



Alaska's 10-year Oil Production Outlook And Potential Future Developments Report



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04/27/2017

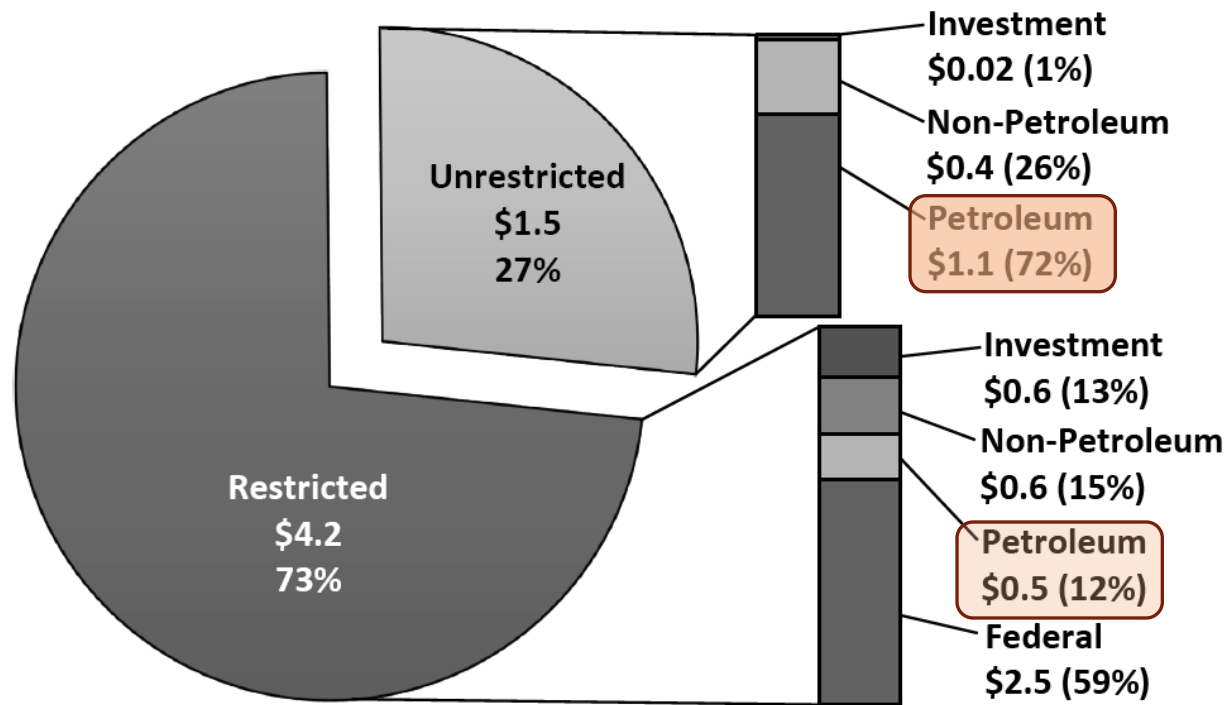
Overview

- Introduction and Background
- Fall 2016 Forecast
 - Past and Current Forecast Methods
 - Review of Production Tranches
- Potential Future Production
 - Projects within the DOG's Public Report
 - New Discovery Announcements
- Summary

