

Beyond Cheap Oil

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As I read authoritative reports by well-known petroleum geologists on the Internet about the end of Cheap Oil, I became more and more engrossed about this greatest story never told. (In fact, the story has been told, but it has never reached the press headlines.) I wanted to know how it all turns out. It is surprising how much high quality, authoritative information can be obtained from a careful search of the Web [15, 16].

This report is in three sections. For many people, Section 1 will suffice. Some will wish to study the issue in greater detail in Sections 2 and to consider alternative energy sources (Section 3). A few may also wish to examine the References section at the end. No one should ever accept an argument without having the ability to check the underlying facts.

1 Peak Oil in Regions around the World

It is a fact that peak production of oil will occur. Many place that peak before 2010, while some place it before 2020. The largest point of disagreement is how much oil lies in reserve in the Persian Gulf. This section reviews the past history and current projections of oil production.

This section is based on the paper "Future World Oil Supply" by Werner Zittel and Jörg Schindler [14]. The first observation (Figure 1) is that non-OPEC production outside the former Soviet Union is now facing a steep decline. The decline is too large for the Persian Gulf producers to make up on a sustained basis. Alaska and the North Sea, the two largest oil discoveries since the energy crises of the 1970s, illustrate the point.

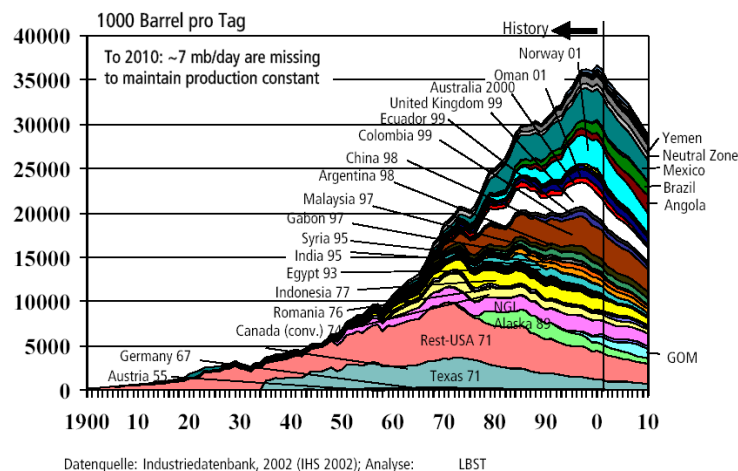


Figure 1: World excl. OPEC, former Soviet Union and non-conventional Canadian oil (tar sands). (Peak years for each country are shown.); The peak 35 million barrels per day is 42% of world production. SOURCE: Salzburg 2002 Summer School [14, Figure 9]

Second, observe the three phases: rise, plateau and fall for different oil regions. The north slope of Alaska and the North Sea were two of the largest fields to be discovered outside of OPEC since 1950. In Figures 2 and 3, we see the

typical rise and fall of an oil region. Note how the largest oil fields of a region tend to be discovered and exploited first, followed by successively smaller oil fields. Note also that thirty years of continuously improving technology was unable to prevent the decline of these oil fields.

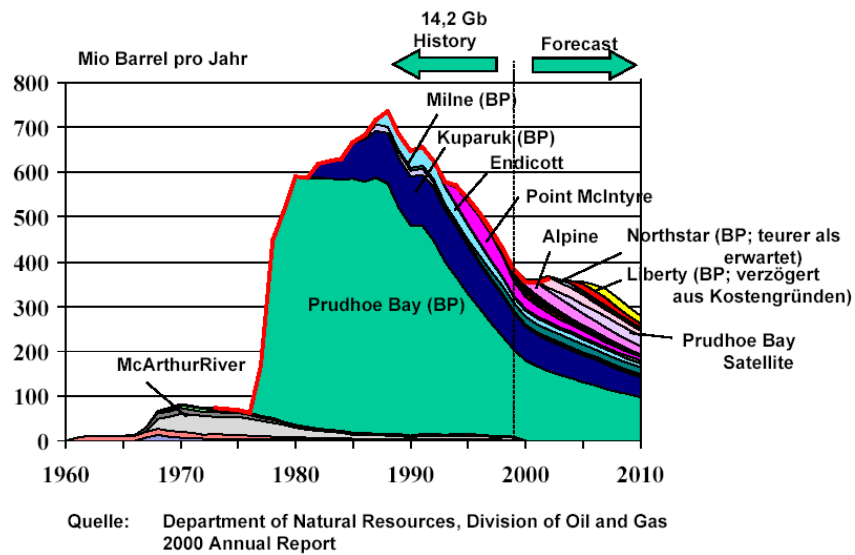


Figure 2: Alaska; the peak 750 million barrels per year is 2 million barrels per day, or 2% of today’s world production. SOURCE: Salzburg 2002 Summer School [14, Figure 3]

