# Division of Oil and Gas 2016 Fall Production Forecast

*Senate Resources Committee*

***Presented by:***
**Paul Decker and Ed King**
**Division of Oil and Gas**
**Alaska Department of Natural Resources**

***January 30, 2017***

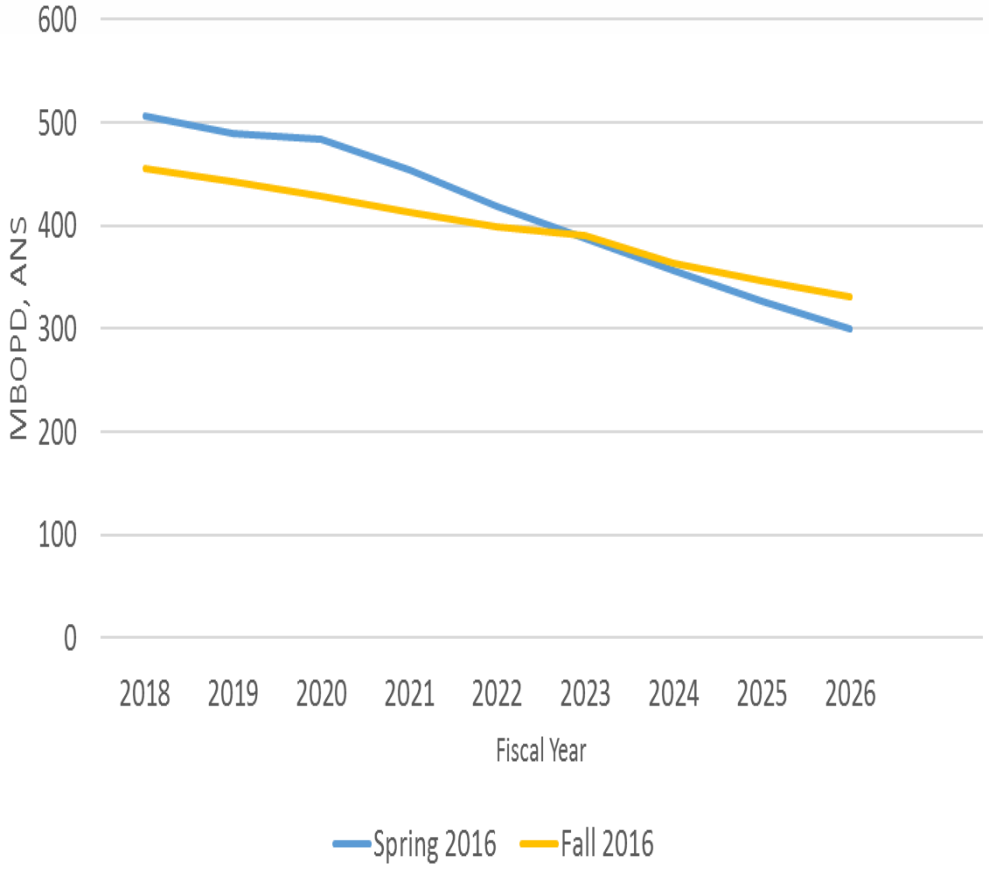
# AGENDA

- EXECUTIVE SUMMARY
- REVIEW OF PAST FORECASTS
- 2012 METHOD CHANGES
- 2016 FORECAST METHOD
- 2016 FORECAST RESULTS
- SUMMARY

# EXECUTIVE SUMMARY

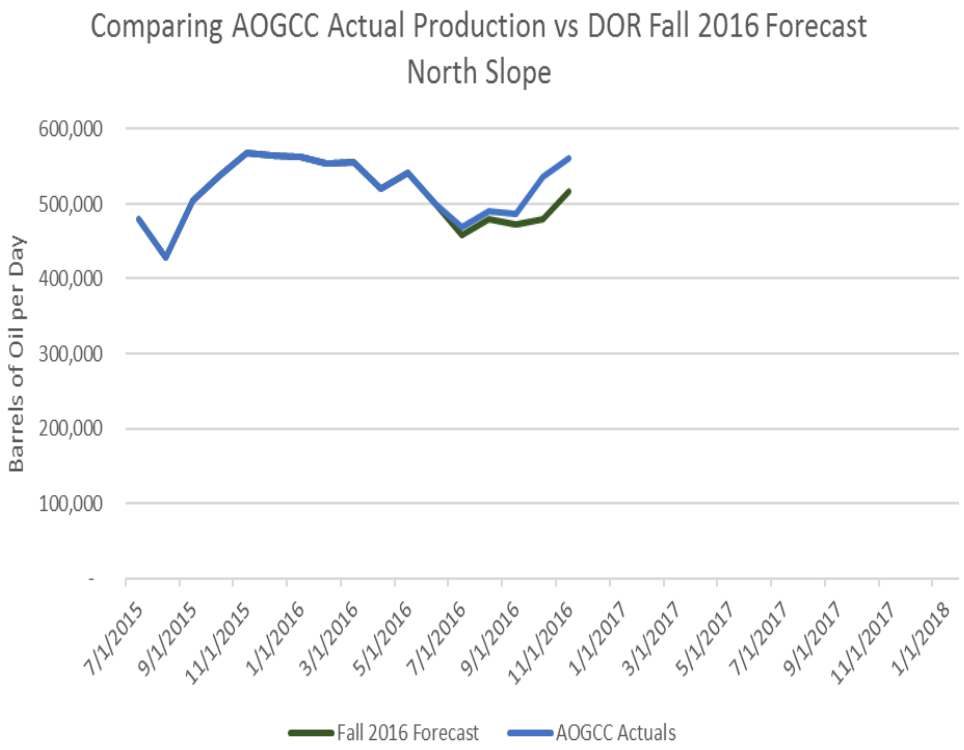
- Fall 2016 *Revenue Sources Book* is the first time the DNR has been responsible for developing the State's oil production forecast
- The forecast was developed independently of previous forecasts, applying industry-standard engineering and commercial analysis
- Major goals included minimizing the difference between forecast and actual values, relying on industry best practices, and avoiding subjectivity and speculation
- DNR acknowledges the difference between the Fall 2016 forecast versus today's actual production and past forecasts

# DIFFERENCES BETWEEN SPRING AND FALL 2016 FORECASTS




- Methodology change between the two forecasts
- Reflects change in operators' plans and activity level
- Since the Spring 2016 forecast there have been several months of activity levels significantly lower than in the past

# DIFFERENCES BETWEEN DOR'S FALL 2016 AND ACTUALS




- Why the difference between today's actuals and forecast?
  - Chart shows forecasting of seasonality versus actual seasonality
  - Production from new areas along with less maintenance contributed to actual production exceeding forecast
  - There is a lag in the production impact of changes in operator activity levels such as:
    - PBU Laydown of drilling rigs
    - Nikaitchuq suspended drilling
    - Oooguruk suspended drilling