The Place of Oil and Gas in Alaska's Economy

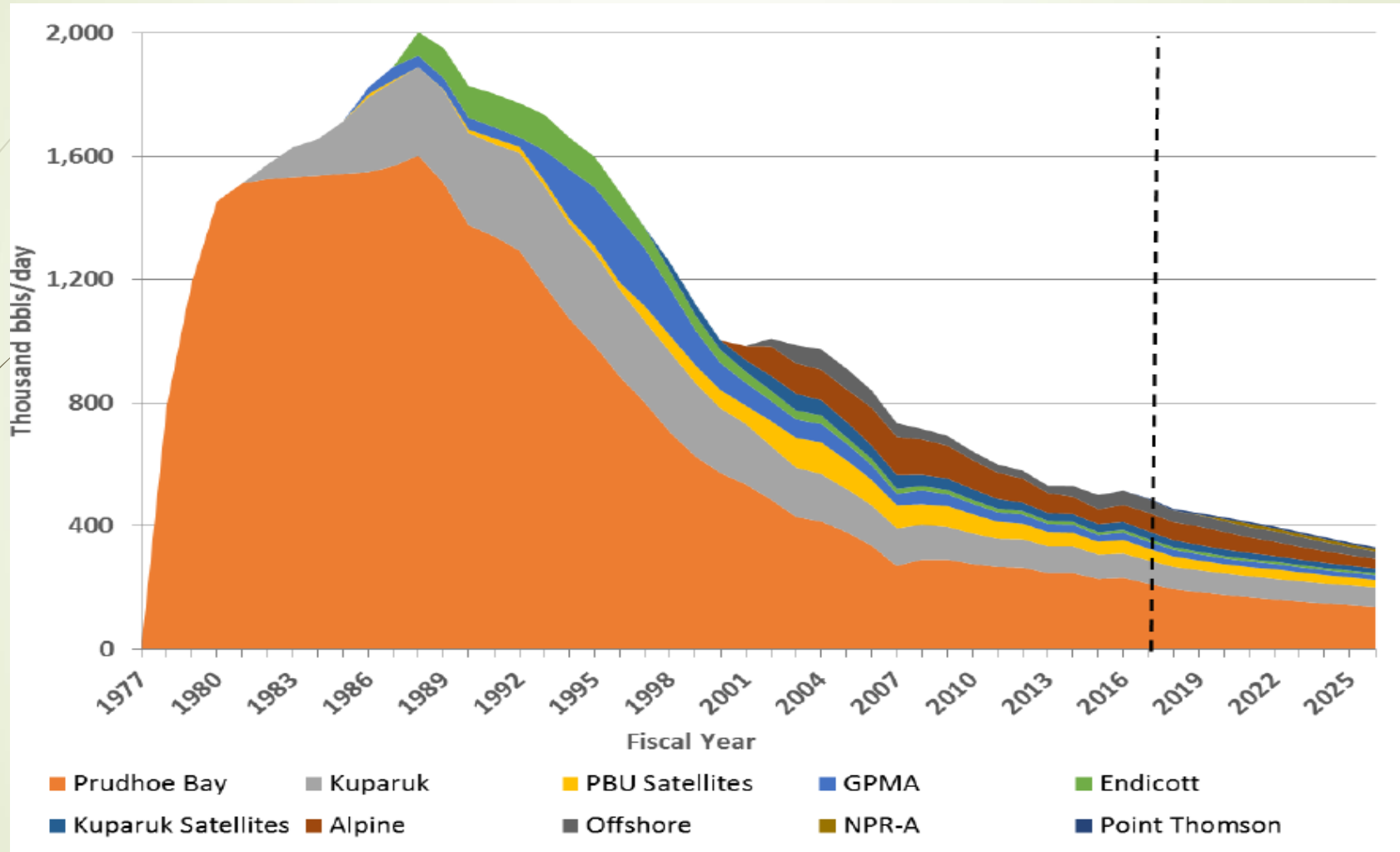
FY 2016 Total State Revenue

By restriction and type, in billions of dollars



Revenue Sources Book, 2016

DOR Fall 2016 Forecast

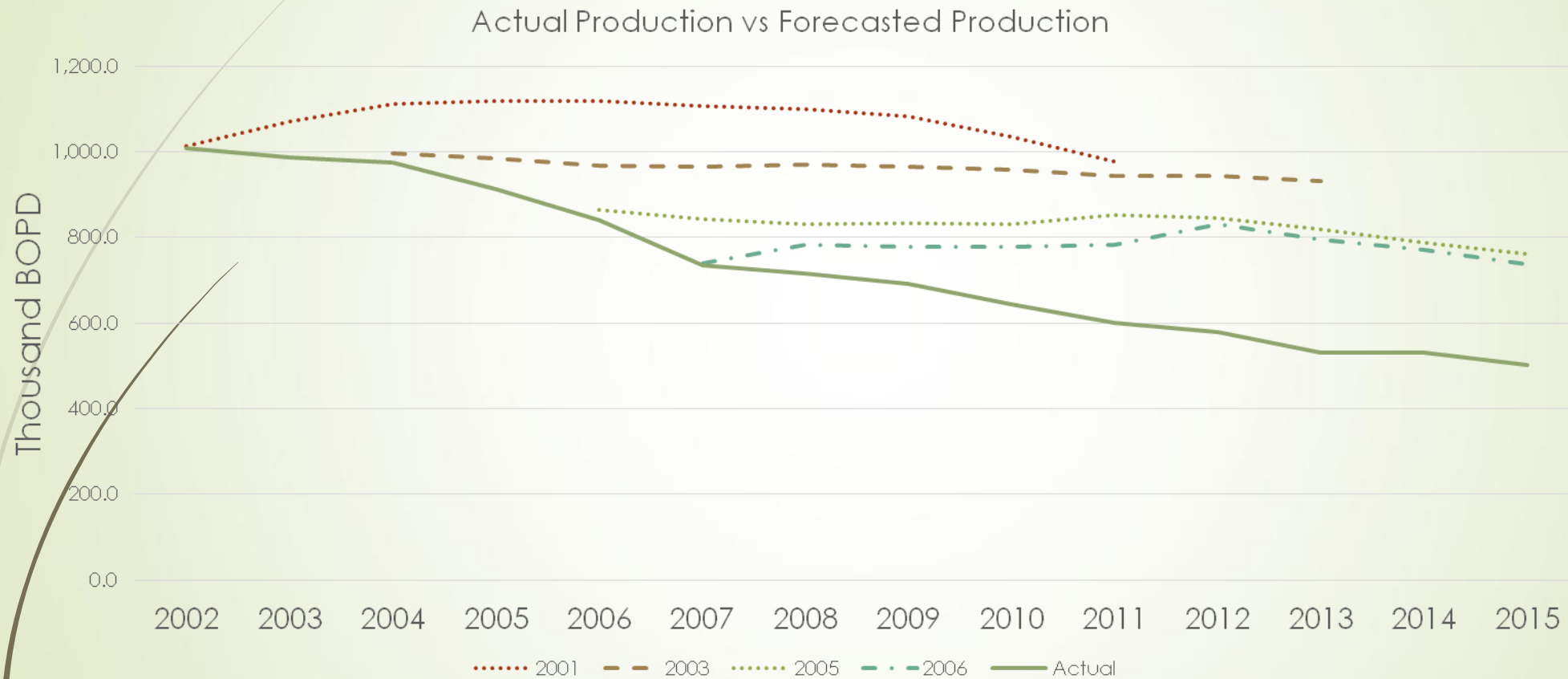




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Motivation for Change in Forecast Methodology

