

# Prudhoe Oil Pool Gas Offtake Reservoir Study

## Public Summary

February 28, 2007

# Presentation Summary

- Commission authority
- Historical perspective
- Reservoir concerns related to gas sales
- Study purpose and available information
- Observations
- Recommendations

# AOGCC Major Gas Sales Reservoir Study Disclaimer

*Evaluation and opinions reflect those of only BSI and AOGCC staff who worked directly on the project. These opinions do not necessarily reflect those of the WIO, Commissioners or other AOGCC staff*

# Prudhoe Gas Offtake Allowable Commission Authority

- **Commission Duties** (related to MGS decisions)
  - prevent physical waste of resource
  - promote greater ultimate recovery
- **Authorities**
  - require/approve development plans
  - set allowable offtake

# Prudhoe Gas Offtake Allowable Historical

- Pool Rules CO 341D, Rule 9 (1977)
  - Offtake allowable set at 2.7 BCFD
  - Envisioned  $\approx$  2.0 BCFD Pipeline Delivery
- Currently produced gas re-injected

# Why do we care about gas offtake?

- Gas extraction lowers reservoir pressure
  - Decreases energy required for oil production
  - Oil recovery suffers; gas production benefits
- How is ultimate total hydrocarbon recovery affected by gas sales offtake?

# Prudhoe Gas Offtake Allowable

## Recent Activities

- 2002 WIO study
  - Tentative P/L design of 4.3 BCFD
  - Prudhoe major source for P/L (+24 TCF)
- Pipeline fiscal discussions/negotiations
- No Application for Rule 9 Amendment
- AOGCC 2005 inquiry
  - Concluded comprehensive revisit of Rule 9 needed
  - Proactive Approach
  - “Principles” for access to WIO reservoir studies

# Prudhoe Gas Offtake Study

- Study begun January 2006
  - Engineering Consultant Blaskovich Services Inc. (BSI)
  - WIO provided Data Room with necessary information and studies
- WIO Full Field Reservoir Simulator Primary Tool
  - Access/Electronic copies of reservoir simulation results
  - Additional simulation runs on request
- Good Cooperation from WIO staff, management



# Study Approach

- Simulation runs variables
  - Gas Startup Times (2015-2024) Offtake Rates (1-5.6 BCFD)
  - Other field operating strategies
- Compared on basis of total energy content
  - Units of Barrel Oil Equivalent (BOE)
- Concentrated on trends in recovery, not absolutes
  - Not looking for “the” optimum development strategy

# Conclusions

- Major Gas Sales adds  $\approx$  4 Billion BOE (+/- 24 TCF)
  - 11.4 BSTB Oil/Condensate/NGLs produced to date
  - 1977 projections of less than 9 Billion Barrel Oil
    - Initial projections assumed 1982 Gas Sales
    - End of Field life estimated 2003

# Conclusions - Model

- WIO model best currently available
  - Years in development
  - Should be good for evaluation of directional trends
  - Some improvements needed in predictive mode

