Tar sands: Reprieve or apocalypse?

Jon Claerbout

ABSTRACT

Based on a Hubbert-type analysis two projections are made of tar sands production. With tar sand production growing at 5%/year total petroleum production declines at an annual rate of 1-2%. With tar sand production growing at 10%/year total petroleum production continues rising at almost the historic rate until 2040 followed by a catastrophic rate of 50%/decade.

PREFACE

This paper with references as embedded web links may be found at http://sep.stanford .edu/sep/jon/tarsand/

TAR SANDS

Tar Sands are an amazing resource, mostly in Canada. Already in 2007, 44% of Canadian petroleum production came from tar sands. The total Canadian resource (not all producable) is estimated to be 2.2 trillion barrels. That's a lot! For comparison producible world petroleum liquids are estimated at 2 trillion barrels, half of which have already been consumed. Below are two scenarios for future tar-sands production. The plot on the left (labeled Malthusian) shows tar sands growing and decaying at the same 5% annual rate that liquid petroleum has done. The decay of the sum is not severe, roughly 15% per decade, 1-2% per year. The plot on the right (labeled Cornucopian) shows what might happen in case of laissez-faire or perceived grave urgency, a 10% tar-sands growth rate for 30-35 years followed by precipitous collapse about 50% per decade.

Unfortunately, of the Canadian 2.2 trillion barrels only 20% is estimated to be recoverable by strip mining. Having myself seen that the residual output of a tar sand extraction plant is clean white sand, we may take that resource to be 100% fully recoverable, 440 billion barrels. Hooray! Unfortunately, what is not reachable by strip mining is more difficult to recover. I took this to be 25%, so that 80% adds 420 billion barrels.

You may hear, "Tar sands are profitably produced at $28-$44/barrel". Yes, and there may be oil in the Middle East that can be produced at $1-$2/barrel. That oil will be sold for the "market clearing price". Even if someone could rapidly produce
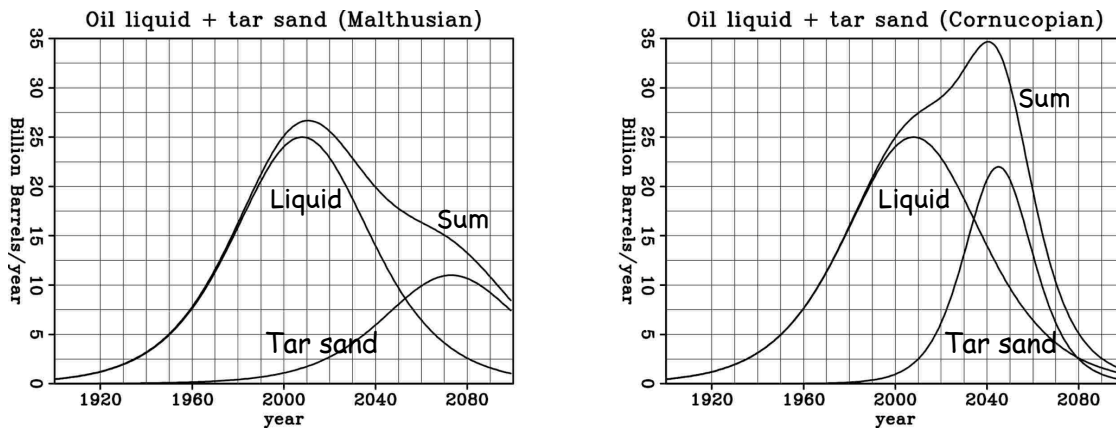
Figure 1: Two scenarios for tar sands exploitation.[NR]

great volumes from tar sands it would only accelerate the subsequent decline (as the Cornucopian plot shows). Tar sand production requires monsterous industrial machinery. "Obscene profits" are building it now.

We neglect here many things. Natural gas is an important resource about the size of oil with a peak trailing oil by a few decades. Tar sands will need to replace the natural gas too! Venezuela has a reserve of heavy oil possibly comparable to Canada's. Past nationalization of investments has effectively stopped current investment, but the oil in place has been quoted as 1.3 trillion barrels with a 20% recovery, netting 260 billion barrels – a bump a quarter the size of Canada occuring later in time. Shale oil can be burned like coal. Unfortunately liquifaction of shale oil and world-wide gas hydrates are nice to dream about, but there are no functioning demonstration production facilities anywhere. Recently USGS forecast 1/10 trillion barrels in the arctic, a pimple on the graphs above. Nuclear is not a transportation fuel. Coal (with its own Hubbert curve) can be converted to the gaseous fuel dimethyl ether (DMD) particularly suitable as a replacement for diesel fuel. Ironically, nuclear, including the fast breeder reactor, including thorium as well as uranium is more fully described by the old-time geologist Hubbert in 1956 than by today's Cal Tech physicist and vice provost David Goodstein in his 2004 book "Out of gas". http://www.usgs.gov/newsroom/article.asp?ID=1980 http://www.hubbertpeak.com/hubbert/1956/1956.pdf

WILL THIS AFFECT YOU?

You may ask, "What makes you believe these predictions?" The classic paper of M.King Hubbert, written in 1956 predicted a USA liquid oil peak in 1973. It did peak then. That paper also predicted a world peak about the year 2000, a bit early, but not much. Most recent predictions [1] [2] calculate twice as much oil as Hubbert predicted, but the peak has moved only about a decade later, about now. Why does double the

oil move the peak so little? Because so much is depleted in the middle decades. http://www.amazon.com/Beyond-Oil-View-Hubberts-Peak/dp/080902957X/

Didn't you assume the total oil in place? Not for the liquids. When the production peaks, half is gone; the other half is left. There is widespread agreement the production will soon or has already peaked. For the tar sands resource size I refer to The Petroleum Society of Canada. http://www.energy.gov.ab.ca/OilSands/pdfs/RPT _Chops_app3.pdf

The next question is, "Does it matter to me?" I suggest you print this page. Upon the printed page draw a horizontal arrow from the day you were born to then plus 84 years. Then draw the arrows for your parents, your children, and grandchildren.

Poor people will be the first to conserve. After that people with long commutes. After that comes you. You have some time prepare yourself before the crowds. Don't waste it! How much time do we have? If the choice is political between the Malthusian and the Cornucopian which choice do you think will be made? I fear the disaster. (Sorry.) Would that the Canadians learned the lesson of the East Texas Oil Field and the Texas Railroad Commission.

CREDITS

CONFLICT OF INTEREST STATEMENT

The author is an emeritus (retired) professor specialized in the geophysical prospecting industry, an industry dependent for customers on the oil industry (but little on its tar sands sector).