Long-term Global Oil Scenarios: Looking Beyond 2030

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EIA's view to 2030

- Reference Case:
  - Liquid fuels consumption grows to 113 MMB/D
  - 29 MMB/D increase from 2006
  - Conventional crude oil and lease condensate up only 12 MMB/D
- Higher oil prices slow consumption growth
  - Liquid fuels grow to 98 MMB/D in the high price case
  - Conventional crude and lease condensate down 11 MMB/D from 2006
- Important difference between conventional crude oil and total liquids

Unconventional liquids become more important over time

(MMB/D)		Reference Case	High Price Case
	2006	2030	2030
Conventional Crude*	71.5	83.4	60.3
Natural Gas Plant Liquids	8.0	13.0	13.7
Refinery Gain	2.4	2.9	2.1
Conventional Subtotal	**81.9**	**99.3**	**76.1**
Unconventional Crude**	1.8	5.2	6.6
CTL and GTL	0.2	4.8	9.0
Biofuels (oil equivalent)	0.8	4.0	6.1
Unconventional Subtotal	**2.8**	**14.0**	**21.6**
Total Liquids	**84.7**	**113.3**	**97.7**

* Crude oil and lease condensates. ** Oil sands, extra-heavy crude, and shale oil

Source: Annual Energy Outlook 2008. Published Reference Case; preliminary High Price Case.

Looking beyond 2030

- Our approach
- Preliminary results and findings
- Next steps

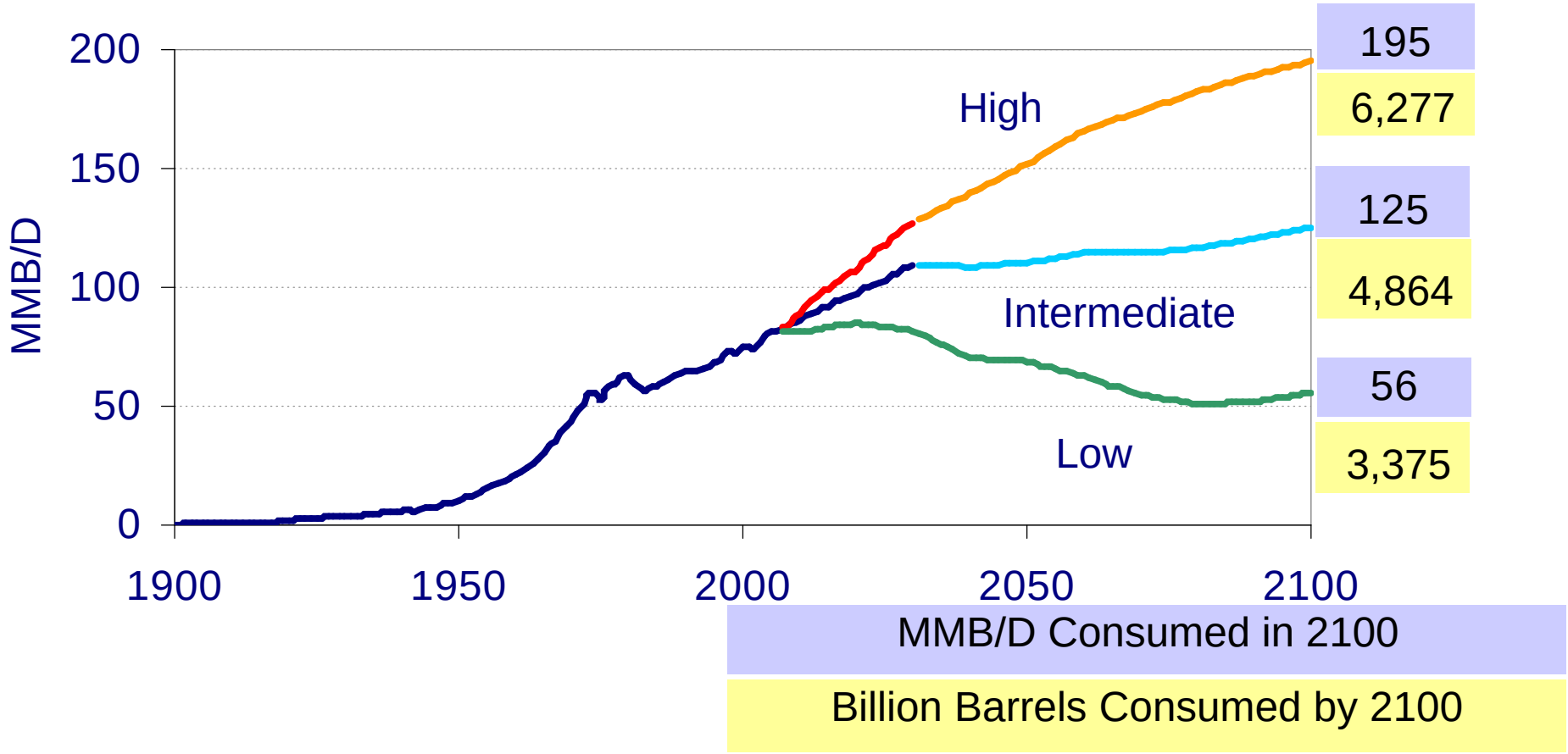
Global Oil Scenarios: Our Approach

- **Proved developed reserves** for different oil streams (conventional crude+condensate, NGPLs, bitumen, extra heavy oil, shale, and other source rock) are generated through investment, constrained by both above ground and below ground factors
- The availability of production from proved developed reserves is used to assess the viability of "candidate" oil demand paths drawn from the recent U.S. Climate Change Science Program scenarios report.