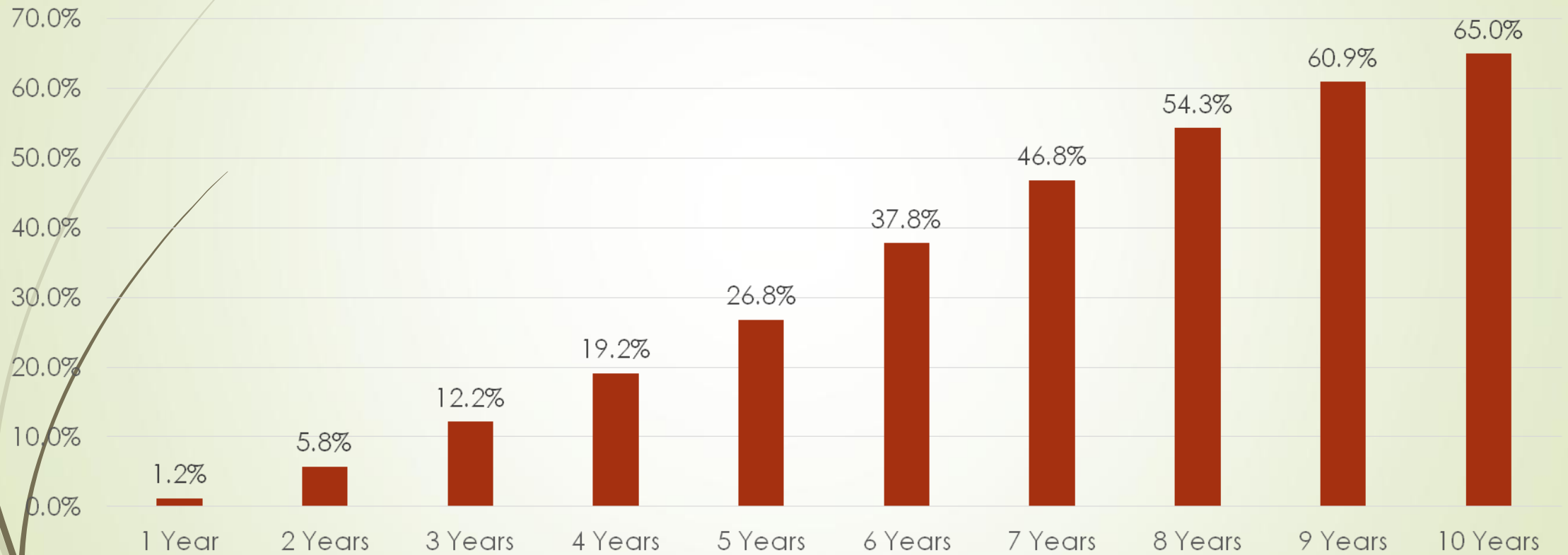
Forecast Uncertainty



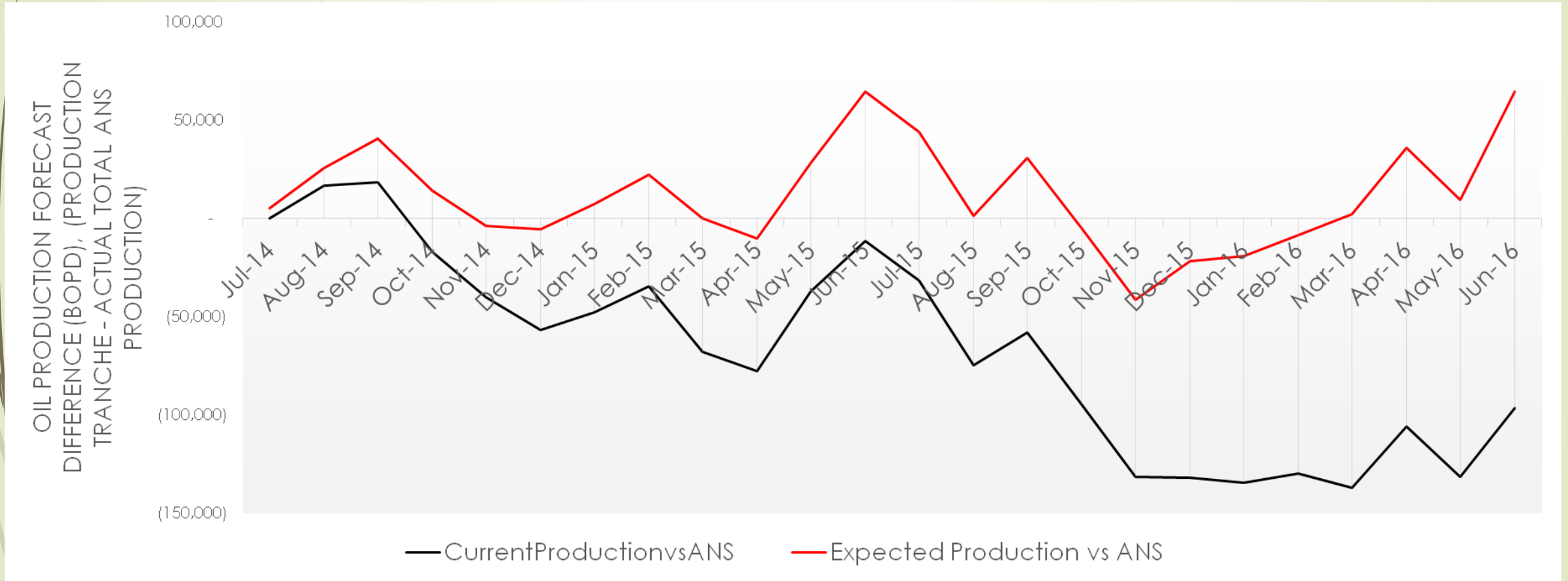
➤ Variance in Forecasted Production vs Actual Production

Forecast-vs-actual variance increases into the future

Average ANS variance by years out (2001-2014)



Expected Production from Future Projects Has Driven Over-estimation in the Past.



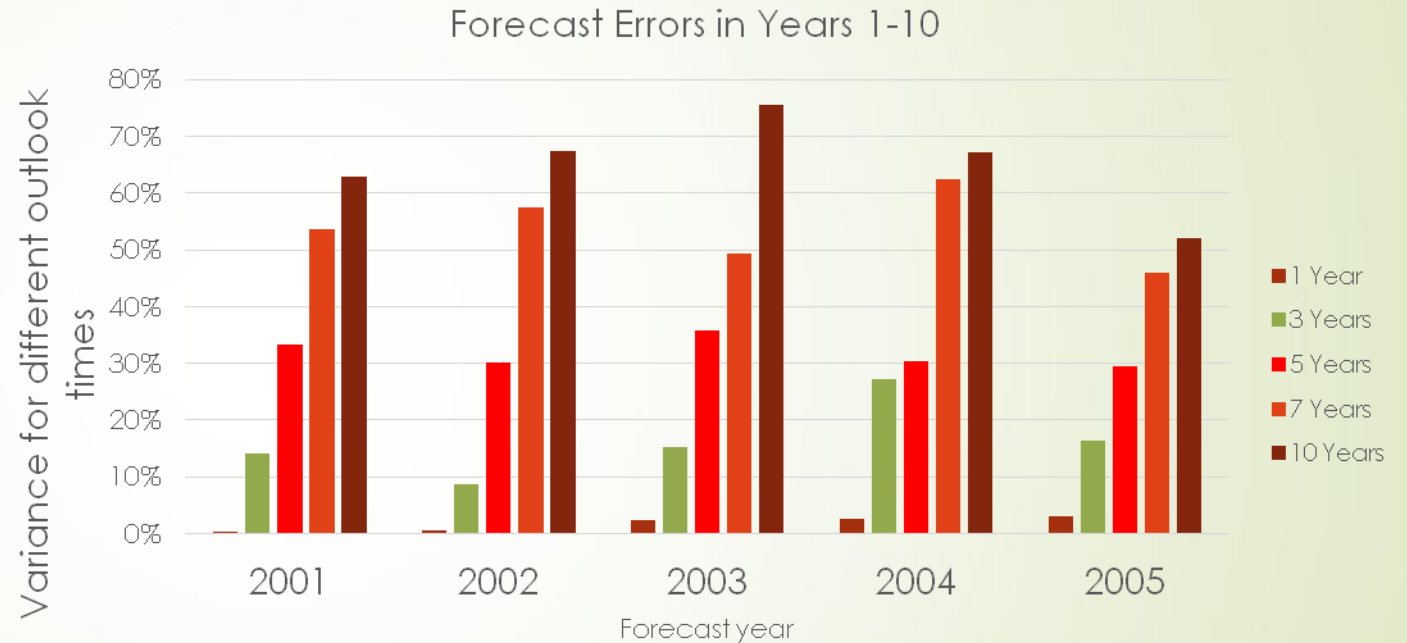
- Forecast will be too conservative if no expected production is considered.
- Forecast will be overly optimistic if all anticipated production is included.
- Expected Production must discount estimated year-on-year historical base production activity.

