Peak Oil Demand: Fact or Fiction?

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"It's not a question if it will come, it's only a question of what the timing of the arrival will be." - JULES KORTENHORST, CEO of the Rocky Mountain Institute, referring to peak oil demand

INTRODUCTION

The theme of this week's EVA revolves around the topic of peak oil demand. Much has been written and debated about this recently – especially considering energy's dismal start to 2017 and Trump's recent decision to withdraw from the Paris Agreement.

In January, Evergreen Gavekal CIO, David Hay, was even so bold as to predict a correction in energy commodities was close at hand. In an interview with Real Vision TV, David outlined his views (around the 6:00 minute mark), stating: "When you look at speculative positioning, it is extremely bullish on oil right now, so personally I think oil is going to go through another correction, plus there is a ton of inventory out there... I do believe that we are in the long-term recovery process for oil, and I still think by 2020 you could see triple digits again but it is going to be a rocky road and I think this is one of those times where oil is overbought. I wouldn't be surprised to see it back in the mid $40s here in the relatively near future." In February, David reaffirmed these views in a *Random Thoughts EVA*, writing, "accordingly, be prepared for crude to correct near?term."

Well, as David predicted, here we are with crude oil hovering in the mid-$40s. But what does the long-term future hold for oil?

Earlier this week, we asked some of our Twitter followers to weigh in on the issue and the results were fairly split. 33% of respondents said that they believed peak oil demand will come by 2030, 28% said it's more likely to come around 2040, and 39% claimed the idea is fiction and there's no foreseeable peak demand.

In a return to one of our most popular formats, the *Evergreen Exchange*, EVA author Michael Johnston and Director of Portfolios Jeff Dicks debate different sides of the peak oil demand argument. The former argues that we will reach peak demand sometime well before 2040, while the latter concludes that it's not within sight.

As we often do with our Exchange issue, we ask readers to select which case was made most persuasively. We would greatly appreciate it if you'd take the time to submit your vote here. Thank you!

The End of Big Oil The words are almost too ominous to write. Peak oil supply theorists saw a far different end only ten years ago when crude oil prices soared to nearly $150 per barrel. Kenneth Deffeyes, a strong advocate of peak oil supply theory, even confidently wrote in 2008, "welcome to the world beyond Hubbert's peak oil."

The end that Deffeyes, M. King Hubbert, and others predicted was that oil production would top out then diminish, and a subsequent supply deficit would push oil prices higher and higher as

nations battled for shrinking reserves. In the early 1970s, this theory became wildly popular when US oil output did in fact peak for a time, combined with the first OPEC oil embargo. The result was long lines at the gas pump and dire warnings of overpopulation and the exhaustion of natural resources. Recently, as you can see in the chart below, the more than tripling of crude oil prices between 2005 and 2008 added fuel (no pun intended) to this theory.

CRUDE OIL PRICES (1986-2017)

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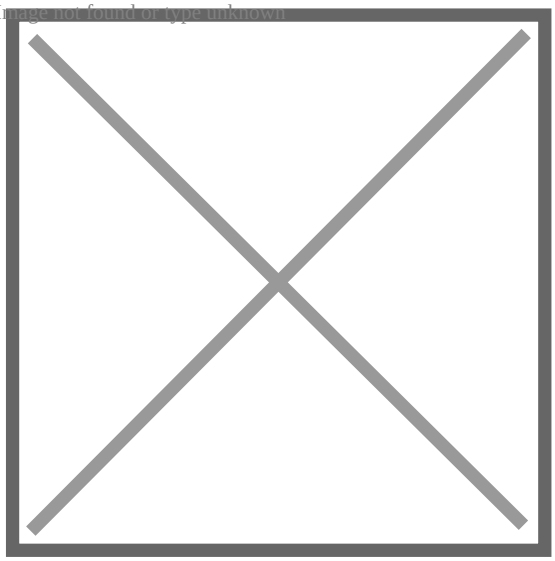

Source: Energy Information Administration

But, to quote Nobel Prize-winning (and belatedly accepting) Bob Dylan, the times they are a-changin'.

