



OUR VISION:

To enable massive scale Sustainable Energy that will generate the next vibrant economy while protecting our planet for future generations to enjoy.

Together, We can.

By Probir Ghosh
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Note: This is a living document and will be continuously updated as new ideas are added to provide more depth for deployment from an ever increasing number of collaborators who are embracing it to make it a shared vision.

What is *inv*VEST?

*inv*VEST stands for: **invest** in **E**nergy that's **S**ustainable thru' **V**irtual **T**eams.

*inv*VEST is dedicated to enabling Global Leadership in Sustainable Energy Initiatives (SEI) for USA through **Massive Scaling**. Massive scaling will need significant investment in resources & new ideas, hence the name *inv*VEST.

*inv*VEST is dedicated to handing over a vibrant economy and environment for our future generations to thrive.

*inv*VEST will be a technologically & politically agnostic nonprofit organization made up virtual clusters of thought leaders focused on the dedicated vision.

*inv*VEST will enable **Close Collaboration** between diverse thought leaders from public and private sectors in vertical and functional clusters to develop comprehensive strategies and deployment plans to execute massive scaling of sustainable energy initiatives.

*inv*VEST will work with all other associations & organizations who are involved directly or indirectly with Sustainable Energy Initiatives. *inv*VEST **is focused on exponentially increasing the pie size for SEI.**

*inv*VEST **Online Collaborative Blog** is one of the critical tools for socializing ideas, gaining mass support and communicating effectively between the disparate vertical and functional clusters in each state, that can be mapped at national level and finally at a global level. This will be accomplished through **Cross Cluster Facilitated Workshops** by vertical and cross functional experts trained on using the **Best-in-Class Mapping Tools**.

The Vertical Clusters are different energy sources, including Energy Efficiency & Conservation:

Energy Efficiency & Conservation Cluster, Solar Energy Cluster, Wind Energy Cluster, Geo Thermal Energy Cluster, Bio Fuels Energy Cluster, Biomass Energy Cluster, Nuclear Energy Cluster, Hydro Energy Cluster, Other Sustainable Energy Cluster, Energy Storage Cluster, Energy Transmission Cluster, Energy Transportation and infrastructure cluster, Coal Energy cluster, Oil Energy cluster, Gas Energy Cluster

The Functional Clusters are different functions each vertical cluster may need to address to become a viable sustainable energy source as defined by *inv*VEST:

Customers of Energy Clusters, Funding & Financial Sector Cluster, Policy and Regulatory cluster, Behavioral Change Cluster, Education Services Cluster, Job Creation Services Cluster, Marketing & Strategy Planning Clusters, Advertising & Promotion Cluster.

The **invVEST** team has identified 3 Sustainable Energy Initiatives for Massive Scaling. We will consider other viable SEI initiatives in the future.

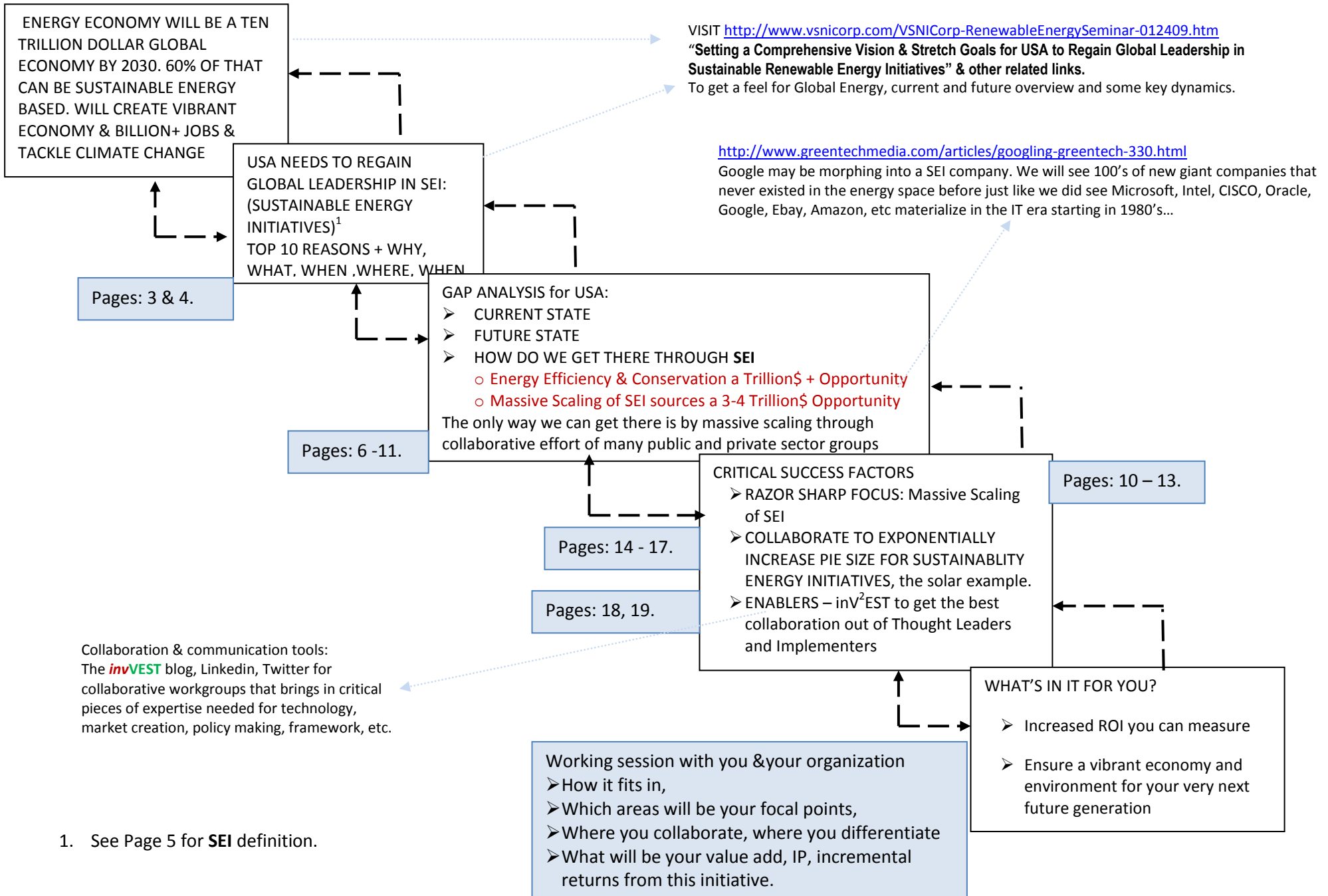
1. **BreakThrough Solar Energy:** Our breakthrough Solar Massive Scaling plan propagates the following goals through a well coordinated 12 year collaborative effort between Public and Private sectors:
 - Ramp up aggressively to meet or beat Germany in Solar installs. 340MW installed in 2008 to 8 GW installed in 2010.
 - Along with a well structured policy & legislation that spans at least 12 years, support and promote competition through massive scaling, to reduce price of solar energy below fossil fuel pricing well before 2020 (our proposed target is 2015).
 - Generate at least 20% of total US energy consumption by 2030 if the critical success factors identified are met.
2. **Garnering Education Community Support for Massive Scaling of SEI:** Involving the Students and Faculty of Schools, Colleges and Universities in generating a mass grassroots movement to support **invVEST** SEI Massive Scaling. The student population will be key in changing our behavior and perception on the way we use energy by introducing relevant curriculum and activities around SEI.
3. **Energy Efficiency and Conservation Initiative:** The US consumes 54% more energy than a comparable OECD country. Our goal is to reduce energy consumption per capita incrementally by 1% a year for 12 years for a total 12% reduction by 2020. While this at first glance may look insignificant compared to OECD Europe achievements, it will need considerable investments; \$1+ Trillion in 12 years, but the returns can be significant (\$360 Billion/year) and we should see the returns on investments on most projects almost instantaneously. We will not catch up with Europe unless we are willing to invest much more and are willing to do so with potentially lower ROIs.
4. **Other well defined ideas** that hold the promise of meeting sustainable energy definition will be given serious consideration. The **invVEST** team can help promote well defined Sustainable Energy Initiatives that have the potential for massive scaling.

Specific Areas of Interest:

Wind Energy Cluster, Geo Thermal Energy Cluster, Bio Fuels Energy Cluster, Biomass Energy Cluster, Nuclear Energy Cluster, Hydro Energy Cluster, Other Sustainable Energy Cluster, Energy Storage Cluster, Energy Transmission Cluster, Energy Transportation and infrastructure cluster, Coal Energy cluster, Oil Energy cluster, Gas Energy Cluster, other new promising areas of SEI clusters.

We may very well find that many of these initiatives need to be scaled massively to enable a shift to a new energy economy that provides clean energy economically that in turn fuels a sustained vibrant economy for our future generations.

UNDERSTANDING THE FRAMEWORK FOR THE VISION & DEPLOYMENT PLAN:



Top ten reasons for USA to become the Global Leader for Sustainable Energy Initiatives NOW:

- I. USA is the only nation on earth who has the economic power to implement massive scale sustainable energy initiatives needed to make it become a significant part of the energy generation in the near future. Others like Japan and Germany have blazed through the initial laps and now USA needs to take over and run the last lap... and win for everyone.
- II. USA is the only nation on earth who has available land mass and the ingenuity to implement massive scale sustainable energy initiatives needed to make it a significant part of the energy generation over the near future.
- III. The current economic crisis of gigantic proportions also presents us with the greatest opportunity of our lifetime to reshape our economies in a way that makes USA the global leader. We will lead the way by example.
- IV. The vast amounts of investments being made by the Federal Government this year to revive the economy can be leveraged to reshape the energy usage in residential, commercial and industrial entities to align to new energy economy initiatives.
- V. The new energy economy based on sustainable energy will be the next vibrant economic engine of growth that will create millions of jobs for our country and no other country can take most of these jobs away!
- VI. Massive scaling and intense competition will derive economies of scale that will rapidly bring the prices down to below what we pay for fossil fuel based energy within next six to eight years. The investment we make now will be paid back many times over by 2030. It is time to change our mindset that sustainable energy means a perpetual “big whopping tax” to the people.
- VII. Massive scaling of sustainable energy initiatives will tackle climate change issues and sidetrack the raging debates about why, when and how we tackle the climate change problem.
- VIII. It’s about time we listened to Thomas Edison, inventor of the light bulb (1847–1931) *'I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait 'til oil and coal run out before we tackle that.'*
- IX. In the absence of massive scaling, sustainable energy initiatives will remain significantly more costly to deploy and will always be viewed as a “tax” we have to pay and make us less competitive compared to developing countries that are taking our jobs away. It’s like throwing a pebble in the ocean and expecting to make a difference.
- X. Failure to capitalize on the current economic crisis to become the Global Leader in Sustainable Energy Initiatives has serious detrimental effects to overall positioning of Global Leadership of USA in not only energy arena but will also permeate to other areas of leadership. Over time our future generations will pay the price if we fail to act now.

2. What do we need to do to scale massively?
 - I. Collaborate aggressively between Federal, States, Counties that constitute the Public sectors (party neutral) and a whole spectrum of Private Sector organizations to set three consecutive four year policies and roadmap to enable massive scaling of sustainable energy initiatives.
 - II. What will a successful collaboration look like? Our ability to scale will depend on harnessing the best source of expertise in our infinite virtual network of private and public sector organizations without having the fear of being left behind. Ideally, our brain Neurons are the perfect example, tapping massive independent processing power by expertise and yet getting to decision points with lightening speed. This is the concept *invVEST* will learn to replicate for close collaboration between the entities noted above.
 - III. What will *invVEST* focus on? Increasing the pie size exponentially rather than focusing on getting a bigger slice of the pie to enable massive scaling of Sustainable Energy Initiatives.

3. When can massive scaling be applied?
 - I. When fundamental technologies have been developed and have been tested in production environment.
 - II. It has shown indications that massive scaling & intense competition can bring the price down dramatically to meet and beat current fossil fuel prices.

We will use sustainable energy from Solar (one of the energy resource components we are researching and advocating) as an example. There can be many other sources of sustainable energy such as Wind, Geo Thermal, Energy Efficiency & Conservation initiatives that can very well meet the definition of sustainable energy defined in the next page.

4. Where do we start?
 - I. We will start by looking at where USA stands today compared to the rest of the world. We provide a gap analysis between the current state and the desired future state. The desired future state is when sustainable energy is cheaper to generate compared to traditional methods of generating energy from fossil fuels and is deployed in massive scale.
 - II. That will lead us to specific focus areas:
 - i. Reviewing each component of promising Sustainable Energy Initiatives
 - Addressing the Energy Efficiency and Conservation Gap
 - Taking a closer look into one of the promising components: Solar Energy Initiative.

5. When do we start?

NOW!

