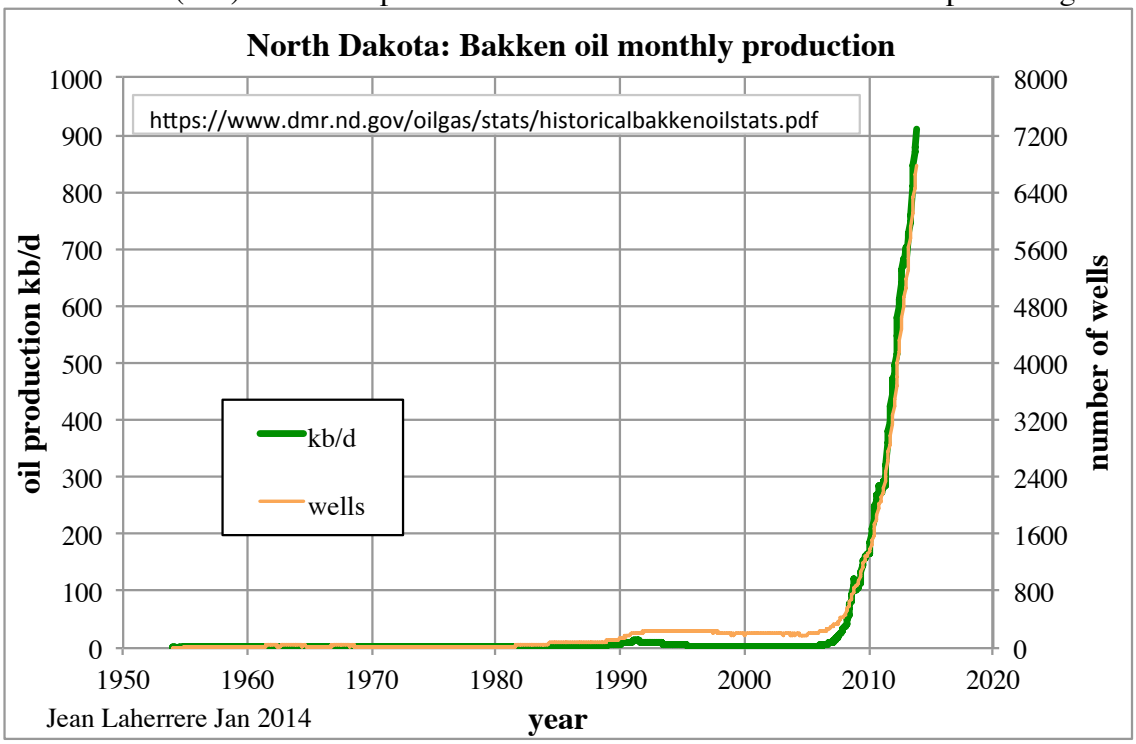
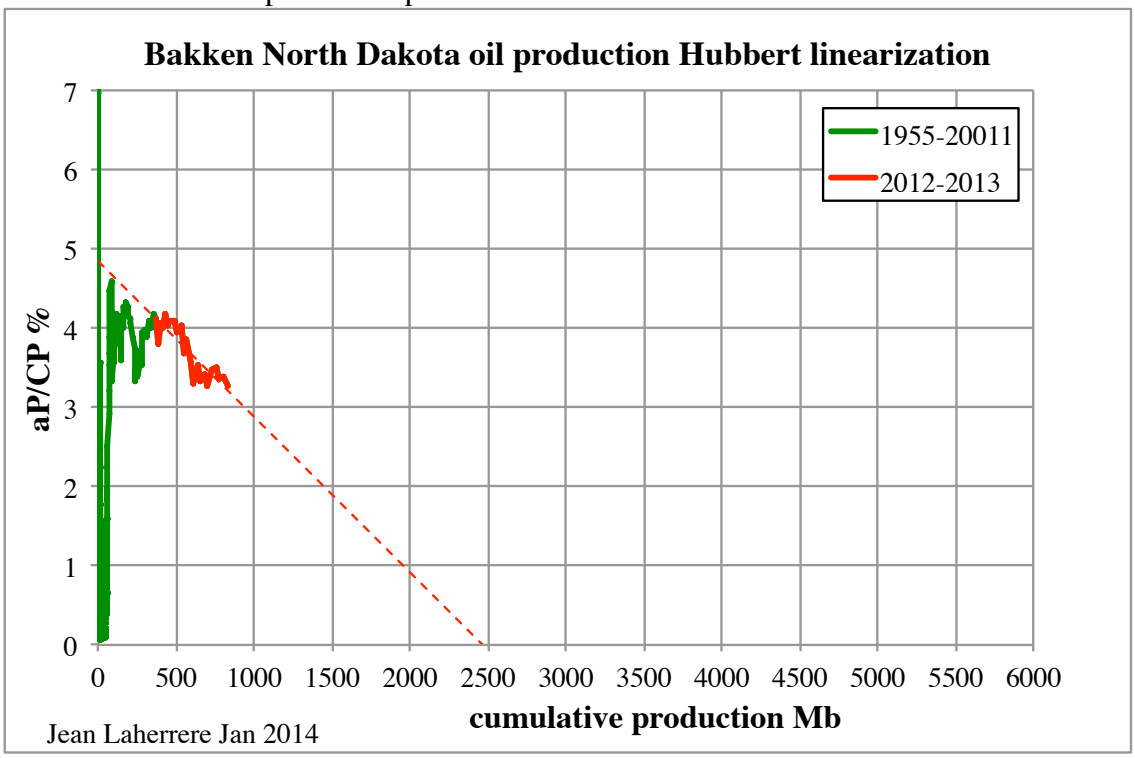
Jean Laherrere 25 January 2014

Oil peak in North Dakota & Montana

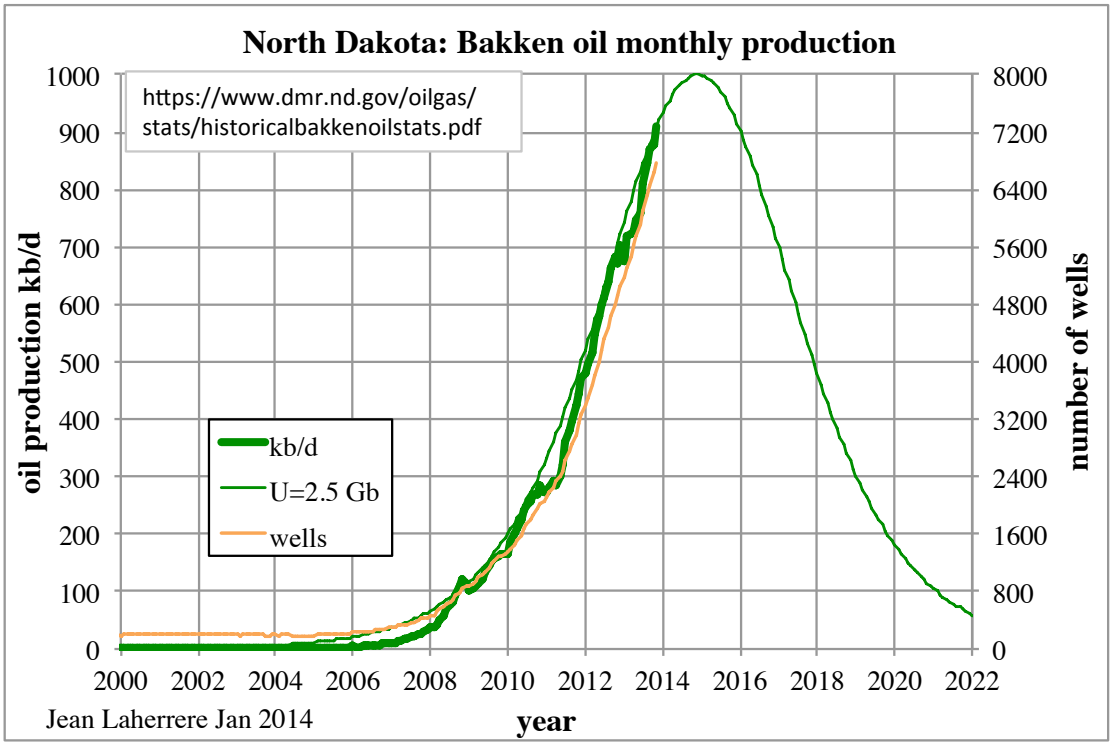
Last North Dakota (ND) Bakken report for November is at 908 kb/d with 6784 producing wells