Something that M. King Hubbert failed to predict when he presented his theory to the American Petroleum Institute in 1956 (only eight years before Dylan released his timeless ballad to the world) was how technological changes would impact both the supply and demand side of the oil equation.

Supply-Side Implications Innovations in oil-field technologies have contributed to both the discovery and extraction of more oil. In the United States, the 2014 shale boom drove oil production higher, creating competition among oil-rich nations to lower prices in the face of increased supply. In fact, the Energy Information Administration (EIA) estimates in its *2017 Annual Energy Outlook* that "about 4.9 million barrels per day of crude oil were produced directly from tight oil (shale) resources… equal to about 52% of total US crude oil production." (And equal to roughly 5% of the 97 million barrels of oil produced globally each day.) As shown below, U.S. production of shale will continue to rise through 2040 as the production of non-shale oil declines.

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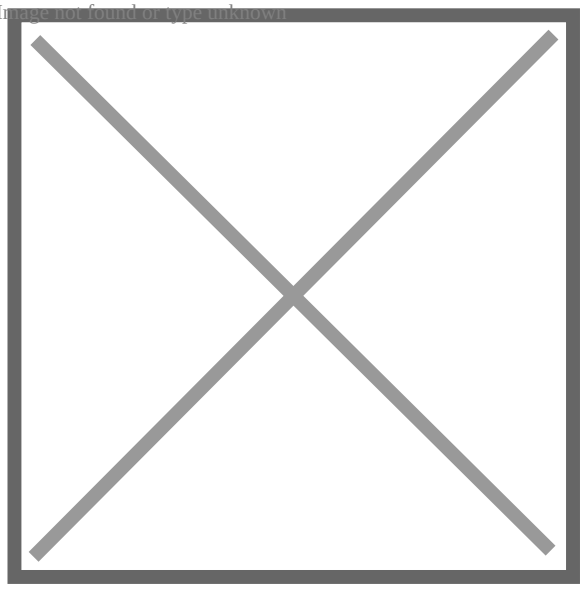

Source: U.S. Energy Information Administration, 2017 Annual Energy Outlook

Technological innovations such as the use of sound waves to locate oil fields through thousands of feet of water and rock have also spurred a boom in deep-water drilling. These, and other geophysical imaging technologies, have made the previously inaccessible accessible and the previously undiscoverable discoverable. Perhaps, the most important breakthrough has been horizontal drilling, allowing producers to access hydrocarbons far more efficiently.

David “the Clairvoyant” Hay (at least when it comes to some of his energy forecasts) even accurately predicted that technology advancements would help ease supply concerns in 2007 – back when oil prices were climbing to new heights and many sat in Hubbert’s peak oil camp. In a February 2007 EVA, David wrote: “The assumption that we are hopelessly wedded to fossil fuel is erroneous. I continue to believe that there will be myriad processes and technologies, many currently under development, which are likely to greatly ease the supply-side concerns. Gasoline consumption may see one of the most dramatic changes.”

Why does this matter? For decades, peak oil theorists have dug their heels into the ground and stood firmly on the assumption that as the supply of a seemingly finite resource diminished over time, and as global demand continued to rise, there would be a forthcoming battle for oil reserves. However, as the era of “easy-to-find” and “easy-to-access” oil comes to an end, technologies have advanced in lockstep, muting concerns over a supply crisis – at least for the time-being.

The supply-side of the equation isn’t the only factor weighing down oil prices and sparking questions around the future of oil. Equally (and perhaps more) important to the discussion is how demand for oil is shifting.

Demand-Side Implications Many prominent oil-focused entities – such as The International Energy Agency (IEA), OPEC, Exxon, and BP to name a few – predict global oil demand growth through at least 2040. As the chart below shows, even with a slowdown in demand of nearly -.9% per annum by developed countries, overall usage is still expected to expand by 1.8% per annum among developing countries through 2040. The major contributors to this steady incline in demand are India, China, and OPEC nations.

