Financing Technology Revolutions:

What entrepreneurial capital does, why it succeeds and fails, and its relevance to Energy Technology Investing

Venture Capital can produce spectacular and unexpected returns. It can also spectacularly disappoint just when returns are expected. It remains a poorly understood science – often described by its practitioners as an art. Whether science or art, we do have 40 years of venture capital investing to show us some consistent patterns and learnings. A closer look at those patterns suggests a new approach to investing in energy technologies.

Disruptive new technologies evolve in steps that can be described as:
1) explosive ideation,
2) competitive carnage,
3) adoptive inflection points,
4) insightful recombinations, and
5) applications and network effects.

These can be summarized as follows:

Explosive Ideation is the point at which a new idea, invention, product captures the imagination of a significant number of entrepreneurs, each of whom now believes they can perfect their embodiment of that idea and successfully take it to market, typically convincing groups of investors to back them in doing so. This is the hardest of all of the stages because it involves the purest form of invention – intentionally solving a hard problem by attacking it directly.

Competitive Carnage happens when those entrepreneurs and investors realize perfecting that idea was more difficult, more expensive, and/or simply took longer than expected and the hoped for market adoption has not materialized as quickly as hoped. The realization fosters rampant competition for what little market acceptance there is. This competition kills

off of the weaker competitors and rapidly lowers prices, even as progress in perfecting the idea continues. Often, by the time this stage is completed only a handful of meaningful competitors remain, but pricing is now very attractive to the market.

Adoptive Inflection Points represent the phenomenon, particularly as regards significant "hardware" inventions, that once the new technology has been adopted by a couple of percentage points of the addressable population it tends to grow at exponential rates (i.e. CAGR's of 50% plus) until it reaches almost three quarters of its addressable market. Cars, radios, refrigerators, telephones, televisions, microwaves, VCRs, mobile phones and the Internet – they all followed this pattern.

Insightful Recombinations occur as the original entrepreneurs and those from adjoining fields begin to look more closely at the range of ideas that resulted from the "explosive ideation" phase and realize that some of these concepts can be recombined both with each other and with technological advances in adjacent fields to more rapidly move another technology forward. This is the financially most powerful of the stages because these recombinatory insights typically are of the variety that once demonstrated, are obvious to everyone, even if they were anything but obvious before one entrepreneur had that critical insight – and the insight, however brilliant it may have been, took a lot less time, money and work than the initial inventions.

Applications and Network Effects represent the overlay of software, services and business models on top of the underlying hardware technology: Microsoft to the PC, iTunes to the iPhone, Netflix to the VCR, Social Networking to the Internet, etc. These both leverage the difficult work put into the underlying hardware technology and tend to spur further recombinative insights, thereby allowing for far more rapid growth trajectories than the underlying inventions they could not have existed without. Network effects can add the final turbocharging, by strengthening the business proposition of an application exponentially based upon how many users or endpoints it connects.

Completing the cycle typically takes 50 years or more. Many of us have only seen the last few stages of a single cycle. We both lack the experience of having been through the prior cycle and tend to make faulty assumptions both about where we are and how quickly the process we are in will move forward. Those who have only lived through the "insightful recombinations" and "applications and network effects" stages of the Information Technology revolution have very skewed views of the pace and scale of change in the

entirety of these entrepreneurial waves. Those misperceptions create both investor/entrepreneurial opportunity and disappointment.

The world is increasingly coming to the view that we should deal with issues like with resource limitations, climate change, stranded fossil assets, and figuring out how to produce enough water, food and other critical human consumables for world growing from 6.9 billion humans in 2010 to 9.6 billion by 2050, most of whom want better lifestyles than they have today.

Looking at the past 20 years of the Information Technology revolution might cause you to say – "no problem, we can do this." But, if you look to 1975-1995 rather than 1995-2015, you might have a more pessimistic view. In those first 20 years, the pace of change was much more deliberate, more capital intensive and more hardware and infrastructure focused than software and networking focused. On the other hand, the speed with which we developed insightful recombinations, applications and network effects over the subsequent 20 years should give us hope.

We have now completed fifteen years of accelerated sustainability investing – putting us at around 1990 in IT revolution equivalent years. As was the case between 1975 and 1990, we have again moved certain hardware and infrastructure technologies (think wind and solar PV) forward in tremendous

ways that have, in turn, opened the door to software, business model, service and networking inventions that further accelerate the attractiveness and adoption of these technologies. In fact, the availability of technology from the IT revolution, the data communications revolution and the biotechnology revolution have given us the ability to accelerate change in the "Resource Revolution." As a result, we may actually be closer to 1995 than 1990 in equivalent years.

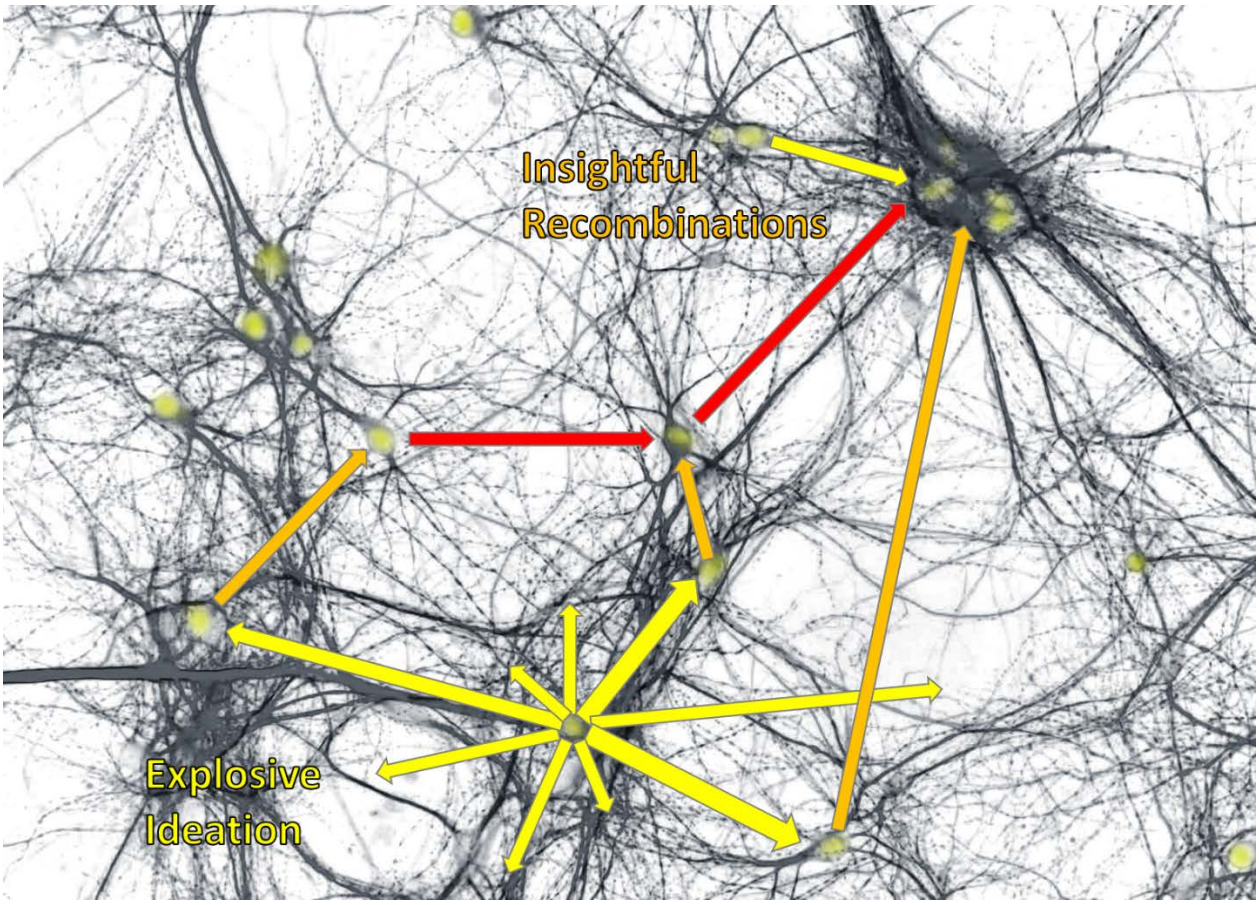
Understanding just where that puts us in the timeline of the inventive process and which opportunities it leverages is key to making intelligent investments in the various subsectors of the Resource Revolution.

I. Explosive Ideation. "Creative destruction" is another term for this part of the process – first coined by economist Joseph Schumpeter in 1942. Schumpeter called capitalism "the perennial gale of creative destruction;" seeing "deliberate disruption" as the key to "transformational growth" for individuals and organizations.

Nature fosters innovation through diversification (mutation) to create new species and variants of existing species able to survive the forces that challenge current forms of life. Nature also represents forces that allow it to correct for overpopulation or overabundance – though often in not particularly pleasant ways (like fires, floods and famines). Each crisis leads to a new beginning and an opportunity to do it better this time around – the natural process we refer to as evolution. Charles Darwin was one of the first

to recognize this natural phenomenon; observing that amazingly, even the simplest creatures respond to such natural and ecological threats by multiplication and diversification – somehow intrinsically understanding that change is a natural ingredient of survival. Change or die is an accepted rule of the animal and plant world.