We keep hearing so many different terms & acronyms: Green, Cleantech, Renewable Energy, Sustainable Energy, Low or zero Carbon footprint, GHG, LEV, ULEV, SULEV, ZEV, PZEV, AT-PZEV, CARB and the list goes on... and is very confusing and ambiguous. **What is your definition for Sustainable Energy?**

Our Definition of Sustainable Energy: Any energy generation, efficiency & conservation source where:

- I. Resources are available to enable massive scaling to become a significant portion of energy generation, long term, preferably 100 years.
- II. Low to zero Carbon footprint and in some cases negativeⁱ Carbon footprint is created.
- III. We can reach and get below power parity by 2020 or earlier, compared to traditional fossil fuel energy generation it replaces.
- IV. No significant side effects to earth's resources, direct or indirect happen.
- V. Energy independence from one main region or country is fostered.
- VI. It helps fuel a long term vibrant economy and significant job opportunities.

By this definition, Specifically for USA:

Many of the Energy Efficiency and Conservation programs actually meet all five criteria now and should be implemented right now aggressively.

Solar Energy has a very low carbon footprint, but will fit this definition only if it is scaled massively from the current state of generating less than 0.01% of total energy to at least 10% by 2030 and becomes cheaper than Fossil Fuels it primarily replaces by 2020.

Wind, Geo Thermal, Ocean Wave energies can become significant sources of energy as long as it meets the six criteria.

Plug-in Battery & Fuel cell cars may have a very low carbon footprintⁱⁱ, but have to be cheaper than gasoline it replaces and will need to scale massively by setting up infrastructure, support & recycling systems. It should constitute at least 5% of the car population by 2020 and 25% by 2030.

Coal meets the above criteria if various clean coal technologies can be made economically viable and there are no side effects from implanting CO₂ and other GHG gases into the ground or elsewhere.

Nuclear already meets five of the six criteria today, if the expert panel in our virtual collaborative team can determine that there are no side effects from:

- will not lead to creation of mass weapons of destruction by rogue countries or terrorists
- will not have any radioactive fallout or issues from waste fuels or operations

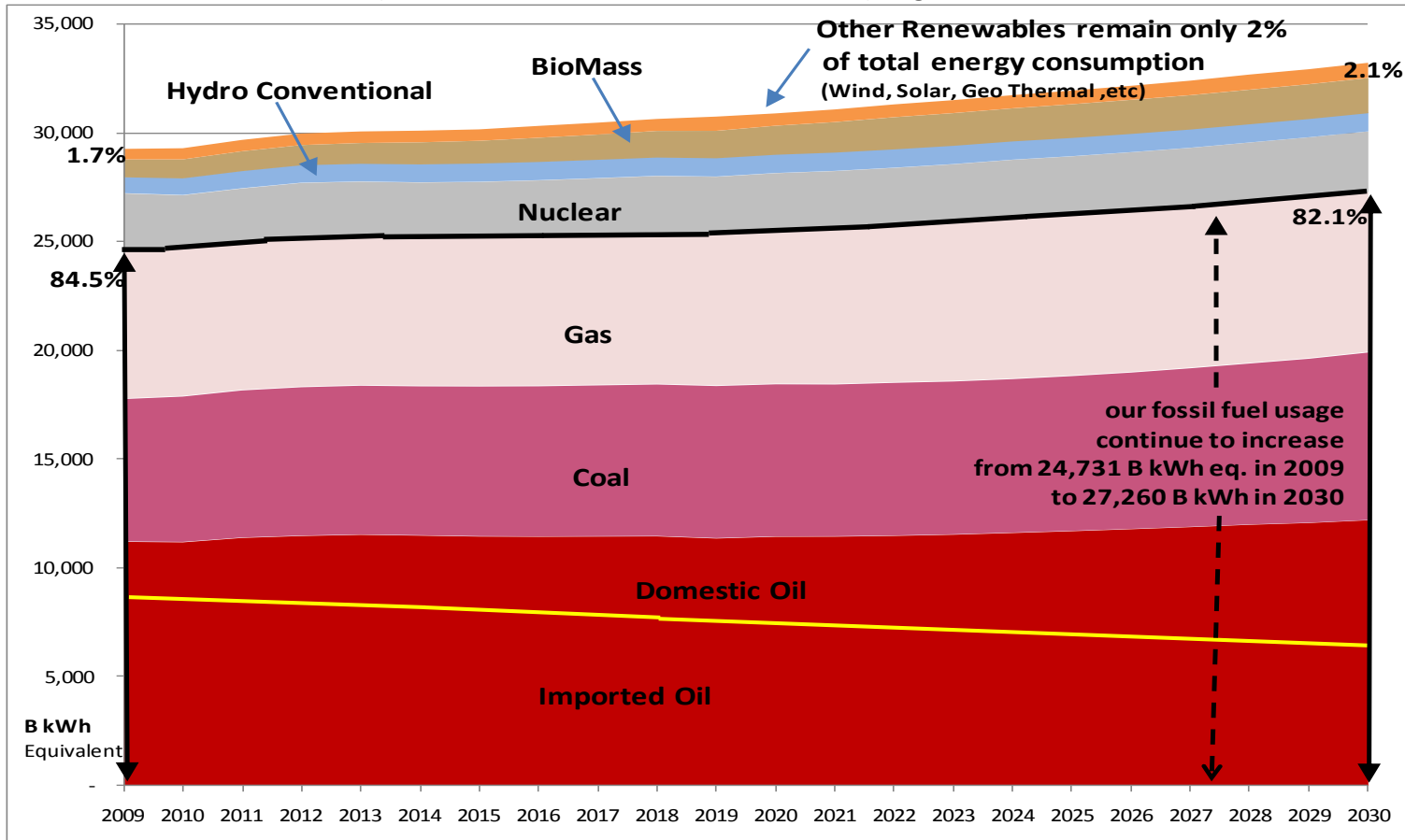
If Algae farms absorb more carbon than they produce in its lifecycle, it actually will have a negative carbon footprint. The key will again be if algae can get to a point in the foreseeable future where cost is lower than fossil fuels it replaces and its ability to scale massively.

We will find many very nontraditional companies entering the Sustainable Energy Initiative arena like Google, CISCO, Intel and broadband communication companies. If Google, CISCO, Intel, Verizon, AT&T can promote real-time high quality broadband virtual conferencing, we may find the need to travel and energy usage can be cut down very significantly. If all employees on average can telecommute from home 20% of the time by 2012 and 50% by 2020, we can cut down our energy needs exponentially in terms of fuel saved and in terms of energy and resources not needed any more for creating new office space.

THE CURRENT STATE OF OUR ENERGY PROFILE & WHERE WE STAND COMPARED TO THE REST OF THE WORLD:

In our research, we tried to find an aggressive sustainable energy usage projection that addresses the overall low carbon footprint energy usage. We could not find one in USA with detailed data behind it to support how to get there. We reviewed EIA, PEW, IEA, NAM and EPRI data. We did notice Repower America, RMI, as well as many other environment focused organizations have some very ambitious goals but are lacking in details on how to get there. Historically, the Federal and even State Govt. policies so far have been addressing each initiative piece meal and do not seem to have an overall comprehensive vision and strategies to address Sustainable Energy Initiatives that will take care of climate change issues & energy security issues.

CURRENT USA ENERGY CONSUMPTION AS PER EIA (ENERGY INFORMATION ADMINISTRATION). Figure 1.

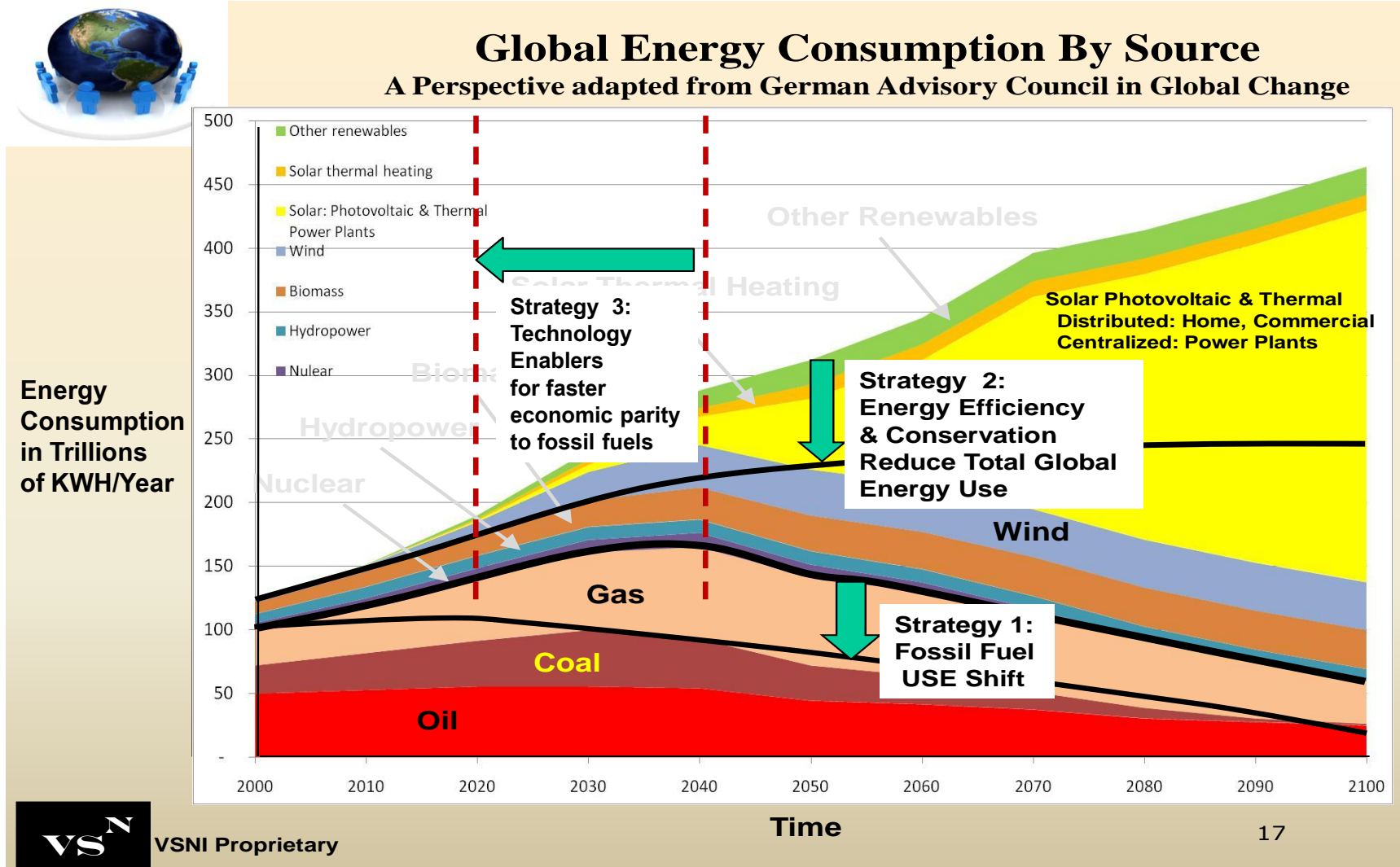


As per the latest EIA dataⁱⁱⁱ, as shown in figure 1, which shows projections until 2030, our country will continue to consume increasing amounts of fossil fuels. In the Renewable Energy area, biomass shows the largest growth of 97% and constitutes about 5% of energy consumption. Other renewables (wind, solar, geothermal, etc.) grow by 44% but will constitute a miniscule 2.1% of consumption, even in 2030. Our country already consumes 54% more energy per capita compared to OECD Europe today and the gap will only increase. While China will overtake us in energy consumption by 30% and pollute 100% more by 2030, we will remain a much higher polluter compared to OECD Europe by at least 50%. The 23 countries comprising OECD Europe is very comparable to USA in terms of

population and GDP. Our country is at least eight years behind in deployment of Sustainable Energy Initiatives compared to OECD Europe. We need to change this status quo for our own energy security and environmental impact and take on global leadership for the sake of our future generation.

This scenario led us to: *Setting a Comprehensive Vision & Stretch Goals for USA to Regain Global Leadership in Sustainable Renewable Energy Initiatives: Creating the next vibrant economic engine of growth while mitigating climate change for our future generations to enjoy.*

THE GLOBAL SUSTAINABLE ENERGY USAGE PROFILE AS PER THE GERMAN ADVISORY COUNCIL FOR GLOBAL CHANGE: Figure 2



So we started with the most aggressive model we found as shown in figure 2, one outlined by German Advisory Council for Global Change^{iv}. We did a gap analysis on where USA stands on sustainable energy initiatives compared to OECD Europe and where China may take the rest of the world in the future^v. India, despite all its hype, is an insignificant player when it comes to energy consumption and usage. We need to create our own energy plan that protects our interests. For example, USA has the world's largest coal reserves; making clean coal technology an imminent solution should be given significant importance^{vi}. From our own research, we tend to agree with the German model that solar energy has the potential to become the dominant energy provider in the future. Our country is a non player currently in solar energy activity compared to Europe.

While we can debate what the GHG emission levels will be if we follow the trajectory shown by Federal Government owned EIA (Energy Information Administration), we would recommend shifting our focus to economically viable sustainable energy generation. There are significant advances already in place that show energy from wind, solar and geothermal can be produced below fossil fuel cost within the next 6 to 10 years if we set & execute stretch goals.

For USA to regain & maintain global leadership in Sustainable Energy initiatives, we need to adopt 3 strategies shown above in figure 2.