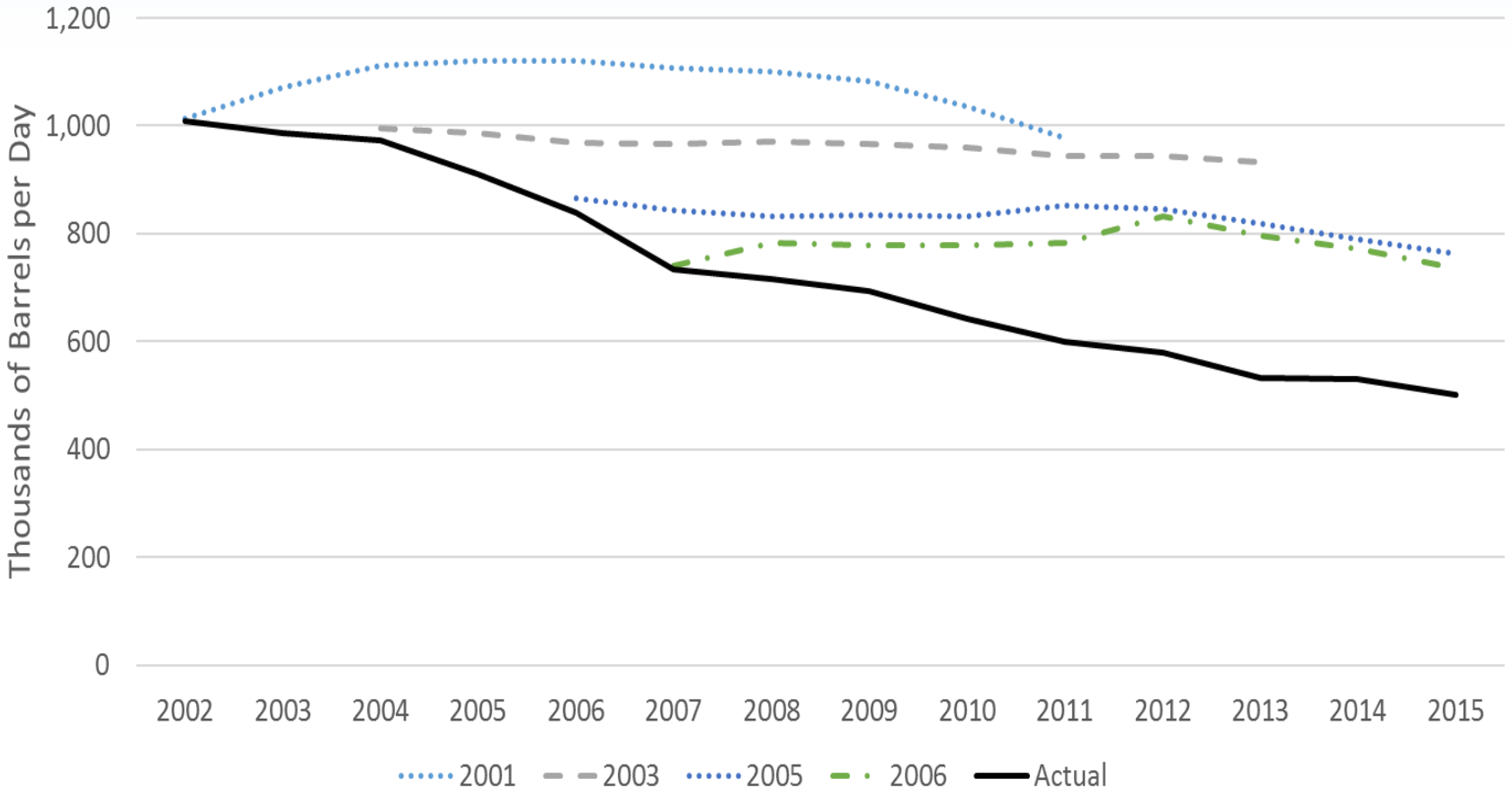
# HIGHLIGHTS

- DNR has developed a new forecast methodology using industry standard probabilistic techniques designed to improve forecast accuracy
- Mean production forecast over 10 year period shows a smaller decline rate (4%) versus historic decline rate since 1988 (5%)
- By employing a probabilistic approach, the range of outcomes can be compared in a statistically quantitative manner (P90, Mean, and P10)
- Method assigns price-dependency and occurrence risks to future activity
- Projects are included or excluded from forecast based on objective criteria