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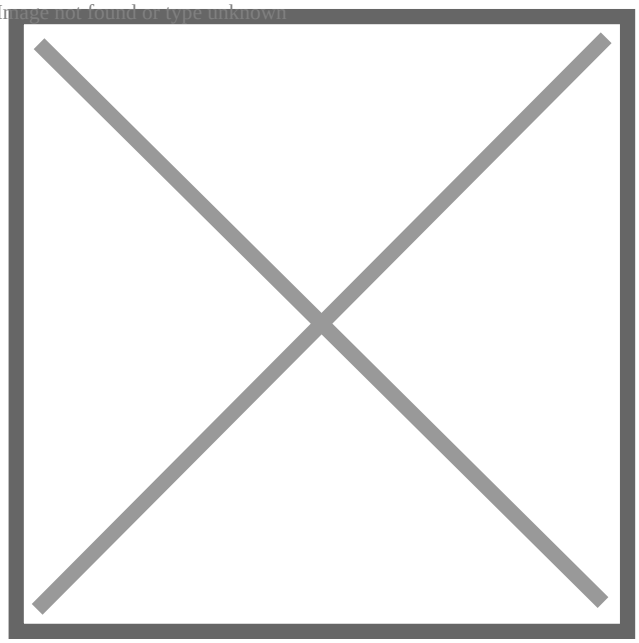

Source: OPEC, World of Oil Outlook 2016

However, even with rising demand among developing countries that is projected to offset the slowdown in energy consumption by developed countries, there's still reason to believe that technological advancements could have progressively worrisome implications for the overall oil market. Specifically, this becomes apparent when looking at changes in the transportation industry – which represents roughly 50-60% of all oil consumption. Efficiency improvements, electric vehicles, and fuel switching could result in the need for significant adjustments to overly optimistic growth projections, such as those made by OPEC above.

First, growing global efforts to curb fuel waste have catalyzed efficiency improvements in recent years. While President Trump took a stand against the Paris Agreement by signaling his intention to withdraw from the accord last week, subsequent support for the agreement (and against Trump's decision) was echoed across the globe. As such, we should expect governments concerned with climate change and air pollution to continue pushing tighter fuel-efficiency standards.

Bloomberg recently stated in an article titled "This is What the Demise of Oil Looks Like" that the IEA projects efficiency improvements could eliminate the need for 11.6 million barrels of oil per day by 2040. If these projections are right, that's about a 10% hit to the bull's best-case 2040 scenario.

Second, the rise of electric cars will slowly carve into the market share of an industry dominated by gas-powered vehicles for over a century (ever since Karl Benz developed the first true automobile in 1885). In the near-term, slowly should be emphasized because even Tesla, a leader in the space, produced only 25,418 electric vehicles in the first quarter of 2017. However, as the chart below shows, some projections call for over 20 million electric vehicle sales by 2030. This growth will only continue to climb through 2040 and beyond. In fact, Morgan Stanley recently predicted that electric vehicles could account for 50%-60% of global light-vehicle sales by 2040.

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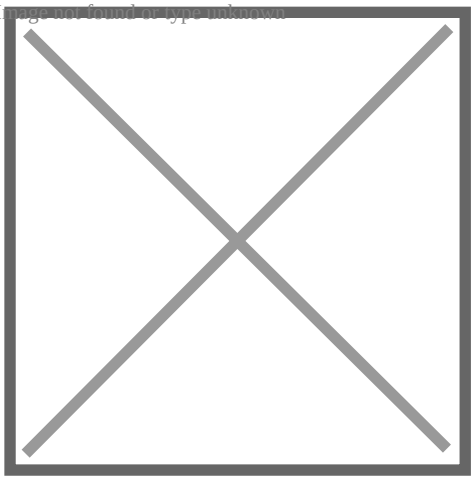

Source: Bloomberg New Energy Finance

This increased production of electric cars has a significant impact to oil demand. Adoption of electric vehicles could eliminate the need for between 1 - 5.2 million barrels per day of oil, depending on who you ask. (BP expects the number of electric cars to skyrocket, but thinks it will only result in the loss of 1–1.5 million barrels per day, while the IEA thinks demand could drop by as much as 5.2 million barrels per day.)