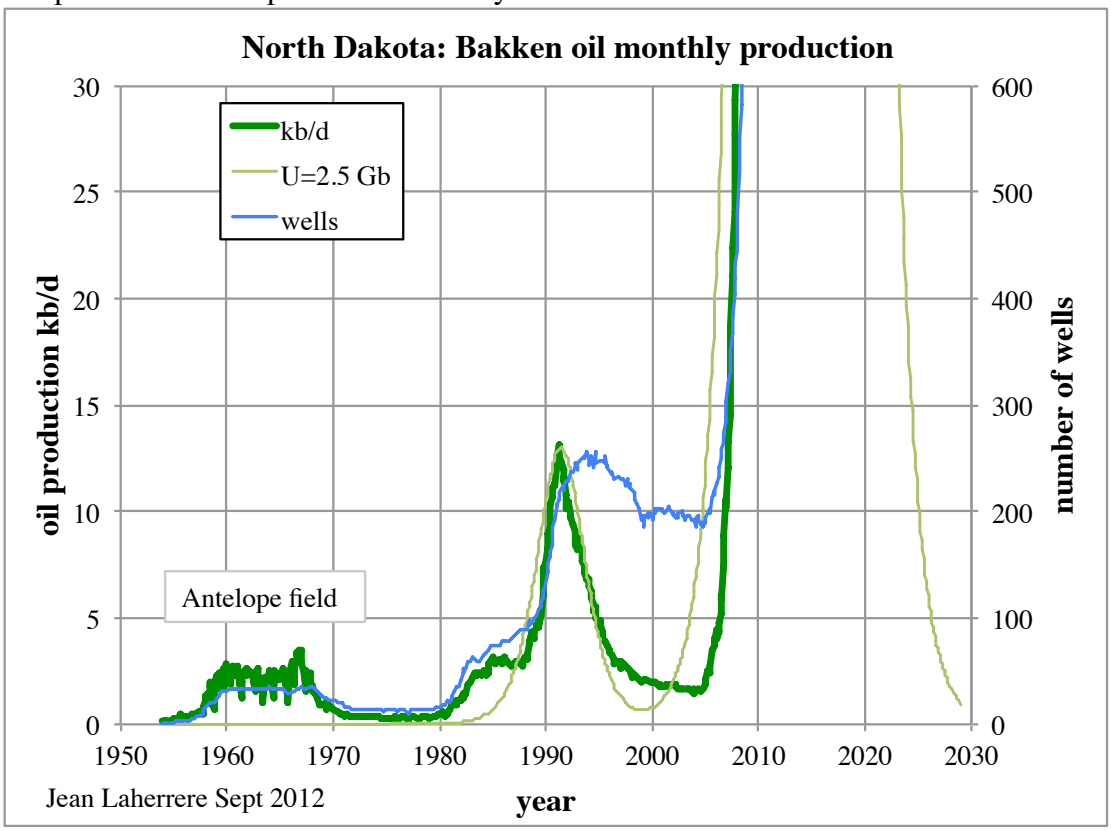
The Hubbert linearization plot of the production since 2012 trends towards 2500 Mb



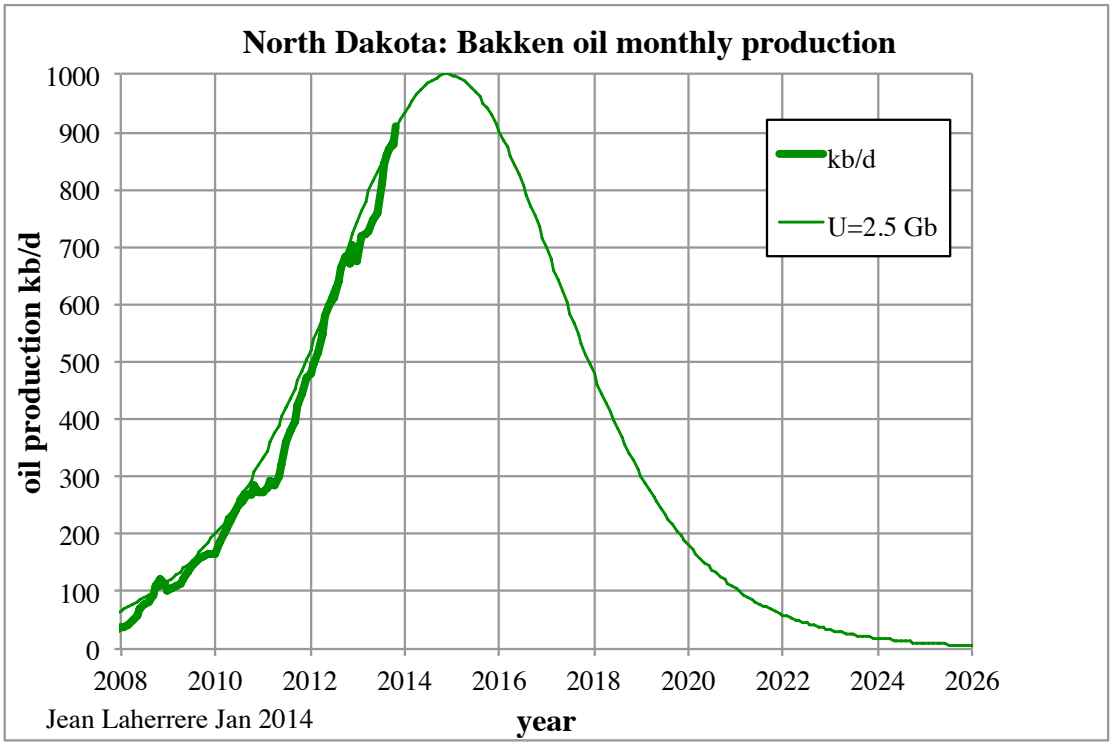
Using an ultimate of 2.5 Gb for ND Bakken the peak is for fall 2014 at 1 Mb/d



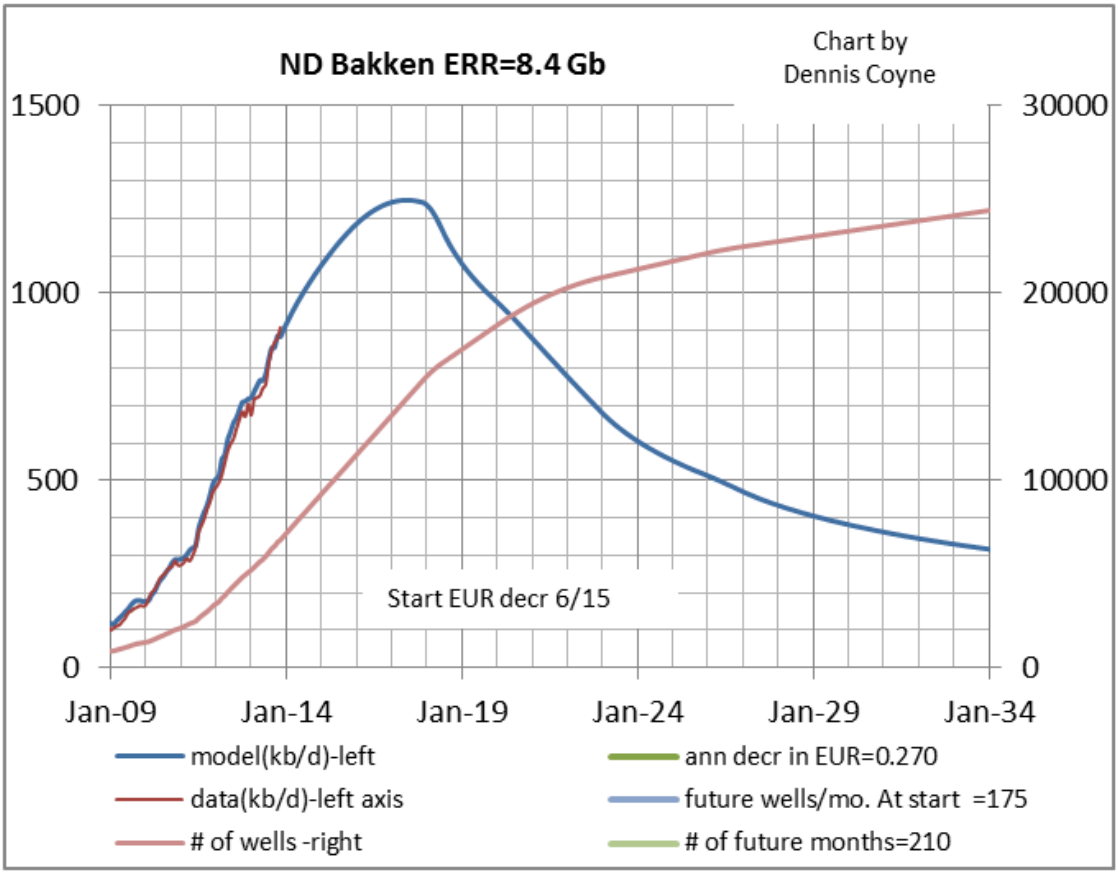
Using symmetrical curve for tight oil production could be seen as questionable but in 1991 ND had a Bakken peak which was produced with a symmetrical curve.



