THE CARBON UTILIZATION PRIZE

PrizeCapital®

SIB SUNFLOWER INTEGRATED BIOENERGY, LLC

A conflict is emerging between providing stable, affordable baseload electricity and lowering carbon emissions. With a long life remaining for the existing coal infrastructure, a retrofit breakthrough is needed to harmonize these conflicting needs.

The *'Carbon Utilization Prize'* will inspire competitors from around the world to develop radically advanced approaches to *utilize* rather than emit carbon, while maintaining energy producers' ability to provide consistent, *cost-effective* baseload power to customers.

In partnership with

XPRIZE FOUNDATION

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I. Overview

Prize Capital®, Sunflower Integrated Bioenergy, and the X PRIZE Foundation are creating a high profile, international competition to find viable technologies that can affordably utilize carbon emissions, predominantly from coal-fired power plants.

Coal provides life-enhancing baseload power, yet unmitigated CO_2 emissions from coal are incompatible with the emerging carbon-constrained world. As nations and regional governments around the world seize the opportunity to control CO_2 emissions, it's essential that the industry ***find a way to continue providing consistent, affordable baseload power while concurrently reducing CO_2 emissions***.

The dominant envisioned technological solution, carbon capture and sequestration (CCS), faces extensive challenges concerning its development and deployment that prompt the need to examine – and aggressively pursue – alternate approaches.

Advanced technologies have the potential to utilize CO2 from coal power plants to produce valuable, revenue-producing products...

...If only challenging technological barriers are overcome!

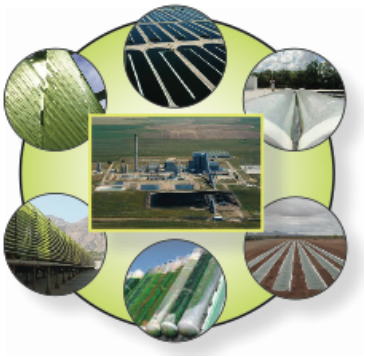
An alternate approach exists that has the potential to not only mitigate carbon emissions, but to treat CO_2 as an asset, ***absorbing CO_2 at the point of production and using it to produce valuable products such as fuel.*** But to reach this potential, the industry must be catalyzed to overcome significant lingering challenges.

The inducement prize mechanism can attract and spur innovative minds to break down barriers: unleashing carbon mitigation potential, harnessing CO_2 at prices that utilities and customers can afford, creating additional revenue streams, and forever changing the world.

Prize competitions have a nearly 300-year track record of spurring the best and the brightest minds to overcome long-standing challenges while creating tremendous benefit for those involved. For instance, **the Ansari X PRIZE competition, a $10 million prize focused on catalyzing prize space travel, *attracted 26 competing teams, who spent an aggregate $100 million chasing the prize, and spawned a $1.6 billion industry.*** **Furthermore, it generated *over 6 billion media impressions with a monetary value of over $120 million.***

Now, the *Carbon Utilization Prize* competition is focused on doing the same, attracting and inspiring some of the best and brightest minds to rise up and meet the carbon challenge by:

1. ***Cost-effectively mitigating carbon emissions*** from coal-fired power plants (and other similar industrial facilities);
2. ***Producing carbon-based products that are adaptable to various markets***, including transportation fuel, animal feed, and materials, among others;
3. ***Being profitably deployed*** to other coal plants around the world.



Draft competition concepts have been formulated and vetted in preparation for an envisioned launch in 2011. The competition may consist of multiple phases, aggregating competitors in centralized location(s) in the United States, and contain multiple media-oriented elements.

A team of unprecedented competence and experience spearheads the *Carbon Utilization Prize*, presenting an impressive array of opportunities to sponsors, competitors, and investors alike. These opportunities are presented through:

- The ***Prize Capital*** patent-pending venture finance mechanism;
- ***The X PRIZE Foundation's*** expertise in managing and promoting inducement prize competitions;
- ***Sunflower Integrated Bioenergy's*** experience with the utility industry, technology commercialization, and connection to a 360-MW coal fired power plant, where it is envisioned that prize ***competitors will aggregate and compete.***

"Prizes attract diverse groups of experts, practitioners, and laypeople—regardless of formal credentials—to attempt to solve difficult problems, dramatically expanding the pool of potential solvers and lower the cost of attempting or recognizing solutions."

McKinsey & Co.
'And the winner is..."
March, 2009

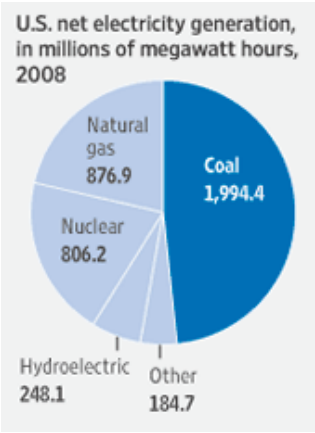
The *Carbon Utilization Prize* offers an unparalleled opportunity to be forever associated with a revolutionary, world-changing event. Accordingly, organizers are seeking exceptional, select candidates to:

- ***Sponsor*** the prize competition;
- ***Compete*** to win it; and
- ***Invest*** in the prize fund.

With your help, we can attract imagination, ability and money to the challenge of carbon utilization. We welcome your support and participation.

II. The Emerging Carbon Constrained World

Electricity lights our towns, warms our homes, and cooks our food. Yet much of our electricity comes from carbon-intensive sources, such as coal, and will continue to do so far into the future. A carbon mitigation breakthrough is urgently needed in order to meet the challenge of supplying reliable baseload electricity to a carbon-constrained world.



Coal is the dominant energy provider in the U.S., providing nearly 50% of our needs.

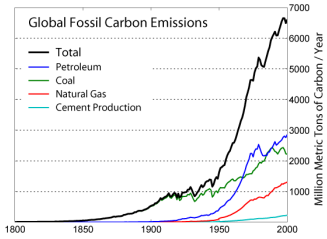
Coal Provides Life-Enhancing "Baseload" Power

Energy consumption can help improve lives. In order to achieve an improved standard of living, developed countries have encouraged the consumption of energy at a very fast rate. (*IEEE Spectrum, 1973*) This is due to the fact that electrical energy consumption is an indicator of economic condition. (*Energy Convers, 1973*) Consequently, nations around the world place great importance in providing energy for their peoples.