What's also potentially devastating to the oil industry is a switch towards alternative energy. Heavy auto industry hitter Toyota Motor Corporation and the world's fifth-largest company in terms of 2016 revenue, Royal Dutch Shell, are putting their weight behind hydrogen-powered vehicles and liquefied natural gas refueling stations.

Both see hydrogen fuel cells as a viable, safe, and less polluting alternative to petrol-powered cars. Shell executive Ben Van Beurden has stated that he expects this alternative form of energy to "power trains, planes, and trucks in the future." There is significant room for growth here, as visions of the ill-fated hydrogen-fueled Hindenburg are forgotten, and the energy source is more widely adopted as a crude oil alternative.

Additionally, bioplastics are on pace to dampen demand for petrol. In the past, petrochemical demand grew at 1.3 to 1.4 times the rate of GDP. However, this demand is waning due to plastics recycling, plastic-packaging efficiency and bioplastic demand. McKinsey and Company estimates that in the long-term, growth will retract and fall in line with global GDP, which could result in the loss of approximately 2.5 million barrels of oil demand per day.

Judgment Day The consequence for those unwilling to accept that times are changing will be that they are one step behind those who have already begun preparing for peak oil demand. The question is when Judgment Day will arrive.

Royal Dutch Shell and Statoil both see peak demand sometime between 2025-2030. BP, Total, and the International Energy Agency anticipate it coming closer to 2040. While American companies like Chevron and Exxon Mobil are holding out, claiming that they don't foresee a peak, supply and demand headwinds might ultimately force them to rethink their position.

When summed together, the IEA estimates the impact of efficiency improvements, electric cars and fuel switching could be a loss of 30 million barrels per day of oil demand by 2040.

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Source: International Energy Agency

Admittedly, this is a worst-case scenario for the oil industry, and one based on what would be required to limit global warming to within 2 degrees Celsius. Under these assumptions, oil demand would peak in 2020. I don't see Judgment Day coming that quickly, but it's reasonable to believe that it's coming soon… perhaps for some on a cloud of glory, and for others like a thief in the night.

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Fading Fads Peak oil demand is the latest idea in the energy sector. I must say it's ironic because, less than 10 years ago, discussions about peak supply were just as prevalent. As Michael highlighted above, falling future consumption centers around rising fuel efficiency, stricter emission regulations, and a rapid rise in the adoption of electric and hybrid cars. These are secular trends that will surely gain traction over the next several decades. But, will this cause oil demand to peak by 2040?

Just as peak supply proved wildly inaccurate in the 1970s and 2000s, I believe the same willring true for the peak consumption debate. The main factors that will drive demand higher overthe next half-century are emerging market growth, slower-than-expected fuel-efficiency gains,and lower adoption for fuel-efficient vehicles than is currently projected.

Emerging Markets Growth Currently, the world consumes 97.67 million of barrels of oil and liquid fuels per day, which is up 1.5% relative to last year. This number includes byproducts such as gasoline, heating oil, and diesel. The picture below does a nice job of illustrating the products a barrel of oil typically create.

PRODUCTS MADE FROM A BARREL OF OIL

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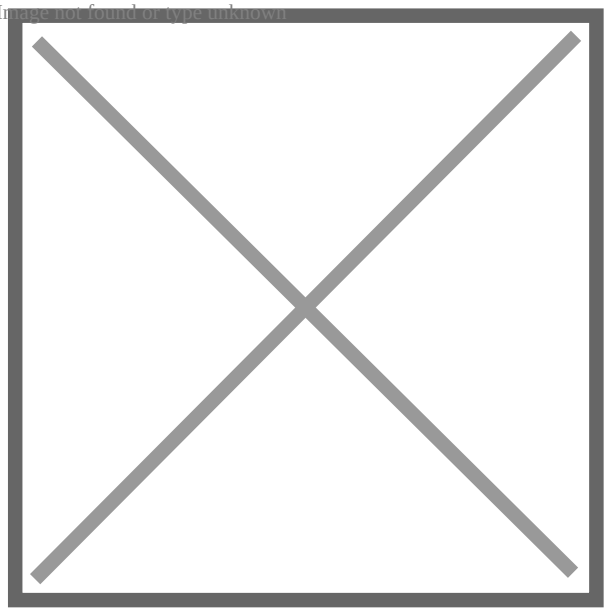

