Peak Oil: Diverging Discursive Pipelines

by

Jeff Doctor
B.A., University of Ottawa, 2009

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Supervisory Committee

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Abstract

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Peak oil is the claimed moment in time when global oil production reaches its maximum rate and henceforth forever declines. It is highly controversial as to whether or not peak oil represents cause for serious concern. My thesis explores how this controversy unfolds but brackets the ontological status of the reality indexed by the peak-oil concept. I do not choose a side in the debate; I look at the debate itself. I examine the energy outlook documents of ExxonMobil, Shell, BP, Chevron, Total and the International Energy Agency (IEA) as well as academic articles and documentaries. Through an in-depth analysis of peak-oil controversy via tenets of actor-network theory (ANT), I show that what is at stake are competing framings of reality itself, which must be understood when engaging with the contentious idea of peak oil.
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To all of my friends and family who helped keep me functionally insane, “I want to offer my love and respect to the end.” – MCA
Introduction

It is incredible how two small words can carry so many different meanings when put together. In trying to define ‘peak oil’, I am left making a choice between something that is an economic construct and something that is a physical event. I could define peak oil as a function of market forces or an inevitable result of resource extraction. Either way, in its most fundamental definition, peak oil is the claimed moment in time when global oil production reaches its maximum rate and henceforth forever declines.

In this thesis, I use peak oil to refer to a controversy. I treat peak oil as a matter of concern, not a matter of fact. If peak oil was a matter of fact then it would be true or untrue, inevitable or a myth. I could claim that nefarious businessmen who wished to destroy the world were denying peak oil, while earnest humanists were preaching its immanence in order to save the world. Alternatively, I could claim that peak oil is a myth, a story told by environmental activists to scare people into changing their consumption patterns. Instead of reproducing these claims, I bracket questions of whether, or when, oil supplies might reach a peak because the idea of what an oil supply is, or could be, is itself a contested notion.

This thesis uses actor-network theory (Latour 2005) concepts of human and non-human actors instead of the classical concepts of society and nature. According to actor-network theory or ANT, these actors are neither social nor natural. Rather, they act on or with other actors to give form to what appear as social or natural entities, but can be better thought of as a co-production of both. This approach helps us witness various agencies constantly at work that are otherwise hidden—a massive army of ‘things’ that is often
ignored in discussions of society/nature, or worse, lumped into tools of society that only serve to manipulate nature. This thesis considers oil as neither a social nor natural construction. Instead, I look to how people talk about oil, how they attribute different importance to human and non-human agencies involved in the peak-oil debate.

Through an engagement with actor-network theory, I show that oil is presented as fulfilling a role in a relationship between a supply and a demand. However, this role is presented via two different frames. I borrow from Bridge and Wood (2010) the terms ‘above-ground’ and ‘below-ground’ to help visualize these frames. The above-ground frame presents a picture of a world where human agency makes oil, or an alternative to it, endless in supply whereas demand for oil is limited by price. The below-ground frame presents a picture of a world where non-human agency makes oil, which has no alternative, finite in supply whereas the demand for oil is limitless because of its speciality. Peak oil is controversial because these two competing frames attribute different value to oil, and in doing so differently depict the relationship between oil supply and oil demand. One frame states that people give oil economic value, the other states that oil has energy value unto itself.

Peak-oil discourse flows through the aforementioned above-ground and below-ground frames via key sites of discourse—energy supply and demand forecast documents, academic papers, and peak-oil documentaries—that consist of artifacts or paintings held up in order to maintain networks of truth. Above and below-ground frames serve to further different perceptions of reality, leading proponents of these different realities to talk ‘past each other’ instead of ‘to each other’. They lack a common ground to enable
effective communication and these frames act as discursive pipelines that intersect at certain junctions—like the concept of supply and demand—but lead to different problems and provide different solutions to those problems.

Chapter one of my thesis outlines the methodological approach I use to study peak-oil discourse. Following a review of the literature on the topic, I highlight how an approach informed by the conceptualization of human and non-human actors as per ANT will address a significant gap in the sociological literature. I conclude this chapter with the specifics of my data collection techniques.

Chapter two uses Beck, Bonss, and Lau (2003)’s concept of first and second modernity to illustrate that the above and below-ground framing of the peak-oil concept can be understood as two sides of the same coin. They show different pictures, but still operate on similar assumptions of reality. Both of these subjects maintain the classic divide between society and nature, both postulate objective reality ‘out there’, and both attempt to predict the future. They claim that if we could only find the ‘right solution’ we would be ‘ok’. The first modern ideal is largely represented by the above-ground frame: a confident, sure-of-the-future perspective, ready to manipulate nature and continue the march towards utopia. The second modern ideal is largely represented by the below-ground frame: a cautious, weary-of-the-future perspective, anxious to deal with nature and scared of making things worse.

Chapter three argues that the five largest privately-owned international oil companies (known as the Supermajors) and a highly influential energy think-tank (known as the International Energy Agency, or IEA) present the supply of oil as being determined by
above-ground market forces rather than some naturally determined underground supply. That is, there will always be oil available—at a price. Higher oil prices will bring new oil streams into supply. In doing so, oil’s depletion and subsequent replacement are dictated by market-based demands, making oil relatively limitless in quantity. This potentially limitless supply is in part due to economic incentives that provide motivation to find more efficient ways oil can be extracted and found, but also provide for alternatives to oil. These alternatives are considered various technologies, energy sources, and products that allow for something else to be substituted for oil. In the above-ground frame, peak oil is a problem that economically solves itself, balancing the relationship between supply and demand. There is no intractable problem. The organization of the economy is not hitting its natural limits, as critics of growth and proponents of peak oil suggest.

Chapter four shows peak-oil activists and natural scientists presenting the supply of oil as a result of below-ground natural phenomena, finite and embodied with certain characteristics. This second framing of the oil situation is far less optimistic. Gone is the confidence that market forces and economic investment can produce oil. Much less confident in the future represented by the above-ground frame, this below-ground frame presents logics of investment that emphasise the inherent energy value found in oil. It primarily emphasises that it takes energy to make energy. In this frame, objective physics—not the market—is the key actor.

Peak, and oil—two words put together to fuel controversy about the future of both oil and energy in general. Despite claims to peak oil being objectively real, it is still a socially constructed conceptualization of an objective phenomenon. As such, there are
certain interests at risk when this concept is promoted or attacked. What this thesis
endeavours to show is that what is at stake in this controversy are competing paradigms
of reality itself. These versions of reality show different problems, and in doing so, offer
certain solutions to those presented problems. Any solution runs the risk of harm, so
researchers need to be careful to determine the implications of where they stand. This
thesis takes a step back to show the peak-oil debate rather than perpetuate it.
Chapter 1. The Approach

This chapter begins with a discussion of the academic peak-oil debate. This debate has a blind spot that a sociological analysis can shed light on. To do so, I use tenets of actor-network theory to set the terms of analysis and establish the research question. I then outline my research methodology, data collection, and leave the reader ready to understand how I came to make my arguments.

General awareness of peak oil controversy appears to be increasing (Bardi 2009), but compared to climate change controversy, it receives very little coverage from national agenda-setting media outlets (Nisbet, Maibach, and Leiserowitz 2011). In popular media articles, it is highly contested if peak oil is an event already upon us, if it will happen within thirty years, or if it will happen so far into the future that it is essentially a ‘myth’.

There is a need to illuminate what informs the public peak-oil debate while bracketing out the so-called ‘imminent reality’ of peak oil. In doing so, I can examine roots of the controversy in ways that I would not see had I initially chosen a side in the debate. Also, lessons could be learned as to the social mechanics involved in similar controversies such as climate change. With this in mind, the question I ask is: how do specific sites that are highly influential in informing the peak-oil debate portray what the relationship between energy supply and demand will be in the next thirty years, and how do these portrayals explain the current state of peak-oil controversy? In other words: how can a specific event in time be portrayed as irrefutably problematic by some people but not others? How do some people show the same event occurring at different times (and if at all) and how
do they portray it as being a problem or non-problem? Asking these questions drives at the state of the peak-oil controversy today.

It is widely asserted that recent peak-oil controversy began in 1998 when Campbell and Laherrère published their landmark article, “The End of Cheap Oil”, in *Scientific American* (Zhao, Feng, and Hall 2009). Campbell and Laherrère (1998) claimed that the perception of abundant oil, cheap and easy to access, relies on distorted estimates of reserves\(^1\), assumptions that production rates\(^2\) remain constant, and presumption that the last drop of oil can be extracted from a reserve basin. These figures all suffered from problems with definitions and standardized meanings of proved or probable reserves. There were different regulations per country as to the meanings of what a reserve entailed and its extractability (1998). As to future discoveries, Campbell and Laherrère claimed that “about 80 percent of the oil produced today flows from fields that were found before 1973, and the great majority of them are declining” (1998:80). In other words, “there is only so much crude oil in the world and the industry has found 90 percent of it” (1998:81). These claims were made based on the authors’ experience in the field and a detailed statistical analysis of a variety of data both publicly and privately available. Overall, their findings remain controversial but have influenced much of recent peak-oil controversy.

Campbell went on to found the Association for the Study of Peak Oil (ASPO), defined as “a network of scientists and others, having an interest in determining the date and impact of the peak and decline of the world's production of oil and gas, due to resource

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1 Reserves refers to the estimated amount of oil in an oil field.
2 Production rate refers to the speed oil is extracted from a reserve.
constraints” (ASPO 2012). They emphasise that oil is not ‘running out’, ‘being completely drained’, ‘ceasing to exist’, or similar narratives that portray an end-game of ultimate resource depletion. Instead, it is overall speed or rate oil can be extracted from the ground that is their principal consideration. Oil is constantly burned, destroyed, consumed and combusted, so it needs to be replaced. As there is an overall speed it is destroyed—demand—then there must be an equal speed usable oil can be extracted—supply. There is a fundamental supply and demand relationship. As geology determines the basis of this relationship, peak oil is a matter of below-ground concerns³ (Bridge and Wood 2010).

Of all the academic disciplines, economists have the strongest voice rejecting peak oil as a problem altogether (Ayres 2007). Following the classic economic theory of resources (Solow 1974), economists such as Radetzki (2010) argue that if peak oil were to occur any time soon, it is due to economic forces, not resource scarcity. This is due to the perception that higher oil prices, regardless of the cause, will decrease oil demand. Alternatives to oil will become economically attractive, and incorporated into the overall energy mix as a result. As such, peak oil is also a matter of above-ground concerns⁴ (Bridge and Wood 2010).

**Above-ground versus below-ground discourses**

Since Campbell and Laherrère (1998), there has been increasing interest in debating, and attempting to predict, peak oil. This is hardly surprising considering that in 1998

³ Discussed further in chapter 4.
⁴ Discussed further in chapter 3.
crude oil\textsuperscript{5} was $15 per barrel and by 2008 the price was $140 per barrel (Murray and King 2012). It has since stabilized to approximately $85-100 a barrel in 2012, but according to Schwartz et. al. (2011), peak oil as a concept has had little effect on climate or energy policy. This may be in part due to ecologists and economists often supporting diametrically opposing conclusions as to the implications, and meanings, of peak oil. Unsurprisingly, economists tend to favour market-focused implications and solutions while geologists ring the warning bells of physical depletion (Verbruggen and Al Marchohi 2010). Thus, this issue requires more in-depth study.

Bridge and Wood (2010) provide an explanation of competing understandings of the future of oil by considering what they call ‘below the ground’ versus ‘above the ground’ discourse. They found two major discursive trends. The former addresses petroleum as a geological resource while the latter addresses oil as an economic resource. A focus below-ground may ignore if not wholly replace the economic understandings of oil “with a physical, geologically-based explanation of the constraints on oil supply” (Bridge and Wood 2010:566). However, a focus above-ground lends itself to ignore objective restraints of a physical world.

To illustrate the above versus below-ground dichotomy, I give the example of driving a car. In a car, there are different limits to the speed of travel you can achieve. One limit is regulated by the vehicle itself. No matter how much you push on the pedal, the car can refuse to go faster. Consider these the geological restraints of oil production, or the

\textsuperscript{5} Crude oil refers to unrefined oil
below-ground frame. Supply is finite as the car succumbs to the laws of physics. Demand is infinite, as people can always want to go faster.

Now consider the regulations that humans impose on you to govern your speed, such as speed laws. They deter you from speeding by potentially costing you money. These are the economic restraints to oil production, or the above-ground frame. Supply, as the car’s maximum speed, could very well be infinite because it is dependent on the motivation of the driver. Demand is finite as it is dependent upon how fast people are willing to go.

Both physical and governmental regulations are limits on the speed of the car, but the former is considered impossible to exceed due to the limits of intrinsic non-human physics, while the latter appears impossible to exceed due to the limits of extrinsic human agency. Both views are understood to be real and correct, but are contestable as to which contributes to the true inhibition of speed. Two different stories are centred on one narrative trend: maximum speed. When treated as one story, an unresolvable enigma emerges. If one were to break the human regulated speed limit, his/her car would only allow him/her to go so fast. At the same time, the willingness of the driver makes the objectively limited speed of the car irrelevant. Neither of these is the reason why a car reaches a maximum speed. The concept of peak oil, maximum oil production rate, can thus be considered in a similar vein, a concern of both above and below-ground discourses—both human and non-human agencies. The difference in the framing of these agencies fuels the controversy.
Actor-network theory

According to Schwartz et. al. (2011), peak-oil controversy surrounds the specific timing, the reasons for the peak in oil production and what the downward production curve will look like. Currently, the global production rate of oil has been relatively stable since 2005 despite rapidly rising prices (Murray and King 2012). Peak oil thus represents a very large question mark, and a matter of considerable speculation by academics and the public alike.

Many academics have made claims as to the potentially disastrous implications of peak oil. Climate change articles warn that a switch from conventional oil to something else could produce more CO2 emissions (Atkinson 2010; Hughes 2011; Verbruggen and Al Marchohi 2010). International security articles warn of the intersection between resource scarcity and conflict (Mulligan 2011). The American Journal of Public Health devoted an entire issue to warn of the health implications of scarce and expensive oil (AJPH 2011). All of these sources treat peak oil as something real, inevitable, and potentially disastrous to society.

Despite the above claims, sociology has a scant engagement with the peak-oil concept (Caffentzis 2008; Pruitt 2010). Peak oil is often considered a geological event that is outside of sociological questioning. This could be in part due to what Latour (2005) highlights as the common sociological divide between the social and the natural. If peak oil were a social occurrence, it would be an economic and political matter. If it were a natural occurrence, it would be under the purview of the hard sciences. Reviewing the literature tempts the sociologist to fall into one of these camps and it is difficult to stay
out of them. The social-nature divide makes for an uncomfortable engagement with what fellow academics treat as an objective economic or natural phenomenon.

Actor-network theory (Latour 2005) informs this thesis as it helps dissolve the divide we place between ‘social’ and ‘natural’ objects. The division between the social and the natural is fundamental to much Western thought, at least since the Enlightenment, and not surprisingly it is a key established dichotomy within peak-oil controversy. The peak-oil concept is not very useful when it is explained through a purely social narrative involving only human actors because the concept indexes something that is not simply or only social. Simple economic notions of supply and demand that place a strict divide between oil as a resource and demand as a human motivation miss many important geological variables. Conversely, narratives that focus on scarcity of oil as a natural resource that is simply exploited through extraction and production ignore the agencies of the humans involved. Removing the artificial divide between ‘the human social actor’ and ‘oil as a natural resource’ may greatly complicate the analysis, but it provides a much more thorough understanding of our relationship with oil. Importantly, it enables a more nuanced view of the peak-oil debate.

In order to follow actor-network theory or ANT, one must reconsider the usual meaning of actor and network. Latour does not attempt to change the terminology, as he believes “there exists no good word anyway, only sensible usage” (2005:132). According to Latour, an actor is not the original source of action. It is not solely responsible for any source of intent or agency. Instead, it is an actant, a part of a series of relationships of actions between many other actants. Latour uses the term actor to describe an actant that
has been given figuration, a loose shape, a blurry image or a rough configuration (2005). An actant fulfills an important role in a story and an actor is the perceived shape that role takes. Latour borrows these terms from narrative theory because they allow our imagination to see important roles taking place beyond people and consider that these roles as relational instead of independent. To determine if something or someone is an actor, all one is to do is ask “does it make a difference in the course of some other agent’s action or not?”, and “[i]s there some trial that allows someone to detect this difference?” (Latour 2005:71). Answering yes to both of these questions shows that something has agency regardless if it is human or not.

In actor-network theory, actor and network exist only in relation to each other, which is why Latour places a hyphen between them (2005). The term network in actor-network is better thought of as a ‘work-net’, described thusly: “a) a point-to-point connection is being established which is physically traceable and thus can be recorded empirically… b) such a connection leaves empty most of what is not connected… c) this connection is not made for free” (Latour 2005). It is not that this network is made of a durable, lasting substance. Instead, it is a fleeting series of events between actants that can only be viewed when it is in action. According to Latour, a researcher must look for a network that is essentially in progress. The account of this network is both difficult and risky as it can quite easily fail in its claim to accuracy and truthfulness. There are many actants that are difficult to spot, as actor-networks often look like solid constructs that do not appear to have any agency. Instead, they look like they exist in order to be manipulated by something else. For example, statistics appear to be neutral, reliable tools that can be
picked up and used to examine something. But those statistics are actively promoted or contested by someone or something, and contribute to the overall perception as well as objective reality of an issue. They are a part of an actor-network not as a neutral, passive device, but as an active and integral component that exists in a fluid relationship with other actors.

