



IDEA's *in Production* - MANUFACTURING INITIATIVE PANAMA CITY, FLORIDA & VICINITY

IDEA Investment Group, LLC (IDEA) is an international engineering and development organization with a 40-professionals Project Management Team (PMT) with very broad technological and business background experiences. IDEA intends to incorporate operations for our manufacturing initiative in Panama City as IDEA's *in Production* for reasons that become clear in this limited description of our proposed products. Many of our professional Member/Employees are military veterans with strong associations in the Panama City, Fort Walton Beach and Eglin Air Force Base area. The PMT has proposed projects and manufacturing/employment programs for countries around the world with similar economic development objectives to Panama City for hosting these types of programs. We have interacted with over 150 venture capitalists, many entrepreneurial product and project developers and numerous major university research departments. These experiences have emphasized to us that manufacturing operations must have high production rates over a sustainable long period of time to be viable. Otherwise the business concept or startup is destined to failure as it struggles without venture capital or soon finds itself on the road to early bankruptcy. The IDEA's *in Production* approach assures success for brilliant IDEA's that just don't make good venture-capital application sense otherwise.

Our due diligence indicates that prospective technical employees and logistical access of Panama City sites will facilitate success as our center for integrated manufacturing operations. A large number of service workers (golf course, restaurants, food service, marinas and hotels) or persons dependent upon remote travel-type jobs are generally under-employed and may find rewarding and higher-compensation positions with IDEA's *in Production*. Many former and retired military personnel living in the area or hoping to get back to the area will welcome a long-term position in a strong company in high-technology product development and production. Other professionals have vacationed in the resorts and attractions of the Florida Panhandle beaches and look and seek a good reason to return to the area not dreaming of an opportunity to work here on a permanent basis

Location-wise the Gulf Coast Inter-Coastal Waterway, the Apalachicola River, the Tombigbee Waterway the Pensacola and Atlantic Railroad (P&A), the Apalachicola and Northern Rail Spur (AN) to Port St. Joe, the local international airport and I-10 provide excellent logistical interface with America and the world. The I-10 corridor from Pensacola to Port St. Joe has ample idled property mostly owned by St. Joe Paper Company. There is an industrial park looking for our type of operations around the NW Beaches Airport and our proposed expansion to services there will provide major economic development. That land is also mostly owned by St. Joe Paper and is available for substantial maintenance and logistical systems development. Another Industrial park at East Mossy Head off I-10 just east of Eglin AFB has room for expansion. In summary, much industrial space is available and some in Industrial parks have good access to deep water with rail and infrastructure virtually ready to go for manufacturing.

IDEA's *in Production's* proposed high-technology products and systems for local manufacture, assembly, fabrication and modularization are mostly environmentally oriented for waste-energy recovery, energy efficiency and greenhouse gas reduction. They are especially

beneficial for use and installation in numerous developing countries with bad energy balance where an IDEA's *in Production* affiliate and the PMT have performed feasibility studies for energy conservation and economic development in concert with major infrastructure projects. There are many opportunities for expansion and utilization of industrial fabrication yards in Bay County and other counties of the Florida Gulf Coast.

Many of the products and systems will be integrated into a commercial-operations Demonstration Village for prospective client observations and operational assessment before purchase and before installation in their particular locality/country. The Demonstration Village will provide an end product application of the several systems to be manufactured, fabricated, marketed and transported world-wide. Below are brief descriptions of the systems. Most of the modular/system components incorporate high technology or concept-protected products under various patents and licensing agreements. Our Members have close relationships with the license and patent holders and the company has conducted acquisition or merger discussions with all parties. Some businesses will be acquired and some will just be merged into the IDEA's *in Production* Manufacturing Initiative. Some products will be manufactured, fabricated, and marketed while while IDEA's *in Production* pays a patent holder royalty. In any event in the following pages the largest programs envisioned for the IDEA's *in Production* Manufacturing Initiative are described. Others are listed at the end. Detailed business plans are available for each area of manufacture.

Key to success of IDEA's *in Production* is the efficient integration for manufacturing of cyclic or low demand products and systems that just don't meet a stand-alone manufacturing plant criteria. Operations for high-volume, high-quality services for payroll, human resources, insurance and engineering services are outsourced. For examples: (1) IDEA's *in Production* has arranged for a contract with INSPERITY SOLUTIONS as our Personnel Employment Organization to fully integrate human relations, payroll and benefits for all manufacturing elements under a common salary base. (2) Willis Insurance, as the largest insurance agency in the USA, is providing and will continue to provide consultation assistance for our immediate insurance needs and risk assessment for all manufacturing and our affiliate installations of our products. (3) IDEA's *in Production* intends to contract WorleyParsons engineers as our engineering services contractor for early site development work and for meeting our design, program controls, procurement, quality control, and logistics operations until such time as IDEA's *in Production* staff is sufficient to handle these functions internally.

Management, professional engineering, technologists' services, machine-tool operations, assembly, welding, pipe fitting, etc. are highly cross product integrated for fabrication/manufacturing/assembly operations and will be managed and assigned from central operations control. All design services, procurement, quality control, logistics operations, program scheduling, cost control, sales, accounting and employee training and certification will transition to central corporate operations over time. New product resourcing will be assigned to a "Marketing Team" that meets with venture capitalists and university research directors to line up IDEA's that just don't make the financial cut for a sole-use assembly line. This approach provides a strong employment base during normal business cycles and further assures that all specialty employees find professional job growth opportunity and satisfaction over the long term.

The following are system end-product descriptions from our various manufacturing or product business plans that comprise the manufacturing plant products for our Panama City IDEA's *in Production* operations:

CONVERSION OF MUNICIPAL SOLID WASTE TO BIOFUELS

The IDEA's *in Production* MSW (municipal solid waste) and biomass conversion process uses thermal chemical methods to convert MSW and biomass feedstock into liquid biofuels (butanol). The first commercial demonstration scale plant will be assembled in the commercial operations demonstration center at a cost of \$160 million. The plant will convert 800 Tons per Day (TPD) of MSW to syncoal then gasify the syncoal to produce 25 million gallons per year (mmgpy) of bio-butanol. Initially, 300 manufacturing and 600 construction jobs will be created for fabricating the modular components of the plant and on-site construction. When operating 24/7 the plant will employ 100 full time skilled technical workers. Immediately following will be an international roll-out of full-capacity plants, designed to convert 3,200 TPD of MSW into 100 mmgpy of bio-butanol for a total all-in operational cost of \$535.4 million, each to be externally funded. The IDEA's *in Production* Manufacturing Initiative will continuously employ over 300 crafts trade employees in the fabrication, transport and installation support of these facilities.

Globally the world population generates 1,483 million tons of MSW annually and MSW landfills are the single largest contributor to greenhouse gases generating 21% of all such gases, or 50% more than is generated by all fossil fuel combustion. The IDEA low temperature mechanical pyrolysis (LTMP) process has the potential to reduce the landfill contribution of greenhouse gases from 21% to 1% of all such gases. Domestically, the US generates 250 million tons of MSW annually the majority of which is transported and buried in landfills. Worldwide MSW generation will double to 2,900 million tons annually by 2023.

The LTMP Pyrolysis Process has proven to be the most efficient approach for converting MSW into useful forms of energy. LTMP Pyrolysis reduces MSW to landfill to 15% by volume thereby extending the useful life of landfills by a factor of 7X to 10X. LTMP Pyrolysis does not form dioxins, as do other pyrolysis methods for waste conversion processes.

HIGH EFFICIENCY AND LOW WIND-SPEED ADVANCED WIND ENERGY SYSTEMS (AWES)

The market for utility-scale wind turbines is now one of the fastest growing industrial sectors in the entire U.S. For most of the country wind energy is the only practical form of renewable energy. Most states have or are planning to adopt Renewable Portfolio Standards (RPS) legislation requiring the regulated electric utility companies to have a certain percentage of their entire base load generating capacity met by renewable energy. At approximately \$4 million cost per turbine, there is now an immediate US market currently running at near \$50 billion per year. There is a \$2.5 billion per year manufacturing market available to IDEA's *in Production* Manufacturing Initiative with just a 5% penetration of market share. Over 20,000 employees are involved in wind power generator manufacturing so it is reasonable to project over 1,000 employees in this aspect of our business especially when our international market outreach is considered.

IDEA's *in Production* will exclusively license the patents and turbine design and fabrication technology from Advanced Wind Energy Systems LLC (AWES) of Toms River, New Jersey, and

continue with full development of the all-composite blade next-generation wind turbine demonstrated in recent demonstration installations in New Jersey. The product to be manufactured is a 2 MW land-based wind turbine that demonstrates efficiencies at 40% better than any current-generation turbine design, while at the same time being much more reliable and low-cost compared to current systems.

A unique feature of the AWES turbine design is the ability to store energy in each turbine tower base using a patented hydraulic drive train and energy storage system. This gives wind farm developers and utilities that use the AWES turbine technology the ability to manage wind power output over time and make wind energy a reliable base load power supply rather than an intermittent one.

REFUGEE AND SURVIVAL SHELTER SYSTEMS

Shelter Technologies, Inc. has designed and patented polyethylene and polyurethane temporary 14'x14' shelters from 7'x7' foot sheets with locking doors and windows. The shelters are idea for use by displaced persons in civil strife or storm refugee situations and can be used as permanent low cost housing situations in both tropical and arctic locations. The units are easy to assemble and can be set up in only an hour or so by two or more untrained personnel. The units are already in high demand from red cross and red crescent. Modular bath, services and utility modules are designed and can be fabricated and shipped along with the palletized 7'x7' foot shelter panels.