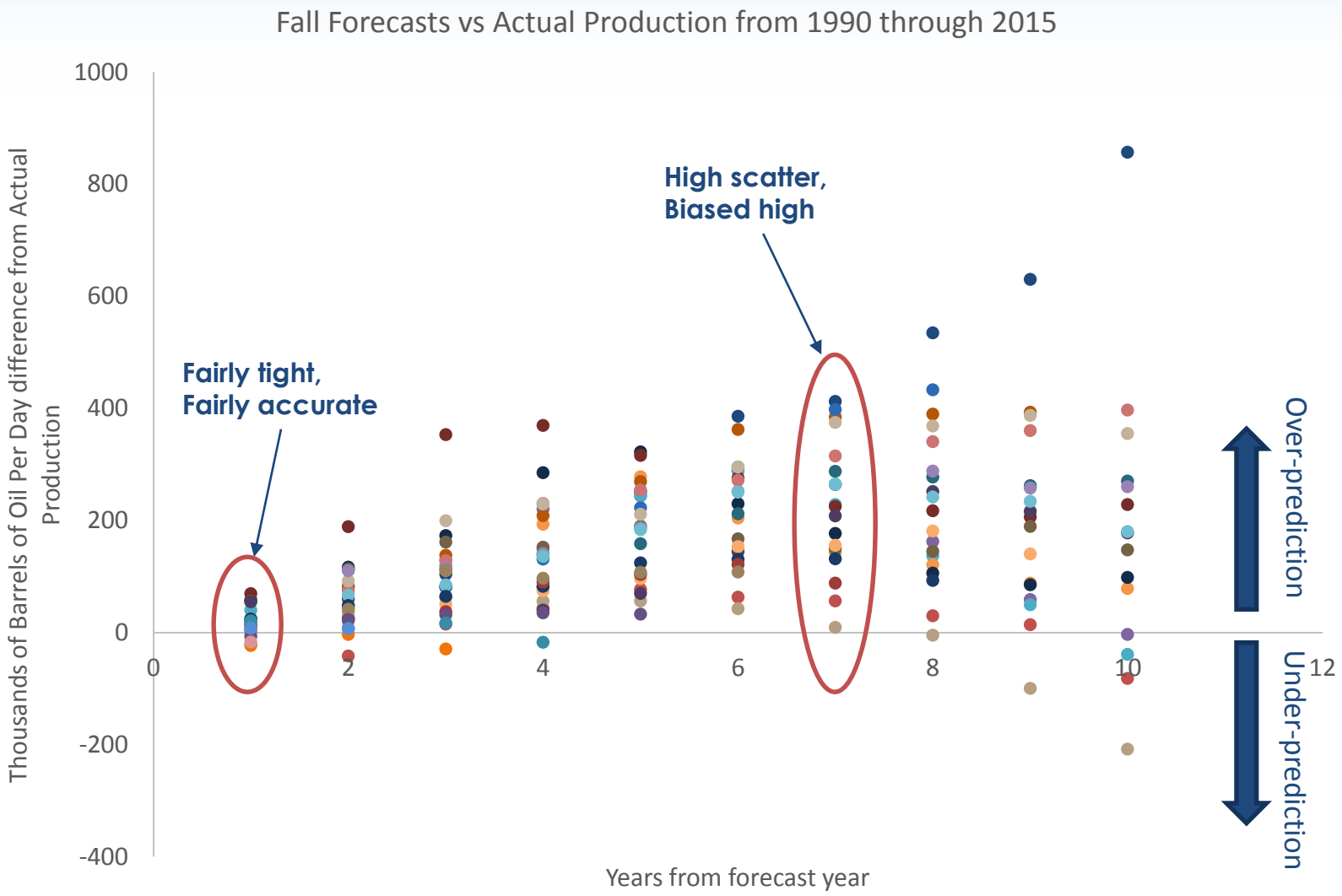
# AGENDA

- EXECUTIVE SUMMARY
- REVIEW OF PAST FORECASTS
- 2012 METHOD CHANGES (DOR)
- 2016 FORECAST METHOD
- 2016 FORECAST RESULTS
- SUMMARY

# PREVIOUS FORECASTS vs ACTUAL PRODUCTION



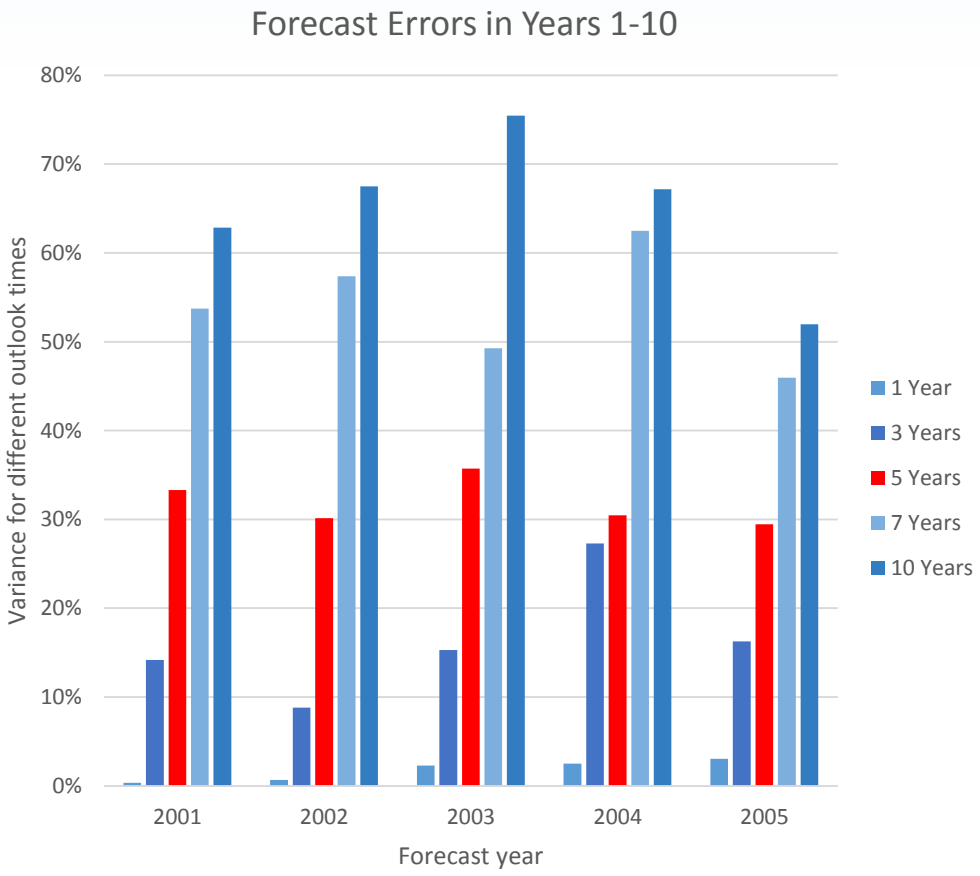
# PREVIOUS FORECASTS vs ACTUAL PRODUCTION: STRONG BIAS TOWARD OVERPREDICTION



# WHAT OUTLOOK TIME WOULD WE RECOMMEND?

- Forecast error (uncertainty) increases with number of years into the future
- Even the operators' long-range plans may change with market conditions
- The accuracy of the forecast is reduced as projects further out in time are included

**2001 to 2005 allows for analysis of 10 year prediction vs actual*



# REASONS FOR REVISING METHODOLOGY

- Previous forecasts included projects with first oil production expected as far as 10 years into the future
  - This was the biggest reason for over-prediction, since many future fields did not come online when expected
- Current forecast method employs shorter 5-year time period for inclusion of projects, excluding highly uncertain future projects

# AGENDA

- EXECUTIVE SUMMARY
- REVIEW OF PAST FORECASTS
- 2012 METHOD CHANGES (DOR)
- 2016 FORECAST METHOD
- 2016 FORECAST RESULTS
- SUMMARY

# 2012 METHODOLOGICAL CHANGE

- Acknowledgment of upward bias
- Application of “risk factors” honored some uncertainty in new developments
- “Risking” applied by the department, not the contractor
- Not perfect, but an improvement over past methods
  - Better method would use stochastic approach

# AGENDA

- EXECUTIVE SUMMARY
- REVIEW OF PAST FORECASTS
- 2012 METHOD CHANGES (DOR)
- 2016 FORECAST METHOD
- 2016 FORECAST RESULTS
- SUMMARY

# FORECASTED PRODUCTION CATEGORIES

- Current and previous forecasts each divided production into three different categories:
  - Currently Producing (CP):
    - Oil from currently producing pools.
  - Under Development (UD):
    - Oil from well defined projects that are not yet contributing to production.
  - Under Evaluation (UE):
    - Oil from more speculative projects under consideration.

- The revised methodology has adjusted the terms for inclusion in the UD and UE categories in an attempt to decrease persistent over-prediction of rate seen in previous forecasts.

# DIFFERENCES BETWEEN FORECAST METHODS

| | 1989 - 2009 | 2009 – Spring 2016 | Fall 2016 - present |
|---|---|---|---|
| **Under Development Tranche** | 10-year outlook | 10-year outlook | 1-year outlook |
| **Under Evaluation Tranche** | 10-year outlook | 10-year outlook | 5-year outlook |
| **Approach towards Uncertainty** | Deterministic (some scenarios) | Deterministic | Probabilistic |
| **Oil Price Dependency for Risking** | None | None | Dependence on oil price |
| **Risking** | N/A | CP not Risked<br>First UD/UE risking in 2012 Fall forecast | Probabilistic technical and non-technical risk |
| **Type wells for future production** | N/A | Single type well, by field | Pool-by-pool type wells |
| **Forecast Level** | Field-Level Forecast | Well–Level Forecast | Pool-Level forecast |

*Probabilistic methodology allows for statistical quantification of the range of forecast outcomes

# CATEGORY: CURRENTLY PRODUCING (CP)

- Constitutes more than 90% of total forecast
- All currently producing pools
  - North Slope: 34 individual oil pools
  - Cook Inlet: One aggregated oil 'pool' and Cosmo oil pool
- Based on public AOGCC production data. Two month lag in availability; data cutoff at 6/30/2016 (end FY16)
- Decline Curve Analysis (DCA) forecast at pool level inherently includes 'background' ongoing development activity, facility maintenance, turn-around events.