Witnessing, tracing, recording, or tracking an actor-network is not a futile endeavor if many actants are missed in the account. Failure provides important insight. The objective is not the full completion of the account, but what is learned during the process, or as Latour calls it, “deploying controversies about the social world” (2005:227). The point is not to fully, objectively describe the social reality one investigates. Rather, illuminating truths of social phenomena involves dead-ends, incommensurabilities, and learning what does not reflect reality as well.

According to the above tenets of ANT, crude oil does not just sit in the ground waiting for someone to take control of it. It is an actant, or a flow of action between humans and non-humans, each with their own dispositions, their own characteristics and their own abilities to act. Crude oil ‘becomes’ what is perceived as crude oil when other actors, such as geologists informed by geological theories, give it a form. Geology defines crude oil as the compressed residue of organic material that is hundreds of millions years old. Instead of thinking of this geological definition of oil as true or untrue, we can consider the definition itself an ongoing process that results in giving crude oil a form. However, it is not a static, singular form, as it only exists in relation to the network it is involved in. Economists, informed by economic theories, define crude oil as a product to be bought
and sold. This is a very important consideration in understanding peak-oil controversy. Oil has potential for multiple shapes depending on the actor-network in progress. The task of this thesis becomes not one of delineating what oil is, but rather illuminating the network that forms it.

Thus, peak-oil controversy can be considered a part of a fluid process that requires maintenance by various actants in an actor-network. In this sense, it should not be treated as a static construction, concept, fact, or reality that exists all on its own, ready to be placed into a social context.

Oil itself, the alternatives that promise to replace it, and the energy efficient technologies—all of these things can now be taken into account as objects having agency that exist in association with each other. Latour uses two terms to organize these associations: Intermediary and mediator. An intermediary “transports meaning or force without transformation: defining its inputs is enough to define its outputs” (2005:39). We often consider agency only in this term as a predetermined, straightforward and predictable flow of action. The actor is simply carrying out motions in a chain of events. However, according to Latour this occurs only in very rare cases. Most actors are actually mediators in that they modify action and cannot necessarily be fully restrained. When they are functioning according to what is expected of them, we assume they are intermediary (2005). We often take their agency for granted until they rebel.

Many would think of a drill on an off-shore oil rig, such as the infamous Deepwater Horizon, as an intermediary when it is functioning within set operational guidelines. The user interacts with the machinery in a predictable manner, and a predictable flow of
actions among many interacting non-human devices occurs. However, if the drill responds in an unpredictable manner, often to an unpredicted event such as methane rushing up the drill shaft, the drill is suddenly witnessed as a mediator. The output of action can no longer be so easily predicted by the input of action. The subsequent explosion, and difficulty of capping the wellhead afterwards, shows just how quickly calm, stable, functioning intermediaries become seemingly rebellious and chaotic mediators. This is because “if some causality appears to be transported in a predictable and routine way, then it’s the proof that other mediators have been put in place to render such a displacement smooth and predictable” (Latour 2005:108). If an actor does not appear to have agency, then that is because there are other actants invisibly at work keeping things ‘working as intended’.

What is considered to be oil production is thus a massive actor-network that is largely invisible to those not directly involved in the oil industry. It appears to many as a smooth and predictable relationship between intermediaries. However, to someone in the oil industry who is directly involved in this network, especially someone with a managerial role in it, oil production likely appears as a much larger, much more chaotic, mess. It has a completely different shape or figuration to him/her.

The controversy surrounding peak-oil discourse involves several key figurations, chief among them is oil production. Production rate refers to the speed oil is extracted from the ground. It is usually given the figuration supply. Actors burn up all of this oil in a process that is often given the figuration demand. The peak-oil debate revolves around this relationship between supply and demand. Maintaining a balance between the two is the
top concern of all parties involved. As supply and demand only exist in relation to each other, it is important to note they both have agency. Much of peak-oil controversy stems from attributing different amounts of importance to these agents, a point that I will expand in subsequent chapters.

Many diverse phenomena are uncritically linked to peak oil, leaving the concept itself “a rhetorically potent yet surprisingly empty signifier: the proverbial hollow drum” (Bridge and Wood 2010:566). Strictly defining peak oil as something that is real and inevitable runs the danger of treating oil as an intermediate actor—a means that results in a predictable end. Whether that be the end of cheap oil (IEA 2008), oil-apocalypse (Kent 2007), or a techno-utopia (Chevron 2010), these predictions assume relatively linear assessments of the agency of oil. In doing so, the emotional ‘aura’ surrounding peak oil often leaves the predictions confused with the explanations⁶ (Caffentzis 2008). To avoid treating peak oil as an intermediary, hollow drum, I use ANT to demonstrate the different constructions of reality at work in peak-oil controversy.

The concept of peak oil can be described as a ‘wicked problem’ that is difficult to solve, as “optimal solutions for one set of interests threaten the interests of others, and being multifaceted, no simple solution will suffice” (Young, Borland, and Coghill 2012:252). Far from solving problems, this thesis simply asks: how do specific influential sites portray what the relationship between energy supply and demand will be in the next thirty years. And it also asks how these portrayals help explain the current state of peak-oil controversy.

⁶ I discuss this further next chapter.
Influenced by tenets of ANT, my approach to answering the research question I liken to “the cartography of controversies” (Venturini 2009:258). This cartography is not attempting to map what peak oil really is. Instead, it is mapping how peak oil is portrayed via competing discourses. I chart key sites of these discourses by starting with basic statements disputing peak oil. Then I chart what actors are involved in these statements. I then examine in more detail the connections between the actors. Then I look at how these connections came together to strengthen perceptions of what the actors deemed the world should look like. Lastly, I place peak-oil controversy into the discursive construction of reality. The cartography of peak-oil controversy thus culminates in the presentation of this thesis.

**Data collection**

This section shows in chronological order the steps I took to collect data. I began data collection with highly influential documents that present claims of current global energy supply and demand trends. These documents also forecast these trends 30 years into the future. I call these documents energy outlook reports or simply outlooks, as they are called this by both the documents themselves and other actors I examined. The outlooks are produced by the Supermajors7—the five largest non-state-owned oil corporations: ExxonMobil, Royal Dutch Shell8, BP, Chevron, and Total. In the outlooks, the Supermajors present their current and future strategies in regards to oil supply, demand, and the relation between the two.

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7 Also called ‘Big Oil’
8 Henceforth referred to as Shell
Not only do the Supermajors have a vested interest in the past, present, and future of oil, but they collect and provide much of the data that predictions about future oil supply and demand are based. These data are presented via the outlooks the Supermajors publish annually. These outlooks provide the initial data for this thesis, but I later move on to other sources of data that were referred to by these outlooks. I discuss those sources further in this section.

This thesis limits its data collection of oil company produced documents to these Supermajors outlooks. There are many influential state-owned oil companies, but they are not nearly as prevalent as the Supermajors are in Western peak-oil discourse. To many involved in peak-oil discourse, the Supermajors symbolically represent typical oil companies. Also, many state-owned oil companies are not fully vertically integrated. State-owned oil companies may own the global majority of oil in the ground, but much of their operations consist of selling this oil to companies like the Supermajors. I discuss this further in chapter three. Overall, the Supermajors are much more comparable to each other than to state-owned oil companies. Taking into account OPEC\(^9\) and the state-owned companies OPEC represents, is beyond the scope of this thesis\(^10\). This limitation puts a frame on research that looks at frames, but there needs to be practical limits to data collection. Incorporating OPEC member perspectives would open an entirely new window that would require a much longer thesis to look through. Considering I am only


\(^10\) A similar study to this one could be conducted that examines state-owned oil companies and OPEC, as opposed to the Supermajors and the IEA—a Western energy think-tank that is explained further below.
able to read English, I would still be reading documents translated and likely directed towards Western audiences.

The Supermajors are all fully vertically integrated corporations meaning that they operate through the entire production, distribution and retail chain of oil. Bridge and Wood stress the importance of paying attention to the middle layer of the Supermajors, the “ownership, competition, technological capacity, and politics – that articulates between geological conditions and the financial performance of firms” (Bridge and Wood 2010:572). The Supermajors’ various subsidiary companies are divided by what are called upstream and downstream sectors. The former refers to exploration and extraction of oil whereas the latter refers to refining and selling oil as a product. The term Supermajor refers to the specific corporate umbrella that these subsidiary companies fall under. Each Supermajor represents a different umbrella, however there are a few joint ventures and strategic alliances involving some of the various subsidiary companies. In general, the Supermajors work separately from each other in both upstream and downstream sectors. The annual energy outlook reports they produce forecast future global energy supply and demand. The corporation’s strategic division between upstream and downstream sectors translates into a division between supply and demand sectors. The middle layer that Bridge and Wood (2010) stress investigating is the Supermajors’ interaction between these two divided, but interrelated corporate sectors. I review the Supermajor’s outlooks as they provide a site where this middle layer is shown.

\[11\] Mapping the connections of ownership between the various subsidiary companies connections is beyond the scope of this thesis.
Each of the Supermajors maintains public websites that publish their annual energy outlook reports. I have a relatively comparable data set by using only these reports. The intended audience for these reports is not always explicit, and the format as well as discussion topics of each report sometimes vary extensively. However, I reasonably assume that these reports are meant to advertise products, attract investments, comfort shareholders and provide ‘forward-looking’ views of the company. As each report is produced annually, I can also observe historical trends. I limited data collection to the 2006-2010 reports, each of which provided outlooks to the year 2030. My overall objective was to compare and contrast what narratives were being promoted through these reports about future energy supply and demand, identify other actants commonly invoked, and look for further sites of inquiry.

The Supermajors’ outlook reports served as an excellent starting point, as they source their facts, figures, and estimations from other specific locations. They provided an initial outline for a data collection map\(^\text{12}\) guiding additional searches. As the map was developed, other influential organizations, like the IEA, were found, their energy outlook reports were analysed, and the actants they refer to were added to the map. Everything observed was considered data: videos, audio reports, pictures, advertisements, etc., but, overall, written text represented the most data. Dates, statistics, names, places, and technologies were of particular importance as these things leave historical evidence of actors’ activities (Latour 2005).

\(^{12}\) This map was rather unconventional as it formed via a complex Excel spreadsheet of my own design. Due to the digital, rather than visual, nature of the map it cannot be usefully reproduced in this thesis document.
I read each of the Supermajor outlooks and extracted quotations directly relevant to peak oil and the predicted relationship between energy supply and demand. I organized these quotations based on the categories of alternative energy, energy supply, energy demand, and energy type. I then summarized my findings comparing and contrasting changes or similarities over time in the outlooks.

The Supermajor outlooks often source their data from the International Energy Agency (IEA), the sister agency of the Organization for Economic Cooperation and Development (OECD). The OECD is a pro free-market think-tank that promotes the interests of many ‘developed’ Western countries. The IEA provides energy statistics, as well as policy recommendations, for these countries (IEA 2012). OECD countries are mostly European with the exception of the United States, Canada, Mexico, Chile, Japan, Israel, Australia and New Zealand. The OECD does not include Russia or any of the OPEC countries.\(^\text{13}\)

The IEA’s energy statistics are widely used and disseminated publicly through a variety of digital documents, including annual energy outlooks much like those produced by the Supermajors. The IEA outlooks are much larger and provide more in-depth analysis than those of the Supermajors. I examined the IEA outlooks in the same way as the Supermajor outlooks. The IEA are considered a major actor when mapping peak-oil controversy due to their prevalence in citation networks, and influence in governmental circles.

\(^{13}\) A full listing of the 34 OECD member countries can be found at http://www.oecd.org/pages/0,3417,en_36734052_36761800_1_1_1_1_1,00.html.
After examining the IEA outlooks and the actors they referred to\textsuperscript{14}, I returned to where I had initially learned about peak oil—peak-oil documentaries. I chose these because they represent a popular site where the peak-oil concept is promoted and discussed. They are also easier to compare than books or websites as these documentaries are all of similar length, topic, style, tone, and format. They are also intended for a general audience and introduce the idea of peak oil more than debate its specific intricacies like many books or websites do. That is not to say books and websites are not critical actors, but involving them invokes a much more complicated and time-consuming network that I aimed to avoid. I found that peak-oil documentaries provide a concise and comparable locus of inquiry of a specific time period, a perfect complement to the data found in the Supermajor and IEA outlooks.

The bulk of full-length documentaries specifically about peak oil were produced from 2004-2007. In chronological order these are: \textit{The End of Suburbia} (Greene 2004), \textit{The Power of Community: How Cuba Survived Peak Oil} (Morgan 2006), \textit{Crude awakening} (Gelpke, McCormack, and Caduff 2006), \textit{Crude Impact} (Wood 2006), \textit{Who Killed the Electric Car}\textsuperscript{15} (Paine 2006), \textit{Crude} (Smith 2007), \textit{Oil Apocalypse} (Kent 2007). Since 2007, the concept of peak oil has been addressed in other, more general documentaries; however the major peak-oil specific documentaries were all produced during this short time span. I watched each of these films and recorded their major arguments, statistics, 

\textsuperscript{14} While examining key actors in these outlooks I was led to many external websites that the outlooks linked to directly or indirectly. These websites were also considered data however represented a much smaller portion of the overall dataset.

\textsuperscript{15} \textit{Who killed the Electric Car} was largely about an electric automobile, however the concept of peak oil was a theme throughout the documentary.
tone, style of the narratives and the major interviewees. After examining these
documentaries, I largely ceased data collection and summarized my findings. I then built
an explanatory theory that evolved as I drafted this thesis. What follows is an in-depth
dissemination of my findings, followed by a rigorous analysis of the controversy
reflected in the unveiling of the actants involved in peak-oil discussion.
Chapter 2. Framing Peak Oil

This thesis presents two conflicting frames that each represent the controversial concept of peak oil. To do so, I use actor-network theory (Latour 2005) concepts of human and non-human actors, instead of society and nature. While non-human actors usually fall under the umbrella term of ‘nature’, this thesis takes into account anything with the ability to act or influence something else as an actor. As such, non-humans are neither natural nor unnatural, and humans are not separate from these non-humans. Human and non-human actors work together in a symbiotic relationship of activity.

Using the concepts of human and non-human actors allows us to look at stories beyond those depicted by labels of society or nature. Instead, we can view relationships between flows of actions. In this thesis, I do not treat peak oil as a real, objective phenomenon. Instead, I present peak oil as a story of a relationship between oil supply and oil demand. Peak oil is a narrative hook in a story, a plot element that serves to justify other actions the story portrays.

The peak-oil concept is presented as a ‘chicken and egg’ scenario: What comes first, slowed demand for oil or slowed oil production? The above-ground frame shows that if oil demand slows due to price, then oil production will slow as well. The below-ground frame shows that if oil production slows due to limitations of geology, then oil demand will be forced to slow.

In this chapter, I first discuss what I mean by frames. Then I invoke a discussion of modernity to help explain why there are two different views of the peak-oil concept’s supply and demand scenario. In short, this thesis considers frames as social constructs
that filter available discourse by presenting certain logics and realities about the world while excluding others. An objective reality may be presented via a frame, but only a part of it is shown from a specific angle when it is framed. Reality is simply too big and messy to be usefully depicted without some things being filtered and left out. Beck, Bonss, and Lau (2003) concepts of first and second modernity help explain that while peak oil appears very differently via above and below-ground frames, both frames present modern ideals, albeit slightly different ones. Unlike frames that present specific pictures, first and second modernity present broadly defined ideals. These are general guidelines that show how the world supposedly functions. Ideals influence what is portrayed via a frame as things that are not ideal are either left out or discounted as irrelevant.

Further, the Supermajor and IEA outlooks champion alternative energy sources and energy efficiency—rather than energy conservation and redistribution—to reduce, if not prevent, what they call ‘energy poverty’. They predict that the OECD countries will use these alternative energy sources and energy efficient products to slow if not cease their growing energy demand. However, the Supermajor and IEA outlooks predict energy demand to continue to grow in what they call ‘developing’ countries, especially China and India, as they will not be able to afford these alternative energy sources and energy efficient technologies. The challenge that the above-ground frame presents is reducing ‘developed’ countries energy demand while supplying ‘developing’ countries growing demand. I elaborate on these arguments throughout the chapter.
Maintaining peak-oil controversy

As demonstrated throughout this thesis, the concept of peak oil is often portrayed via two different frames that depict conflicting versions of reality. I call these the above and below-ground frames. Even though both frames show peak oil as an oil supply and demand relationship, the depictions diverge and lead to different representations of the past, present and future of oil. As such, the frames cannot be aligned to show one true objective reality. Eliminating the frames will not resolve peak-oil controversy either. If there is no frame to view peak oil, then peak oil ceases to exist.

The framing of the peak-oil concept is an ongoing process, actively maintained and perpetuated through discourse. We can only see the realities that are available to us through discourse, but we can choose between discourses. Latour (2005) would tell us that this choice does not come from a single individual actor, but from a relationship, a network, between various actors. These actors are both human and non-humans that exist because of their interactions with each other. Networks are active processes; they require actors to constantly upkeep or maintain them, even if those activities are not always visible. If those activities or actions stop, then whatever network it was they were producing effectively ceases to exist. Actors and networks are symbiotic constructs, thus the hyphen between actor-network. Each word describes a different part of the construct, but they do not operate without each other (Latour 2005).

A concept can be an actor-network. It requires various actors to construct and maintain it. It does not just simply appear nor does it maintain itself. Meanwhile, other actors may be attempting to deconstruct and destroy it or promote their own variant of the concept.  