A map of the human brain and our neural networks is a fairly good representation of how we use a series of neural networks to expand upon initial thoughts and continuously combine those with other expansions of adjacent thinking (see below):



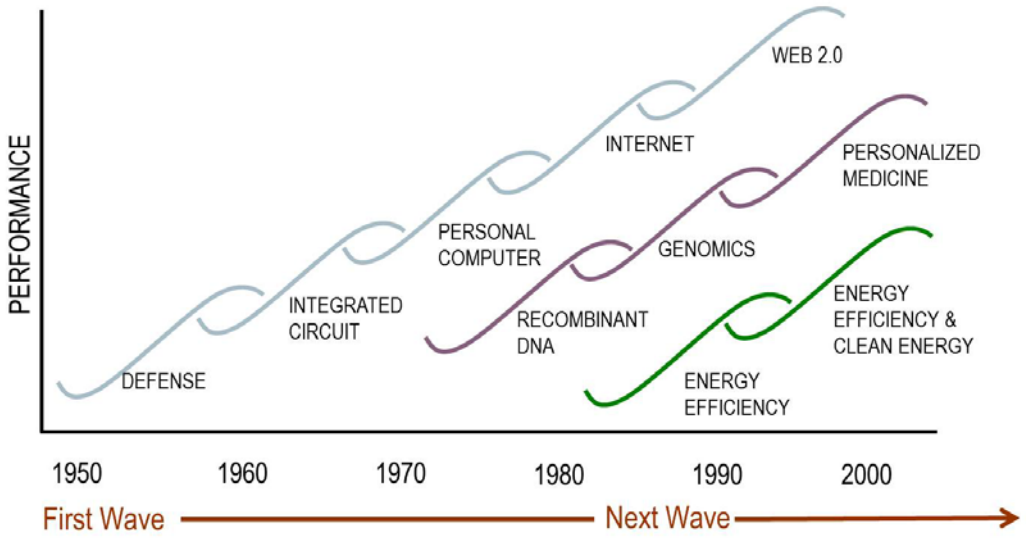
The bigger the problem, the greater the opportunity to use a diversity of ideas and approaches to find a possible solution. By definition, most changes to our status quo create market gaps or opportunities that can be exploited by this process of explosive ideation.

Unfortunately, the big problems often don't lend themselves to instantaneous solutions. As per the picture above, early approaches often seem like a random scattershot of ideas. Investment returns from this phase of the process confirm the scattershot notion – most ideas are losers.

When you trying to solve really big problems that require lots of time and capital, those losers are often BIG losers.

History suggests that some of our most impactful inventions were the result of a "happy accident" (microwave oven, X-ray, Penicillin and Plastic), and others were more the result of an "insight" than the result of a highly focused process to solve a particular problem (printing press, steam engine, telephone or solar panels). Picking a particular problem to solve and then doggedly pursuing a "best" solution often proves far harder and far more elusive. So the good news of having a big problem that lots of people want to solve is that you do get a whole lot of scattershot solutions, most of which aren't very useful, but one or more often are and then the whole Technology Evolution Process gets going.

Humans are particularly adept at continuously improving upon a first great idea, continuously refining it until it fully meets market needs and is rapidly adopted by users. Each of these discovery, refinement, adoption and maturation processes can be depicted as an S-curve in that they start slowly, reach an inflection point, grow rapidly to a certain level of saturation and then slow down. As a result, technological process is often depicted as a consecutive series of these S-curves (see charts below):

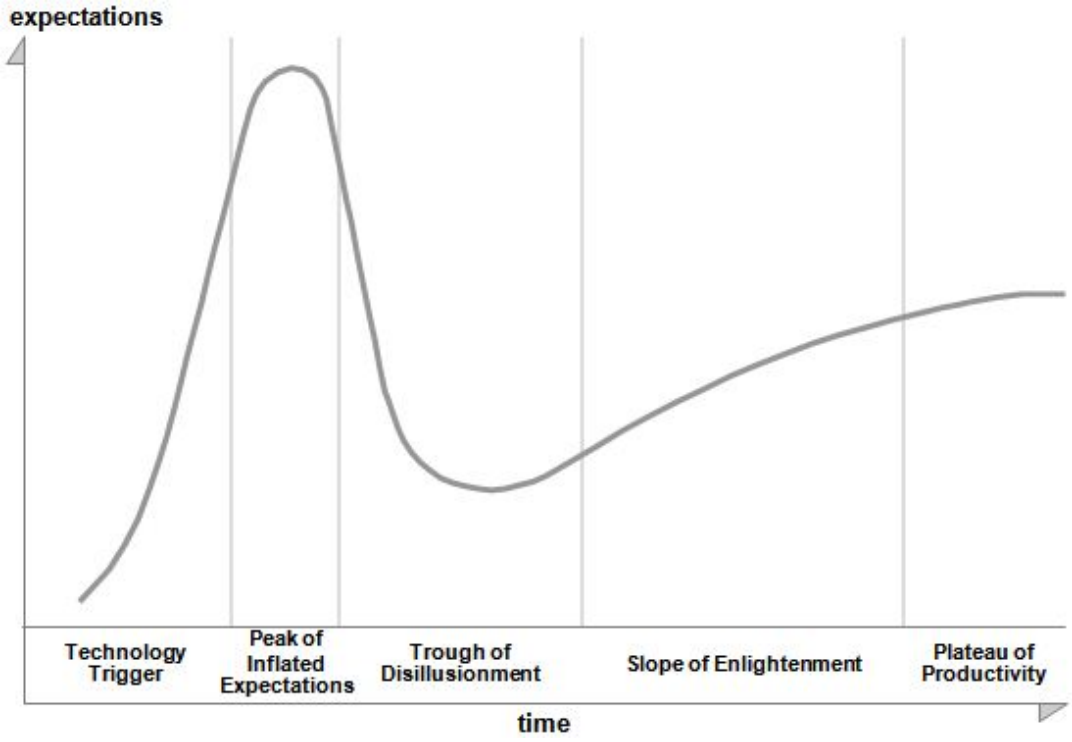


SOURCE: 2008 California Green Innovation Index

But the chart above, glosses over what happens between the flattening of one S-curve and the start of the next, and, more importantly, how difficult it is to start an entirely new set of curves from scratch.

Most of us are familiar with the concept of the Gartner Hype Cycle (see figure below). But Gartner speaks more to market adoption trends and

investor excitement than the creative destruction process that is occurring amongst the companies vying for leadership in a given market segment.



In the time frame between the "Technology Trigger" and the "Peak of Inflated Expectations" human excitement causes lots of new companies to be built and financed – the "explosive ideation" phase. But, because our excitement gets ahead of the reality of really addressing market needs at attractive price points, we get to Gartner's "Trough of Illusionment." It is during this phase that competition becomes most fierce and companies kill each other off in driving prices down – our "competitive carnage" phase.

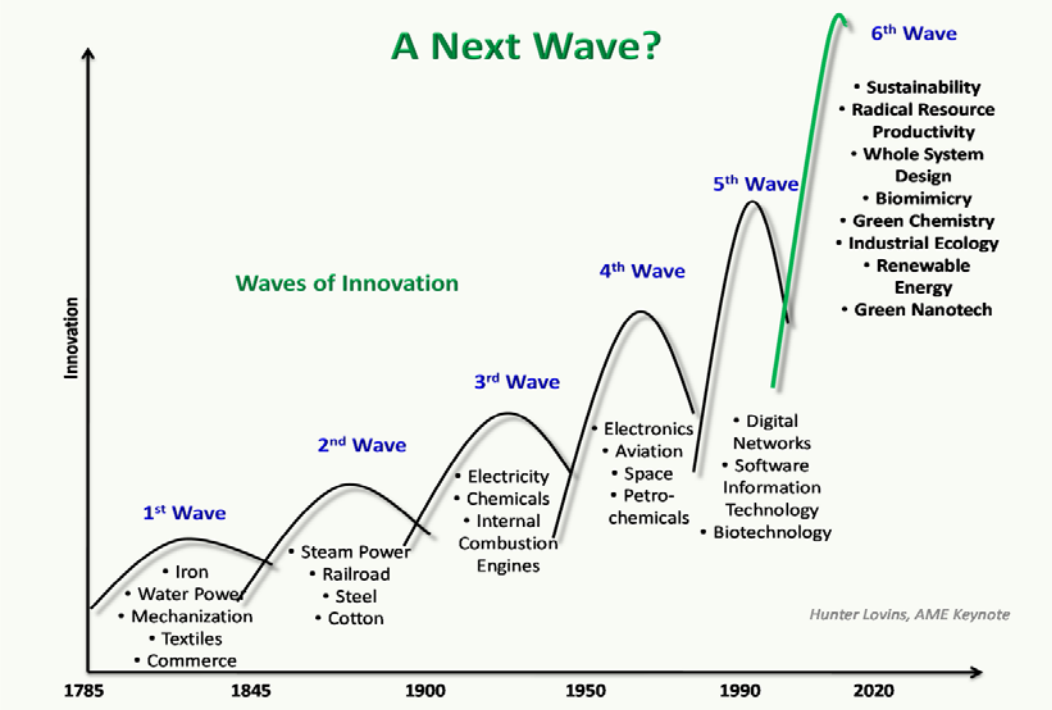
If you are an investor, the idea that you might make a small investment at the point of "technology trigger" and then liquidate that investment at the "peak of inflated expectations," is the dream of the seed and early stage venture capital investment world.

