 4.1 BCFD
  - Address several topics of interest for the AOGCC
- Support Application for AIO Modification of AIO 3A and AIO 4F
  - Technical justification for request to inject CO2-byproduct into the POP for Enhanced Recovery and Pressure Maintenance

Summary Conclusions

- The Major Gas Sales (MGS) Reference Case (3.3 BSCFD) and the Maximum Allowable Gas (MAG) Sensitivity Case (4.1 BSCFD) both demonstrate significant additional hydrocarbon recovery from POP as a result of major gas sales
- Results of the MGS reference case demonstrate that POP is capable of delivering:
  - Approximately 22 Trillion Standard Cubic Feet (TSCF) of hydrocarbon sales gas or 3.8 billion Barrels of Oil Equivalent (BOE)
  - A gas sales plateau length of 20+ years
  - Continued oil development and production
- The MAG sensitivity case produces an equivalent ultimate hydrocarbon recovery of between 17.7 and 17.8 billion BOE's
- An increase in Rule 9 gas offtake to an annual average of 4.1 billion standard cubic feet per day (BSCFD) is consistent with good oil field engineering practices, and positions the Prudhoe Bay Unit working interest owners to access of the MGS opportunity afforded by the Alaska LNG Project, and therefore should be approved

Prudhoe Bay Full Field Model

- Parallel, Compositional VIP Model
- Integrated subsurface, well, pipeline and facility model
- World class history match from 1977 to Present
- Examples of Uses:
  - Facility optimization
  - Activity planning
  - Lean and Miscible gas injection
  - Gas Cap Water Injection (GCWI)
  - Gas Sales Development planning

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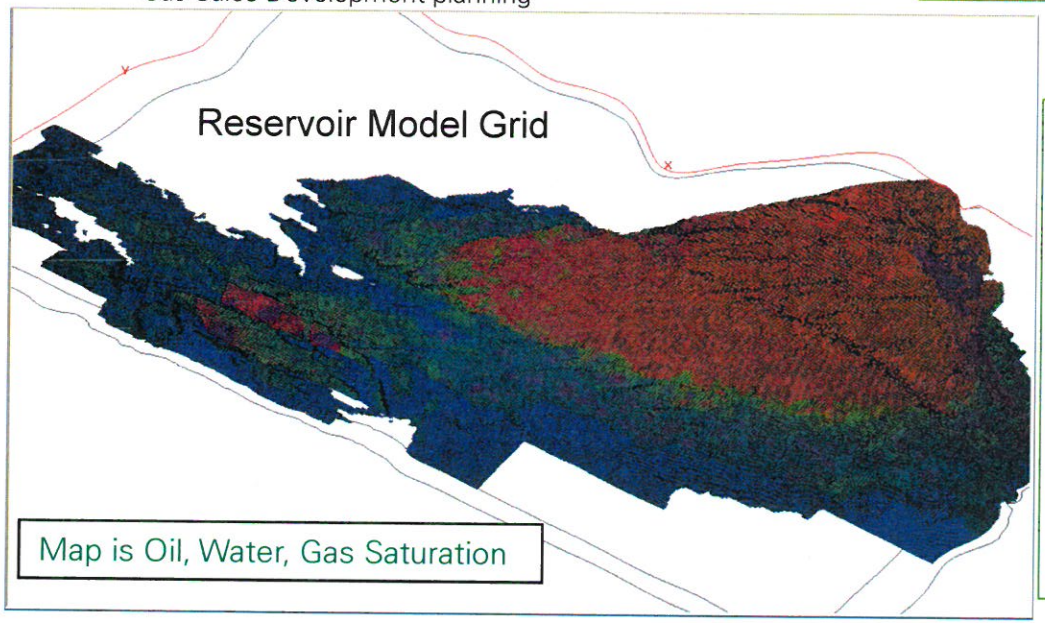

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Cases & Assumptions

1) Oil Reference Case
   a) Active development drilling program
   b) Rig workovers for well repair
   c) Continued Gas Cap Water Injection (GCWI)
   d) Normal annual TAR events and facility downtime