Our Approach: Key Drivers

- Future Oil Demand
  - Transportation demand growth, availability of efficiency improvements, and alternative fuels
  - Policy and economics both matter
- "Below Ground" Supply Potential
  - Initial-in-Place quantities (IIP)
  - Rock and fluid properties
- Maximum Long-term Recovery Factors (RF)
  - Rock and fluid properties of specific streams
  - Technological improvements and costs
- "Above Ground" Supply Factors
  - Resource owner economic and non-economic objectives
  - Access to resources (conventional and unconventional)
  - Local and global policies (environmental and other)

Future Oil Demand: Three Candidate Paths



Note: Biofuels, gas-to-liquids, coal-to-liquids, and refinery gain are excluded
Source: U.S. Climate Change Science Program (July 2007), EIA analysis

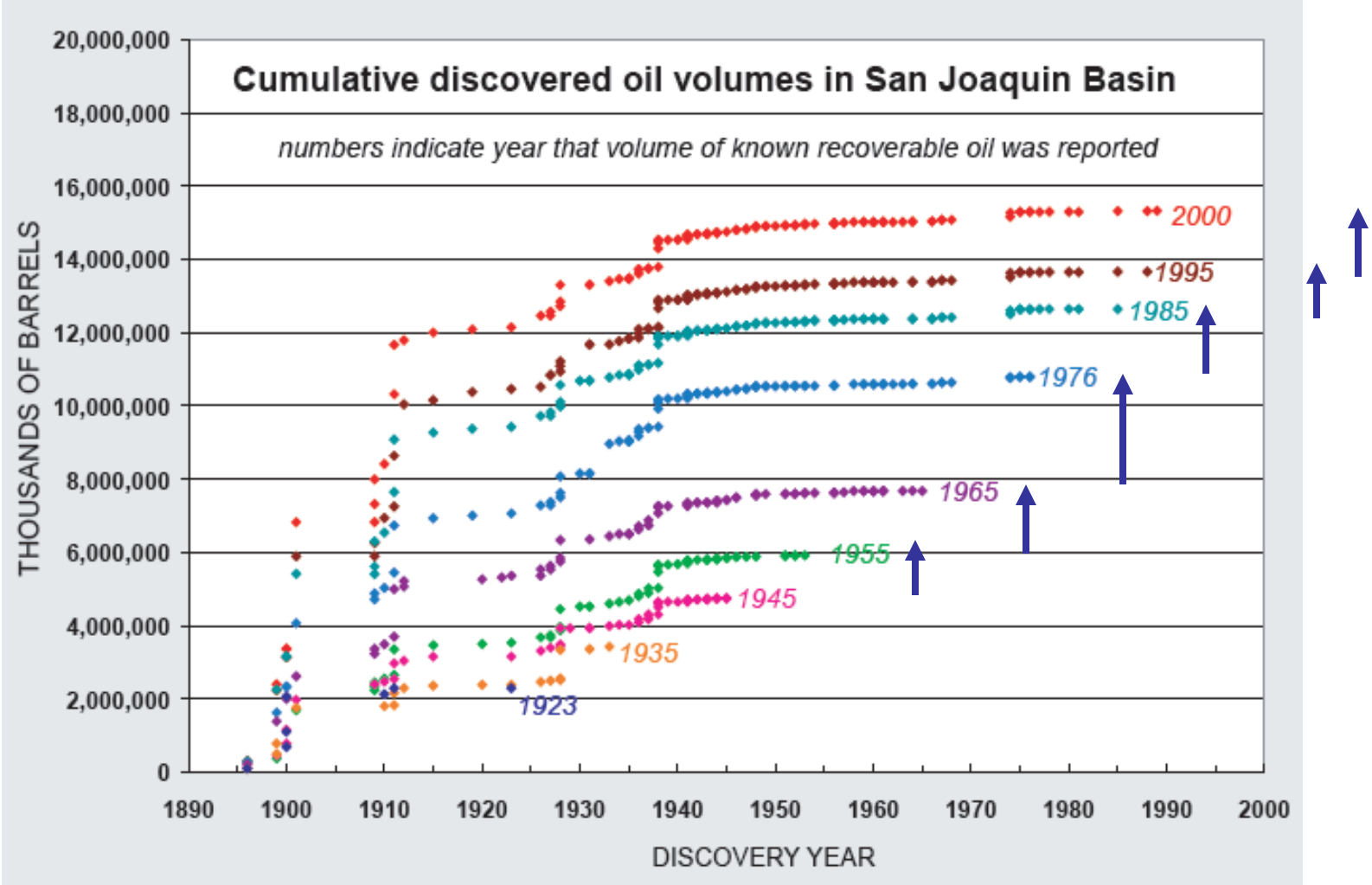
Initial-in-Place estimates vary widely

- Estimates of global IIP for petroleum liquids vary from 14 to 24 trillion barrels. Our preliminary base case uses 20.6 trillion barrels.