16 I discuss the specific details of these frames in chapters three and four.
This is why Latour (2005) emphasises matters of concern, not a matters of fact. What appears as a solid construct or indisputable truth only exists as it is actively maintained and defended by both humans and non-human actors. These efforts are made possible by actors recruiting and working with other actors. This is why a concept is both an actor, and a network, as it acts on or with other actors but itself requires a network of actors to exist. As such, a concept exists in a perpetual state of controversy. Depending on the relative strength of their allies and enemies, some concepts appear more controversial than others. For a sociologist, it is these relationships that are important to examine, not the inherent ‘truthfulness’ of the concept.

This thesis focuses on the recent state of peak-oil controversy. As explained later in chapter four, the concept of peak oil is at least fifty years old. It is beyond the scope of this thesis to discuss in detail the beginnings of the controversy. As such, I acknowledge that the concept did not simply appear, but I focus on how it is maintained, not how it was created. As such, I use present tense to describe what the documents and films say. I do this to remind the reader that these are on-going statements. They continue to exist both in electronic print as well as citation networks. They also continue to influence the minds of those who witnessed them directly or via the citation chain. They continue to exist as you read them in this thesis and later ponder this document.

This thesis considers the peak-oil concept to exist as two competing actor-networks or frames. Both humans and non-humans actively construct and maintain reality, however there can exist multiple realities that are real in effect. These realities may be constructs, but they have concrete influence on humans as well as non-humans.
Further, this thesis considers a frame as the way these actor-networks are illustrated or given figuration or shape. A frame makes sense of, or gives shape to, a series of actions and in doing so it depicts an actor. This depiction is not permanent, and it is malleable depending on changes made to the frame or the subjectivity of the person viewing the actor. A frame strongly suggests a certain representation, but the viewer does not necessarily have to agree with that representation. They could consider the frame to show a false reality.

The example of a painting versus a window illustrates a key confusion inherent in frames. A viewer would likely consider a painting to show a representation of reality whereas they would assume a window shows reality itself. Both of these depictions of reality are framed, but the assumptions are quite functionally different. The problem with the concept of peak oil is that it is two paintings that are confused with a single window. There are effectively two peak oil actor-networks or more succinctly, two peak oils. One is represented via the above-ground frame, the other is represented via the below-ground frame. But both views are influenced by different modern ideals, discussed next section.

When people consider peak oil to be real or false phenomena, and not a constructed, controversial concept, they claim they are looking at oil through a window, not a painting. When other people disagree with this view of oil, they are simply considered to be wrong. I argue that peak oil is a concept that is painted or constructed. This thesis discusses frames that show paintings of oil, not windows that oil is seen through. These paintings require painters, and also space to display them. I call these sites of discourse.
The various sites of discourse examined throughout this thesis; energy outlooks, scientific papers and documentaries, all serve as artifacts or paintings held up by two different actor-networks or frames that are competing to show the one ‘true’ reality. The paintings are themselves participants, but they do not claim absolute loyalty to any one version of reality. Different networks can interact with them to prove or disprove certain representations of reality. The documentaries and academic literature reviewed sometimes referred to statistics from a Supermajor energy outlook report, but usually they used IEA statistics. The outlooks of both the Supermajors and IEA never directly referred to documentaries or academics I reviewed, but they all talked about similar issues such as unconventional oil or growing energy demand.

For actors to maintain networks of truth requires connections as well as separations between networks. They require allies as well as enemies. According to Daly (1999), these networks are both inclusive, as represented by ‘us’, and exclusive, as represented by the ‘other’. For us to exist there requires an other that is not us. Both us and other are signifiers that are often very vague and constantly in a state of flux. Their only persistence is that they exist in opposition as a perpetual antagonism. For a network to function, actors need to identify and promote inclusive and exclusive groups or themselves and others.

While Daly (1999) was referring to people in his analysis, it can be useful to include non-humans as per Latour (2005). I borrow from both Daly and Latour to consider both humans and non-humans as actors that require a perpetual process of identification. Human actors, Daly calls them subjects, often place characteristics, shapes or figurations
on non-humans, such as oil, but also on each other. As an example, when I say an economist is telling us that oil is an economic product, the reader pictures both the economist and the oil. The pictures do not have to be very clear, but a rough sort of visualisation or figuration has to take place for the sentence to make sense. Controversies represent an ideal opportunity for building these pictures as they show both what something is, and what something is not. Shown later in this thesis, peak-oil controversy is not about the specifics of peaking oil production. Instead, it is about the depiction of different sets of problems, and different sets of solutions to those problems. There can be a strategic agenda at work, as per the Supermajors and their acquisition of unconventional oil, or a social movement agenda as per peak-oil activists and their acquisition of allies. Either way, both depictions include certain identities or pictures, while excluding others. Oil itself is depicted as either a product of an economic exchange or a geological resource of intrinsic value, but it is seldom depicted as both.

Geologists and economists may be discussing the same concept of peak oil, or the maximum rate oil can be produced, but they are giving drastically different figurations, different shapes or visualized attributes to oil. In doing so, they are invoking completely different actor-networks. Economists perceive oil reserves as the amount of oil that is extractable depending on economic investments (Radetzki 2010). Geologists, however, perceive oil reserves as non-renewable and thus fixed, making the overall stock decrease over time as they are consumed (Campbell 2008). The former see oil as an actor with investment limits, while the latter see oil as an actor with geological limits. As they both treat oil as a fixed, singular reality, their figurations of oil flow right through peak oil.
Thus, they create opposing versions of what the future must entail if there is a peak in oil production rate. This is discussed further in the next chapters.

I remind the reader of last chapter’s discussion of oil as an actor that only exists in relation to something else. Oil is thus performed as part of a network of actants—actors without shape or figuration—that are working away diligently, albeit often invisibly. In this context, oil should not be defined as a solid thing or a solid set of consequences. Instead it should be constantly examined anew as an actant, fulfilling a role in a story, an action involved in a work-net. As the context of the story changes and the work-net, or actor-network, is made anew by different actions throughout it, then oil itself must be re-considered, remade, and rethought, as its relation to other actants changes through time. We should be able to engage with oil without forcing ourselves into camps that already have outcomes of its peak production in mind. Thus, when oil is invoked we should question what its role in the story is. The rest of this thesis does just that.

First and second modernity

The Supermajor and IEA outlooks, discussed last chapter, portray the energy past, present, and future through a frame that attributes the most important agency to humans and human-created systems. In these outlooks, economic forces and human ingenuity provide for the basis for action that all other agencies, including that of natural things, are secondary to. To explain this rationale, I borrow from Beck, Bonss, and Lau (2003) the concept of an ideal society called first modernity. It is not that this society has ever actually existed or ever will exist. Instead, first modernity appears as an ideal or a set of universal values as to how society should be. Akin to classic conceptions of modernity,
first modernity shows the future with a certain optimistic confidence. With a ‘can do’ attitude, anything seems possible if one is willing to put in the work. I found the energy outlook reports of the Supermajors and IEA to represent a first modern positive, energetic tone. The former’s outlooks are public relations documents whereas the latter’s are policy recommendations documents. Both have implicit and explicit political agendas that encourage certain actions, but those actions are conducive to a first modern ideal as described below.

First modernity shows natural resources as essentially limitless because they can be replaced by something else. The first modern view dictates that this alternative resource or new technology will be similar, if not better, than what it replaced. To those with a first modern outlook, a concept like peak oil appears as if a few ‘Chicken Little’s’ are running around squawking that ‘the sky is falling’ (Cobb 2010). That is not to say first modernity dictates that there are infinite oil supplies. Instead, it shows that alternatives to oil can, and will, be found in due time, long before any sort of emergency situation occurs. It makes sense to portray the future with a first modern tone considering the Supermajors’ interests in unconventional oil, and the IEA’s interest in Western energy independence from OPEC. I discuss these interests further next chapter.

Through the first modern portrayal, while nature exists independently of people, people have the ultimate authority in their relationship with nature (Beck et. al. 2003). This perception leaves progress towards a better future, for people, inconvenienced by a concept like peak oil, but progress is still ultimately inevitable. I show the following

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17 Two people dressed in suits depicting Chicken Little protested a 2010 Association for the Study of Peak Oil conference in Washington D.C.
excerpts from the opening addresses of the Supermajors’ 2010 energy outlooks to illustrate how the first modern perspective was often adopted. Appendix A provides the rest of the paragraphs. These introductions set the tone for the rest of the publication:

[S]uccess will depend on expanding access to economic sources… this will require the development and application of new technologies. (ExxonMobil 2010:1)

[E]nergy demand is again increasing. All energy sources will be needed to meet this demand… continued investment in technology and innovation will help us to deliver this energy. (Shell 2010:1)

Given the nature of the challenges we take on… will be enabled by… technology and the development of capability along the value chain in exploration, development and production. (BP 2010:3)

Technology, and the know-how required to develop and deploy it at scale, will deliver the breakthroughs, just as they have done in the past. The world will need all the energy it can get from all sources. (Chevron 2010:1)

Can the world strike a balance between a steady energy supply, growth, and the protection of lives and the environment? We believe it can… The technical, business and environmental challenges we face are enormous. (Total 2010:2)

The Supermajor outlooks regarded nature as consisting of resources ready for exploitation. They not only championed technology, but considered it the best tool available to solve the energy challenges they portrayed. To properly calibrate the perceived technological tools, the outlooks broke society down into statistical units. By demonstrating these statistics, the outlooks showed what the company could do to solve the problems the outlooks presented. This quantitative rationale is typical of first modern ideals (Beck et. al. 2003).
The concept of peak oil presents a near-impossible challenge if resource restraints make it unavoidable. But under a first modern portrayal, humans can overcome resource scarcity by finding a new resource to exploit or developing a technology, an alternative, which makes that resource obsolete. As such, resources themselves are irrelevant as demonstrated by the 2010 IEA outlook:

The message is clear: if governments act more vigorously than currently planned to encourage more efficient use of oil and the development of alternatives, then demand for oil might begin to ease soon and, as a result, we might see a fairly early peak in oil production. That peak would not be caused by resource constraints. (IEA 2010b:50)

The IEA outlook shows that through the strategies of increased efficiency and development of alternatives, not only is peak oil a non-problem, but it will happen sooner. This is not because of geology, but reduction in demand for oil. The IEA uses a complex statistical modelling system to make these predictions based on the data that is inputted. The IEA calculates and graphs reality like something to be managed, controlled, and ultimately owned. Natural events and phenomena are mere obstacles to be overcome through human agency functionally divided by progressively specialized labours, calibrated to ensure a smooth-running social machine. All of the Supermajor and IEA outlook reports examined throughout this thesis consistently promoted these ideals of Beck et. al. (2003) first modernity.

In the Supermajor outlooks, risks are largely portrayed as unfortunate series of unrelated events that the Supermajors are doing their best to work around or prevent through safety precautions. Much of BP’s 2010 outlook directly addressed the Deepwater Horizon oil spill that BP was responsible for. Here is an example:
We are determined that BP will be a safer, more risk-aware business. We will deliver on our commitments from the Gulf Coast incident and work hard to earn back the trust in our operations. We will rebuild value for our shareholders by re-establishing our competitive position within the sector by playing our part in meeting the world’s growing demand for energy, as well as participating in the transition to a low-carbon economy. (BP 2010:1)

The above quote shows BP’s claims that it can go back to business-as-usual as long as it ‘works hard’ to be safer. These claims illustrate that Supermajors like BP are not chained solely to principals of economics. Instead, they use the projection of a growing energy demand as well as concerns for CO2 to show that BP’s operations are not only necessary, but ‘good’ for mitigating climate change. This fits into the progressive narrative of the first modern story—risks can be known, planned for, and subsequently avoided as we march towards a bright future (Beck et. al. 2003).

Beck et. al. claim that first modern ideals are no longer as convincing as they used to be. Many people are adopting a second modern perspective that assumes “the future is less deducible from the past” (2003:13). That is not to say the second modern portrayal of the future is any more or less accurate that the first modern portrayal. Instead, second modern portrayals are less confident and more uncertain. The Supermajors’ outlooks may appear confident on the surface, but as shown next chapter, each of these outlooks had disclaimers demonstrating their respective corporations’ legal inability to stand by its outlook’s predictions. The Supermajors reserved the right to claim that a wide variety of circumstances beyond their control render their outlooks’ predictions null and void.

While the outlooks’ explicit tones were confident, usually through the narrative of ‘challenge’, an underlying concern was prevalent as to an uncertain future full of risks
and difficult operating environments. Key themes throughout the outlooks were safety and harm prevention strategies in regards to both people and the environment. The above-ground frame of the Supermajor and IEA outlooks, shown in-depth next chapter, represented a first modern perspective that looked to be responding to second modern concerns.

Beck et. al. would consider second modern concerns an element of what they call risk society, in that “risks and expectations of catastrophe now dominate public debate before decisions are made” (2003:15). While first modern portrayals calculate and assess hazards with a reliable degree of trustworthy, scientific credibility, second modern portrayals emphasize uncertainty, often stress irrational caution, and generally dictate that ‘the more we learn, the less we know.’ The academic papers and documentaries shown later in chapter four, stress the certainty of uncertainty of the peak-oil concept. They argue that peak oil represents a serious concern, but demonstrate that the issue is so complex that solutions are difficult if not impossible to achieve.

Second modern concerns were raised by various academics in academic journals, but those papers are not likely circulating among a general public. Instead, popular peak-oil documentaries likely represent a larger share of the public’s engagement with the peak-oil concept. The bulk of full length documentaries specifically about peak oil were produced from 2004-2007. Since 2007, the concept of peak oil has been addressed in other, more general documentaries; however the major peak-oil specific documentaries were all produced during this short time span. The Supermajor and IEA outlooks reviewed in this thesis were produced from 2006-2010. While the outlooks did not
directly address claims made by these documentaries, many of the same concerns were
brought up such as: alternative energy sources, unconventional fuels, Western energy
security and independence, oil prices, oil shortages, and general oil supply and demand
projections.

The peak-oil documentaries reviewed showed similar concerns and interviewed many
of the same people. The documentaries labeled these people as energy experts. They
represented a variety of both academic and labour fields from geology to investment
banking. They were likely carefully chosen, and their interviews carefully edited, to get a
specific message across. In all of the documentaries, the message generally defined what
the concept of peak oil is, why it is real, why it is a threat, and what must be done to
avoid or mitigate this threat. But the range of messages varied from peak oil potentially
bringing about a better society, as represented in The Power of Community: How Cuba
Survived Peak Oil (Morgan 2006), to peak oil bringing about societal collapse, as
represented in Oil Apocalypse (Kent 2007). The second modern, risk society, concerns
brought forth by these documentaries show the major sites responsible for publicly
promoting the concept of peak oil were unable to universally define what peak oil is, and
what it represents for the future.

Under risk society, universality is no longer certain, experts endlessly argue, and with
new research emerges new side effects (Beck et. al. 2003). The peak-oil concept can be
considered a product of risk society. It appears as an unavoidable risk, a disaster waiting
to happen, that must be managed, mitigated, prevented, thwarted, etc.. Yet, endless
debate surrounds how to do so, whether we should do these things soon, or if other important risks, such as the concept of climate change, should take priority.

**Energy demand**

Despite the differences in first and second modern ideals, when it comes to energy in general, they both share a common story or basic assumption of continuing progress and development. Both the Supermajor and International Energy Agency outlook reports as well the academic papers and peak oil documentaries this thesis examines predict energy demand to continue increasing indefinitely. The first ExxonMobil energy outlook I examined predicts “global energy demand to increase significantly over next 25 years” (ExxonMobil 2006:15). The last documentary I watched, *Crude Awakening*, claims “demand is on the march” (Gelpke, McCormack, and Caduff 2006). Of all my data sources, I found ExxonMobil’s outlooks represent the strongest rejection of peak oil as a problem whereas the documentary *Crude Awakening* represents the strongest promotion of peak oil as a problem. Yet both sources agree that overall global demand for energy will continue to increase for at least the next thirty years. The disconnect lies in the argument of what will meet that demand. The below-ground frame shows oil being the only known solution to the demand problem because oil is a special, irreplaceable resource. The above-ground frame shows the solution as inevitable because financial incentives will prompt the discovery and implementation of alternatives to oil. The former sees an insurmountable hurdle, the latter sees a motivational coach. But both assume a path towards some form of betterment, some utopian future that we, as humans, are working towards in a linear manner. Something like peak oil will either block our
path there or give us the push we need to keep going. Energy sustains that progress, therefore more progress requires more energy. Equitable distribution of energy, where energy is used and for what purpose is largely ignored. Instead, outlooks project the future energy scenario as a continuation of the global status quo.

