

Middle East Oil and Long Term Global Supply

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Today's Objectives

1. Resources, reserves and peaking
2. Global production forecasts
3. The Middle East position
4. Problems of global depletion

Definitions

- *Reserves* are discovered and recoverable
- *Recoverable resources* are undiscovered but potentially recoverable using technology/economics of the time
- ◆ **Cumulative oil production**
 - reserves already produced
- ◆ **Remaining oil reserves**
 - discovered reserves that will eventually be produced but have not yet been
- ◆ **Yet-to-find oil resources**
 - recoverable resources that will be discovered
- ◆ **Total cumulative reserves and resources**
 - all oil that has and will be produced in the future

So Why the Uncertainty?

Ambiguous numbers

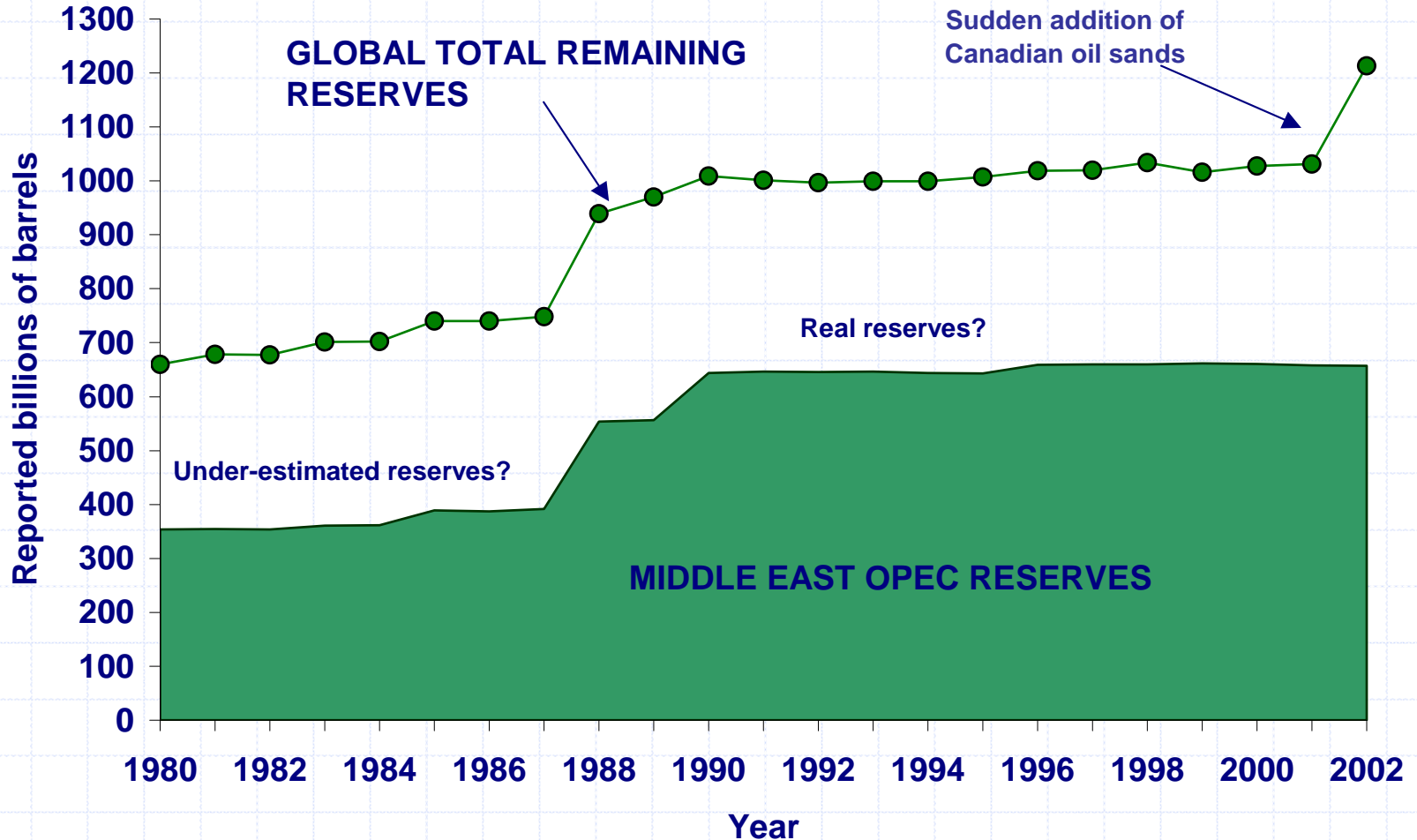
- ◆ Actually there are no standard definitions
- ◆ Treatment of unconventional sources varies:
 - For example inclusion or exclusion of oil with different economics (oil sands, natural gas liquids)
- ◆ Estimates are technically uncertain (ranges)
 - What's proven, probable or possible
- ◆ Misunderstanding the time element:
 - Reserves divided by yearly production (R/P Ratio) is thought to be years of supply remaining – a meaningless number in practical terms

So Why the Uncertainty?

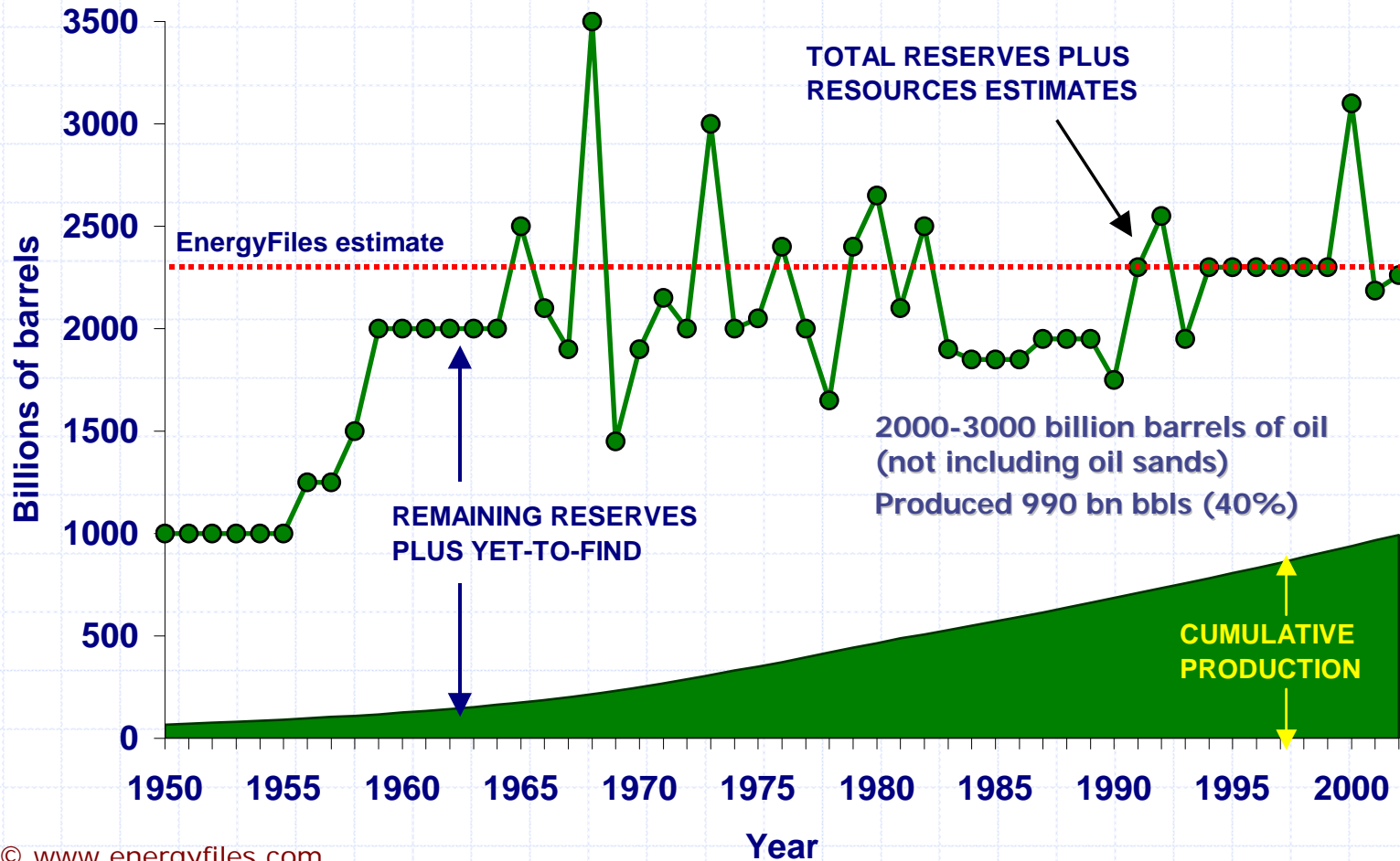
Distorted numbers (bias)

- ◆ When geologists say they are “optimistic”, the truth is that “realism” will give a different result
- ◆ Industry may under report for regulatory reasons
- ◆ Industry may over report to maximise value
- ◆ Governments over report for promotional reasons
- ◆ Both governments and industry do not update
- ◆ Public data sources (Oil & Gas Journal, World Oil, Oil industry databases etc.) give different numbers so individuals pick the one that suits their argument