(trillion barrels)	Mid. East OPEC	Other OPEC	United States	Other Non-OPEC
Conv. Crude and Condensate	2.6	2.6	0.9	2.9
Natural Gas Plant Liquids	0.3	0.3	0.2	0.4
Extra Heavy Crude (<10º API)	0.0	2.3	0.0	0.0
Bitumen	0.0	0.0	0.0	2.4
Shale Oil	0.0	0.0	2.1	0.7
Source Rock	0.9	0.9	0.3	1.0
Total Liquids	**3.8**	**6.0**	**3.4**	**7.4**

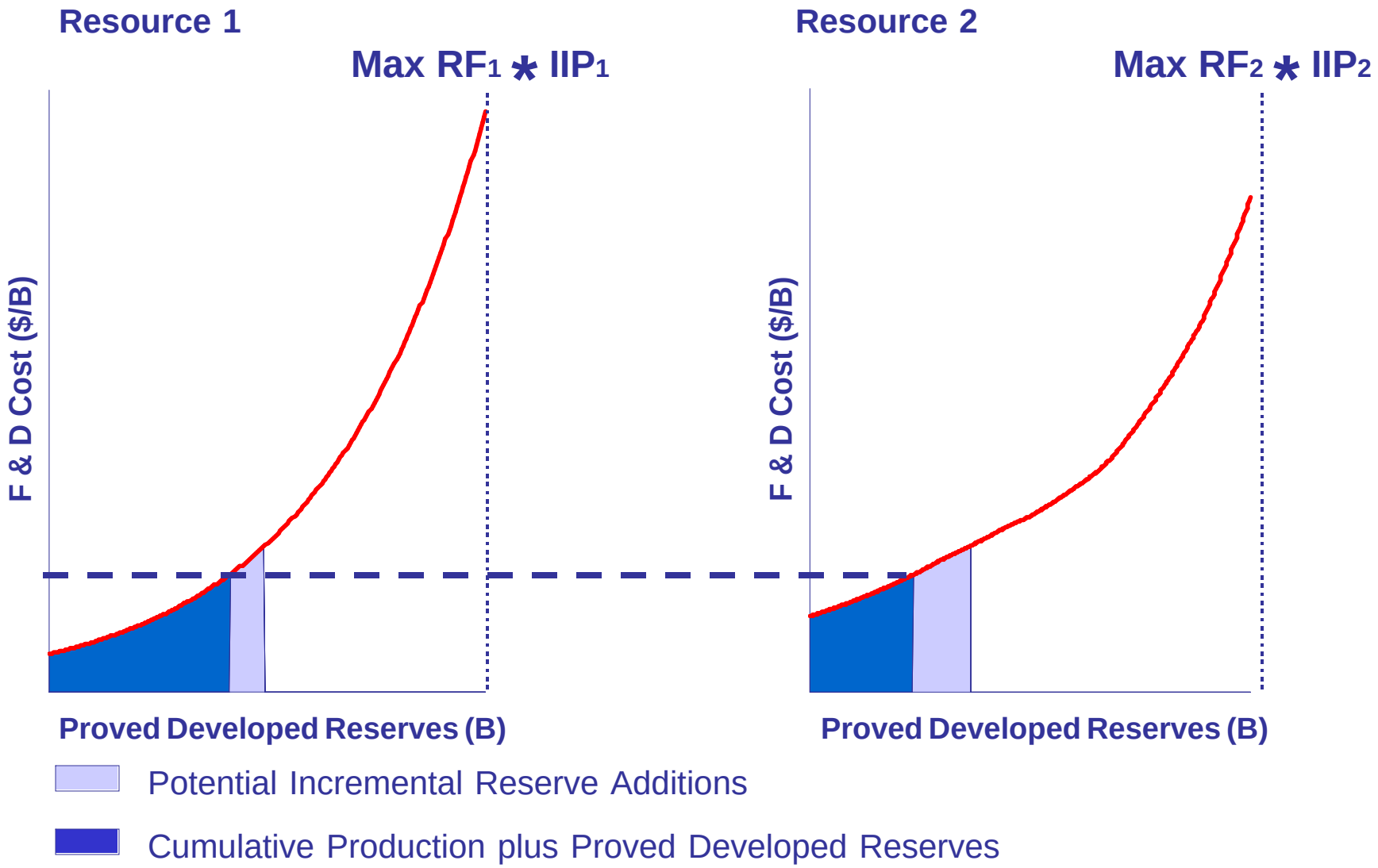
Sources: I.H.S. Energy, World Energy Council, USGS, Nehring Associates, EIA analysis