But, if as that investor, you actually have to wait until the "plateau of productivity" for your liquidity, cash on cash returns might still be attractive, but your IRR has suffered meaningfully. Worse, if during the "trough of disillusionment" the development of that technology required significant additional dilutive capital, then virtually all your gains may be erased, particularly if you don't have the deep pockets to retain your ownership share as the company proceeds through the full set of Gartner stages.

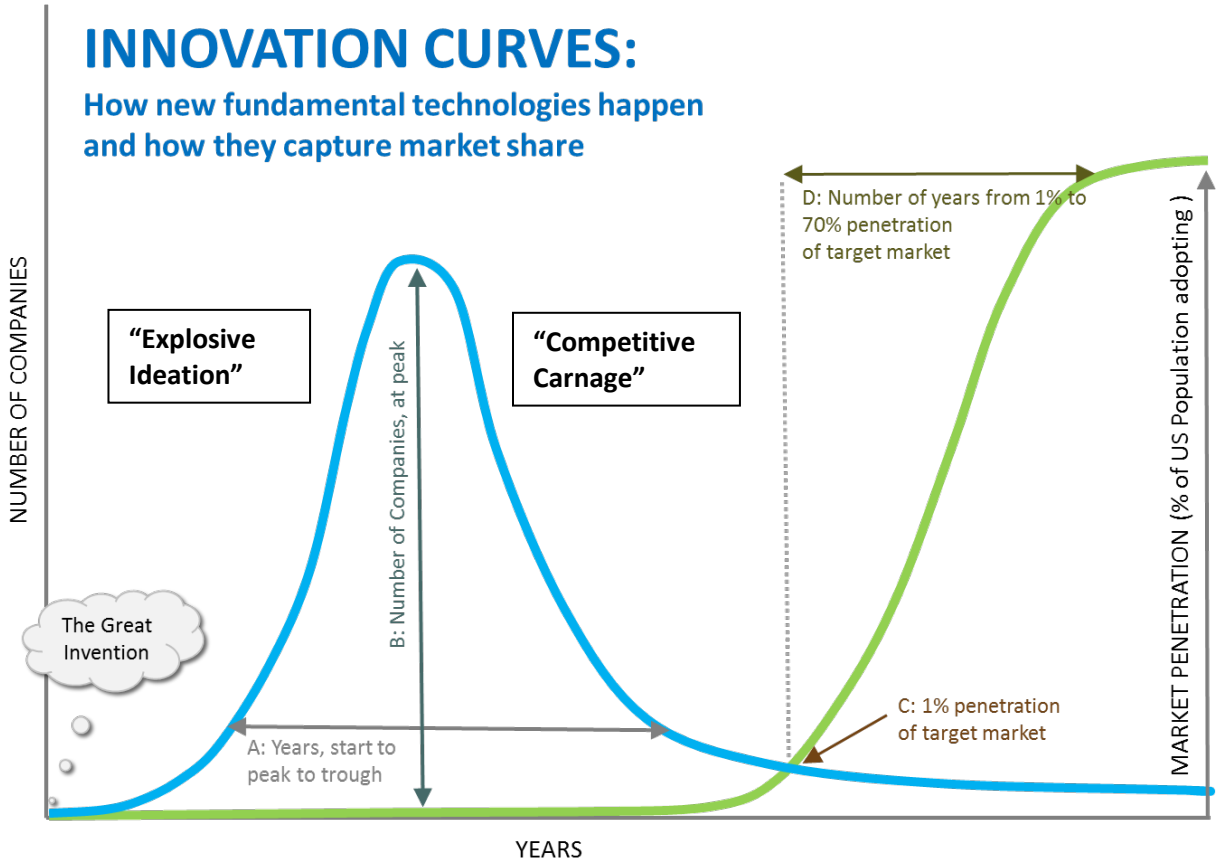
II. Competitive Carnage. We see the "trough of illusionment" in a different light. We see it as the point at which the enthusiasm built up during the "peak of inflated expectations" realizes the market simply isn't ready to adopt the new technology at the pace needed to support the hundreds of companies built and funded to exploit that technology.

As a result, they begin to compete very aggressively for what little market adoption there is, lowering prices and driving each other out of business. As they do so, the lower prices begin to attract more early adopters, but the market typically turns upward too late to save most of the companies first created to exploit it. In fact, typically only a handful of companies remain viable to benefit from the rapid growth phase of the new market.

So instead of a picture that looks like the chart below ("A Next Wave?"), we get a series of curves that look more like a Gartner curve but depict not "expectations" (per Gartner) but "number of companies" and "level of market adoption" or revenue.

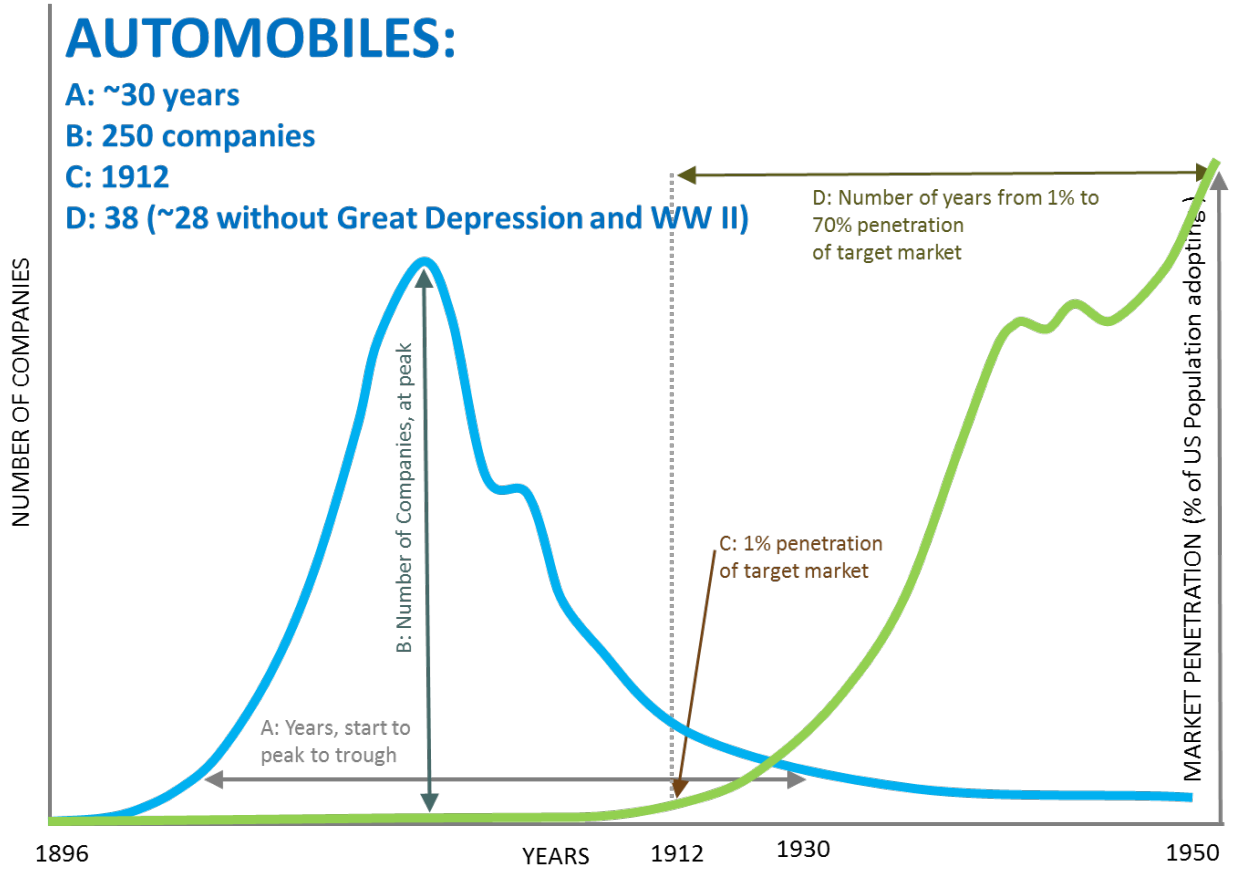


The chart below shows how a fundamental technological breakthrough tends to spur an outburst of company formations (the "Explosive Ideation" phase), seeking to perfect that initial invention and effectively bring it to market, followed by the competitive decline forced by a not yet ready market (the "Competitive Carnage" phase).