Much of the current energy provision and consumption comes from coal, and will continue to do so far into the future. Coal can be used to generate electricity day or night, rain or shine, at price that people can afford. Thus, it is an appealing fuel and is in widespread use. In the U.S., coal currently supplies approximately 49% of total energy needs. (*EIA, 2009)* This number is much higher in other countries. For instance, China utilizes coal for about 70% of its total energy consumption. (Ibid.) In fact, China has enough coal to sustain its economic growth (at current rates) for a century or more. (*Technology Review, 2007*) Overall, the countries of non-OECD Asia (including China) account for 90% of the projected increase in world coal consumption from 2006 to 2030. (*EIA, 2009*)

But the World is Charging Ahead in Dealing with Carbon Emissions

Unmitigated carbon emissions from coal are incompatible with a carbon-constrained world. Unfortunately, coal is a carbon-intense fuel. For every MBTU of energy obtained, coal releases about 57 pounds of carbon, as compared to 47 pounds of carbon for oil, and 32 for natural gas. (*EPRI, 2000*) Even without formal regulation of CO_2 in the U.S., a carbon-constrained environment is a current reality. Concerns about climate change have created an impasse in the construction of new baseload generation. This trend will continue until there is greater clarity on public policy and the capabilities and costs of new



The increasing atmospheric concentration of carbon dioxide is prompting governments to take action to limit emissions.

technologies.

National and regional governments around the world are enacting regulations. California, Hawaii, and Minnesota have enacted climate legislation. (*The Pew Center on Global Climate Change*) The U.S. House of Representatives passed the Waxman-Markey climate and energy bill, the Senate is working towards passing legislation, and President Obama has vowed to sign it. Europe has implemented a cap-and-trade program, and China has established GHG intensity targets. The world as a whole will also be working towards passing a binding agreement in Mexico in late 2010. The message is clear: a carbon-constrained world is likely.

"China was asleep during the Industrial Revolution. She was just waking during the Information Technology Revolution. She intends to participate fully in the Green Revolution."

C. H. Tung,
Vice Chairman,
National Committee of the Chinese People's Politics Consultative Conference

To meet the challenge, innovative countries around the world, such as China, aim to be developers and exporters of low-carbon technologies. As the Chinese population migrates from the countryside to urban centers energy demand is surging. China is determined to meet this increase in demand with cleaner, homegrown sources so that its future economy will be less vulnerable to supply shocks and to reduce pollution. (*New York Times, 2010*) "By the end of this decade, China will be dominating global production of the whole range of power equipment," said Andrew Brandler, the C.E.O. of the CLP Group, Hong Kong's largest power utility. (*Ibid.*) U.S. utilities can similarly develop technologies – in advance of any regulation – to tap into this emerging opportunity.

Current Renewable Energy Technologies Alone Cannot Solve the Carbon Challenge

Energy from solar and wind fluctuates, and is not timed to peak demand. Instead, solar energy produces more electricity when the sun is shining, and wind energy produces more energy when the wind is blowing. Neither wind energy nor solar energy can be dependably relied upon to meet customer's daily needs. This is particularly true given the absence of viable energy storage technologies. When solving the carbon challenge, we must continue to provide the essential, life-enhancing base load power that consumers demand.

Less CO_2-intense energies currently cost significantly more than energy from coal. **While costs vary from utility to utility, in general a modern coal plant of conventional design produces electricity at about 7.8 cents a kilowatt-hour; a high-efficiency natural gas plant, 10.6 cents; a new nuclear reactor, 10.8 cents; and a wind plant in a favorable location, 9.9 cents per kilowatt-hour. (*New York Times, 2009*) Solar electricity can cost double this amount. (*Solarbuzz, 2010*)** When solving the carbon challenge, we must provide solutions at affordable prices.

Solar energy is low in carbon emissions, but high in cost, and doesn't address the emissions from existing, carbon-intensive facilities

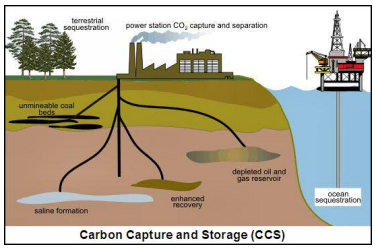
Even as renewable energy technologies improve and are deployed, they won't address the existing carbon-intense infrastructure. Coal fired power plants in opera-

tion today will continue to run for decades longer. Given the fact that China alone is building two new coal power plants every week (*BBC, 2007*), it's important to develop and implement technologies that can be retrofitted into this long-lasting infrastructure instead of depending on replacing existing energy-generation capacity.

How will we meet the needs for – and opportunities of – consistent, affordable base load power with reduced CO_2 emissions?

III. The Challenges of Carbon Sequestration

To solve the challenge, the world is going to need technologies that can effectively capture carbon molecules directly from coal plants' flue gas, prevent those molecules from being emitted directly into the atmosphere, and do so at an affordable price or, even better, be a source of revenue. Does carbon capture and sequestration (CCS), currently the dominant envisioned technological solution, fit this profile?



Conceptually, CCS solves the carbon challenge. But real-world shortcomings prompt the need for a parallel approach.

Carbon capture and sequestration (CCS) is a process of isolating CO_2 emissions from large point sources, such as coal fired power plants, capturing and then storing it away from the atmosphere, underground in natural geological formations such as aquifers, coal bed methane formations, depleted oil or gas reservoirs, deep in the ocean, or via other similar locations. While CO_2 has long been injected into geological formations for various purposes – including enhanced oil recovery – the long-term results of storage is less understood.

CCS Technology Should Not Be Our Only Bet

In theory, CCS is a viable solution to the carbon challenge, safely isolating CO_2, storing it away from the atmosphere, and thereby preventing adverse climatic impacts. Yet the path to CCS technology development and deployment has revealed challenges that call into question whether or not the technology will one day be able to make a real world impact:

Energy inefficient. Capturing and compressing CO_2 requires significant energy and would increase the fuel needs of a coal-fired plant with CCS by 25%-40%. (*IPCC, 2005*)

Angry Oregonians protest a power plant's construction in their community. Similar protests could be expected should regions wish to bury CO_2 under communities.

Expensive. Capturing, compressing, and storing CO_2 from new coal fired plants is estimated to increase the cost of energy from such plants with CCS by 21-91%. (Ibid.) CCS retrofits are estimated to be even more expensive.