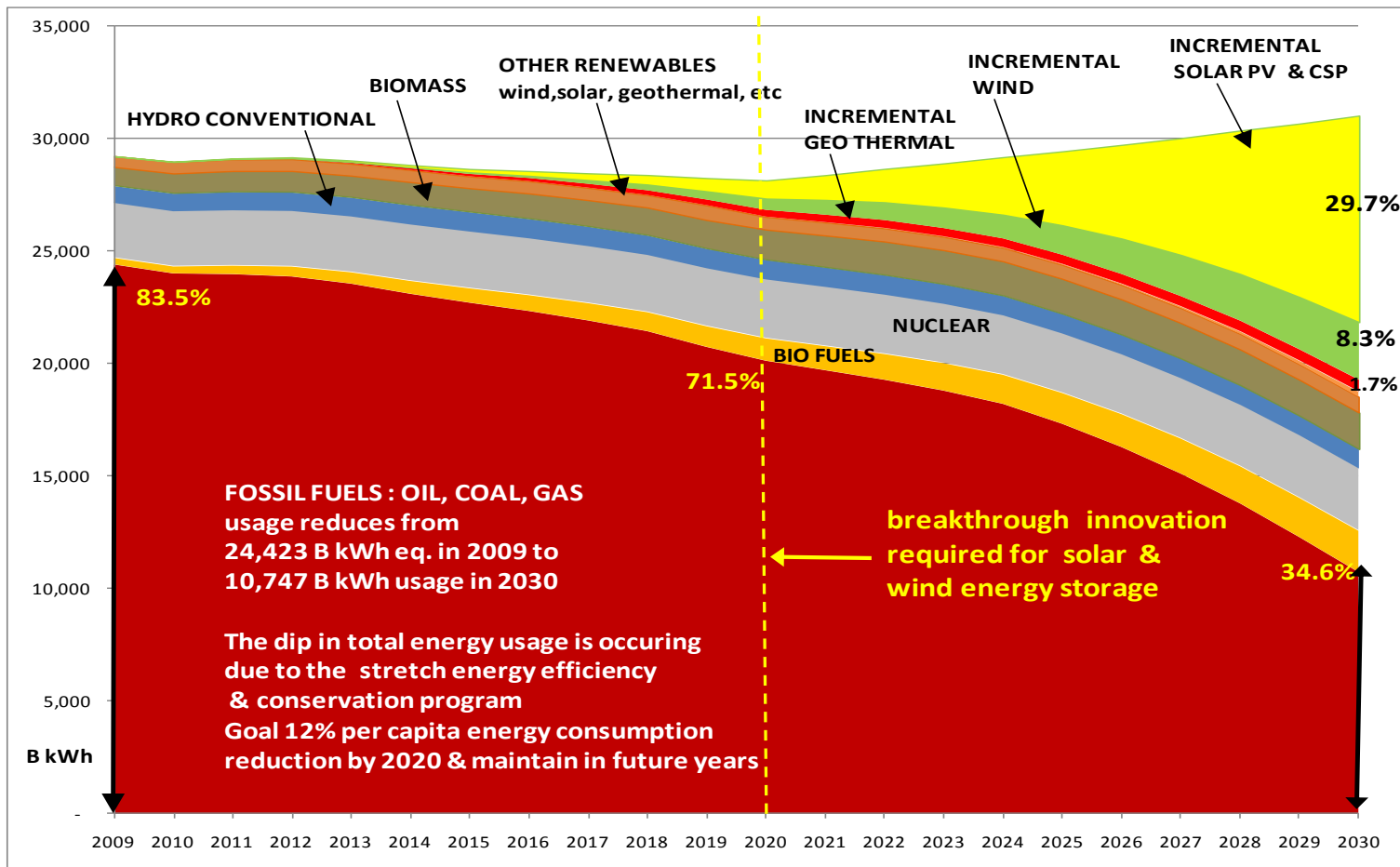
STRATEGY 1: Evaluate ways to reduce fossil fuel use further by increasing sustainable energy usage aggressively. We will see a stretch target framework to shoot for in the following pages.

STRATEGY 2: Evaluate ways to apply energy efficiency and conservation aggressively to cut down our per capita energy consumption.

STRATEGY 3: Invest in technology to enable radical technology discoveries to generate renewable energy more efficiently and effectively earlier than current scenario. We believe our country can generate and use 10% - 15% of our total energy consumption from new renewable energy sources such as wind, solar and geo thermal sources leveraging existing technologies. We will need radical energy generation and energy storage technologies to effectively use renewable energies beyond the 20% point.

FUTURE STATE: A POSSIBLE SCENARIO FOR USA TO REGAIN GLOBAL LEADERSHIP IN SUSTAINABLE ENERGY INITIATIVES:

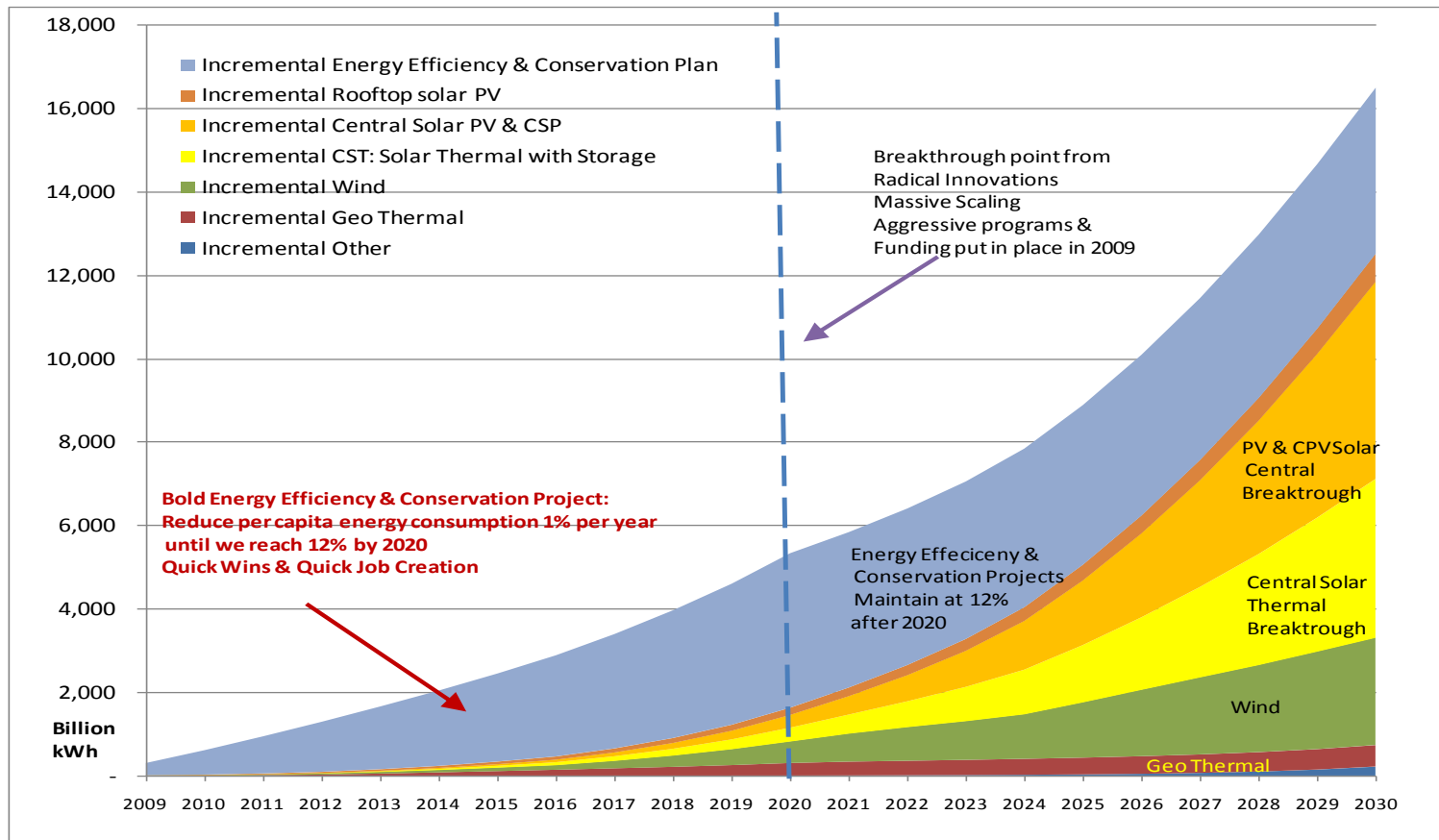
CASE STUDY I: SOLAR ENERGY BREAKTHROUGH IF STRETCH GOALS^{vii} ARE MET. Figure 3



We have a fairly in-depth model of what we need to do starting now, leveraging the stimulus package and identifying what are the follow on incentives needed, as well as the prioritized critical success factors that needs to be addressed. We will need to leverage any work we can find that has already been done by many great institutions. Notice that we have not identified the breakdown of the 49% reduction in Fossil Fuel usage. This initiative must have close ties with electric car programs and other new usage, storage and transmission of electricity.

The reason for our urgency is we believe this gigantic economic crisis has presented us with an opportunity of a lifetime^{viii}. If we all work together to leverage the demand supply mismatch as well as use the stimulus package and structure a follow on focused incentives framework well starting right now, we will have a an unparalleled transformation towards a vibrant new energy economy^{ix}. At times like this, it almost seems a modern day Charles Dickens would have flipped his quote and said *"It is the worst of times, and it will be the best of times"*... Yes, we can do this if we take control of our destiny together^x.

A CLOSER LOOK AT THE INCREMENTAL PORTION OF THE STRETCH GOALS FOR SUSTAINABLE ENERGY PROGRAM. Figure 4



Stretch goals for SEI (Sustainable Energy Initiative) Programs: We need razor sharp focus

Energy Efficiency and Conservation Programs: Energy Efficiency and Conservation Programs can make a huge impact immediately. Our research has shown that our per capita energy consumption is 54% more than OECD European countries who have very similar GDP per Capita earnings to USA overall.^{xi} While a part of this can be attributed to our geography, population density and the sheer size of homes we own compared to our counterparts in European nations, much of it is because Europeans are using energy much more efficiently than us. Energy Efficiency and Conservation Programs can be quick wins and will have a significant return on investment and result in millions of jobs immediately.

The blue wedge represents the energy saved by implementing energy programs that save an incremental 1% more energy each year for the next twelve years. If we set a goal to reduce 12% energy consumption by implementing aggressive Energy Efficiency and Conservation Programs by 2020, it can mean \$300B in energy savings. Given that we consumed 29,500 Billion kWh equivalent energy in 2008, 1% savings account for 295 Billion kWh. If we assume we save 10 cents for every kWh energy we save through this program, this amounts to roughly \$30B savings, so for 12% we save \$360B. **Note that energy efficiency & conservation programs will continue to make the single largest impact from day one to at least 2020 among all the stretch goals SEI programs.**

SEI stretch goal programs do need significant investment. If we assume on average the simple return on investment is 3 years, (a no brainer for any investment initiatives) we will need \$90B for every 1% of energy we want to save for USA. We will find that many energy conservation programs (switching the light off is the simplest example) is behavioral changes and almost cost next to nothing, where else some energy efficiency programs may have a much more involved deployment and longer pay back periods (smart grids, transmission line improvements) but will have a major impact on reducing significant energy consumption. The stimulus package rightly has invested in both these programs. So if we stick to an average 3 years payback we will need roughly 1,080 Billion dollars over the 12 years to implement this program. We believe the Fed and State should work with private sector organizations to pay for a significant part of the program. The return on investment needs to be shared in proportions of investments made. Hence we need a long term program (we recommend at least 12 years) similar to that of many European countries who have developed careful structuring of policies and framework to support/entice/enforce this plan.

Let's for a moment assume that in 2009 we go after programs that have a larger human resources component. Let's assume 50% (plumbing, insulation, roofing etc, construction jobs where we are hurting most) and because of the stimulus we target 2% or \$180B (of which lets assume the Fed pays 33%). The human resource component is \$90B and that equates to 1.8 million jobs that pay an avg. \$50,000 per year. We believe this is a no brainer and should be done by Federal, State and Private sectors if not already planned for. The other \$90B goes towards purchase of goods, which in turn feeds the economy. The stretch goal will be to shoot for 5% reduction per capita energy consumption in the first two years, and then try to maintain a 1% per year incremental reduction until 2020.

From Colorado perspective, we have 1.6% of the population and 1.67% of GDP of USA. So if Colorado wants to show leadership, we should strive for a stretch goal of targeting at least 2% of the energy efficiency & conservation programs in USA, be generated out of Colorado. That means \$3.6B in energy efficiency programs for Colorado in 2009. Let us assume 33% comes from stimulus funding, which amounts to \$1.2B. The rest needs to come from state and private sectors. Our current understanding is our expected allocations and stimulus funds are far short of this target. While the target may seem unattainable at the first glance, if we can for example, leverage the work done on the Smart grid project in Boulder and get 25% of the \$4.5 Billion allotted in the stimulus package for smart grids, this one project alone can contribute up to 30% of our goal. We have significant Federal building presence in Colorado. If we can position ourselves for 5% of the \$4.5Billion fund for "Green Federal Building" that amounts to \$225M. Even if get our fair share of \$6.3B funds for State and Local efficiency & renewable efforts, that works to about \$100M. Making a more simplistic overall assumption, 1.6% of \$787B stimulus funds equate to \$12.6B, that should be Colorado's fair share, and if we assume that constitutes 33% of the total funds and the balance needs to come from State (Bond Funds is one avenue), private sectors, etc it grows to a \$38B injection that Colorado can hope to experience in the next 18 -24 months.