HIGH DENSITY POWER GENERATION SYSTEMS FOR MILITARY CONTRACT

Candent Technologies has completed development and demonstration of three high-technology power generation systems that have been favorably reviewed by Pentagon procurement teams and await production capability before purchase. The "power team" from Candent will provide a high synergy cast of professionals for our continuing development in other manufacturing areas of development. The three systems that await production capacity are:

- Navy waste heat energy recovery system for the ship service generators on the DDG-51 class destroyers (Navy funding is committed when production gets off the ground).
- USMC 250kw high power density gas turbine generator for a non-lethally directed energy weapon system. Turbine generator for this system is highly scalable and has many military and commercial applications.
- 5kW auxiliary power unit (APU) for the USMC's amphibious combat vehicle. The first engine has already sold to that program. Candent manufactures the installed small heavy fuel (piston) engine for that system.

OIL AND GAS PRODUCTION AND ENVIRONMENTAL SYSTEMS

IDEA's *in Production* is involved with our affiliate company IDEA Oil & Gas for the responsible and cost-effective development of oil leases throughout the USA. In field development we have proven that modular processing facilities can be installed for less than 70% of the cost of those that are field assembled and constructed. Some of the reduced methane emission process facilities that we will provide to our affiliate and offer for sale to other operators in the industry include:

- WELLHEAD MODULES FOR HANDLING NATURAL GAS
- SMALL SCALE NATURAL GAS LIQUIFACTION PLANTS

- **FIELD GAS PROCESSING PLANTS**

IDEA's *in Production* will endeavor to contract modularization for these units and other general project systems for the petroleum industry. Modularization is limited to very few locations on the Gulf Coast and with the management, engineering, craft trades and logistical resources of IDEA's *in Production*'s Panama City facilities; we can easily become a leader in this cyclic, yet very profitable, business opportunity.

TRI-GENERATOR SYSTEMS (POWER, HEATING, COOLING) MODULARIZATION

Industrial sites that use small reciprocating engines or gas turbines to generate their own electrical power typically piece-meal heat recovery, water and space heating and hot and chilled water service systems. A properly engineered system can automate and operate more efficiently with a much better level of maintenance requirements and if shop modularized can save substantial costs of installation.

A sister system to the above conventional Tri-Gen uses a patented CO₂ absorption and evaporation process (Registered as Tertia³ Systems) to install at locations where the engine/turbine waste heat sources are not available. Tertia³ Systems are an innovatively engineered product/process that enhances living and work spaces with heating, cooling, and hot water production and dramatically reduced utility costs, power usage and greenhouse-gas emissions. This Tertia³ Systems meets the needs of homeowners, business property owners, civic properties, disaster relief projects, and military locations (fixed and mobile).

IDEA's *in Production* proposes to design and package these systems as a product line for our fabrication facilities. Properly timed for down-cycles in other business, the real costs of this modularization are minimized.

INDUSTRIAL WATER AND WASTE WATER PROCESSING SYSTEMS

IDEA's *in Production* will assemble systems and modularize, test and install systems for treatment of stubborn organic and hazardous waste streams at client industrial sites. These systems will be defined by site waste and energy efficiency surveys that suggest the installation of IDEA's *in Production* equipment and systems or affiliate services are in order.

IDEA's *in Production* uses two proprietary processes to facilitate waste stream cleanup beyond the typical waste water processes and these will typically be used to systemize and modularize for our industrial clients:

Advanced Fluidized Composting Technology uses separate bioreactors to increase process efficiency of a typical waste processing system. In the first reactor (acetogenesis) hydrolytic and acetogenic bacteria convert dispersed and dissolved organics into aldehydes, alcohols, acids and carbon dioxide. In the second reactor (methanogenesis) methanogenic bacteria convert the acetogenesis products into methane gas; sulfur compounds convert to hydrogen sulfide gas; and heavy metals reduce to insoluble sulfides. Acetogenesis is optimized with a pH range of 4 to 6 in the first reactor and methanogenesis is optimized at a pH range of 7 to 8 in the second reactor. When both steps occur in a single vessel at a single pH, the anaerobic reactor operates at a depressed level of process efficiency. By isolating each of these biological processes into separate phases, process efficiency of the entire system allows for a reduction in size of the components.

AFC is a unique, proprietary patented process for treating organic wastes and sludges. AFC converts organics to carbon dioxide and water and virtually eliminates residuals production and disposal issues. AFC combines thermophilic biological treatment and chemical treatment (oxidation or hydrolysis).

A diffusion driven process for desalinating seawater at low temperatures is described by James F. Klausner, Mohamed Y. Darwish and Renwei Mei of the University of Florida. The main advantage of the diffusion driven desalination (DDD) process is that low thermodynamic availability waste heat may be used to drive the process. When low pressure condensing steam from a 100 MW power plant supplies the heat to drive the DDD process, a fresh water production rate of 20 million gallons per day is feasible. This process therefore has the potential for wide application in solar power generation plants to provide much improved thermal efficiency. IDEA's *in Production* will develop modular DDD systems for installation in all regions that have water shortage and where our associated joint venture partners install gas-turbine power or solar power plants.

REGIONAL/INTERNATIONAL/CHARTER & SCHEDULED AIRLINE HEADQUARTERED AT NORTHWEST BEACHES INTERNATIONAL AIRPORT

IDEA's *in Production*. has formed a partnership with Skystar Airlines, previously a charter airline with limited client base. The airline will use Boeing 767's and form a newly licensed/certified commercial and charter service, headquartered at Northwest Beaches International. Maintenance under IDEA will eventually migrate from Cecil Field to facilities at Northwest Beaches International. The new scheduled/chartered airline has been designated as the National Airline of Barbados because of recent agreements and concessions from the government there with full service to Europe, South & Latin America and the World. Service to Asia will be granted by a recent agreement with and funding from a Korean Charter service and a Chinese charter service out of Hainan where Skystar will provide operations, training and maintenance management and services. Skystar will continue to cater to the Catholic Blue Army touring service with 20 million members that a predecessor charter service catered to in the 1990's when there were only 5 million members. That service kept three Boeing 707's fully loaded 365 days per year. The airline will be the only dually licensed and certified commercial U.S. scheduled and chartered service that can fly anywhere in the world.

KEY WRAPUP POINTS

The concept for integrated product manufacturing provides a conduit for many products of high value to mankind to find a route to market where otherwise they die on the shelf. The management of such a concept company must have a wide base of technical experience as well as an exceptional understanding of product design and assembly, manufacturing and industrial engineering as well as major project management. Many or most of the products designated for production here and likely by others who propose here do not have high-volume and constant-level, long-term demand. The dynamic IDEA's *in Production* Manufacturing Initiative is an exceptional business model that can maintain a solid base-load of production. For the preeminent beach resort area of Panama City this model can sustain over 4,000 full-time, long-term and highly-qualified employees without later risk of sudden layoffs.

IDEA's *in Production* has an ongoing relationship with WorleyParsons for project Engineering Services via our affiliate's oil and gas development program. Those services will be provided on an as-required, time and materials basis during the Manufacturing Initiative startup for rapid implementation. WorleyParsons' environmental and permitting resources will supplement our own PMT resources to properly man and talent the Initiative through kickoff.

Other exceptional manufactured products are under assessment for inclusion in IDEA's *in Production's* Manufacturing Initiative. A preliminary listing follows:

- **NEW TECHNOLOGY HIGH-EFFICIENCY SOLAR POWER SYSTEMS PATENTED BY GE BUT LICENSED TO MANUFACTURERS WORLD-WIDE.**
- **COMMERCIAL BUILDING ROOF-TOP WIND POWER GENERATORS**
- **BUILD AND RETROFIT CAR HAULERS AND TRAILERS TO ADD UNIT CAPACITY AND RELIEVE CURRENT AND PROJECTED CAPACITY SHORTAGES.**
- **PROVIDE PROPANE/BUTANE INJECTION SYSTEMS/EQUIPMENT FOR DIESEL ENGINE TRUCKING INDUSTRY TO IMPROVE FUEL BURN EFFICIENCY AND REDUCE FUEL COSTS.**