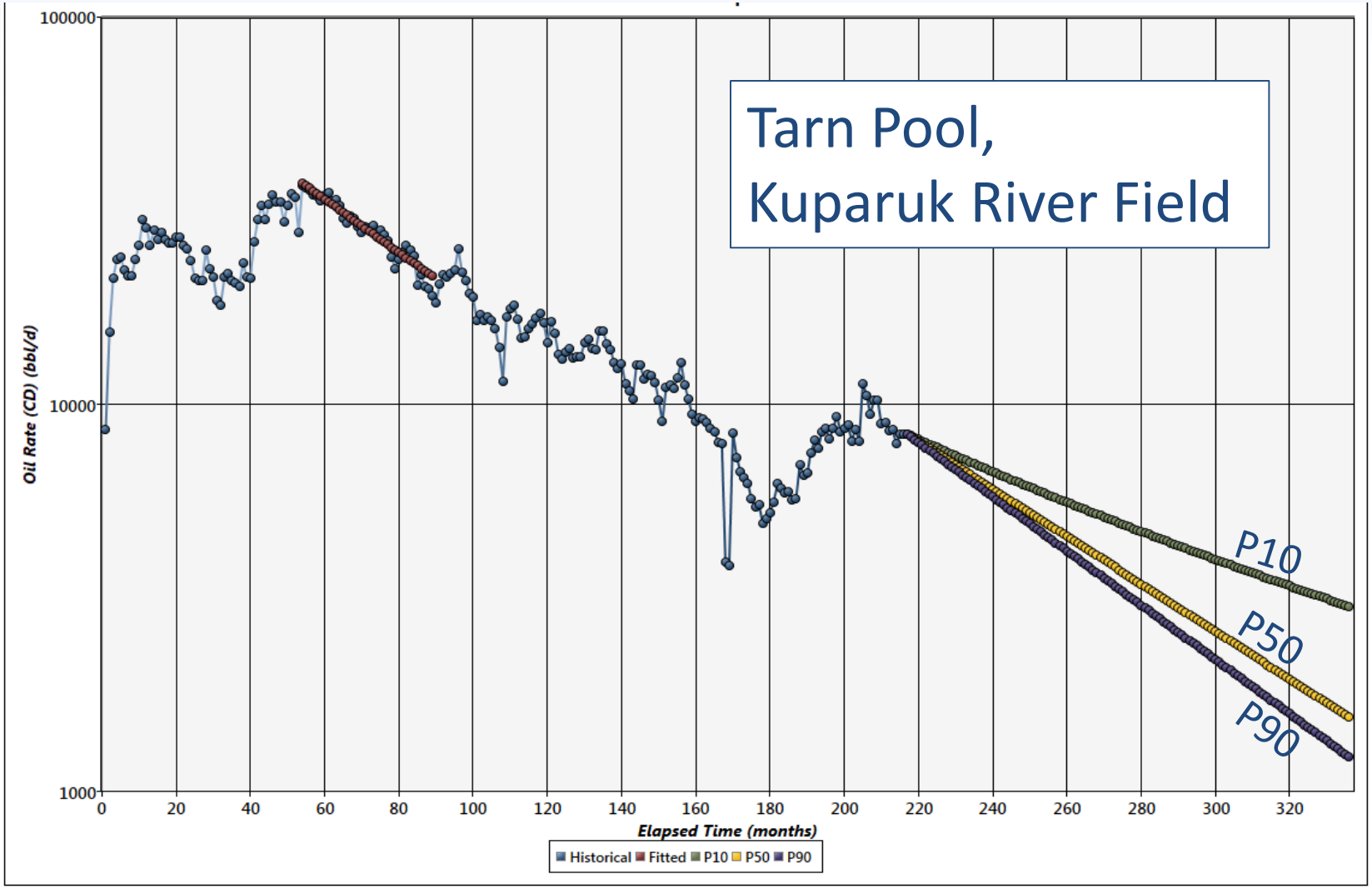
# HOW PROBABILISTIC DCA WORKS

- Decline Curve Analysis (DCA) applies trends on historical production data to forecast production based on an understanding of reservoir and operational performance of producing fields/wells.

- Probabilistic DCA includes uncertainty analysis to produce a range of future production rather than a single deterministic forecast profile.

- Software used:
  - Schlumberger's Oil Field Manager (OFM) alongside a probabilistic suite.
  - Uncertainty analysis in excel used @Risk by Palisade

# PROBABILISTIC DCA CP FORECAST EXAMPLE



# CATEGORY: UNDER DEVELOPMENT (UD)

**First production expected by 06/30/2017**

- Includes incremental wells added in currently producing fields in excess of 'background' drilling levels ('background' is inherently captured in CP Decline Curve Analysis)
- Defined to include new fields expected to produce within 1 year.
  - *None in this year's forecast, but there could be next year*.
- Probabilistic type wells were developed from analogue fields, capturing uncertainty around well performance.
- A 90% chance of occurrence was applied to each UD and UE well based on Plan of Development lookback.
- Economic risk was applied to all UD and UE production based on Department of Revenue's Price Outlook.

# CATEGORY: UNDER EVALUATION (UE)

**First production expected between 7/1/2017 and 6/30/2021**

- Development plans in place
- Significant sunk cost or sources of funding secured
- Facilities or facility-sharing agreements in place
- National Environmental Policy Act (NEPA) analysis in progress or completed
- The same chance of occurrence and economic risks were applied to both UE and UD
- Examples: Oooguruk Nuna, Greater Mooses Tooth 1, Mustang, Kuparuk Moraine, 1H NEWS, Oooguruk Nuiqsut Expansion, Greater Mooses Tooth 2