Maximum recovery factors improve with new technology and investment



Source: Marilyn Tennyson, USGS, *Recent and Potential Growth of Known Recoverable Oil in California, U.S.A.* Poster presented at AAPG Annual Meeting, Long Beach, California, April 1-4, 2007

Scheduling: Investment In Incremental Production Capacity (Proved Developed Reserves)

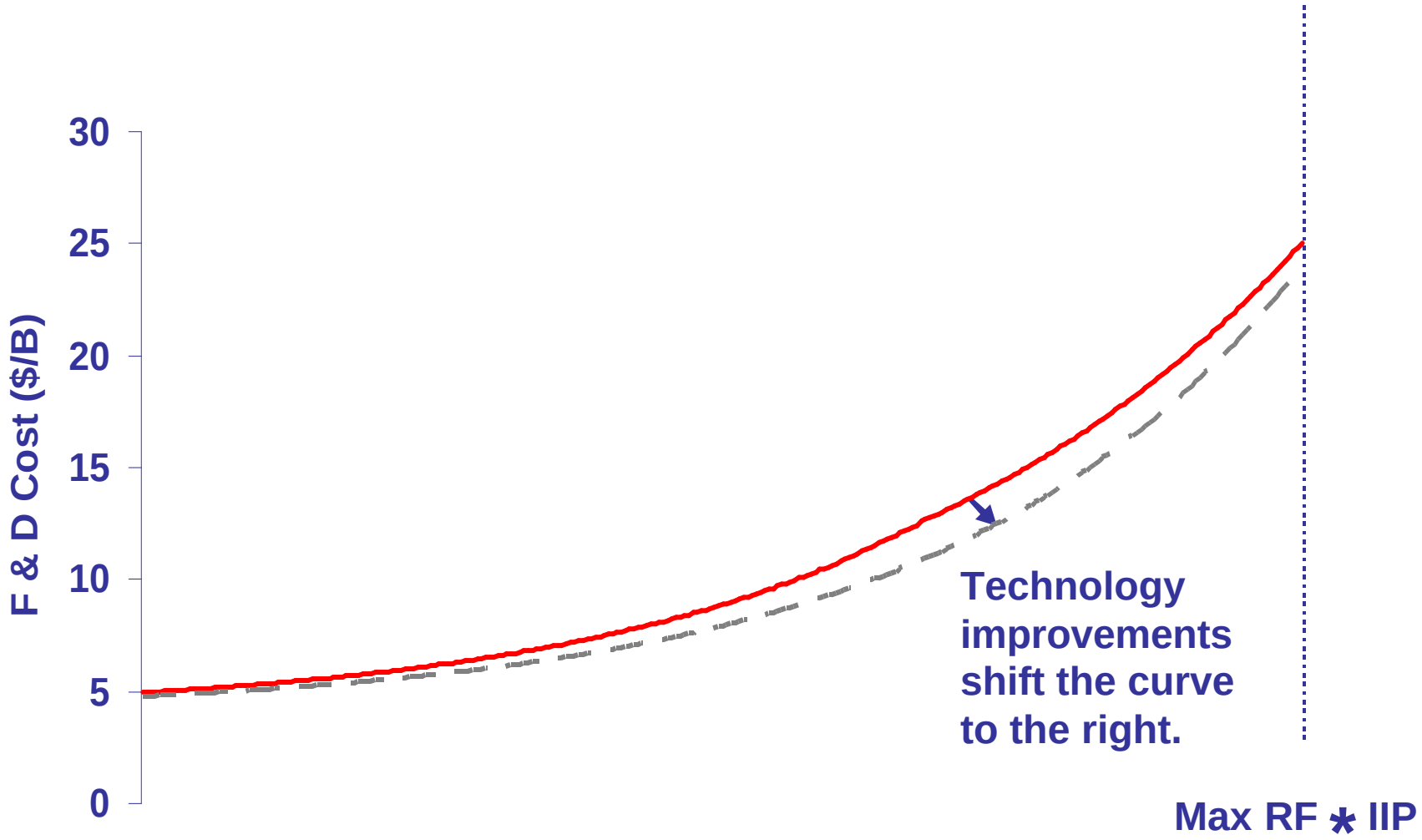


"Above Ground" factors also affect investment scheduling

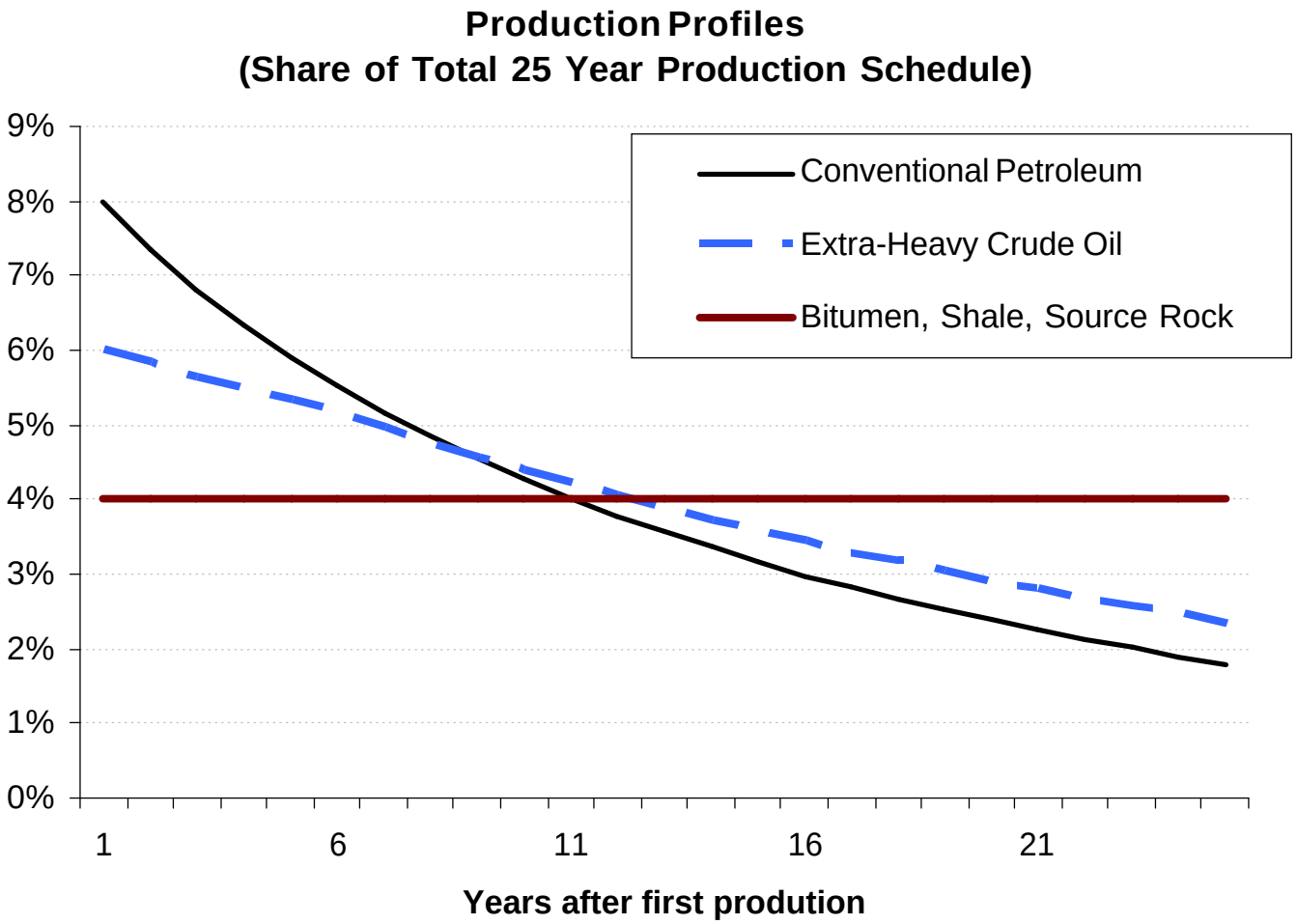
- Improving Technology
  - Horizontal drilling
  - Enhanced completion techniques
- National Oil Company Investment Decisions
  - Saudi Arabia
  - Venezuela
- Unfavorable Fiscal Regimes
  - Russia
  - Iran
- Environmental Restrictions
  - United States: ANWR, East and West Coast OCS, shale in future?
  - Canada: oil sands in future?
  - Global: interaction with future greenhouse gas mitigation efforts?

Note: Short-term above ground factors like civil unrest and cyclical increases in factor costs are generally excluded

New technology lowers finding and development costs and improves maximum recovery factors