IDEA's *in Production*

**FABRICATION YARD
MANUFACTURING BUILDING**

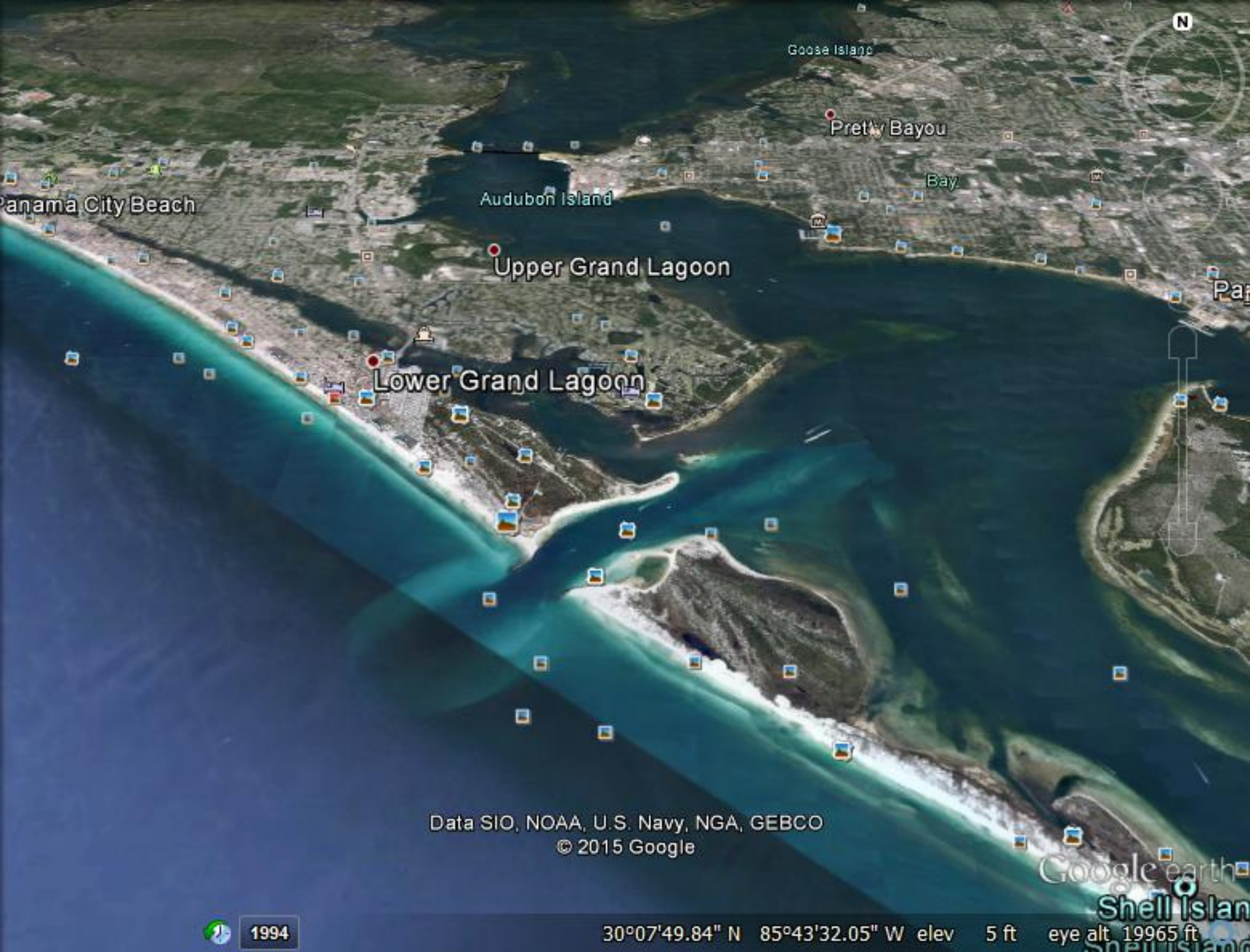
**INITIAL EMPLOYMENT 200
LOCAL PERMANENT EMPLOYMENT 50
PRODUCTION PERSONNEL ALLOCATED TO PRODUCTS/SYSTEMS**

MAJOR FABRICATION AND MANUFACTURING FACILITIES PANAMA CITY

The IDEA's *in Production* fabrication and manufacturing concept addressed in the forward pages of this Business Plan will exploit the founding-member focus and high motivation into the synergism of multiple smaller to intermediate sized business operations in a cooperative and efficient manner. All sub-businesses will share design, procurement, manufacturing, fabrication, sales, logistics and installation manpower and expertise. The objective, of course, is to stabilize employment and share technical and management expertise/experience under a single economic umbrella. In the case of IDEA's *in Production* we will co-op to well over 4,000 permanent local employees within four years and, conservatively maintain an international employment of at least that number in operating facilities that will use the systems manufactured and fabricated in the fabrication yards and manufacturing structures, both existing and new, of Panama City. The following pages of this business plan illustrate some of those facilities now in existence or envisioned for our operations.

Commonality of work-place structure and conditions for fire, health, environmental, materials handling and structural safety will be foremost in our consideration for work day environment. Integrated with safety priority, are consistent employee benefits and pay scale/professional assessments -- all managed by a central HR group. Production performance measurement will be fair and consistent as measured by our Program Controls Systems and Central Accounting Office. All economic impact business decisions will be financially modeled on a common model basis and will be the driver for assignment of capital, management focus and termination and expansion of product lines. All operations will be under quality control by Total Quality Management subscribed to by all employees for President-of-Division to clean-up crews. Employee training programs will be composed, coordinated and implemented so any employee, so motivated, can advance in the many cross-training positions and job assignments as they may wish to participate.

Best-in-Business industrial engineering practices, cost-effective materials control, efficient work schedules, smooth-flow product line management and timely equipment turn-around will be possible and employed for all the product lines. Starting with the existing facilities available in the Panama City area, IDEA's *in Production* will quickly grow into the largest employer in the area and among the most satisfying companies to work for in the USA. It is projected by assessment of the initial businesses addressed by our integrated business plan, we will add not less than 1,000 employees per year and by the end of year four will have 4,000 local employees and 4,000 international product-system employees while creating up to 65,000 indirect employment positions.



Panama City Beach

Audubon Island

Goose Island

Pretty Bayou

Bay

Upper Grand Lagoon

Lower Grand Lagoon

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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Google earth