GLOBAL: Reported remaining reserves



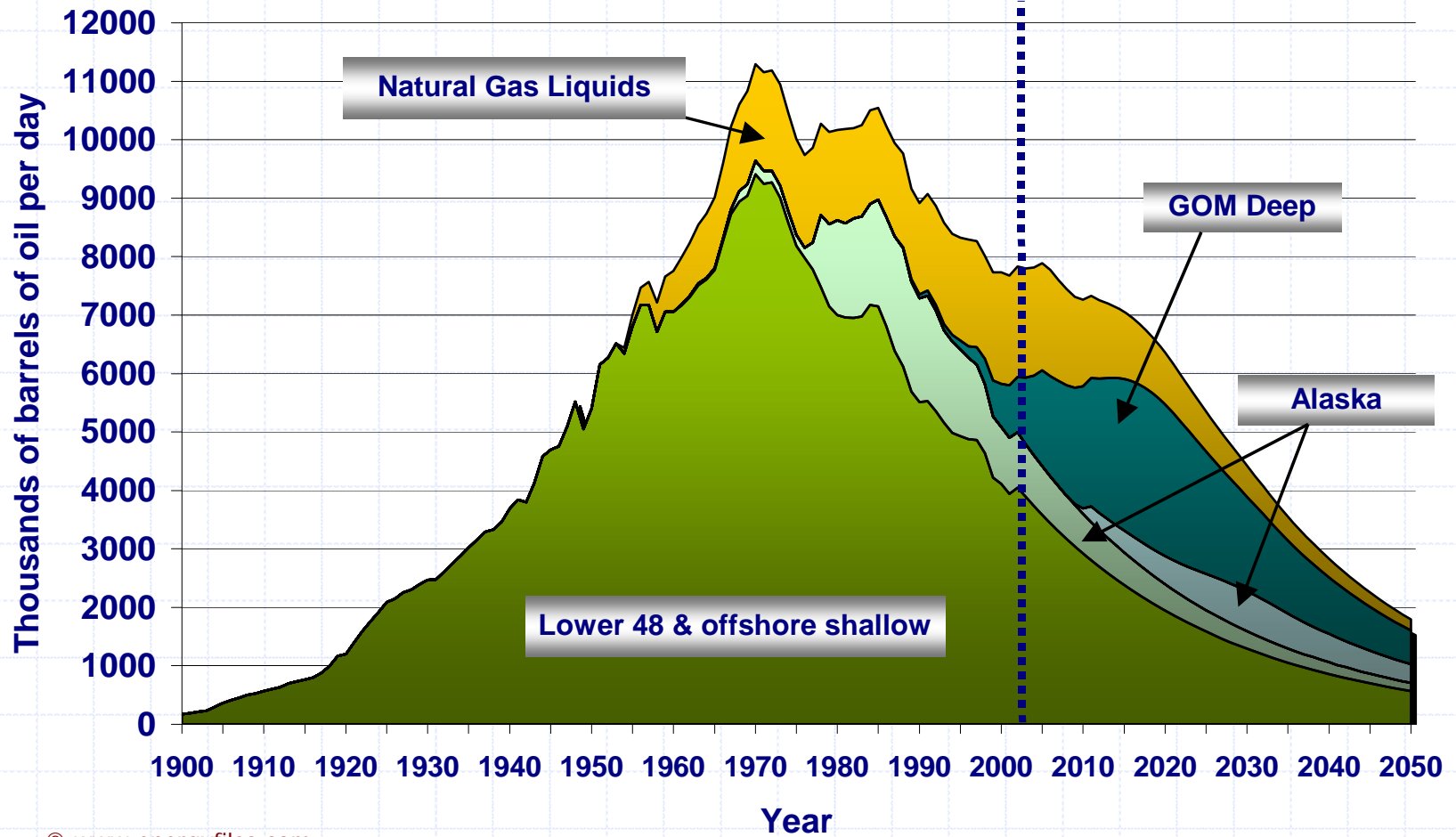
GLOBAL: Reserves and resources estimates



But What Really Matters...

- ◆ New oil cannot be instantaneously brought onstream...
- ◆ ...and there will come a year when the production rate can rise no longer...
- ◆ ...even though there is a lot more oil left to be produced
- ◆ This is the **production peak** first described by M.K. Hubbert in 1956
- ◆ The peak date is unaffected by technology and fields that remain to be found

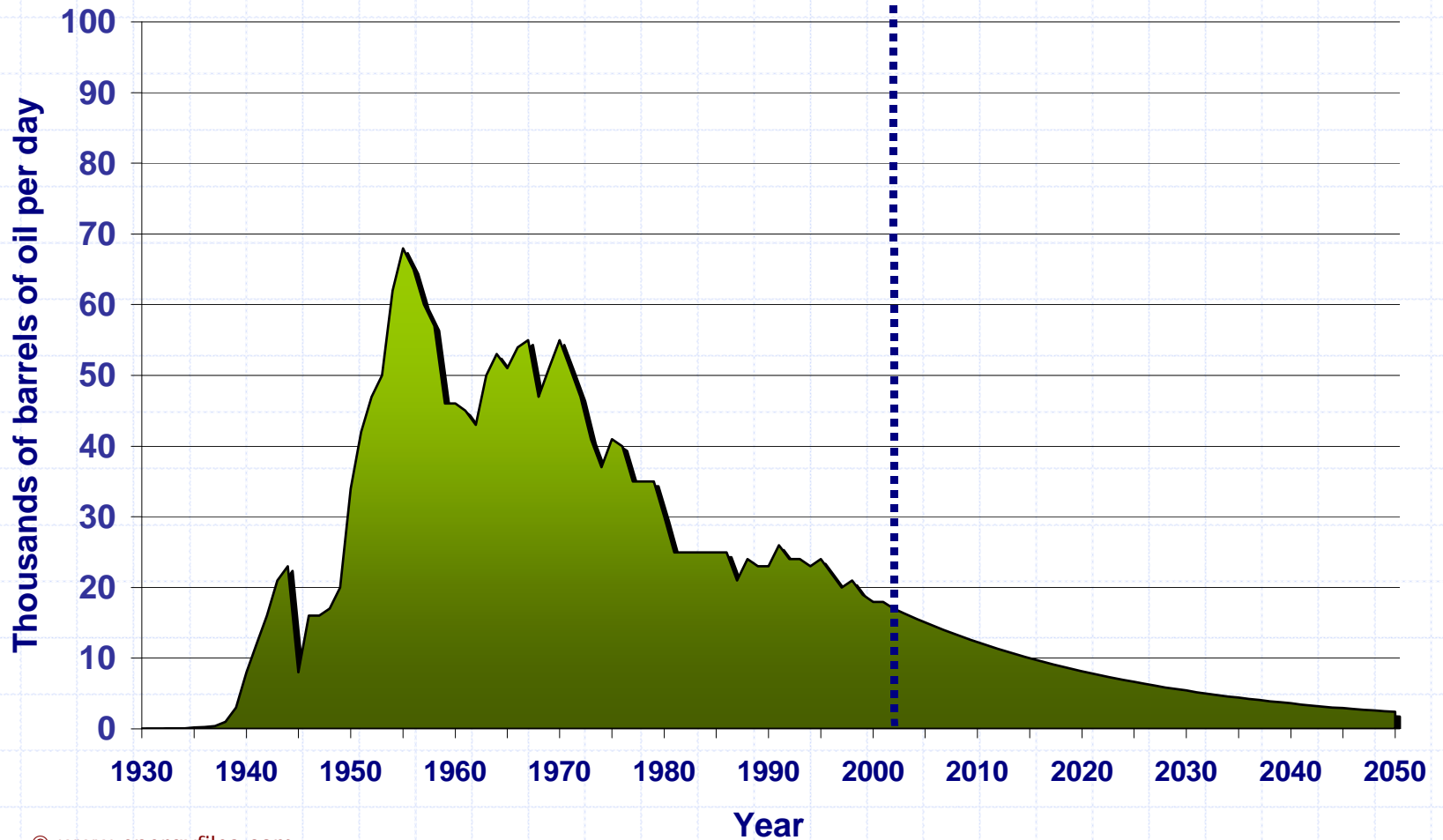
USA: Oil production forecast 1900 to 2050



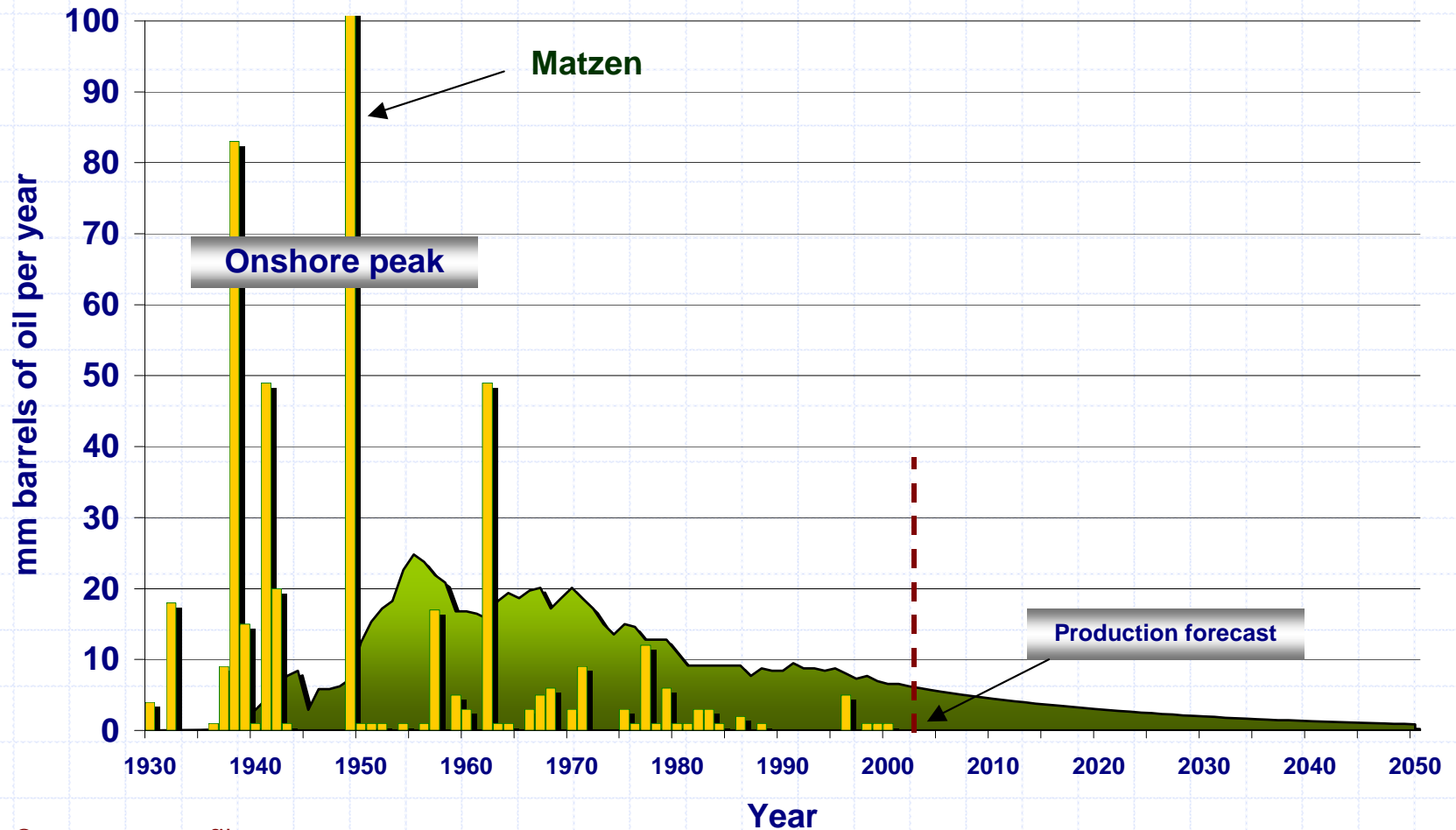
Other Countries Past Peak?