Different streams have different production profiles



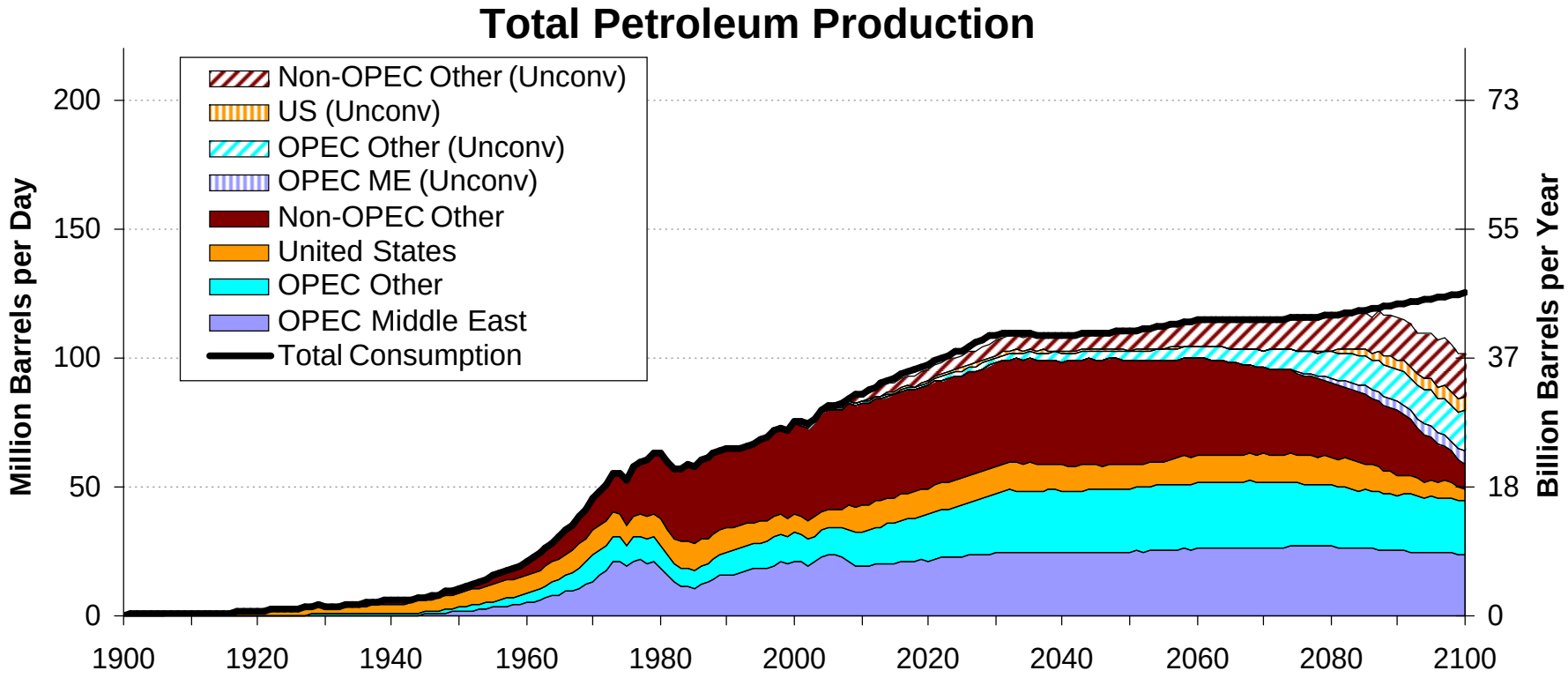
Four Scenarios using the Intermediate Demand Case

	Max RF	IIP	OPEC Decision
Preliminary Base Case	10 - 50%	21	constant market share*
Lower Recovery Factors	0 - 35%	21	constant market share*
Lower Initial-In-Place	10 - 50%	16	constant market share*
Unfavorable “above ground”	10 - 50%	21	Max = 35 MMBD **

* Conventional petroleum as a share of total petroleum liquids

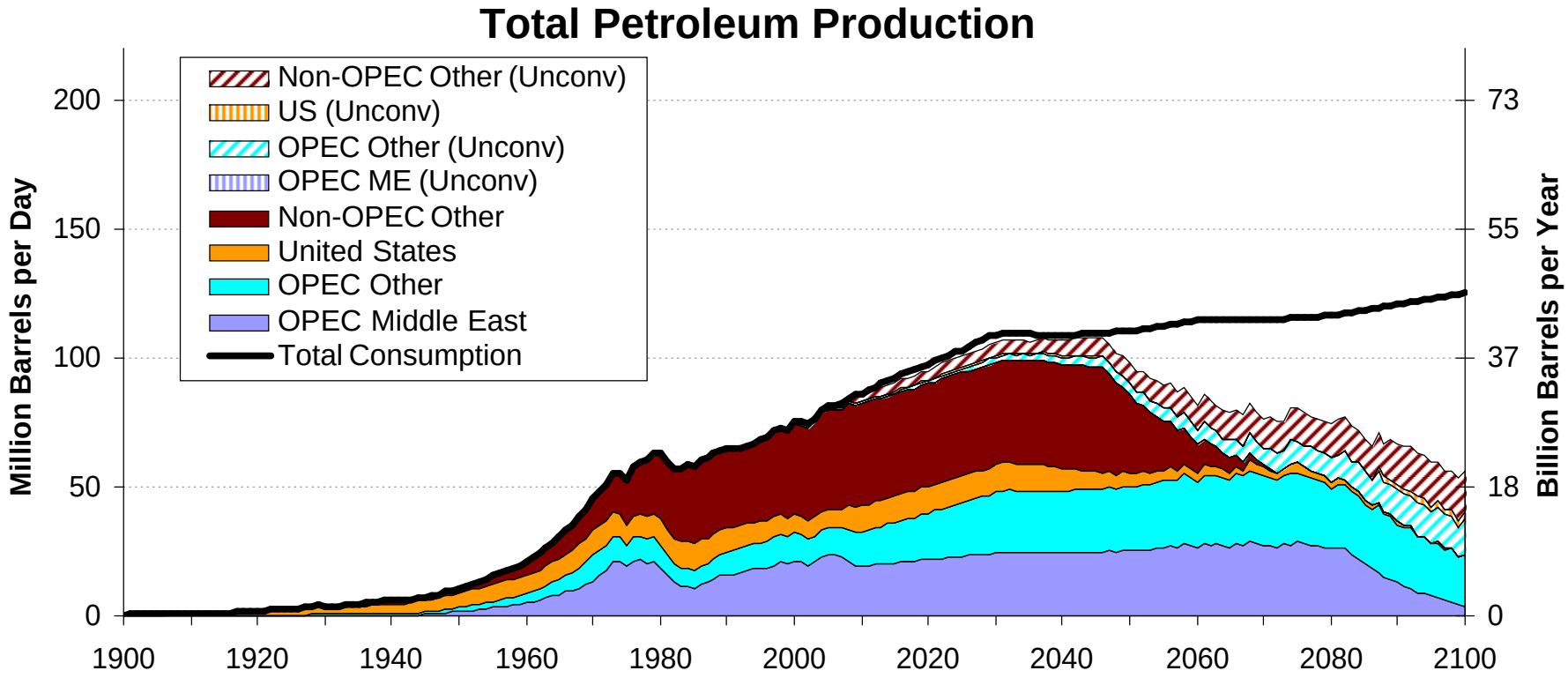
** Max = 35 MMBD includes all OPEC production (conventional and unconventional)