Shell Island



1994

30°07'49.84" N 85°43'32.05" W elev 5 ft eye alt 19965 ft



Bay County Land Co

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Google earth



1994

30°10'36.98" N 85°43'46.87" W elev 43 ft eye alt 1697 ft



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1994

30°10'34.67" N 85°43'43.63" W elev 15 ft eye alt 175 ft

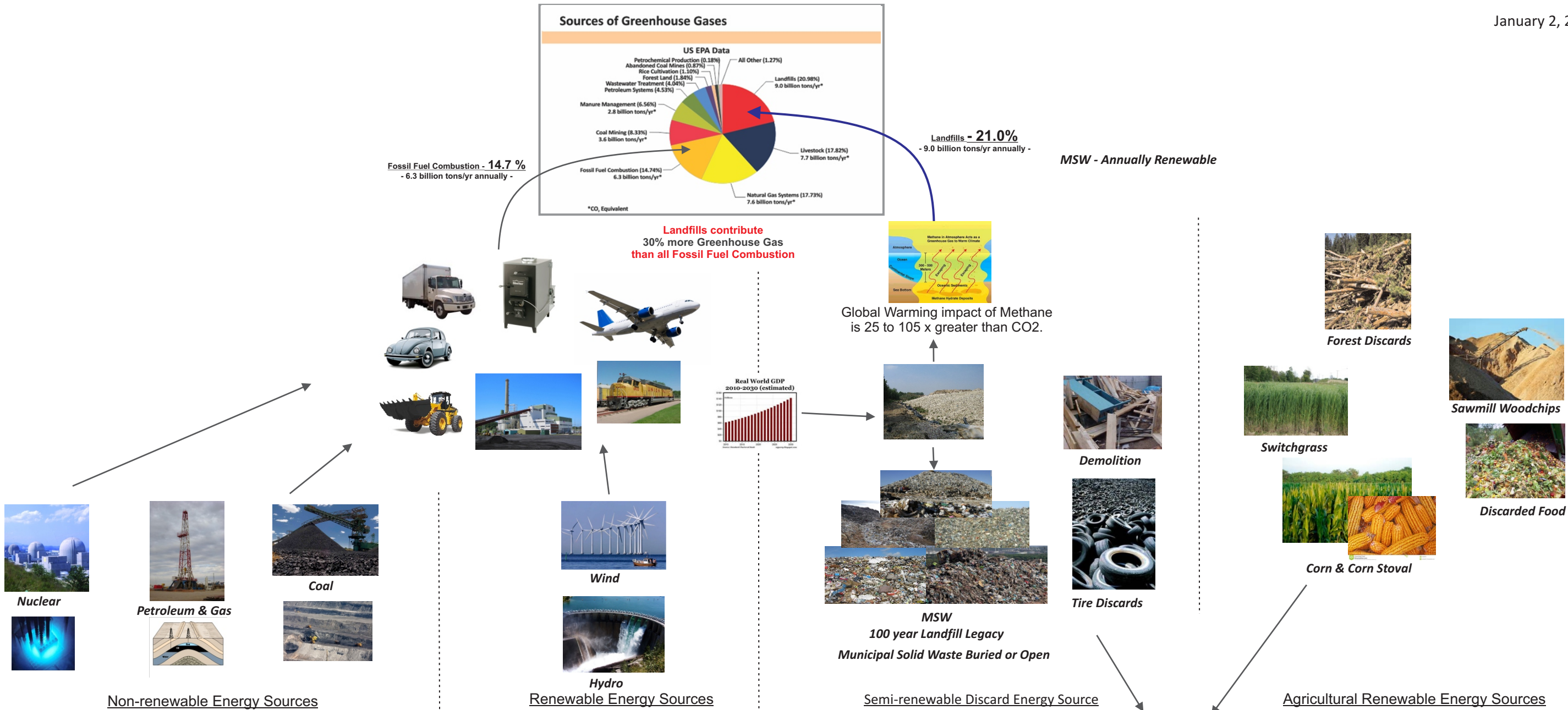




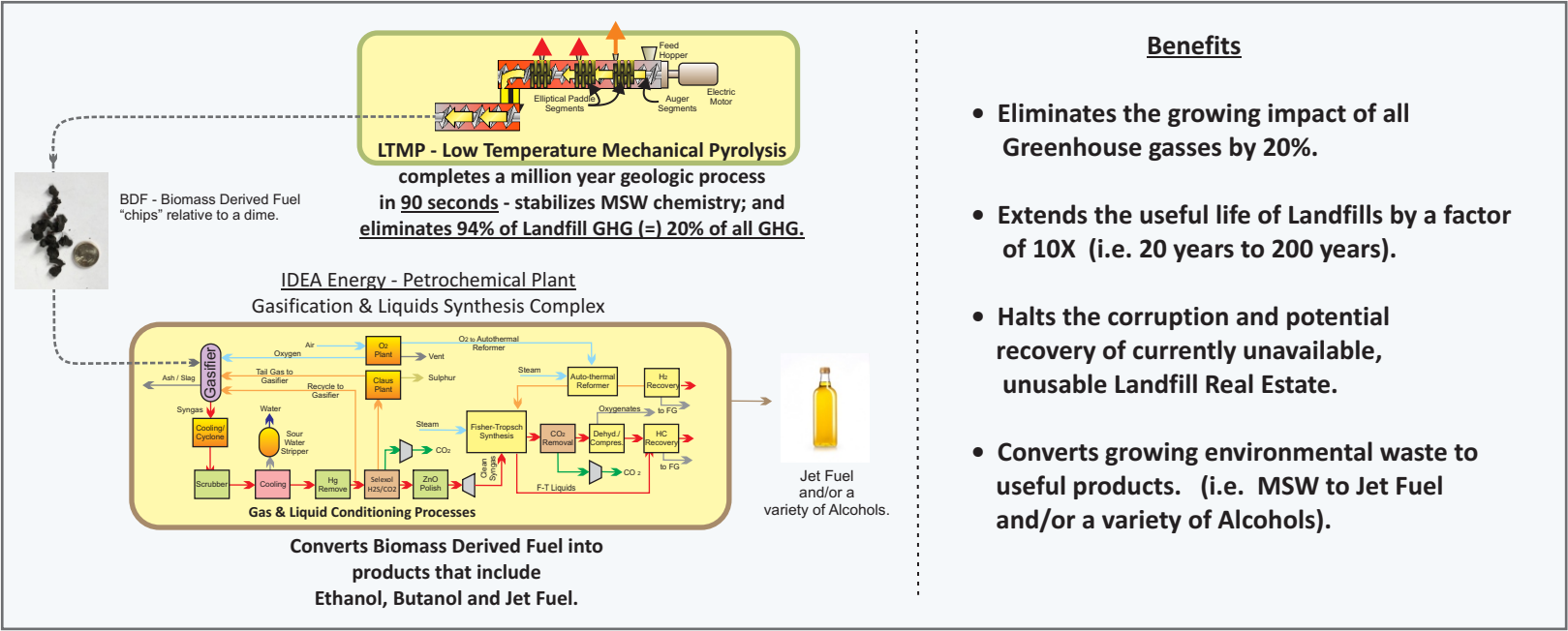
IDEA's *in Production*

**CONVERSION OF MUNICIPAL SOLID WASTE
TO LIQUID BIOFUELS**

**INITIAL EMPLOYMENT 600
LOCAL PERMANENT EMPLOYMENT 120
NATIONAL PERMANENT EMPLOYMENT 1,200**



Government World Leaders
Focus on reducing CO₂ Greenhouse Gas



IDEA's *in Production*

Municipal Solid Waste & Biomass Conversion to Biofuels Program Systems Manufacturing



***Hurricane & Flood
Debris***



Municipal Landfills

DECEMBER 1, 2015

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This is an application for federal guarantee.*

Municipal Solid Waste & Biomass Conversion to Biofuels Program EXECUTIVE SUMMARY

The **IDEA Biofuels, LLC (IDEA)** MSW and biomass conversion-to-biofuels process uses thermal chemical methods to reliably and efficiently convert municipal solid waste feedstock to liquid biofuels and selected biochemical feedstock. An IDEA front-end pyrolysis system for conversion of refuse derived feedstock (RDF) into synthetic coal is being installed by an affiliated third party in East Chicago, Illinois. IDEA's initial commercial demonstration plant is envisioned to be installed in a demonstration village in Panama City, Florida as part of the Gulf Coast Restoration program and the first three 100-million-gallon-per-year full capacity plants are planned for the Detroit/Toledo auto industry manufacturing region. The demonstration plant in Panama City will optimize process efficiencies and modular constructability providing the modular design basis to roll out not less than ten fuel-grade liquids projects to metropolitan areas throughout the US with high interest indicated internationally. The initial funds undertaking for \$2.6 billion will build the 25-million-gallon-per-year demonstration facility and allow IDEA to move forward at low risk on three-operational-capacity, 100-million-gallon-per-year plants in the Detroit/Toledo area. The national roll-out at all major metro-complexes will follow.

The **IDEA** technology for biomass conversion can:

- **Reliably convert municipal solid waste and biomass crops into biofuels,**
- **Reduce the negative environmental consequences of waste management,**
- **Reduce operating costs to waste management service companies,**
- **Improve opportunities for investment in use of waste recycling materials,**
- **Provide opportunities for local employment,**
- **Revolutionize biofuels production as a motor fuels oxygenate resource,**
- **Reduce greenhouse emissions and provide carbon credits,**
- **Reduce emissions from landfills that are the single greatest annual contributor of greenhouse gases (21%) in the US, and**
- **Increase the projected useful life of landfills by a factor of 10.**

The projects will use the proprietary IDEA conversion processes, with patented components, configured into modular units designed by WorleyParsons Engineering of Houston and Chicago, a firm preeminent in gasification and in modular petrochemical process facilities. Process details are set forth in Appendix A of the Business Plan. The fabrication program provides plug-in units that are mass produced within the Detroit and Toledo auto industry area of influence. The modular units are fabricated at an estimated 30% reduced costs and are to be assembled for ease of installation and removal for major overhaul turnarounds. An operating engineering staff trained by **IDEA** and WorleyParsons will operate the plants.

The capital cost for the 25 million gallon per year biofuels/biochemical demonstration facility is approximately \$165 million and for each 100 million gallon per year biofuels/biochemical production facility is \$512 million except when distributed MSW processing front-end plants are used and the total cost goes up to \$544 million. Off-sites add another \$167 million. The demonstration facility can be constructed and made operational within two years and then the other three projects will follow as scheduled to be fully operational at the end of year five. EBITDA earnings from the facilities, enhanced by tipping fees and waste materials recovery but excluding subsidies, are projected to provide a return on asset in excess of 20% per annum at the current \$40 per barrel oil prices.

The first key step in the process is **IDEA's** mechanical pyrolysis reactor that is the only known proven technology for preparation of MSW as feedstock for reliable gasification without inherent process and environmental issues. This distributed pyrolysis system provides a convenient and cost effective method

to gather biomass, consolidate it and deliver it to a central processing facility where it can be used with existing established petrochemical/ biochemical technologies for conversion to many high-value products. The thermal-chemical process, developed by **IDEA**, produces a range of selected biofuels (and/or hydrogen) from MSW or other biomass feedstock. Product slates can be adjusted to reflect current market values.

Summarizing, the IDEA Low Temperature Mechanical Pyrolysis Low Temperature Mechanical Pyrolysis (LTMP) is a very sensible approach to converting Municipal Solid Waste into coal with an exceptionally high BTU content that can be used, stored or converted into liquid transportation biofuels. LTMP is a one million years of geological process completed in 90 seconds. MSW residuals that must be sent to a landfill are non-organic, reduce landfill volume by 85%; extend the projected life of the landfill by a factor of 10 (the expected life of a landfill of 20 years is extended to 200 years). Fully-employed, Landfill Greenhouse gases, which represent 21% of all greenhouse gases, are almost eliminated (reduced by 94%).

The proposed roll-out plan allows **IDEA** to “leap-frog” competing offerings by commencing modularized construction for a remote site before completing permitting and move to on-site installation immediately upon permitting. Permitting or political delays on one site will simply direct prepared equipment to parallel permitted sites. Production is accelerated, maximizing tax credits, and realizing materially enhanced operating and profit margins. Our program, implemented by a major engineering, procurement and construction (EPC) firm, can avoid the non-commercial delays that plague competitors.

IDEA’s Management Team is highly qualified to direct the project business development and operations. The project management team of 25 professionals will direct the facilities design at WorleyParsons in Chicago. WorleyParsons will also assist in recruiting and training plant operating personnel. The IDEA Group management team key managers are:

Larry G. Cox, P.E., CEO and Project Director. Forty-nine years in major project development and management, environmental engineering, design engineering, and operations in senior engineering and management positions with Parsons Corporation, Exxon Company, U.S.A. and the United States Navy. Mr. Cox had eleven years with Exxon and fifteen years with Parsons where he managed all aspects of oil and gas production, refining and transportation; major project management; and advanced technologies program direction including hazardous waste management, space shuttle solid rocket motor development, advanced space test and launcher programs, and chemical weapons manufacturing and destruction programs. He graduated with a B.S. degree from the United States Naval Academy. He completed both the United States Navy Nuclear Power and Submarine Schools. Mr. Cox also attended and directed the Exxon Company, U.S.A. project, production and gas process training programs.

Fred L. Jones, PhD, President. Forty years in refinery, power and gasification cycle design, performance, and economic evaluations. Mr. Jones has one U.S. patent and one international (Provisional) patent pending for application of equipment used in the IDEA Pyrolysis Unit. He served on the development team for the Great Plains Coal Gasification Project, a \$2.1 billion synthetic fuels plant converting lignite coal to natural gas. Mr. Jones has a B.S. in Chemical Engineering, and a Ph.D. in Fuel Science, with minors in Chemical Engineering and Applied Mathematics. His research topic was “Combustion Characteristics of an Opposed Jet Diffusion Flame.”