- There are 100 potential or actual producing countries in the world
- How many do you think are past peak?
 - ◆ 10 to 15?
 - ◆ 20 to 25?
 - ◆ Actually 60 countries are at or past peak
 - ◆ A further 12 countries are very near peak

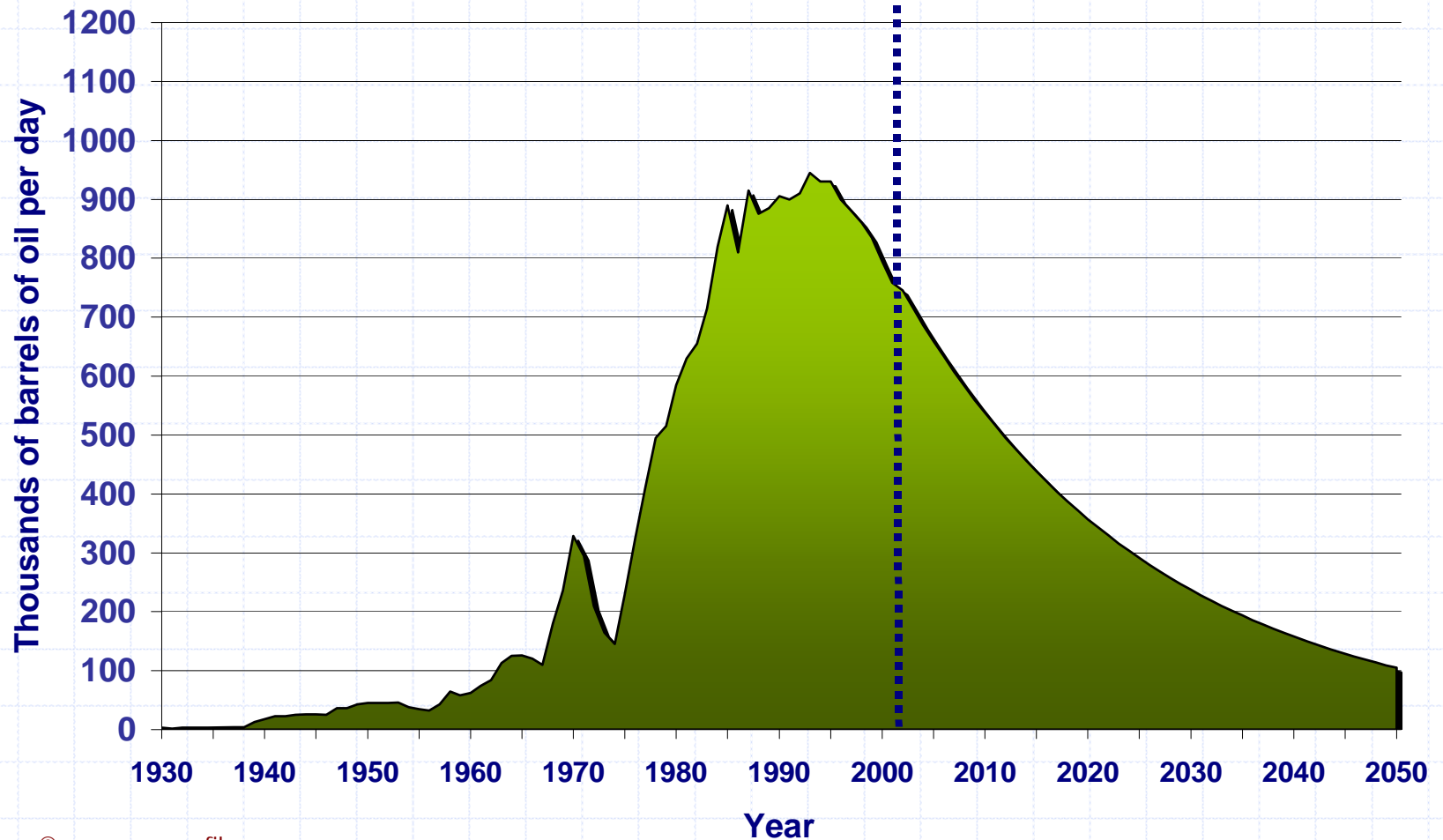
AUSTRIA: Oil production forecast 1930 to 2050



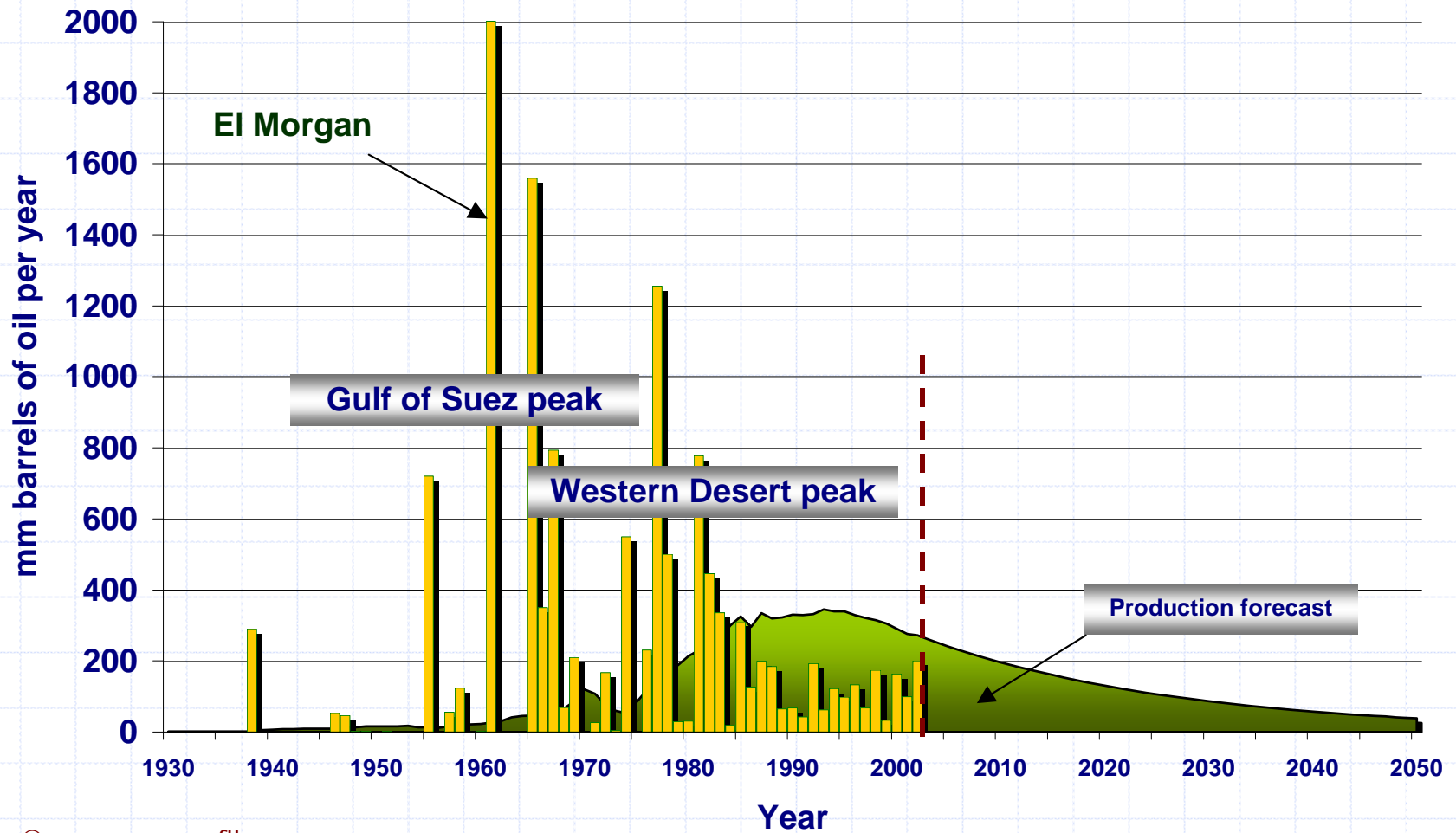
AUSTRIA: Oil discoveries 1930 to present day



