RUNE LIKVERN

HUBBERT'S METHOD

APPLIED ON

NCS

(**N**orwegian **C**ontinental **S**helf)

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INTRODUCTION

Inspired by the book "**Beyond Oil.** ***The view from Hubbert's Peak***" by Kenneth S. Deffeyes, Hill and Wang 2005, I set out to test how the Hubbert methodology would describe regular oil production from NCS (Norwegian Continental Shelf).

Armed with the latest production and reserves data as published by NPD (Norwegian Petroleum Directorate) at end 2004 and a computer based spreadsheet, the recipe was followed step by step as described in part three "The Hubbert Method" of abovementioned book.

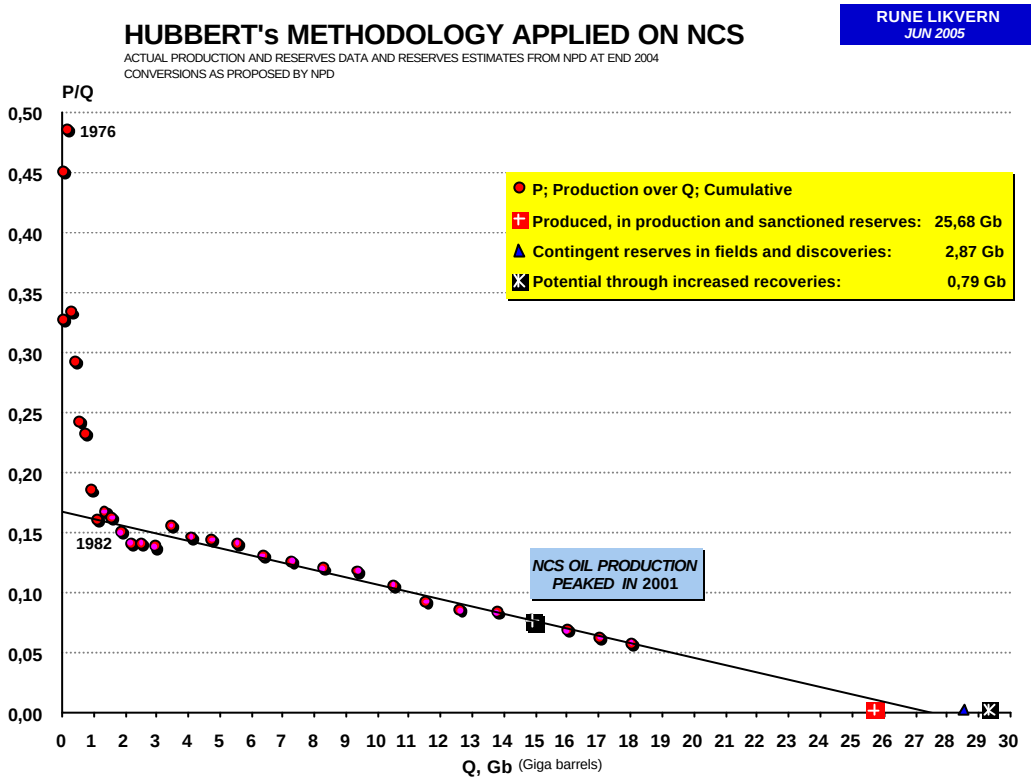
NPD maintains a good quality petroleum database that can be accessed from their web site www.npd.no.

The following pages contain mainly graphical presentations from this exercise.

In September 2005 the development in regular oil production from NCS based on monthly-published figures from NPD for the period January 2002 – July 2005 was added to illustrate the depletion on NCS.

ESTIMATED RECOVERABLE OIL FROM NCS

The first step was to obtain an estimate of total recoverable regular oil reserves from NCS based on the methodology described in “Beyond Oil”.



The above diagram illustrates that Hubbert’s methodology would predict total recoveries of 27,41 Gb of regular oil from NCS.
(For non-technical readers; that’s where the sloping line intersects the x-axis (horizontal axis).)
The straight line represents the best fit of the data from 1982 to 2004.