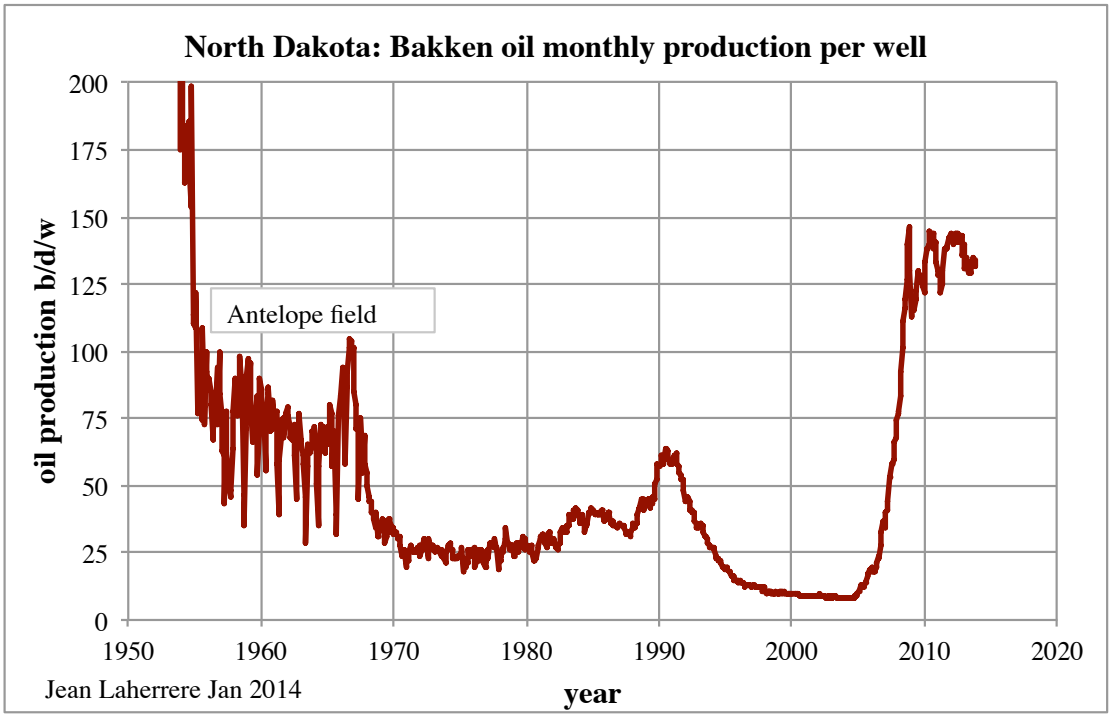
The ND Bakken peak in 2014 for an ultimate of 2,5 Gb is different to D.Coyne's forecast of a peak in 2017 at 1.25 Mb/d with a unsymmetrical decline for an ultimate of 8.4 Gb



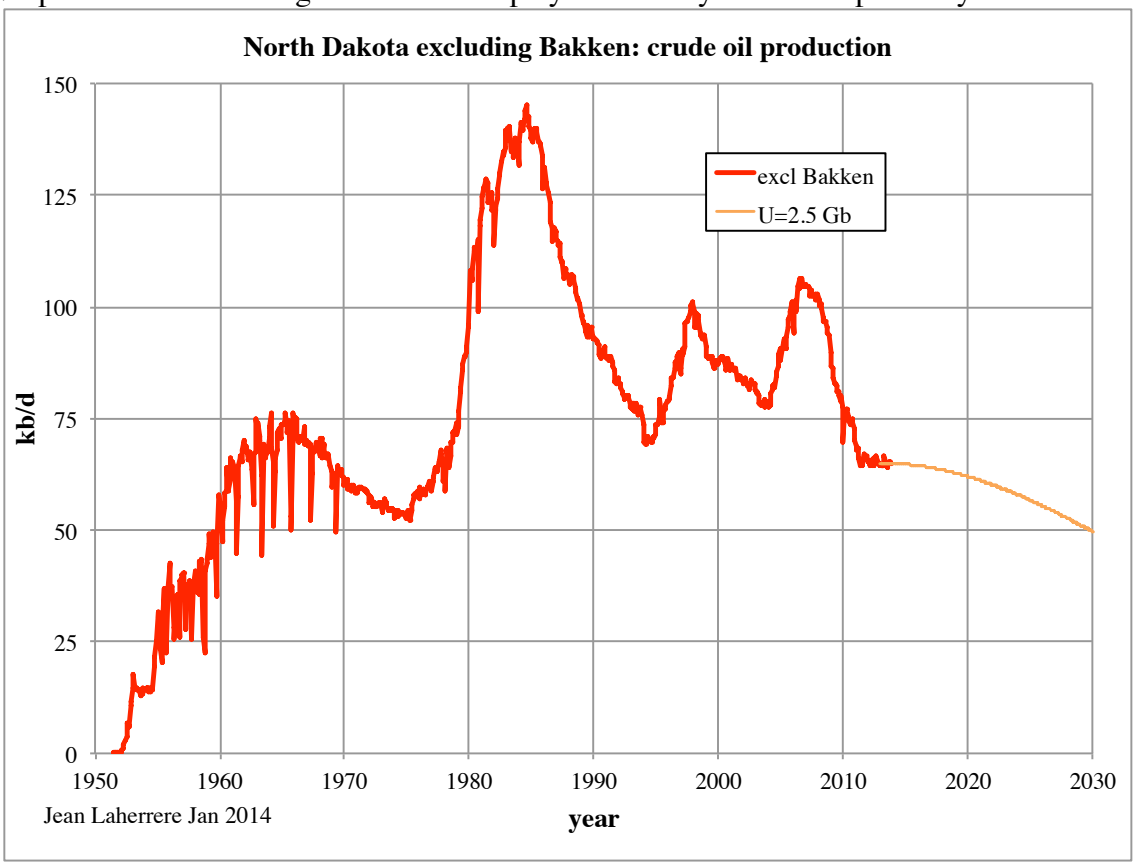
D.Coyne forecasts 500 kb/d in 2026 for ND Bakken when my forecast is zero!