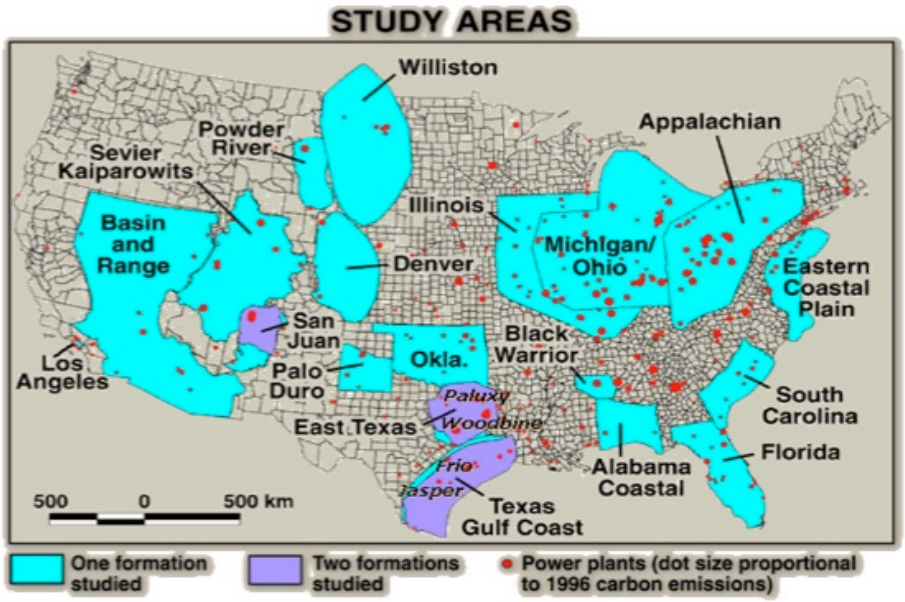
'NIMBYism'. While the potential for "leakage" – where stored CO_2 leaks back into the atmosphere – is small, estimated at less than 1% over 100 years (*IPCC, 2005*), the mere thought – and fear – of it happening, and envisioning the potential adverse affects, such as creating an asphyxiating CO_2 cloud above residential areas, is likely to prompt intense protest by people living near proposed sequestration sites. Such "not in my backyard" protests have successfully thwarted previous industrial projects.

Geographically, CCS may not be optimally aligned. While the U.S. has a significant 130 Gt sequestration potential (*DOE, 1999*), for CCS to work, CCS formations should be located away from population centers (given NIMBYism) and

close to CO_2 producing power plants (given the logistics and expense associated with moving CO_2 long distances). Such situations aren't necessarily the case, as the following map indicates:

"We do not expect the use of CCS in GHG (greenhouse gas) emissions abatement until after 2020…There are difficulties in finding suitable locations and obtaining permits for carbon storage, as well as potential liability issues."

McKinsey & Co., Wall Street Journal, December 11, 2009



Dependent on government. Without the essential step of immediately deploying CCS technology, working out its logistics, and improving its economics, the future of CCS is in doubt. Yet in order to deploy rapidly and have the opportunity to vet technologies, significant capital is needed, requiring the involvement of government. Yet governments have proven unreliable when it comes to CCS.

The FutureGen project, an essential step to overcoming CCS challenges, consumed significant time and money, and was eventually abandoned, leaving the future of CCS in doubt. The industry can't wait for the government for solutions!

One of the most anticipated CCS projects to lead deployment of the technology, the FutureGen project in Mattoon, Illinois, was (temporarily?) abandoned in early 2008 after the Department of Energy declined to provide additional financial support to help cover the projected $1.8 billion in costs. European leaders agreed in March 2007 to equip up to 12 power plants with carbon capture and storage (CCS) technology by 2015, to allow Europe to carry on burning coal while meeting its greenhouse gas reduction targets. But member states are now arguing with the Commission over who gets to choose which projects are selected. (*European Voice, 2010*) Altogether, there are now just eight active carbon capture, storage or sequestration, or CCS projects, globally (*DOE, 2009*)

Stored CO_2 does not produce new products that can be sold for revenue. Simply storing CO_2 overlooks a more appealing paradigm: CO_2 is an essential building block that could instead be used to create valuable materials and biomass that, rather than being an expense and liability for the power plants, could instead be a source of additional revenue.

How do we catalyze new approaches and

technologies that treat CO_2 as an asset, create additional revenue for coal utilities and operators, and lead to real-world, widespread, affordable deployment?

IV. A Different Approach: *Carbon Utilization*

Carbon and oxygen are essential building blocks for materials and life. Rather than sequester CO_2 from coal power plants, CO_2 can instead be *utilized* to produce valuable, revenue-producing products.

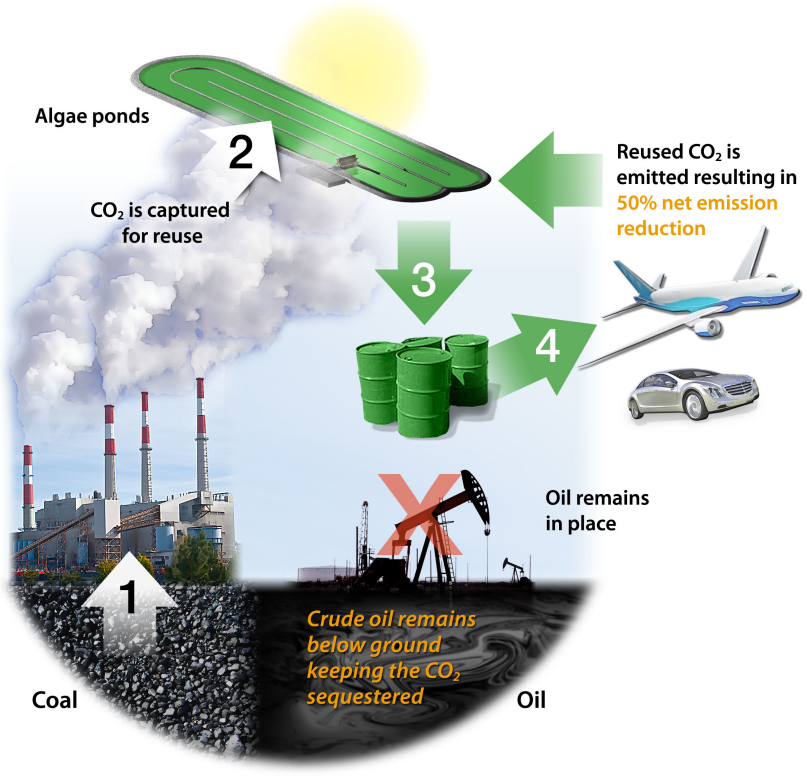
By mass, carbon dioxide is in fact the 19th most important commodity chemical in America, according to the Department of Energy. (*Economist, 2009*) Advanced technologies have the potential to absorb CO_2 at the point of production, then used to capitalize on CO_2's importance by producing valuable products such as fuel, thereby creating additional revenue streams for operators and utilities.