Reasons For Differences in Forecast vs Actual Production

- ▶ Previously, a ten-year window was used for projects in the under development (UD) and under evaluation (UE) portions of the forecast.
 - ▶ Leading to more uncertainty in the forecast
- ▶ This resulted in more projects (expected production) being included that didn't go into production within the expected time frame.
 - ▶ For example: Mustang, Liberty, OCS production
- ▶ All expected production was added to the forecast as UD and UE.
 - ▶ No price dependency, or risk of occurrence applied until recently
 - ▶ Historical drilling activity was not properly accounted for.

Reducing Outlook Time to Improve Accuracy of the Forecast.

- It is more challenging looking far out.
- Typically operators wouldn't have a set plan and will be open to changes in market conditions that do affect their plans.
- Including projects with first oil farther out reduces the accuracy of the forecast.



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

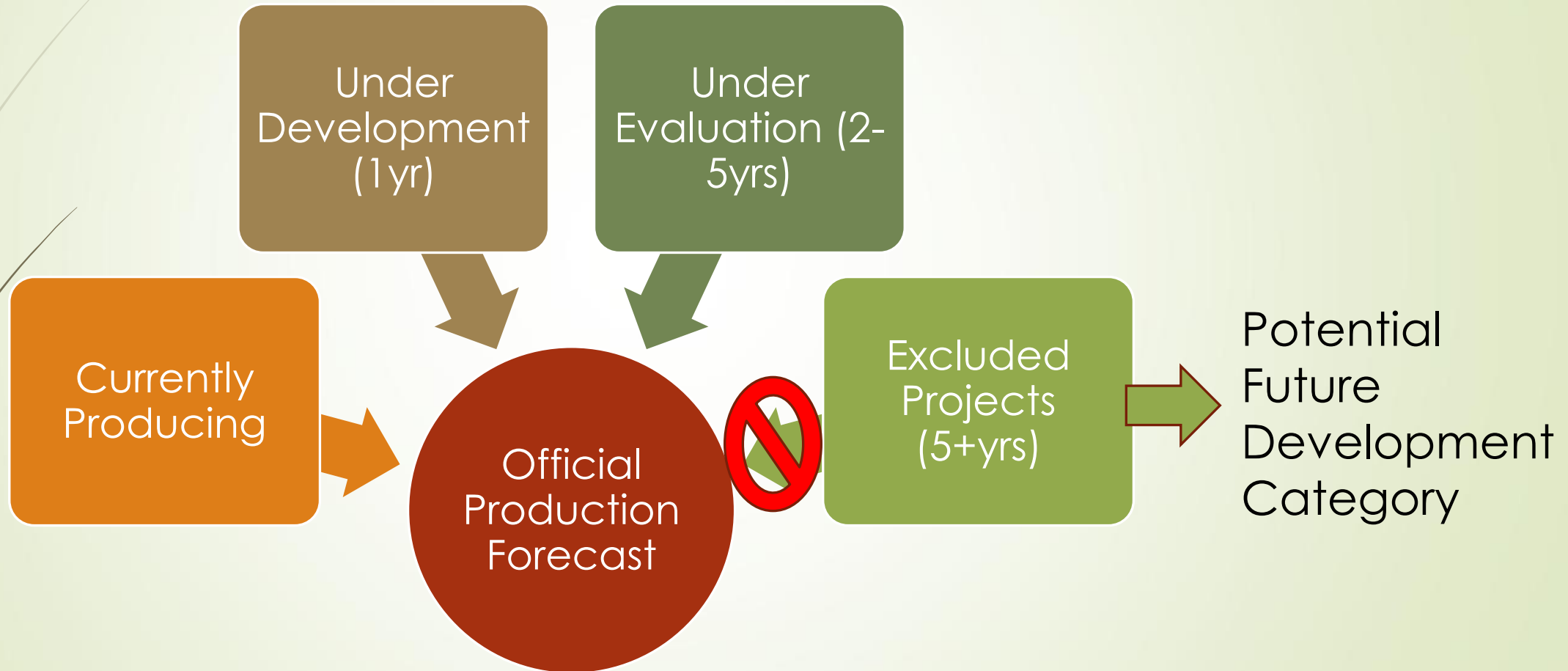
Differences Between Forecast Methods

	Previously (1990-2015)	2016 - Present
Forecast Level	Pool Level, Well – by–Well Forecast	Pool Level forecast
Uncertainty Handling	Deterministic	Probabilistic
Risking	Unrisked CP not risked. First UD/UE risking in 2013 Fall forecast	Probabilistic technical and Non-technical risk
Oil Price dependency	None	Dependence on oil price
UD Production	10 year outlook	1 year outlook
UE Production	10 year outlook	5 year outlook