Over the last decade, consumption has risen 16%, which works out to 1.5% growth per year. Despite overall rising demand, the United States (which makes up the largest part of the demand-pie at roughly 20%), has seen demand fall by 10%. Japan and Europe have seen even more pronounced declines of 13% and 19%, respectively. Initially, declines could be traced to the 2008 financial crisis; however, the fact that demand in the three largest developed economies has not recovered to pre-recession levels illustrates shifting consumption behaviors. More on this topic later.

As the demand chart below indicates, the dropoff in demand from developed economies has been more than offset by the rest of the world.

WORLD AND US OIL CONSUMPTION

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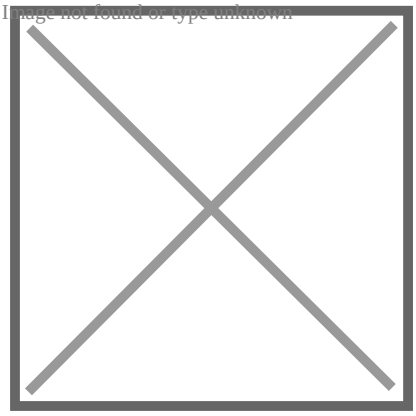

The largest contribution has been from developing nations. As you can see in the chart below, looking out to 2040, the continued demand declines out of Japan, Europe and the US are expected to be more than offset by increases within the rest of the world. China and India are critically important to this outlook.

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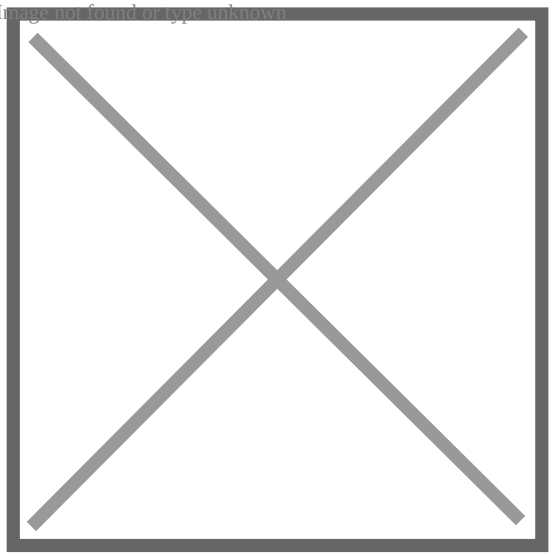

What's interesting is that China has added about 400 million people to their population over the last 40 years, which is almost exactly what is expected out of India over the next forty. Each of these figures eclipses the entire population of the United States. In China, as you can see from the trend below, population growth has slowed and is expected to fall by 2050.

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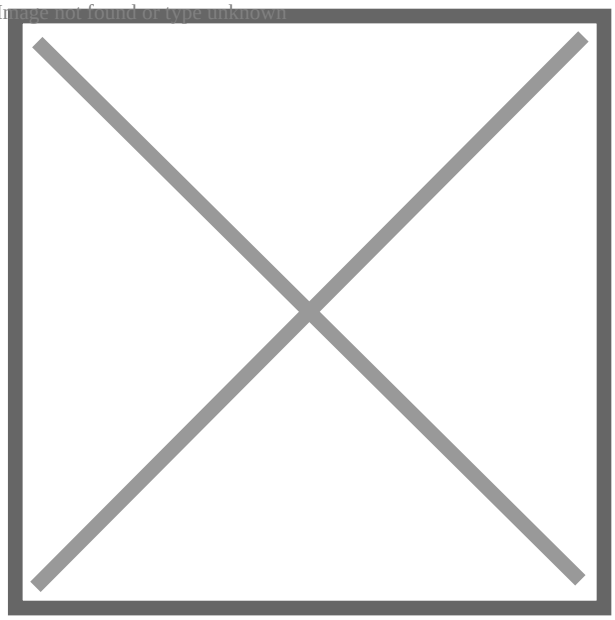

Source: United Nations Department of Economic and Social Affairs

However, per capita GDP, a key indicator of future oil demand, is expected to steadily rise over the next several decades. China's per capita GDP has more than doubled to $6,500 (USD) since 2006. According to GS Global ECS Research, this number is set to rise to nearly $40,000 by 2050. What's equally important to the debate around future oil demand is that this is also happening in India, as an unprecedented number of consumers move from lower to middle incomes.