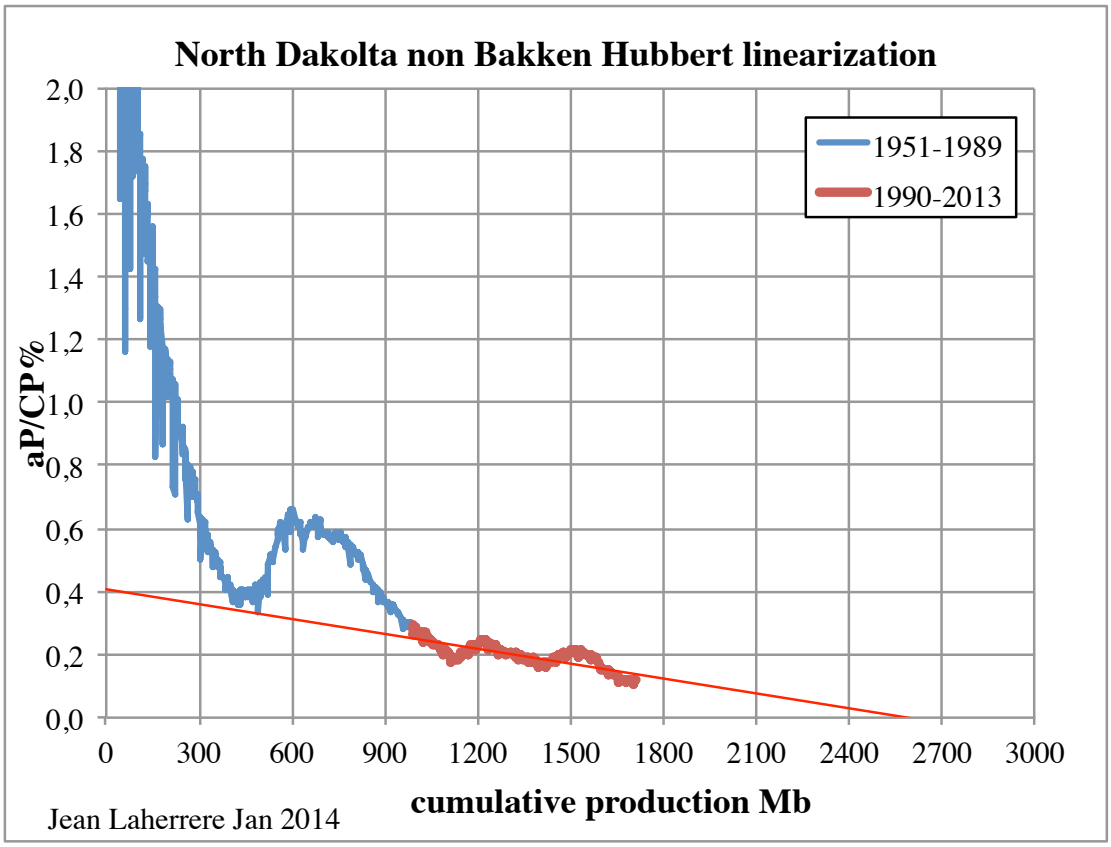
The ND Bakken production per well was above 200 b/d/w in 1954, flattened in the 60s at 75 b/d/w, up to 60 in 1991 and since 2009 at 135 b/d/w



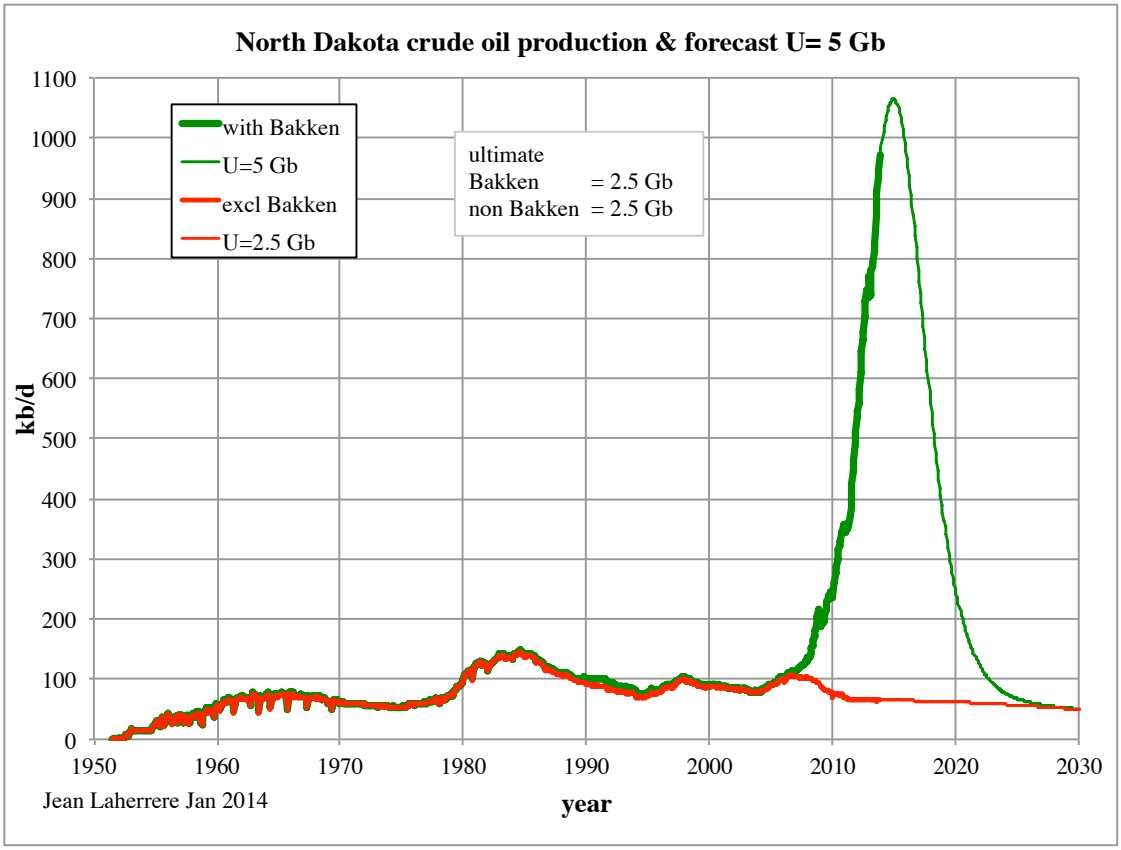
The ND production excluding the Bakken displays several cycles and is presently flat at 65 kb/d



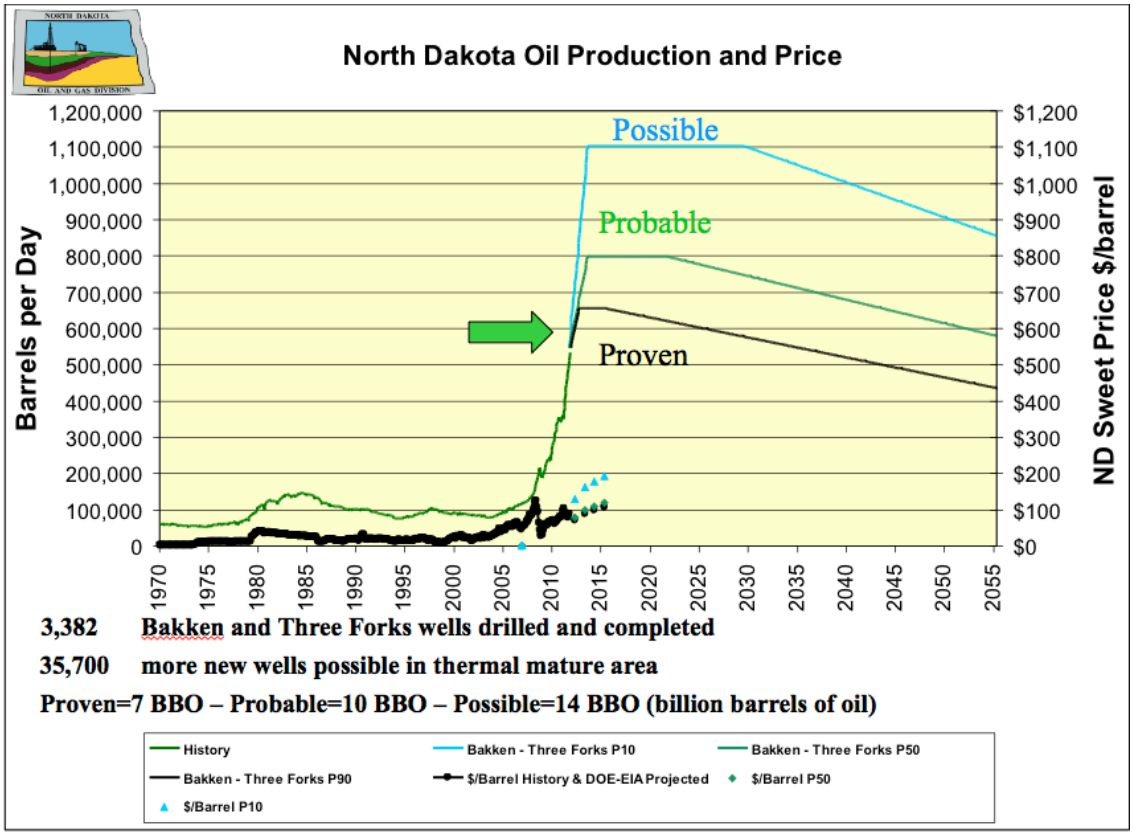
The Hubbert linearization for the period 1990-2013 trends towards an ultimate of 2500 Mb