2) MGS Reference Case and MAG Sensitivity Case
   a) Same drilling program as Oil reference case
   b) Rig workovers for well repair
   c) Continued Gas Cap Water Injection (GCWI)
   d) 1/1/2025 gas sales startup with a 1 year ramp
   e) Annual average supply to AKLNG GTP inlet (w/CO2):

MGS Reference Case	MAG Sensitivity Case
2.7 BCF/D	3.6 BCF/D

   f) Normal annual TAR events and facility downtime
   g) GTP by-product (CO2) injected into Eileen West End (EWE)
   h) Convert apex gas injectors to producers
   i) Add gas perforations
   j) Project length 30 years

Oil Reference Case – POP Oil and NGL Production

- Forecasted liquid volumes reflect ongoing development activity
- Field production continues to decline with substantial development and optimization
- Recovery approaches 4.5 billion stb's more than originally predicted in 1977 of 9.7 billion stb's

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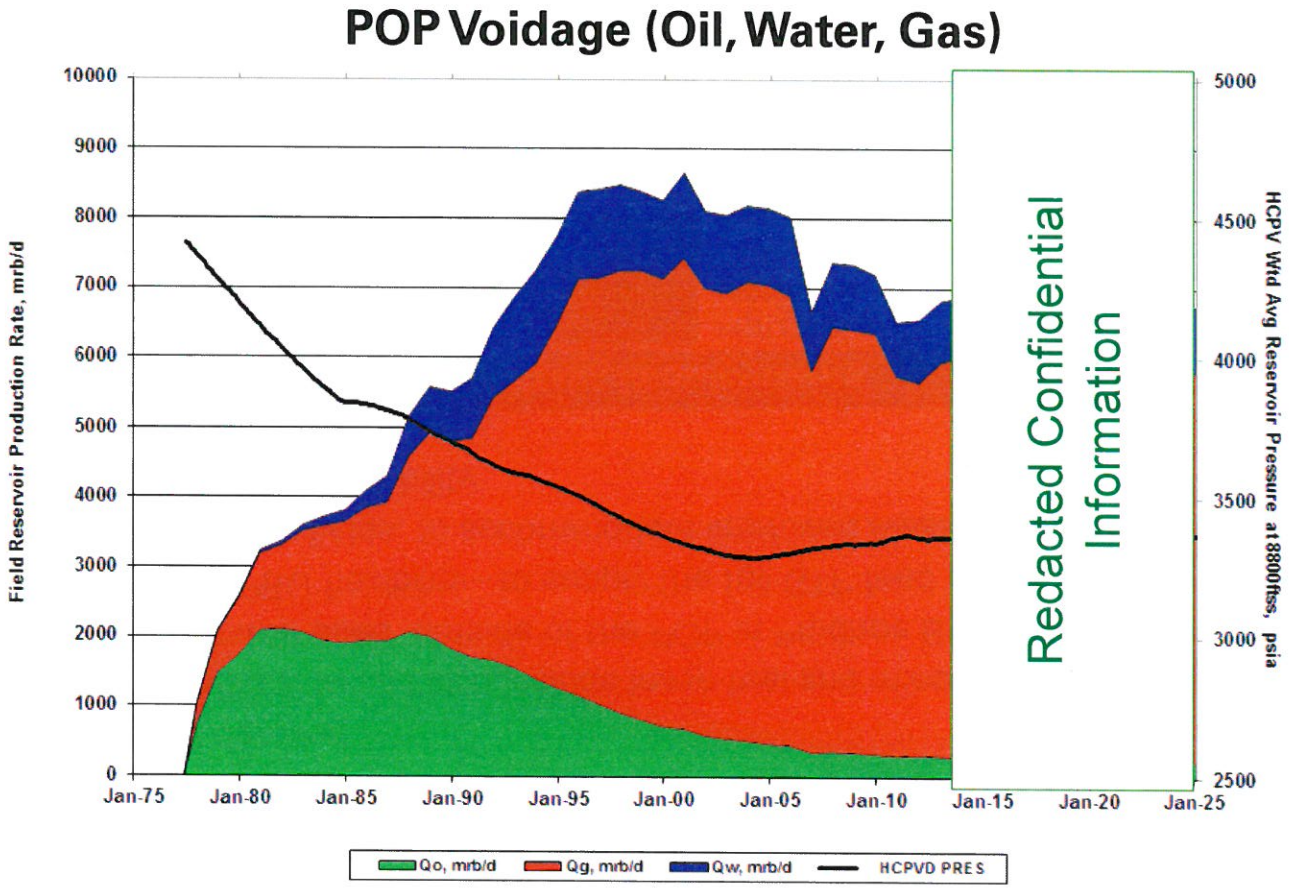
Reservoir Voidage for Reference Oil Case