By focusing on A (the number of years it takes between reduction to practice of the critical invention, the height of entrepreneurial enthusiasm and company building and the end of the competitive carnage that inevitably follows), B (the number of companies created to pursue the perfection of that fundamental invention), C (the point at which the new technology has actually been adopted by 1% of the U.S. population (or relevant target market) and D (the time it takes to get from 1% adoption to approximately 70% market penetration (where adoption often begins to level off), we can compare a series of such inventive cycles around technologies now familiar to us and begin to predict where other fundamental technologies are on this same development scale.

Here, for example, is the set of curves and points A, B, C and d applicable to the automobile:



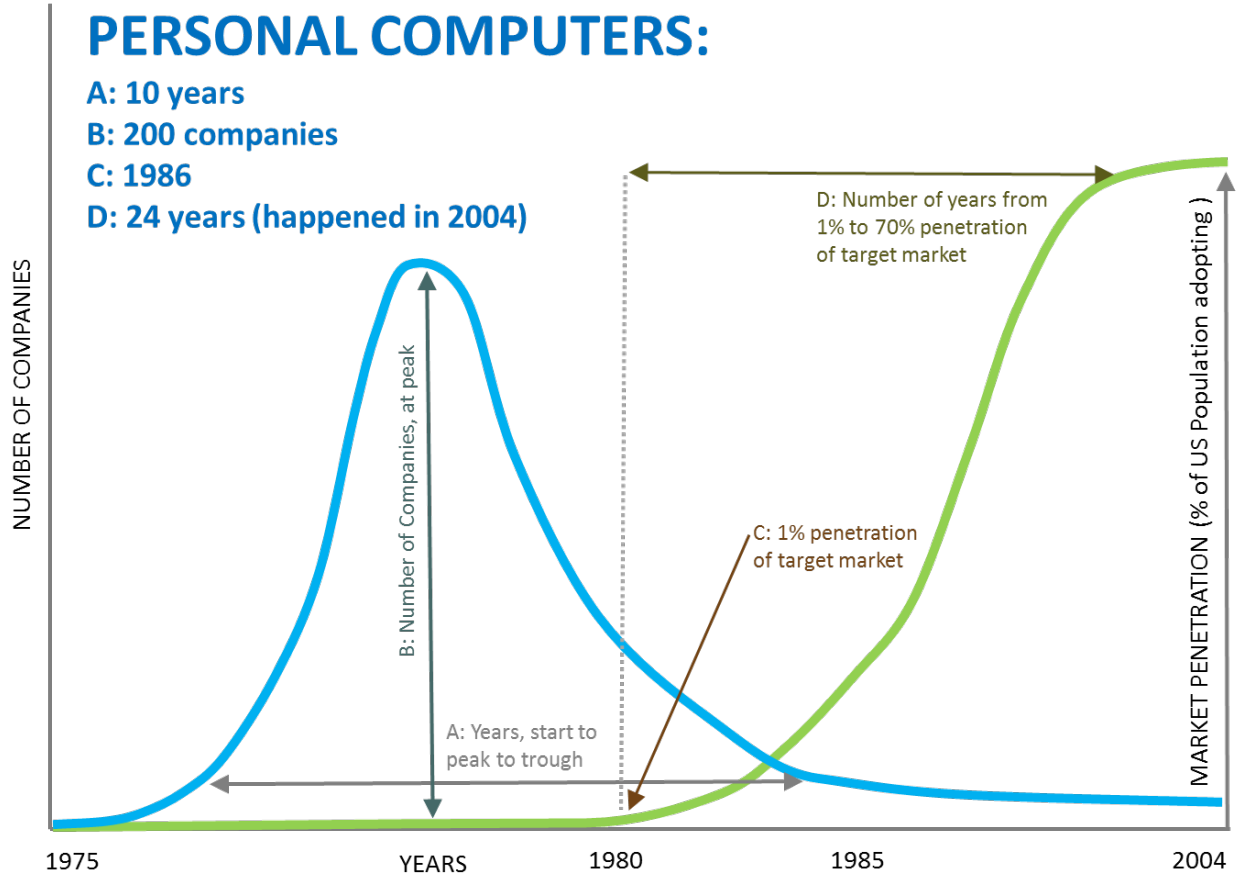
In this instance both World War Two and The Great Depression slowed the automobile's progression toward 70% or greater market penetration. Importantly, we today tend to forget the important part of automotive history that was the roughly 250 car companies that competed alongside Ford, General Motors, and Chrysler for domination of this nascent market. In fact, in the early years it was far from clear who would dominate and in fact Chrysler didn't enter the picture until 25 years after the automotive "gold rush" began.

As importantly, the 1% market penetration point occurred only after most of the competitive carnage was over and the field had been reduced to a relatively small number of competitors. In all, the rise and fall of the entrepreneurial wave of automobiles took about 35 years to run its course. But once that 35 years was over, the growth rate in car sales was exponential and the few winning companies, represented extremely

attractive long-term investment opportunities, even if they did anything but that during the prior 30 years.

For the investor "playing the field" of car startups, the average returns would have been miserable, as the vast majority of the competitors failed. Although we have not studied it in detail across technologies, our initial research indicates that winners tend to represent odds of 5-in-100 or less and, although over the long run they represent outstanding investments, the IRR for investors betting on those same companies after the competitive carnage is over (i.e. in 1912) is generally far better than that for those who actually picked out the Ford Motor company back in 1903.

More recent history for most of us is the development of the personal computer (although for many of today's investors their memory only covers the subsequent software and internet periods, not the more difficult hardware development phase of information technology).

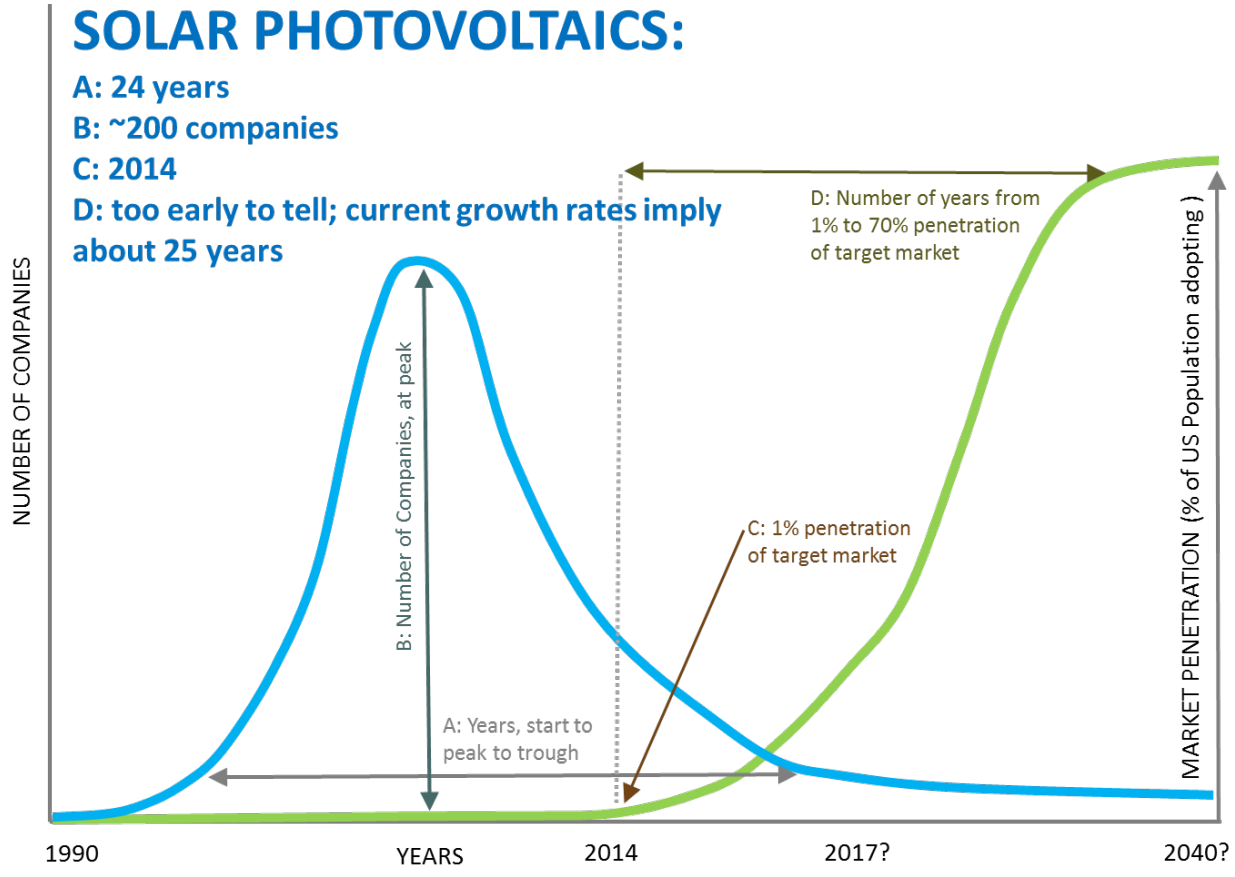


A few investors were prescient enough to bet on Apple Computer by 1980. But, you could have waited until 1985 and still have gotten most of Apple's computer gains (and until 2006 to get in ahead of Apple's next technological

breakthrough – the iPhone). Betting the field on personal computer hardware manufacturers would have produced very disappointing overall results during that same 1975 to 1985 time period.