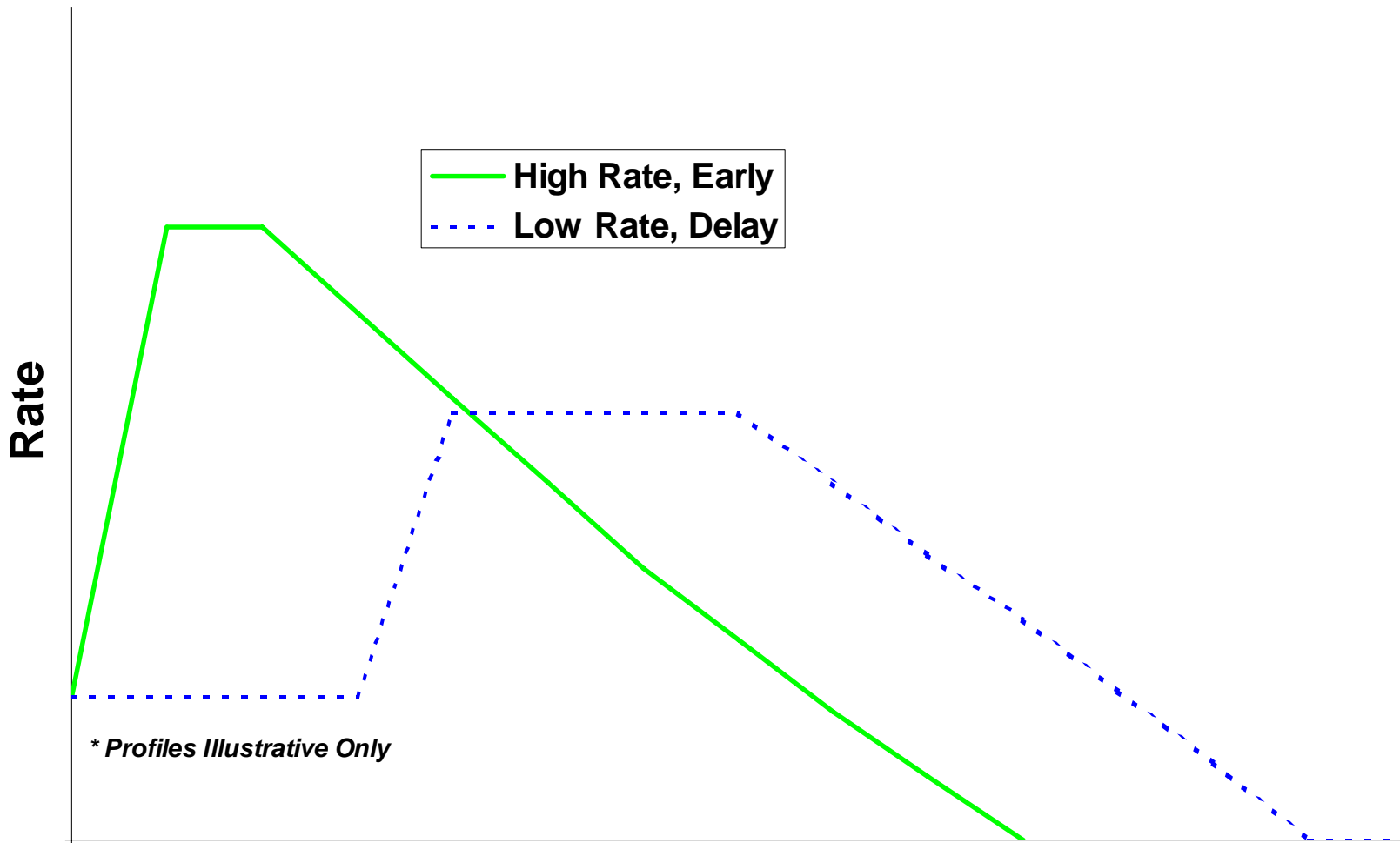
# Conclusions

- *Increased oil capture prior to Gas Sales*  
*Improved recovery trends*
  - Most encouraging strategy
  - Recovery trends less sensitive to gas offtake or S/U Rate
    - Allows for more flexibility

# End of Field Life (EOFL)

- End of Field Life (EOFL) is when costs exceed revenue from continued production.
  - Reserves are evaluated at an assumed EOFL
  - Unknown – but important to compare all cases at same assumed EOFL
- Major effect upon predicted recovery outcomes
- Date Limit favors earlier, higher rate MGS
- Rate Limit favors later, lower rate MGS