- POP has acted like a gas field from early in its development
- 85% of reservoir volume produced is gas.
- Objective of gas sales is to turn the dominant remaining phase into recovered hydrocarbons.

POP Gas Offtake Volume Basis

- Alaska LNG Project has advised gas supply to the GTP must be maintained, under normal operations, at rate of ~3.5 BSCFD annual average untreated gas
- GTP feed rate of ~3.5 BSCFD rate allows for 0.4 - 0.5 BSCFD for in-State demand and ~2.7 BSCFD LNG facility inlet demand
- POP's total gas offtake would also include lease fuel and minor North Slope sales sales and Miscible Injectant (MI) used outside of the POP in Prudhoe Bay Unit satellites.
- 4.1 BSCFD allows PBU flexibility - to supply the full GTP feed rate in the event of supply disruptions from other fields, to accommodate improved Alaska LNG Project facility performance and to allow operational flexibility

Gas Offtake Requirements		
	POP Offtake – MGS Reference Case (Normal Operations)	POP Offtake – MAG Sensitivity Case
PBU supply to AK LNG	~2.7	~3.6*
PBU lease fuel	~ 0.4	~0.3
Minor North Slope sales (Alyeska, Norgasco , KRU, etc.)	~ 0.2	~0.2
Total	~3.3	~4.1
(all rates in units BSCFD annual average raw gas)		

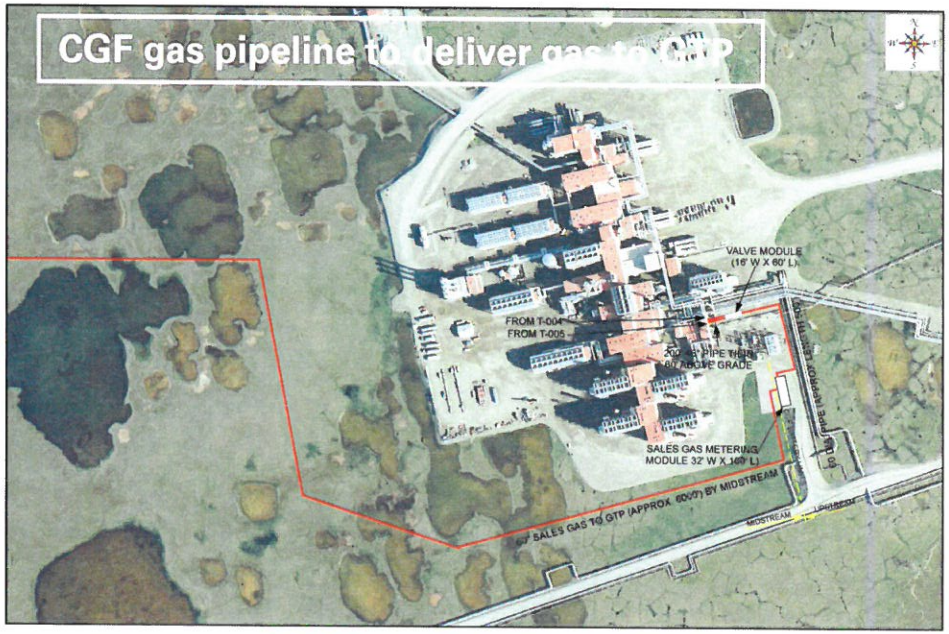
* Higher supply rate due to higher CO_2 concentrations in POP than in other fields