Microbes and Enzymes

During photosynthesis, microbes such as algae use solar energy to fix CO_2 into biomass, so the water used to cultivate microbes must be enriched with CO_2. (*DOE, 2008*) Many varieties of microbes absorb double their weight in CO_2, and can double in size in a matter of hours. This ability presents an opportunity to make productive use of the CO_2 from power plants and other sources. (*Ibid.*)

There is "enough waste CO_2 available in the states where climate conditions [are] suitable to support 2 to 7 quads [i.e. 10^{15} BTUs] of [algal] fuel production annually."

Department of Energy, Report on biodiesel from algae, July 1998



Algae have tremendous productive potential to not only absorb CO_2, but also to produce valuable product, such as transportation fuel. This, in turn, could help displace CO_2 intensive fuels, such as petroleum.

Microbes have potential, but many questions remain, such as what's the most effective way to connect biological systems to coal smokestacks, to absorb the most CO_2 without reducing significant power output?

Algae are rich in oil, which comprises 20% of every molecule on average. This oil can be refined into transportation fuel, bioplastics, or sold as a high-value omega-3 nutritional supplement, among other uses. Omega-3 rich algae can also be fed to cattle and other animals to help balance their diets. Furthermore, algae love "dirty" (i.e. nutrient enriched) water. In fact, algae are often used in combination with municipal water treatment facilities to clean water. Not only does this mean that algae may depend less on fresh water sources, but also rather than separating CO_2 from flue gas before mitigating, flue gas can be fed directly into algae production systems. The systems can use the CO_2 to grow biomass, and may remediate other elements in flue gas by using them as fertilizer.

Another approach involves enzymes – proteins that accelerate the rate of a biochemical reaction – that can be used to "scrub" CO_2 from coal smokestacks, utilizing an enzyme carbonic anhydrase at its core that absorbs CO_2 and turns it into a bicarbonate ion. (*Earth2tech, 2009*)

The *potential* of microbes and enzymes is immense, but only if major advances are achieved. The industry needs a catalyst to spur the conquering of lingering challenges including species selection, platform optimization, power plant integration, harvesting, dewatering, and cost.

Thermo-Chemical Recycling

The advantage of the Carbon Utilization Prize is that it may also uncover technologies in addition to microbes that can utililize CO_2. For instance, potential exists to use the sun's energy to convert water and CO_2 into the molecular building blocks (i.e. carbon monoxide) that make up transportation fuels and other hydrocarbon-based products.

A researcher at Sandia assembles a prototype device intended to chemically reenergize CO_2 into carbon monoxide, which ultimately could become the building block to synthesize a liquid combustible fuel. But can this technology work in the real world?

Already, researchers at Sandia National Laboratories have successfully demonstrated just such a prototype that accomplishes this in a laboratory. As one of Sandia's researchers describes, instead of just pumping CO_2 underground for permanent storage, the sun's abundant energy can be used to achieve "reverse combustion" that essentially turns CO_2 back into a fuel. "It's a productive utilization of CO_2 that you might capture from a coal plant, a brewery, and similar concentrated sources." (*Technology Review, 2009*)

Yet this technology has only been demonstrated on a basic level in a laboratory, and may be over a decade before the technology is ready for market. (*Ibid.*) Thus, this industry too needs a catalyst.

Aqueous Absorption

In November 2006, Fortune Magazine profiled an entrepreneur who is pioneering a new experimental technology called a "liquid chimney" that captures CO_2 escaping from coal and natural-gas furnaces and turns it into a harmless material that could be used in construction or even dropped into the ocean to rebuild coral reefs. (*Fortune, 2006*)

The basic technology for liquid chimneys - so called because the exhaust from a power plant is filtered through a liquid-filled tank - has been around for 30 years. But the entrepreneur has made his patent-pending system more efficient and believes that he is close to a working model that could be retrofitted to existing industrial furnaces or boilers that run on natural gas. Eventually he hopes to get the technology to work with any fossil fuel, including coal. (*Ibid.*)

Still, the technology is far from fully developed, tested, or proven. A challenge is needed to determine whether this technology can step up and meet the real-world demands of industrial CO_2 producing facilities.

"Green" cement manufacturers, such as Calera, utilize CO_2 in production rather than emit it. But the technology has only been proven in the laboratory. How does it compare to other carbon utilization methods in the real world?

Biomimicry

Conventional cement is the world's third-largest industrial contributor of CO_2, mainly due to the high-temperature kilns required to make traditional cement pastes. (*VOA News, 2010*) New companies, such as Calera, produce cement by using CO_2 from industrial plants to mimic the way that nature grows the hard, durable materials in teeth, bone and sea shells. To capture the gas, Calera mixes the air with briny, brackish seawater, oil field wastewater or other salty waters. This causes minerals in the water to bond with CO_2 and then rain out as particles of synthetic limestone. For every unit of carbon that Portland cement adds to the air, green cement can remove three units. (*Ibid.*) However, while demonstrations are planned, the technology so far has only been proven in the laboratory.

The Economist (2009) cites a telling historical precedent:

> *In 1909 Fritz Haber, a German chemist, discovered a new way to combine nitrogen from the air with hydrogen to produce ammonia. Previously, this was known to be technically possible, but the process was hopelessly inefficient. Haber's new process, subsequently scaled up by Carl Bosch, meant that ammonia could be produced in industrial quantities, for use in both agricultural fertilizer and explosives—with momentous historical consequences. Haber was awarded the Nobel Prize in chemistry for producing "bread from the air". Ammonia synthesized using the Haber-Bosch process underpinned the "green revolution" in the second half of the 20th century and its associated population boom; today it sustains one-third of the world's population.*

"CO_2 is so readily available, especially from the smokestack of industries that burn coal and other fossil fuels…If we can replace more expensive starting materials with CO_2, then you'll have an economic driving force."