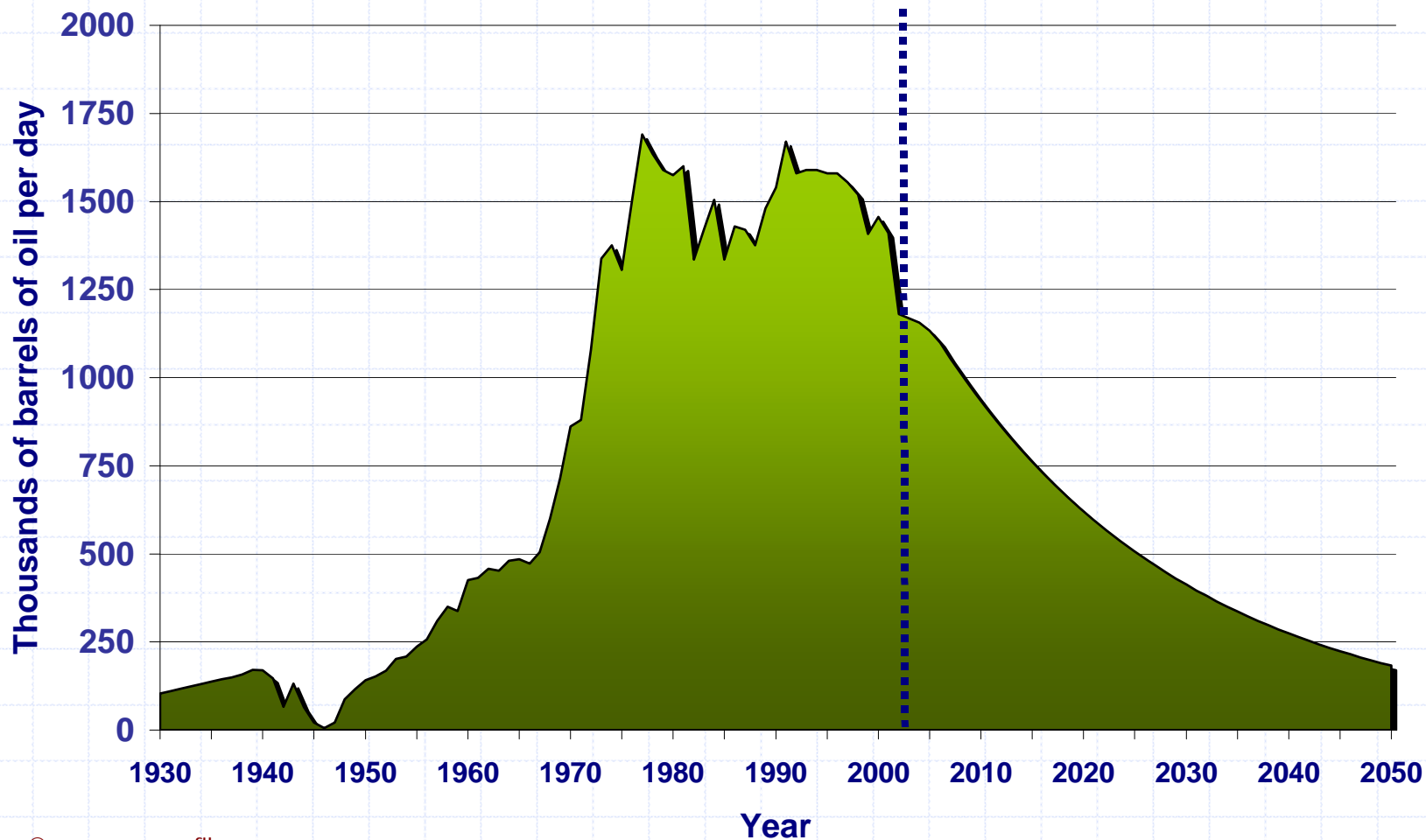
EGYPT: Oil production forecast 1930 to 2050



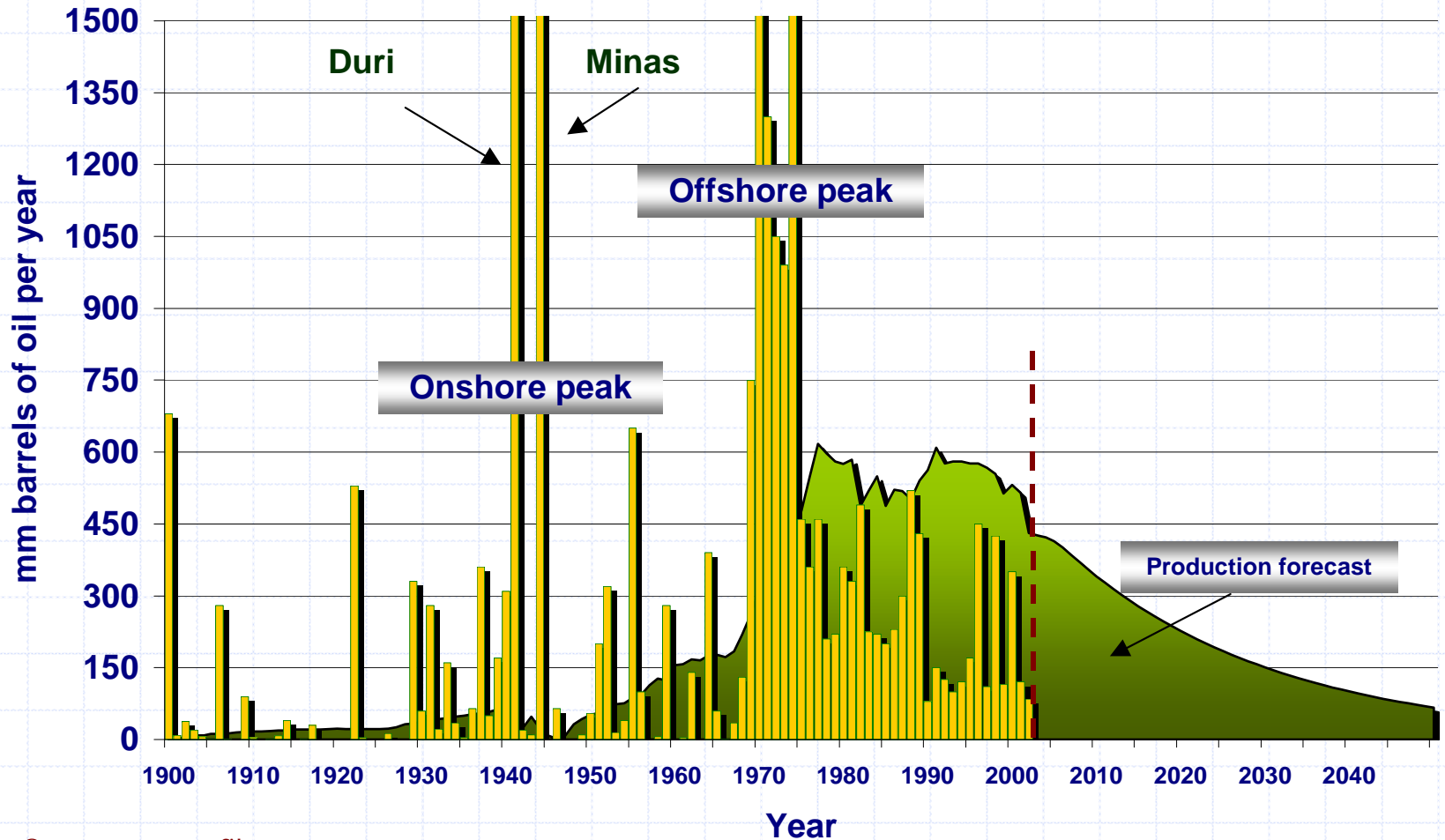
EGYPT: Oil discoveries 1930 to present day



INDONESIA: Oil production forecast 1930 to 2050



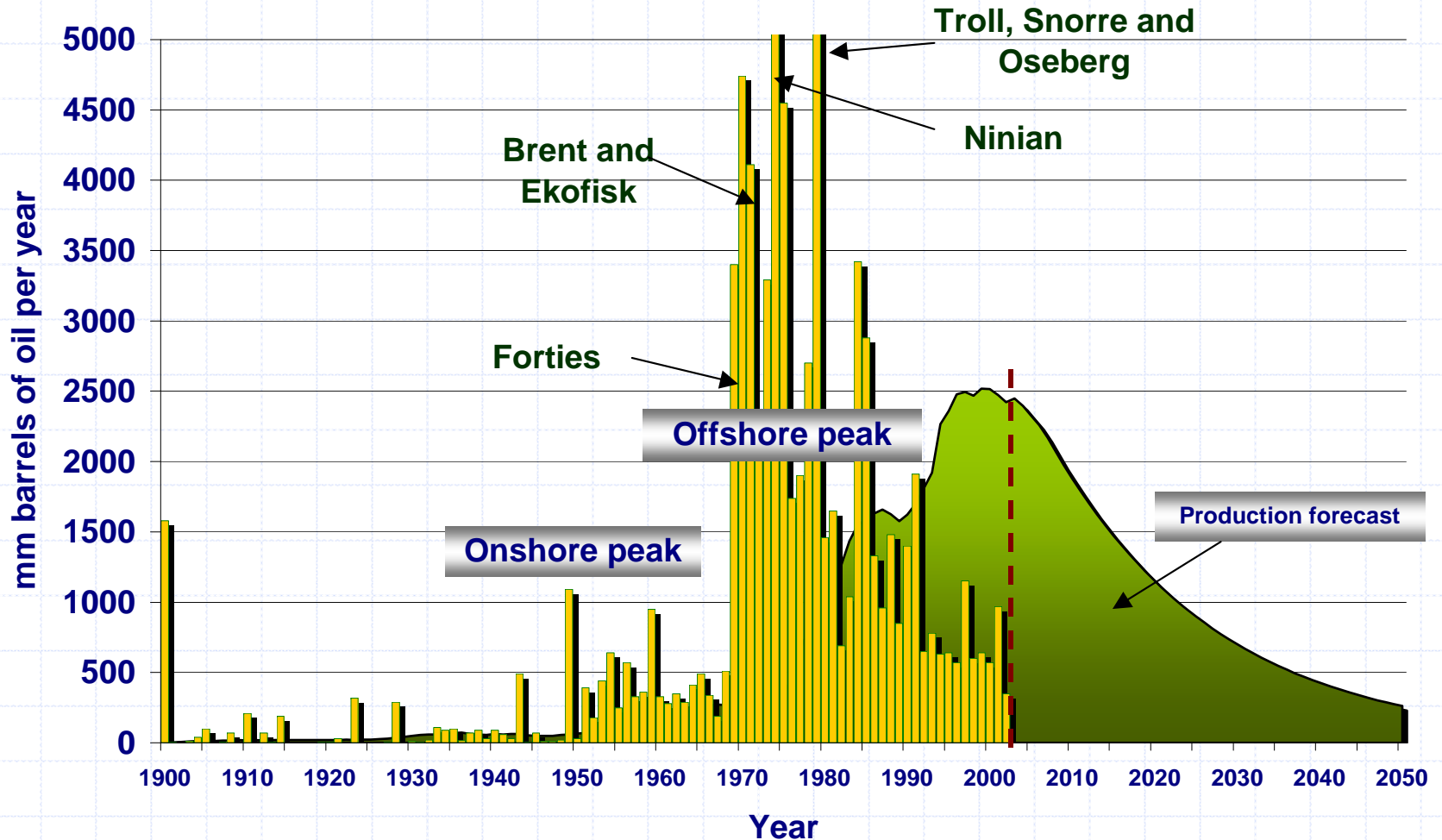
INDONESIA: Oil discoveries 1900 to present day