Generally, the difficulty with most of these hardware breakthroughs is that they require significant amounts of capital to a) reduce the technology to practice, b) build a factory to scale up production and c) produce in enough volume to bring prices down to high levels of market acceptance.

Of greater relevance to the "6th wave" discussion on clean energy, sustainability and green chemistries, is the same set of curves as applied to the solar industry (see below):

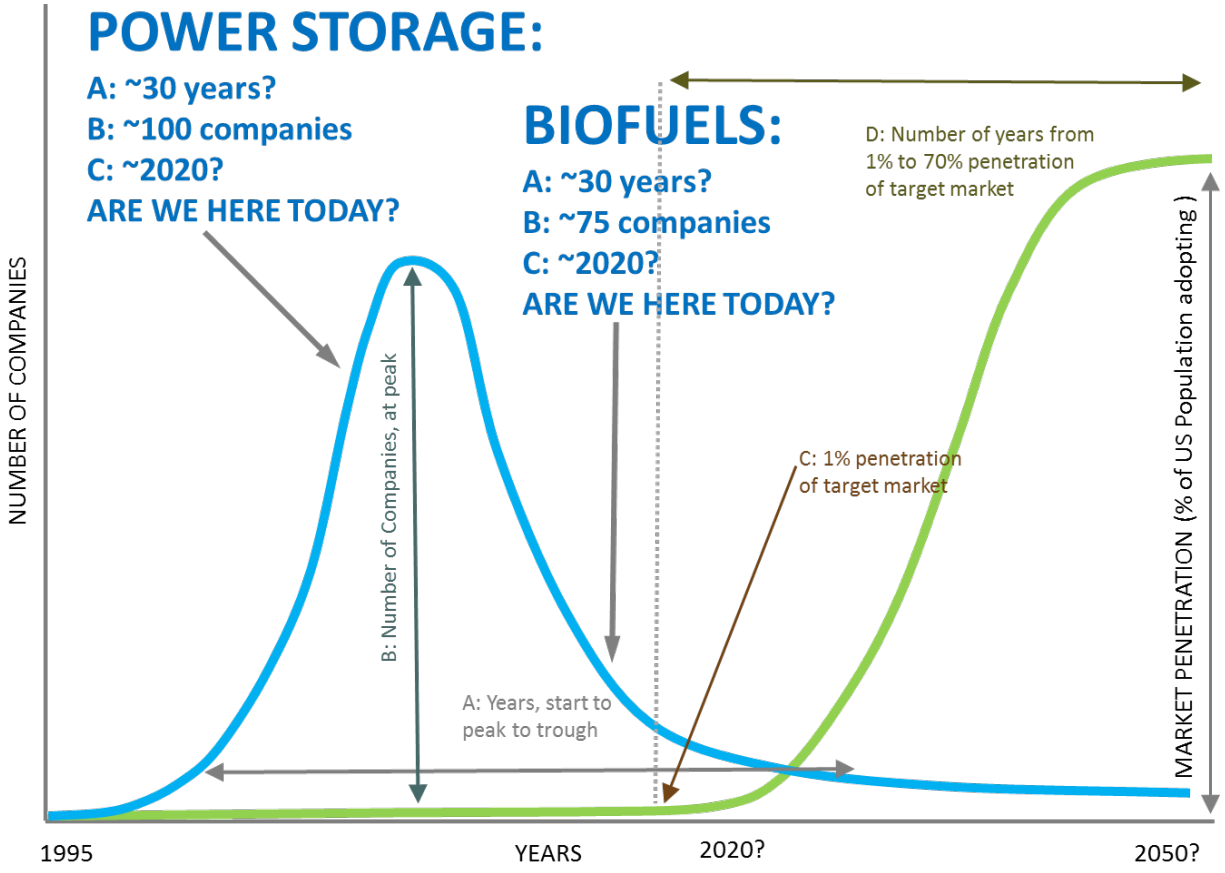


For solar, we are nearing the completion of the competitive carnage phase. We have seen massive drops in production costs and, as a result, panel costs (see chart below). Solar PV now represents more than 1% of US energy capacity, but has already crossed the 10% penetration levels of eligible households in several states (like Hawaii, California, Massachusetts, Arizona and Colorado) that were early adopters. Conforming to the historical pattern, investing across the field of PV manufacturers was, on

average, a very poor bet. Interestingly, one investor, Europe's Good Energies turned a roughly $400M initial investment across a range of German, U.S. and Chinese solar companies into a roughly $6B paper valuation at the height of the competitive frenzy, but (in large part because liquidity was unavailable) rode those valuations back down to less than $1B by the time the carnage was over.

Today's First Solar and SunPower probably represent the investment equivalents of Ford or Chrysler, Dell or Apple in terms of their long term prospects as the solar industry continues its long climb toward 70% penetration of eligible households.

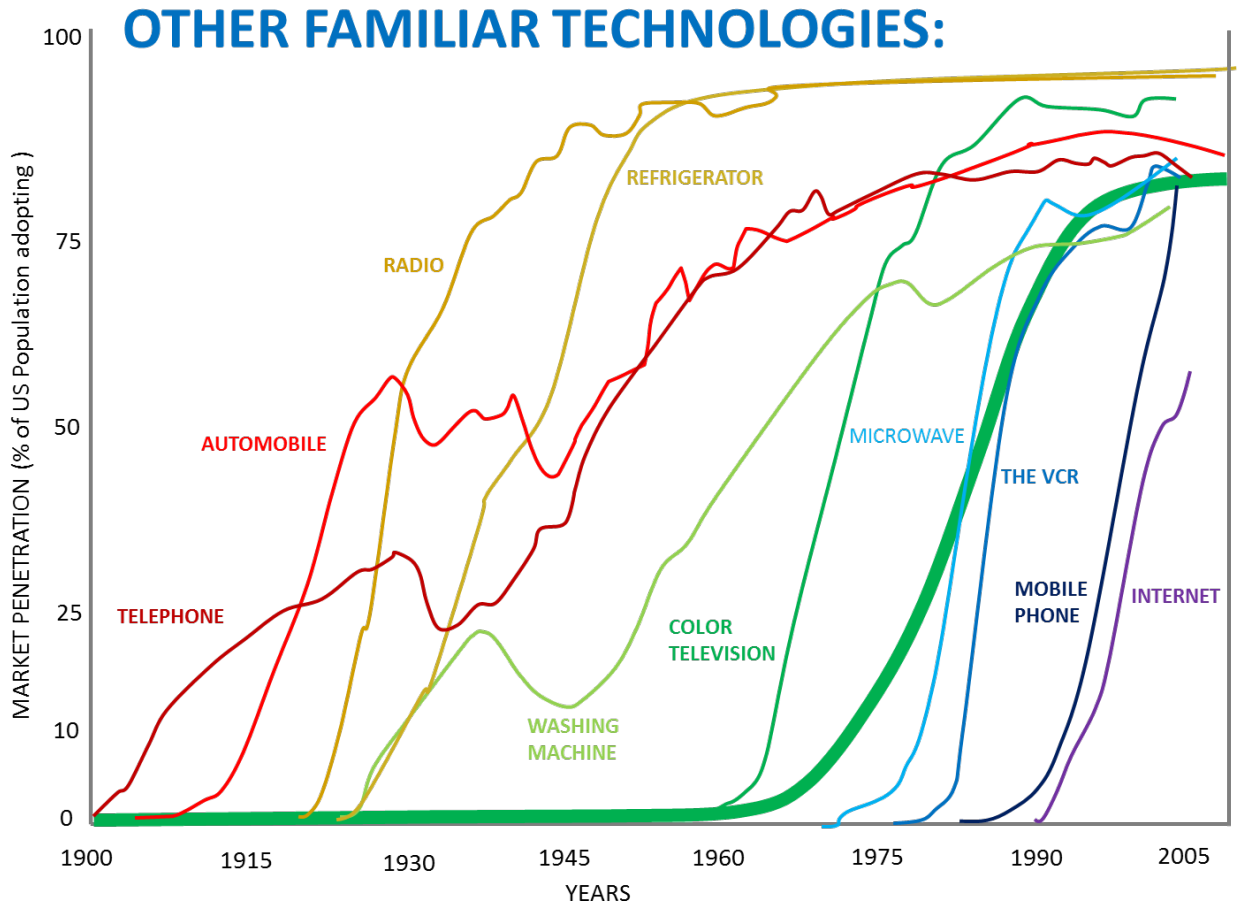
What about the rest of the so-called "CleanTech" industry?