Preliminary Base Case, Intermediate Demand



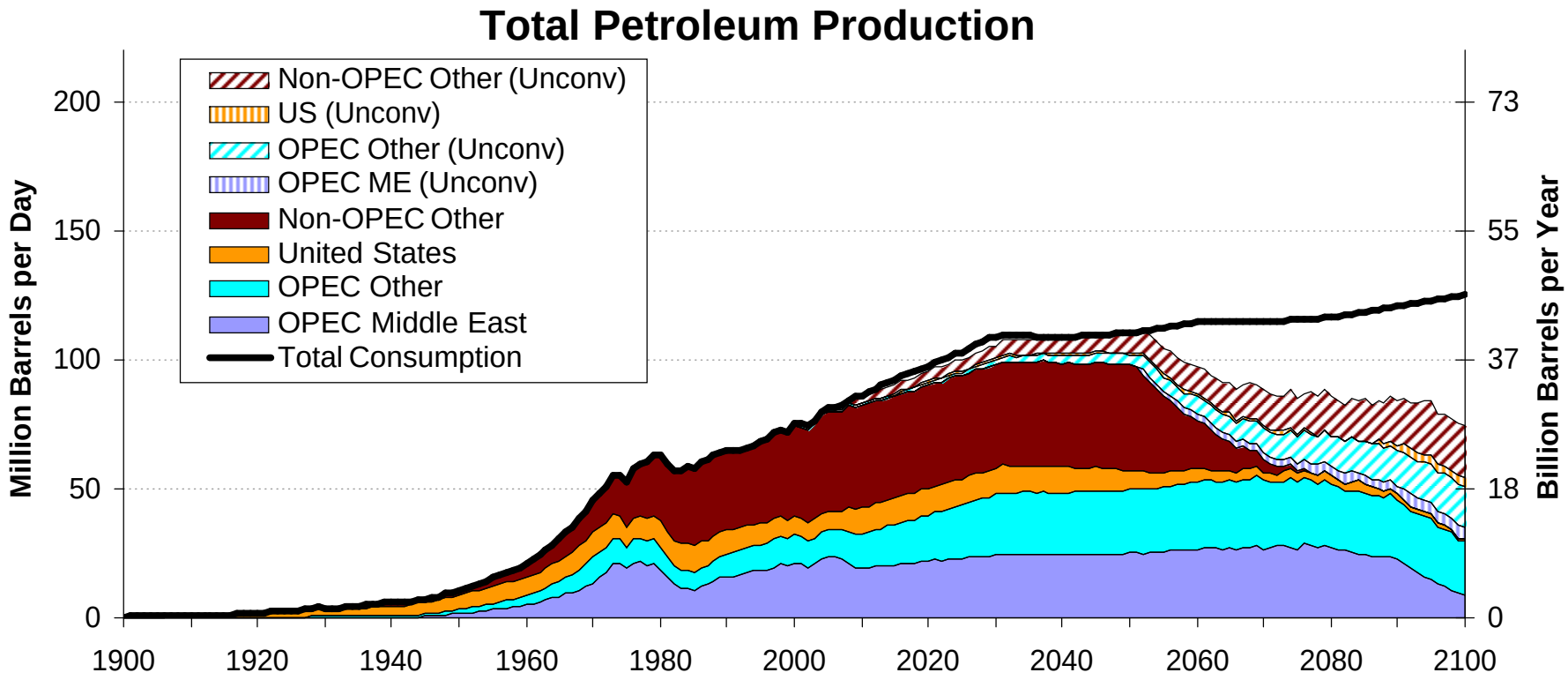
- This supply scenario satisfies the candidate demand path through 2090