In general, the Supermajor and IEA outlook reports represent first modern ideals responding to second modern concerns. They project classical assumptions of modernity, but do so while responding to public concerns of an uncertain future. The key stated objectives of the IEA are “efficiency, liberalization of markets, security of electricity and gas supply, as well as that of oil…energy security, environmental protection, and economic growth” (IEA 2010a). While the Supermajor outlooks do not make such explicit statements, they imply much of the same objectives shown in this IEA statement. In the statement, efficiency refers to new products that use less energy; liberalization refers to the opening of spaces so sellers have access to markets they were previously shut out from; security of energy supply ties in to these markets as well as political conflicts such as war or sabotage; environmental protection refers to reducing oil spills, CO2, and accidental pollution; and, lastly, economic growth refers to the paradigm that economies not only grow indefinitely, but are required to do so in order to function. These objectives of the IEA appear to be quite compatible with what is presented in the Supermajors’ outlooks. The biggest difference is that to meet these objectives, the Supermajors emphasise what they, as companies, are doing whereas the IEA emphasise what companies and governments should do.
The latest IEA annual energy outlook report claims that due to gains in efficiency, relatively stable populations, responsible energy consumption, and competitive free-markets, OECD member countries are not forecasted to significantly grow or shrink their energy demand for the next thirty years (IEA 2011). Instead, it is the rest of the world, mainly China and India, which the IEA outlooks forecast to rapidly increase their insatiable energy appetites. The Supermajors’ outlooks said much of the same thing. The reason given is that these countries are playing catch-up with the so-called developed world. Developing countries are expected to speed up their energy consumption while the developed countries are slowing down or maintaining a steady rate.

ExxonMobil’s 2010 outlook predicts that by 2030, Non-OECD countries energy demand will grow by 70 percent whereas global energy demand will grow by only 35 percent. The outlook claims that we “will need to continue to expand all available energy sources to meet this substantial increase in demand” (2010:2). All of the outlooks, from both the Supermajor and IEA, claim that open access to new sources of fossil fuels as well as increased investment in alternative energy research are necessary to meet this projected energy demand. The projected bulk of growing energy demand is not in Western countries; instead it is in the Eastern countries that the outlooks call ‘developing’. Shell’s 2010 outlook provides an example:

Increasing global population and rapid economic growth in the developing world are driving the surge in energy demand. China has now overtaken the USA as the world’s largest consumer of energy. By 2050 there are expected to be around 9 billion people, over 2 billion more than today. Energy demand by then could have doubled, according to the International Energy Agency (IEA). (Shell 2010:8)
The above claim is common among all of the Supermajor and IEA outlooks reviewed. In what they call the developing world, increasing global population and rapid economic growth are driving a surge in energy demand. Shell’s 2010 outlook goes on to present IEA claims that China has now overtaken the USA as the world’s largest consumer of energy; that the world will have around 9 billion people in the year 2050, over 2 billion more people than today (Shell 2010). This is among many examples of the Supermajors’ outlooks borrowing IEA statistics, especially projections of global population and economic growth. Those two factors are highly influential in IEA models that forecast future energy demand. In these models, where these people are located determines how much energy they are expected to use. That is not expected to significantly change unless nations ‘develop’ or become more like the ideal West.

The Supermajor and IEA outlooks project Eastern, non-OECD countries to continue having more cars, more factories, more homes, and more people whereas they project Western, OECD countries to have almost the same amount of these things as they did before. This difference is attributed to the modern concepts of developing, and developed. The non-OECD countries are expected to develop in a certain way by having more of the aforementioned things, all of them are assumed to consume increasing amounts of energy. OECD countries are assumed to be at the relative pinnacle of their development. As such, they are projected to use generally the same amount of energy.

For the outlooks, development and energy demand are directly correlated. As an example, ExxonMobil’s 2010 outlook discusses the projected rise in global energy
demand by showing an image\textsuperscript{18} of women carrying bundles of branches next to an image of massive cargo ships. Below that is an image of a bent-over woman prodding a cooking fire next to the image of a woman cooking over a shiny metallic stove. The following caption explains this choice of imagery: “Many of the hallmarks of human progress – the improvements in how people live, work and stay safe and healthy – are enabled by energy. As societies and technologies develop, people’s energy usage will continue to evolve” (ExxonMobil 2010:4). In both the Supermajor and IEA outlooks, one way of living is portrayed as not only superior to the other, but inevitable. That inevitability is claimed to be enabled by energy companies like ExxonMobil and the other Supermajors.

The Supermajors’ and IEA outlooks often display representations of the contrasts between an energy-rich developed world and an energy-poor developing world. The embedded narratives associate societal progress with increased energy demand. The Supermajors’ and IEA outlooks stressed the imperative to provide for the growing ‘energy needs’ of the developing world and their ‘energy poverty’ as shown by the 2006 IEA outlook claim that “[e]nergy poverty threatens to hold back the economic and social development of more than two billion people in the developing world” (IEA 2006:50). The threat of impeded development is portrayed by the IEA 2010 outlook as so drastic in terms of human suffering that "[e]nergy poverty in the developing world calls for urgent action" (IEA 2010b:58). The IEA outlook even puts a price on solving this suffering: “$36 billion per year — the cost of ending global energy poverty by 2030” (2010b:5)\textsuperscript{19}.

\textsuperscript{18} Unfortunately I cannot reproduce these images without permission from ExxonMobil, which I was unable to obtain. They can be found on page 4 of Exxon’s 2010 outlook.

\textsuperscript{19} Chapter three discusses how the IEA styles itself as a pro free-market energy NATO.
This energy version of the military humanism depicted by Chomsky (1999) needs to be interrogated. Instead of ‘bringing democracy to an oppressed peoples’ as Chomsky says the Americans claimed to do with Iraq, the IEA claimed it wants to ‘bring development to an energy-poor peoples’. What are these people developing towards? Does more energy really help bring people out of poverty? How is this energy to be distributed? Perhaps most importantly, at least to the IEA and Supermajors, who is going to pay for it, and how? These questions cannot be answered by first or second modern ideals that assume a linear, one-size-fits-all, model of development.

A look at current events in Nigeria provides an example of the policies suggested by the IEA to reduce energy demand while maintaining a path towards development. As of January 1st 2012, the Nigerian government ended national gasoline subsidies. As a result, gasoline prices more than doubled, causing protests, civil unrest and widespread suffering (Jazeera 2012). Under the title “[g]etting rid of fossil-fuel subsidies is a triple-win solution”, the 2010 IEA outlook states:

Eradicating subsidies to fossil fuels would enhance energy security, reduce emissions of greenhouse gases and air pollution, and bring economic benefits. Fossil-fuel subsidies remain commonplace in many countries. They result in an economically inefficient allocation of resources and market distortions, while often failing to meet their intended objectives. Subsidies that artificially lower energy prices encourage wasteful consumption, exacerbate energy-price volatility by blurring market signals, incentivise fuel adulteration and smuggling, and undermine the competitiveness of renewables and more efficient energy technologies. (IEA 2010b:55).

Looking at the current situation in Nigeria provides an example of an economic solution advocated by the IEA. Making oil more expensive may not seem like much to someone with a large disposable income, but for many Nigerians who live on less than two dollars
per day (Jazeera 2012), doubling the price of oil can be disastrous. This ‘triple-win solution’ proposed by the IEA may enhance energy security, clean the air, and bring economic benefits, but for whom, for how long, and at what cost? The abstractions produced by both above and below-ground frames do not appear to answer these questions. Instead, the meta-narratives they invoke may universalize problems, and provide solutions that could be quite harmful to those impacted. This is why when establishing the problem, one must be careful as to the logics involved in producing the solutions.

For the IEA and Supermajors, energy poverty provides a clear ‘social bad’ that they can work to ‘address’. To do so, they can promote other agendas, such as the promoting access to unconventional energy sources or free-market reforms. Mulligan (2010) argues that there is growing public concern that “lives are already being lost, even in the industrialized world, due to ‘energy poverty,’ the notion of overshoot and ‘die-off’ puts this threat at the level of the species” (2010:91). Even while the Supermajors and IEA account for the future of oil in a way that makes the concept of peak oil disappear, the spectre that the concept invokes also puts the threat of energy poverty at the doorstep of the Western world. Expensive gasoline, intermittent electricity, unreliable public transportation networks—all these are images invoked to describe the ‘poor’ world, brought home under the spectre of the peak. Chapter four discusses these images used by academic papers and peak-oil documentaries in their attempt to show what peak oil is, and how they conceive of it as a problem.

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20 I discuss this further next chapter.
Ultimately, the uncertain foundation of the peak-oil concept splits it into being perceived via two different frames. These are the above and below-ground frames discussed throughout this thesis. While the above-ground frame largely represents first modern ideals, it still has to respond to second modern concerns. The below-ground frame represents many of these concerns, but it’s uncertain, second modern foundations give an air of fear and disaster. Both frames show peak oil as a supply and demand relationship, but the representations of this relationship are vastly different. The rest of this thesis goes into detail as to the specifics images shown by these two frames.
Chapter 3. Above-ground Frame: Extrinsic Economic Value

My project of mapping peak-oil controversy has led to the isolation of two discrete frames. I call these above-ground and below-ground frames. This chapter examines the above-ground frame. The major sites involved in promoting this frame are the Supermajor and IEA documents that forecast future global energy supply and demand. I call these documents ‘outlooks’. Many of the statistics used by the Supermajors’ outlooks are provided by the IEA. The IEA is a widely trusted source, so trusted that their methodologies are taken for granted as reliable. But the IEA is an agency that promotes free markets and prioritizes OECD country interests, promoting the same above-ground frame as the Supermajors. The IEA holds that economic investments will solve the problems their outlooks present. Like in Supermajor outlooks, these problems are often labeled as an energy challenge, a theme persistent throughout the above-ground frame, and a key discussion of this chapter.

This chapter argues that the energy outlooks of the Supermajors and IEA frame oil as a product of extrinsic economic value. People give oil value. As such, the problems the outlooks predict can only be solved via economic means. This frame shows oil as a resource to be exploited for capital gain and its depletion and subsequent replacement are dictated by market-based demands. As such, oil is relatively limitless in quantity. This is in part due to economic incentives that provide motivation to find more oil, but also alternatives to oil. These alternatives are the various technologies, energy sources, and products that allow for oil to be substituted for something else.
I start with Bridge and Wood (2010) and Sinclair (2007) reviews of Supermajor peak-oil statements and follow with my own review of the Supermajor outlook reports. I then review the IEA outlooks. Bridge and Wood found that Supermajor public statements ranged from ExxonMobil’s rejection of the peak-oil concept altogether, to Total’s prediction of oil production peak by 2020 being ‘a real challenge’ (Bridge and Wood 2010; Sinclair 2007). My own findings show this very word, ‘challenge’, being often used to describe future energy scenarios. To begin my examination of the above-ground frame, I turn to a discussion of the Supermajors.

**The Supermajors**

I provide the following chart to give context as to the size and rank of the Supermajors:

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>4</td>
<td>ExxonMobil</td>
<td>USA</td>
<td>$341.6</td>
<td>$30.5</td>
<td>$302.5</td>
<td>$407.2</td>
</tr>
<tr>
<td>5</td>
<td>Royal Dutch Shell</td>
<td>Netherlands</td>
<td>$369.1</td>
<td>$20.1</td>
<td>$317.2</td>
<td>$212.9</td>
</tr>
<tr>
<td>16</td>
<td>Chevron</td>
<td>USA</td>
<td>$189.6</td>
<td>$19</td>
<td>$184.8</td>
<td>$200.6</td>
</tr>
<tr>
<td>19</td>
<td>Total</td>
<td>France</td>
<td>$188.1</td>
<td>$14.2</td>
<td>$192.8</td>
<td>$138</td>
</tr>
<tr>
<td>390</td>
<td>BP²¹</td>
<td>UK</td>
<td>$297.1</td>
<td>$-3.7</td>
<td>$272.3</td>
<td>$141</td>
</tr>
</tbody>
</table>

(Forbes 2011)

To further provide context I briefly compare the different Supermajors explicit or implicit responses to talk of peak oil. I show this to illustrate that while the specifics of the Supermajor responses are different, overall they make the same general argument.

²¹ These values were calculated April 2011. BP had massive losses in part due to the Deepwater Horizon incident which is why Forbes ranked them so poorly despite strong sales.
According to Bridge and Wood (2010) and Sinclair (2007), and corroborated by my analysis, ExxonMobil is the most aggressive in its rejection of the concept of peak oil. In full-page advertising, ExxonMobil directly counter the very notion of peak oil, claiming that “contrary to the theory, oil production shows no sign of a peak” (Bridge and Wood 2010:570). Compared to the other Supermajors, ExxonMobil is the most confident in the long-term supply of oil, almost to the point of neglecting the need altogether to invest in alternatives (Sinclair 2007).

Shell claim that there is a geological restraint to oil supplies, but peaking extraction rates of those supplies is not the issue. Instead, the issue is the relative gap between production and demand (Bridge and Wood 2010). In 2004, Shell said it overstated its reserves by up to 20%, but finding new fields will stop the decline of actual oil production (Sinclair 2007).

BP also denies the concept of peak-oil as an immediate threat. It alludes to peak oil being a concern in the far future, but it does not consider peak oil a problem in the short and medium term (Bridge and Wood 2010; Sinclair 2007). It is not explicit what the length of this term is, but given the context of the discussion it can be reasonably assumed that BP is speaking to the next thirty years.

Chevron takes an almost contradictory approach with its “will you join us campaign” (Bridge and Wood 2010:569). It argues that the age of ‘easy oil’ is over, calling for a more aggressive approach to adopting alternative energies and increased energy efficiency. However, Chevron does not attribute the end of easy oil to peak oil. Instead, it
emphasises increased difficulty in finding, extracting, and refining new oil supplies (Bridge and Wood 2010; Sinclair 2007).

Total is the most publicly concerned Supermajor in regards to the peak-oil concept. It even goes so far as to predict peak oil to occur near the year 2020. Nonetheless, Total treats peak oil rather casually as a ‘real challenge’ that can be solved through economic investment (Bridge and Wood 2010; Sinclair 2007).

For ease of comparison, here are the Supermajors placed in general order of most to least explicit denial of the concept of peak oil. I place ranking via Forbes (2011) measurement of company size in brackets and provide a summary of the company’s position on peak oil:

- ExxonMobil (1st) There are no signs of peak oil due to an abundance of oil and gas.
- Shell (2nd) Abundant oil makes peak oil irrelevant, but meeting demand is difficult.
- BP (5th\(^22\)) Peak oil is not an immediate concern, but one far into the future.
- Chevron (3rd) Oil is getting harder to extract, but technology makes peak oil irrelevant.
- Total (4th) Peak oil is coming soon, but it is not a problem, it is an economic challenge.

Above, we see a rough correlation between Supermajor size, largely measured by profits, and explicit denial of the concept of peak oil. Perhaps the larger the corporation’s current profits, the more strictly vested it is in immediate petroleum concerns. This warrants further investigation beyond the scope of this research\(^23\). Sinclair (2007) concluded that,

\(^{22}\) According to Forbes (2011) listing of sales BP would be ranked third on this list, but because they had losses instead of profits in the year measured they were placed very low on the size list.

\(^{23}\) I had to decide between various paths of investigation for time and practical reasons. I could have delved further into the differences between Supermajors, but instead I
“it is unlikely that ExxonMobil's managers actually believe that there is abundant oil and gas for all, but they may expect to use the enormous profits to be earned in the next few years to buy up the most successful independent developers of alternative energy and to take over one of the other majors” (2007:16). Supermajor managers may not believe in an abundance of oil and gas, but what of their employees engaged with the public: What kind of portrait are they painting in regards to what the future will look like for those who work for the company? Considering that the Supermajors themselves structure peak-oil discourse, to a degree, what narratives do they use when addressing supply and demand predictions? How do these outlooks present how people talk about, point to, invoke, textually and numerically represent, and visually characterize in charts, graphs and spreadsheets this contested social object: the future reality of oil? Informed by Bridge and Wood (2010) and Sinclair (2007), these were the questions that guided my examination of the Supermajors’ annual outlook reports.

The Supermajors make public predictions as to the future state of oil, and energy in general, in a variety of electronically published annual reports. While each company has different titles for these reports, I refer to them all as outlooks, as they provide ‘forward-looking statements’ as to the future of a variety of energy issues. I review each company’s 2006-2010 annual energy outlooks. In these outlooks, peak oil may not be explicitly mentioned, in that the terms peak and oil may not be used, but the same relationship is often portrayed between potential oil supply and demand. Peak oil is thus both implicitly and explicitly mentioned, forming a locus for comparison. The outlooks decided to treat them as a homogenous group so I could research non-oil company key actors as well.
provide portrayals of present, as well as future, energy scenarios, the technologies that would be required as part of those future scenarios, the statistics showing the various rates of production and demand, and the company’s current strategies towards its vision of the future.

The Supermajors produce their outlooks with carefully crafted narratives, likely part of a corporate strategy to manage the relation between oil supply and demand. The outlooks are not general advertisements, but public relations documents directed to influence certain groups. This is explained by BP’s 2006 outlook, “This report is aimed at our shareholders, employees, governments and JV partners, academics, NGOs and other parties or individuals with a working interest in the company” (BP 2006:48). In this quote, JV refers to joint venture partners which are sometimes the other Supermajors. The Supermajors largely operate independently from each other however there is some collaboration on various projects. The rest of the groups and individuals the quote refers to are not the public in general, but a wide swath of people with certain vested interests in the Supermajor. The outlook reports show certain problems with supply, demand and the relation between the two. In doing so, they show how the Supermajors are going to address those problems. They present a certain corporate strategy in regards to the present and future of oil as well as energy in general.

Overall, I found that the Supermajors’ outlooks rarely addressed the peak-oil concept directly. In the infrequent cases that they did, it was presented as a non-problematic reality. That is, maximum petroleum production will be reached, but by then other energy sources will have taken the place of oil’s dominant role. Interestingly, the Supermajors
did insist that they were engaged with preventative measures in regards to climate change. Each Supermajor made bold claims as to making its practices less C02-intensive through technological innovation and increased energy efficiency. Appendix A provides a sample of the opening dialogue of the 2010 outlooks that sets the tone for the rest of the publication. It is misleading to claim the Supermajors represented a unanimous voice in particular understandings of the imminence of peak oil, so I present below a summary of the Supermajor outlooks divided by each company. These summaries briefly show each Supermajor’s take on peak oil from its 2006-2010 energy outlook reports. First, I present each of these summaries individually. Then, I discuss the key themes found throughout them as a whole.