Douglas A. Wierman, P.G., Vice President Operations. Thirty-two years in environmental consulting and management including 20 years with three international environmental consultancies. He is a member of the unconventional shale gas play group and has performed numerous water resources studies and due diligence activities in various shale gas plays. He managed his firm’s relationship with a strategic partner affiliate of IDEA in the development and permitting of waste heat/energy to power projects in the carbon

black and calcined carbon industries. His accomplishments include the negotiation of favorable agreements with the U.S. EPA Acid Rain Program to expand the number of carbon industry power projects that could be included as “Qualified Facilities”. In his prior assignment with RMT, Mr. Wierman negotiated the acquisition of Jones and Neuse, Inc., the largest privately held environmental consulting company in Texas. For Warzyn, Inc., he managed the national environmental assessment, audit, and compliance business unit. He has a B.S. degree from the University of Wisconsin – Madison and an M.S. degree from the University of Wisconsin – Milwaukee.

Gordon L. Strobeck, Vice President Business Development. Thirty years in energy and finance senior management. Gordon created added financial value to organizations through application of financial and commercial skills in, M&A, Corporate Finance, Equity Research, and senior-level management functions. He served as Planning Manager, Exploration & Production Department at British Gas, London; Head of Oil & Gas Team - Capital Markets Group at Alfa Bank, Moscow; Interim Finance Director at Premier Oil, Jakarta; and Managing Director, Mergers & Acquisitions, Oil & Gas at CIBC World Markets, London; He received degrees as MBA-Finance/Energy Finance, Denver University; MA-Accounting and Finance, London School of Economics; BS- Petroleum Engineering, Colorado School of Mines.

The use of a world class major EPC firm assures concurrent multiple plant construction capacity from facility design; modular fabrication, assembly, testing and delivery; sites preparation; startup. **IDEA** will standardize the design and centralize the fabrication of process units to the extent possible to leverage related economies of scale, under established methods and procedures employed on behalf of global integrated energy companies.

IDEA has a competitive advantage in this market because of five key factors:

- **Our deeply experienced management team with the capability to step-out to new technology advancements.**
- **Our ability to immediately formulate and execute project plans by using major engineering, procurement and construction resources with unique close direction from our project management team.**
- **Our intention to vertically integrate from feedstock supply through products distribution with our IDEA Oil & Gas Company affiliate that will be one of the major oil companies in the United States within four years.**
- **Our ownership of the most efficient organic/cellulosic materials conversion technology in existence that produces biofuels/bio-chemicals at less than the cost of other biomass conversion methods and at approximately one-third the cost of fermentation process methods.**
- **The following certification of our process technology by Michigan Economic Development Corporation (MEDC), Technical Review Committee, as the best of 17 offerings they had assessed (see the following letter from MEDC).**

The Market for Renewable Fuels Systems is established by the US EPA Renewable Fuel Standards program driven initially by conservation but now directed toward controls on carbon emissions. The following page addresses those standards as they relate to cellulosic biofuels production. The standard for 2016 is double that for 2015 and is likely to continue to increase if Global Climate Change remains a political issue.

US EPA RENEWABLE FUEL STANDARDS PROGRAM

Last updated on December 1, 2015

The [final requirements](#) will boost renewable fuel production and provide for robust, achievable growth of the biofuels industry. The final rule considered the many public comments EPA received on the proposal, and incorporates updated information and data. EPA is finalizing 2014 and 2015 standards at levels that reflect the actual amount of domestic biofuel used in those years, and standards for 2016 (and 2017 for biodiesel) that represent significant growth over historical levels.

Final Renewable Fuel Volumes

	2014	2015	2016	2017
Cellulosic biofuel (million gallons)	33	123	230	n/a
Biomass-based diesel (billion gallons)	1.63	1.73	1.90	2.00
Advanced biofuel (billion gallons)	2.67	2.88	3.61	n/a
Renewable fuel (billion gallons)	16.28	16.93	18.11	n/a

(Units for all volumes are ethanol-equivalent, except for biomass-based diesel volumes which are expressed as physical gallons.)

Final Percentage Standards

	2014	2015	2016
Cellulosic biofuel	0.019%	0.069%	0.128%
Biomass-based diesel	1.41%	1.49%	1.59%
Advanced biofuel	1.51%	1.62%	2.01%
Renewable fuel	9.19%	9.52%	10.10%

The final 2016 standard for advanced biofuel is nearly 1 billion gallons, or 35 percent, higher than the actual 2014 volumes, while the total renewable standard requires growth from 2014 to 2016 of over 1.8 billion gallons of biofuel, or 11% higher than 2014 actual volumes. Biodiesel standards grow steadily over the next several years, increasing every year to reach 2 billion gallons by 2017.



MICHIGAN ECONOMIC DEVELOPMENT CORPORATION

300 N. WASHINGTON SQ.
LANSING, MI 48913

CUSTOMER
ASSISTANCE CENTER
517 373 9808

WWW.THEMEDC.ORG

April 21, 2009

Larry G. Cox, P.E.
President - IDEA Energy Company, LLC
CEO - IDEA Biofuels, LLC
150 North Michigan Ave., Suite 2800
Chicago, Illinois 60601

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Oakland County

PETER S. WALTERS
Guardian Industries Corp.

TODD A. WYETT
Versa Development, LLC

Dear Mr. Cox:

Thank you for giving us the opportunity to work with IDEA Energy Company on a new facility in Marshall. The Michigan Economic Development Corporation (MEDC) would be pleased to partner with Marshall to work closely with your company to provide applicable job creation incentives to secure your investment in Michigan.

As you know, the MEDC New Markets technical panel conducted a review of the technologies and processes to be used in the Idea Energy waste to energy project. This review included a discussion of the actual process, its technical merit (including equipment design, and energy and material balances) and economic viability. While the MEDC does not, as a rule, release specific numbers and details of technical evaluations, we can give an overview of our evaluation.

Idea Energy's process converts waste via pyrolysis into syncoal which is then gasified to produce synthesis gas to be used as a feedstock for the production of ethanol. After evaluation of the technologies used in each step the panel concluded that they are valid and based on the calculations and analyses provided by the company, the process appears to be economically viable. Overall, this company and proposed project received a positive review from the MEDC New Markets technical panel.

For IDEA Energy Company's initial consideration, a summary follows of the incentives that may be available in Michigan. The MEDC will work to tailor the final incentive package to meet your company's specific needs.

Michigan Economic Growth Authority (MEGA) Employment Tax Credit: For projects creating large numbers of jobs or high-technology businesses, the MEDC can provide a revenue stream to the company to offset some of its annual operating expenses. This program requires all wages at this new facility being more than 1.5 times the federal minimum wage and the creation of 50 new jobs. This rebate cannot exceed the net investment that your company makes in this facility for building, equipment, training, and relocation costs.

Property Tax Abatements: Local property taxes on new investments in plants, machinery, and equipment can be reduced by local units of government by up to one-half for up to 12 years.



Mr. Larry Cox
April 21, 2009
Page Two

Workforce Development: Michigan offers a coordinated job training system using federal, state, and local resources to provide a highly trained and productive workforce. There are funding sources available to help pay for customized training and retraining programs for companies hiring new workers and for upgrading the skills of existing workers.

Recruitment: Recruitment, screening, and testing services are available for existing, as well as new employers expanding in Michigan through local programs.

In summary, the State of Michigan and the City of Marshall have the resources to custom-design a site location and incentive package to best meet the requirements of your company. Please call me at (517) 335-3145 or launsteinp@michigan.org with any questions you may have. I look forward to working with you on this project.

Sincerely,

A handwritten signature in black ink that reads "Penny Launstein".

Penny Launstein
Manager, Sales Support

cc: Mike Hindenach

MSW & Biomass Conversion to Biofuels Business Plan

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IDEA's *in Production*

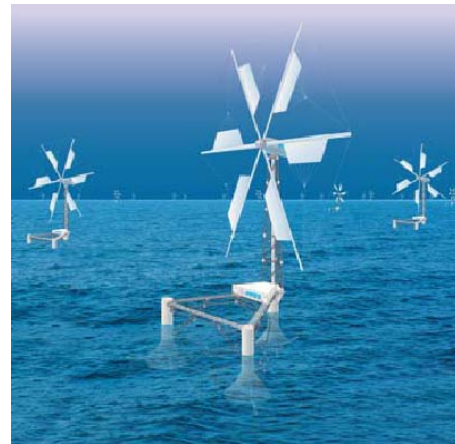
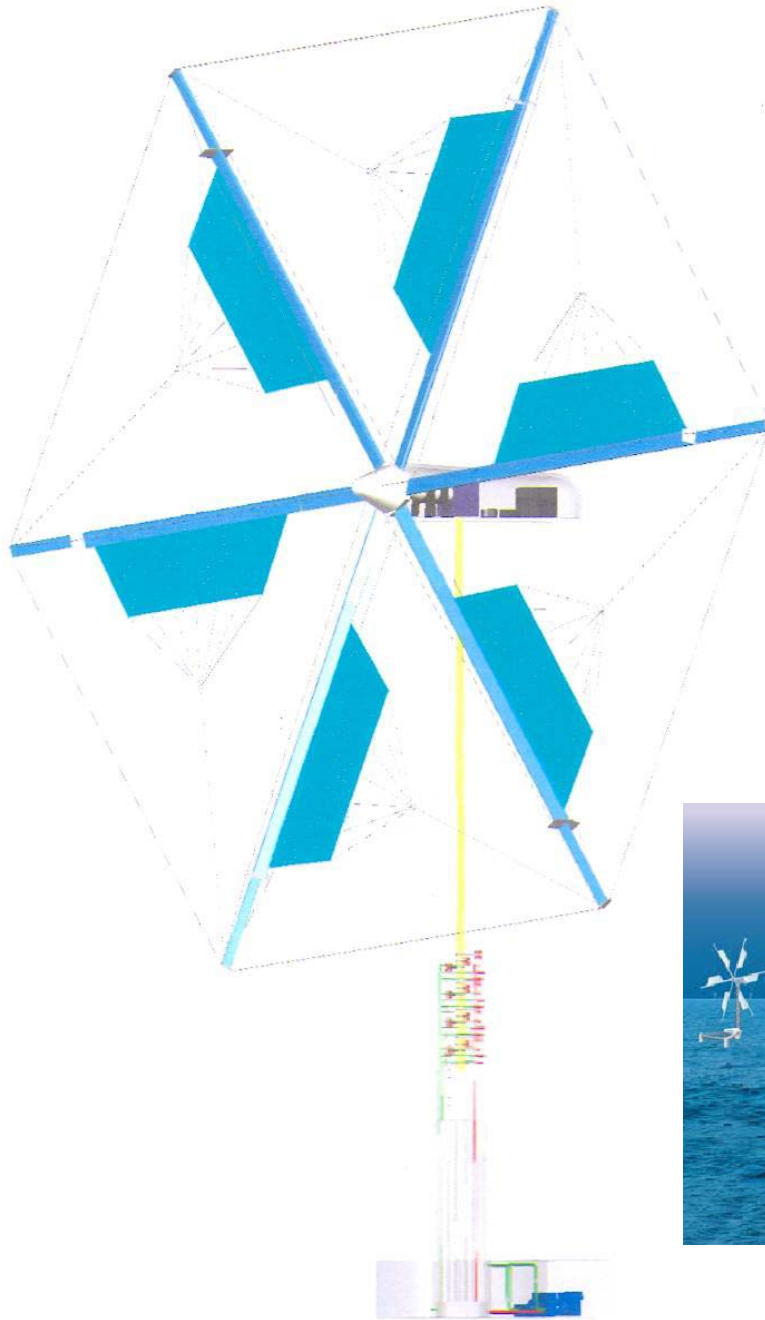
**HIGH EFFICIENCY & LOW SPEED
ADVANCED WIND ENERGY SYSTEMS**