Modeled Gas Offtake and CO2 Handling

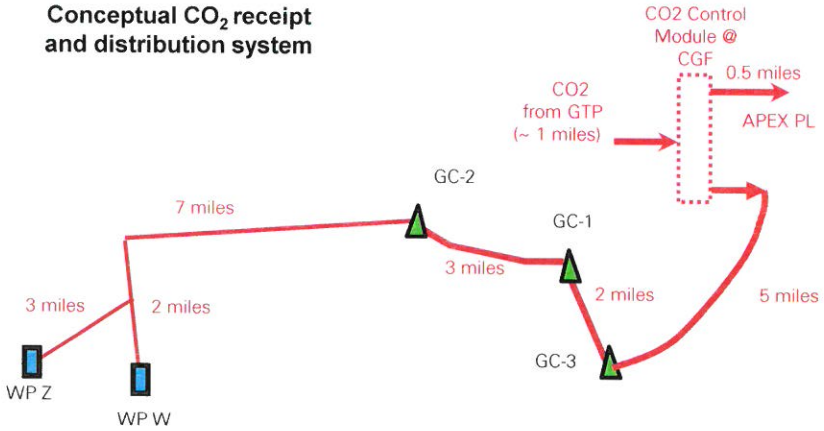
Gas Offtake

- Produce gas from existing well stock
- Optimize offtake with:
  - Targeted re-completion for gas
  - Injector to producer conversions
- Two redundant offtake points at Central Gas Facility (CGF)
- Upgrade select equipment to ensure reliable gas delivery

AKLNG Project participants are designing the GTP to return the CO2 byproduct to PBU



Conceptual CO_2 receipt and distribution system



CO2 Receipt and Injection

- EWE is the most promising option. Injection into Eileen West End (EWE) through new pipeline to existing wells at well pads W and Z
- Additional CO2 injection options outside POP will be evaluated for additional enhanced recovery opportunity
- Backup capability could be FS2 and the Apex injectors

POP MGS Reference Case Offtake Profile

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POP MAG Sensitivity Case Offtake Profile

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Prediction Results – GTP Gas Supply

- Results of MGS reference case demonstrate POP is capable of delivering planned plateau gas supply for approximately 20 years.
- Total gas supply from POP over project period is comparable for MGS reference and MAG sensitivity cases

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Prediction Results –Average Reservoir Pressure

- POP pressure declines about 100 psi / year in the MGS reference case during the plateau period, but remains sufficient to sustain the planned gas supply.
- POP pressure decline slightly greater in the MAG case, but still remains sufficient to sustain planned gas supply.

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MGS, MAG and Oil Reference Case – POP Oil and NGL Offtake

Cumulative curves include gas recovery in BOE totals

Case	BOE Recovery (Billion BOE)
MGS	17.7
MAG	17.8
Oil Reference	14.1

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Key Prediction Results –BOE Production