The Hubbert prediction comes out right in the middle of produced and proven reserves of 25,68 Gb, and total estimated and expected of 29,34 Gb at end 2004 as reported by NPD, and indicated by symbols along the x-axis in the above diagram.

Through the recent years NPD has revised down the potential for increased recoveries as reflected in their annual resources accounting.

Factors that could impact the outcome from this analysis;

- Future economical discoveries, potential from the Nordland/Lofoten area (presently not open for exploration) and new discoveries in the Barents Sea.

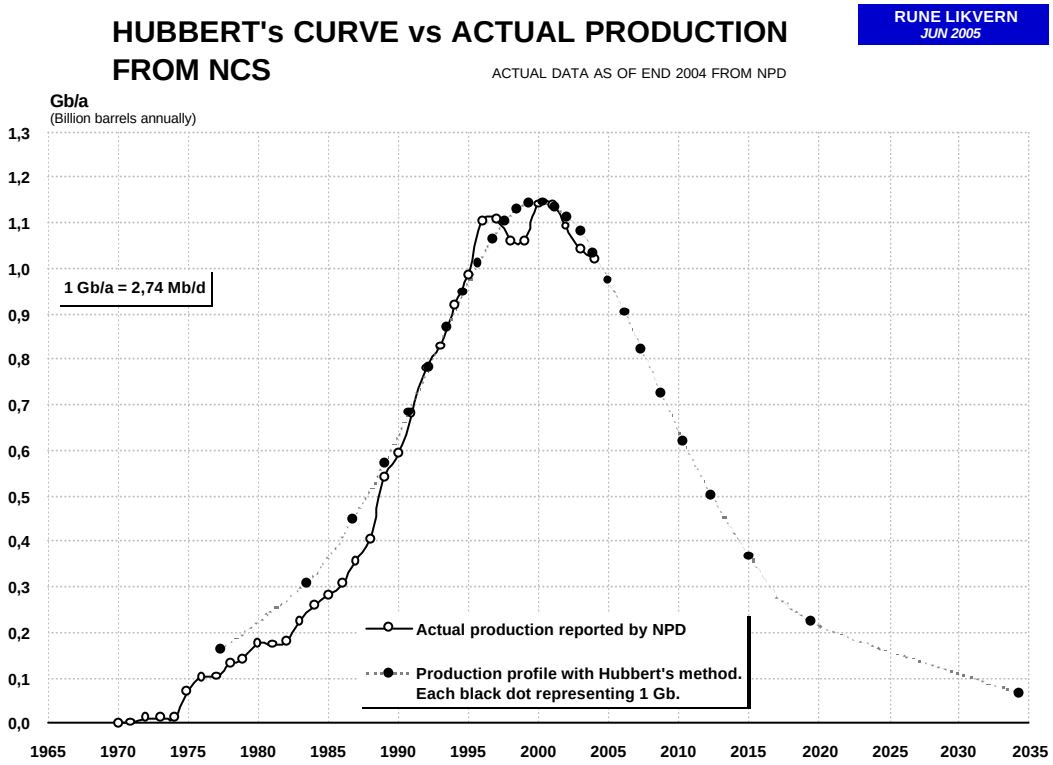
- Reserves becomeing non economical due to depletion (declining production) as total OPEX exceeds gross incomes from petroleum sales from now producing fields.

- Timecritical reserves. These are additions and/or discoveries that presently are considered non economical to develop by themselves or due to their relative location to supportive infrastructure, which synergies could improve economics.
  (The price increases induced by approaching the summit of Hubbert’s Global Peak should ceartinly improve those economical incentives.)

PROFILE DERIVED FROM HUBBERT'S METHOD vs ACTUAL

The next step was to set the clock so it would be possible to produce a production profile versus time.