VSNI – *invVEST* can help initiate a collaborative think tank described in the later part of this document to help realize a vision and deployment plan that can be similar to the target where each group(s) provides the expertise that they are best at and be accountable to reach a shared vision for energy efficiency.

Aggressive installations of wind energy can generate an incremental 2,500 Billion kWh or more provided price performance goals are met. Currently, energy from wind is cheaper than solar^{xii}. However by 2020 that may not be the case, as the price points for Solar seem to be dropping much more aggressively than wind energy technologies. But at this point there are no clear winners and we need to aggressively push all sustainable energy technologies that hold promise for massive scaling and can meet or beat the price points for the traditional fossil fuel based energy. VSNI has not done any in-depth work in this area and will leave it for experts much more knowledgeable than us in this area.

Geothermal and other renewables that hold promise can contribute much more than what is shown on this graph. Similarly, nuclear energy holds a huge opportunity. VSNI has not done any in-depth work in this area and will leave it for experts who have much more knowledge than us in this area.

Massive scaling of solar energy holds the promise of rapidly decreasing the price of solar energy below conventional fossil fuel energy by 2020. With a long term policy and collaboration between Public and Private Sector energy, if the price performance goals are met, the industry can ramp up exponentially. We have shown a possible breakthrough scenario of this component in the stretch goals for the Bold Solar Energy Plan.

A Brief Overview of the Solar Energy Model before we look at the Breakthrough Scenario:

Solar Industry has two major components: The Solar Panel Manufacturers and what the industry calls BOS or Balance Of Systems needed to make a complete installation before it can generate power. Among the panel manufacturers it can be roughly broken down by:

- Non Concentrated, (Industry Parlance is one sun) typically what is going on all the rooftops, Flat Plate Panel Manufacturers that are
 - First generation Silicon Wafer based flat plates: SunPower, SunTech, Qcell are a few leading players. 1st gen currently has higher efficiencies than the Thin Film 2nd gen but is costlier to produce than CdTe model which has lower efficiencies. Mostly used in rooftops & space constrained applications.
 - Second Generation Thin Film based on CIGS, CdTe both in flat rigid formats and flexible formats: FirstSolar, NanoSolar, Unisolar are examples. The second generation technologies use a lot less of critical materials and holds a promise to lower the cost significantly compared to the 1st gen.
 - Third Generation that will go from single junction to triple junction technologies that can increase the efficiencies significantly. These are still in lab scale and will need at least 4- 6 years to get to viable production scaling.
- CSP: Concentrated Solar Panels: has two main groupings
 - CPV: Concentrated Photo-Voltaic that uses lens to increase the power of the sun in low (typically around 50 -100X) to high (typically greater than 500X) to have increased efficiencies to capture energy. Many companies are working to come up with scalable production that can be mass produced and installed at close to fossil fuel priced energy. This industry is nascent and needs to be closely watched.
 - CST: Concentrated Solar Thermal that uses mirrors to concentrate and direct the sunlight to a limited heat storage medium, so it supposedly addresses the intermittency issues faced with the PV technologies. Utilities are currently favoring this technology. Many companies are working to come up with scalable production that can be mass produced and installed at close to fossil fuel priced energy.

While some companies are trying to become vertically integrated like SunPower, most would depend on independent installers to take their solar systems and add on the invertors and hardware to connect the systems to each other as well as to the power grid and deal with the permits and warranties involved. This part is known as BOS or the Balance of System. Currently most of the installs on residential and small commercial roof tops are done by small businesses like Namaste. For larger size commercial rooftops (Kohls) and midsize on the ground installations like the 8.2MW capacity plant done in Alamosa are done by Third Party Installers who would also arrange for the financing the project. Many of the small business installers will team up with Third Party financiers to finance the projects, where the financiers recover back their investment and cost of capital through Federal and State incentives and energy savings over the years. Currently, the industry needs 30 -35 FTEs to install one MW of solar panel on the rooftops.

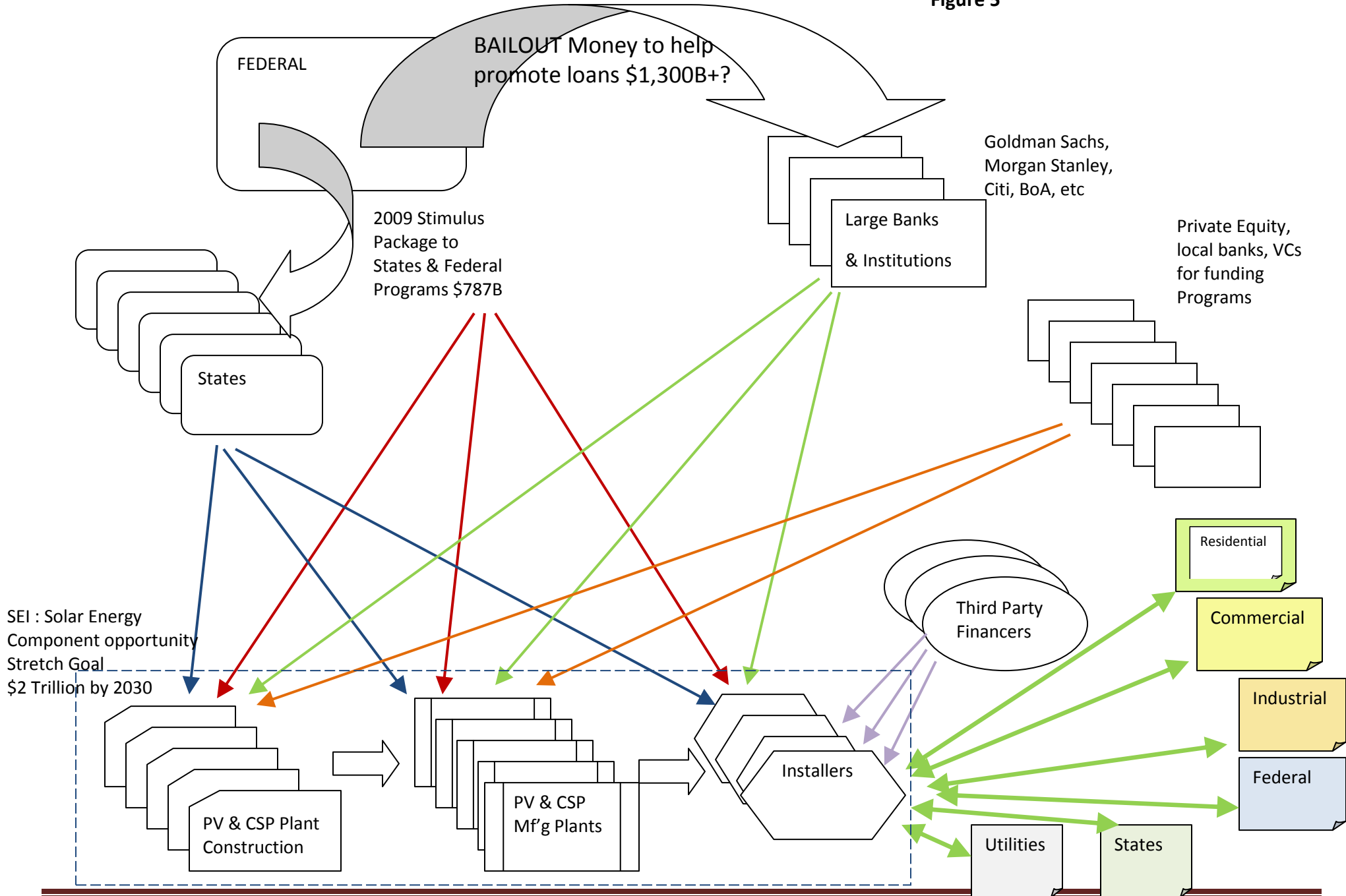
As we have seen in the German model, the manufacturers tend to locate near the source of installs since labor cost is only a small portion of the manufacturing costs and shipping the panels from Far East Asia consumes most of the difference in labor costs. It takes anywhere from \$1/W to \$2/W to set up a manufacturing plant. So a typical 200MW plant will cost \$200 to \$400 Million to set up. Hence the industry is very capital intensive and has a high fixed cost. It is detrimental to run the plant at low utilization capacities. A large manufacturing plant employs 2.5 -3.5 FTEs for every MW of production capacity.

It takes roughly 3-4 FTEs for every MW of factory built at the current scale. Malaysia has been very aggressively pursuing building of solar panel factories to create construction and manufacturing based opportunities. They have provided as much as \$230M in incentives to SunPower to set up one GW of manufacturing capacity. First Solar has already operationalized three of their four factories they have signed up to build in Malaysia.

The whole value-chain needs significant funding to scale, which in turn will bring down the cost of energy to meet or beat the current fossil fuel based energy generation in the near future. Hence there is an urgent need for a close collaboration between Federal, States, Counties, and Private Sector to make this happen. The following pages depict why we have an opportunity of a lifetime to take on global leadership in Solar Energy Initiatives. While it is true that we have a global economic crisis of massive proportions that have dried up the capital and credit, the \$787 Billion Federal Stimulus money and the \$1.3 Trillion plus Bailout money committed to the financial systems can trigger the breakout program for solar energy massive scaling. Figure 5 in the following page shows how the funding model may work. We will next try to size the opportunity for the Solar Energy opportunity.

HOW THE SOLAR ENERGY FUNDING MODEL CAN WORK: RAPID REALTIME COLLABORATION AMONG KEY PLAYERS.

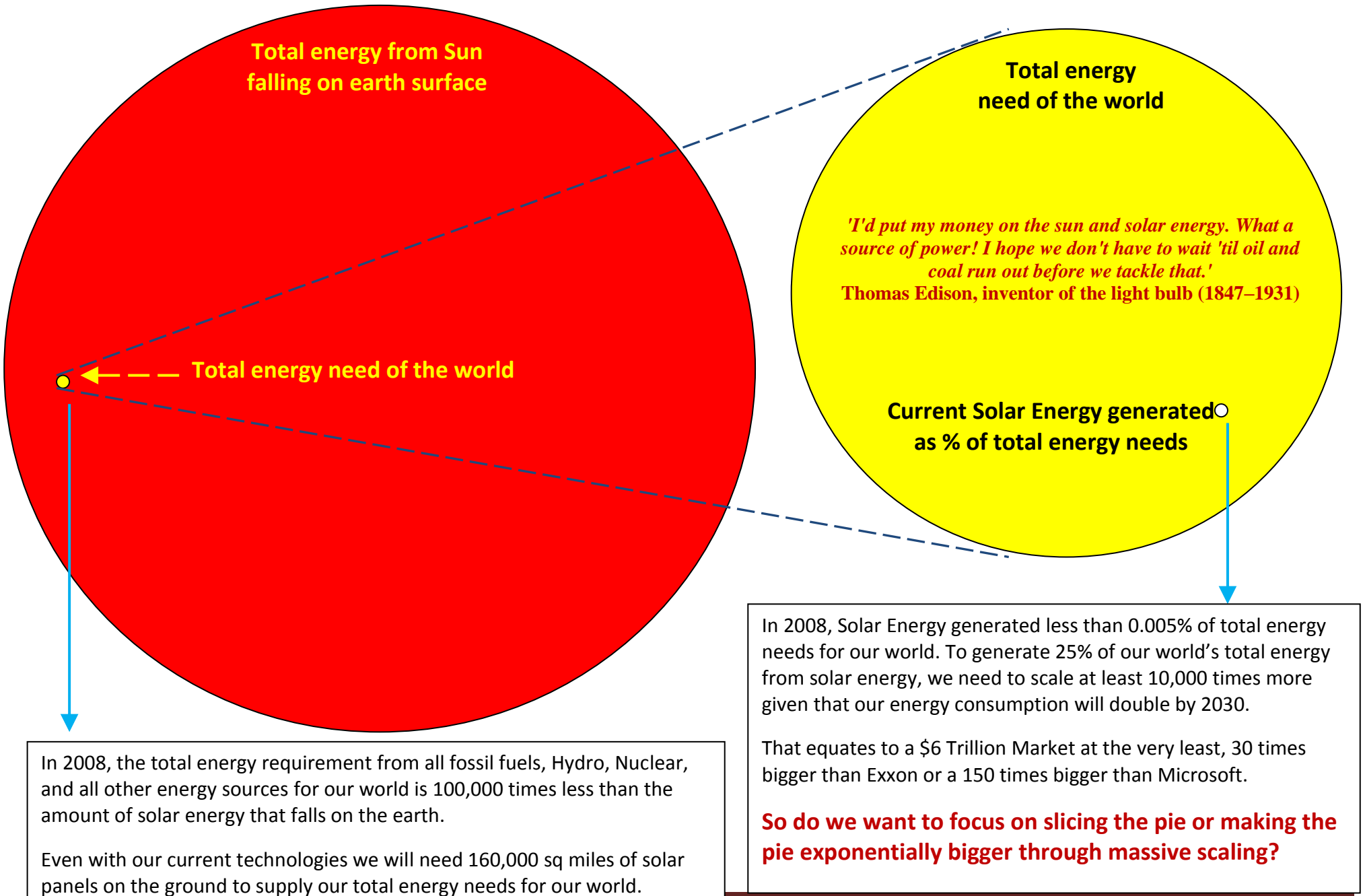
Figure 5



Understanding the Exponential Size of the Pie for the Solar Energy Opportunity:

Focus on increasing the pie size exponentially more than focusing on getting a bigger slice of the existing pie.