Current Production Forecasting Method

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Production Categories

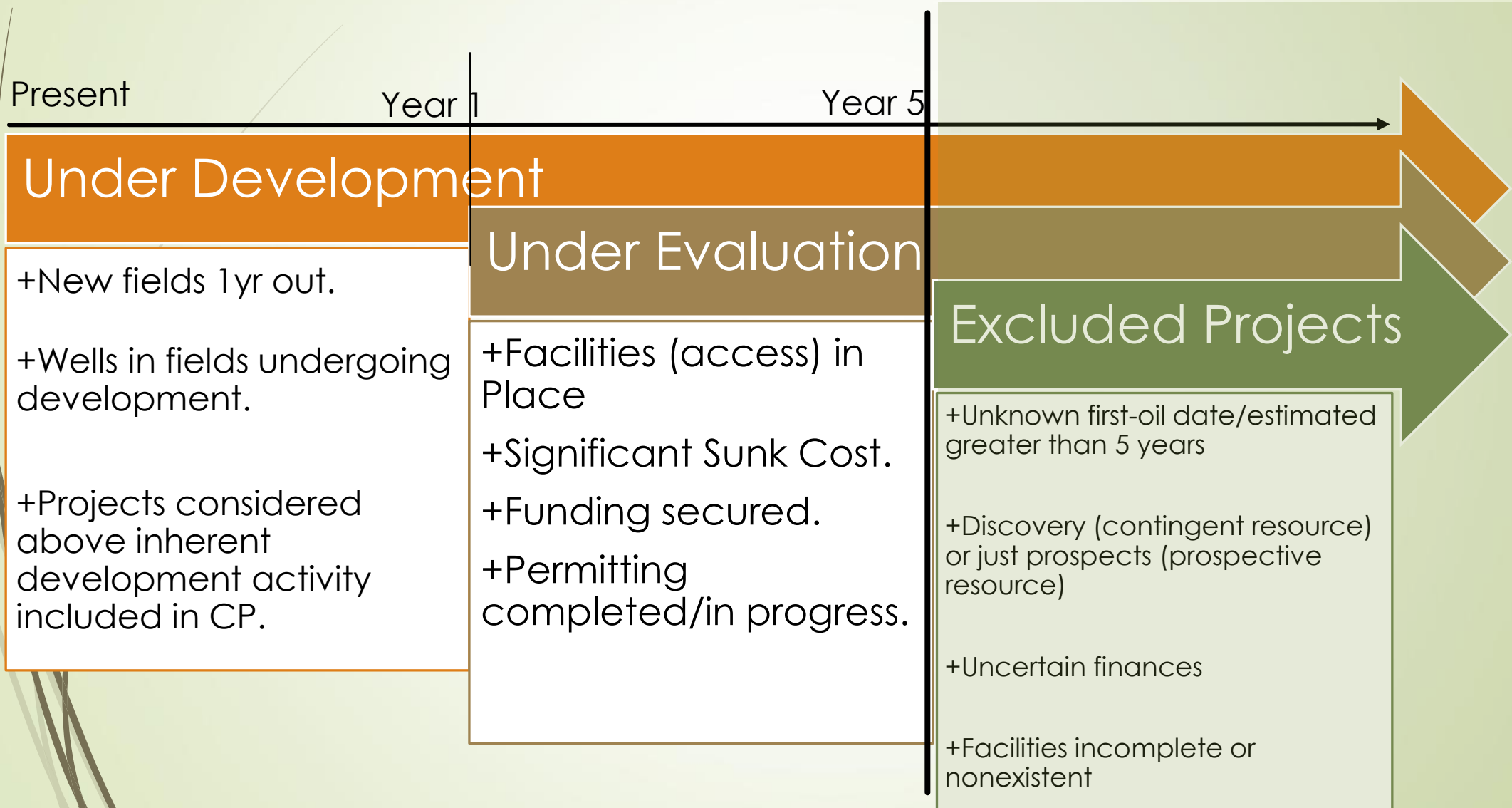


Production Category: Currently Producing (CP) Tranche.

Characteristics:

- ▶ All currently producing pools in ANS and Cook Inlet
 - ▶ Examples: Legacy fields and other fields in production
- ▶ Decline Curve Analysis forecast at pool level acknowledges some level of 'background' or ongoing development activity, facility maintenance, well intervention and turn-around events.

Production Category: Future Production (UD/UE): 5-Year Outlook Window



First Oil Estimated in 2018-2021

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- Projects in Blue Have Been Postponed -

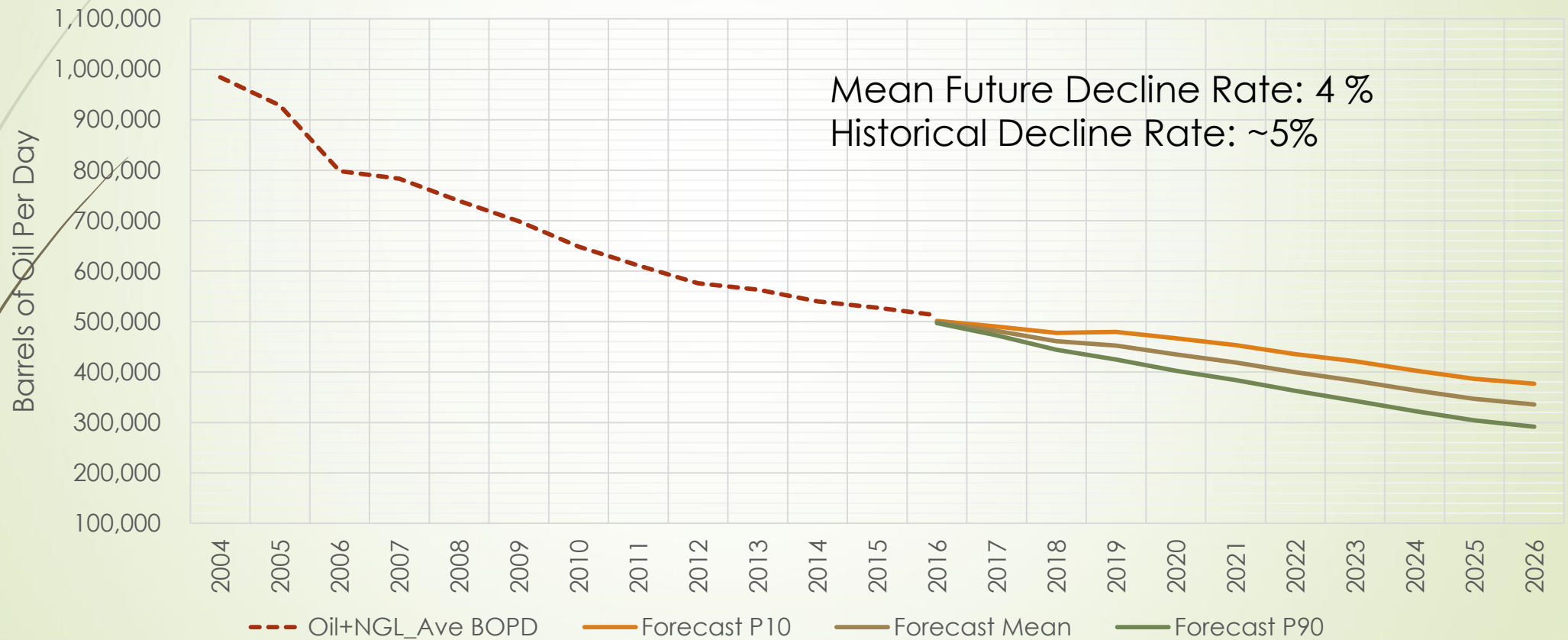
Project	Reservoir Formation	Peak Rate Est, BOPD (From Public Sources)
Add'l CD5 wells, Colville River Unit	Alpine sands, Kuparuk Fm	n/a
Greater Mooses Tooth 1	Alpine sands (Lookout)	30,000
Greater Mooses Tooth 2	Alpine sands (Spark-Rendezvous)	25,000 – 30,000
Nuna Project, Oooguruk Unit (postponed)	Torok Fm (same horizon as Moraine)	20,000 – 25,000
Nuiqsut Expansion, Oooguruk Unit (postponed)	Nuiqsut sand	n/a
Mustang Project, S Miluveach Unit (postponed)	Kuparuk Fm	12,000 – 15,000
Add'l wells, Nikaitchuq Unit (postponed)	Schrader Bluff Fm	n/a
Moose Pad, Milne Point Unit	Schrader Bluff Fm	10,000
Moraine Project, Kuparuk Unit	Torok Fm (same horizon as Nuna)	n/a
1H NEWS, Kuparuk Unit (postponed)	Schrader Bluff Fm (West Sak sands)	8,000