Adding the forecasts of Bakken and non-Bakken each with an ultimate of 2.5 Gb, gives a peak for ND at 1.06 Mb/d in the fall 2014 and a sharp decline with only 0,2 Mb/d in 2020



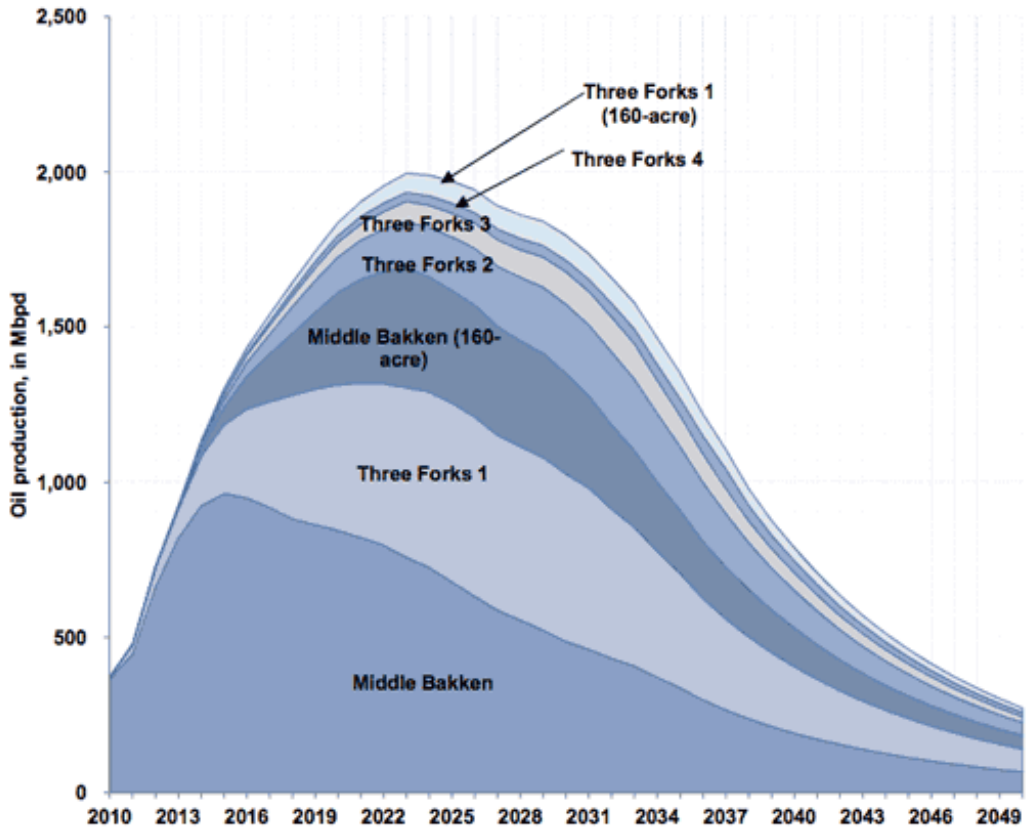
In 2012 ND Department of Mineral resources forecasted NG production with a slow decline, which is in contradiction with the sharp decline of tight oil production producing mainly from fractures and not from the pores of the reservoir.



USGS assessments are useless, reporting only the potential of undiscovered without telling how much is already discovered. Undiscovered tight oil seems queer when it is assumed to be a continuous accumulation being only one already Bakken discovered accumulation!
USGS should stop making assessment of undiscovered reserves and replaced by assessment of ultimate reserves! I doubt that they are able to do so (their seventh approximation sheet (base of their assessment) is pure guess)!

Goldman Sachs (Sept 2013) forecasts peak in 2025 but including Three Forks, with a Middle Bakken peak in 2015.

Exhibit 2: We see continued upside to production even as production from the Middle Bakken zone at 320-acre spacing is maturing
Bakken/Three Forks oil production, thousand barrels per day



Source: IHS, NDIC Oil and Gas Division, DNRC Montana Board Oil and Gas, Company data, Goldman Sachs Global Investment Research

Three Forks is just under Bakken formation and has 4 layers: it is claimed to be underexplored..
http://www.worldoil.com/June_2013_Bakken/Three_Forks_shale_once-ignored_zone_could_double_reserve_base.html

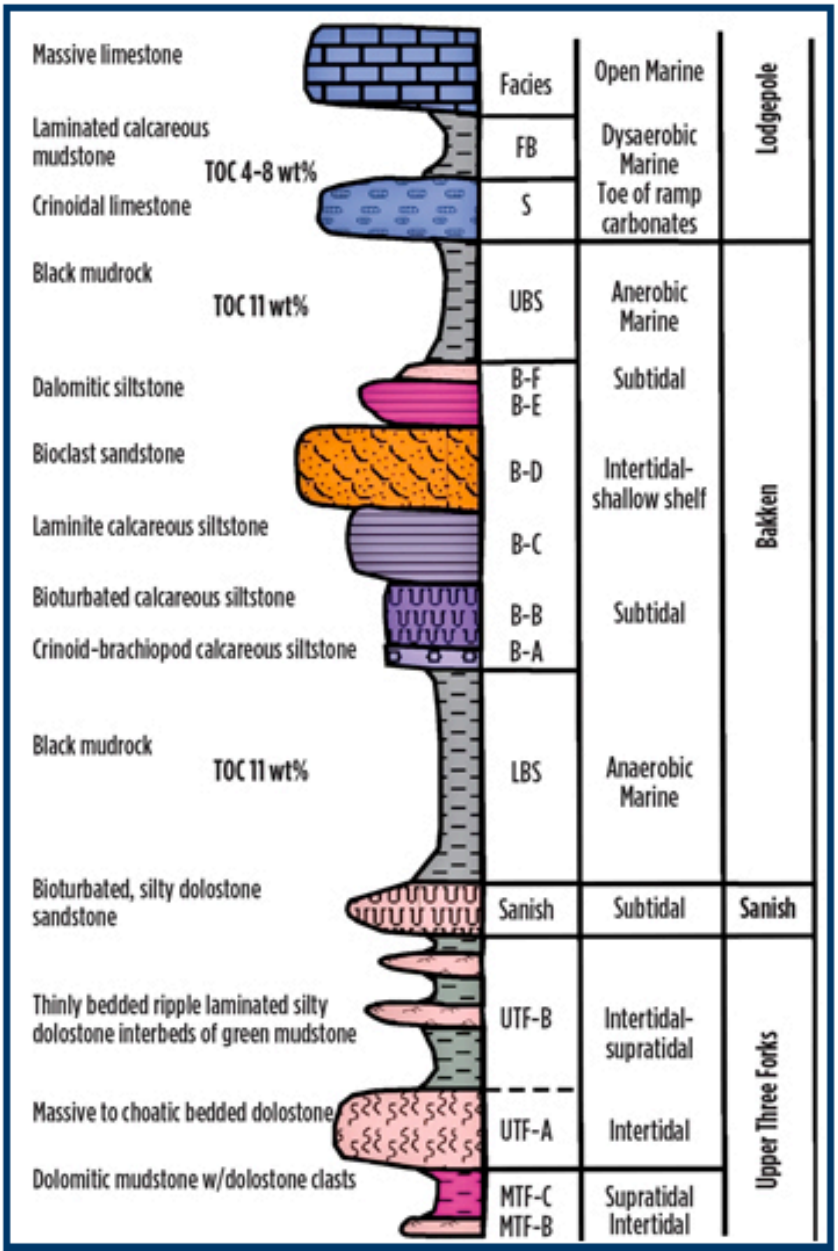
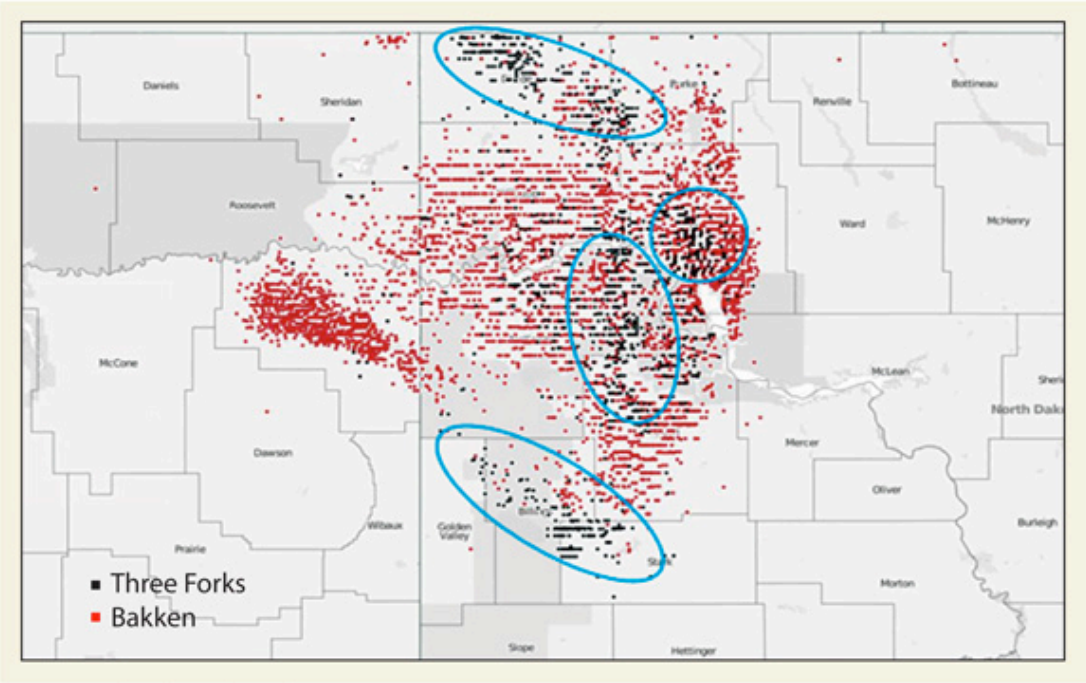