# CATEGORY: EXCLUDED FROM PRODUCTION FORECAST FOR REVENUE PURPOSES

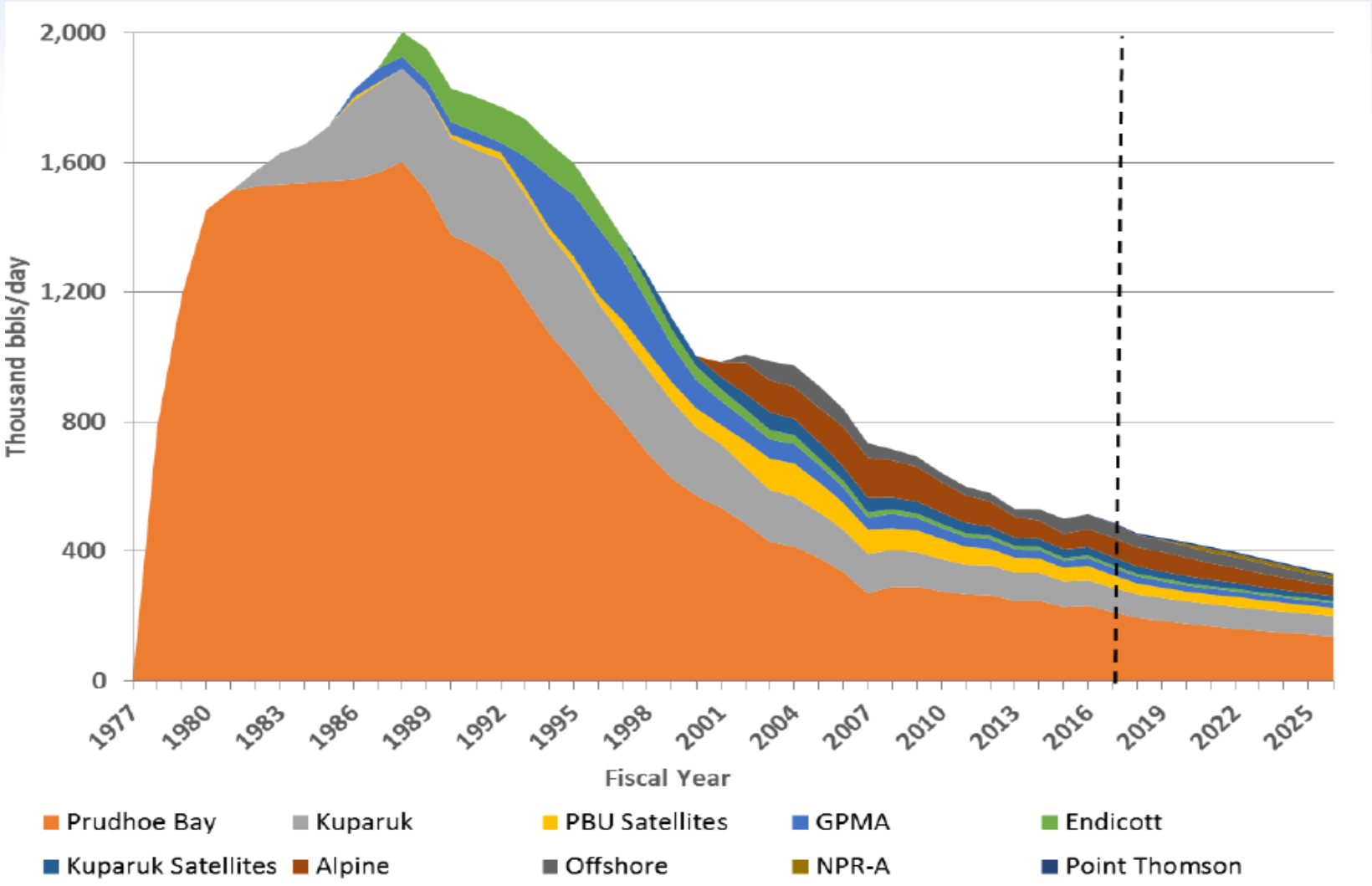
Factors considered:

- First-oil date estimated beyond five years
- Discovery (contingent resource) or just prospects (prospective resource)
- Projects still in appraisal
- Uncertain funding
- Facilities incomplete or nonexistent
- Commercial uncertainty
- Technological challenges
- Environmental/permitting challenges
- Examples: Pikka, Ugnu, Placer, Tofkat, Pt Thomson (Major Gas Sales case), Liberty, Fiord West, Smith Bay, Willow, ANWR

# AGENDA

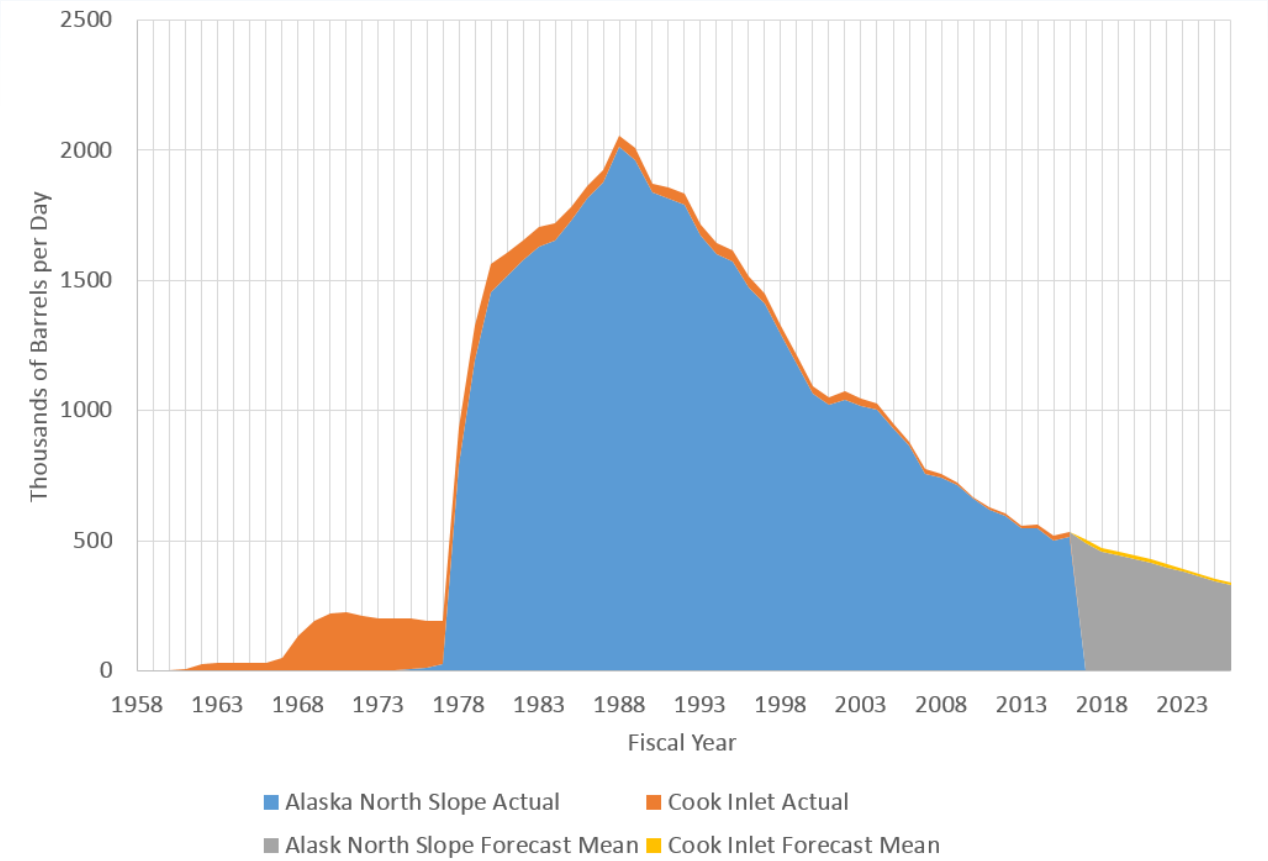
- EXECUTIVE SUMMARY
- REVIEW OF PAST FORECASTS
- 2012 METHOD CHANGES (DOR)
- 2016 FORECAST METHOD
- **2016 FORECAST RESULTS**
- SUMMARY