Decker, P., (2017b)

How Probabilistic DCA Works

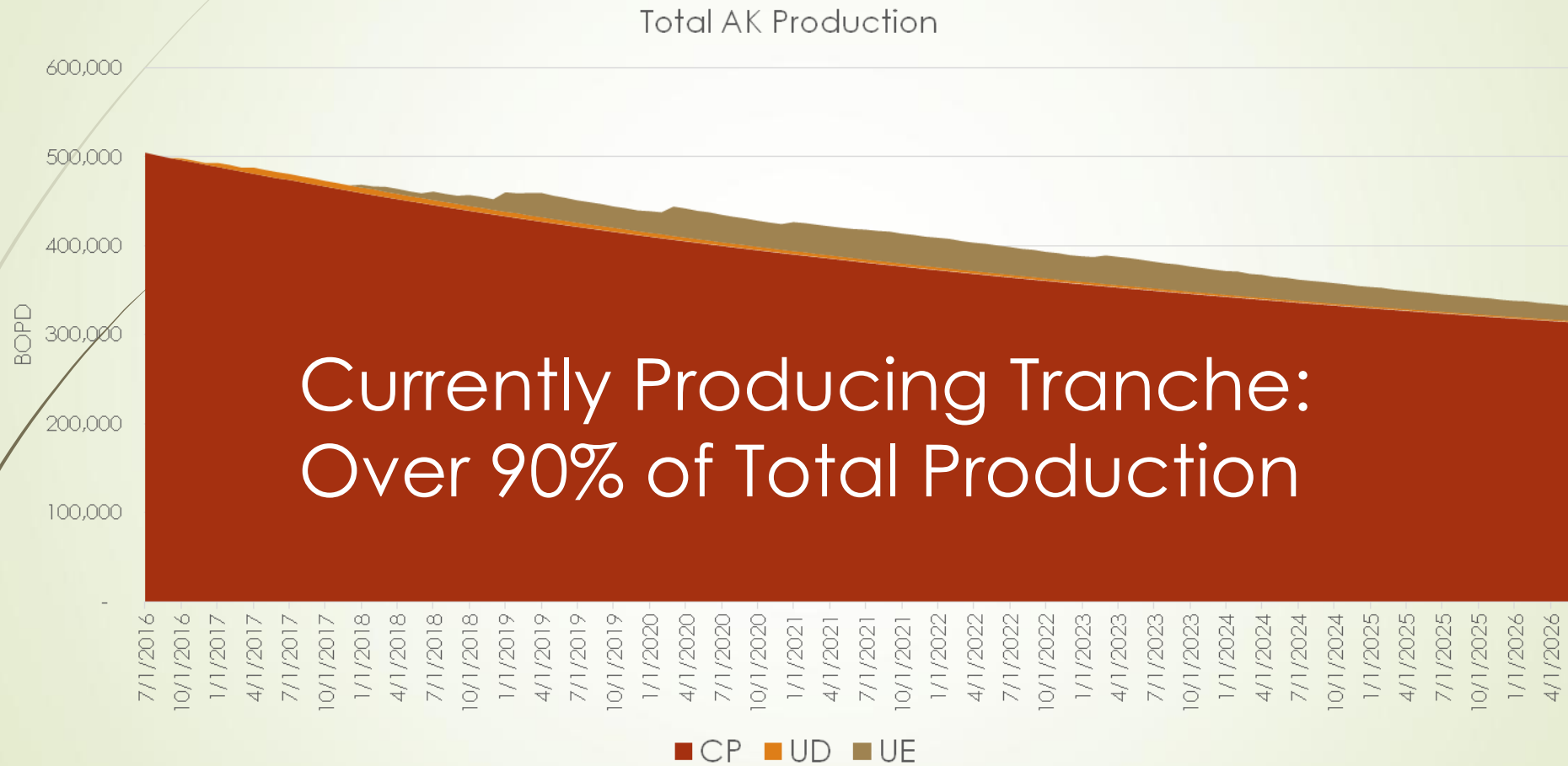
- Decline Curve Analysis (DCA) develops trends based on historical production data to forecast future production. It incorporates an understanding of reservoir and operational performance of producing fields/wells.
- Probabilistic DCA includes uncertainty analysis to produce a range of future production 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

Statewide Production Forecast Range



Fall 2016 Forecast: Production Tranches

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The biggest share of production forecast (CP) still requires wellwork and facility upgrade, optimization services from Alaska's support industry.

Longer Term Outlook

Potential Future Development Projects

Why undertake a task to develop 'speculative' profiles?

- Not to provide a technical or economic project-by-project assessment.
- To contribute to the framing of conversations in the public space while acknowledging the technological and commercial challenges faced by these projects.

How were profiles developed?

- Type curves from analogous reservoir rocks and potential well performances.
- Using public presentations, reports and statements from project operators.