The Discovery Profile

- ◆ Discoveries are a signal
- ◆ Discovery peaks 20-30 years prior to production peak
- ◆ Offshore areas and those developed with newer technologies peak faster
- ◆ Areas with production restrictions (mostly OPEC countries) peak later
- ◆ Production peaks are broadly predictable using:
 - Discovery peak
 - Estimated total cumulative reserves and resources
 - Current depletion rate
 - Political factors (restrictions)

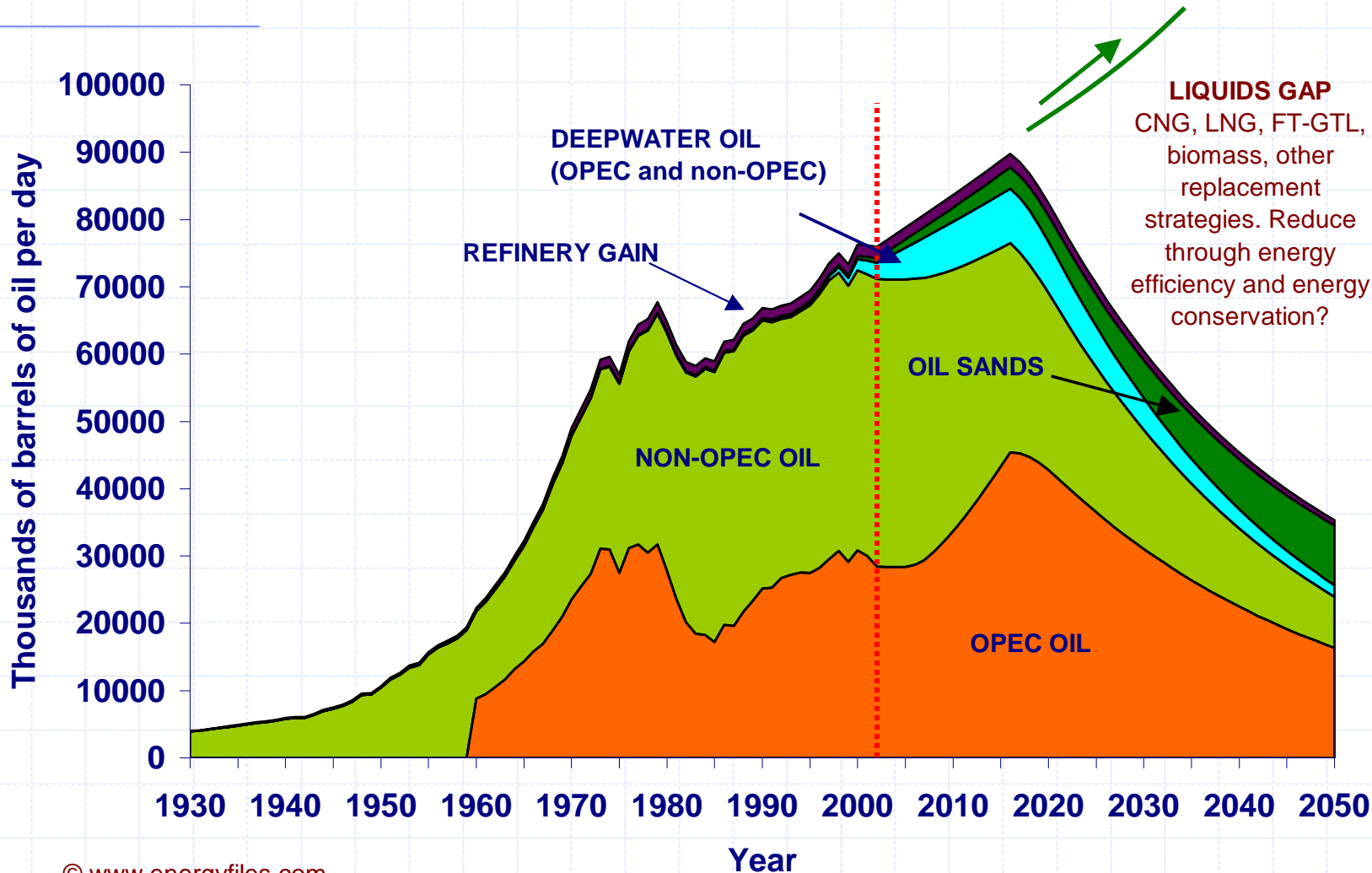
EUROPE: Oil discoveries 1900 to present day



Global Oil Peak Estimate

<i>Demand growth</i> <i>(constant to peak year)</i>	<i>Peak year</i> <i>(last year in which supply can match demand)</i>	<i>Production capacity</i> <i>in peak year</i> <i>(mm bbls per day)</i>
Flat	2020	75
1%	2016	85
2%	2012	90
3%	2008	90

GLOBAL: All oil supplies, 1930-2050



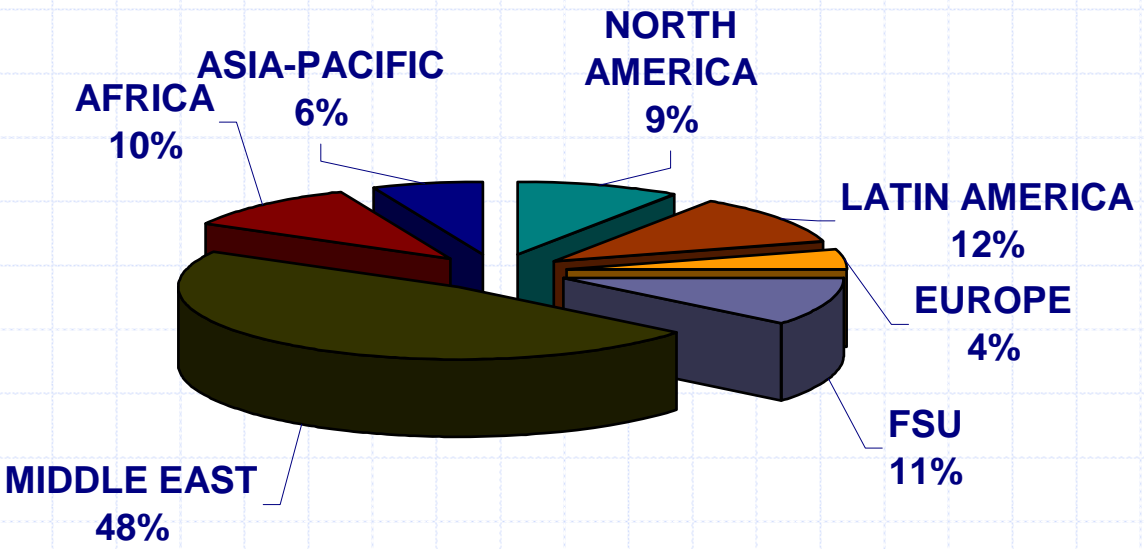
What About Technology?

- 30 years of new exploration technology:
 - ◆ Has reduced risk but has not found unexpected oil (drilling has always been in the best areas)
- 30 years of new production technology:
 - ◆ Has improved development of fields but has not extracted unplanned oil (faster and cheaper production)
- 30 years of new engineering technology has allowed development in remote areas:
 - ◆ But deepwaters and polar oil may only achieve around 10 to 15% of global output at peak
- Technology speeds depletion but hardly increases reserves

Middle East Oil

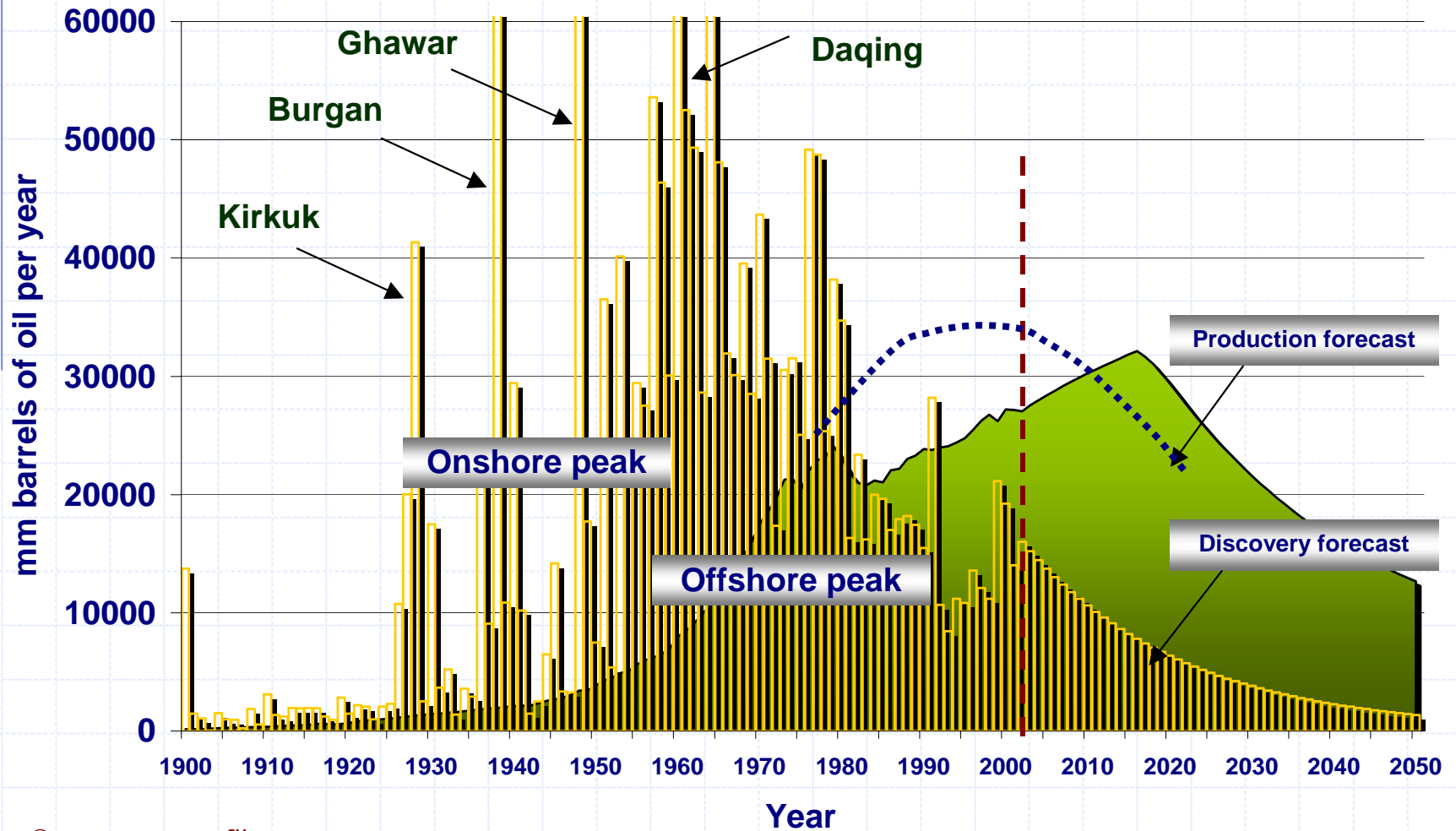
- The only countries that have actively conserved oil for the future are OPEC members
- If OPEC had produced as fast as it could global peak would be around now (as Hubbert predicted)
- And expensive “tail-end” production elsewhere (e.g. Deepwaters) would not yet have begun