# FALL 2016 REVENUE SOURCES BOOK



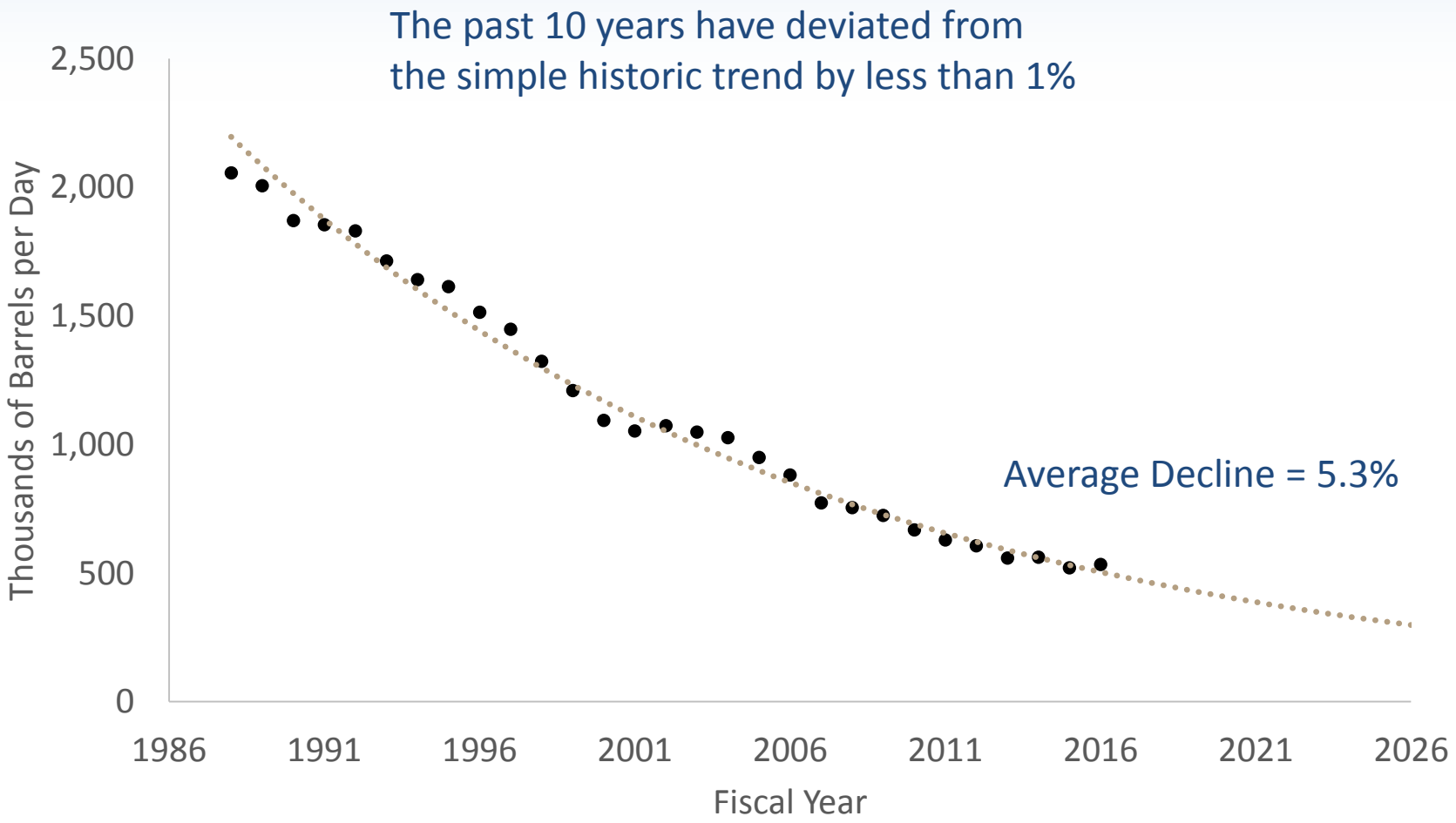

**Source: Fall 2016 Revenue Sources Book**

# NORTH SLOPE VS. COOK INLET PRODUCTION AND FORECAST

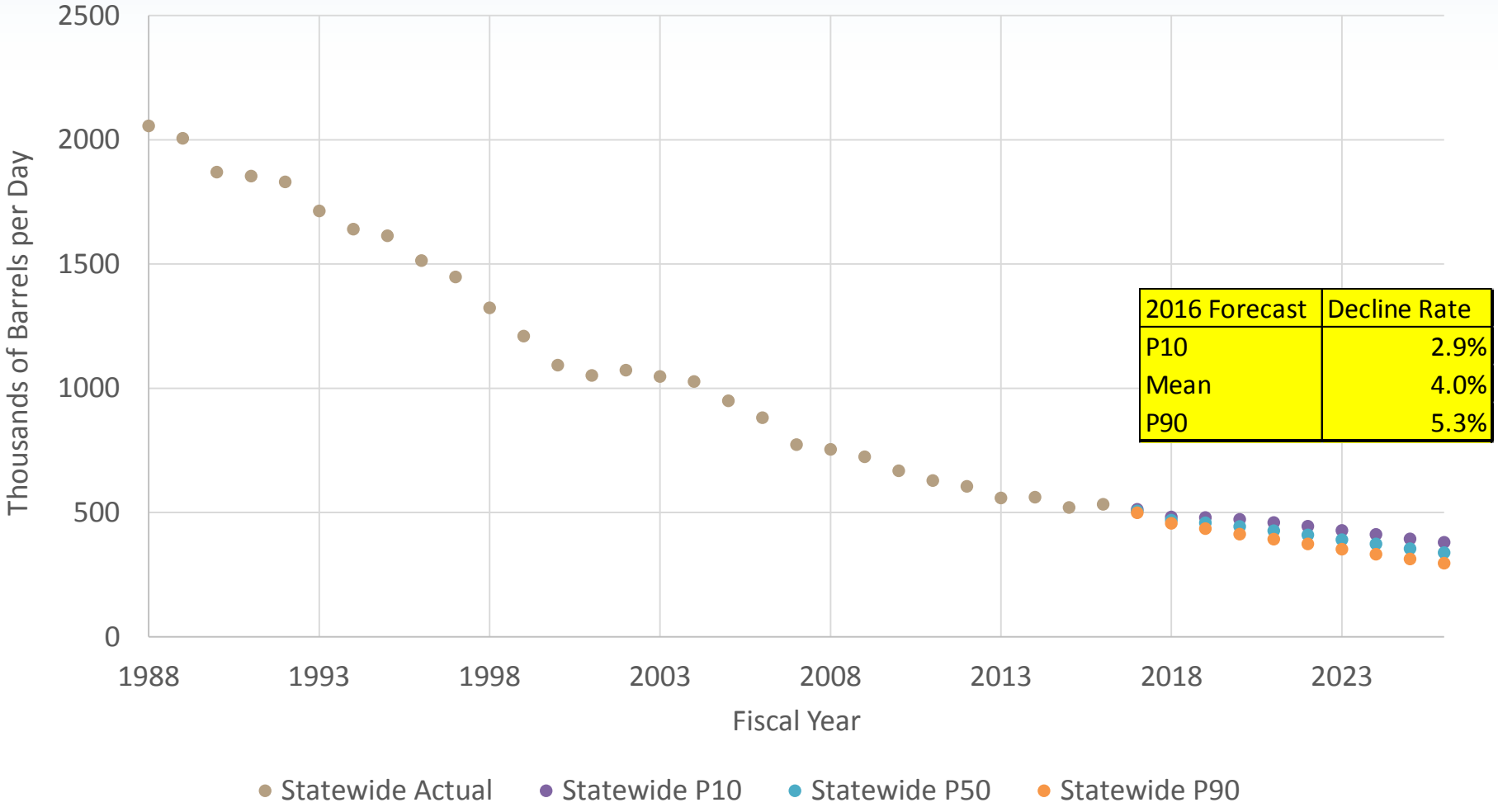



- Alaska North Slope is the major part of statewide forecast
- Over the 10-year forecast period, 3% of oil and NGLs production come from the Cook Inlet
- Chart shows annualized average production per year