Lower Recovery Factors, Intermediate Demand



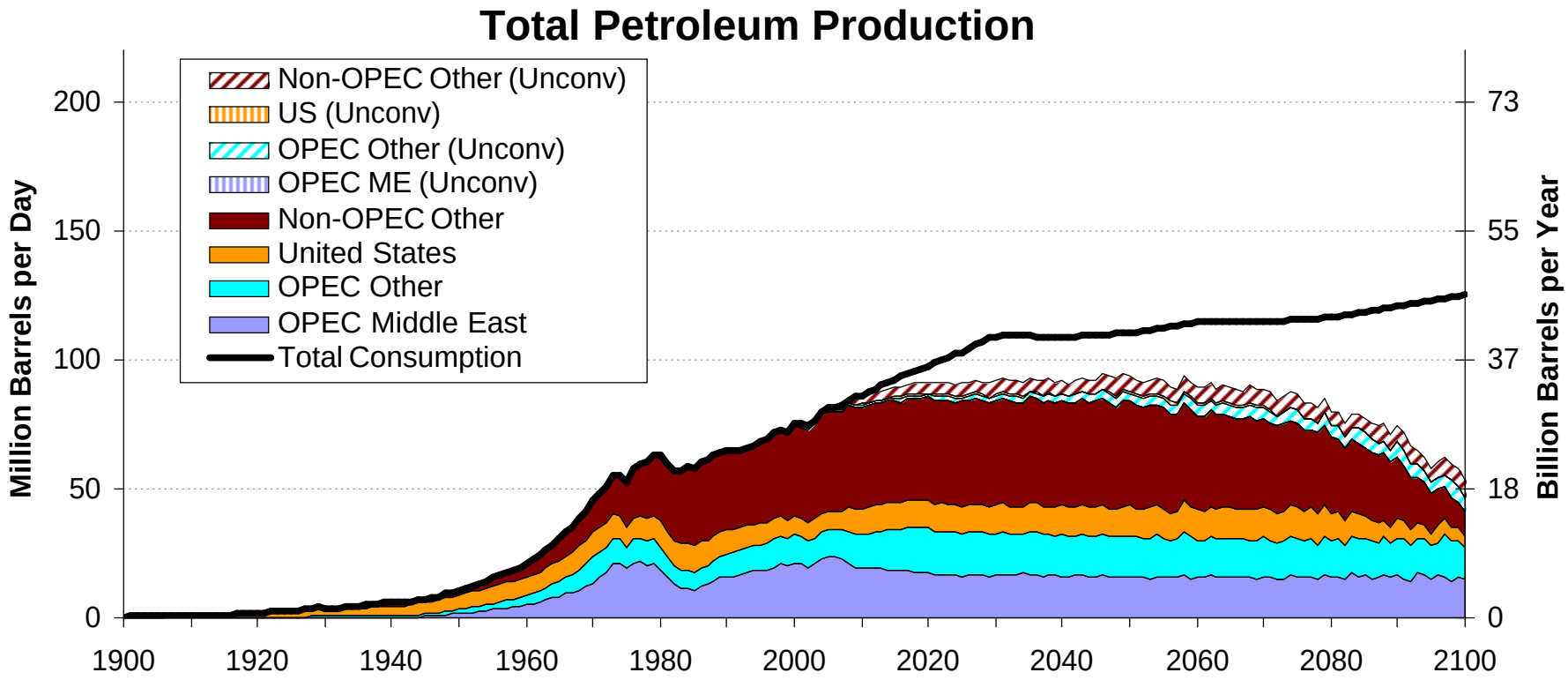
- This supply scenario falls short of the candidate demand path

Lower Initial-in-Place Estimates, Intermediate Demand



- This supply scenario falls short of the candidate demand path

More Unfavorable Above Ground Factors, Intermediate Demand



- This supply scenario falls short of the candidate demand path

Results to Date - Preliminary

- The high demand path may be difficult to meet even with favorable supply assumptions
- The low demand path can be satisfied even with relatively unfavorable supply assumptions
- The viability of the intermediate demand path is sensitive to “below ground” and “above ground” assumptions
  - Initial-in-place
  - Recovery factors
  - Government decisions affecting investments in incremental oil production capacity

Key Findings - Preliminary

- Only a small fraction, 4 - 7%, of estimated IIP resource has been produced
- Either demand or supply can cause global oil to peak and decline
- The extent and nature of access concerns may evolve over time
- Results are very sensitive to recovery factors; more study is needed
- Unconventional liquids play an important role, especially in higher demand cases

Next Steps (for EIA and others)

- Develop an agreed common terminology to more clearly distinguish substantive issues from those arising from inconsistent use of terms
- Improve understanding of long-term oil demand drivers
- Provide Initial-in-Place (IIP) resource estimates, together with, or instead of, estimates by resource assessors that present only a combined view of both IIP and potential recovery
- Improve understanding of future technology on costs and maximum recovery factors
- Explicitly consider impact of “above ground” behavior and policies on oil production capacity investment decisions

Comments and Suggestions Welcome

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