Higher GDP per capita leads to higher income levels across these developing nations. Komi Kharas, a deputy director at the Brookings Institute, ran a fascinating study titled "The Unprecedented Expansion of the Global Middle Class". As you can see in the chart below, over the next 15 years we will see an additional 2 billion consumers enter the middle class, which is almost entirely driven by growth in the Asia Pacific region.

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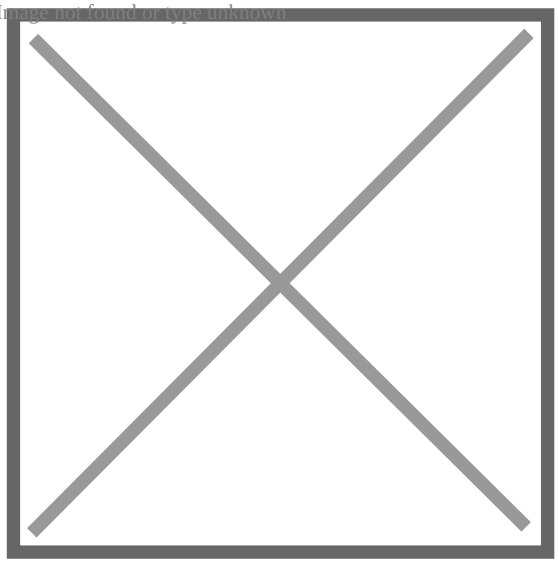


Source: The Unprecedented Expansion of the Global Middle Class, by Komi Kharas

This will no doubt create substantial incremental demand as these consumers purchase more vehicles, fly more miles, and require more trade (leading to higher demand within the trucking industry which has positive readthroughs for diesel).

Fuel Efficiency Standards and Adoption Rates In terms of fuel efficiency standards, Michael brings up a solid point: that we have seen tremendous technological advancements in recent history. Several of the top fuel-efficient cars, including electric, now get over 100 miles-per-gallon. The problem is, when looking across the entire US car fleet, this hasn't really moved the needle.

Michael Sivak and Brandon Schoettle, from the University of Michigan Transportation Research Institute, found that on-road fuel economy (including cars, trucks, buses and motorcycles) has only improved from 16.9 mpg in 1991 to 17.9 mpg in 2015 despite the tremendous advancements we have seen.

The lack of adoption for fuel-efficient vehicles likely comes down to sticker price. The cheapest version of the Chevy Bolt, for instance, carries a price on Kelly Blue Book of roughly $36,000. This is roughly double the price of a similar sedan with an internal combustion engine. The problem is that EV batteries account for roughly one third of the total vehicle cost.

While Stanford University's leading researcher, Yi Cui, estimates that battery costs are likely to fall by 50% over the next decade, that would only mean a $6,000 cost reduction, which still wouldn't be very competitive. Additionally, it's estimated that General Motors loses around $9,000 per Bolt. Thus, it's not likely that any savings will be passed onto the customer.

Making matters worse for electric manufacturers of the world, is that the US looks like it's heading in the opposite direction for policy on emission standards. We have already seen tax breaks on EV vehicles begin to fall at the state level, with only 16 states now offering tax credits (down from 25).

The existing tax breaks of up to $9,500 may even be eliminated or further reduced by the Trump administration. Furthermore, there is a distinct possibility that Donald Trump rolls back Obama's fuel efficiency regulations. If this occurs, it would greatly reduce the incentive for US automakers to build electric cars, prolonging the shift to a more fuel-efficient fleet.