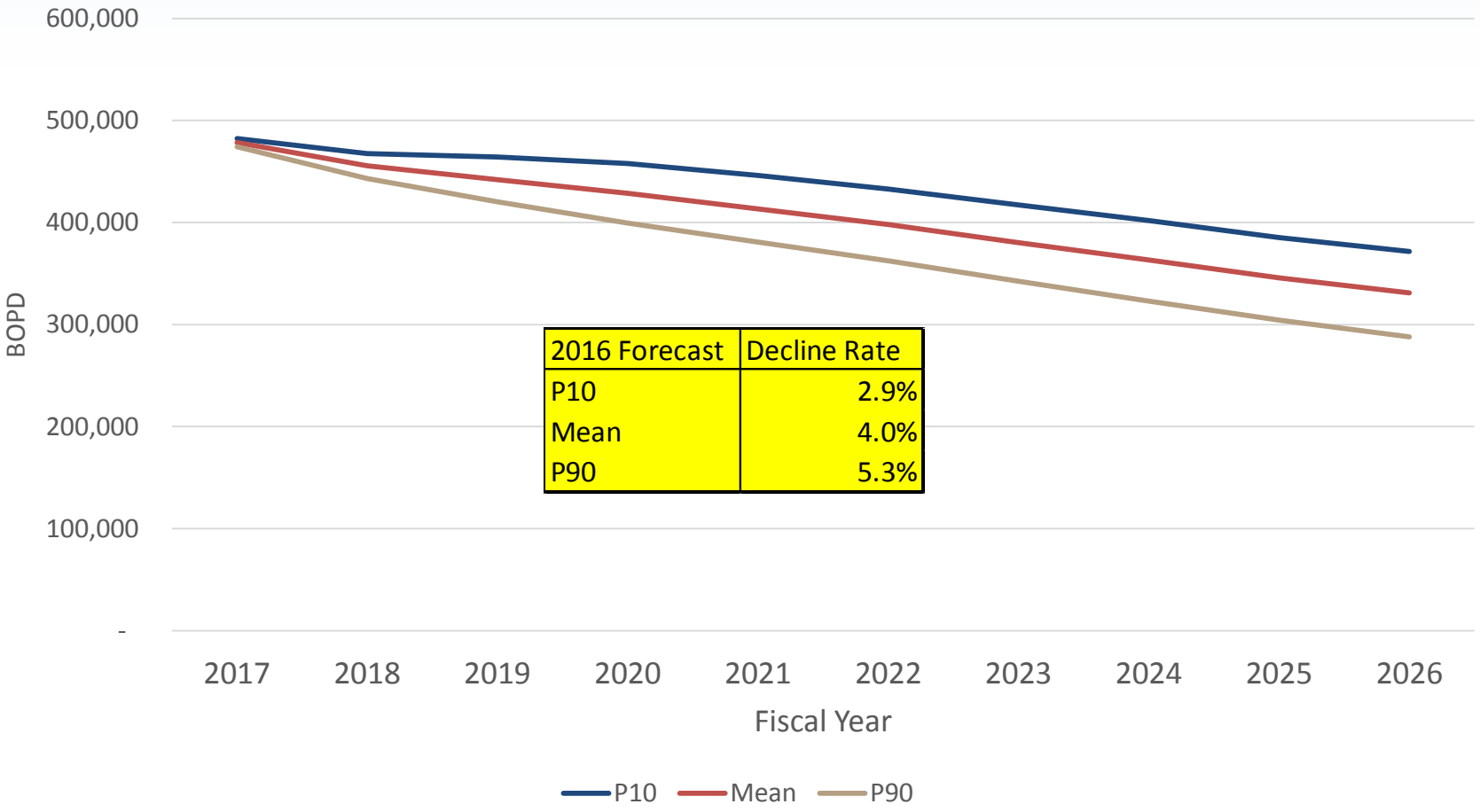
# STATEWIDE PRODUCTION TREND



# STATEWIDE ANNUALIZED OIL + NGL ACTUAL & FORECAST

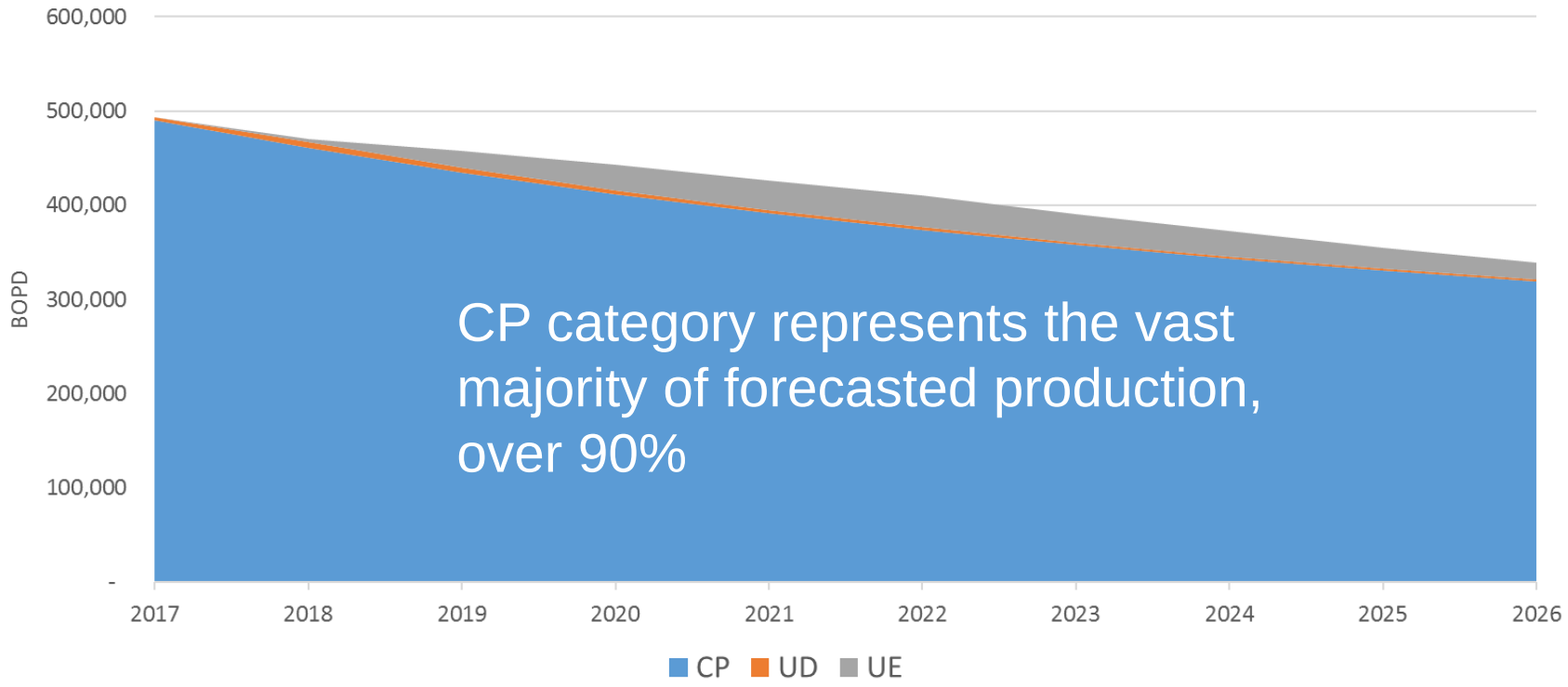


# STATEWIDE PRODUCTION FORECAST RANGE

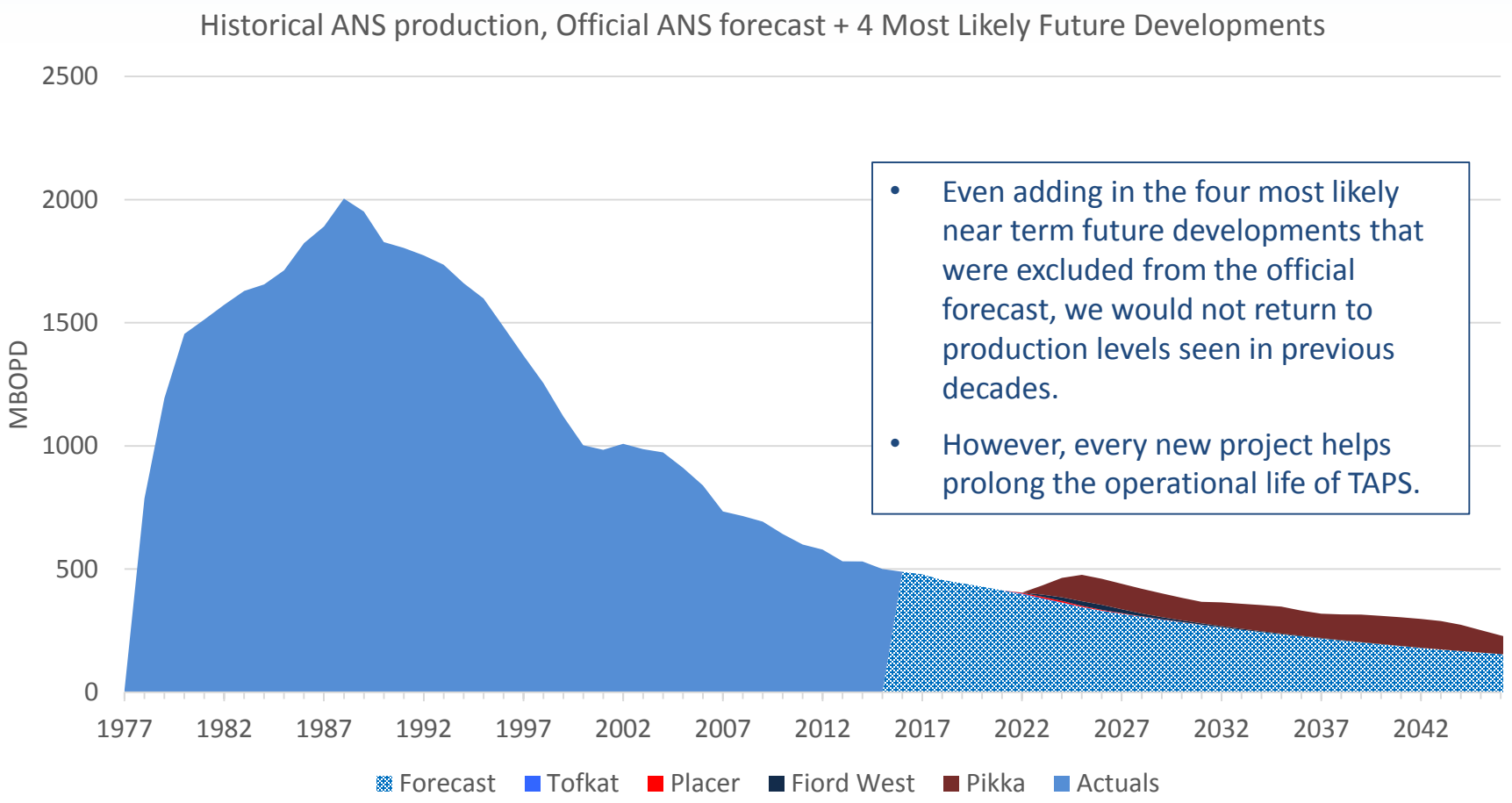



| 2016 Forecast | Decline Rate |
|---|---|
| P10 | 2.9% |
| Mean | 4.0% |
| P90 | 5.3% |

# STATEWIDE PRODUCTION FORECAST



# IMPACT OF SPECULATIVE FUTURE DEVELOPMENTS EXCLUDED FROM FORECAST



# SUMMARY

- DNR has developed a new forecast methodology using industry standard probabilistic techniques designed to improve forecast accuracy.
- Mean production forecast over 10 year period shows a smaller decline rate (4%) versus historic decline rate since 1988 (5%)
- By employing a probabilistic approach, the range of outcomes can be compared in a statistically quantitative manner (P90, Mean, and P10)
- Method assigns price-dependency and occurrence risks to UD and UE production
- Projects are included or excluded from forecast based on estimated first oil date, factoring in technical, commercial and environmental considerations

# THANK YOU!

550 W. 7TH AVE, STE. 1100, ANCHORAGE, AK 99501
www.dog.dnr.alaska.gov