Fig. 3. Detailed lithofacies of the Bakken formation provide a framework for the Bakken exploration model and reservoir geo-model. Source: Colorado School of Mines for U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL), issued March 2012.

But ND DMR reports only Bakken and total production. In their report of cumulative production up to end 2012, Bakken was 546 Mb and Bakken Three Forks only for 2 Mb.
Three Forks production covers less than Bakken
http://www.ogfj.com/articles/print/volume-10/issue-12/features/three-forks-vs-bakken.html

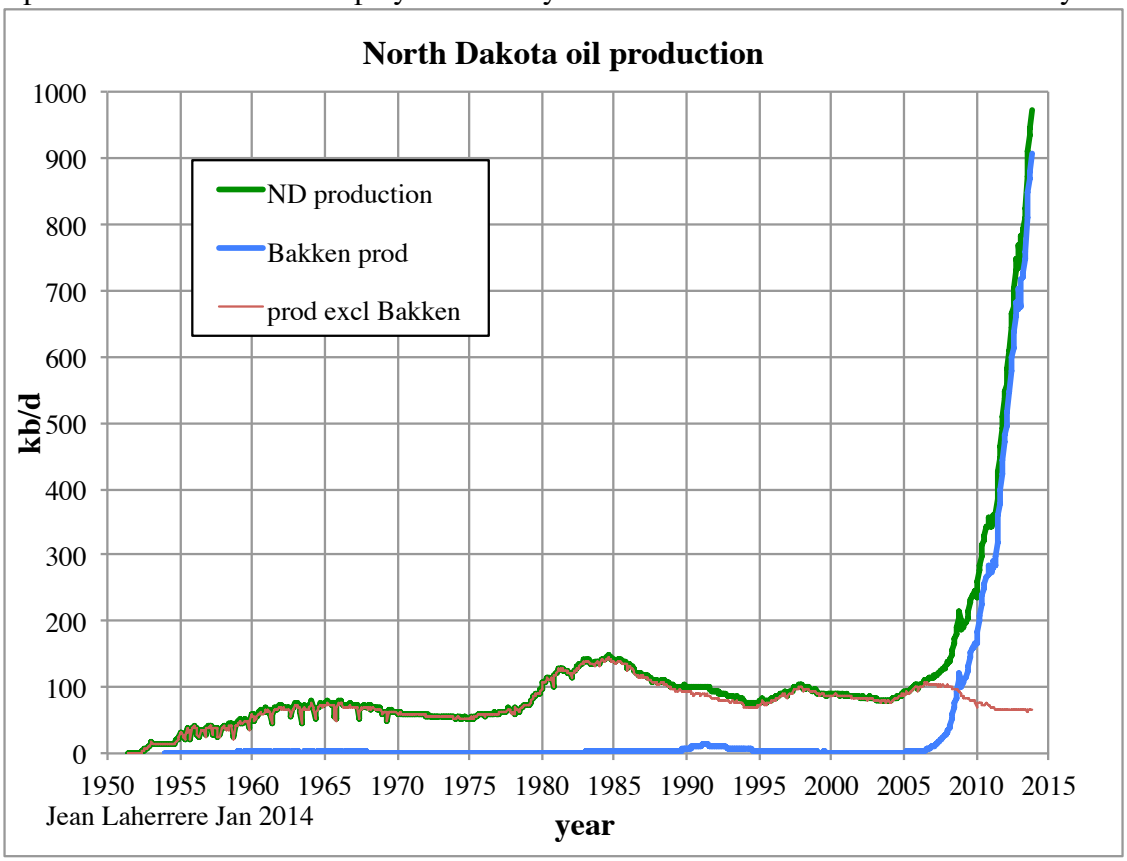
Fig. 2: THREE FORKS FOOTPRINT CONTAINS FOUR WELL CONCENTRATIONS



Source: North Dakota Industrial Commission, IHS

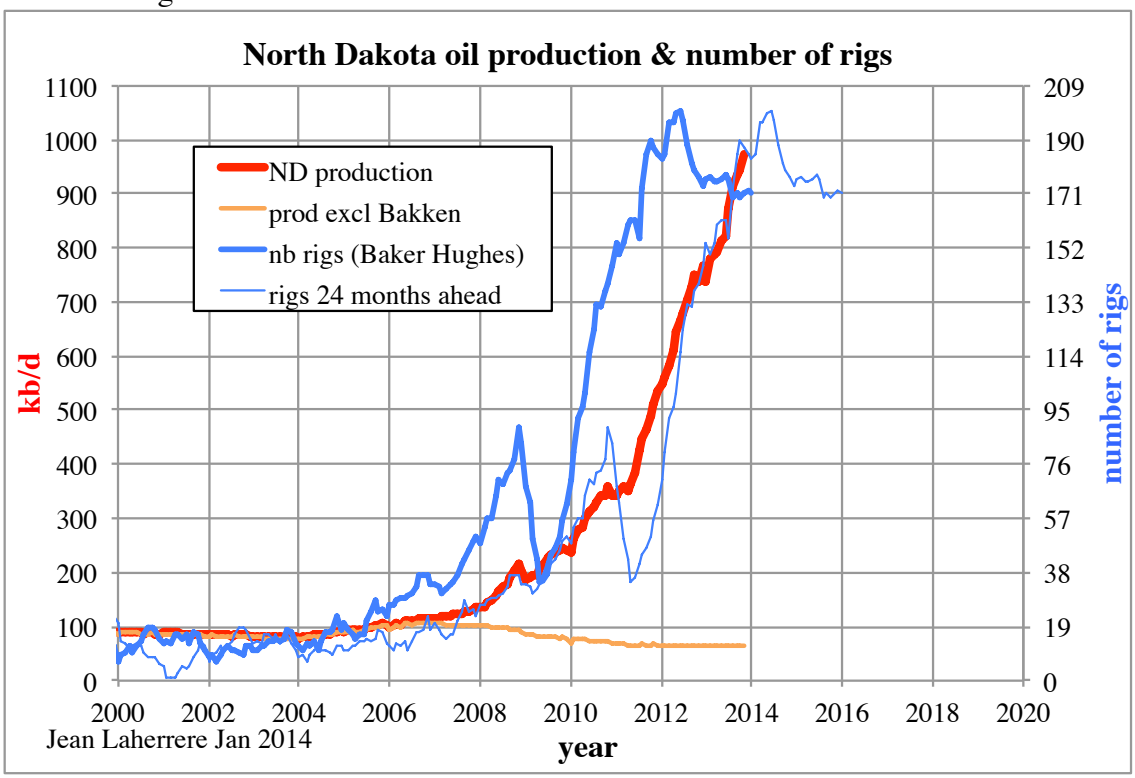
Production in 2013 at Elm Coulee in Montana from Three Forks is negligible and at Elm Coulee Northeast small. (5%)

ND oil production 1953-2013 displays several cycles but the last one with Bakken is very sharp.