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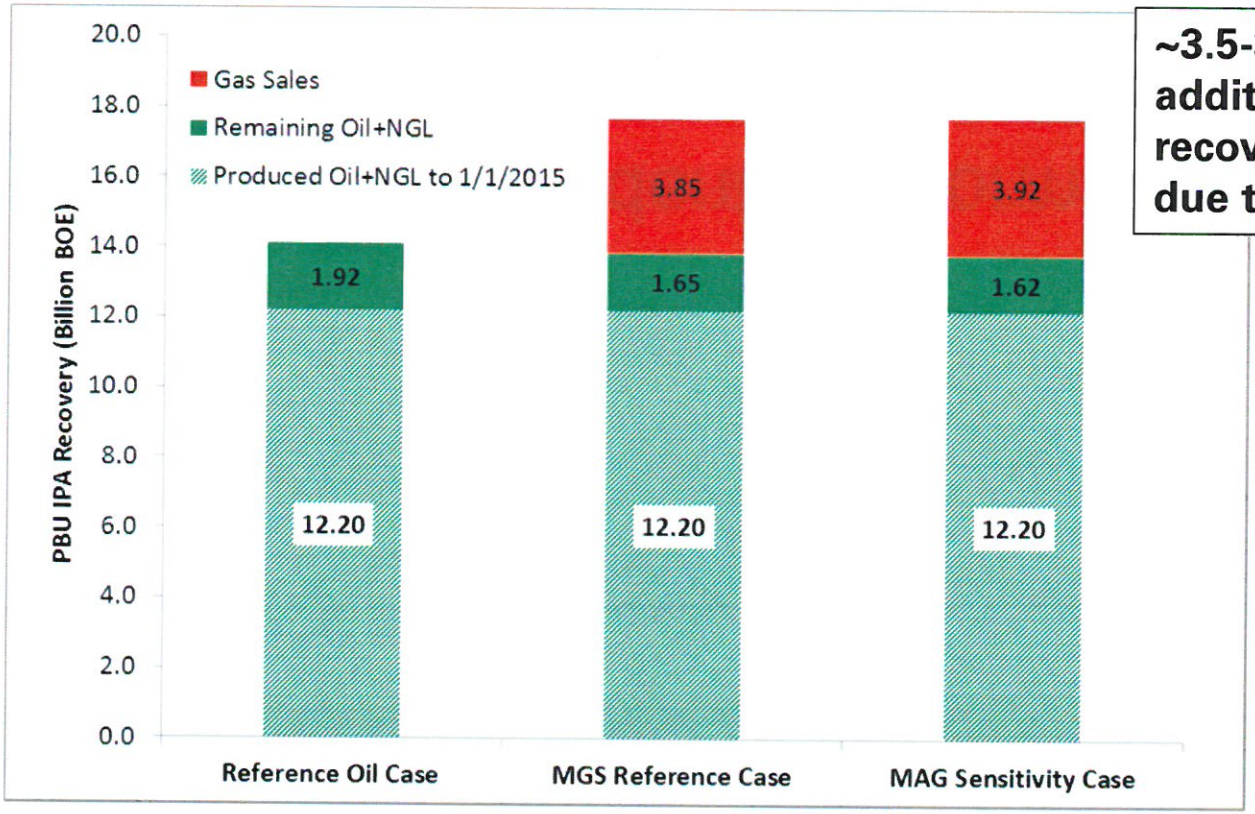
- The net total BOE recovery increase from POP due to MGS is ~3.6 Billion BOE.
- Cumulative oil during major gas sales is decreased by <300 million bbls, due to pressure impacts, but greatly offset by increased BOE's from gas sales.

Key Prediction Results – POP BOE Recovery

- The MGS reference and MAG sensitivity cases demonstrate the substantial increased hydrocarbon recovery from POP due to MGS compared to the Oil Reference case



~3.5-3.6 billion BOE's additional HC recovery from POP due to MGS.

Ongoing Depletion Strategy

- The current field activity prepares for MGS:
  - Active drilling program
  - Rig workovers to maintain healthy well stock
  - Continued Gas Cap Water Injection (GCWI)
  - Active non-rig well work programs
  - Waterflood and MI management
- BPXA and the other unit owners will continue to actively manage field optimization of the depletion strategy to enhance field performance into the future

Additional Topic - MGS Start Date Sensitivity

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- The Alaska LNG schedule basis is for a 2025 start-up.
- It is unknown when or if other major gas sales opportunities will come
- Later initiation of gas sales by more than 5 years will decrease recovery, as fuel gas impacts become larger than oil impacts
- Later gas sales increases risk of facility life impacts on recovery (not accounted for in profiles).

Additional Topic - PTU Gas Injection into POP

- PBU FFM used to test sensitivity to injection of PTU gas into POP starting in 2023 at rate of ~800 MMSCFD.
  - Inject 0.6 TCF of PTU gas into POP.
- In 2025 PTU and POP deliver gas to GTP
- Results:
  - Negligible net impacts to oil recovery
  - POP oil rates decrease during PTU gas injection
  - Additional pressure provides some compensating oil benefits

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Summary Conclusions

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AIO Objective and Summary

- Objective
  - Requesting modification to AIO 3A and 4F for the POP
  - Explain technical benefits and implications of injection CO2 into POP
- Summary
  - CO2 handling limitations impact CO2 injection development options
  - POP is injecting a similar amount of CO2 under current field operations
  - EWE is the most promising location for CO2 injection within the POP
  - Additional CO2 from outside sources generates negligible changes to POP reservoir outcomes
  - BPXA has studied and anticipates that the PBU working interest owners will continue to evaluate potential locations where CO2 injection may be economically beneficial for enhanced recovery and pressure maintenance