Projects discussed in report:

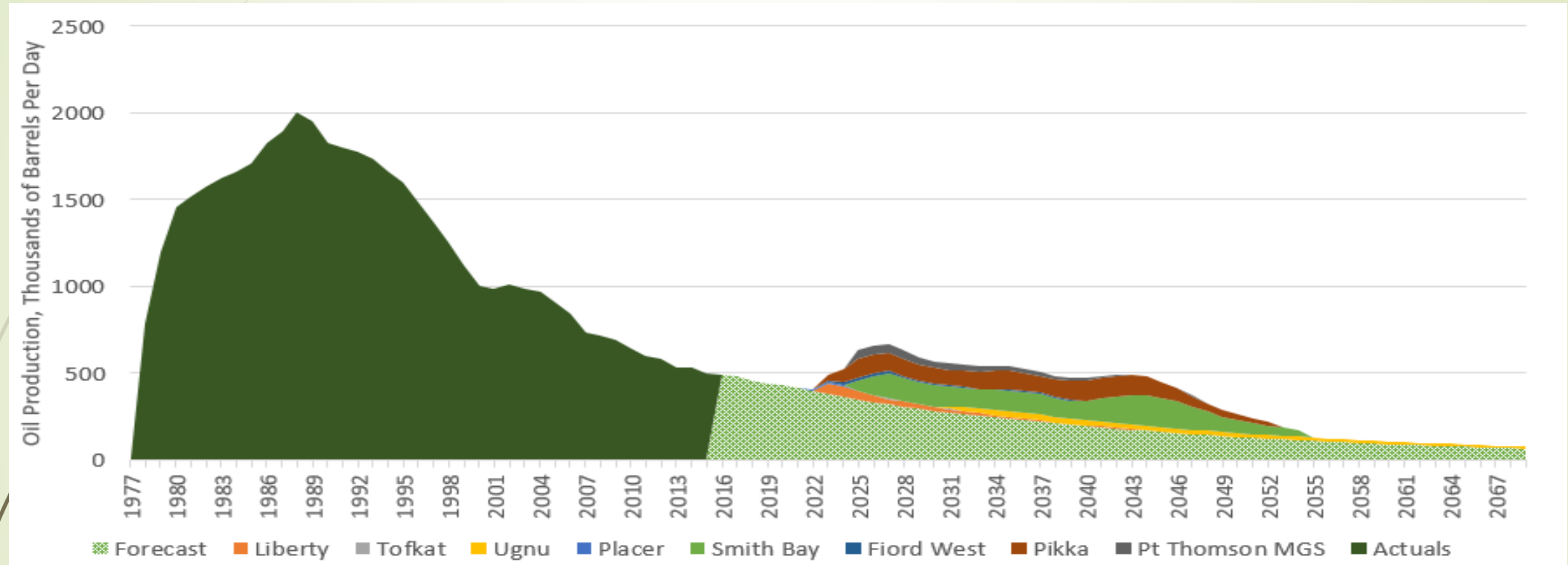
- Fiord West Project
- Placer Project
- Pikka Project
- Tofkat Kuparuk C Project
- Liberty Project
- Point Thomson Major Gas Sales Project
- Smith Bay Project
- Ugnu Project

First Oil Potentially 2022 or Later

- Some Projects May Not Occur -

Project	Reservoir Formation	Peak Rate Est, BOPD (From Public Sources)
Fiord West Project	Kuparuk Fm and Nechelik sand	n/a
Placer Project	Kuparuk Fm	n/a
Pikka Nanushuk Project	Nanushuk Fm & Alpine sands	Up to 120,000
Tofkat Kuparuk C Project	Kuparuk Fm	n/a
Willow Project	Nanushuk Fm	40,000 – 100,000
Liberty Project	Kekiktuk Fm	60,000
PTU Major Gas Sales Project	Thomson sands	Up to 70,000
Smith Bay Project	Torok Fm	Up to 200,000 (?)
Ugnu	Prince Creek Fm (Ugnu sands)	n/a

Potential Impact on Long term North Slope Production



- North Slope profile showing possible impact of potential future projects.
- Production profiles are unrisked and actual timing remains uncertain.
- Projects could help prolong the operational life of TAPS.

Recent Discovery Announcements

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Finding the big one 10/9/2016

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Caelus discovery at Smith Bay could add 200,000 barrels per day to TAPS

Success at Horseshoe 4/12/2017

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Repsol and Armstrong make largest US onshore oil find in 30 years

Another big find 1/22/2017

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ConocoPhillips announces Willow oil discovery to west of Mooses Tooth 2

**Willow:
part of a
Brookian
play**

Vol. 22, No. 5

Week of January 29, 2017

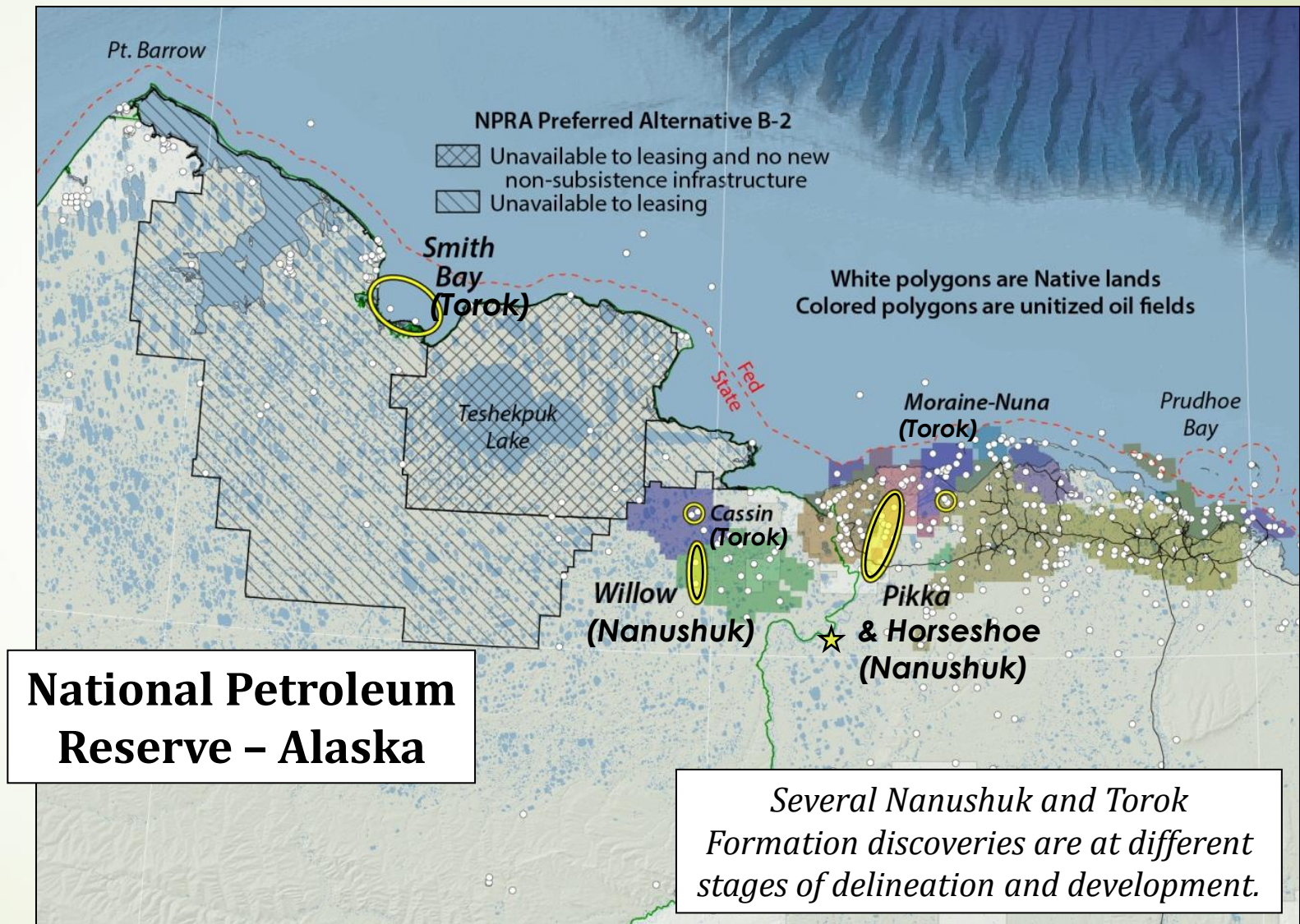
Providing coverage of Alaska and northern Canada's oil and gas industry