There is nothing pertaining directly to peak oil in the ExxonMobil outlooks I review. The outlooks frequently stress the future importance of oil and the challenges inherent in acquiring it, but with a tone that indicated no concern for production peak. In 2008, the outlooks start using the term “Energy Challenge” (ExxonMobil 2008:21) more often, and that remained a key theme throughout. However, this is likely nothing new as in all of the outlooks reviewed, ExxonMobil’s trademarked slogan is ‘taking on the world’s toughest energy challenges’²⁴. The overall tone of the ExxonMobil outlooks is represented by the statement “Human ingenuity will continue to make a powerful contribution to solving the world’s energy challenges” (ExxonMobil 2010:52). This statement represented the bullish, ‘we can do it’ attitude portrayed via the corporate slogan²⁵.

²⁴ This slogan is on the title page of every outlook just under the name ExxonMobil.
²⁵ I return to the key theme ‘energy challenge’ after I summarise the rest of the outlooks, and I address the key theme ‘we can do it’ in chapter four’s discussion of modernity.
Peak oil is directly addressed only once in all of the BP outlooks I review. In the beginning of the 2008 outlook, Tony Hayward, the CEO of BP at the time, is asked a series of questions by an unnamed interviewer. BP outlooks often present interview dynamics, but as no details of the interviewer were given I assume that this is just a different way to present a corporate statement. Here is Tony’s response to the question of a peak in oil production:

I don’t believe the world is running out of oil in the near or foreseeable future. The data shows that there are around 40 years of proved oil reserves left in the ground and 60 years of natural gas, at today’s consumption rates, not including unconventional hydrocarbons. When it comes to meeting demand, the problems are above ground not below it. (BP 2008:3)

Claims of abundant oil supplies are often made throughout all of BP’s outlooks that I review. Meeting oil demand is portrayed not as a resource scarcity problem, but a resource management problem. The energy challenge is portrayed as one of economic management, not geological limits. This is similar to the ExxonMobil outlooks, yet unlike ExxonMobil, the overall tone of BP’s outlooks is apologetic. This tone is likely due to the major environmental accidents during 2006-2010 that BP is responsible for26.

While the tone and style of message delivery may be slightly different, ExxonMobil and BP outlooks both express denial of peak oil based on resource scarcity. The former do so implicitly, while the later do so explicitly.

Shell never explicitly addresses the peak-oil concept in any of its outlooks I review. Its 2006 outlook does however mention a similar theme with the phrase, “as the era of easy

oil ends, new resources must be developed to meet the world’s growing need for energy” (Shell 2006:20). The 2010 outlook uses the phrase, ‘the world’s easy-to-access oil is becoming more scarce’, under the subtitle “Delivering Energy Responsibly” (Shell 2010:14). For Shell, as well as the other Supermajors, it is not that oil is becoming scarce, but it is getting harder for them to access it. This difficulty is in part due to geological variables such as remote drilling locations, but also due to conventional oil supplies already being state-owned. A key struggle for the Supermajors is finding and extracting oil that is not already owned by someone else. This is both an above-ground and below-ground concern. They have to deal with oil that is physically underground, but also deal with actors above-ground who influence and trade oil. To legitimate this quest whilst calming public fears, Shell’s outlooks often use the term “environmental challenge” (Shell 2010:3). Instead of apologizing for environmental accidents like BP’s outlooks do, Shell’s outlooks promote all the various strategies the corporation had in place to ensure environmental protection. Folding environmental concerns into the portrayed energy challenge is a key theme I return to later.

The theme of the end of easy-oil is prevalent throughout the Chevron outlooks I review, but peak oil is only addressed once. Like BP, Chevron’s outlooks stage interviews without mentioning who is asking the questions. In Chevron’s 2006 outlook, one of these interviews is conducted with Chevron’s ‘technological officer’ Don Paul. The unknown interviewer asks “what would you say to people who are worried we’re running out of energy resources?” This is Don’s response:

No one doubts that conventional oil production eventually is going to peak. Some say 2010, others 2030. How fast we can fill the gap with
other resources, such as heavy oil and undeveloped natural gas, remains to be seen. But we won't run out of energy molecules, so we won't run out of fuel. As the resource base shifts, R&D investment - for example, in unconventional feedstocks and in commercializing alternative energy sources - will follow opportunity, as it always as. Just when the world thinks it is running out of something, science and technology make something else work. (Chevron 2006:36)

Unlike the ExxonMobil, BP, and Shell outlooks, Chevron’s outlook directly tackles claims of peak oil, but shrugs them off as irrelevant because unconventional fuels and alternative energy sources will fill any demand gaps that peak oil leaves behind. The overall theme of technological determinism found throughout Chevron’s outlooks is illustrated by this claim made in its 2008 outlook: “Though many consider Chevron to be an oil company, we think of ourselves as an energy company; it may be more accurate to say we are a technology company that produces energy, including oil, gas and renewables” (2008:2). This version of the energy challenge stresses the idea of a switch from oil to something else as not only inevitable, but relatively easy to do thanks to science and technology. There are no energy resource limits because humans will always be able to find ways to make other energy sources work before major problems arise. I address this theme further later in this thesis.

Total devotes much of its outlooks I review to the analysis of oil supply and demand, and engages directly with the concept of peak oil more than the other Supermajors. Total’s outlooks from 2006-2009 use the words peak oil directly, however its 2010 outlook replace peak oil with ‘plateau oil.’ The message is similar; however, the picture of the future after the peak moment changes. Instead of the production rate dropping, it stabilises or plateaus. As an example of this depiction, Total’s outlook asks itself:
How much longer can supply quench the ever-growing thirst for oil? According to our experts, until about 2020-2025 if the environment remains stable overall. That is when global oil production capacity is expected to reach about 95 million barrels per day, plateauing thereafter. Resource scarcity will not be the culprit. The plateau will be caused instead by structural market constraints related to technical, economic and geopolitical issues, such as investment capacity, lack of manpower, limited access to resources, and political instability. (Total 2010:15)

Like the other Supermajors, Total’s outlooks do not accredit peak or plateau oil to resource scarcity. Instead, technological, economic, and political issues are portrayed as the ‘culprit’. Total’s version of the energy challenge presents the same problems as the other Supermajors, however Total expresses plateau oil as the call-to-action while the other Supermajors emphasise other issues. Total’s outlooks may appear to represent a more critical depiction of the energy future, but the solutions they provide to the ‘energy challenge’ are in line with those of the other Supermajors.

The above quotes of the Supermajors’ energy outlook reports show that the outlooks frame the peak-oil concept in much more similar than different ways. My findings correspond with Bridge and Wood (2010). They argue that some of the differences among Supermajors’ portrayals of peak oil are based on attempts to brand the Supermajor in a way that shows it is different from the other Supermajors. However, I found that the Supermajors’ outlooks discuss the same general themes, narratives, and approaches to problem-solving. When compared with each other, while specific language and interpretations of energy issues are slightly different, the discursive content is largely the same. The future is presented as an energy challenge that requires solutions in the form of economic actions. Resource scarcity in general geological terms was not the problem.
Instead, access to geologically abundant resources was portrayed as inhibited due to economic barriers. Thus, peak oil was presented as a problem to be solved by above-ground, economic agency.

The rough correlation between the size of the Supermajor and its discursive engagement with the peak-oil concept hints at additional complexities beyond the scope of this research. There are likely many strategic decisions being made as to the specific presentation of certain issues like peak oil or global warming. For example, Total is explicitly interested in investing in nuclear energy while ExxonMobil boasts the merits of fossil fuel. But it must be remembered that Total has much less capital invested in oil compared to ExxonMobil, and faces a much harder time breaking in to that market as a relative outsider. Each company has drastically different physical and economic investment portfolios, and a complex intertwining of strategic interests. I decided it would be more beneficial for the purposes of this research to treat the Supermajors as a homogenous group. Though acknowledgement of peak oil as a problem varied in degrees, the similarities I present below show the Supermajors’ framing the peak-oil controversy in a particular way, despite their specific discursive variances.

**Presenting the energy challenge: conventional and unconventional oil**

The Supermajors’ annual energy outlook reports portray the future of oil as challenging, but not bleak, difficult but not impossible, and consistent with advancing human welfare. This section shows that the Supermajors’ outlooks present an energy challenge that consists of acquiring access to new oil supplies, not to stave off physical scarcity, but to disrupt the Supermajors’ competitor’s existing oil market near-
monopolies. Newly available unconventional oil resources are the key to this strategy. Definitions of unconventional oil sources varies, for the purposes of this thesis they consist of oil sands, deepwater oil, and generally any oil that requires excessive refining or extreme measures to be made accessible.

The Supermajor outlooks portray slightly different ratios of the past, present and future energy mix, but all of them forecast fossil fuels remaining as the dominant part of the energy supply, with oil as its primary source. However, they devote relatively little discussion to conventional\textsuperscript{27} oil. When they do, it is usually in regards to new exploration and extraction technologies, not existing ones. According Owen, Inderwildi, and King (2010), among existing sources, conventional crude oil or easy oil has mostly been exploited and is now generally off-limits to new owners. But new, unconventional oil supplies such as the Alberta oil sands or the Gulf of Mexico deepwater oil, are still relatively available. Accessing these supplies requires massive capital investments because they either need excessive refinement, like the oil sands, or are located in remote areas, like deepwater oil. Even though the Supermajor and IEA outlooks forecast these new supplies as representing a minor share in the future global energy mix, the outlooks often stress the importance of investing and promoting their development.

According to Forbes, 77\% of the world’s oil is owned by nationalised oil companies (Helman 2010). These include the companies that make up OPEC\textsuperscript{28} as well as, in no

\textsuperscript{27} There are claimed to be many kinds and grades of conventional crude oil but for the sake of brevity they will be included as single category, distinct from unconventional oil.

\textsuperscript{28} OPEC produced discourses were not included as data in this thesis for reasons stated in chapter one.
particular order, Gazpom (Russia), Petrobras (Brazil), China National Petroleum Corporation (China) and Petroleos Mexicanos (Mexico). Reserves estimates are highly controversial and different sites make different estimations as to what constitutes the ‘size’ of an oil field as well as an oil company. Nonetheless, it is widely accepted by those involved in the oil industry that although the Supermajors are massive corporations\(^{29}\), as non-state entities they own only a small fraction of the known oil in the ground.

According to Bridge and Wood (2010), a Supermajor’s financial performance is only indirectly related to its ownership of an oil field. The top ten oil companies who own the largest oil reserves are all nationalised. ExxonMobil is 14\(^{th}\) on that list, and as the largest Supermajor it owns a mere 1\% of the world’s oil (2010). OPEC members by contrast claim to collectively own 81\%\(^{30}\) of the world’s oil (OPEC 2010). Bridge and Wood (2010) argue that much of Supermajor operations do not directly involve oil extraction but the rest of the production and distribution chain from finding new sources of oil to refining and selling oil products. The Supermajors would have even more control over the end-price if they own more of the resources that supply the production chain.

Further, Bridge and Wood (2010) claim that if demand increases faster than the conventional sources can supply and if it translates into enough of a price increase, then fossil fuels must increasingly come from more unconventional sources. As new

\(^{29}\) As explained in chapter one, the Supermajors are publicly-owned through corporate shares, but they are not to be confused with state-owned oil companies.

\(^{30}\) The above conflicting percentages show that there is much discrepancy in the numbers of who owns how much oil in the world. A discussion of these numbers is beyond the scope of this thesis and is often discussed elsewhere.
conventional reserves are practically off-limits to the Supermajors, new unconventional reserves help inflate the growth of overall company reserves. Emphasizing the growth of a company’s oil reserves provides comfort to its shareholders as well as the public at large. Unconventional sources are not nearly as profitable, energy dense, or even accessible, but effective discursive management can obscure the Supermajors precarious position.

Unconventional oil reserves, as well as other alternative energy sources, provide a way for the Supermajors to break up or at least challenge the nationalised oil companies near monopoly on increasing the oil supply from conventional sources. The solutions to the challenges presented by the outlooks may be presented as above-ground agencies, however from the perspective of the Supermajors there is an issue of control over a below-ground resource. Using Latour (2005) terms from chapter one, conventional oil sources are intermediary in the Supermajor future forecast, the future of conventional crude oil is already ‘locked up’. I give an example of this from Total’s 2007 outlook:

Where does R&D fit into Total’s strategy objectives? There are two aspects to consider. For oil and gas, we have a core business strategy: Total must shift to oil sands, deep resources, sour gas, etc. to step up production through accessible resources that are not “locked up” by national oil companies. (Total 2007:15)

In the Supermajors’ outlooks, crude oil’s future is largely pre-determined, established, and made real, as it is already ‘owned’. Its status as a supply is already given, and as such its agency is limited to those who ‘own’ it. However, unconventional oil supplies are uncertain, unproven, unpredictable mediators; they represent the ‘frontier’ of energy, and
their relative uncontrollable agency is made visible as efforts are made to make sense of them.

A public debate is ongoing as to the status of the Canadian oil sands as an environmental issue, a pipeline issue, a job security issue, etc. Discursively, the Supermajors rein-in the complicated agency of this uncertain energy source, making it simple and predictable. BP’s 2009 outlook was entitled ‘operating at the energy frontiers’. A key theme throughout was the exploration and subsequent exploitation of new or previously unavailable energy resources. In a page devoted to the Canadian oil sands, also known as the tar sands, BP’s 2009 outlook asked itself the following question: “Does the world need oil from the oil sands?” Its reply was:

We estimate that demand for energy will rise significantly in the future. The International Energy Agency has indicated that, even if GHG emissions are tightly constrained, fossil fuels will still be the dominant source of energy in 2030 and that the world will require a wide range of hydrocarbons within a balanced and sustainable energy mix. We believe there is enough supply to meet that demand affordably, through conventional and unconventional resources such as oil sands. (BP 2009:12)

This representation of the future as dependent on existing and newly developed sources of oil was found often throughout the various Supermajor outlooks. Sourcing their data from the IEA, they all claimed energy demand will rise, fossil fuels will remain a dominant source of energy, and a sustainable mix of energy types must be found to adequately satisfy the rising demand. Sustainable in this sense not only means physical fuel meeting a physical demand, but a sustainable profit portfolio for the Supermajor. Conventional fuels are becoming increasingly unable to meet either of these versions of corporate sustainability.
Unconventional fuels are still relatively untapped, offering an opportunity for the Supermajors. However, even if a glut of unconventional fuels exists underground, to extract them requires certain pre-existing market prices. Depicting the oil sands as easily extractable as long as ‘the price is right’ serves as an example of a complicated issue that is given a specific, limited frame, in order to reduce its agency to the status of an intermediary that serves the interest of the Supermajors. This is illustrated when BP’s 2009 outlook asks itself: “Has BP properly examined the commercial risks of oil sands projects?” Its reply:

Current estimates indicate that the average break-even price for Canadian oil sands projects range somewhere between $45 and $70 per barrel. BP’s current view of oil prices assumes a range of $60 to $90 per barrel out to 2015 and requires all projects to offer an acceptable rate of return at $60 per barrel. All investments in Canadian oil sands will be required to meet these basic criteria. (BP 2009:12)

The Supermajors are interchangeably considered corporations, companies or businesses. They implicitly exist in order to make an economic profit. Thus, their portrayal of sustainability in part means sustainable profit generation for themselves. Energy sources, no matter what they are, are not worth investing in through a Supermajor frame if they do not turn a profit. At the same time, as already established energies, such as conventional crude oil, become more expensive, other energy sources become profitable, and thus available through an economic frame.

According to classic economics, the concept of peak oil can promote the idea of scarcity, which increases the potential consumer willingness to pay higher prices. Still, it
must be remembered that the Supermajors are themselves consumers of crude oil. According to Labban (2010) as the Supermajors buy much of their crude oil from nationalized sources, then refine it themselves, they likely want cheap international crude oil prices, but also international markets willing to pay for expensive refined oil products.

Low crude oil prices and high refined oil prices can be achieved and maintained to a willing public if “narratives that re-frame oil extraction as a difficult and costly task in the face of physical scarcity… help legitimize prices and the status quo of large energy companies dedicated to the production and marketing of fossil fuels” (Bridge and Wood 2010:575). When international crude oil prices are low, the Supermajors can buy their oil from conventional markets. When crude oil prices are high and unconventionals ‘exist’, the Supermajors can buy their oil from unconventional markets. But the Supermajors can own the unconventional sources if they are able to provide the economic and materiel investments to get there first in order to stake their claim. From the perspective of the Supermajor, unconventionals look like a win-win scenario. They can own or buy new supplies and therefore challenge OPECs near monopoly on oil. This perspective also makes the perceived problem of peak oil solve itself, as the market balances the relationship between supply and demand. Higher prices means more oil will become available.