Wind has already undergone its boom, bust and recovery phases, but it is largely a business-to-business or utility-scale solution and thus didn't generate the same competitive frenzy as most consumer product technologies (of which solar PV is really the first energy entrant). Biofuels and biochemical are well into their competitive carnage phase and even if we haven't seen the end of the carnage, there are few new entrants in those

fields at the moment. On the other hand, battery chemistries are all the rage today and we may still be on the upswing of new company creation. Will overbuilding of lithium ion factories for car batteries, particularly in the face of lower oil prices, spur the beginnings of competitive carnage in batteries? Will it rapidly bring down prices and, as a result, speed up adoption?

This pattern has repeated itself over and over again with regard to a series of technological hardware breakthroughs (including the telephone, radio, washing machine, microwave, VCR, color television, etc.), each having somewhat differing levels of entrepreneurial gold rushes, competitive carnages and years from start to peak to trough. But the pattern of proceeding rapidly from those first percentage points of market adoption up to nearly 70% of households generally holds true across this range of consumer goods (see chart below).



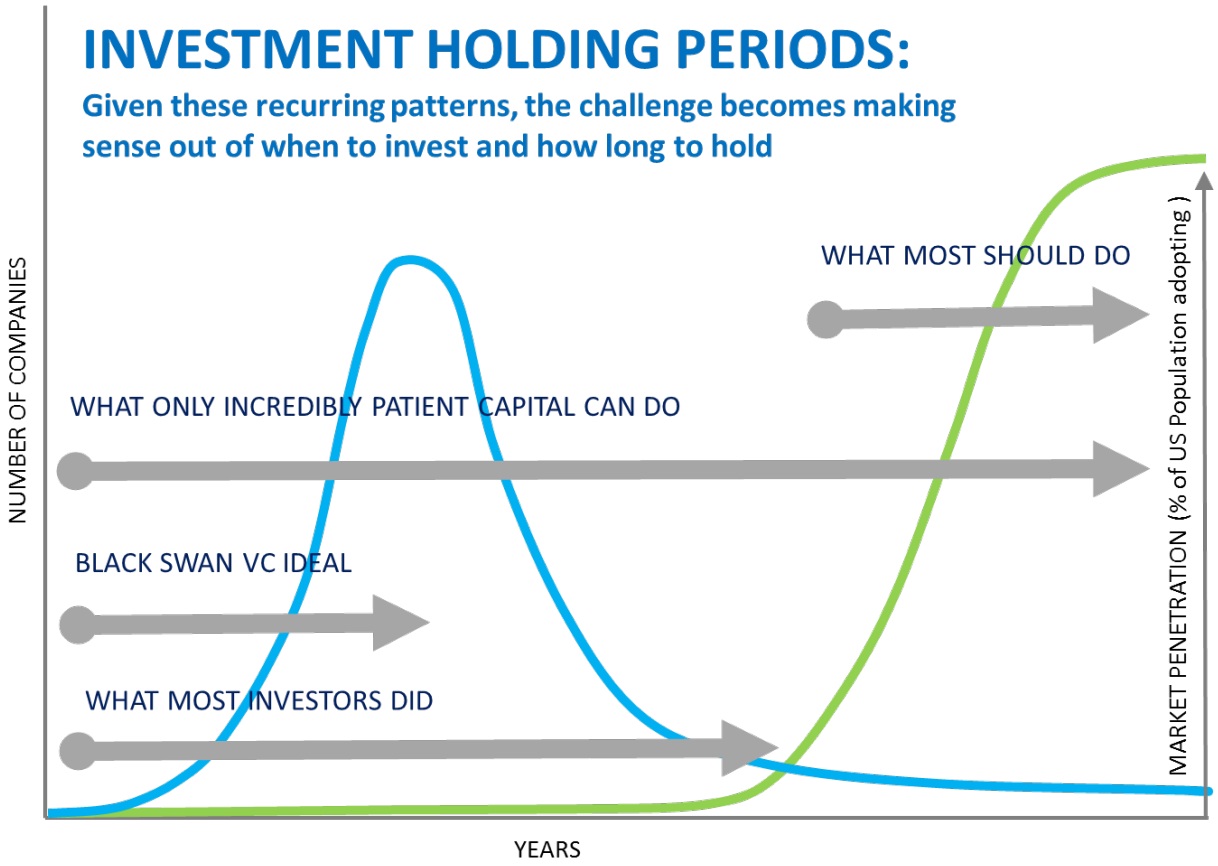
We have specifically focused on the automobile, personal computer and solar PV industries because they each represent a paradigm change in a) personal mobility, b) personal information access and c) personal energy production

as compared to their legacy counterparts of a) trains, b) enterprise computing and c) utility scale energy. The parallels between cars, pc's and solar are further extended when you factor in the importance of storage (the gasoline tank and the gasoline station, computer memory and cloud storage, and energy storage whether in the form of batteries or the grid) and a supporting network (the road and highway system, the Ethernet and Internet, and the "Smart Grid"). The power of the new consumer technology, affordable storage and networking technologies together represent a new era in energy as much as cars and personal computers changed mobility and information technology.

III. Adoptive Inflection Points. History shows us that with these "hardware" technologies, once they are adopted by just a few percentage points of the applicable population, they very rapidly grow (at exponential rates) until they have been adopted by somewhere between 70 and 90 percent of the population.

What these curves generally don't reflect particularly well, is how many years a new technology crept along at the less than 1% adoption level. Pure math tells us that with 100% per year growth rates (exponential doubling), it takes equally as long to get from 0% to 1% as it takes to get from 1% to 100%.

Think about that math in the context of the typical 10-year venture fund. If your technology is going to take 20-30 years to gain full market adoption, why would you want to invest in the first decade, when you know that penetration rates are likely to be less than 1%?



So it isn't surprising that investors are often ready to give up at about the same time as the noticeable inflection point of more than 1% adoption really happens. Sometimes they don't even have much of a choice, if the fund they invested from is at the end of its life. As a result, knowing when to invest, how long you are likely going to need to hold that investment and how much capital you might need to protect your position through liquidity become critical success criteria.

Investing early in these breakthrough hardware technologies is neither for the faint of heart nor for the shallow of pocket book. If you don't have a good sense of the timelines and where you are, you probably shouldn't venture in. On the other hand, waiting too long and not investing in the leading companies once they have emerged from the competitive carnage means leaving large sums of money on the table. Worse, if you are still heavily invested in the old world and wait too long to get in on the new, you may lose money on both ends.

But as difficult as it is for investors, getting this timing right is often even more difficult for the incumbent corporations being disintermediated by these changes. First, by being in the "old world" you tend to believe your

own technology will live longer than it typically does. Secondly, you tend to be a born skeptic about the shortcomings of the new technology. Lastly, making the switch often seems like it is forcing you to cannibalize your own, market-leading technology at its maturity.

But the ugly truth is, that if you wait, you cannot expect to successfully acquire the winning technology once that player has established a dominant position – the price will always seem too high. At the same time, developing a successfully disruptive technology inside a company dependent on the old may be even more difficult. We have previously published a "One Pager" on this challenge – see "A Repeating Growth Pattern" http://www.resourcient.com/#!repeating-growth-pattern/clw3).

The good news for most investors is that fundamental hardware breakthroughs are just the first part of the story. For each such breakthrough there follows a succession of new business models, service industries, and software applications and solutions that are enabled by the hardware/infrastructure breakthrough and that generally represent far shorter and therefore more attractive paths to economic returns from investment.

So, you might not need to even play in the "hardware and infrastructure" innings of the game.

IV. Insightful Recombinations. The other very important pattern of entrepreneurial behavior enabled by these technology invention and adoption curves is the ability to combine technologies across markets together with new concepts to address entirely new market opportunities. Good examples of this type of recombinant invention for the resource revolution sector are 1) Tesla Motors, Nest Labs, Solar City, and 4) Uber.

Tesla involved taking advantage of technological progress in the electric motor segment, the lithium ion battery segment and the parallel processing computing segment and applying the best available technologies to an entirely new segment – automotive transport. Ultimately building first the Tesla Roadster and then the brilliant Model S were still daunting challenges, but imagine if Tesla had had to develop its own engine, its own battery and a novel way to process charging and discharging all by itself. Instead, it leveraged the work of others by applying it to an entirely new market segment.

Similarly, Nest Labs took the known capabilities of a thermostat and overlaid the learnings of having built the iPhone (as well as its global supply chain) to

rethinking what a thermostat might do. In so doing, Nest combined the best attributes of two industries that hadn't yet fully intersected on their own.

Solar City didn't develop its own PV modules. It relied on the hard work of others to do that. But it borrowed business models from the housing industry to rethink rooftop installation, lending models from banking to provide innovative financing tools, Google Maps to provide a quick look at rooftop eligibility and innovative marketing models to change how energy is sold to a consumer market.

Uber, in turn, has completely disrupted the Taxi industry by borrowing a series of Internet inventions developed by others (Google maps again, routing software algorithms, handheld devices and the ability to use those devices for billing and payment, and a series of other tools developed for the Internet industry, but applied them to a business theretofore not disrupted by these technologies.