REGIONS: Unproduced oil

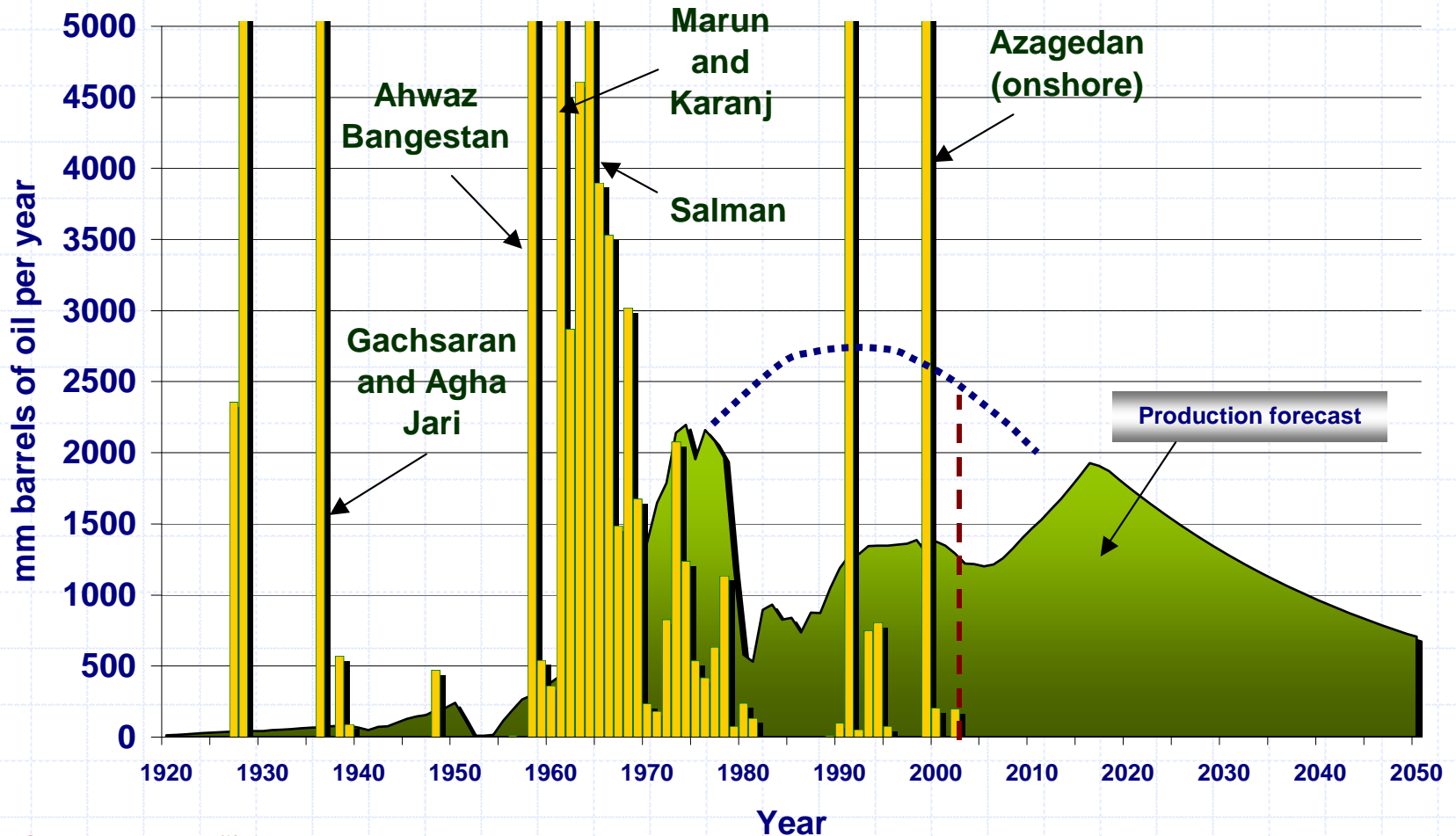


NB: does not include synthetic oil

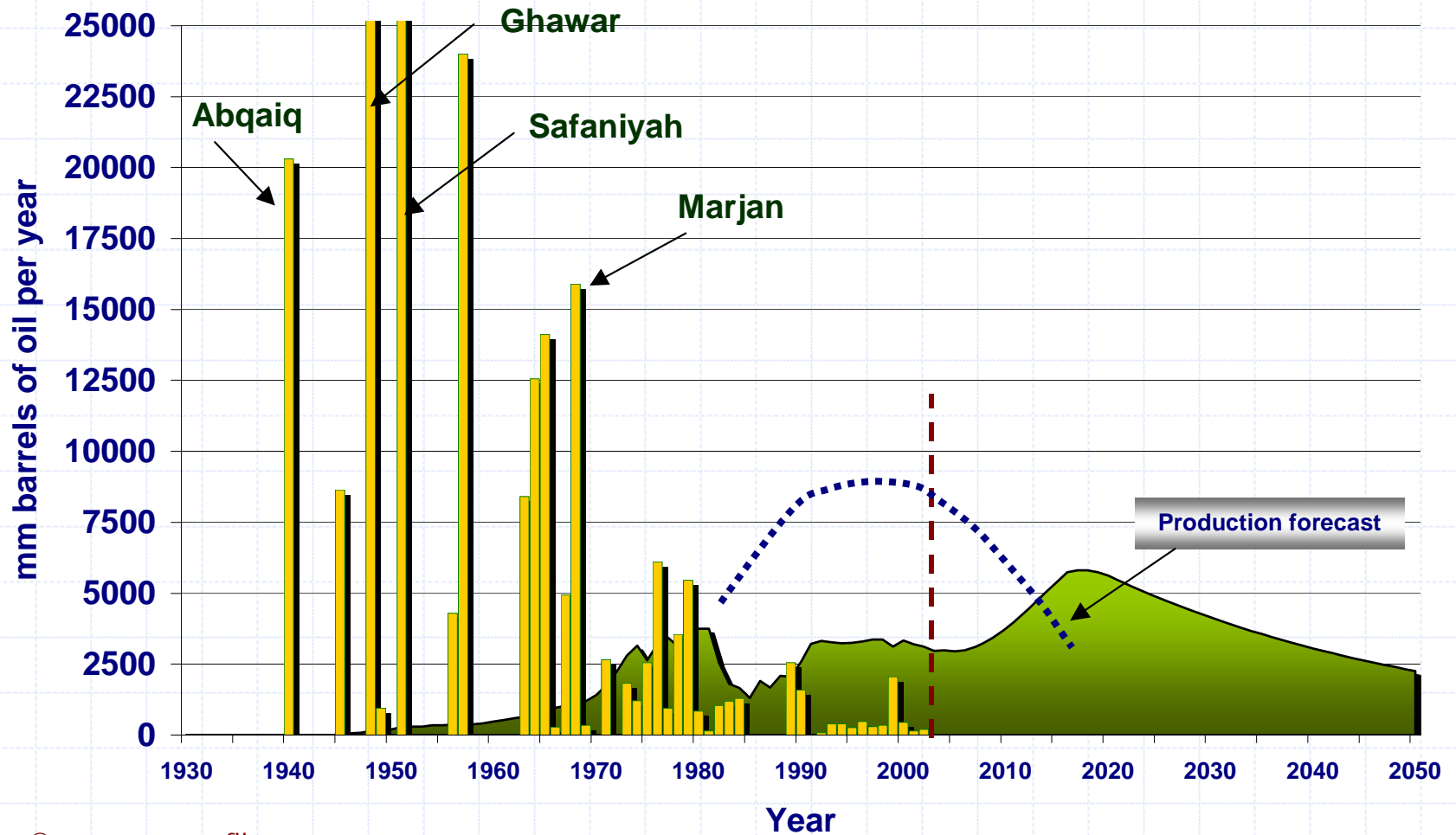
GLOBAL: Oil discoveries 1900 to present day