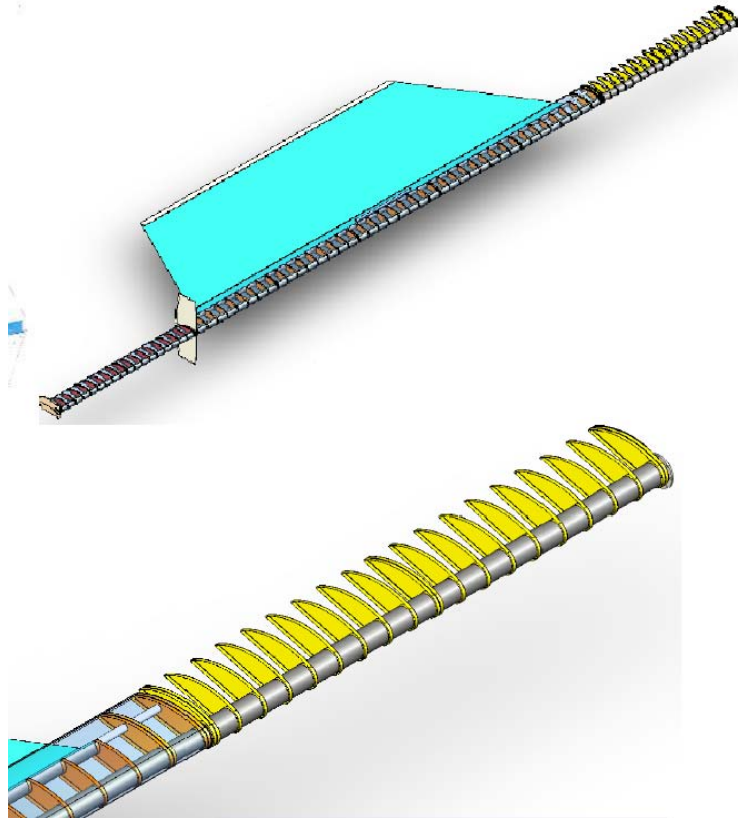
**INITIAL EMPLOYMENT 200
LOCAL PERMANENT EMPLOYMENT 40
NATIONAL PERMANENT EMPLOYMENT 2,000**

IDEA's *in Production*

Advanced Wind Energy System

December 1, 2015





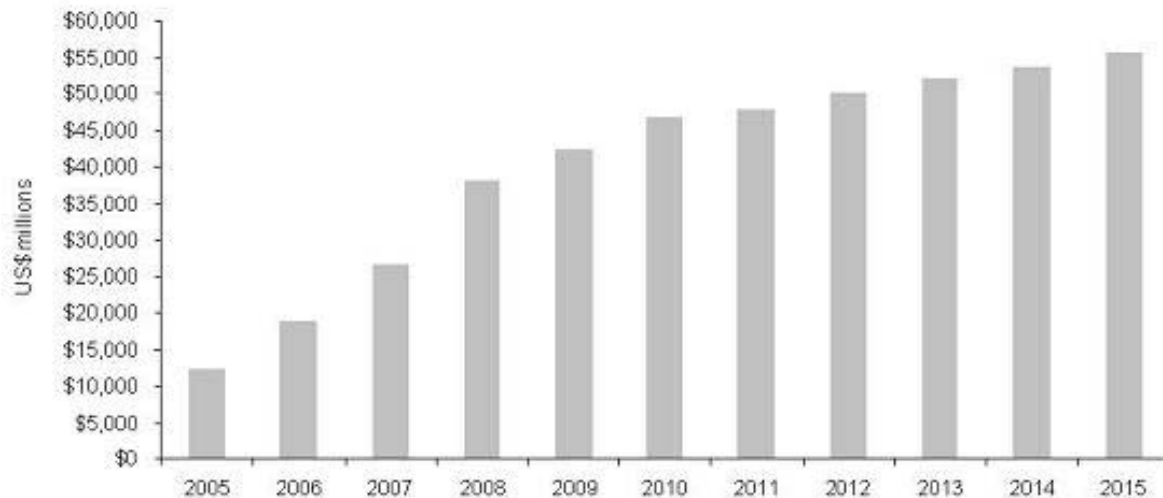
EXECUTIVE SUMMARY

The market for utility-scale wind turbines is now one of the fastest growing industrial sectors in the entire U.S. For most of the country wind energy is the only practical form of renewable energy. Most states have or are planning to adopt Renewable Portfolio Standards (RPS) legislation requiring the regulated electric utility companies to have a certain percentage of their entire base load generating capacity met by renewable energy. In Michigan the RPS legislation that passed in November of 2008 requires the 40 regulated electric utility companies in the state to have 10% of their total capacity provided by renewable sources by 2009. This RPS percentage requirement works out to about 3,000 mW of generating capacity, which means a mandated demand for over 1,500 new utility-scale wind turbines to be installed over the next four years. At approximately \$4 million cost per turbine, if that RPS were to hold, there is a local market in Michigan worth over \$6 billion. Wisconsin has already passed similar legislation, and Ohio is now considering an even higher RPS requirement of 12.5%.

Several recent national market studies concur that the total annual sales of utility-scale wind turbine equipment will grow to \$60 billion per year within five years. The estimated total market for turbines over the next 20 years to reach the national goal of 20% of total US electric supply met by renewable energy is \$450 billion. Developing the

domestic manufacturing and assembly capacity to service this growing market is now a major priority, and many states are offering substantial financial incentives for the creation of “green manufacturing” jobs that domestic OEM turbine manufacturing creates. Table 1 shows the U.S. market growth in wind turbine equipment sales over the past ten years.

Table 1: Wind Turbine Sales



On a national basis, the US EPA Renewable Portfolio Standards set the goals for all forms of Renewable Energy and actions by the states establish a very strong market for the domestic wind turbine business. The following summarizes:

States often have multiple RPS goals, such as benefitting the environment, developing local economies, hedging fossil fuel price risks, and advancing specific technologies (NREL 2007). Depending on their goals, states may have broader “clean energy standards,” requirements that encompass more than just renewable energy. Some requirements, such as those in Pennsylvania and Ohio, are called alternative energy portfolio standards. They may have a separate tier or target for non-renewable technologies that the state wants to support, but sometimes renewable and non-renewables (e.g., fuels cells and combined heat and power [CHP]) qualify within the same tier.

IDEA Wind LLC (SWL) is a new business venture under direction of IDEA Energy Company, LLC. The new business entity will exclusively license the patents and turbine design and fabrication technology from Advanced Wind Energy Systems LLC (AWES) of Tom’s River, New Jersey, and begin full development of an all-composite blade next-generation wind turbine. The initial product to be manufactured is a 2 mW land-based wind turbine that is at a minimum 40% more efficient than any current-generation turbine design, while at the same time being much more reliable and low-cost compared to current systems.

A unique feature of the AWES turbine design is the ability to store energy in each turbine tower base using a patented hydraulic drive train and energy storage system. This gives wind farm developers and utilities that utilize the AWES turbine technology

the ability to manage wind power output over time and make wind energy a reliable base load power supply rather than an intermittent one.