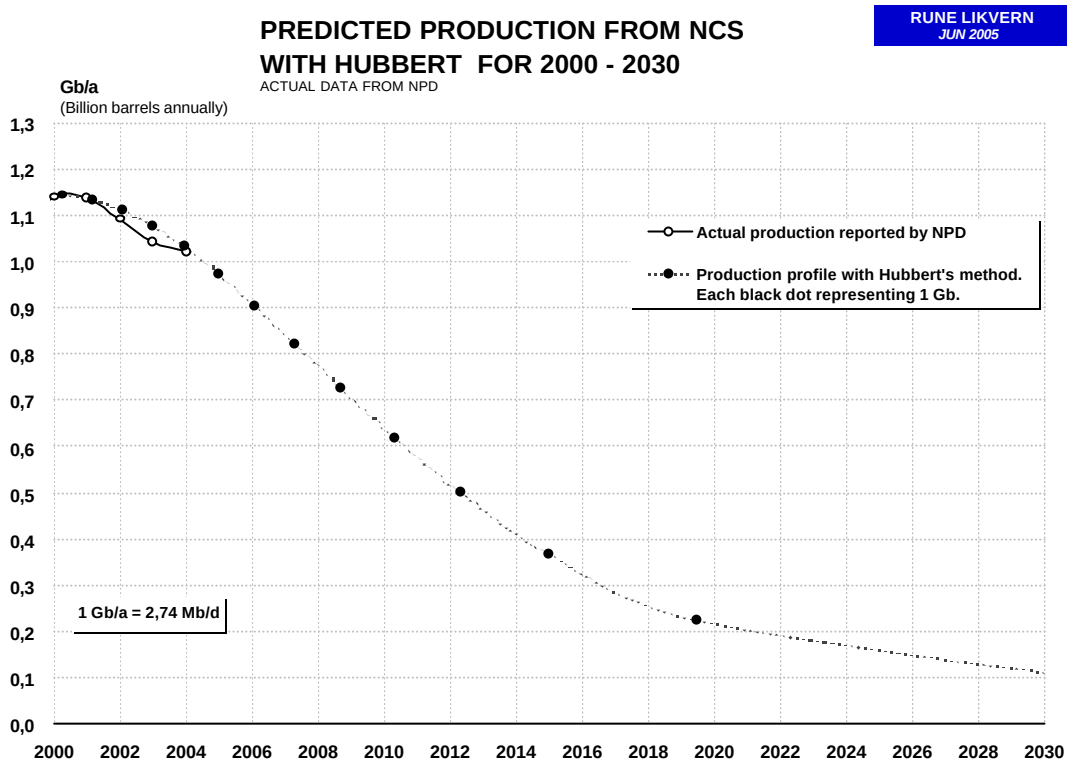
The below diagram presents how the production profile derived from Hubbert's method compares with actual production data from NPD at end 2004.



The diagram speaks very much by itself. Not bad!

A CLOSER LOOK FOR NCS TOWARDS 2030

A closer look on how the Hubbert method predicts regular oil production from NCS towards 2030.



The smoothed Hubbert curve predicts a production of approximately 2,65 Mb/d from NCS for 2005.
By February 2006 the official numbers are expected to be published by NPD.