GTP Gas Supply & CO2 By-Product Volume

- Total GTP supply in the MGS reference case assumes 25% of gas delivered from non-POP sources.
- Currently POP produces and injects ~800 MMSCFD of CO2 as part of field operations
- The AIO modification requests approval to inject GTP CO2 By-Product (POP CO2 plus an estimated ~40 MMSCFD from PTU).
- Estimated GTP CO2 By-Product:
  - POP – 3.1 TCF
  - PTU – 0.3 TCF
  - Total – 3.4 TCF

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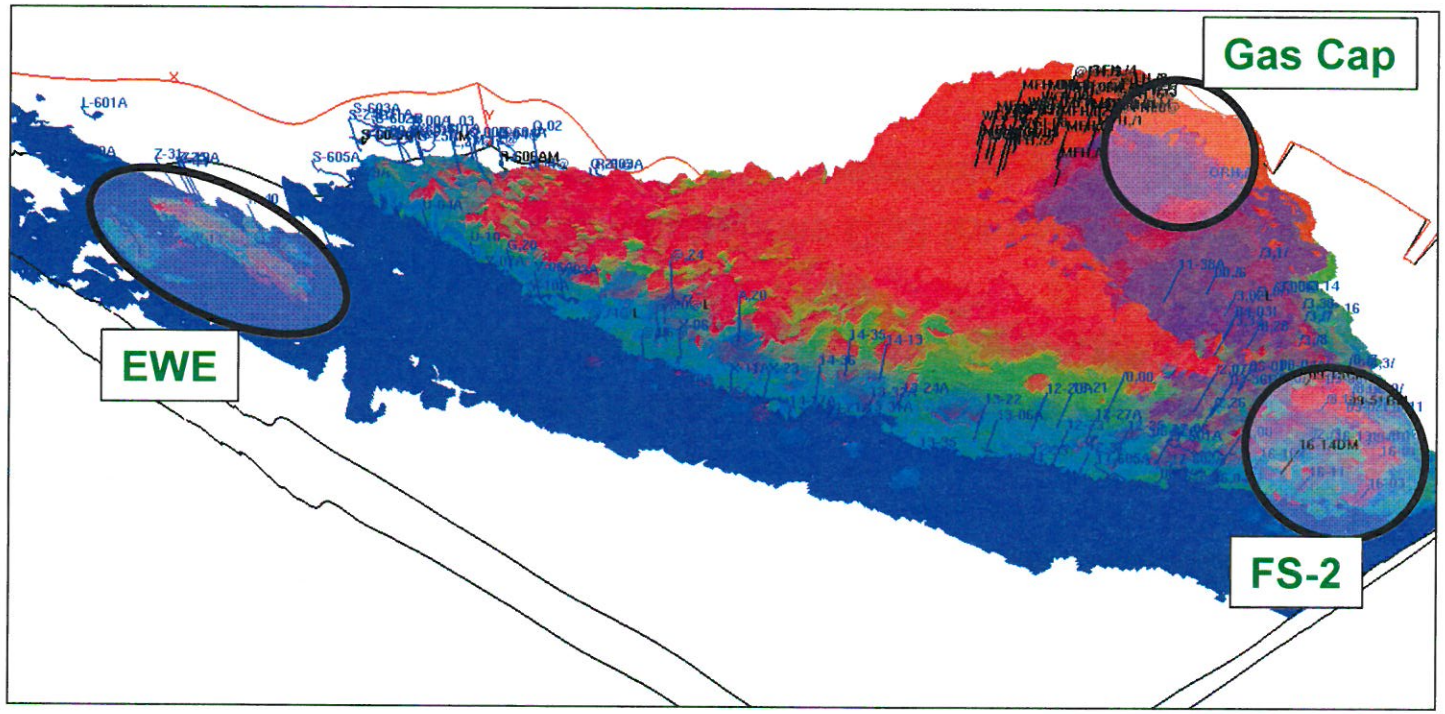
CO2 Handling Limitations