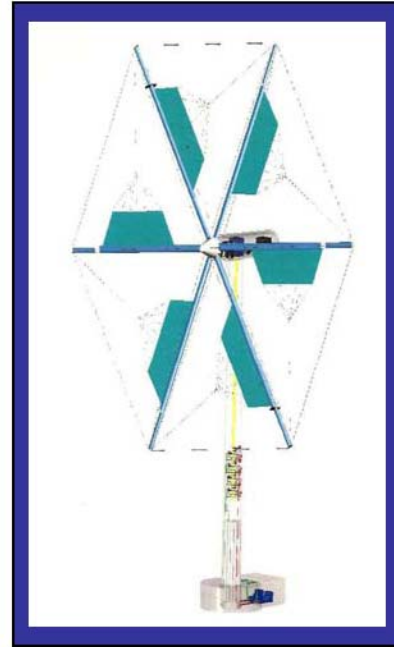


Figure 1: Conventional Wind Turbine

Advanced Wind Energy Systems (AWES)

Figure 1 above compares a current-generation conventional wind turbine design with the AWES turbine. The six-blade rotor features an all-composite segmental blade construction and a rigid cable-stay bracing system for the blade tips similar to those found on the masts of racing yachts. The cable-stay tip-supported blades do not deflect in high winds and therefore are capable of generating power in much higher winds when conventional turbines have to shut down for safety reasons. Another feature adopted from racing yacht technology is the computer-controlled sail-furler mechanism in the center section of each blade. This allows the turbine to operate effectively in light winds where conventional turbines are barely turning and generating almost no power. Since the majority of the land-based wind energy resources in Michigan and most other states in the U.S. are Class 3 or 4, the higher power output in lighter wind conditions makes the AWES turbine much more cost effective and profitable to the owners. The six-blade design also gathers more wind energy per rotation, providing a slower equivalent RPM that is quieter and more environmentally friendly to birds and bats.

Advanced Wind Energy Systems, Inc. has completed a 1/10th scale model of the AWES turbine and conducted wind tunnel and field tests to validate these design features. To complete the validation process and bring the product to market, Advanced Wind Energy Systems, Inc. will license the right to manufacture the 2 MW land-based AWES turbine to SWL in exchange for funding the development and construction of the full scale prototype. The cost to construct and test the prototype is \$14.2 million. Final design, engineering tooling fabrication and component testing will

take ten to twelve months from full funding. Construction and integration of the full-scale prototype will take three months which leaves three to six months for field testing. Upon successful completion of the initial field test, SWL will finalize all of the actions to begin manufacturing eight (8) AWES per month beginning in the sixth month of year two. An additional investment of \$12 million is required to finance the plant and equipment tooling and assembly jigs and provide working capital for the manufacturing start up phase.

The end result of this public-private partnership investment is the creation of a new OEM wind turbine manufacturing business utilizing the most advanced design and technology on the market with a planned manufacturing capacity of 300 units per year and a growth plan for securing a dominant share of the emerging offshore wind turbine market in the next three years, both domestically and internationally. There is sufficient demand in Michigan and the other Midwestern states for new utility-scale wind turbines to fully utilize this production capacity for the next ten years or more, without factoring in additional demand-generating factors such as future offshore wind power development. Because the State of Michigan has made the development of this potentially significant new market a priority, SWL seeks to fill this demand.

A major benefit of the AWES turbine design with its rigid cable-stay rotor is that the system scales up effectively from the 2 mW land-based turbine size to the larger 5 or 6 mW size needed to effectively tap into the massive wind-energy resources of the Great Lakes. The Great Lakes Offshore Wind Council (GLOW Council) report released on September 1, 2009 calls for the creation of tens of thousands of megawatts of offshore wind power. Currently the technology for effective 5 mW and larger turbines is in the prototype stage. By creating an AWES turbine manufacturing business here in Michigan, initially with the 2 mW land-based turbines, the State and IDEA Wind, using the licensed AWES technology, will be positioned to gain the dominant market share of the thousands of new large turbines that will be installed offshore in all of the Great Lakes in the next ten years.

IDEA Wind LLC has teamed with ATK Tactical Missiles & Propulsion Group (www.atk.com) as its Tier 1 supplier for the advanced composite components of the blades and driveshaft for the AWES turbine. In addition, ATK will be designing and fabricating the tooling, assembly jigs, fixtures and molds needed to produce the AWES wind turbines in high volume. The design capacity for the Muskegon, Michigan manufacturing plant is 300 turbines per year in both 2 mW and the later 5 or 6 mW size. The existing ATK composite parts manufacturing capacity is very high and will be able to supply the Michigan AWES turbine manufacturing facility with all of the components needed for the advanced manufacturing operation.

L3 Communications Combat Systems Division (www.l-3com.com) in Muskegon, Michigan is teaming with SWL for the supply of new advanced permanent magnet generator units for the AWES turbines. These generators will be optimized for the AWES drive train and are expected to be more than 95% efficient, while also being inherently reliable and low-maintenance due to the brushless design. L3 will develop

and manufacture these generator units at a new facility being built at their existing military drive train plant site.

The Panama City Demonstration Village provides an excellent location to install a demonstration wind turbine. An ideal fabrication site at the existing fabrication yard near Audubon Island provides 52 acres, zoned for heavy industry and is served by rail. The IDEA's in Production manufacturing facilities will have the capacity to begin producing and assembling the component parts for a 5 MW offshore AWES turbine. A manufacturing plant near the assembly yard will house the equipment and tooling required to produce the 2 MW land-based AWES turbines. The manufacturing operation is expected to start with about 50 employees and grow to 300 employees on two shifts as production volume increases.

A major offshore wind turbine market is described by the article attached as Exhibit A to this Executive Summary.

A Ten-Year Cash Flow Proforma is presented in Table 2. This forecast includes only eight (8) 2 MW AWES land-based turbines per month beginning in the last quarter of the second year.

Table 2: IDEA Wind, LLC - Ten Year Pro Forma

Year of Operations	1	2	3	4	5	6	7	8	9	10	totals
Revenues											
AWES wind turbines											
2 MW land based (units)		25	100	100	100	200	200	250	300	300	1,575
sales (millions)	0	65	260	260	260	520	520	650	780	780	\$4,095
Royalty fees (millions)		4	16	16	16	32	32	40	48	48	\$252
Revenues (millions)	0	\$75	\$276	\$276	\$276	\$552	\$552	\$690	\$828	\$828	\$4,347
Cost of Goods Sold											
Prototype Development	\$12										
Plant, Equipment & Employee Training		\$12									
AWES wind turbines											
2 MW land based (units)		25	100	100	100	200	200	250	300	300	
production cost	0	50	180	180	180	360	360	450	540	540	\$2,840
Total Cost of Goods Sold (millions)	0	62	180	180	180	360	360	450	540	540	\$2,864
Gross Margin (millions)	0	13	96	96	96	192	192	240	288	288	\$1,501
SG&A (millions)	\$2.2	\$3	\$16	\$16	\$16	\$31	\$31	\$39	\$47	\$47	\$248
as % of revenue	NA	4%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%	
EBITDA	(\$14.2)	\$10	\$80	\$80	\$80	\$161	\$161	\$201	\$241	\$241	
Cumulative Pretax Net Income (loss)	(\$14.2)	(\$4.2)	\$75.8	\$155.8	\$235.8	\$396.8	\$557.8	\$758.8	\$999.8	\$1,242	

Notes:

1. All figures in constant 2009 dollars;
2. Sales revenue is from 2 mW land-based turbine sales only, additional revenue from larger offshore turbine sales starting in Year 4 or 5 is not included;
3. Royalty payments on AWES licensing is based on one additional licensed manufacturer producing an equal number of turbines to SWL;
 - a. 20% of AWES total corporate royalty revenue is distributed to SWL;
 - b. AWES corporate will provide continued engineering support and new product development for licensees;
4. Warranty service contract revenue and expenses are not included, and for analysis purposes this is assumed to be a break

EXHIBIT A

Huge Offshore Potential Seen

Bill Opalka | Sep 20, 2010



There could be four times as much energy potential off the coasts of the United States as there was generating capacity from all sources in 2008.

That's one way to get attention.

Of course, not nearly that much will ever be developed, but it's on measure of how much energy is waiting to be tapped along the coastlines of the United States.

A recent study published by the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) assesses the electricity generating potential of offshore wind resources in the United States.

According to the *"Assessment of Offshore Wind Energy Resources for the United States,"* 4,150 gigawatts of potential wind turbine nameplate capacity (maximum turbine capacity) from offshore wind resources are available.

This report summarizes the offshore wind resource potential, based on map estimates, for the contiguous United States and Hawaii, as of May 2009. According to the U.S. Energy Information Administration (EIA), in 2008 the [nation's total electric generating capacity](#) from all sources was 1,010 gigawatts. Another study pointed to the potential of [20 percent wind penetration by 2030](#).

"Offshore wind energy development promises to be a significant domestic renewable energy source, especially for coastal energy loads with limited access to interstate grid transmission," the study said.

The study did not consider that many areas would be eliminated for wind development due to environmental or technical reasons.

Offshore wind has held fascination for renewable energy advocates for years, due in part to the difficulties land-based developments routinely face. Available land and transmission access are two of the most common obstacles for adequate wind development, particularly in the Northeast.

"Many coastal areas in the United States have large electricity demand but have limited access to a high-quality land-based wind resource, and these areas are typically limited in their access to interstate grid transmission," the report said. "Offshore wind resources have the potential to be a significant domestic renewable energy source for coastal electricity loads."

The NREL report includes detailed resource maps and tables for 26 coastal states' (ocean and Great Lakes) offshore wind resources break down the wind energy potential by wind speed, water depth, and distance from shore.

The primary method used to present the offshore wind resource data are maps that categorize the resource by annual average wind speed at 90 meters above the surface. The resource maps extend from the shoreline out to 50 nautical miles offshore.

NREL said the development of a database for the resource is an important step in the process to develop for the development of the resource in the future.