Thomas E. Müller, Ph.D., Professor, The Institute for Technical Chemistry and Macromolecular Chemistry, RWTH Aachen University

What mechanism can spur innovators to overcome lingering hurdles, expedite development, and create new, affordable, revenue-generating products from coal

V. The Carbon Utilization Prize: Overcoming Technological Barriers, Leveraging the Media, and Engaging the Public

Inducement prizes are powerful tools for progress. They "aim innovation" where needed, motivating the world's best minds to tackle pressing problems. The *Carbon Utilization Prize* will aim innovation where it is most needed: at creating a viable, real-world, affordable solution to the carbon challenge

Recognition prizes (e.g. the Nobel Prizes) look backward, rewarding past achievements. Large ***inducement prizes*** (i.e. 'MegaPrizes') look forward, directing effort at a desired outcome. They cross borders, bypass bureaucracy and accelerate innovation. MegaPrize advantages include:

- **More attention:** The media spotlight around a MegaPrize can bring an important technology challenge to the attention of millions.
- **More minds:** A MegaPrize effectively "crowdsources", inducing competitors from around the world to join the search for a solution.
- **More effort:** The competitive spirit brings out the best, in science as in sports. Watson and Crick deciphered DNA while rushing to beat rivals. Lindbergh risked his life crossing the Atlantic to win a prize.
- **More approaches:** Inducement prizes attract a wider range of participants, from traditional researchers to maverick thinkers, from large public companies to serial entrepreneurs. (Compare this to the typical government grant, which finances only one competitor in one location using one approach.)
- **More return on investment:** Inducement prizes create tremendous leverage. For instance, competitors spent more than $100 million in their efforts to launch a private spacecraft and win the $10 million Ansari X PRIZE. And sponsors don't have to pay the prize until – and unless – they get the result they want.

"Offer a large enough prize with clear rules and you can achieve a solution to almost any problem."

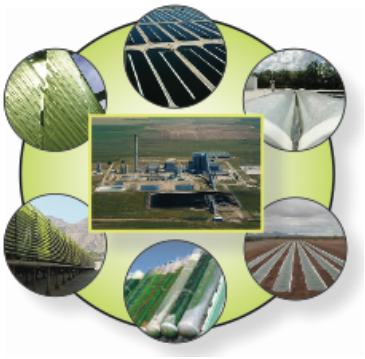
Peter Diamandis, Chairman, X PRIZE Foundation

Throughout history, prizes have been used to bring forth breakthroughs. The ideal competition includes: a compelling target, a large prize, simple, stringent rules, and competitions to capture public imagination.

The 'Carbon Utilization Prize' will include all these elements, and will introduce innovations to increase funding

1714	1791	1927	1992	2004
				
The Longitude Act revolutionized navigation and time	*The French Academy Prize revolutionized Chemical Engineering*	*The Orteig Prize (Charles Lindbergh) revolutionized Aviation*	*The Golden Carrot Prize revolutionized Energy Efficiency*	*The Ansari X Prize revolutionized Personal Space Flight*

Teams from all over the world will unite in centralized location(s) and compete to meet ambitious targets. The winners receive millions of dollars, enormous publicity, the praise of the world, and potential future revenues and royalties from technology commercialization.



The goal of the *Carbon Utilization Prize* competition is to overcome barriers to carbon utilization production systems, especially regarding how the components of the system work with each other, thereby jumpstarting an economically feasible and scalable carbon mitigation industry.

Specifically, the *Carbon Utilization Prize* will spark the creation and feasibility of algal-based technologies that can:

1. Cost-effectively mitigate carbon emissions from coal-fired power plants (and other similar industrial facilities);
2. Utilize the carbon to produce versatile products, including transportation fuel, animal feed, and materials, among others;
3. Be profitably deployed to other coal plants around the world.

Initial **Draft** Prize Concepts

Subject to Prize Sponsor Review and Approval

"I recruited a highly educated and skilled Aerospace team; started a small commercial space organization in a country where that is unprecedented; and dedicated all of my spare time and money to a contest I was sure we would not win. THAT is the power of incentivized competition."

Dumitru Popescu
The Romanian Space Team
Ansari X PRIZE

The competition series may consist of two phases (one small scale, and one larger scale), in centralized location(s) in the United States, as well as media demonstration elements between 2011 and 2014. These phases would focus on:

- Removing the most net-CO_2 from a coal-fired power plant's flue gas stream, at the lowest cost per ton of CO_2 removed, without reducing the power plant's energy output (beyond a designated percentage), over a given period of time;
- Producing the most carbon-based material;
- Generating the most revenue for the given carbon-based material.

In addition to a cash prize, the top finalists may have an opportunity to compete for deployment at power plants around the world.

Constraints

In addition to land constraints, competitors must also abide by other constraints:

- **Water quantity**— the goal could be achieved using less than a designated amount of water per acre.
- **Water quality (input)**— the goal could be accomplished without compromising fresh water supplies.
- **Water quality (output)**—water leaving the carbon utilization system would meet standard regulatory water quality guidelines.
- **Genetically Modified Organisms (GMOs)**— Genetically modified organisms could be allowed if the competitor and carbon utilization system meet existing regulatory requirements, including the appropriate local permits.
- **Demonstration events**— in order to remain in contention, competitors would submit a minimum amount of carbon-based product annually.
- **Timeframe**— the competition is envisioned to take place between January 1, 2011 and December 31, 2014.

All qualifications, inputs, and results will be sampled, verified, calculated, and confidentially audited by an independent third party or parties.

Verification

To determine whether prize criteria are met, teams, particularly those claiming to have won, may be audited by a respected, authoritative third-party to determine:

- The total ***amount of carbon*** their system has utilized to date;
- The total ***amount of energy*** consumed to produce this product;
- The ***cost per ton*** of carbon absorbed.

The criteria for measuring and projecting these three audited areas will be determined during the scoping and diligence phase of the competition (through 2010) and will be provided to prospective competitors before the competition announcement.

Specific data collected will never be disclosed to those not associated with operating the Carbon Utilization Prize.