The oil in the ground is irrelevant if it is too expensive to extract, but once prices rise and its extraction becomes economically viable, it becomes available—it effectively begins to exist. This is why the Supermajors’ outlooks can confidently promote

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31 Crude oil refers to unrefined conventional and unconventional oil. Petroleum is often interchangeably used to refer to crude oil or refined oil.
abundance of oil supplies. The logic they use dictates that while conventional, pre-
existing oil is already under the control of nationalised oil companies, unclaimed,
undeveloped and unconventional oil supplies will increasingly become available. This 
resource abundance means that if peak oil happens, it will be so far into the future that it
is not a concern. Thus, oil is presented as a symbiotic relationship between resources and
profit or a geological-market actant. The above-ground frame shows oil as a phenomenon
of geology, but it presents higher prices to make new oil extractable and thus exist in
practice. Thus, the above-ground frame shows the key forces as prices or markets, not
geology.

The Supermajors’ presentation of the energy challenge consists of acquiring access to
new oil supplies, not to stave off physical scarcity, but to disrupt their competitors,
largely OPEC, existing oil market near-monopolies. There are further complications to
the aforementioned analysis. Supply needs to satisfy demand, but demand is needed in
order to maintain a supply. Resource issues aside, the Supermajors require markets to sell
their products. The problem with unconventional oil is it is often considered ‘dirty’ as it
emits more toxic gases and carbon dioxide (C02) than conventional oil. The public
appears concerned that C02 emissions are causing looming climate change, which leaves
the Supermajors with a fundamental problem. They need to persuade the public and
governments to allow them access to unconventional oil resources, but they also need to
persuade them to buy the products made from those resources. Or failing that, the
Supermajors may consider non-oil energy sources as a larger part of their business
portfolio.
Solving the energy challenge: climate change and energy efficiency

The discursive invocation of the issue of climate change may be considered an excellent moral framing to the Supermajors’ claimed ‘energy challenge’. By aligning their problems with those of a popular public issue, such as climate change, the Supermajors can frame their strategies as environmentally friendly or ‘green’. This gives a moral justification for the Supermajors business strategies. The following quote from BP’s 2007 outlook exemplifies this:

In the industry, the year was marked by high and volatile prices, rising concerns about climate change and fears over security of energy supplies as some governments asserted greater control over national resources. As we set out our response to these challenges, we must start by acknowledging that BP is predominantly an oil and gas business. However, this is not incompatible with environmental progress because there will be a continuing role for fossil fuels in the future alongside greater energy efficiency and more low-carbon energy. Our aim is not to abandon fossil fuels, but to produce and use them more efficiently, while scaling up and investing significant resources in the new technologies we need for the transition to a low-carbon future. This is what we mean by going ‘beyond petroleum’ and it is reflected in this report. (BP 2007:1)

Despite the slogan of beyond petroleum, BP does not claim it is giving up on fossil fuels. Instead, it promotes more efficient use of these fuels whilst developing ‘low-carbon’ energy sources like natural gas that is claimed to emit less C02 than coal. This can be marketed as a global warming preventative measure. The Supermajors are ‘locked out’ of conventional oil, but also conventional natural gas as it exists alongside oil deposits. Like oil, unconventional natural gas sources become available as international gas prices rise.

Supermajors such as BP can promote efficiency in the use of fossil fuels to increase the transition time from conventional to unconventional resources. This efficiency is framed
in terms of using less energy, and thus less C02 is outputted. This is win-win for the Supermajors, because not only can they brand themselves as concerned for climate change, but they can actually do concrete things that reduce C02 output without harming their profits. While they may lobby in the background to promote denial of climate change (Bridge and Wood 2010), in the foreground they can show the things they do to prevent or at least delay it.

Reducing C02 output is beneficial to the Supermajors not only in terms of public branding, but political strategy as well. Regardless of the validity of the climate change concept, if governments act to place limits on C02 output or public consumption patterns do the same, fossil fuels that emit high C02 in their use will sell less or be taxed more or both. Either way, the Supermajors likely do not encourage the perceived onset of climate change, but they no longer publicly deny it as a concept. Instead, they discursively manipulate it to fit their own strategies. This is exemplified by the following quote from Total’s 2006 outlook:

Manufacturers like Total have to consider and plan for the impact of a product throughout its entire life cycle. This process involves finding innovative solutions to improve our products’ environmental performance, starting in the design phase right through to end-of-life. Curbing harmful emissions, recycling waste and designing new products are just some of the ways in which we are meeting this challenge. (Total 2006:51)

This portrayal of ‘environmental performance’ dictates that Supermajors can reduce C02 emissions by developing the right, improved, products. Recycling waste refers to the general notion of efficiency—using less but getting more out of it. The Supermajors are
both consumers and producers of fossil fuels so it is advantageous for them to use less fossil fuels in their own operations.

If efficient usage of fossil fuels reduces their demand, then fossil fuel companies will sell less of these fuels now, but retain those fuels to sell later. This appears as a win-win solution for everyone and allows for longer exploitation of a finite resource. All of the Supermajors’ outlooks project massive gains in energy efficiency. Here is an example from ExxonMobil’s 2008 outlook:

in developing this Outlook we assume significant efficiency improvements over time. Our forecast is that energy-intensity gains to 2030 will average 70 percent faster improvement per year compared to historical trends. Compared to 2005 levels, these intensity gains translate to energy savings of approximately 170 MBDOE by 2030 – about double the corresponding growth in demand. (ExxonMobil 2008:15)

When the Supermajors’ outlooks make their projections they assume certain strides in fossil fuel usage efficiency will be made. With the exception of a brief sentence in Chevron’s 2006 outlook, the outlooks always use the word efficiency, rather than conservation, when referring to reduced future fuel demand. Both efficiency and conservation reduce fuel demand, however they suggest two different approaches. Efficient use of fuel uses less fuel to get the same end result whereas conservative use of fuel uses less fuel to get less of a result. For example, given the same amount of fuel in a tank, a fuel efficient car travels further than a car that simply conserves fuel. The efficient car still technically conserves fuel, but it goes a greater distance in doing so.

It seems counter-intuitive to suggest that Supermajors want people to use oil more efficiently. If gas mileage improved, people would need to buy less gas to travel the same
distances. But as stated in the last section, the Supermajors themselves buy crude oil from elsewhere. If crude oil demand increases too fast and supply cannot keep up, then according to classic economics prices for crude oil would rise. The Supermajors can push increased crude oil prices down to their consumers, but not indefinitely. If the concept of peak oil holds true, this puts the Supermajors themselves in a precarious position. However, if the Supermajors can develop their own monopolies on unconventional fossil fuels, a peak oil event, perceived or actual, could see their profits rise dramatically. As owners of crude fuel, they could benefit from price spikes and even manipulate resource scarcity. Fossil fuel efficiency that reduces demand could buy time for the Supermajors to develop their monopolies without convincing people to change their consumption patterns. The public can continue to consume fossil fuels, but they can do so better. The outlooks portray this as a win-win scenario for everyone.

The Supermajors future energy outlooks can be considered a case of a finely calculated balance that is actively and intentionally, to a certain degree, maintained. On one hand, internally the Supermajors likely spend more effort than anyone predicting the future of energy consumption, but, on the other hand, externally they need to help foster perception of a reality that is favourable to them. Discursively combining CO2 output concerns with fossil fuel efficiency is a clever way for Supermajors to promote green branding, cut operation costs, and stretch a finite resource while obtaining another, all without having to significantly change their operating practices.

The Supermajor outlooks explicitly claim to show an objective reality and a prediction of the future based on objective facts, but they do not always source their statistics. When
they do, the statistics are usually either cited as in-house or taken from the IEA. The Supermajor outlooks *never* show their in-house prediction methodology. Instead, the outlooks all have similar disclaimers in tiny writing:

>This presentation includes forward-looking statements. Actual future conditions (including economic conditions, energy demand and energy supply) could differ materially due to changes in technology, the development of new supply sources, political events, demographic changes… (ExxonMobil 2010:2) demand and pricing; operational problems; general economic conditions; political stability and economic growth in relevant areas of the world; changes in laws and governmental regulations; regulatory action; exchange rate fluctuations; development and use of new technology; changes in public expectations and other changes in business conditions; the actions of competitors; natural disasters and adverse weather conditions; wars and acts of terrorism or sabotage… (BP 2010:4)

Further, the Supermajor outlooks list websites people can visit to find other additional factors that could make all the outlooks’ forward-looking statements wrong. These outlooks present an explicitly certain view to an implicitly uncertain future. Bold lettering confidently shows the way forward while tiny lettering cautiously warns against that confidence.

The Supermajors’ outlooks depict a forecast of the future. In doing so, they convince some people to view the present in a certain way. The above legal disclaimer that protects the Supermajors from their potentially faulty forecasts shows that not everyone trusts these forecasts to be accurate. While statistics from Supermajor outlooks are sometimes used in outside publications, those who disagree with Supermajors’ business practises are quick to point to their outlooks as presenting a ‘false’ reality. However, the Supermajors often explicitly cite the sources for their predictions as coming from the International Energy Agency. This necessitates examining the IEA source.
The IEA: informing the energy challenge

The International Energy Agency style themselves as an ‘energy NATO’ formed in direct response to the 1973 OPEC oil embargo on the West (IEA 2010a). They used the term energy NATO to compare their conflict with OPEC to the Cold War Era conflict between NATO and the Warsaw Pact. However, the IEA opposed OPEC through policy recommendations, not oil production. Instead of representing oil producing countries like OPEC does, the IEA is a think-tank that claims to produce “authoritative and unbiased research, statistics, analysis and recommendations” (IEA 2012) for its member countries. These are European, excluding Russia, and North American countries with a few exceptions such as Japan, Australia, and New Zealand32.

I found the IEA to be the most widely quoted centralized authority that produced the most broadly used energy statistics. The IEA promotes this as they consider themselves “at the heart of global dialogue on energy” (IEA 2012). Most scientific papers writing on energy cite IEA statistics directly or indirectly through the citation chain. It appears to be assumed that the IEA is a trustworthy data site, however it must be noted my data collection was limited to Western sources. It is highly possible that non-Western sources do not place so much trust in the IEA, however that discussion is beyond the scope of this thesis.

The IEA website33 has a massive database of energy statistics documents. These documents are not peer-reviewed in the traditional academic sense and only a few concise documents are available for free. However, other than Aleklett et. al. (2010),

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32 A full listing of IEA member countries can be found at http://www.iea.org/about/membercountries.asp.
33 A database of IEA statistics can be found at http://www.iea.org/stats/index.asp.
which I discuss below, I could find no academic literature critical of the IEA.

Considering the authority the IEA has on energy statistics, I assumed academic literature would provide more critical analysis of IEA methods. Instead, it appears as if IEA work is ‘black boxed’, in that the IEA is so successful in producing accepted energy statistics that the details of their work are made invisible (Latour 1999). IEA data collection techniques, analysis, and conclusions are often assumed to provide reliable representations of reality. This reading of the IEA casts it the role of an intermediary actor in a scientific perception of the world that dictates a reality ‘out there’. This actor correctly interprets it and presents it for others to view. The IEA then become trusted arbiters of the ‘truth’ in regards to the energy reality. However, it is an explicitly political entity representing their member states, corporate interests and free-market ideals (IEA 2012), a fact that may get lost in the citational chain. I return to this at the end of the section.

The IEA publish annual energy outlook reports entitled World Energy Outlook. I refer to them as outlooks. IEA outlooks are approximately 700 pages long, much longer than Supermajor outlooks, which are up to 80 pages long. I reviewed the 2006-2011 IEA outlooks.

I begin discussion with the 2008 IEA outlook as it had an emphasis on oil in particular. It was written in the midst of an international economic crisis when oil prices began skyrocketing. In the first paragraph of its foreword it states, “The era of cheap oil is over”

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34 While their findings were often directly cited, their methodology was not. I had to find it myself through a search of their website.
This was likely intended as a powerful political statement as it later stated that peak oil represents a problem in investment:

The big resources lie, increasingly, in a few countries, whose share of the world market climbs inexorably. The international oil companies have diminishing access to these reserves. Investment per barrel of oil produced has shot up. But big producers are becoming so wealthy that they are losing the incentive to invest. Though the resources are there, the world will struggle to satisfy its thirst for oil, even at today’s prices. (IEA 2008:3)

This statement shows the outlook presenting above-ground agency as the primary problem in regards to extracting oil. There are economic barriers preventing companies like the Supermajors in accessing oil resources. The resources are there, but there lacks a will to invest in extracting them. As such, peak oil is largely framed as an investment problem:

A growing number of oil companies and analysts have suggested that oil production may peak within the next two decades, as a result of limits on the amount of investment that can be mobilised, rising costs and political and geological factors. (2008:5)

In fact, the immediate risk to supply is not one of a lack of global resources, but rather a lack of investment where it is needed. (2008:39)

The IEA outlook goes on to claim:

Though most of the increase in reserves has come from revisions made in the 1980s in OPEC countries rather than from new discoveries, modest increases have continued since 1990, despite rising consumption. The volume of oil discovered each year on average has been higher since 2000 than in the 1990s, thanks to increased exploration activity and improvements in technology, though production continues to outstrip discoveries... (2008:43)

This is important to note, as

Although global oil production in total is not expected to peak before 2030, production of conventional oil — crude oil, natural gas liquids
(NGLs) and enhanced oil recovery (EOR) — is projected to level off towards the end of the projection period. (2008:42)

Non-OPEC conventional oil production is already at plateau and is projected to start to decline by around the middle of the next decade, accelerating through to the end of the projection period. Production has already peaked in most non-OPEC countries and will peak in most others before 2030. (2008:43)

The 2008 IEA outlook claimed that due to lack of proper investments, non-OPEC peak oil has already occurred and overall, the world is dependent on OPEC to prevent peak oil in the near future. Due to new technologies and increased exploration for oil, new oil discoveries are being made but they are only helping us to level off the amount of non-OPEC oil we can produce. Remember that the IEA was formed to oppose OPEC, not by means of oil production, but by political persuasion. The IEA claims of dependence on OPEC to prevent peak oil may be a mixture of geological data assessment and political maneuvering.

Fueling peak-oil controversy were claims that OPEC members arbitrarily raised their oil reserve estimates in the 1980’s. According to Simmons (2005) this was done in order to increase their production quotas, as OPEC only allowed its members to produce oil at a certain rate in relation to how much oil the members claimed they owned. Geological assessments of these oil reserves are state secrets. There is no way to independently verify these numbers and one must trust they are getting the right statistics. So how do we know the IEA was using the right statistics?

Both trust and what is deemed to be right are highly controversial in many reserve estimates, and even more controversial are the reserves claimed as ‘yet to be discovered’. Despite IEA statistical methods being ‘black boxes’, Callon and Latour (1981) tell us that
black boxes are leaky and not always as solid as they seem, as there are usually people, or things, that threaten to open them. Despite being little more than an educated guess, reserves yet to be discovered are factored in to many future oil estimates, leaving these estimates wide open for attack by critics.

One critic of the 2008 IEA outlook was a self-proclaimed whistleblower who worked for the IEA. Critical of the assessments made in the outlook, he or she claimed that “Many inside the organisation believe that maintaining oil supplies at even 90m to 95m barrels a day would be impossible but there are fears that panic could spread on the financial markets if the figures were brought down further” (Macalister 2009). As a point of reference, the 2008 IEA outlook claimed 85 million barrels per day (mb/d) were consumed in 2007, and 106 mb/d will be consumed in 2030. Not much seemed to come from this critic’s attack on the outlook other than a few articles in newspapers making the IEA look bad (Macalister 2009); however, it may have motivated further inquiry.

A second attack on the 2008 outlook came from an academic report acting as a version of peer review. It examined the outlook and came to similar conclusions as the whistleblower. Using the same data as the IEA, but a different methodology, the authors found “The future production that IEA proposes assumes unrealistically high values” (Aleklett et al. 2010:17). This study used a different technique to form an estimated guess of yet to be discovered reserves and came to different results than the IEA outlook as to how much oil could be produced in the future.

The above two attacks on the 2008 outlook are by no means able to destroy the credibility of the IEA, and should not be treated as any more ‘real’ than the IEA’s claims.
However, it is worth noting that IEA statistics are an integral part of a much larger actor-network involving global energy policy, academic research and even activism. The data they produce can be used to legitimate a wide variety of claims. The 2011 IEA outlook reduced the projected oil production estimates, showing the world consumed 87 mb/d in 2010 and forecasted that consumption to rise to only 99 mb/d by 2035. The reason given for this reduced estimate was not that geological limits were discovered, but that the global recession briefly curtailed growing energy demand (IEA 2011). Yet environmental activists concerned about impending peak oil could use this change in forecast to ‘prove’ that peak oil is nigh. This shows that depending on one’s frame of analysis, facts exist on a contestable terrain in the consideration of peak oil. I discuss this further next chapter.

To conclude this chapter, I present the kinds of logic that appear throughout both the Supermajors’ and IEA annual energy outlook reports:

[The concept of] Peak Oil expresses contempt of economic analysis, and gives no attention to economic considerations. To an economist like myself, the clear case of depletion is a situation where exploitation becomes increasingly more expensive and where the price rises in consequence, leading to falling demand, in the extreme case down to zero. In my studies over forty years of the economics of raw materials, I have not come across any indubitable example of an exhaustible resource material whose costs and prices have risen due to depletion, with an ensuing long-run decline in consumption and output. (Radetzki 2010)

I quote this statement because it represents the framing of the future of oil by the Supermajors’ and IEA outlooks. The statement also represents the views of nearly every classical economist I have ever read, or met, that knows about peak oil and wishes to talk about it. These economists usually claim that as oil prices increase, more oil will be found, or we will simply use less of it as it gets too expensive. Faith in the power of
technology means people believe they will have a never-ending ability to generate more energy as needed. The general economist consensus is that immutable laws of supply and demand will not lead us to an energy precipice, especially one as drastic as some proponents of peak oil present.