Figure 6



AN OVERVIEW ON WHERE USA STANDS ON SOLAR INSTALLS COMPARED TO GERMANY AND REST OF THE WORLD

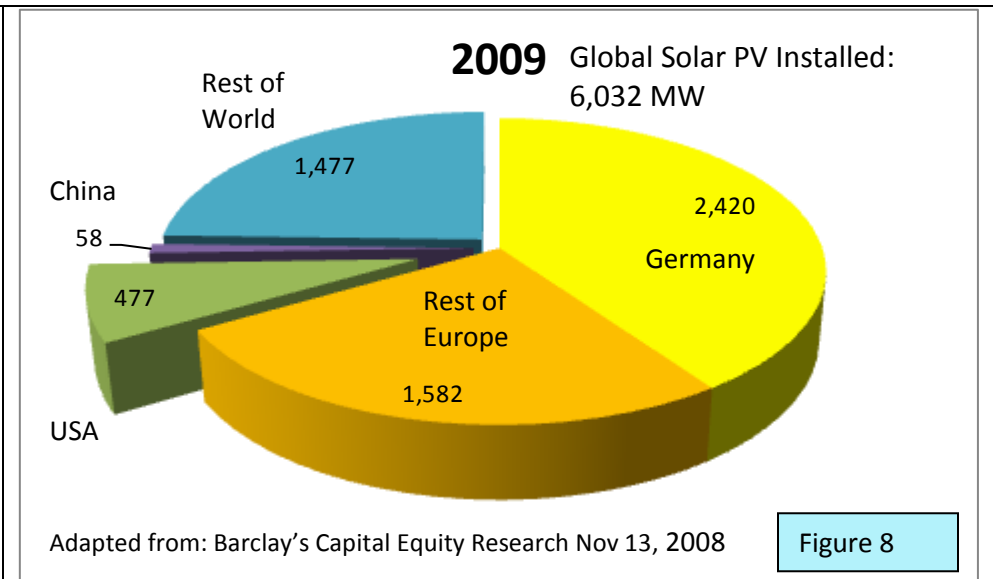
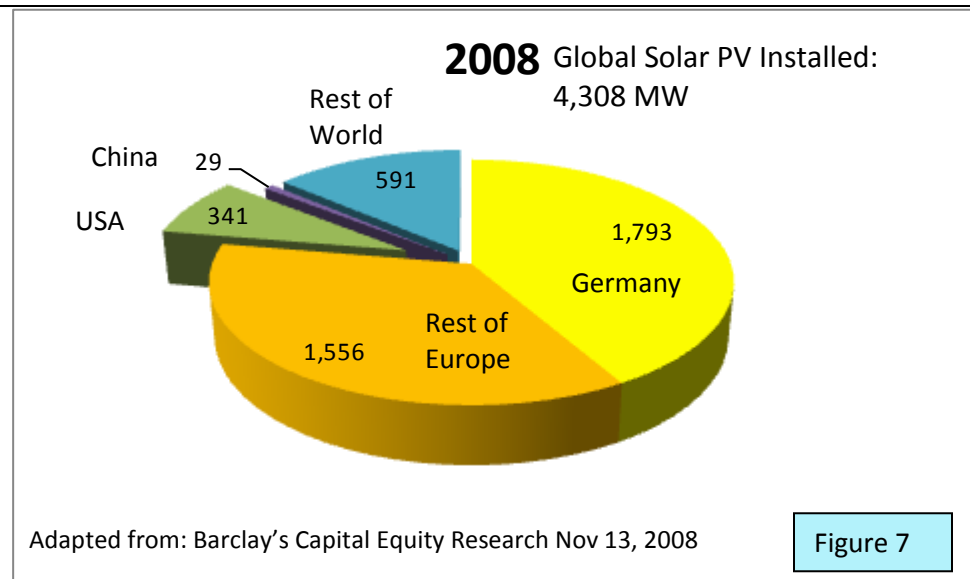


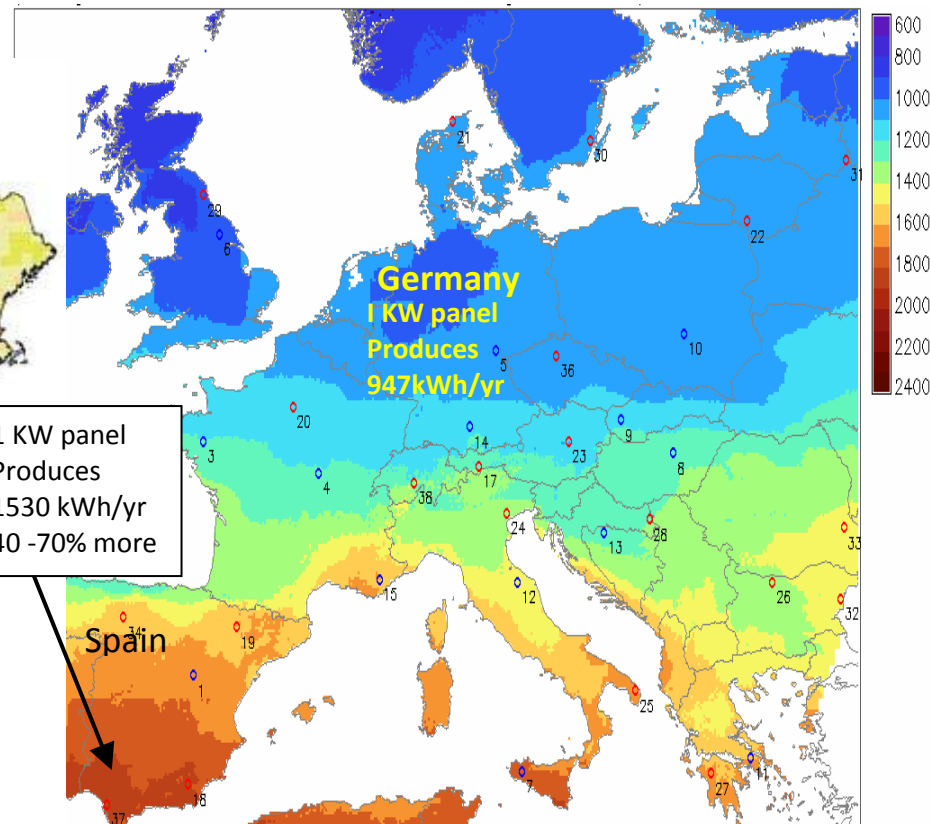
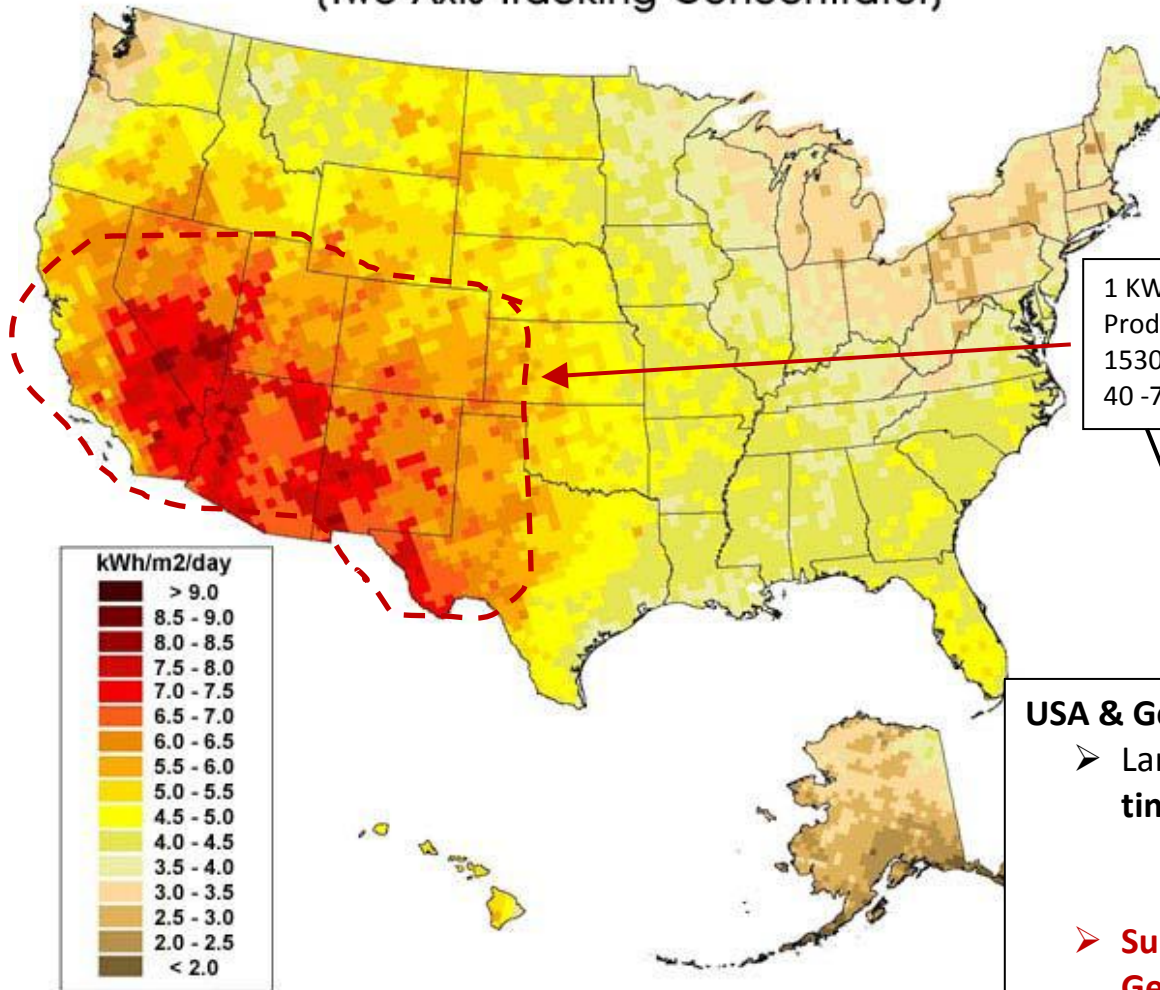
Figure 8 and figure 9 show total PV installed in 2008(actual installed until Q3 2008 and projected PV installs in Q4 2008) and 2009 (projections) by Vishal Shah of Barclays Capital, which tracks the Solar PV industry closely, in a report published in November, 2008. Figures 8 & 9 compares where Germany stands compared to USA for Solar PV installs.

Germany, which has approximately 30% of US GDP & population, about 8% of US landmass and 40% less sun radiance, installed 1.8GW capacity in 2008, 5.3 times more that USA in 2008. So, if we assume USA needs to replicate Germany in 2009, USA needs to install 8GW of PV. US GDP & population profile match that of OECD Europe and OECD Europe will install about 4 GW in 2009.

Historically, Japan was the first country that initiated the Solar panel industry, since Sharp started production in the early '90's. The country adopted a long term policy to nurture the industry and brought the price of solar panels from the high \$20/W to low teens by start of 2000. Germany took the baton on and initiated a 20 year program with a reducing FIT (feed in tariff) and by Q4 2008 the average price was down to \$6/watt. The flat plate panel industry is maturing rapidly and with many more thin film companies coming on line the prices for solar panels are getting very close to \$2/W when it reaches price parity for many states in USA for residential installs and when it reaches \$1.50/W it will reach price parity for industrial rates of about 7 cents/kWh.

This actually provides our country with a once in a life time opportunity to take on the global leadership in Solar Energy Initiatives, that in turn will create huge job opportunities and lead to a vibrant new energy economy. If we do not, we may see China take on a much larger role than what is projected by Barclays as almost 50% of solar PV manufacturing operations are situated in China and China will consider using a part of their \$600 Billion stimulus package to save this large manufacturing base. The next page shows USA is ideally suited for harnessing solar energy compared to almost all parts of Europe.

Direct Normal Solar Radiation (Two-Axis Tracking Concentrator)



USA & Germany: A Perspective:

- Land Area: USA has 26 times more land mass & **1,000 times free/arid land space.**
 - USA 3,536,279 sq miles, Germany 136,532sq.miles
 - Colorado Land area 103,729 sq.miles
- **Sun Radiance: SW corner of USA (5 times larger than Germany) has 40 - 60% more sun radiance.**
- USA GDP \$14 Trillion, Germany GDP \$3.2Trillion
- USA Population 307M, Germany 85M

Yet, USA deployed a mere 340MW of Solar PV compared to Germany's 1,800MW in 2008. USA should have deployed at least 4X times what Germany did, given any of these ratios. What is wrong with this picture?