Demonstration Events

The viability of the materials and biomass produced by the competing teams will be verified and demonstrated in very media oriented ways. Some potential demonstration events include:

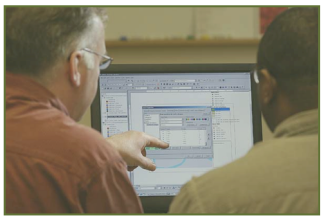
- **Race Car Competition**: Utilized CO_2 would be used to produce "green" vehicle fuel, qualifying under ASTM standards D975 or D4814, then raced in unmodified vehicles;
- **Jet Aircraft Race**: Utilized CO_2 would be used to produce "green" jet fuel, qualifying under the Jet A or JP-8 Bio-SPK fuel standards, then raced in unmodified commercial aircraft;
- **Agricultural Events**: CO_2 used in the form of biomass could produce high quality animal feed. After qualifying under applicable standards it could be fed to animals that would then be used in various events, including rodeos and celebrity cook-offs;
- **Industrial Events**: Utilized CO_2 would be used to produce high-quality plastics and/or other industrial materials, then subject to integrity tests through strongmen competitions or impact demonstrations.

Demonstration Example: *Race Car Competition*

A racecar competition could serve an important function: testing for the fuel qualities needed to compete in the marketplace against petroleum-based fuels. Those qualities include performance, efficiency, durability, emissions, cost and compatibility with today's engines and infrastructure.

The competition would also be designed for media appeal. Therefore, the organizers would possibly conform this event to demonstrate the needed media qualities. Partners, sponsors and scientific advisors would help

The criteria for winning would be straightforward: Prize competitors would provide standard, uniform, sponsor-provided, diesel powered cars with five days average fuel production (from the preceding 12 months), produced on the equivalent of one acre of land. These cars would then race at a notable, world-class raceway, such as Le Mans, Qatar, and Laguna Seca. The competitor that travels ***the greatest number of laps while averaging a speed faster than 100 miles per hour*** would win. The prestige of winning, enormous exposure, increased ability to attract capital, increased valuation



The "Prize Place" online community would facilitate matchmaking, problem solving, and financing among competitors.

Competition Facilitation

To strengthen the competitors and, in turn, the prize competition, the *Carbon Utilization Prize* envisions offering a portfolio of resources to competitors, and in turn to sponsors and investors. While prize sponsors and available resources will determine the final portfolio of resources to be offered, some envisioned examples include:

"Prize Place" Online Competitor Forum: One of the challenges associated with microbe production is that the sequential steps in the production value chain – from species selection through dewatering and oil extraction – means that various entities working in the community are distributed and dispersed. Thus, the only entities that would currently be positioned to compete are those that integrate the entire value chain.

The "Prize Place" Online Competitor Forum would help facilitate competition by providing a virtual, secure (i.e. password enabled) community

where competitors focused on one portion of the value chain can seek out and team with competitors working on other portions of the value chain. Furthermore, teams could exchange questions, thoughts, and experiences associated with the competition, either privately, via discussion boards, or chat rooms. The Forum would also provide a platform for venture capital involvement, by facilitating insight into competing entities and allowing these entities to virtually pitch venture capitalists.

Bi-annual workshops would bring competitors face-to-face with each other, as well as with prospective investors.

Competition Workshops: Building off of the "Prize Place" concept, bi-annual competition workshops would bring competitors, regulators, investors, sponsors, and others together to:

- Present updates on the competition;
- Discuss outcomes and remaining challenges;
- Pitch various needs (i.e. finance) and concepts;
- Facilitate public and private financing to worthy projects; and to
- Facilitate the emergence of thoughtful regulation that encourages developed technologies.




The Art and Science of Inducement Prizes

The 2004 Ansari X PRIZE was tremendously successful because it set an appropriate challenge, articulated a straightforward ruleset, and leveraged the media to capture the world's attention.

Selecting rules for an inducement prize is a balance between show business and science. The target must be:

- So challenging it attracts the best brains;
- So remarkable it attracts major publicity;
- So groundbreaking it jumpstarts a new industry.

At the same time, the target must be realistic and (just barely) achievable. If the bar is set too high, if a single prize attempts to solve all the world's problems, the competition will fail to attract competitors and media attention.

To succeed, the competition must capture the world's imagination. The ideal rules are "binary" — that is, spectators can easily make a yes/no decision whether the competitor has succeeded without a detailed laboratory analysis or lengthy deliberations. Ideally, no lawyers, consultants or scientists are required to judge who wins the prize.

Even though we must have rules that are simple and "media-friendly," we must use appropriate science. We must avoid cheating and negative side effects. Below are a few key "proxies" the *Carbon Utilization Prize* will use as substitutes for more complicated goals.

Rewarding production level. By requiring competitors to produce an aggregate quantity of carbon-based product, competitors are focused on developing a continuous rather than batch system of production, which will no doubt be essential, as competitors ramp up production after the competition has ended.

Energy inputs and efficiency. By focusing on net-CO_2 (i.e. the amount of carbon utilized after energy consumption is subtracted), competitors are given incentive to develop energy efficient means of utilizing carbon and race to outperform each other.

Rewarding resource efficiency. By requiring competitors to consume no more than a maximum amount of water per acre of land, competitors are encouraged to recycle inputs to the greatest extent.

"Prizes highlight and elevate superlative behaviors, ideas, and achievements in order to motivate, guide, and inspire others. Identifying excellence remains the cornerstone of many prizes—the essence of their power to produce change."

McKinsey & Co.
'And the winner is..."
March, 2009

Rules and Requirements

Eligibility: The competition is open to teams from any country, as long as they are incorporated as a company and agree to the terms of the prize in the Master Participation Agreement. Individual companies may form multiple competition teams with other competitors.

Proof of concept: Before they may enter either phase, competitors must demonstrate the ability to meet or exceed the requirements of the competition, including the ability to bear all the costs of competition and other obligations.

Entry fees and requirements: All competitors must sign and agree to a Master Participation Agreement, which specifies the timing, the rules, the entry

Verifiability: Competitors must agree to submit for auditing all data relevant to judging the prize competitions, including but not limited to production inputs (to determine total energy consumption), water sources, applicable products and permitting records, and water samples.

Minimum annual production: In order to remain in contention for each phase, competitors must submit a minimum amount of finished product in any given year.

VI. The Prize Team

The *Carbon Utilization Prize* implements Prize Capital's innovative mechanism to attract funding for competitors, harnesses the expertise of the X PRIZE Foundation, and provides a real-world hosting facility through Sunflower Integrated Bioenergy. This is a unique combination offering unprecedented opportunities to competitors, sponsors, and investors.