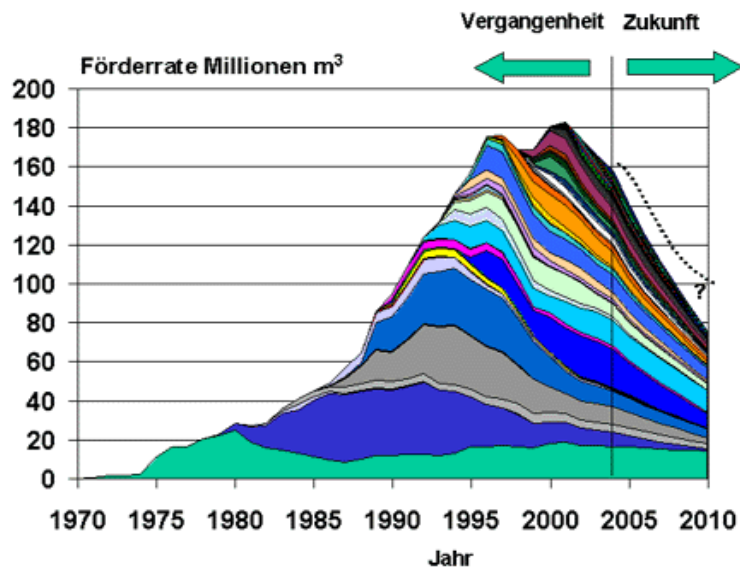


Figure 3: Norway (U.K.); Past and future production are indicated. The peak production corresponds to 3.1 million barrels per day, or almost 4% of world production. The U.K. share of North Sea production adds an additional 2.5 million barrels or 3%, and is similarly declining.

SOURCE: energiekrise.de [News, Gazette (2004)]citeorganizations

Another hope for more oil is non-conventional oil. Non-conventional oil must be processed to be converted into an equivalent of crude oil. Tar Sands (see Section 3.1) are an example of a non-conventional oil. Canada, with 85% of the world's tar sands, is the world's largest producer of non-conventional oil (Figure 4).

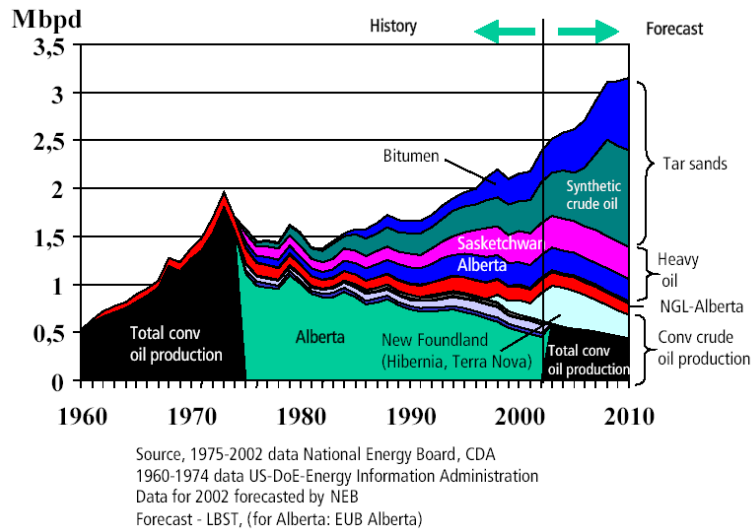


Figure 4: Canada (including non-conventional oil); 2.5 million barrels per day is 3% of world production
 SOURCE: Salzburg 2002 Summer School [14, Figure 6]

We have now considered all sources of oil outside of OPEC and outside of the former Soviet Union. Figure 5 shows the total world production when these two last sources of oil are included. (Indonesia was excluded from OPEC for these purposes, since its oil production has long been declining.) Most people think that Saudi Arabia is the only country with major spare capacity. With the non-OPEC countries rapidly losing capacity, it is unlikely that Saudi Arabia alone can make up the difference.

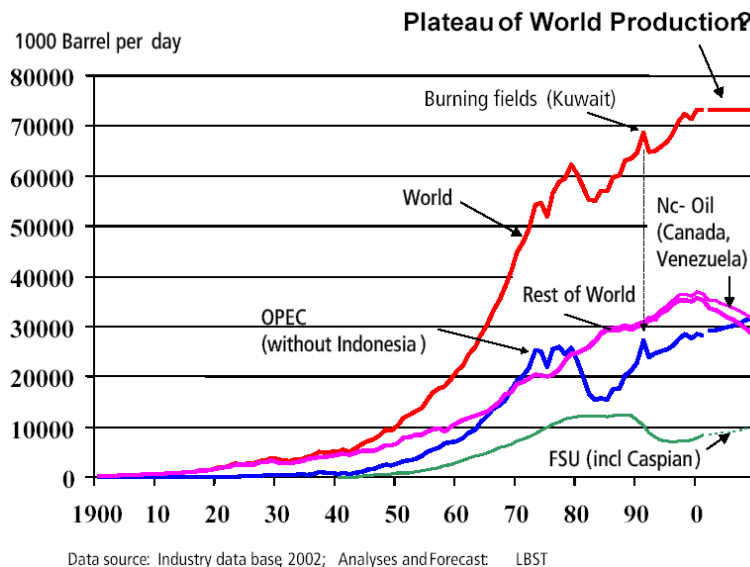


Figure 5: World Production, 2000 (Since 2000, the world emerged from a recession with current production of 82 million barrels per day, in line with the estimates of Figure 8.)
 SOURCE: Salzburg 2002 Summer School [14, Figure 10]