- CO2 handling limitations
  - Corrosion mitigation limits CO2 concentrations in equipment
  - Increased CO2 concentration impacts equipment operational efficiency (turbines, flares, de-hydration)
  - Gas liquefaction must have very low concentrations CO2 for LNG processing.
  - GTP CO2 processing capacity is expected to limit overall inlet gas CO2 concentrations.
- Current modeling assumptions
  - Wells shut-in upon reaching 25 mole% CO2
  - The GTP will have a CO2 handling limit

CO_2 Injection Locations Investigated

- The PBU FFM was used to determine the most promising location in the POP for GTP CO_2 by-product injection for total hydrocarbon recovery
- Injection areas investigated:
  - Eileen West End (EWE)
  - Flow Station 2 Area (FS-2)
  - Gas Cap – behind GCWI Injectors



CO2 Injection Location, POP Recovery

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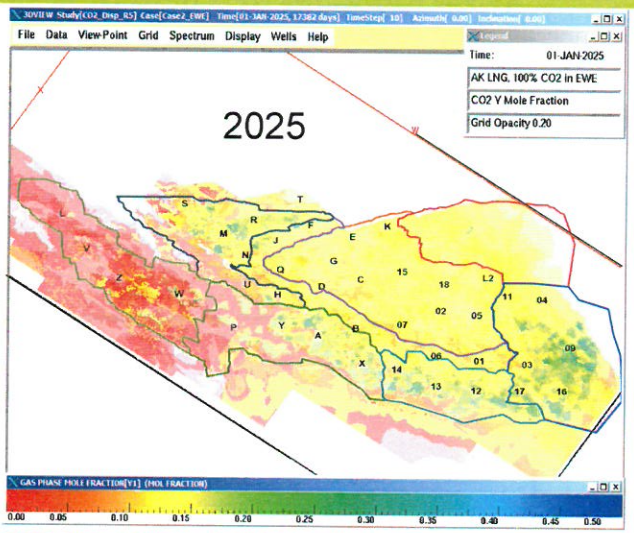
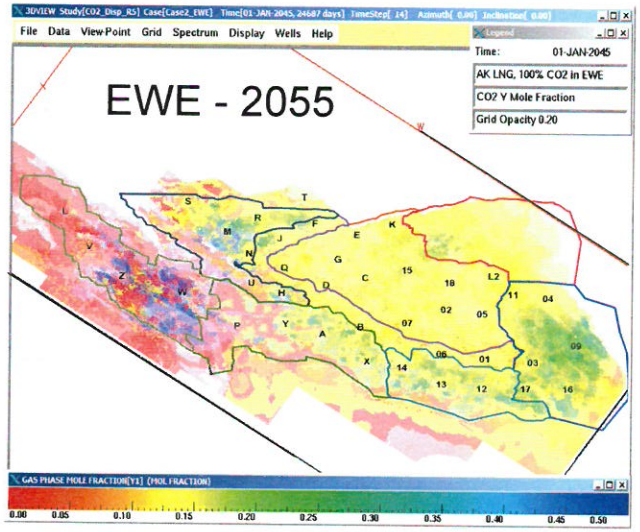
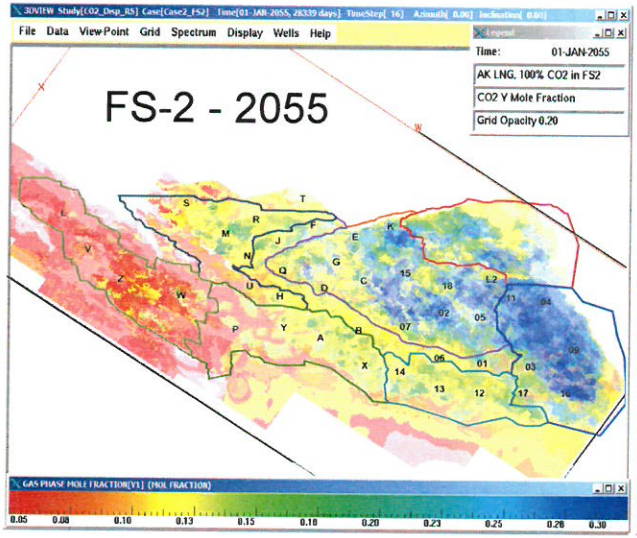
CO2 Injection Location	BOE Recovery (Billion BOE)
EWE	17.7
FS-2	17.3
Gas Cap	17.4