Since its founding in 2006, Prize Capital has been on a quest to identify and create investment methodologies that help lead to a sustainable world. That quest led to the use of prizes for innovation, and to the concept of Natural Capital – valuing healthy ecosystems, and the benefits they provide, as an asset.

Prize Capital's emphasis is on Venture Philanthropy – a methodology that envisions the sustainable financing of initiatives to achieve environmental and social goals, while generating profits and the eventual return of capital to investors.

Prize Capital's first investment methodology is its patent-pending venture finance mechanism, which leverages the power of inducement prize competitions.

Lee Stein (middle), Prize Capital's Chairman and Founder, meeting with state leaders in Sacramento, CA.

The Prize Capital venture finance mechanism presents "*a novel way for investors to get exposure to a broad spectrum of approaches in emerging technologies*" that can "*address exactly [the need for increased early stage investing in clean technologies] in a novel and powerful way.*"

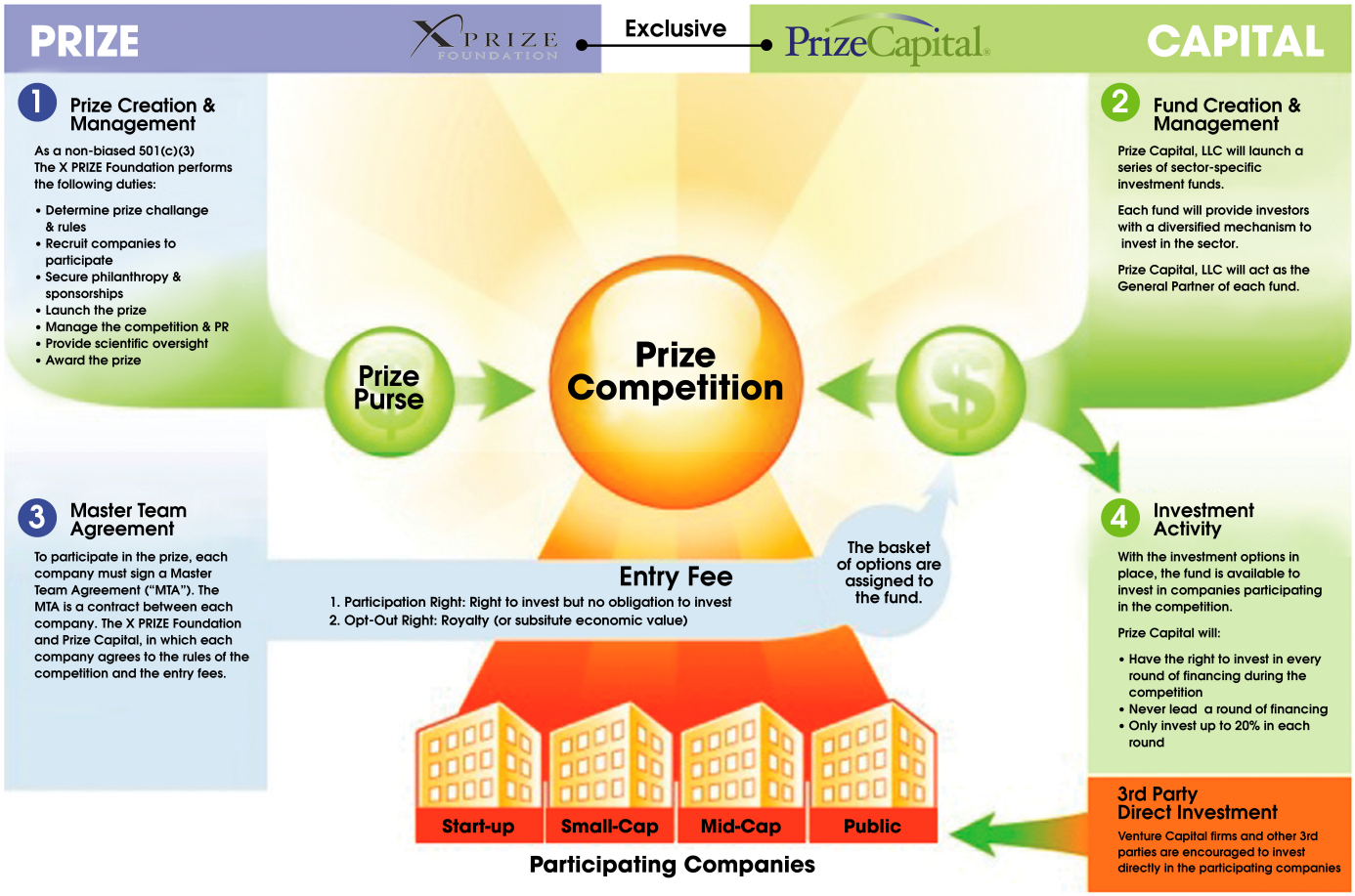
Josh Lerner,
Jacob H. Schiff Professor of Investment Banking,
Harvard Business School

Prize Capital's Venture Finance Mechanism

Approximately 30% of all prize competition winners originate from outside of the competition field, spurring out-of-the- box approaches to overcoming longstanding barriers. The Prize Capital venture finance mechanism establishes a new approach to venture investing that taps the power of prizes. This mechanism introduces a simple but powerful innovation: rather than a cash entry fee paid by the entrants, the entry fee takes the form of Prize Capital's fund having the right to co-invest in competitors' future rounds of financing. It will invest as a passive "tag-along" investor on identical terms as other co-investors.

Diversified investing, stronger competition. Prize Capital's investment approach allows it to invest in multiple dynamic problem solvers – direct competitors within a given sector – while creating value regardless of which team wins a given competition. The model possibly enables an investment in "every horse in the race" – each of which may be a winner in the marketplace after the prize competition is over.

The Prize Capital venture finance mechanism provides a platform for even the smallest of competitors to secure additional funding, more appropriately develop their technology, and compete more fiercely. The end result is a stronger overall prize competition.