# Hypothetical Profiles\*



\* Profiles Illustrative Only

**Time**

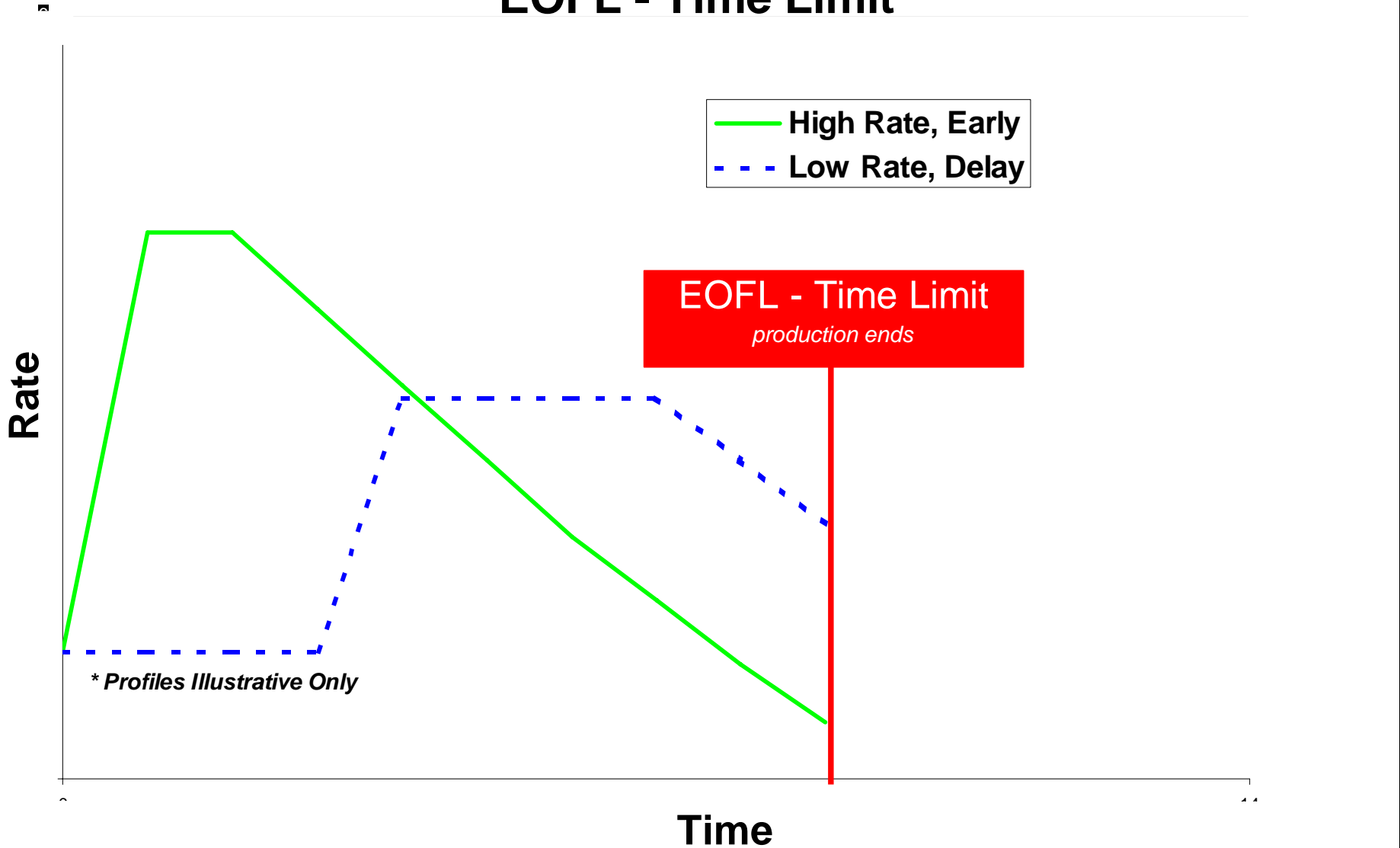
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AOGCC Public Meeting - MGS  
Reservoir Study