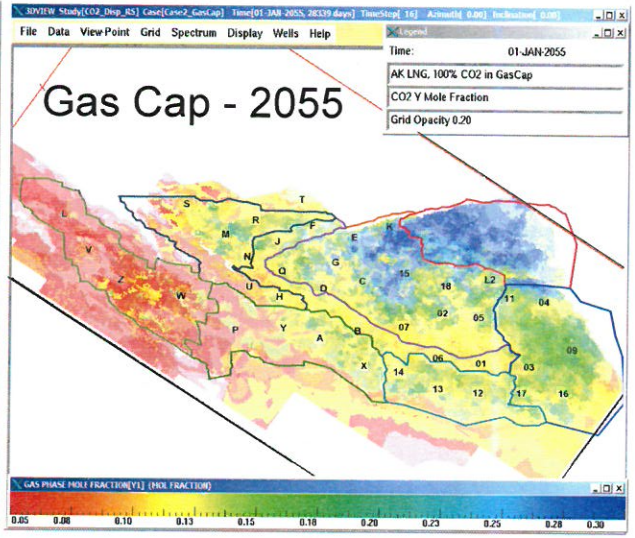
- EWE is the most promising location for CO2 injection for total hydrocarbon recovery
  - EWE CO2 injection limits migration to high gas recovery areas

Distribution CO2 in Gas Phase









Blue indicates higher CO2 concentrations

Additional Topic of Interest - Sensitivity to Injection of CO2 from PTU gas

- PBU FFM used to test sensitivity of reservoir to additional 0.3 TCF CO2 removed from PTU gas
- Same total BOE recovery as MGS reference case within model resolution
- Injection of CO2 removed from PTU gas into POP creates no discernable change to ultimate hydrocarbon recovery from POP

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Additional Topic of Interest
Alternate CO2 Usage in PBU – Studies

- CO2 Injection Lab Studies
  - POP
  - Point McIntyre
  - Borealis
  - Orion
- Tools developed for CO2 injection benefit prediction
  - EOS models tuned to CO2 lab data
  - Type patterns
  - Type pattern scale-up tools (COBRA)
  - Compositional full field models
- Continuing to perform development studies to evaluate potential use of CO2 within PBU

Additional Topic of Interest
CO2 Injection Recovery Range Estimates

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- To achieve upside all CO2 handling limitations need to be removed.
- High side assumes MI injection discontinued in 2015 with no additional EOR recovery.

AIO Summary

- Summary
  - CO2 handling limitations impact CO2 injection development options
  - POP is injecting a similar amount of CO2 under current field operations
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BPXA Presentation

- All opinions, assessments and analyses (including forward looking or predictions of future activities) in this presentation are those of BP Exploration (Alaska) Inc., in its capacity as an individual working interest owner in the Prudhoe Bay Unit.
- The PBU FFM consists of three parts: (i) historical PBU operational data; (ii) a set of reasoned assumptions about future PBU activities; (items (i) and (ii) are collectively referred to as the "FFM Inputs"); and (iii) a BPXA proprietary and trade secret process consisting of software code and algorithms owned by or licensed to BPXA (the "FFM Tool"). Full Field Model runs (sometimes referred to as cases or scenarios) are generated by inputting the FFM Inputs into the FFM Tool. FFM runs are meant to be predictive of future circumstances or consequences that could occur, depending on the FFM Inputs. Because of the proprietary and trade secret processes that BPXA employs in the use of the FFM Tool, it is not possible to derive the details of PBU operational or technical data (e.g., specific geological data) from FFM runs. BPXA uses the FFM Tool to generate FFM runs for both itself and, upon request, for the PBU working interest owners. All references in this testimony to the FFM (or to PBU FFM) are a reference to FFM Inputs plus the FFM Tool.