'I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait 'til oil and coal run out before we tackle that.'
Thomas Edison, inventor of the light bulb (1847-1931)

SUMMARY OF WHAT IT MAY LOOK LIKE IF STRETCH GOALS FOR BOLD SOLAR ENERGY BREAKTHROUGH^{xiii} ARE REACHED:

Here is a snapshot of the key indicators for this initiative:

STRETCH GOAL: 30% POWER FROM THE SUN BY 2030, GATEWAY TO INFINITE ENERGY CREATION

The SOLAR ENERGY STRETCH GOALS INITIATIVE: JOBS AND ECONOMIC IMPLICATIONS FOR USA & COLORADO

Need to have THREE four year plans, each with cascading levels of COMPREHENSIVE deployment plans and ACCOUNTABILITY.

UNITS	actual estimate 2008	FIRST FOUR YEAR PLAN				SECOND FOUR YEAR PLAN				THIRD FOUR YEAR PLAN				THE PAYBACK YEARS
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
USA JOBS CREATED, PV ONLY	7,673	59,846	91,192	108,389	132,265	158,782	191,605	231,760	282,683	349,447	434,975	538,206	666,919	2,172,566
COLORADO JOBS CREATED, PV ONLY	559	4,991	9,978	13,811	19,361	25,304	33,345	41,993	53,142	67,884	87,330	111,482	141,529	502,591
TOTAL SOLAR ENERGY GENERATED USA B kWh	2	7	15	27	44	68	101	147	212	301	424	590	813	9,217
STRETCH GOAL: SOLAR ENERGY AS % OF TOTAL USA	0.007%	0.023%	0.05%	0.09%	0.15%	0.23%	0.34%	0.50%	0.72%	1.03%	1.45%	2.02%	2.78%	31.51%
TOTAL PV ENERGY GENERATED CO. B kWh	0.17	0.42	1.02	1.94	3.23	4.94	7.26	10.62	15.46	22.46	32.62	47.16	67.64	967.91
ENERGY AS % OF TOTAL COLORADO	0.04%	0.09%	0.22%	0.41%	0.68%	1.02%	1.48%	2.13%	3.05%	4.36%	6.25%	8.90%	12.57%	155.01%
TOTAL SOLAR ENERGY REVENUE USA \$B	\$ 0.19	\$ 0.71	\$ 1.64	\$ 3.02	\$ 5.17	\$ 8.31	\$ 12.86	\$ 19.58	\$ 29.29	\$ 43.27	\$ 63.33	\$ 91.63	\$ 131.36	\$ 2,205.44
CUMMULATIVE SOLAR REVENUE \$B	\$ 0.19	\$ 0.71	\$ 2.35	\$ 5.37	\$ 10.54	\$ 18.85	\$ 31.70	\$ 51.29	\$ 80.57	\$ 123.84	\$ 187.17	\$ 278.80	\$ 410.16	\$ 9,722.52
TOTAL DEMAND SUPPORT INCENTIVES NEEDED \$B		\$ 13.99	\$ 17.71	\$ 16.20	\$ 14.04	\$ 10.60	\$ 5.69	\$ 0.56	\$ -	\$ (1.08)	\$ (1.90)	\$ (3.21)	\$ (5.25)	\$ (110.27)
TOTAL R&D SUPPORT INCENTIVES \$B	-	\$ 3.00	\$ 4.00	\$ 6.00	\$ 5.00	\$ 4.00	\$ 3.00	\$ 2.00						
TOTAL INCENTIVES FOR USA BASED PLANTS \$B	\$ -	\$ 3.50	\$ 6.00	\$ 7.00	\$ 7.00	\$ 6.00	\$ 3.00	\$ 2.00						
CUMULATIVE INCENTIVES/(payback) \$B	\$ -	\$ 20.49	\$ 48.20	\$ 77.40	\$ 103.43	\$ 124.03	\$ 135.73	\$ 140.29		\$ (1.08)	\$ (2.98)	\$ (6.19)	\$ (11.44)	\$ (476.13)
PPI: Power-Parity Index rooftops PV	4.12	3.00	2.51	2.09	1.75	1.46	1.22	1.02	0.86	0.72	0.60	0.50	0.42	0.13
PPI: Power-Parity Index centralized PV	4.38	3.44	2.84	2.18	1.74	1.39	1.11	0.89	0.71	0.59	0.49	0.40	0.33	0.10
		PRICED HIGHER THAN FOSSIL FUELS, NEEDS LONG TERM INCENTIVES					POWER PARITY		PRICED LOWER THAN FOSSIL FUELS					

All the information provided here is proprietary information that resulted from deep research and analysis conducted by VSNI THINKTANK and its virtual partners. No information may be used in parts or whole in any direct or indirect form without the express written consent of VSNI authorized member of the Board.

If we can realize the stretch goals for harnessing Solar Energy, we will not only create three million jobs by 2030, we will be generating about 27- 30% of the total energy required for USA^{xiv}. Colorado & its neighboring states are well positioned to take on a leading role and have manufacturing plants that supply the solar PV and Thermal units to supply energy to most other states. In this model we have shown that Colorado will supply as much as 1.8 Trillion kWh of energy, 80% of which will be supplied to other states. The Investment and incentives needed from Federal, State and Private Sectors in the next 6-8 years will be paid back handsomely by 2030 without even considering the snowball effect on other industries and economy as a whole. The key to making this happen is for Federal, State and Private Sectors to come together and agree to a Three consecutive four year plans that provide a long term twelve year agreement on policies and framework conducive to massive scaling of sustainable energy.

A more detailed documentation will provide the steps required to deploy the stretch goals^{xv} needed for USA and Colorado to take on the global leadership for a Solar Energy based initiatives. This initiative significantly reduces the dependency on fossil fuels that are harming our environment, addresses the energy security issues and launches the era of a vibrant new energy economy. This, in turn, will drive the next economic growth engine and create jobs in a size and proportion never experienced before. We will end the overview with a quick look at a proposed model for using *invVEST* as an enabler to foster collaboration needed for massive scaling and exponentially increasing the opportunity pie.^{xvi}

VERTICAL-FUNCTIONAL FACILITATORS IDENTIFICATION TOOL: As mentioned in the previous page, for each vertical energy source cluster, the facilitating team will need to map to key functional clusters and determine the opportunities and gaps that need to be taken care of. This table will be used simply to identify the best available experts (minimum 2, maximum 4) who will act as facilitator & take ownership of getting things done for tasks related to that box.

invVEST Ambassador, Thought Leader Selection Matrix

Horizontal Clusters / Vertical Clusters	Thought Leaders & Influencers Energy Cluster	Customers to Energy Clusters	Funding & Financial Sector Cluster	Policy and Regulatory cluster	Behaviorial change cluster	Education Services Cluster	Job Creation Services Cluster	Marketing & Strategy Planning Cluster	Media & Promotion Cluster
Energy Efficiency & Conservation Cluster									
Solar Energy Cluster									
Wind Energy Cluster									
Geo Thermal Energy Cluster									
Bio Fuels Energy Cluster									
Biomass Energy Cluster									
Nuclear Energy Cluster									
Hydro Energy Cluster									
Other Sustainable Energy Clusters									
Energy Storage Cluster									
Energy Transmission Cluster									
Energy Transportation and infrastructure cluster.									
Coal Energy cluster									
Oil Energy cluster									
Gas Energy Cluster									

invVEST focus: Each of us as Ambassadors & Thought Leaders need to have a very specific focus to realize Invest's sole dedication:

invVEST is dedicated to enabling Global Leadership in Sustainable Energy Initiatives (SEI) for USA through Massive Scaling. invVEST will be a technologically & politically agnostic nonprofit organization made up virtual clusters of thought leaders focused on the dedicated vision.

There are three levels on engagement for **invVEST** participants: (Please also view **invVEST & You** on the menu bar.

1. Ambassadors in invVEST

The role of the Ambassadors as to facilitate a group of thought leaders that are focused around each vertical energy cluster to bring it to a logical conclusion and to round up as much support as possible for Investment in Massive Scaling of Sustainable Energy Initiatives. We will try to find at least 4-6 ambassadors for each energy cluster and we try to find as many thought leaders as possible with expertise in each of the functional areas to help the group.

2. Thought Leaders in invVEST

Thought Leaders are individual (independent or part of an organization) who have a deep knowledge/influence in the specific energy cluster they are participating in and/or people who have deep knowledge/influence in any of the functional clusters.

3. Supporters:

Supporters are any person/organization that supports: **Global Leadership in Sustainable Energy Initiatives (SEI) for USA through Massive Scaling.** Supporters will simply blog to say they support the initiative (Blog 1) and contribute in any way.

More on Ambassadors:

The ambassadors need to be conversant with the Strategy Document, and the two mapping tools. If there are concerns or issues about the strategy we can discuss and update, it is a living document. But we will not deviate from our goals. We will not get sidetracked, climate change is a huge issue and we believe it is real, but our position is climate change is an effect from the cause: which is the way we use generate and use our energy, if we treat the cause we mitigate climate change. So we remain focused on massive scaling of SEI.

We will Train the Ambassadors to get many of the discussions into one of these three logical conclusions:

- a. Get an action item that helps meet the Massive Scaling Goal by the Virtual Team itself
- b. Handoff to one of the participants for deployment/RFP/ lead that will lead to a convert into a paid for service/product sale.
- c. Closeout if it is leading nowhere.

Other Areas of focus for Ambassadors:

- a. Get trained on use of structured facilitating/ coaching.
- b. Get as many citizens/ public support as we can. Question 1 is ideal to post their support. It can be anyone of the friends & family saying consistently "We believe USA should take on the Global Leadership role for Sustainable Energy Initiatives and I select these 3 as the top reasons. Comment on why they think it is important for the top reason. If they have any other reason they can voice that too.
- c. Flag any other items that help with a & b or realizing the goal. The web team will prioritize the requests/ideas.

BASE MAPPING TOOL: For each vertical cluster the vertical & functional industry experts will determine the strength for each of the 6 traits defined for Sustainable Energy (SE). The index of 0 means worst, 10 means best.

SEI Traits 0-10 Vertical Clusters	Massive Scalability in future	Carbon FootPrint	PPI slope	Reducing Energy Dependence on one Region or Source	Side Effects	Job Creation
Energy Efficiency & Conservation Cluster						
Solar Energy Cluster						
Wind Energy Cluster						
Geo Thermal Energy Cluster						
Bio Fuels Energy Cluster						
Biomass Energy Cluster						
Nuclear Energy Cluster						
Hydro Energy Cluster						
Other Sustainable Energy Cluster						
Energy Storage Cluster						
Energy Transmission Cluster						
Energy Transportation and infrastructure cluster.						
Coal Energy cluster						
Oil Energy cluster						
Gas Energy Cluster						

PPI™ is Power Parity Index as defined by VSNI. A PPI of greater than 1 will mean the cost to generate power is more than the comparable traditional fossil fuel source it replaces. PPI of 4 will mean it is four times more costly. A PPI of 0.5 will mean it is 50% cheaper than the fossil fuel source it replaces. A PPI Slope will indicate the rate the price is declining over the review period, in this case is 2020 and 2030. It is simply $(2008Price - 2020Price) / 2020Price$. The larger the positive number, the more aggressive the price decline slope will be. The larger the negative number the more the price increase slope will be. The projections will be based on the CORE MAPPING TOOL shown in the next page.

CORE MAPPING TOOL: For each vertical cluster the vertical & functional industry experts will determine the strength for each of the parameters shown. The index of 0 means worst, 10 means best. Where future projections are made the team needs to identify critical success factors needed to meet those projections.

Parameters 0-10 Vertical Clusters	Innovation & Fundamental R&D	Application R&D	Manufact- uring	Market Size	Install Services	2008 PPI	2020 PPI	2030 PPI	2008 size as % of total Energy	2020 size as % of total Energy	2030 size as % of total Energy	Immediate Impact effectiveness	Industry Growth	Critical Success Factors
Energy Efficiency & Conservation Cluster														
Solar Energy Cluster														
Wind Energy Cluster														
Geo Thermal Energy Cluster														
Bio Fuels Energy Cluster														
Biomass Energy Cluster														
Nuclear Energy Cluster														
Hydro Energy Cluster														
Other Sustainable Energy Cluster														
Energy Storage Cluster														
Energy Transmission Cluster														
Energy Transportation and infrastructure cluster.														
Coal Energy cluster														
Oil Energy cluster														
Gas Energy Cluster														

PPI™ is Power Parity Index as defined by VSNI. A PPI of greater than 1 will mean the cost to generate power is more than the comparable traditional fossil fuel source it replaces. PPI of 4 will mean it is four times more costly. A PPI of 0.5 will mean it is 50% cheaper than the fossil fuel source it replaces. In many of these cases, invest team will rely on outside Industry experts as and when needed.

