

# Betting on Black Swans

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The phrase “Black Swan” was coined in the [book of the same name](#) by author [Nassim Taleb](#) to describe an event that is hugely important and influential that was not anticipated but yet in retrospect could have been.

September 11, 2001 is a classic example of a Black Swan. It was only a failure of imagination by most Americans (including myself) to never have contemplated beforehand the possibility of such a dreadful day. But, the terror attacks of that fateful day were pulled off with pitiful ease, without requiring any enabling technical or social developments. Upon reflection, we should have seen it coming. And, because it came, most countries around the world undertook a host of incredibly expensive actions. Everything changed on 9/11. The trajectory of human events was irrevocably and dramatically altered.

Of course, there have been many other Black Swans in recent history: the Pearl Harbor attacks, the unveiling of the atomic bomb, the launch of Sputnik, JFK’s assassination, and so on. Each was shocking, and changed the course of history.

These are all geopolitical examples, but there have been commercial examples as well. In the past 50 years, the way we live has been wholly altered by such inventions as the transistor, graphic user interfaces (GUIs), touchscreens, and the Internet. The way medicine is practiced has been overturned with the advent of medical imaging and non-invasive surgery, and the Genome project promises radical breakthroughs that we generally can’t foresee yet.

In energy, probably the most significant Black Swans in our lifetimes so far relate to advanced methods for discovering or extracting oil and gas from resources that were previously believed to have little economic opportunity. This most notably includes [hydraulic fracturing](#) (a.k.a. “fracking”) to tap natural gas and oil from shale formations, but also embraces deepwater offshore exploration/production and [steam-assisted gravity drainage \(SAGD\)](#) recovery of the [Athabasca oil sands](#) in Alberta — all of which were pipe dreams (at best) a decade or two ago.

These hydrocarbon breakthroughs were largely made possible by the emergence of massive computational power to enable 3-D seismic imaging of deep geology and precision control of drilling and subsurface operations, assisted by dramatic improvements (in many cases, evolutionary over decades) in materials and mechanical technologies. Some wags have said that the best rocket science occurring today is not aimed towards the heavens but instead is aimed underground.

Needless to say, these Black Swans in energy have transformed the oil/gas sector — one of the largest economic enterprises on the planet — which in turn has shifted the economic and financial fortunes of many players in the industry by untold billions of dollars.

So, the question becomes, are there Black Swans lurking ahead in the cleantech space?

[Vinod Khosla](#) certainly thinks so. One of the most visible of the cleantech venture capitalists, Khosla penned last year a wide-ranging and ambitious thought-piece entitled [“Black Swans Thesis of Energy Transformation”](#).

Khosla thinks that many other venture capitalists — including, presumably, me — are too cautious in pursuing “what could be” in energy. By focusing mostly on the potential for attractive returns, venture capitalists have become captive to the pursuit of incremental improvement, and are thus

overlooking “game-changers” that admittedly have higher risks. A large part of his argument is built on the notion that forecasts are largely bogus, and too much weight in investing and managing is placed on the projections of the future by even the most expert of observers.

Khosla acknowledges that failure is a strong possibility with his bolder philosophy, but that is the price to be paid for aiming high and achieving great things. Quoting Robert F. Kennedy, “only those who dare to fail greatly can ever achieve greatly.” Now, maybe having a billion dollars of your own wealth, stemming mainly from his role in founding [Sun Microsystems](#), helps to give Khosla the confidence to accept a high likelihood of failure. However, through his fund vehicle [Khosla Ventures](#), he is investing other people’s money too, so he can’t afford to be too cavalier — at least for very long.

Khosla’s mantra is “shots on goal”: making lots of bets in potentially transformative technology areas. In his paper, he singles out twelve of the portfolio companies of Khosla Ventures as being particularly ambitious, with the potential for huge returns.

His lament is that there aren’t more firms or funds or organizations taking similarly audacious and numerous “shots on goal”. “If there were a hundred such Black Swan venture funds [similar to ours], each with its own points of view, we would have 10,000 ‘technology’ shots on goal over a decade, or at least more than 1,000 non-overlapping attempts. With that number of shots, or even just a thousand, I believe we would have a near certainty of at least ten assumption-shattering successes in major market segments.”

I don’t have a clue as to where the other 99 funds like Khosla’s will come from. I don’t know many investors who have that risk-appetite, especially in today’s turbulent world. There may be some needles in the haystack out there, but they are few and far between. Moreover, it’s unclear how much wealth those rare individuals possess and can allocate to helping hatch the Black Swans of cleantech.

It’s notable that Khosla supports the efforts of [ARPA-E](#), the group within the [U.S. Department of Energy](#) tasked with providing funds to risky but promising energy innovations. He probably knows that the other Black Swan funds he’d like to see from the private sector aren’t likely to emerge. Indeed, in his white paper, Khosla really doesn’t offer much of a logical investment thesis for Black Swan investing, beyond some wishful thinking and a deep trust in the law of large numbers.

Alas, low-cost public sector capital is simply more well-suited than private capital to cleantech Black Swans, which after all are big/bold bets offering large long-term social value.

In turn, this reliance on public sector grant support for new energy innovation causes many observers in the political realm to buck up their backs in opposition, complaining that the government shouldn’t be in the business of “picking winners and losers”. Unstated but underlying this criticism is the belief that our conventional energy system based on hydrocarbons never benefited from such largesse, so why should cleantech?

Tell that to [George Mitchell](#).

For many years during the 1980s and 1990s, Mitchell and his firm experimented with fracking, with limited success. Many in the oil patch told him that he was wasting his time...and his money, about \$6 million of it.

But, as this [recent analysis](#) by The Breakthrough Institute concludes convincingly, the development of fracking technology to enable the production of shale gas would not have happened if the U.S. DOE hadn’t provided a substantial amount of support for decades along the way.

Today, years later, shale gas has dramatically reshaped the playing field in the energy sector. The tireless efforts of George Mitchell and his willingness to bet big bucks have rewarded him with a fortune worth billions. He built that Black Swan.

But, then, he did so with the help of U.S. taxpayers. Mitchell almost certainly wouldn't have achieved what he did without substantial involvement of the government.

It's the kind of public-private partnership that will need to be replicated to achieve more breakthroughs in cleantech in the decades to come. The resulting Black Swans will also generate a number of cleantech fortunes, and these should be celebrated, as the appetite for risk-taking by devoted entrepreneurs and inventors must be commensurately rewarded by enough examples of success.

And, it should be hoped, these future cleantech billionaires can plow back large shares of their fortunes into philanthropy and investment in efforts to address and solve the world's problems of that later era for subsequent generations. Much like Vinod Khosla is doing today.

About the author

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Richard Stuebi has 25 years of experience as an executive, entrepreneur, and consultant in the energy industry, with the last 12 years focused on advanced energy technologies and business opportunities. Richard is a Managing Director of the venture capital firm Early Stage Partners, where he manages cleantech investment activities. Richard founded NextWave Energy in 1999 to help clients capitalize on the transition to an advanced energy economy. He continues to serve private sector clients on various business development topics, as well as civic organizations in Northeast Ohio as an outgrowth of his 2006-2010 role as Fellow for Energy and Environmental Advancement at The Cleveland Foundation. Earlier in his career, Richard was a senior vice president at Louis Dreyfus, the global commodity-trading firm, and was a management consultant in the energy practice of McKinsey & Co. Richard began his career in the late 1980s at ICF Resources. Richard is a member of the Board of Directors of EnLink Geoenergy Services and MAR Systems. He earned degrees in economics from the Massachusetts Institute of Technology (1984) and Stanford University (1986).

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