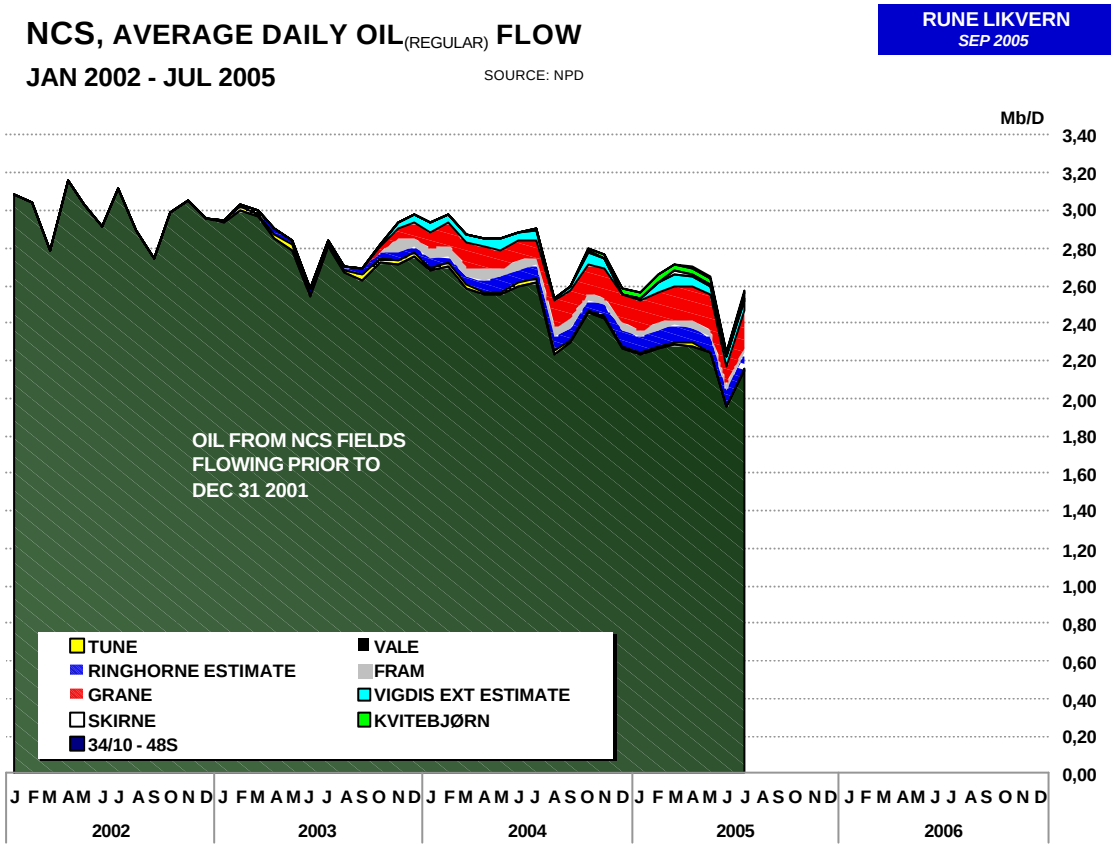
Actual production data from NCS as of July 2005 shows an average of 2,59 Mb/d for the period January through July. (Ref. Update on next page)

(During January and February production was reduced from the Snorre and Vigdis fields due to a severe gas leak occurring back in November 2004. NCS will see reduced production during the summer months due to scheduled maintenance (turn arounds).

As of now and given the reserves estimates from NPD at end 2004, expectations from the writer is that future actual production of regular oil from NCS towards 2010 will tend to stay close to the smoothed Hubbert curve presented above.

And beyond 2010, well, we will have to wait and see.

SEPTEMBER 2005 UPDATE, DEPLETION ON NCS



The figure above illustrates average daily (based on monthly NPD data) oil flow from NCS from January 2002 to July 2005. In the diagram new fields starting to flow post January 1st 2002 are shown with different colour coding to enhance the effects from depletion from all fields starting to flow prior to December 31st 2001.

NOTE: As Ringhorne is jointly reported by NPD with Balder, the Ringhorne profile has been derived from a projected profile for Balder based upon historical development until Ringhorne started to flow. The same method was applied to Vigdis Extension, which is a further development of the Vigdis field.

In the last three years a total of 0,8-0,9 Mb/d of oil capacity on NCS have fallen victim to depletion from fields starting to flow prior to 2002.

Previously in this document it was shown that for 2005 Hubbert's method predicted an oil flow of approximately 2,65 Mb/d from NCS. Actual data from NPD as for the months January through August for 2005 gives a daily average oil flow of 2,58 Mb/d (preliminary data from NPD reports an oil production of 2,50 Mb/d for August 2005). The figure above illustrates that new fields that started to flow post January 1st 2002 only have partly offset the declines of the more mature base.

New field developments like Kristin and Urd (Norne satellites) are scheduled to start to flow this fall. It is now expected that these new fields will partly offset the depletion from the mature base.

For 2006 Hubbert's method predicts a total oil extraction just below 2,50 Mb/d from NCS. As of now the only new oil field scheduled to come on stream during 2006 is Fram East.