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# Hypothetical Profiles\*

## EOFL - Time Limit

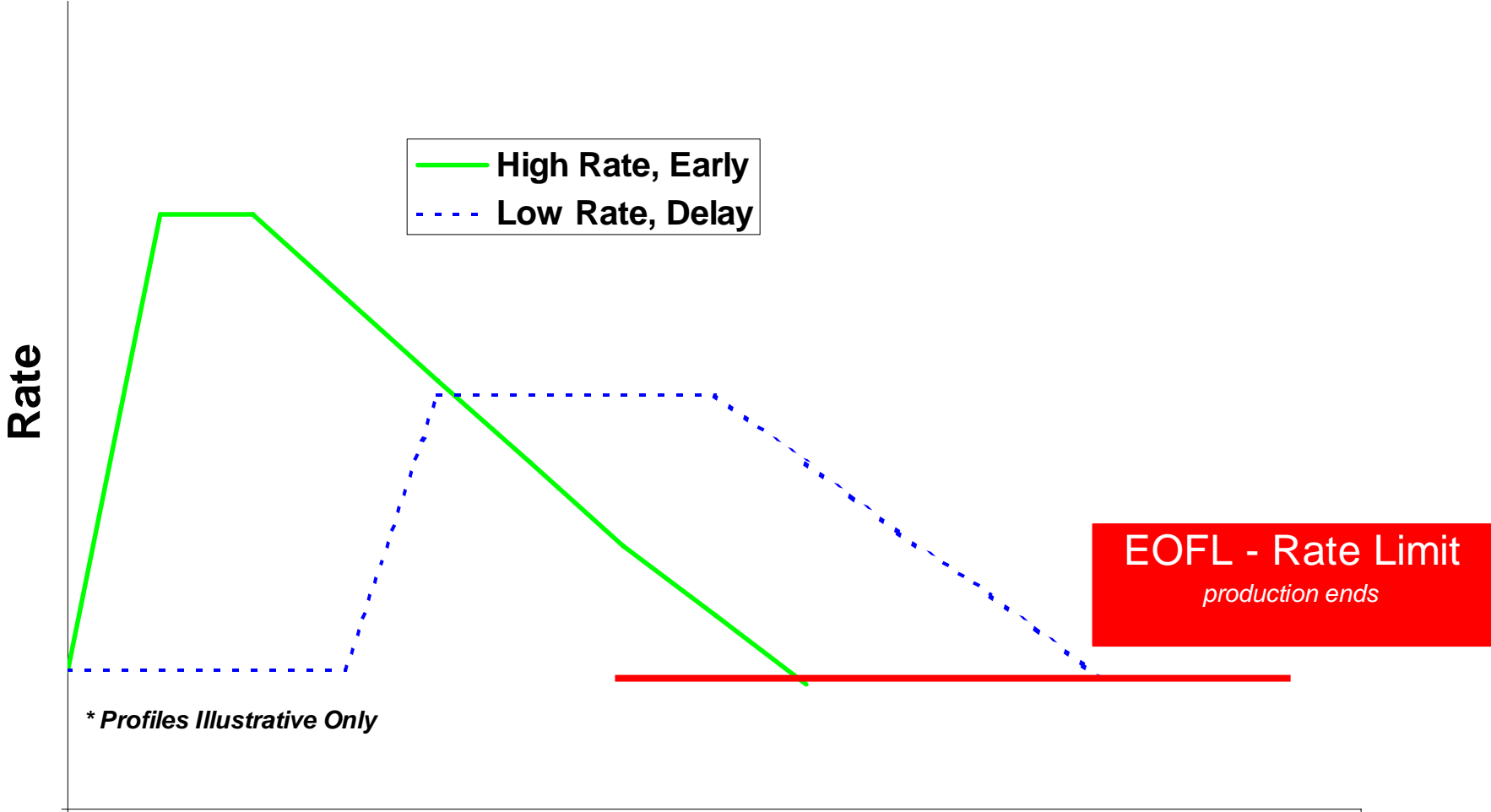


\* Profiles Illustrative Only

EOFL - Time Limit  
*production ends*

# Hypothetical Profiles\*

## EOFL - Rate Limit



**EOFL - Rate Limit**  
*production ends*

\* Profiles Illustrative Only



# EOFL Summary

- Time limits do not treat production (revenue) fairly.
- Rate limits do not treat future risk (costs) fairly.
- We believe rate limits are more correct but we need to consider risk with age.
- Use rate limits and risk analysis

# Field Well/Infrastructure Failures

- Failures increase reserves risk
  - If MGS delayed
    - Higher risk with age– impact field life
  - Near Term failures
    - Deferred oil production prior to MGS risks reserves

# Recommendations

## MGS Offtake

- There is insufficient evidence at this time to recommend increasing Rule 9 Offtake
- No request for modification of Rule 9
- Depletion planning should be required prior to commitments to sell gas

# Recommendations

## Pre-MGS Strategies/Plans

- Regardless of timing of request for modification near term strategies needed to prepare for MGS
  - Increase oil capture prior to MGS
  - Minimize well and facility downtime
- Mechanism needed for exchanging information during the depletion planning stage