The above-ground frame presented mobilizes many different actants in the shaping of its discourse. These actants include technological products, humans with creative potential, and rational schema, such as economic formula, that present peak oil as a solvable problem. This chapter has presented my findings of the above-ground, economic frame as presented by the Supermajors’ and IEA annual energy outlook reports. The next chapter examines the non-human-centred discourse shown by the below-ground frame, and asks how it shows its version of the peak oil story.
Chapter 4. Below-ground Frame: Intrinsic Physical Value

This chapter builds on the last by showing a second framing of the peak-oil concept. I call this the below-ground frame. The sites that act as contributors to this frame include scientists studying geology, energy, and technology, as well as activists’ work in public documentaries themed to demonstrate what ‘peak oil is’. Geologists define oil using geological theories, terms, and measurements thus ‘imagining’ oil in a certain way. Scientists studying energy in general look at the claimed physical properties of various energy sources. Both scientific communities then borrow insights from each other to predict certain technologies required to solve their version of ‘the energy challenge’. These scientists publish papers, and are interviewed in documentaries that are made to promote certain political agendas or at least depict certain possible futures. Like the above-ground frame described last chapter, the below-ground frame presents a certain energy challenge. This challenge depicts certain problems and ways to go about addressing these problems.

This chapter argues that scientific papers and peak-oil documentaries frame oil as a product of intrinsic physical value, that oil has value unto itself. This value is derived from the energy oil outputs when it is burned. In this below-ground frame, raw energy is the primary consideration, not economics. Oil is considered a resource to be exploited for energy gain, its depletion and subsequent replacement are dictated by geological forces, and it is quantitatively limited. The challenges that this frame shows can only be solved via geological and technological means that make more energy available. Oil is considered to be special and difficult to replace despite the economic incentives discussed
last chapter. The various technologies, energy sources, and products that allow for oil to be substituted for something else in the above-ground frame are largely considered in terms of their inherent energy value, not their price tag.

I start this chapter by examining a presentation by M. King Hubbert, the figurehead of the below-ground frame, the geologist credited with having ‘discovered’ the peak oil concept just over fifty years ago. I show that the initial creation of peak-oil discourse postulates a hard, objective reality existing ‘out there’, awaiting discovery. I then discuss how scientists studying geology and energy perceive oil on these objective grounds, and how they use these assertions to dictate different, non-economic, logics of investment in regards to energy. To begin my examination of the below-ground frame, I turn to the initial formation of the peak-oil concept.

**Imagining oil**

_Then, as now, a voyager starting out on a major expedition of discovery needed to equip himself with charts of two kinds. He needed the large-scale detailed charts for piloting along known shores, and the comprehensive charts of whole oceans, of even of the known world, as a guide for his major navigations._ (Hubbert 1956:2)

The beginning of peak-oil discourse has been widely attributed to Shell geologist M. King Hubbert’s 1956 presentation to the American Petroleum Institute entitled *Nuclear Energy and the Fossil Fuels*. I show how the peak-oil concept began by first presenting a description of Hubbert’s presentation. I then discuss this presentation in the next few paragraphs.

This thesis considers peak oil a product of the social imaginary, however there are many people that consider it to be objectively real. M. King Hubbert is unanimously
accredited as being the first of these people. Hubbert began the first promotion of the peak-oil concept with the above-quoted navigation analogy, which formed the narrative thread for the rest of his presentation. The analogy dictates that the graphs he used could be considered navigational charts as if they represented a hard, objective world that need only be revealed. Once charted, it was simply a matter of plotting an effective course. To plot the course of the American oil supply, Hubbert presented a brief historical summary of oil, stating: “No better record exists of the history of the exploitation of the fossil fuels than the annual statistics of their production” (1956:6). He then showed a few graphs describing past production rates of oil growing exponentially and asked: “How many periods of doubling can be sustained before the production rate would reach astronomical magnitudes?” (1956:8). After discussing predicted reserves and the mathematics involved in predicting US production futures, he showed a graph with a bell-shaped line: “the curve must culminate at about 1965 and then must decline at a rate comparable to its earlier rate of growth” (1956:24). To illustrate the highest point of the curve he used the phrase ‘the ultimate production peak’. Peak oil later became a shorthand way of using this phrase. It was a qualitative description—a bell-shaped line—of a quantitative measurement, a production rate. The problem with Hubbert’s speculation is that peak oil is but a line drawn on a map, and both that line and map are contested.

It is clear that in Hubbert’s above presentation he is postulating an objective reality ‘out there’ that needs to be revealed in order to solve perceived problems. However, an engagement with sociological literature shows the difficulties inherent in attempting to promote a concept based solely on a claimed objective reality. This is because reality
itself is a contestable terrain. As an example, one scholar insists that “the Peak Oil view of the prospects for global oil production is inconsistent, void of theoretical foundations and has no support in empirical observations. The analysis is therefore defective and misleading” (Radetzki 2010:6567). According to Verbruggen and Al Marchohi (2010), this kind of refutation is exactly what Hubbert encountered after his 1956 presentation. In this presentation, described above, Hubbert claimed that American oil production would peak in 1965. According to the U.S. Energy Information Administration (2012), American oil production peaked in 1970, and has been in overall decline ever since. There has been a slight increase in production since 2008, but overall the rate remains just over half of what it was in 1970\(^\text{35}\) (2012). Some scholars claim Hubbert’s prediction of American peak oil is proof that global peak oil can also be accurately predicted (ASPO 2012), while others consider Hubbert’s accurate prediction a stroke of luck based on a much smaller data set (Radetzki 2010). Regardless, as illustrated throughout this thesis, just because something seems logical and real, does not mean everyone will agree with those logics or that reality. Instead, different frames show different logics and realities.

The below-ground frame, championed by people such as Hubbert, considers oil as an absolutely objective thing in the world. This was illustrated in Hubbert’s above presentation:

\[
\text{when we consider that it has taken 500 million years of geological history to accumulate the present supplies of fossil fuels, it should be clear that, although the same geological processes are still operative,}
\]

\(^{35}\) According to the US EIA, in 1970 the US produced 9,637 Thousand oil Barrels per Day (Mbbl/d) whereas in 2011 it produced 5,673 Mbbl/d. According to the IEA, in 2011 global oil consumption was 87,000 Mbbl/d or 87 Million Barrels per Day (mb/d).
the amount of new fossil fuels that is likely to be produced during the next few thousands of years will be inconsequential. (Hubbert 1956:4).

This statement forms the crux of the peak oil concept. The presumption is that since oil is a finite resource, a maximum rate of oil extraction is logically inevitable. This is the ultimate fall-back position of the below-ground frame. Yet, while this seems hard to disagree with, it is not important to everyone. As I showed last chapter, the above-ground frame demonstrates that a reduced demand for oil makes the geology of oil largely irrelevant. Thus, the key assumption of the below-ground frame is that oil is so special that demand for it shows no signs of decreasing.

Hubbert and peak oil discourse carries particular cultural framings of nature in their implicit ontologies—that humans form a relatively homogenous species and that there are divides between what is social and what is natural. Ultimately, nature will triumph. A nature-oriented approach that lumps all humans together as powerless creatures, relative to nature, is illustrated by generalized statements such as this:

throughout all human history until about the thirteenth century, the human race, in common with all other members of the plant and animal complex, had been solely dependent upon the contemporary solar energy which it had been able to command. This comprised the energy from the food it was able to consume, that of the wood burned for fuel, and a trivial amount of power obtained from beasts of burden, from wind, and from flowing water. (Hubbert 1956:5)

Below-ground depictions of the peak-oil concept always have some variation of the above assumption of human interaction with nature. Because we are organic creatures, in order to survive we require energy from outside sources. Obtaining this energy is our most fundamental concern. This assumption is not usually found in the above-ground
frame depictions of peak oil. That is not to say that proponents of that frame do not believe in these supposed fundamentals of nature, but they are not as concerned with them, and do not emphasise them. Oil is imagined alongside a dollar sign, not as source of raw energy. Both dollars and energy are important for our usage of oil, but the importance of these considerations is depicted differently via the above and below-ground frames.

Different visualizations can occur if we imagine crude oil in a reservoir. Oil extraction can be a simple, straightforward matter of finding the right economic incentive. It is easy to think of oil as a liquid sitting in a massive pool just beneath the surface, ready and waiting for extraction once someone is paid enough to do so. According to geologists, however, this is not the case. They claim that if one were to dig a very deep hole, take a flashlight and climb down to the inside of a reservoir, one would see nothing but solid rock. Unless one also brought a microscope along, one would fail to notice that the rock is actually porous. Crude oil moves between those pores; it does not simply sit there, and a vast number of geological processes lead to certain grades of crude oil. No two reservoirs are the same, and some reservoirs are more productive than others (Smith 2007). According to geologists, and the below-ground frame, to further understand oil requires invoking a complex physical definition:

Crude oil is a mixture of thousands of hydrocarbon compounds \( \text{C}_{n}\text{H}_{2n+2} \). The actual composition of crude oil varies with the area of origin. Conventional oil is a liquid lighter than water (API- gravity410) of which 20–30% of the oil in place may flow naturally from the bore hole because of the pressure within the reservoir or can be pumped by simple mechanical force (primary recovery) (Craig et al.,2001). A higher extraction rate of the conventional oil in place requires enhanced oil recovery techniques (e.g. water flooding, steam injection and CO2
pressurizing) at higher production costs (see Fig. 1). Non-conventional oil is the rest, encompassing extra heavy oil, oil sands, oil shale, gas to liquids and coal to liquids. (Verbruggen and Al Marchohi 2010:5573)

This definition combines quantitative measurements, abstract descriptions and mathematical calculations to delegate the complicated work of describing oil and predicting its agency in terms of statistical relevance. These statistical data show why oil does what it does, what it will do when something else interacts with it, and what it will likely do in the future when it no longer wants to move up the massive straws people and machinery dig into the ground. However the data also show that there are numerous complications and variables involved in this extraction, as each oil source is constituted as numerically special. Like the traits of a person, different kinds of oil do very different things, and dealing with oil requires training people to understand these complexities.

When the above-ground frame shows that we can effectively replace oil with an alternative source of energy, the concept of peak oil is shown as non-real, or at least non-problematic. Peak oil is not a problem if we manage to substitute oil with something else to get the same energy or products. The above-ground frame portrays this substitution as a relatively straight-forward matter of investing in the right vaguely defined technologies. The below-ground frame shows a complexity of variables that need be considered to find an adequate replacement to oil. Here is an example of what is required of an alternative to oil in the below-ground framing of the issue:

1. be rapidly scalable to needed capacity; 2. have a high EROEI; 3. be transportable, storable, and energy dense; 4. be renewable and not just another finite, temporary measure (such as nuclear); and 5. not degrade or derange the environment and its ecosystem services, with a specific focus on human health implications (which would rule out oil sands and oil shale). (Schwartz et. al. 2011:1562)
The below-ground frame shows a physical, intrinsic, definition of an alternative to oil and none of these considerations are economic. I discuss these considerations in detail later in this chapter. For now, I present a brief summary of each. Rapidly scalable considers how much energy is needed and how fast it can be physically made available. EROEI stands for energy return on energy invested. It is like an economic investment but it prioritises physical energy return instead of economic return. The below-ground frame stresses the importance of the objective properties of the alternative, whether it is a liquid, gas, or solid, and how much energy it contains in relation to the size that it takes up.

Renewability is a consideration of sustainability regardless of how expensive it is. An energy source can only be renewable if it does not exploit a finite resource. The last consideration is likely the most controversial. Unlike the above concerns, environmental and health degradation are difficult to objectively measure, but the below-ground frame attempts to nonetheless. The September 2011 issue of the *American Journal of Public Health* was devoted to the potential human health implications of the peak-oil concept (AJPH 2011) and many peak-oil activists protest the environmental impacts of unconventional oil projects like Alberta’s oil sands.

The above and below-ground frames show vastly different priorities in regards to alternatives to oil. Each frame stresses it shows the right priorities, however, in doing so it runs the risk of emphasising only certain kinds of agency. Oil consists of a co-production between human and non-human actors. It takes capital, both physical machinery and economic incentives, to extract oil but it also takes scientific, technical knowledge to find oil in the first place and figure out what to do with it. The two frames
do not deny this. Instead, they limit discussion to largely one actor or the other, human or non-human. The below-ground frame accuses the above-ground frame of ignoring non-human agency. In doing so, focus on the physical properties of potential alternatives to oil ignores the various economic agencies embedded into the energy sources. A pure focus on the perceived physical nature of an energy source may ignore the economic relationships being co-produced alongside it. I further discuss this co-production as I examine in detail the claims made by the below-ground frame as to the variables that must be considered in order to replace oil with an alternative.

**Investing in alternatives to oil**

Alternative energy is a term often used to describe something that will replace oil, but that replacement is usually portrayed as being made available due to technological advancement. Technology in this sense is a thing that replaces something else and in doing so, does the activity better than the thing that it replaced. Common assumptions are that new drilling techniques unlock new sources of oil and new observational devices find more oil. Or, new ways to harness the energy inherent in a variety of things found in nature can allow us to replace oil with something else. In both the above and below-ground frames, technology is always considered as something new and constantly advancing when given the proper motivation. The above-ground frame shows this motivation as economic incentives. Give people money and they will work to invent new technology. Because the below-ground depiction greatly limits, if not ignores, human agency, then many of the technologies championed by the above-ground depiction appear as impossible or highly impractical. Limits are not only placed on the geology of oil, but
on the physical properties of the alternatives claimed to replace it. The above-ground frame shows potential whereas the below-ground frame shows limits.

Langdon Winner (1980) claims that technological artifacts are not neutral innate objects free from influencing social reality. Instead, they serve as political actors in a social paradigm through intentional, unintentional and innate means. There are countless “instances in which the invention, design, or arrangement of a specific technical device or system becomes a way of settling an issue in the affairs of a particular community” (Winner 1980:123). Winner gave an example of this with the story of Robert Moses, a famous architect who designed New York City bridges to be so low that city buses could not pass under them. He did this so those who took the bus, mostly racial minorities and people with low income, could not access places like Jones beach (Winner 1980). This is an example of a technology intentionally limiting human action.

The documentary The End of Suburbia (Greene 2004) illustrates the story of Robert Moses to prove its argument that suburbia is not a politically neutral construct. It claims suburbia itself is discriminatory to those who do not own a car or those who cannot afford gasoline. As such, North American suburbia is a political construct designed to be conducive only to drivers. This, according to the documentary, is an intentional design promoted by all levels of government, which are heavily lobbied by the energy industry, to push for city designs that champion the individual gasoline automobile over public mass transit systems. This example shows a simple depiction of human agency, that ‘bad people’ make ‘bad decisions’ and if the ‘good people’ make ‘good decisions’ then
everything will eventually work out. Unfortunately, the interaction between people and technology is much muddier than this clear below-ground depiction.

Some technologies appear strongly compatible with certain political social relations, but they do not necessarily require them. Examples of this include solar energy, as it is effectively used in decentralized manners unlike coal, oil, or nuclear power. Solar power has flexible political willpower as it can also be implemented into a centralized grid (Winner 1980). Individuals can own solar panels and in doing so power their own mini-electricity grid. With many of these panels they could have enough electricity to power their homes without being absolutely dependent on a major electricity grid. This is often called ‘living off the grid’. It is often portrayed by the below-ground frame as a way to get past what it deems the limitations of the current energy system.

Unfortunately, living off the grid is a misleading statement as the products that people consume, also to power their homes, likely come from somewhere dependent on an electrical grid. These products still require much energy and people to make as well as move them. They also cost money. Regardless, with solar panels it is possible to at least heat one’s home and run his or her electrical appliances during daylight without reliance on a major electricity grid. Wind turbines help with the daylight problem, but they take up space, only work in windy areas, and wind is not consistent. As such, there are a few practical limitations to ‘living off the grid’, but there are political limitations as well. Often renewable energy sources are heavily subsidized by governments, and zoning, by-law or property laws limit their application. One cannot simply place a solar panel or wind turbine wherever he or she pleases. Instead, there are many political agencies at
work that limit the application of various energy sources, even if they do objectively exist as ‘readily available’ technologies.

Of all of the known alternatives to fossil fuels, the Supermajor outlooks discussed centralized energy sources far more than potentially decentralised sources such as localized solar or wind power. I did not find a reference to a decentralized energy grid in any of the Supermajor outlooks. Instead, the outlooks referred to massive centralized energy projects that could only be considered if they were “economically competitive” (ExxonMobil 2009:24). For the Supermajors, new energy projects are a viable alternative only if they generate an economic profit. This could be dependent on government subsidies, but also economies of scale. The profit per solar panel, biofuel plant or wind turbine might be very small, so the company would need a lot of them to pay off the initial investment in a reasonable time.

BP recently cut their solar investments completely as they claimed that “[t]he continuing global economic challenges have significantly impacted the solar industry, making it difficult to sustain long-term returns for the company” (Macalister 2011). Individual solar panels have drastically come down in price, but government subsidies in solar panels are hotly debated. With many countries currently adopting austerity policies, the profitability of much alternative energy is in doubt alongside their subsidies.

The Supermajors made massive investments into alternatives to oil but, as argued last chapter, to them alternatives were investments that required an acceptable monetary return. To illustrate this, I show an excerpt from BP’s 2010 outlook. Appendix B
provides the paragraph in its entirety. The following statement was found under the subtitle: “[w]hy not focus exclusively on renewables?”