While I strongly believe these trends will lead to higher future oil demand, one of the biggest threats I see to an oil-demand peak is the future of autonomous (self-driving) cars, and the concept of transport-as-a-service (TaaS). RethinkX, an independent think tank, did a fascinating overview on the topic. In the study, they state that "by 2030….95% of US passenger miles traveled will be served by on-demand autonomous electric vehicles owned by fleets, not individuals, in a new business model 'they' call "transport-as-a-service".

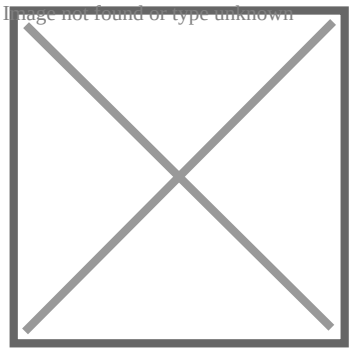
What's remarkable is that they found that TaaS could lower transportation costs by four-to-ten times compared to buying a new car, and two-to-four times compared with operating an existing vehicle. If you think about ride-sharing companies like Uber and Lyft, roughly 75% of their revenue goes to the driver. For these companies, cutting the cost of the driver would not only dramatically lower their cost, but also substantially increase the utilization of their fleet.

Come again? Did RethinkX just predict that in twelve years a concept that is not even on the market, or approved from a regulatory standpoint, will capture 95% market share of US

passenger miles driven? This sounds eerily similar to an article published in 2003 titled How Hydrogen Can Save America. The author of that piece claimed “by 2013, 1/3 of new cars sold would be hydrogen-powered, and that 15% of the nation’s gas stations could pump hydrogen.” To say this prediction fell short would be an understatement.

Humans biologically tend to exhibit what’s called optimism bias (a condition that is dominating the stock market these days!). This is essentially a cognitive predisposition that makes people more optimistic about the future. While human brains are hardwired for hope, and this is a driving force for growth and advancement, it can cause distorted predictions about the future. This has consistently been the case in the transportation sector.

While our fleets will continue to shift from less to more fuel-efficient vehicles, and we will continue to make advancements in battery technology, all of this will take time. Concurrently, we will witness an explosion of growth in the Asia Pacific region. This surge in population accompanied by rising income levels will feed future demand growth for not only oil, but all types of energy, alternative and conventional. I’d like to believe these regions will adopt more fuel-efficient alternatives, but income levels along with high debt burdens will thwart this trend from happening overnight. Therefore, oil demand will almost surely be higher in 2040 than it is today. In my mind, this is definitely not an industry that is running on empty.



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OUR CURRENT LIKES AND DISLIKES

No changes this week.

LIKE

- Large-cap growth (during a correction)
- International developed markets (during a correction)
- Canadian REITs
- Cash
- Publicly-traded pipeline partnerships (MLPs) yielding 7%-12%
- Intermediate-term investment-grade corporate bonds, yielding approximately 4%
- Gold-mining stocks
- Gold
- Intermediate municipal bonds with strong credit ratings

- Select blue chip oil stocks
- Emerging bond markets (dollar-based or hedged); local currency in a few select cases
- Mexican stocks
- Solar Yield Cos on a pull-back
- Long-term municipal bonds

NEUTRAL

- Most cyclical resource-based stocks
- Short-term investment grade corporate bonds
- High-quality preferred stocks yielding 6%
- Short yen ETF
- Emerging market bonds (local currency)
- Short euro ETF
- Bonds denominated in renminbi trading in Hong Kong (dim sum bonds)
- Canadian dollar-denominated bonds
- Mid-cap growth
- Emerging stock markets, however a number of Asian developing markets, ex-India, appear undervalued
- Floating-rate bank debt (junk)
- Select European banks
- BB-rated corporate bonds (i.e., high-quality, high yield)
- Investment-grade floating rate corporate bonds
- Long-term Treasury bonds
- Long-term investment grade corporate bonds
- Intermediate-term Treasury bonds

DISLIKE

- US-based Real Estate Investment Trusts (REITs) (once again, some small-and mid-cap issues appear attractive)
- Small-cap value
- Mid-cap value
- Small-cap growth
- Lower-rated junk bonds
- Large-cap value