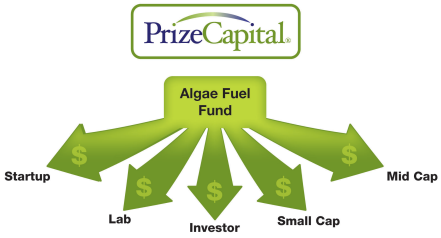
Avoiding conflicts of interest. A natural concern for prize entrants is that by investing in competitors, Prize Capital will face a conflict of interest, and that key intellectual property could be compromised. To address this concern, the following rules and protocols have been created in order to avoid any favoritism or even perceived favoritism:

- The rules of the competition are 100% transparent and are published on a website for public viewing.
- Prize Capital does not administer or judge the competitions.
- The competitions are managed by an independent and objective non-profit organization (e.g. The X PRIZE Foundation).
- Prize Capital and its investment fund are not exposed to competitors' IP details; it simply takes the option to be a passive "tag-along" investor on identical terms as other co-investors.
- Prize Capital and the non-profit managing the competition both follow strict policies to avoid a conflict of interest or even the per-

"Most researchers and small and medium-sized companies find it difficult to self-finance or raise external funding."

Thomas Kalil,
Author,
'Prizes for Technological Innovation'
The Brookings Institution

ceived conflict of interest. Prize Capital will serve as a passive investor, not serving as a director or playing an advisory role with any company. Prize Capital does not take a board seat or perform any management advisory services for any of the competitors and therefore has no mechanism to influence their actions.



Prize Capital's will help enable investments in multiple, direct competitors of various sizes, providing a resource for investors, competitors, and sponsors by helping to enable a stronger prize competition.

Competitors benefit. The availability of a possible co-investor will make it easier for competitors to raise money from venture investors, friends and family or corporate parents. In this fashion, Prize Capital will reduce one of the biggest limitations of the inducement prize mechanism. It will make it easier for competitors to raise money to tackle a complex problem.

The energy sector is woefully underinvested. Governments simply cannot afford to shoulder the burden alone. (Nor do governments have the full range of tools to bring new technologies to the market.) We must find ways to motivate the private sector to participate. The Prize Capital investment approach can eventually attract millions of dollars in new money and apply it to the grand challenge of the century—answering our energy needs while preserving the environment.

The *Carbon Utilization Prize* Team

In order to deliver on the potential for carbon-utilizing technologies, Prize Capital has assembled a team of unprecedented competence and experience:

- ***The X PRIZE Foundation***

The X PRIZE Foundation initially made its mark on the world by leading the resurgence in – and then perfecting – inducement prize competitions. This happened through the Ansari X PRIZE competition, a $10 million prize focused on catalyzing prize space travel that attracted 26 competing teams, who spent an aggregate $100 million chasing the prize, and spawned a $1.6 billion industry.

Today, the X PRIZE Foundation is offering and scoping prize competitions in four groups: Life Sciences; Exploration; Energy and the Environment; and Education and Global Development. It has since launched the Archon Genomics X PRIZE, the Google Lunar X PRIZE, and the Progressive Automotive X PRIZE.

During the *Carbon Utilization Prize* competition, it is envisioned that the X PRIZE Foundation will administer and enforce the prize rules, educate the press and the public on efforts to utilize carbon (as well as the importance of utilizing carbon), support and promote the competing participants, administer the ongoing operations, and judge the results through the creation of a world-class

"I think the [Ansari] X PRIZE should be viewed as the beginning of one giant leap…"

Dr. Buzz Aldrin, NASA Astronaut, Apollo 11

panel of judges and independent research institutions to award the prize purse.

- ***Sunflower Integrated Bioenergy***

  Sunflower Integrated Bioenergy (SIB) was formed by the Kansas Bioscience Authority (KBA), the National Institute for Strategic Technology Acquisition and Commercialization (NISTAC), and Sunflower Electric Power Corporation.

  SIB is dedicated to integrating advanced energy, carbon, and environmental solutions into utilities at scale. To that end, SIB has spent the past four years pursuing carbon, algae, and other renewable technologies suitable for deployment. SIB has expertise in technology commercialization, intellectual property management, and deep connections in the utility sector.

  SIB also has access to Sunflower Electric Power Corporation's 10,000 acres and 360-MW coal fired power plant in Holcomb Kansas. An algae pilot facility was tested at this facility and it is envisioned that this site will serve as a host for the *Carbon Utilization Prize*. Competitors will be allocated land, provided access to resources such as CO_2, water and heat, and offered a platform to show the world what they can do.

Sunflower Electric's 360-MW coal fired power plant in Holcomb Station, Kansas will serve as a host for the Carbon Utilization Prize competition, a place where competitors can aggregate and be provided with valuable resources.

VII. Sponsor, Compete, and Invest in the *Carbon Utilization Prize*

The *Carbon Utilization Prize* offers an unparalleled opportunity to be forever associated with a revolutionary, game-changing event. Accordingly, organizers are seeking exceptional, select candidates to sponsor the prize competition, compete to win it, and invest in the prize fund.

"Becoming title sponsors of X PRIZE was the best philanthropic investment we've ever made. It was a world changing accomplishment and a legacy that will last forever…"

Anousheh Ansari,
Title sponsor,
Ansari X PRIZE

Sponsor

Sponsorships will be accepted from both private and public sources. Opportunities include:

- ***Title and category sponsorships*** similar to major sporting events. The sponsorships will support prize operations and cash awards. (The cash purse is not paid out, however, until the prize is won.)
- ***In-kind sponsorships*** whereby a company becomes the official provider of things such as tools, equipment, travel, shipping, etc.
- ***Event sponsorships*** for the announcements, challenges, and press conferences.

Compete

In the Fall of 2009, Prize Capital issued a survey to nearly 140 different companies and organizations involved in some aspect of the algae production chain. Of the respondents, nearly 90% indicated that their technology was either "applicable" or "very applicable" to carbon utilization approaches associated with coal-fired power plants. Still, only 36% of respondents had a demonstration-level or better facility. Clearly, there's latent potential that is ready to tackle this challenge, if only given the resources and incentives to do so. *This is what the Carbon Utilization Prize is about!*

Invest

Approximately 30% of all prize competition winners originate from outside of the competition field, spurring out-of-the-box approaches to overcoming longstanding barriers, and are thus potentially ideal candidates for investment. *Prize Capital's patent-pending venture finance mechanism is precisely the vehicle to facilitate this investment.*

With your help, we can attract imagination, ability and money to the challenge of carbon utilization. We welcome your support and participation.

For More Information, Contact:

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PrizeCapital®