The virtual teams will act like catalysts to enable an ever growing network of brain-trusts/thought-leaders to collaborate and work synergistically together to enable massive scaling of Sustainable Energy Initiatives. So we view the brain-trusts/thought-leaders as individual Neurons of our brain cells and *invVEST* will be like catalysts to assimilate, decipher and get to decision points lightening fast like the brain cell does, over time. Just like our brain function, it needs to be developed over time. The more we learn to collaborate and depend on each other to provide the best-in-class pieces of the puzzle, the better our resultant outputs will be. The model is depicted in the previous page. This picture depicts the interaction between Federal Level Entities/BrainTrust (DOE, NREL, NOAA, etc..) with STATE Level Entities/BrainTrust both Public and Private organizations. Now imagine this cluster group by function, it can be the Sustainable Energy Companies/Entities in the middle and the clusters surrounding it can be incumbent Energy Companies cluster, Financial Institution cluster, Educational Institutions cluster, Placement Services group clusters, Software companies cluster, Automobile & Transportation Companies cluster ..and so on.

Our definition of brain-trust/thought-leaders are any organization or individuals who can contribute positively towards enabling massive scaling of Sustainable Energy Initiatives rapidly for our country. Besides the incumbents in energy industry for both traditional and new energy initiatives, we will see new ideas and real time fast paced deployments materializing from new entrants like Google and many other smaller nimble players. Any organization or individual who bring critical components of expertise in educating and refocusing our workforce in key areas like policy making at global and local levels, financing, innovative deal structures, and are willing to contribute to a collaborative team for fast paced idea creation and deploy the ideas real time are great assets. This will include an even mix of Industry insiders and outsiders who can bring new ideas and are willing to sign up and be accountable for stretch goals needed to realize the vision and strategies to deploy the plans.



The brain-trust/thought-leaders will provide the hooks and materials to enable massive scaling of Sustainable Energy Initiatives rapidly for our country that in turn will be adapted by other countries of the world to customize it to their own environment. The in-depth knowledge and IP that are differentiators will always be sitting with the individual brain-trust/thought-leaders and it will be a paid for services. At the end of the day,

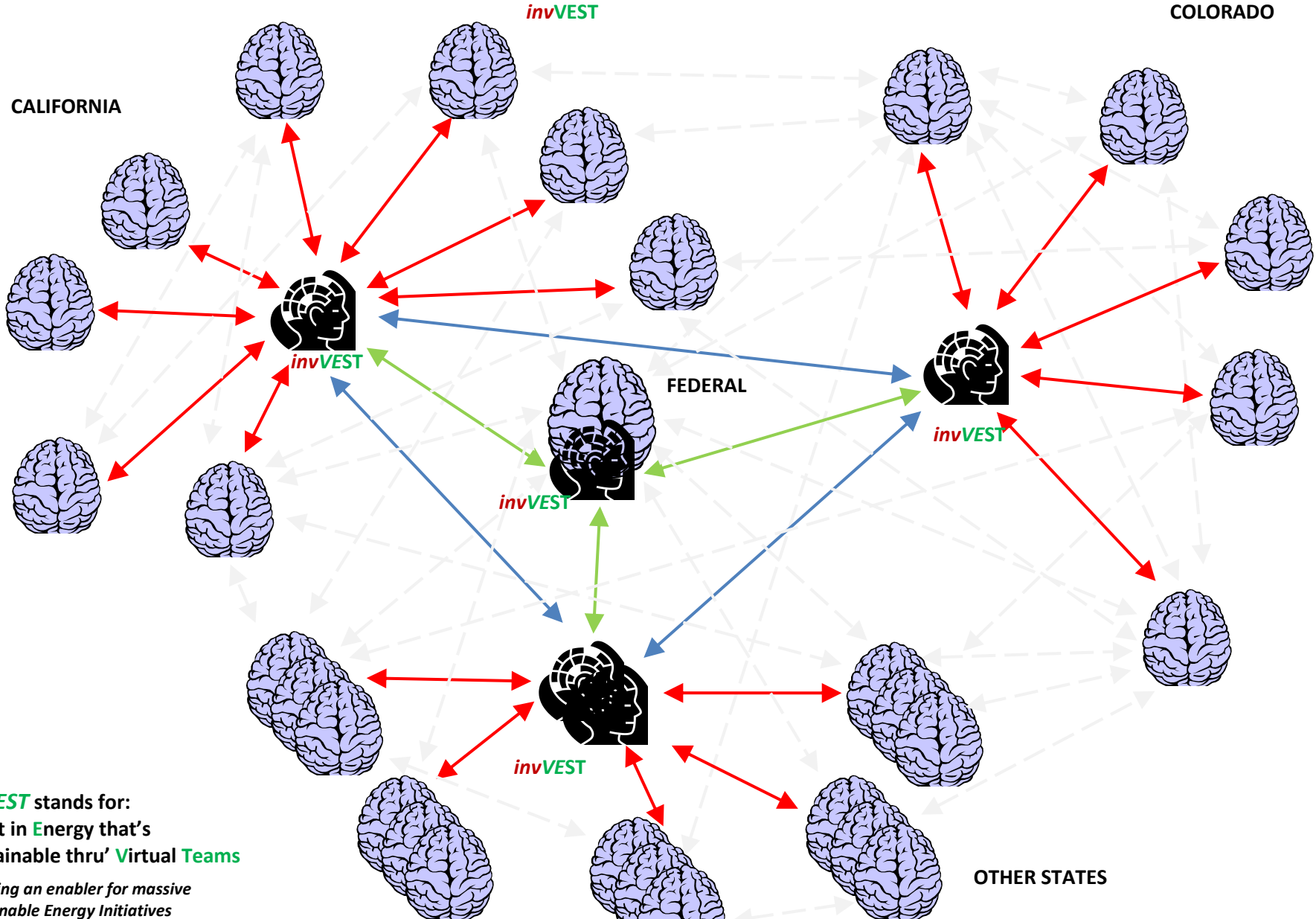
The team can be, but not limited to:

- Policy makers at Federal and State Levels for Energy Initiatives, Employment, World affairs and Finance groups
- Private Banking & Investment organizations : Goldman Sachs, Morgan Stanley, CITI, GE Finance etc, KPCB, Khosla Ventures, Oak investments, etc.
- Third party installers: Sun Edison, Solar City, etc.
- Public and Private Institutions that have been on the forefront on New Energy Initiatives: RMI, PEW, Repower America, etc.
- Private Sector Energy and Utility regulated and non regulated companies, XCEL, PG&E, NRG etc.
- Private Sector Manufacturing and services associations directly associated with Energy Initiatives. Cleantech, ASEA , COSIEA, etc
- Private Sectors that have traditionally not been associated with Energy Initiatives but can make a big impact Google, Intel, Cisco, IBM, Verizon, AT&T, etc. Many of the software companies.
- Others?

The following pages a few examples on how different clusters can be formed to get as deep as one need to get into to create massive scaling.

THE VIRTUAL NETWORK FOR MASSIVE SCALING NEEDED FOR REGAINING GLOBAL LEADERSHIP IN SUSTAINABLE ENERGY INITIATIVES:

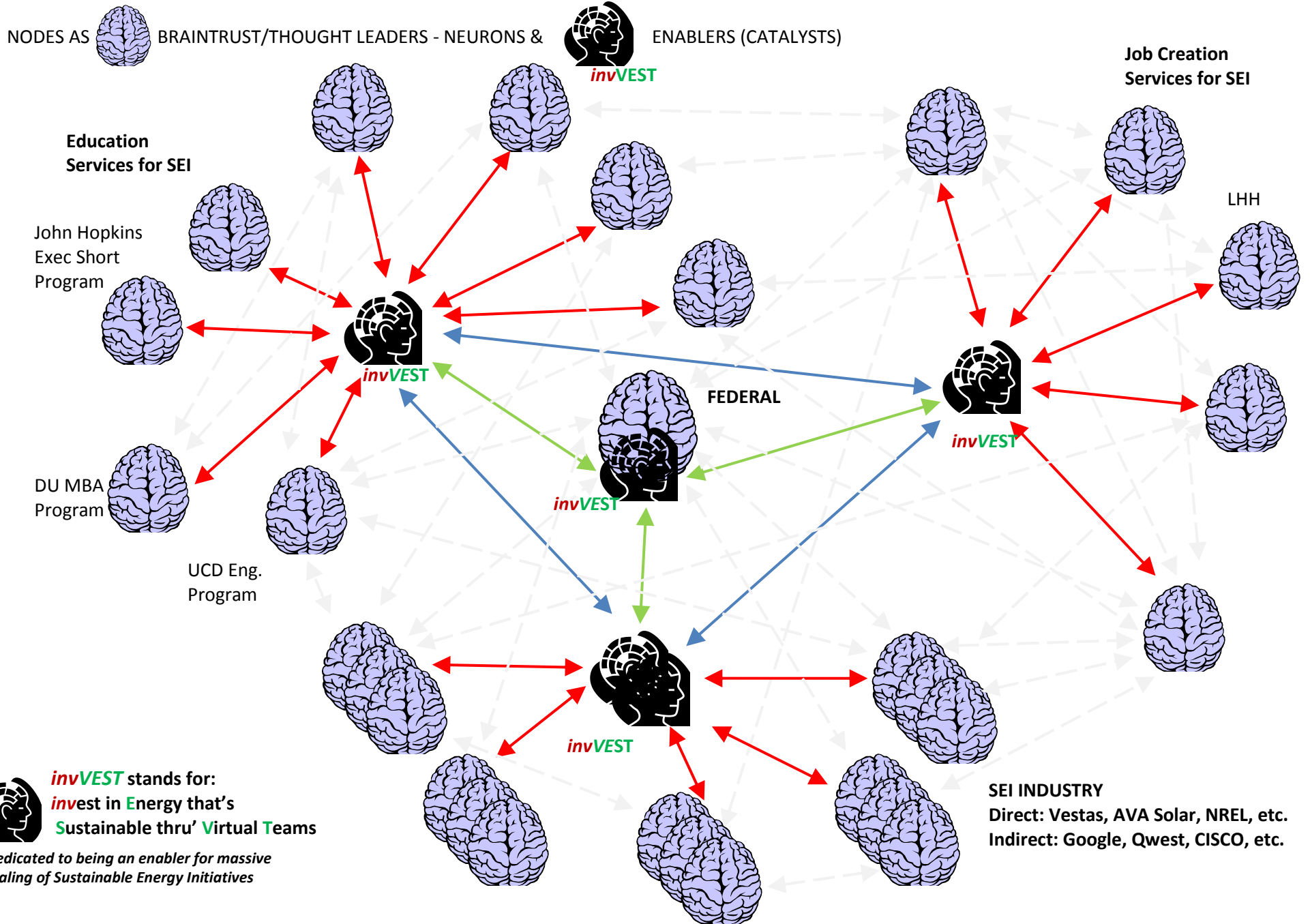
NODES AS  BRAINTRUST/THOUGHT LEADERS - NEURONS &  ENABLERS (CATALYSTS)



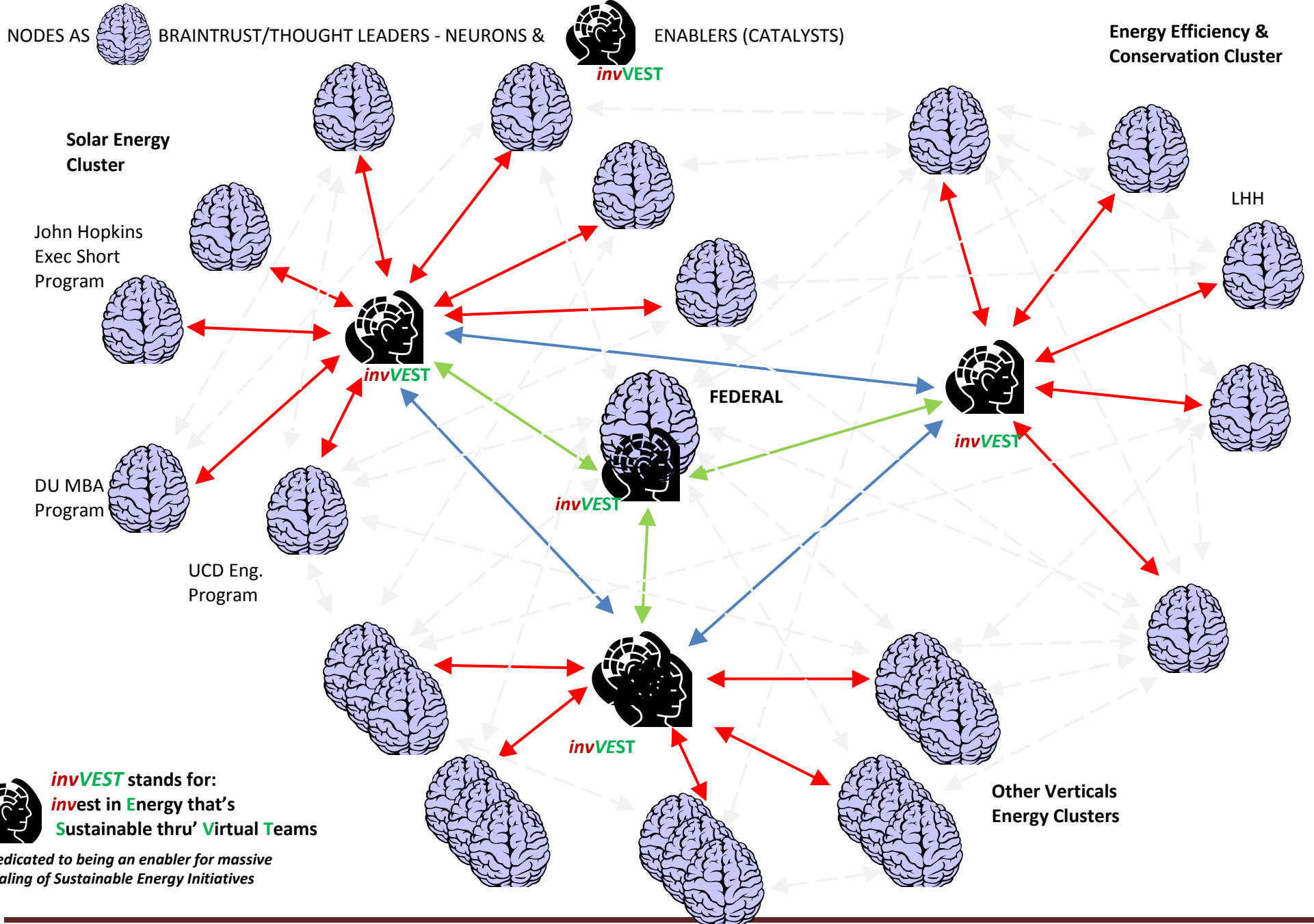
 **invVEST** stands for:
invest in Energy that's
Sustainable thru' Virtual Teams