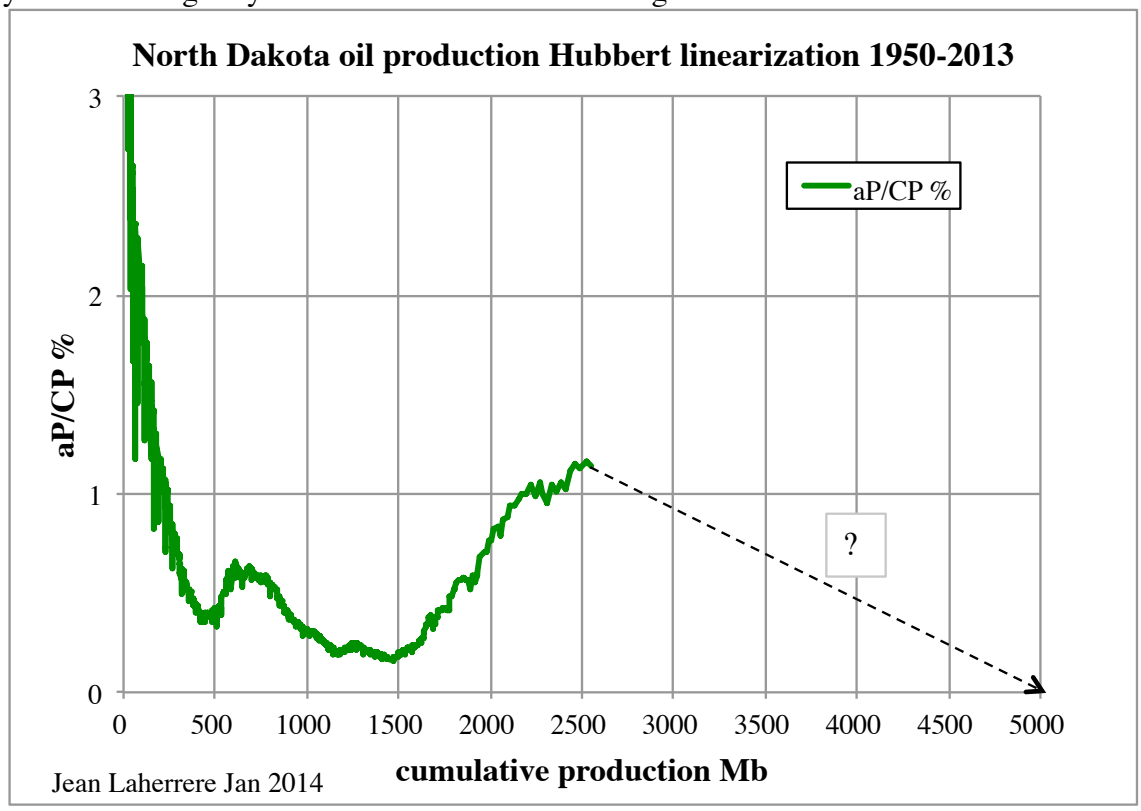


The production is compared to the number of rigs and correlates well when the number is shifted by 2 years (24 months). The extrapolation of the oil production following the shifted number of rigs

leads to a peak in mid 2014, in agreement with the above peak assuming an ultimate of 5 Gb. A year ago we compared ND oil production with the number of rigs shifted by one year using the example of Montana (see below) and forecasted a peak around 2013. We were wrong because in contrary with Montana (rig peak = 25) ND rig peak was 200 and many wells are drilled but not yet fractured. There are presently about 500 wells waiting for hydraulic fracturation, bothering the correlation with rigs.

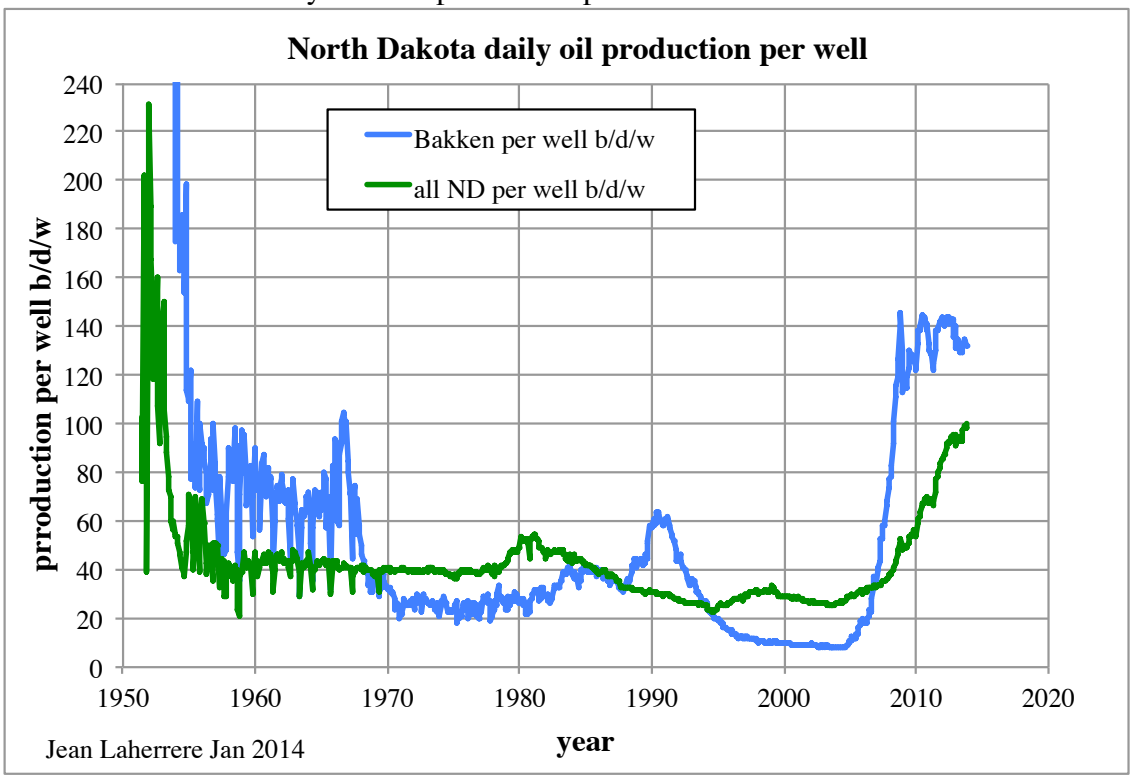


The ND Hubbert linearization of oil production is impossible to extrapolate to 5 Gb, when it is easy when dealing only with Bakken or with excluding Bakken.