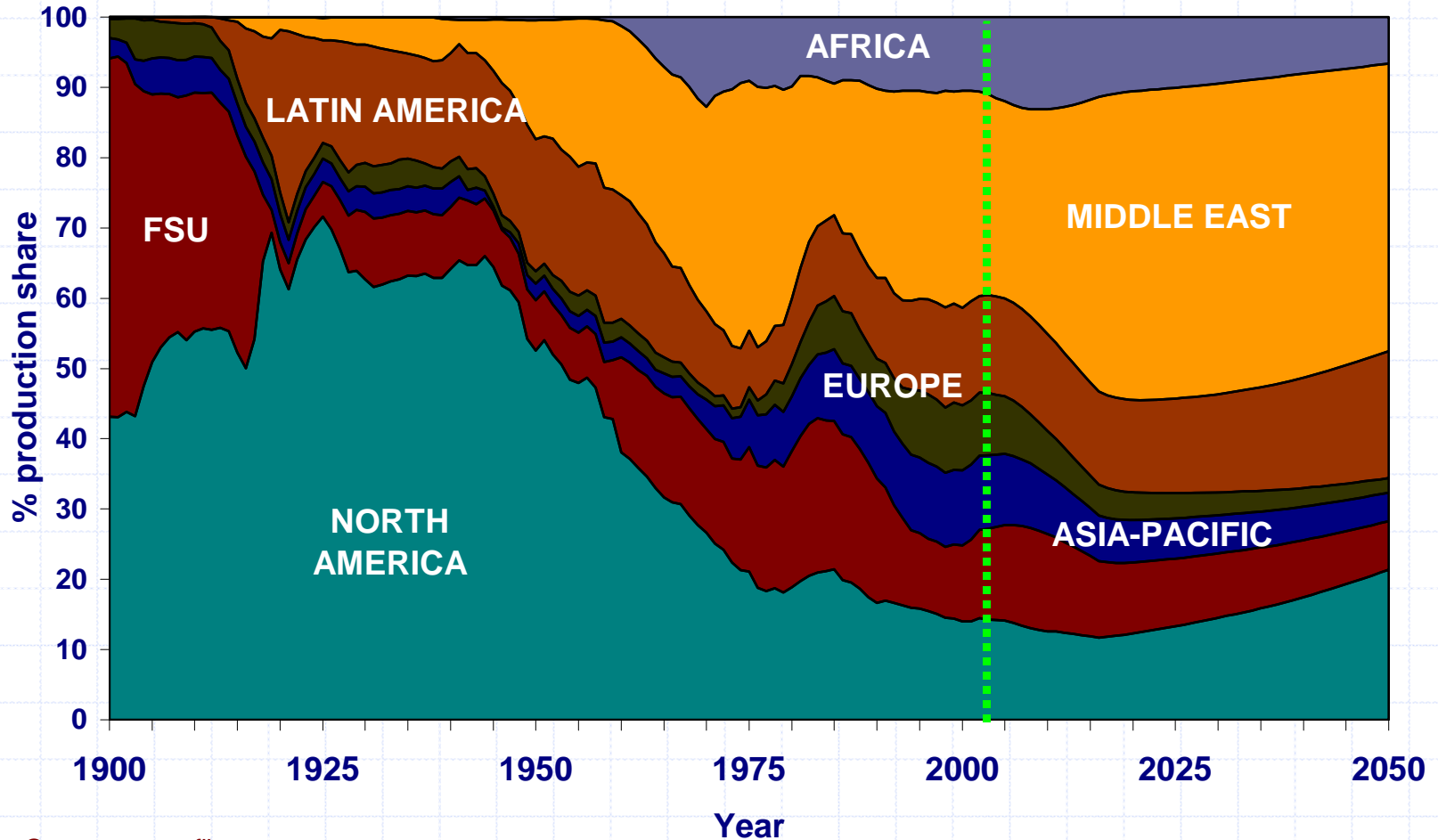
IRAN: Oil discoveries 1920 to present day



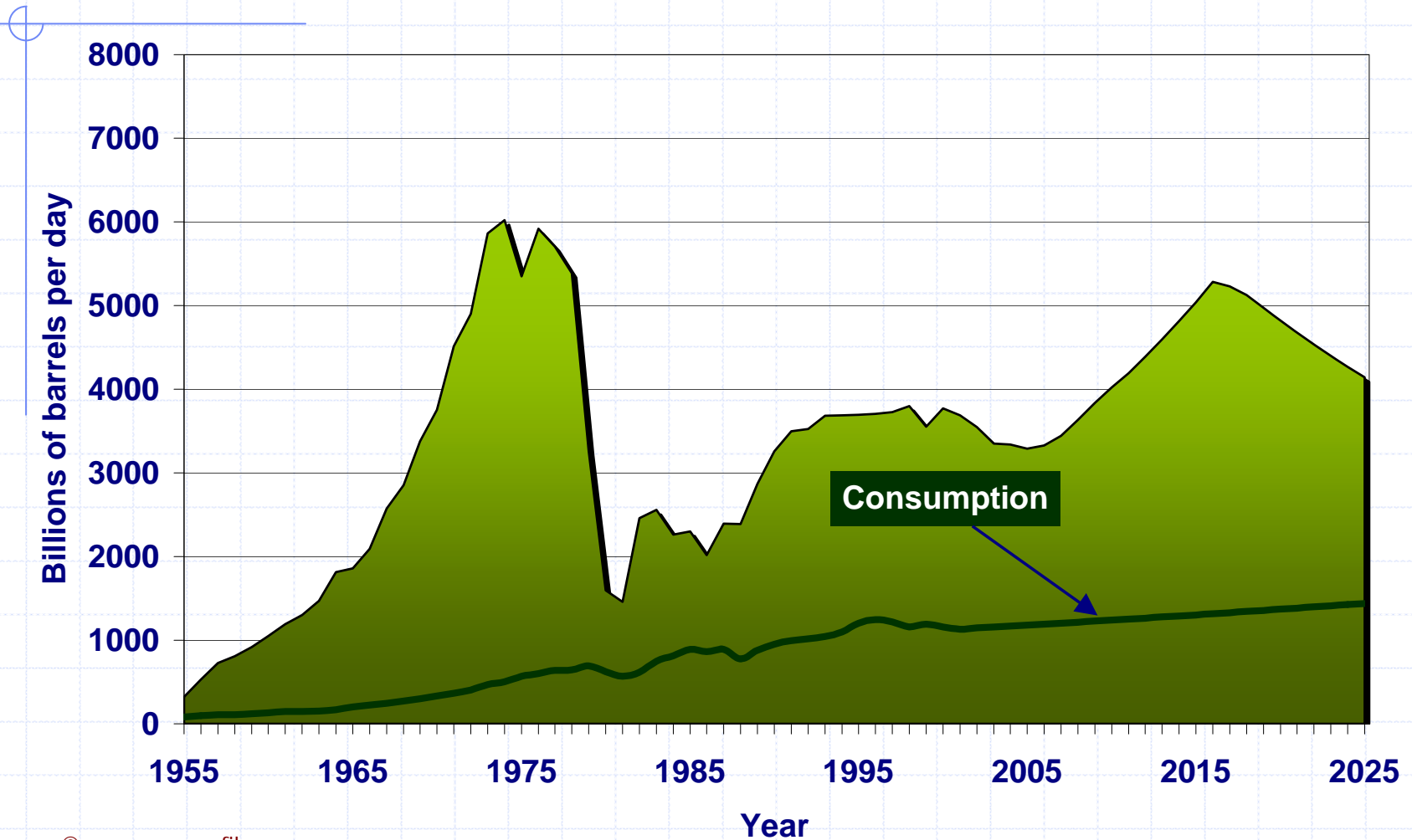
SAUDI ARABIA: Oil discoveries 1930 to present day