Armstrong extols new oil play

North Slope Recent Brookian Discoveries

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- Accumulations in the youngest major rock sequence on the North slope (Decker, P., 2017a)
- According to Petroleum News (2017):
 - Pikka: 1.2 BBO Recoverable
 - Willow: 0.3 BBO “
 - Smith Bay: 1.8-2.4BBO “ (Caelus Energy, 2017)
- Total Contingent Resource: ~3.5 BBO



Summary

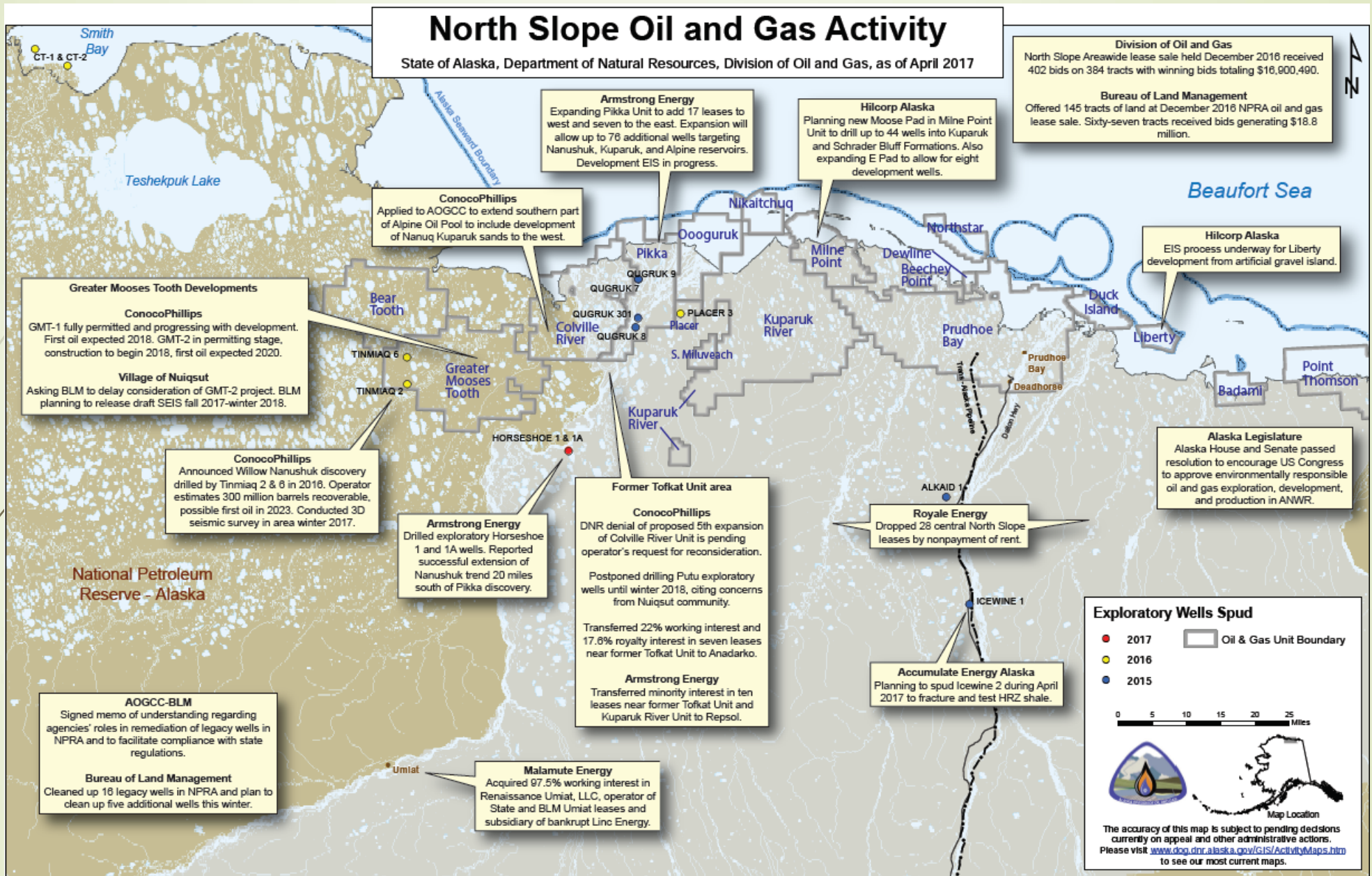
- Official state production forecast applies standard accepted engineering and production risk assessment techniques in determining future production.
- Recent new discoveries show that there is still a strong future for oil production in Alaska.
- Maintaining base production and bringing on new production is impossible without Alaska's Oil and gas support companies.
- Oil prices play a vital role in what resources are ultimately produced.

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 - ▶ <http://www.petroleumnews.com/pnads/748220773.shtml>

Back Up





North Slope Exploration and Development: A snap shot of activity and operator footprint on the North Slope of Alaska.