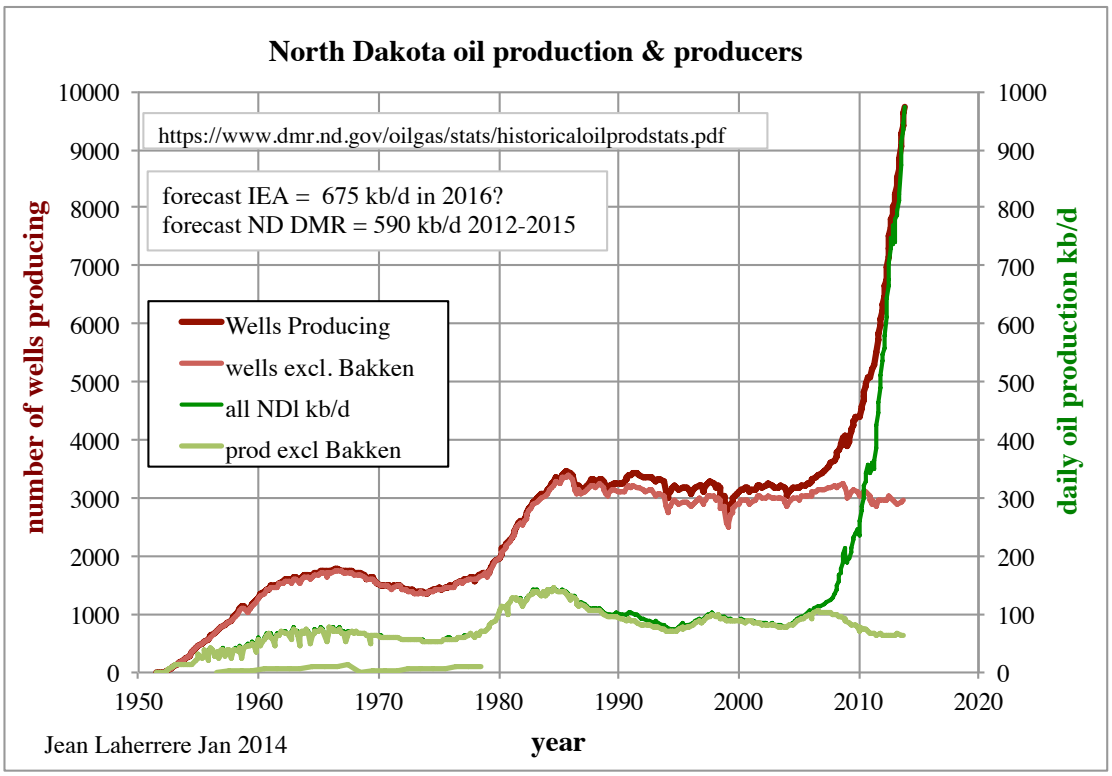


We feel confident for this 2014 peak coming from two different approaches

The ND daily oil production per well (in green) was less than 40 b/d/w from 1955 to 2009 and than jumped to 100 b/d/w. The only Bakken production per well is since 2009 around 130 b/d/w

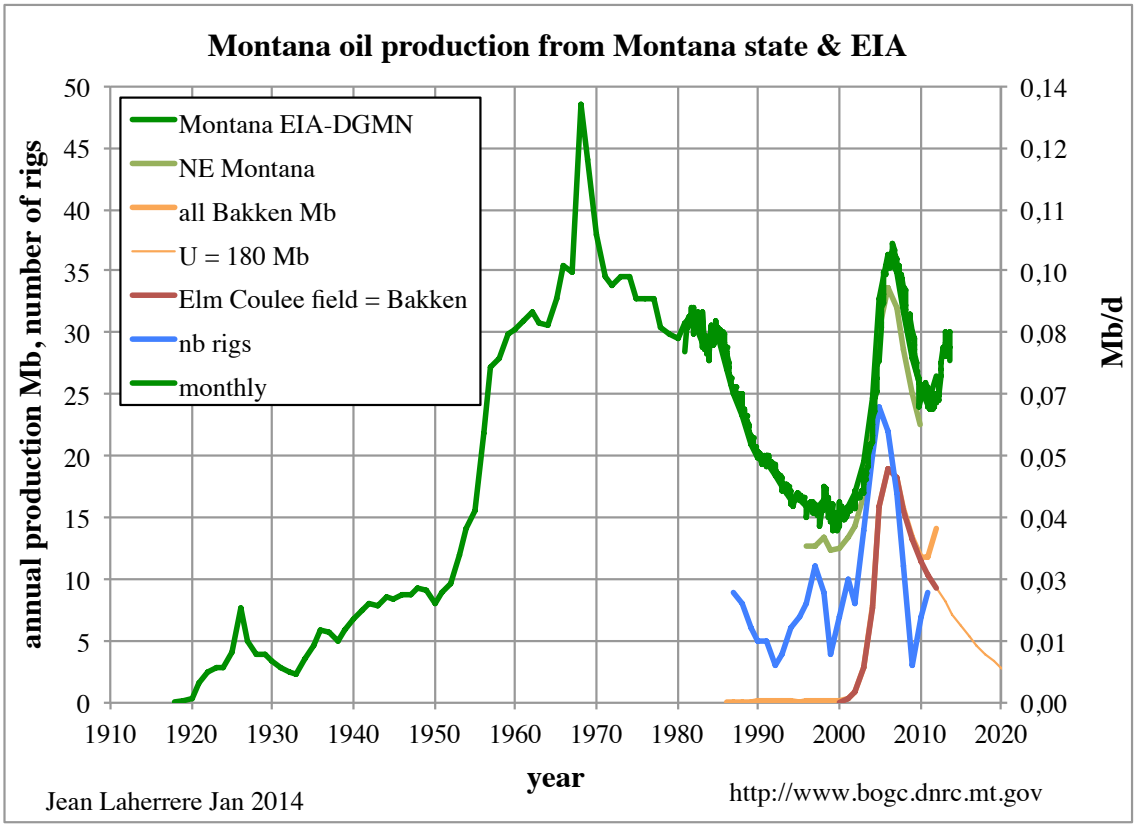


The ND production in November 2013 is at 973 kb/d with 9726 producing wells. The number of producing wells excluding Bakken is flat since 1985 around 3000 wells when production went from 120 kb/d down to 65 kb/d

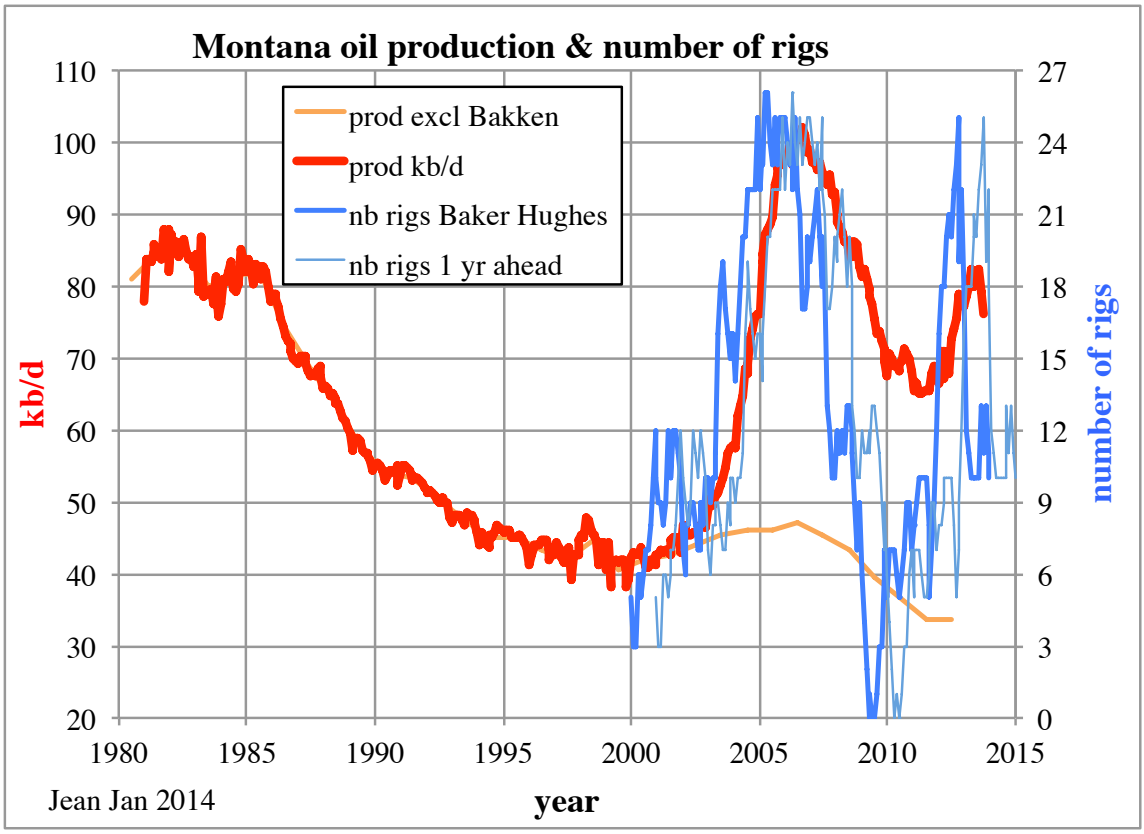


Montana oil production started before 1920, largely sooner than ND, and peaked in 1968 over 120 kb/d, then declined down to 40 kb/d in 2000 and peaked with the discovery of the Bakken Elm Coulee field at 100 kb/d in 2006, followed by a decline in 2011 with a new increase with the discovery of Bakken Elm Coulee Northeast. Elm Coulee cycle is about 10 years and our above

forecast of ND Bakken cycle for an ultimate of 5 Gb is about 14 years in line with Elm Coulee cycle



Montana oil production is compared with the number of rigs and there is a good fit with the number shifted by one year with the first peak of Elm Coulee in 2006 and the second peak with Elm Coulee Northeast at end 2013.



The beauty of these graphs is that most of the peaks are symmetrical.