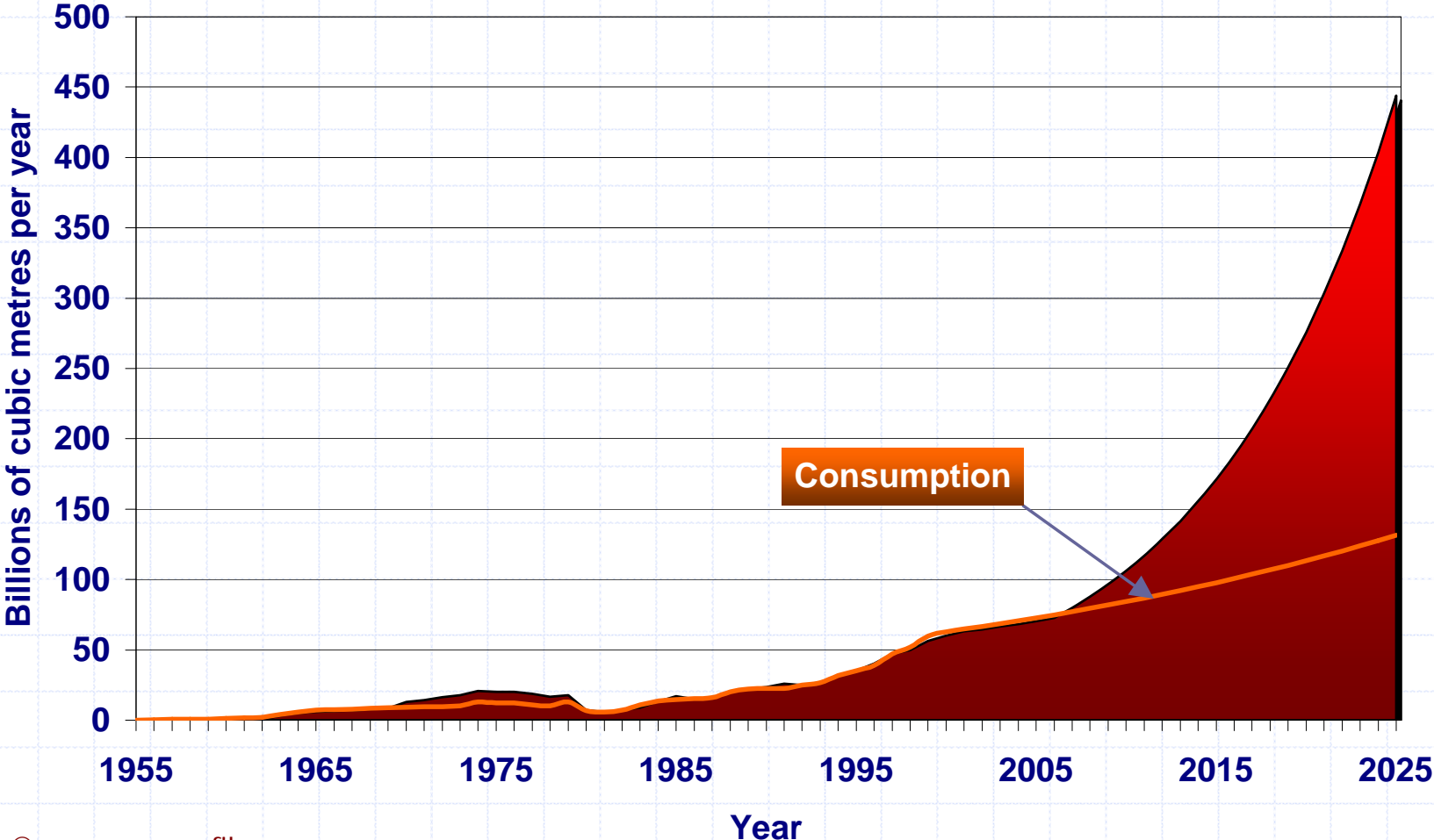
GLOBAL: Oil production share forecast



IRAN: Oil production/consumption 1955 to 2025

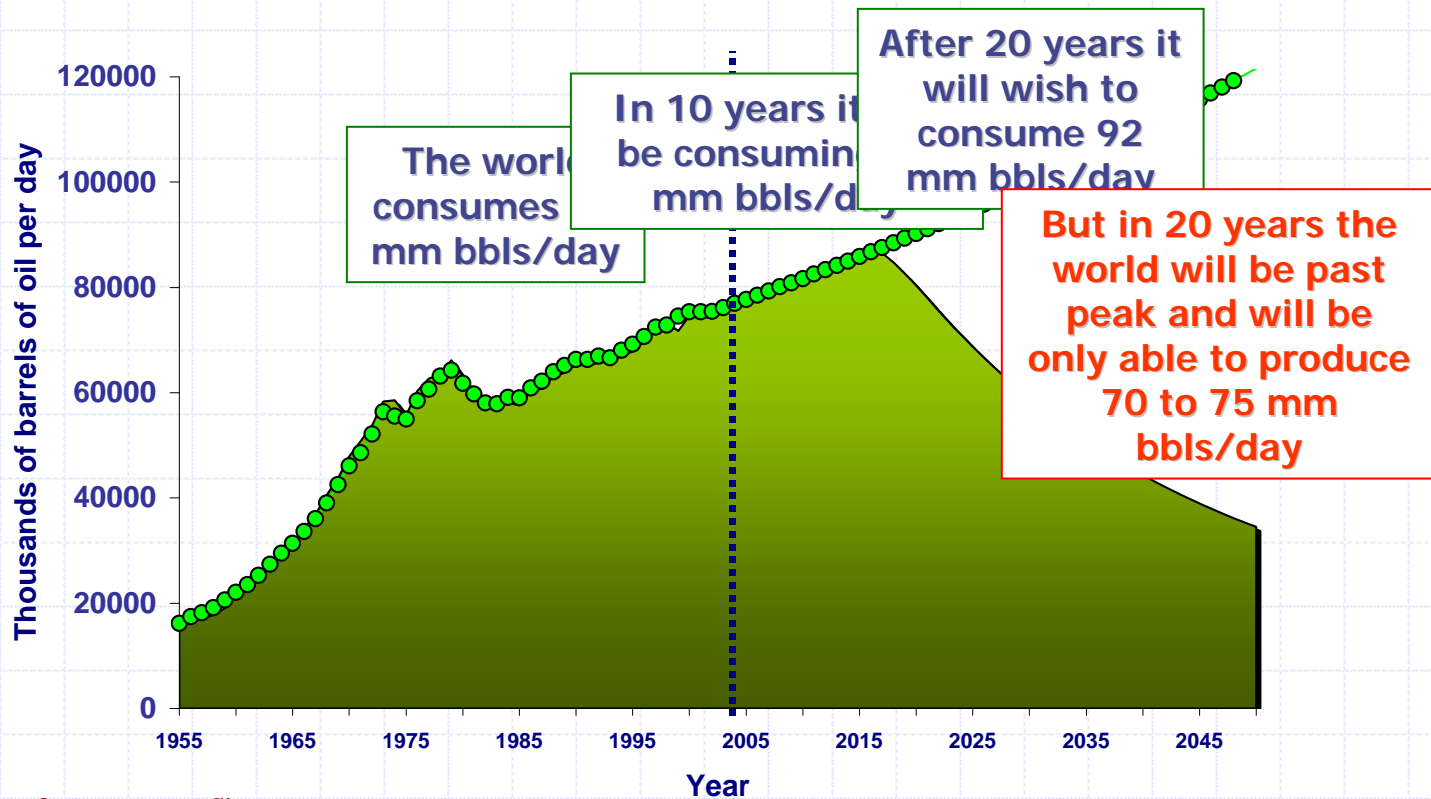


IRAN: Gas production/consumption 1955 to 2025



Global Business As Usual

BUSINESS AS USUAL: Oil production/consumption

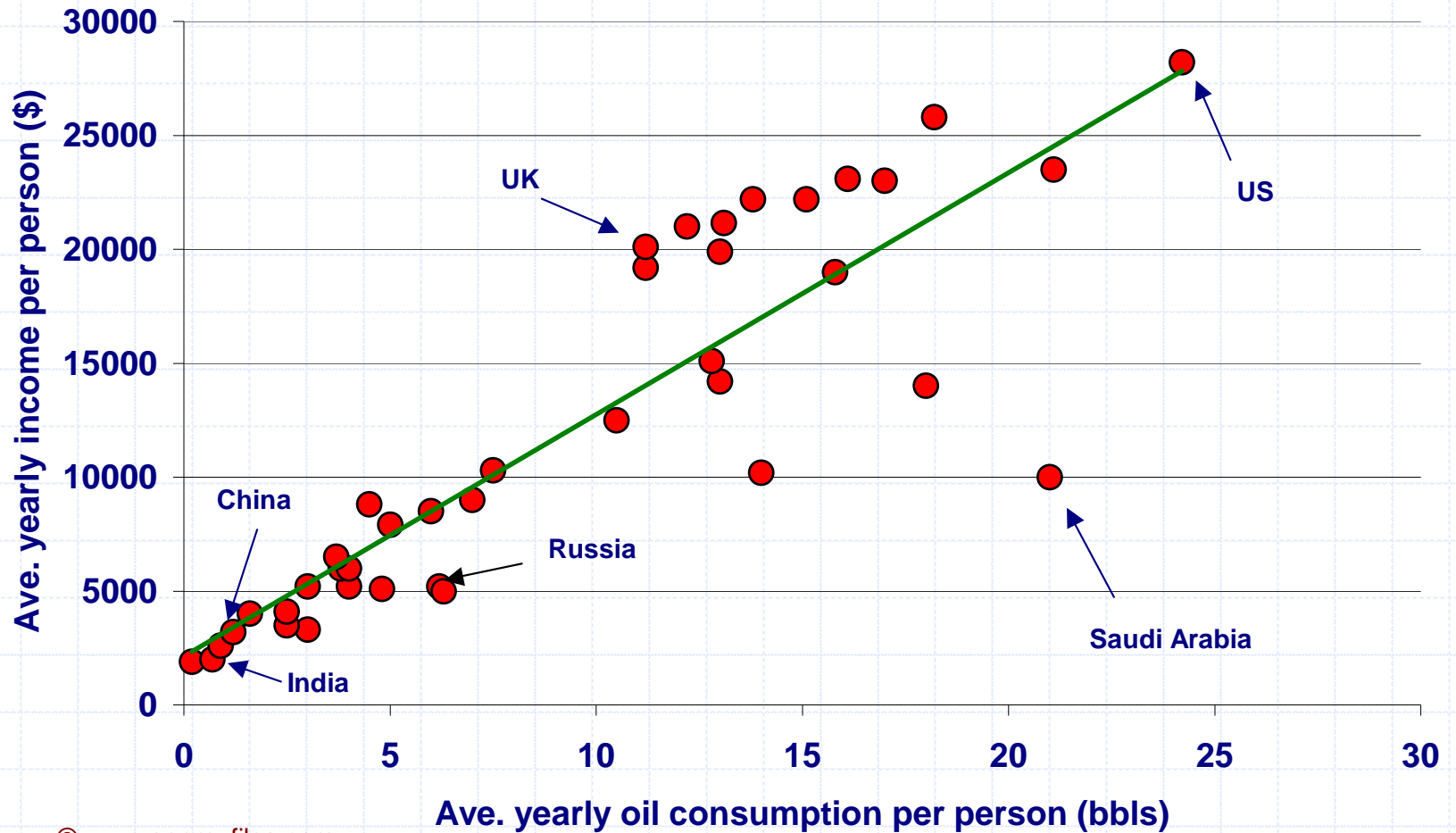


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Global Business As Usual

- The Asia-Pacific is at peak for oil now. It will want at least 28 mm bbls per day (85% imported)
- The USA is already well past peak. It alone will want 24 mm bbls per day (76% imported)
- Europe is at peak for both oil and gas. It will want 19 mm bbls per day (86% imported)
- And many developing countries in other regions will also want more oil and gas.

ANALYSIS: Affluence and Energy



Global Business As Usual

- It cannot be done
- Assuming 1% per year demand growth the world will reach peak oil in ~2016
- At which time every importer will want more oil than it can get
- Without alternatives competition will lead to:
 - ◆ Major real and permanent price rises
 - ◆ Economic stagnation

Conclusion

- Are there alternatives?
- Gas can replace some oil (but not easily in transport) and gas has its own limits
- Along with gas the world contains large quantities of unconventional oil and oil substitutes
- But an unforeseen decline in output of conventional oil makes it unlikely that unconventional sources could come on-stream fast enough to compensate
- Without concerted action soon conservation will be the only option

Thank You for Listening