In retrospect, each of these companies' approaches seem rather obvious, but they obviously didn't occur to the many, and those to whom they did occur rapidly leveraged the preexisting technologies into market dominance. The reason these businesses were big financial successes for the entrepreneurs and investors is that they skipped the really hard part of fundamental invention, but they learned from and deeply understood those difficult inventions and then used creative insights to recombine the inventions of others toward a new market opportunity heretofore unnoticed. Once they did what they did, it was obvious to others, but, by then, these companies had each built a huge competitive lead.

Not surprisingly, these highly successful "insightful recombination" businesses typically have very strong CEOs. Unlike the team efforts that often characterize difficult problem solving and fundamental science, the insight business is often a lonely world – because until you prove it, what you are suggesting seems nonsensical to most everyone. In a fundamental inventions world, you probably couldn't get funded for something so far-fetched. But in the world of insightful recombinations, you are leveraging the hard work of others and may be able to prove enough early on to attract the necessary financing to deliver to the world exactly what you, and no one else, saw until the day you delivered it to the rest of the world. If you are a Steve Jobs, a Walt Disney or an Elon Musk, this is your world.

V. **Applications and Network Effects** represent the overlay of new services and business models and applications software on top of the underlying hardware technology: Microsoft to the PC, iTunes to the iPhone, Netflix to the VCR, Social Networking to the Internet, etc. These both

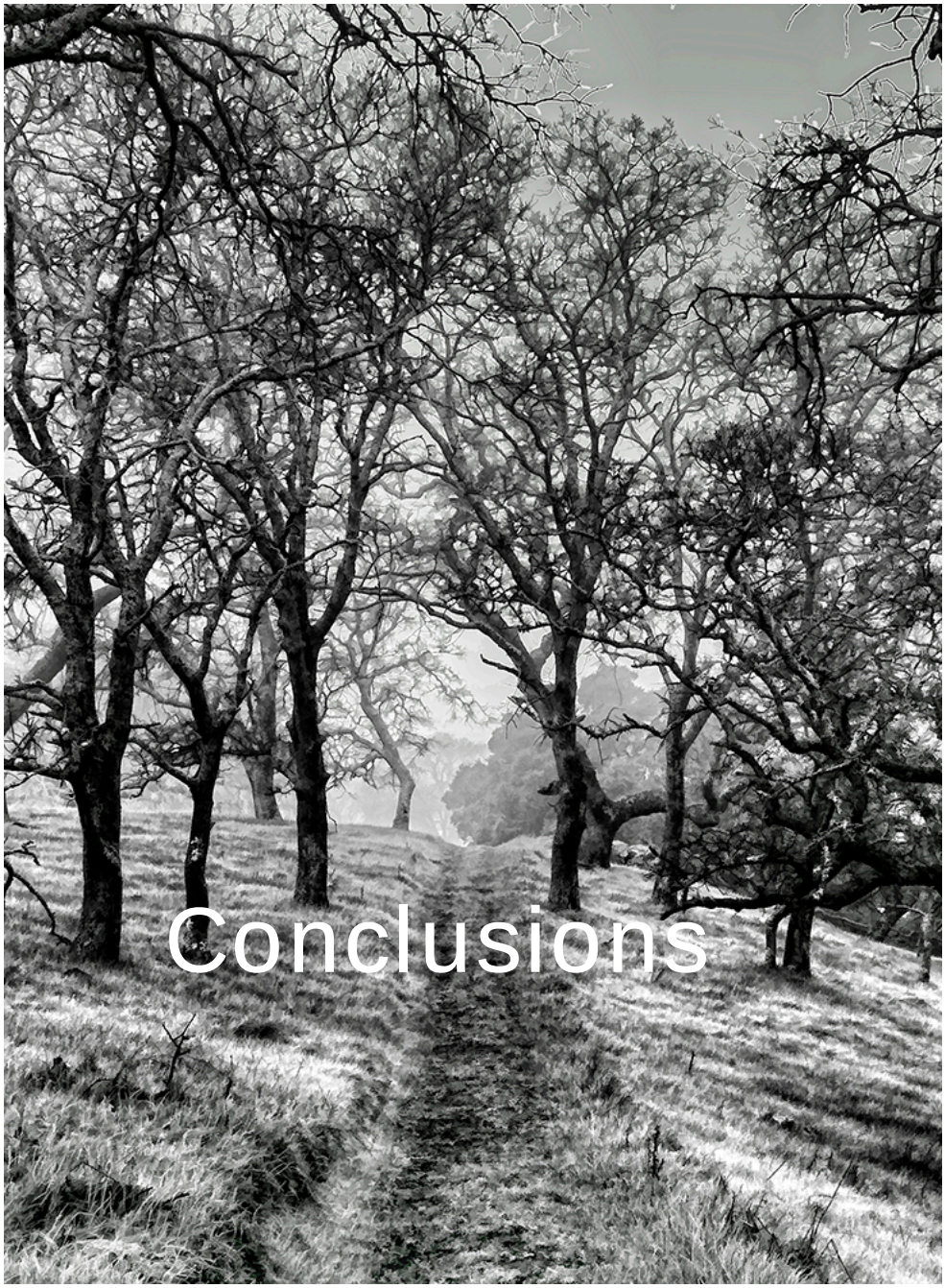
leverage the difficult work put into the underlying hardware technology and open the door to even more recombinative effects, thereby allowing for far more rapid growth trajectories than the underlying inventions they could not have existed without.

Unlike the prior category, most of these businesses involve software or service models and are thus even easier to build and market test than the foregoing category of recombinant insights. Much of what we have seen in social networking and online business models represents this phase of the technological evolutionary process. Here too a strong CEO with a recombinant insight into a business or software solution can make a huge difference. This is the world of Bill Gates, Larry Ellison, Michael Dell, Peter Thiel, and Travis Kalanick.

A very important subset of these businesses ae those that also leverage network effects created by enabling entire clusters of users or endpoints to benefit from the new technology in a mutually reinforcing way. Here the recombinative insight also requires patience as these businesses often don't gain that much traction in their early years – there simply aren't enough nodes on the network to prove out the strength of the network effect. But as those nodes expand, these can become extraordinarily powerful businesses. Once again, a strong founding team or CEO can make a huge difference. These are the businesses that Jeff Bezos, Sergei Brin and Larry Page, Mark Zukerberg, Pierre Omidyar, Janus Friis, Jack Ma, and Reid Hoffman built.

The applications and network effects companies tend to represent the final stage of a technology revolution. Over time, they seek out smaller and smaller niche markets that can rapidly be tested, exploited and then expanded upon as the bigger market segments are exploited and become mature. From an investment perspective they tend to both be "capital light" and have fairly short maturation times, meaning one can "fail quickly and cheaply" and use capital to consolidate success, often producing stellar rates of IRR.

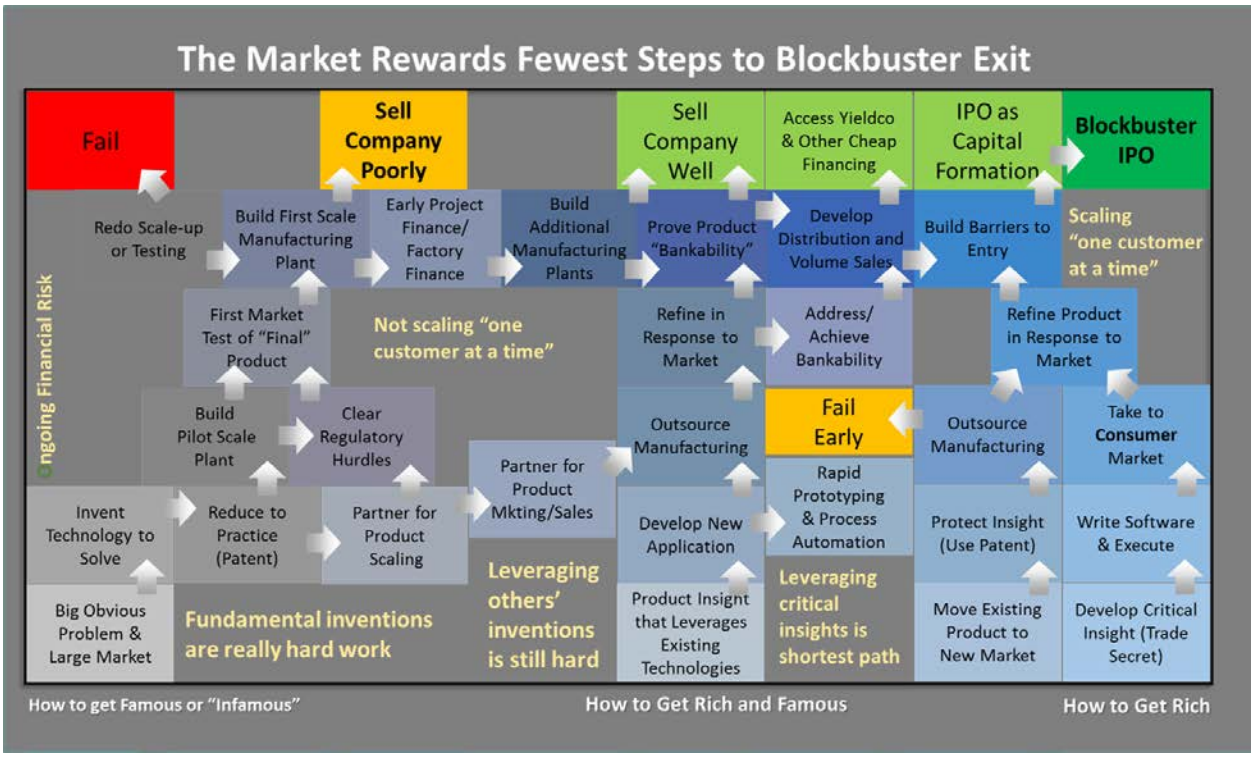
But remember, that these business largely have arisen only in the last 5-10 years of the IT revolution and would not have succeeded or even been possible in the first 20-25 years of that IT revolution.