[E]merging renewable resources like biofuels, wind and solar will meet around 6% of total global energy demand by 2030… However, renewable, low-carbon energy is not yet competitive with conventional power and transportation fuels, even with the benefit of current carbon prices. Significant research and technology advancement as well as industrial scaling-up are required before they will be ready to fulfil a large portion of the world’s energy needs… renewable energy policy and investment decisions should be based on realistic assessments of their costs, performance and demonstrable progress toward commercial viability relative to conventional fuels. These technologies need sufficient policy support to help them advance, with enough deployment to encourage the learning and innovation necessary to drive down their costs and improve efficiency. (BP 2010:24)

Energy sources deemed non-profitable to develop were ignored by the Supermajor outlooks. This makes sense considering the interests of a Supermajor. It essentially exists to create and sell energy, in any form. Oil and natural gas are simply the most profitable at the moment. Any other source of energy, be it renewable or not, is compared with oil and gas in terms of profitability. Performance is related to ‘commercial viability’, not the physical properties of the energy source itself. This represents the above-ground framing of oil as well as energy in general. Investment into alternatives to oil is dictated by an economic return on an economic investment.

**A second look at investment**

There is another way to think of investments that goes beyond an economic lens. This is through what the below-ground frame commonly refers to as Net Energy, or Energy Return on Energy Invested (EROEI). This concept is demonstrated by showing how much work is required to get something that has the ability to fuel something else. For
example, how many barrels of oil equivalent\textsuperscript{36} it takes to extract a barrel of oil from the ground. If the overall result of this activity is a surplus of oil, then the activity is worthwhile. The most oil, for the least amount of energy effort, yields a high EROEI. However, if the overall process becomes more burdensome, if the amount of fuel gained for the same amount of work decreases, then the EROEI is lowered (Mulligan 2010:93).

The below-ground frame qualitatively describes EROEI as reward for effort invested, but qualitative assessments of EROEI are not very practical given the scale and complexity of oil extraction operations. Instead, this frame often uses quantitative assessments to measure what it deems to be a specific EROEI. This requires common statistical determinates of energy such as the aforementioned barrels of oil equivalent or BOE. BOE measures a unit of energy released when using an energy source and millions of barrels per day (mb/d) measures a rate of oil extraction or consumption. These two measurements are combined to determine what the EROEI of an energy source is. As an example, if we consume 87 mb/d as the IEA states (2011), but invest 8.7 mb/d in getting that oil, then overall we have an EROEI of 10/1.

Measurements of barrels consumed were discussed by the IEA outlooks, but not barrels invested. The amount of oil extracted and consumed is relatively easy to measure as it is tracked, calculated, and sold. Records are kept, and measurements are meticulously maintained. But for the Supermajors, investing oil or another energy to get oil back is measured in economic costs such as exploration costs, extraction costs, production costs,

\textsuperscript{36} Barrels of oil equivalent (BOE) is a common oil industry unit of energy based on the approximate amount of energy released by burning a barrel of crude oil. A barrel is commonly defined as 42 US gallons.
etc. These costs do not mention human labour, environmental impact or any number of invisible mediators, often called externalities, at work in extracting oil. Energy return on energy invested is ignored by the Supermajors’ and IEA outlooks as they favour economic return on economic investment.

The measurement of EROEI is itself controversial even within the below-ground frame of oil. Because this frame shows a wide variety of types of oil that release more or less energy when they are burned, showing EROEI without specifying methodology leads to many standardization problems. As such, scientists and activists try to calculate EROEI through a variety of disjointed measures. The EROEI of all types of energy sources is not only highly contested, but practically impossible to determine without trusting statistical measurements from political entities, such as the aforementioned Supermajors’ and IEA outlooks. Trusting in physical measurements of an objective world runs into the very same problems of trusting in economic measurements of a market-based world. Either way, one is dealing with statistical abstractions and must trust that people get those statistics right. The difference between the above and below-ground frames is not fundamental idea of investment on return, but the illustration of what that investment and return is. The former frame depicts economic value whereas the latter frame depicts energy value.

Both above and below-ground frames show that each of the energies considered potential alternatives to oil—such as solar, wind, biofuels, hydroelectricity and nuclear—

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37 For simplicity I use EROEI to describe energy return on energy invested. Economic return on economic investment is more taken-for-granted so it does not require an acronym.
are not raw fuels like refined oil is, but energy production sources. As such, they compare crude oil fueling cars with uranium fueling nuclear plants, grain fueling muscles, etc.

Crude oil, uranium and grain are all sources of energy, but they require complex mechanical processes, technical manipulations, even organic digestions, in order to be made ready to produce an energy output or a fuel. To do this requires that non-humans and humans work together to invest in the creation of fuel, but these investments are framed in very different ways. The above-ground frame shows opportunity for new economic investments whereas the below-ground frame shows energy investment giving ever-diminishing returns. The latter frame is illustrated by energy academic Shane Mulligan:

The economics of energy are generally viewed in terms of production costs and prices in “dollar terms,” but it is essential to recognize the value, and the costs, of inputs in terms of energy. Within this frame it is clear that as the “easy oil” is depleted, each successive marginal barrel will be increasingly costly (on average) in both economic and energetic terms. That is, a greater investment of energy will be required to gain a given return, and many alternative fuels may have too low an energy return on investment (EROI) to sustain economic growth. (Mulligan 2010:93)

Here we see that investment can be a divisive concept, as one way to view investment is through ‘the economics of energy’, whereas another way to view investment is through ‘terms of energy’. The former is depicted by the Supermajors’ and IEA outlooks whereas the latter is depicted by scientists such as Mulligan and peak-oil documentaries. It is not that either is incorrect, but EROEI points towards problems sustaining economic growth. This is often a key argument of many documentaries, including The End of Suburbia, that due to the low EROEI in combination with limited scalability, “there is no combination
of alternatives that will allow us to run what we are running in the US. Not even nuclear” (Greene 2004). Accusing the above-ground frame of ignoring the objective, physical complexities of substituting one energy source for another portrays the Supermajors as investing in economic determinism. But the below-ground frame uses a different ontology that stresses terms of energy instead of terms of economics. Neither ontology should be considered wrong or irrational. They simply operate via different logical assumptions.

The peak oil concept is considered a problem as people consume energy at a rate, and the energy supply must be able to keep up with that rate, or the rate will have to slow down. According to the documentary Crude Awakening (Gelpke, McCormack, and Caduff 2006), this means that although some sources of energy such as wind or solar power are renewable, the overall energy—in terms of both quantity and rate—that these renewables output is miniscule compared to that of a nuclear or natural gas power plant. Despite a large amount of time and space devoted to discussing alternative energies, both above and below-ground frames forecast that renewable energy sources—wind, solar, biomass and hydroelectric—will not contribute much more than a small fraction of the overall energy supply-mix in the foreseeable future. To demonstrate an example of this assumption, I show an excerpt from Total’s 2009 outlook:

Question: The future belongs to renewable energies. Is that true at Total too? We’re securing the future of energy here and now. Renewable energies encompass a wide array of resources that will be able to meet varied demand. We want to leverage our expertise to promote their development. However, these resources will only be able to meet a tiny

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38 As discussed last chapter, of all five of the Supermajors, Total most explicitly considers peak oil or plateau oil as a problem.
fraction of global demand in 2030. That’s why, alongside our solar energy and biomass activities, we are also exploring nuclear power generation. These focuses reflect our determination to increase the supply of non-carbon-emitting energy, through fully mastered commercial processes, to meet growing energy demand worldwide. (Total 2009:19)

Nuclear power enters the picture here in an interesting way. Both above and below-ground frames depict renewable energies to contribute only a little to the future energy mix. However, the Supermajors’ and IEA outlooks often fold nuclear energy into their discussion of renewable energy. According to the documentary *Crude Awakening*, (Gelpke, McCormack, and Caduff 2006) nuclear power is not renewable as it requires a finite natural resource to fuel it. Further, biomass is a highly controversial renewable energy source. According to the below-ground frame, for biomass to have a reasonable EROEI, it requires massive amounts of petrochemical input in terms of machinery, pesticides, and refinement. In the Supermajor and IEA outlooks, mixing nuclear power with what they consider renewable energy—wind, solar, hydroelectric and biomass—makes all of these sources appear similar in terms of what they can do, how much energy they can produce, and how renewable they are. This is so common that nearly every mention of renewable energy includes nuclear energy alongside it. Currently, both above and below-ground frames share the view that renewable energy alone will not output enough energy to make a drastic difference in the future energy mix.

Mixing nuclear energy and renewable energy together via quantitative assessments was another common trend I found, typified by the following statement of the 2010 IEA outlook: “Renewables and nuclear make significant inroads in the energy mix, doubling their current share to 38% in 2035” (IEA 2010b:56). Despite prevalent discussion of
biomass, solar and wind by all sources examined, BP appears to have the highest estimate in its outlook at these things providing 6% of total energy demand by 2030 (BP 2010). ExxonMobil’s outlook forecasts only 2.5% of total demand by 2030 will be from renewables (ExxonMobil 2009). These estimations seem low considering the emphasis placed on the ‘future of renewables’ by all parties involved in energy discourse. Regardless, the Supermajors, and to a lesser extent the IEA, are often accused by the various documentaries of explicitly promoting the future as dominated by renewable energy sources, yet implicitly predicting renewables as having a tiny part to play. In a relative footnote it is always mentioned that everyone appears to forecast fossil fuels as the dominant energy source for the foreseeable future. The assumption of both above and below-ground frames is that energy demand is increasing, and oil will remain a large part of that demand. The above-ground frame presents nuclear as a renewable, or at least very close to it, while the below-ground frame shows it as non-renewable. When it comes to alternative energy technology, the former frame shows possibilities, while the latter shows limits.

Throughout this thesis, I have shown how the concept of peak oil is shrouded in controversy as there are two frames that it is viewed or defined through. The different elements or issues inherent in peak oil are shown in different ways even though they may be given similar labels. Conventional and unconventional oil, supply and demand for oil, alternatives to oil, investment on return for oil, all of these are issues within the peak-oil concept that look different depending upon which frame they are viewed through. Actual investments, where to put forth concentrated efforts in order to address problems such as
those represented by the peak-oil concept, could be stalled by a stubborn engagement
with either an economic or energy-based idea of investment on return. In doing so,
certain technologies or technical solutions that make alternative energy available could be
discounted if they do not fit within what is perceived of as the correct frame.

The above-ground frame considers oil an economic product to be manipulated by
human objects, but the below-ground frame considers oil a natural resource that acts on
its own regardless of human intervention. This conflict in framing is illustrated by the
documentary *Crude Awakening* (Gelpke, McCormack, and Caduff 2006), which asks the
viewer the question: what is more real, financial markets, or the oil that exists in the
ground? The documentary choses the latter when it states that economic markets would
not exist if it were not for ‘petrodollars’, that is, the markets are dependent on the

While the above-ground and below-ground frames overlap in considering peak oil as a
relationship between a supply and a demand, they differ in attributing how technology
acts in relation to that supply and demand. As such, these frames look like they are
presenting the same things, but what is being shown is quite different. This leads the
concept of peak oil to be enshrouded in controversy as its definition, meanings,
predictions, problems and solutions are all framed differently by certain interests and
perceptions of reality.
Final Conclusions

This thesis engages with the question of how peak-oil controversy is made possible, not how to settle it. In doing so, I argue that the Supermajors’ and IEA energy outlooks, peak-oil documentaries, and even academic papers can be perceived not as simple matters of influencing public opinion, but artifacts or paintings held up to maintain networks of truth. These networks consist of both human and non-humans busy working to bring others to their cause, to solidify and present certain depictions of reality. Both supporters and detractors of peak oil as ‘real’, as well as those who champion above-ground and below-ground frames, use these various paintings to both create and legitimate their arguments, to strengthen their networks. Due to the quantitative history of peak-oil discourse, the keepers of the statistics—which is largely the IEA—act as gatekeepers but not final authorities. Instead, different reflexive subjects have different networks of truth that intermingle and must be maintained by framing a controversy that discourse flows through. As discourse flows through these frames it acts as a feedback loop between depicting what is real and perceiving what is real.

Neither the above nor below-ground frame can tell us with absolute certainty what the future will look like. Refusing to understand the opposing frame perpetuates not only the debate, but the perception of a specific, pre-determined future. A person can believe he or she is right if only because the opposition is wrong. This perpetuates both the above and below-ground framing of the peak oil concept. Further discussion or research of peak oil should consider these two frames as equally valid if only for different reasons. However, neither frame should be assumed to correctly predict the future of oil.
While this thesis concentrated on two specific framings of peak oil, there is no reason to say that there are no other frames in existence. Countries with nationalised oil supplies or predominately non-Western discourses likely produce their own distinct framings of peak oil and energy in general. My claims are admittedly wide-sweeping and generic, so further investigation is required in more specific localities of peak oil discourse.

The IEA, the Supermajors, peak-oil activists and even scientists all need to summarize the complexities of oil in order to practically communicate with their audiences. They choose, perhaps unintentionally, what aspects of oil are promoted and what are down-played. This runs the risk of presenting a closed discussion that assumes a specific future. Expecting reliable energy forecasts risks foreclosing any other possibilities because these can be considered wrong before they even have a chance to take form. The concept of peak oil is currently viewed in the West via two distinct frames, but those frames can be changed or new frames can be added. Or, we could simply talk about something else. Either way, we should approach claims of peaking global oil supply with caution. After all, there are interests behind those claims. Further peak-oil research should look to examine more thoroughly those making the claims and leave the future predictions to the clairvoyant. Otherwise we may trade the presentation of one problem for another, without understanding who stands to benefit and who stands to lose from the solution to that problem.
Bibliography


Hughes, David J. 2011. "Will Natural Gas Fuel America In the 21st Century?" Post Carbon Institute, Santa Rosa, California.


—. 2010a. "30 Years of the IEA." YouTube.


Appendices

Appendix A: Opening dialogue of the 2010 Supermajor outlooks

ExxonMobil’s CEO Rex W. Tillerson: “As the Outlook shows, success will depend on expanding access to economic energy sources that meet a number of fundamental criteria: They must be widely available, reliable, affordable, versatile and be produced and used responsibly. This will require the development and application of new technologies; tremendous levels of investment in technology and infrastructure; and international partnerships and cooperation. Together, these will enable the world to expand its energy choices, improve efficiency and reduce emissions” (ExxonMobil 2010:1).

Shell’s CEO Peter Voser: “With the world now out of recession, energy demand is again increasing. All energy sources will be needed to meet this demand, but in the decades ahead the bulk of the world’s energy is expected to continue to come from fossil fuels. Producing oil and gas from deep waters will remain crucial. These resources are a vital part of the secure and diverse supplies of energy the world will need, as are energy resources from other technically challenging environments. Shell’s responsible approach and continued investment in technology and innovation will help us to deliver this energy” (Shell 2010:1).

BP’s Group Chief Exec. Bob Dudley: “We have made some progress, but there is more to do and we know that. Given the nature of the challenges we take on, BP can never eliminate risk, but we can work with others to better understand, limit and manage risk. Exploration and Production Our strategy is to grow long-term value by continuing to build a portfolio of enduring positions in the world’s key hydrocarbon basins, focused on deepwater, gas and giant fields. This will be enabled by strong relationships built on mutual advantage, deep knowledge of the basins, technology and the development of capability along the value chain in exploration, development and production” (BP 2010:3).
Chevron’s Vice President and Chief Technology Officer John W. McDonald: “Technology, and the know-how required to develop and deploy it at scale, will deliver the breakthroughs, just as they have done in the past. The world will need all the energy it can get from all sources, using technology to tap the high energy density, reliability and fungibility of hydrocarbons and to find ways of turning less dense feedstocks, such as biomass, into energy supplies at scale” (Chevron 2010:1).

Total’s Chairman and CEO Christophe de Margerie: “Can the world strike a balance between a steady energy supply, growth, and the protection of lives and the environment? We believe it can. What’s more, we’re focusing all of our skills and expertise on providing practical, innovative answers to this question, dedicating substantial financial resources to it each year. That, in our eyes, is our primary responsibility… The technical, business and environmental challenges we face are enormous. So are the social challenges. Indeed, the recent disasters heighten concerns about industry — mainly in OECD countries — and rekindle questions about its ability to manage its risks and responsibilities” (Total 2010:2).
Appendix B: BP on alternative energy

“By our estimates, emerging renewable resources like biofuels, wind and solar will meet around 6% of total global energy demand by 2030. Over the longer term, we believe that they will play an essential role in addressing the challenge of climate change, as well as offering important energy security benefits. However, renewable, low-carbon energy is not yet competitive with conventional power and transportation fuels, even with the benefit of current carbon prices. Significant research and technology advancement as well as industrial scaling-up are required before they will be ready to fulfil a large portion of the world’s energy needs. BP is working alongside industry, research and academic partners, policymakers and regulators to develop and deploy alternative energy technologies so that they can ultimately play a significant role in our energy mix. We believe renewable energy policy and investment decisions should be based on realistic assessments of their costs, performance and demonstrable progress toward commercial viability relative to conventional fuels. These technologies need sufficient policy support to help them advance, with enough deployment to encourage the learning and innovation necessary to drive down their costs and improve efficiency. Overly generous support, however, for very large-scale deployment could remove the incentive for technology innovation and limit the use of more immediate and affordable alternatives, such as natural gas, for reducing greenhouse gas emissions and providing energy security” (BP 2010:24).