Dedicated to being an enabler for massive scaling of Sustainable Energy Initiatives

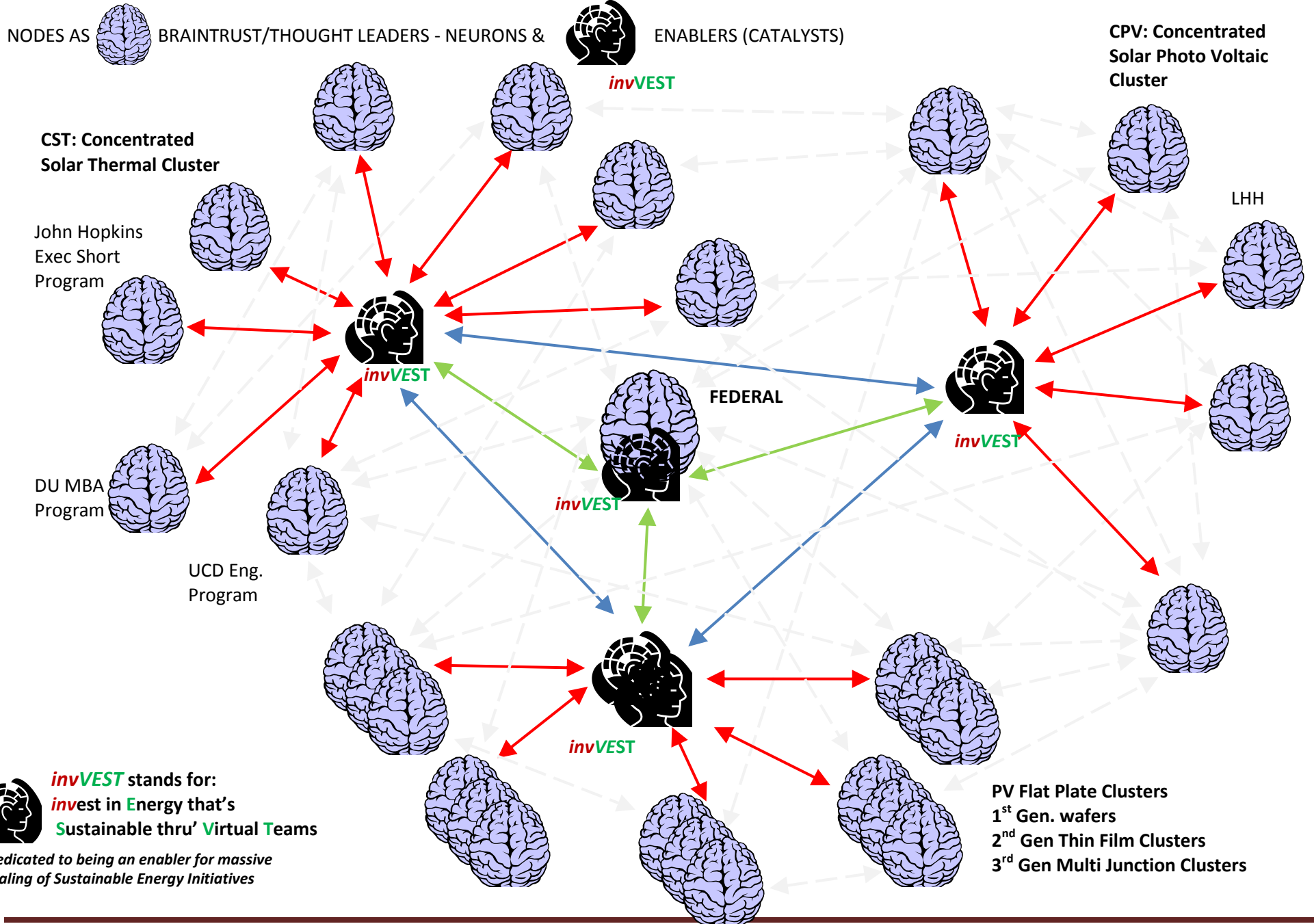
THE VIRTUAL NETWORK FOR MASSIVE SCALING NEEDED FOR REGAINING GLOBAL LEADERSHIP IN SUSTAINABLE ENERGY INITIATIVES:



THE VIRTUAL NETWORK FOR MASSIVE SCALING NEEDED FOR REGAINING GLOBAL LEADERSHIP IN SUSTAINABLE ENERGY INITIATIVES:



THE VIRTUAL NETWORK FOR MASSIVE SCALING NEEDED FOR REGAINING GLOBAL LEADERSHIP IN SUSTAINABLE ENERGY INITIATIVES:



ⁱ Energy conservation programs termed by some as “negawatts”. It can happen from simply switching off a light-bulb when not in use to complex involved programs like smart grids deployment.

ⁱⁱ There may be some truth in research findings that the plug-in hybrids may be creating as big or even a bigger carbon footprint than gasoline engine cars as it is used today if you consider a twenty year lifecycle of creation, use and end of life disposal.

ⁱⁱⁱ EIA: Energy Information Administration; A Federal Govt. body chartered to maintain a treasure trove of information in minute details of energy usage for USA. IEA also maintains a good overview of global energy usage by country. While EIA has several scenarios for projections extended until 2030 it is still a very conservative repository for projections. We feel this reflects the true state of the future for USA energy usage unless we set stretch goals and follow through with a multiyear deployment policy.

^{iv} The German model is a well thought out multiyear plan and is now getting them close to their goals of reaching power parity on a systematic initiative that started off in early 2002. Spain jumped on the band wagon in 2007 without any long term thinking and ensuring that there was a public sector & private sector collaboration in place. It blew up in their face when they found many vendors were taking advantage and charging atrocious premiums compared to Germany and other countries. They withdrew the incentive plan in November 2008.

^v Please review the Presentation “*Setting a Comprehensive Vision & Stretch Goals for USA to Regain Global Leadership in Sustainable Renewable Energy Initiatives: Creating the next vibrant economic engine of growth while mitigating climate change for our future generations to enjoy*” at www.vsnicorp.com under panel presentations for the Sustainability Energy Initiatives workshop. You may find other presentations from other panelists very informative and useful depending on your interest areas for Sustainable Energy Initiatives.

^{vi} German Advisory Council for Global Change have created an aggressive vision and plan that spans to 2100 ,where Solar PV and Solar Thermal generate about 60% of world total energy by that time. While it is a great model, they have approached it strictly from a cure for climate change perspective and not too many details are evident about the return on investment and creating and economic engine for growth. And it is a German version, use of natural resources like coal go away by 2060, since they have no natural resources worth mentioning. USA is sitting on the world’s largest coal resources and it is in US interest to create a comprehensive vision and energy creation by source that specifically takes into account key USA strategic resources. Hence research on clean coal technologies and other ways to generate environment friendly energy from coal needs to be a significant part of the research effort, at least until 2020.

^{vii} The stretch goals concept comes from the extensive works of Hamel and Prahalad which resulted in the NY Times nonfiction best seller “*Competing For The Future*” for many years. Hamel and Prahalad focuses on a systematic approach to realize stretch goals that can significantly change the dynamics of the markets and economies for industries and even countries. It needs a multi-year approach, buy-in from the key stakeholders and razor sharp focus to realize life changing stretch goals.

^{viii} This executive overview is the gleaned from in-depth research and analysis from hundreds of articles, research papers, and inputs from key thought leaders & Industry Experts from inside and outside the energy arena. We then used a systematic modeling using the concepts of the great management gurus of our time who had focused their works on New Emerging Markets and Technologies: Hamel & Prahalad: “*Competing For The Future*”, Clayton Christensen, “*Innovators Dilemma*”; Robert Bergelman’s work on Technology and Innovation, Michael Treacy & Fred Wiersema, “*Discipline of Market Leaders*” Brandenberger & Nalebuff: “*Coopetition*” and a host of others. Their work only humbles us in our effort and makes us stronger in the belief that if we leverage each other’s strengths and knowledge collaboratively, we can overcome any stretch goal we set for ourselves.

^{ix} No one has expressed it better than Admiral Yamamoto, who orchestrated the bombing of Pearl Harbor: “*I am afraid we have awakened the slumbering giant*”

^x In his latest book “*Hot, Flat & Crowded*”, Tom Friedman has coined a phrase “if only we can be China for a day” so that we can get everyone aligned and shove down policies and directives overnight to get the job done. Everyone should think about the enormity of the phrase as we grapple and negotiate through one of the worst financial crisis in our country’s history. While it is very tempting to be China for a day, I firmly believe it will smother innovation and ingenuity, something America has excelled at and will again do so, if we set our mind to it. Besides, having grown up and spent my childhood in Burma, now known as Myanmar, where the current Socialist Military regime is controlling the nation by sheer power and brute force, I cannot support “China for a Day”. They have imprisoned Aung San Su Kyi, the Nobel peace prize winner, who won the only election that was held in Burma by a landslide some 15 years ago and have killed and imprisoned thousands of her followers. I know it works only under brute force and it kills innovation and ingenuity, the very ingredient we need to be the global leader in Sustainable Energy initiatives. But USA does need to find a way to take fast paced bold actions that can blaze a new path for its future generations to enjoy the global leadership position we have enjoyed so far.

^{xi} Please visit www.vsnicorp.com. Refer to endnote 3

^{xii} Please visit www.vsnicorp.com. Refer to endnote 3. Slide 20.

^{xiii} While this section looks into only the Solar component, at the comprehensive vision level we should be technology agnostic. We will need to look into technologies for each different resource for sustainable energy and invest in significant technologies that hold promise for not only meeting power parity compared to the traditional fossil fuels in the near future (next six – eight years), but will become significantly cheaper to produce in the longer term (beyond 2020). Within Solar, Flat-plate PV, CPV: Concentric PV, CST Concentric Solar Thermal technologies all show immense promise to meet or exceed power parity within the next 6- 10 years and should be closely monitored during its massive scaling phase.

^{xiv} There needs to be transformational work that needs to be done to exponentially increase the use of electric power in the areas of Energy Storage, Energy Transmission, Energy Infrastructure and use after solar & wind energy usage, which are currently intermittent energy supply exceeds 10% of total Energy usage. Under the breakthrough scenario, this milestone will be reached between 2020 and 2025.

^{xvi} This executive overview is gleaned from in-depth research and analysis from hundreds of articles, research papers, and inputs from key thought leaders & Industry Experts from inside and outside the energy arena. We then used a systematic modeling using the concepts of the great management gurus of our time who had focused their works on creating New Emerging Markets and Technologies:

Hamel & Prahalad: “Competing For The Future”

Clayton Christensen, “Innovators Dilemma”;

Robert Bergelman’s work on Technology and Innovation,

Michael Treacy & Fred Wiersema, “Discipline of Market Leaders”

Brandenberger & Nalebuff: “*Coopetition*” and a host of others.

Our work was deeply influenced by Jim Collins who was the co-author of Built To Last and Good to Great as well as Roy Spence author of “It’s Not What You Sell, It’s What you Stand For: Why Every Extraordinary Business Is Driven By Purpose. Their work only humbles us in our effort and makes us stronger in the belief that if we leverage each other’s strengths and knowledge collaboratively, we can overcome any stretch goal we set for ourselves.

A few of the books on Energy that may have influenced our thinking:

Two Billion Cars: Driving Towards Sustainability by Daniel Sperling & Deborah Gordon

Green to Gold by Daniel C. Esty & Andrew Winston

Sustainable Energy — without the hot air by David JC MacKay <http://www.inference.phy.cam.ac.uk/sustainable/book/tex/sewtha.pdf>

Go Green Live Rich by David Bach

Freedom From Oil by David Sandalow

Gusher of Lies Robert Bryce

You may find a more extensive list of references and activities on SEI related topics in our resources section.