Understanding these patterns of failure, challenge and success across the range of investment opportunities that occur in a new wave of innovation is a critical aspect of investment success. In attempting to describe the paths that companies must take in succeeding at the various phases of the technology evolution process, we have developed a checkerboard depiction of the steps that various companies progress through on their way to failure or success. It has served as a very useful exercise to take familiar

companies through these steps and remember the challenges and difficulties encountered along the way.

Although complex, we believe the chart below sums up the steps companies need to take on their way to an outcome and thus explains some of the risks involved and the reasons why investment returns are harder to achieve along some paths as compared to others:



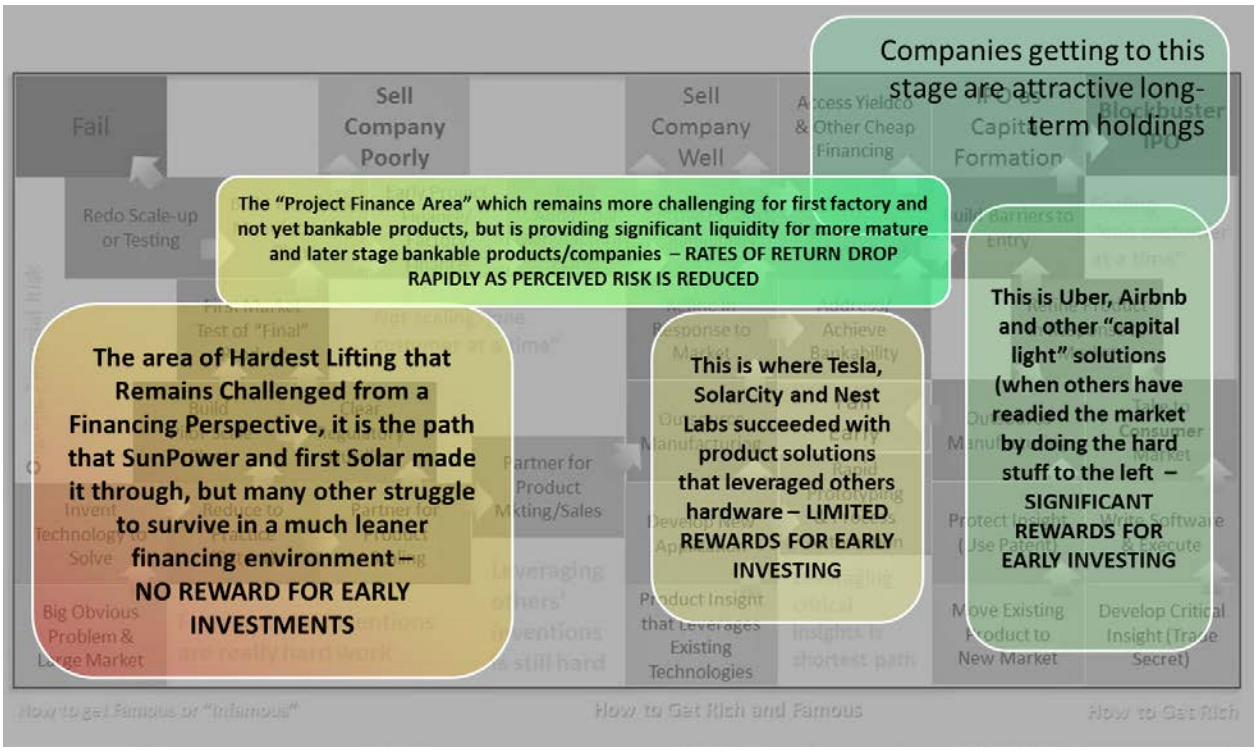
We refer to the challenge of actually solving one of the "big problems" with novel technology as the "How to get Famous or Infamous" path. Because of the time frames and amount of capital required, it is a tough way to make money, but because of the degree of difficulty, if you succeed, you'll likely be famous. Solving problems through recombinative insights that combine others hardware/infrastructure in novel ways and presenting them in a way that opens new markets can produce really big winners in fame and in fortune – but recognizing these winners early isn't easy. Ultimately, if making money is your focus, then you had best either stick to the right side of the game board or start much further up the board, with late stage investments in infrastructure and hardware winners and in their deployment activities.

For the most part, companies on the bottom left of the chart remain very challenging investments. For many of them, successfully gaining access to the horizontal bar of infrastructure/project finance capital becomes a key

determinant of the future success. At the same time, each group of companies that reaches the top right from the bottom middle and left of the chart opens the door to an entire generation of new software-based applications and solutions companies that can travel up the right hand side of the chart and thus represent much more attractive private equity and venture returns. So all the investors that want to make money solely by staying on the far right (often referred to as the "capital light" side of the chart) have to hope that there are other investors out there who will grow the companies on the left side, without which the capital light investments couldn't function.

You can't have a Google, a Facebook, an eBay, etc. without someone first developing the personal computer, Ethernet networking, digital information storage and the Internet backbone (all of which were harder, more capital intensive and produced lower multiple winners).

The chart below overlays some of the historic investment categories in Clean energy on top of the prior chart.



What does that mean for investment prospects in the clean energy arena? In our view it means that one should pay significant attention to the maturity level of the underlying technology. It also means that there are later stage and/or publicly traded companies that represent the scarce survivors of the competitive carnage and that history suggests will represent

20-30 year-long attractive investment holdings that no matter how expensive they appear today, will if they remain a category leader, be yet far more valuable over those many years. SolarCity might turn out to be the parallel of Dell (both utilizing new business models leveraging others' hardware), SunPower, First Solar or SunEdison might be the equivalents of HP, Cisco, Oracle or Salesforce. Might Tesla be the equivalent of Apple? At least some of these will turn out to be as attractive a long term investment holding as their IT revolution counterparts and if you are going to benefit as an investor you should probably already be holding your choices among these stocks.

We also see a very attractive convergence between four technology trends that are all maturing rapidly, two of them already having completed most of their competitive carnage phase. Those four technologies are (i) solar PV, (ii) electric vehicles, (iii) batteries for PV and EV storage; and (iv) the overlay of big data analytics and the internet-of-things on the supply and management of electrons to and from PV, the EVs, households, businesses and the grid. The intersection of these four is spawning a host of new sectors, many characterized more as applications and solutions businesses, which we believe represent the equivalent of the 1995 to 2000 wave of information technology investment.

The hardware exists, it has reached a highly competitive price/performance level, it is being deployed at exponential rates of growth, it has crossed the critical first couple of percentage points of market penetration and it is now pulling along a whole series of ancillary technologies, business models and services that will grow even more rapidly and produce better IRRs than the underlying fundamental technologies.

Collectively these four technology trends provide lots of opportunities for great recombinant insight businesses, as well as for applications businesses and, particularly in the grid management sector, great opportunities for businesses that create significant network effect benefits. Those companies have been formed over the last five years and are now hitting their critical early deployment phase. Some of them will represent not only great equity investments for capital gain, but their deployments will provide highly attractive current yield. For those who understand these technologies and markets, there is no better time to invest. Much as the information technology funds formed in 1995/1996 were the best producing vintage year funds during most of our lifetimes, so will the investments made in 2015/2016 in these companies likely produce energy sector leading returns for decades to come.

Our perspective, omits much of what has been characterized as the "CleanTech" investment landscape from areas that we today see as attractive. Largely that is because they are still progressing along that path from create ideation to competitive carnage and simply haven't reached the adoptive inflection points where market traction opens the door to insightful recombinations, applications and network effects. Those times will come, but understanding where you are in those timelines is critical to ultimately obtaining attractive investment returns, whether from your money or your time.

In the meantime, we remain on the lookout for the great entrepreneurial CEO types who can deliver those recombinative insights when others can't see them, who can focus on the winning set of applications and who can leverage the powerful network effects.

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the resourcient group

We are a highly experienced professional team that builds and helps others build sustainable businesses by applying the best investment, advisory and networking capabilities.

resourcient (/ˈre.sours.i.ənt/) 1. Adj. Able to use resources in innovative ways to create sustainable prosperity; 2. Noun. A coalition of leading investors, strategists, and practitioners working to create resourcient businesses -- businesses that are prescient about where they are headed, resourceful with their people and assets, efficient in the way they utilize scarce resources and resilent in their abiity to thrive in a rapidly changing world.

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