In the future, the database may be expanded to include other important characteristics such as wave power density, extreme wind and wave, ocean currents, and a number of other parameters important to the design of offshore wind turbines.

In the meantime, feasibility and costs studies will continue as real-world applications for projects make their way through the regulatory processes.

The editorial staff at RenewablesBiz.com is passionate about exchanging ideas and dedicated to promoting ongoing conversation about renewables and sustainable energy issues. We invite you to join and contribute to our online community. If you have an idea for an article or editorial contribution, please contact me via email, bopalka@energycentral.com, or phone, 860.633.0090.

IDEA's *in Production*

**CANDENT TECHNOLOGIES
HIGH DENSITY POWER SYSTEMS**

**INITIAL EMPLOYMENT 20
LOCAL PERMANENT EMPLOYMENT 400
NATIONAL PERMANENT EMPLOYMENT 500**



EXECUTIVE SUMMARY

***Submission to the
FLORIDA GULF COAST RESTORATION PROJECT
In Partnership with IDEA'S In PRODUCTION
for Matching Funds***

Advanced Technology Power Systems And Amphibious Vehicles

20 December 2015

COMPANY CONFIDENTIAL

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Candent Technologies, Inc.
6107 W. Airport Blvd, Suite 190
Greenfield, Indiana 46140
Tel. 317-336-4478
Cell 317-442-0624
Email: hmunevar@candent-



Executive Summary

CANDENT TECHNOLOGIES' submission to the FLORIDA GULF COAST RESTORATION PROJECT In partnership with IDEA'S In PRODUCTION

1. Introduction

Candent Technologies, in partnership with IDEA'S IN PRODUCTION, is pleased to submit this Executive Summary for its Advanced Technology Power Systems and Amphibious Vehicles to the FLORIDA GULFCOAST RESTORATION PROJECT, for the purpose of seeking matching funds in order to launch Candent Technologies' high value projects in the Panama City Area, at the Industrial Park located at the NW Beaches International Airport. Upon selection of IDEA'S IN PRODUCTION for funding by the RESTORATION PROJECT, Candent Technologies will establish in Panama City corresponding engineering, research, development, and production programs for its proposed current advanced technology programs, which are currently ongoing development under contracts to the US Navy and Marine Corps, or ongoing as several commercial projects of related and derivative products not only for military use but also for commercial and civilian markets.

2. About the Company

Candent Technologies, Inc. is an innovative, lean, young, technology company, established in May, 2001, and currently based in Greenfield, Indiana. The company is staffed by a team of highly experienced members, all with the skill sets necessary to expertly perform the multidisciplinary functions required for the success of the business, which is focused on the development of technology for environmentally friendly, small, advanced propulsion and power systems, including Hybrid Electric Drive Marine Power and Propulsion systems, and including gas turbines and small heavy fuel engines, as well as waste heat energy recovery systems and amphibious vehicles.

3. Key Personnel

Candent Technologies has a well experienced and rounded pool of human resources from which it draws its strength and capabilities. The background of its president and CEO, Mr. Hernando Munevar, shown below, along with some of other key personnel background information provides a sample of the expertise available to the company.

Hernando Munevar

President & CEO, Candent Technologies, Inc.

Hernando Munevar is a founding member of Candent Technologies, Inc. He has over 40 years of extensive experience in the Aerospace and Defense Industry, including engineering, business, operations, logistics, sales and marketing, as well as a broad background and expertise in turbine engines, propulsion systems, and aircraft operations and maintenance. After a successful career with the U.S. Air Force, Mr. Munevar started his career in early 1987 with the then General Motors Allison Gas Turbine Division, now Rolls-Royce Corporation, from which he retired to dedicate his full attention to developing Candent Technologies.



Executive Summary

CANDENT TECHNOLOGIES' submission to the FLORIDA GULF COAST RESTORATION PROJECT In partnership with IDEA'S In PRODUCTION

In his last position at Rolls-Royce he was Director of Value Engineering and New Product Introduction, responsible for implementing world class management practices in the Supply Chain areas, Lean Manufacturing and Value Engineering, and leading Integrated Product Teams in developing supply chains to launch new programs into production. Previously was Engineering Director of Master Scheduling, responsible for the allocation and management of engineering resources at the Indianapolis site. He also served as Director of Research & Technology, where he developed and coordinated strategies for the business units across the global enterprise and managed the R&T programs at Indianapolis. Previously he held various positions as Program Manager and Chief Engineer for turboprop and turboshaft gas turbine engine programs. Prior to this assignment, he served as Director of Research & Technology, where he developed and coordinated strategies for the business units across the global enterprise, and managed the R&T program at Indianapolis. In other earlier assignments he held various positions as Program Manager and Chief Engineer for turboprop and turboshaft engines in fixed and rotary wing aircraft programs.

Mr. Munevar's last USAF assignment was at Wright-Patterson AFB, with the Aeronautical Systems Divisions (ASD), Deputy for Propulsion, where he served as Chief of the Joint Service and Special Operations Division. In this position he was responsible for Air Force management of various Joint Service engine programs for the V-22, C-130, P-3, E-2, C-2, HH-60 aircraft, and Air Force One, as well as numerous other USAF aircraft engine programs. In this position he was responsible for and managed in excess of \$500 million in government contracts. In other Air Force assignments, Mr. Munevar served at the Air Force Academy as Assistant Professor of Aeronautics, in which capacity he taught courses in aerodynamics, thermodynamics, heat transfer, and propulsion. In addition to his teaching duties, he also served as operations manager of the Aeronautics Laboratory, where RDT&E was conducted for NASA, DARPA, DNA, USAF, and other Government agencies. Mr. Munevar also has extensive experience in aircraft propulsion system integration, performance, simulation, and mission analysis for airlift, fighter, and training aircraft. His background in aircraft operations and maintenance include assignments in fighter, training and RDT&E aircraft squadrons.

Mr. Munevar holds BS and MS degrees in Aerospace Engineering from the University of Colorado, as well as an MA degree in Industrial Management from Central Michigan University.



Executive Summary
CANDENT TECHNOLOGIES' submission to the
FLORIDA GULF COAST RESTORATION PROJECT
In partnership with IDEA'S In PRODUCTION

Emanuel (Manny) Papandreas

Vice President, Engineering

Candent Technologies

Indianapolis, IN

2001- Present

Vice President of Engineering, responsible for the design, construction, development, and testing of a new generation of low cost, high performance small turbine engines for power generation, marine, aviation, and unmanned aircraft applications.

Rolls-Royce, Inc. (Allison Gas Turbine)

Indianapolis, IN

1988-2001

Manager, Advanced Applications, Military and Helicopter Engines. Responsible for strategic product definition for US based Rolls-Royce military and helicopter engines. Responsibilities included customer engineering/marketing interface and propulsion system requirements definition, management of preliminary design activities for new and derivative products.

Project Manager, J104-AD-100 expendable turbojet engine. This advanced low cost turbojet was designed for missiles and remotely piloted vehicles. Efforts included managing entire program from initial bid and proposal through product definition, and the design and development of the engine.

Teledyne CAE,

Toledo, Ohio 1978-1988

Engine Manager, Advanced Product Development Team, 1986-1988

Responsible for design, analysis and development of two unmanned engines. Responsible for air vehicle integration, including interface control documents, engine specification, and qualification planning and engine performance modeling.

Design Project Engineer, Advanced Turbine Engine Gas Generator (ATEGG), USAF

Engine Program, 1985-1986 : Supervised design, analysis and testing of core engine that included a high performance multistage mixed flow compression system and a cooled high temperature, high speed turbine.

Structural Analysis Engineer, Turbine Engines, 1978-1985

Structural analysis and failure analysis of engine components for man-rated and non-man-rated systems, non-destructive testing process development, and development of life prediction systems.

Pratt & Whitney Aircraft, Florida Research and Development Center 1975-1978

Structural analysis on hot and cold section components. Responsible for structural analysis of turbines and fans including ingestion and bird strike considerations. Analysis of F100 fan stages for structural integrity, LCF, and life assessment of field damaged hardware.

EDUCATION

Bachelors Degree, University of Florida, 1971, Mechanical Engineering

Masters Degree, University of Florida, 1973, Mechanical Engineering

Applicable Technical Papers:

AIAA 88-3249, SCAT, a Small Low Cost Turbojet for Missiles and RPV's

AIAA 94-3351, The Model 150 For Volume-Limited Missile/UAV Applications

American Helicopter Society, 2001 Tilt Rotor Specialists Conference, Paper 00-09, AE1107

(T406) Engine Growth Paths and Methodologies



Executive Summary

CANDENT TECHNOLOGIES' submission to the FLORIDA GULF COAST RESTORATION PROJECT In partnership with IDEA'S In PRODUCTION

Javier Camba III

Director of Business Development

In 2002, Javier Camba joined Candent Technologies to assist in the development of an advanced high-pressure ratio gas turbine engine for multiple markets. Mr. Camba has worked with the team to perform market assessments, proposal development and project estimates. Javier brings a wealth of experience in the marketing and application of small turbine engines in helicopters and fixed-wing aircraft from both the engine manufacturer and airframer's perspective.

Mr. Camba joined Rolls-Royce (formerly Allison Engine Company) in 1995 as a Senior Project Engineer on the T800/CTS800 program. Javier has also worked on Model 250 programs in support of new applications, development of customer satisfaction measurement tools and customer relationship management. Javier held positions of increasing responsibility as Manager, Military Marketing for the Helicopter Business Unit in support of Model 250, AE1107 and RTM322 turbine engines for US DoD applications.

Just prior to joining Allison, Mr. Camba spent three years as a consultant, counting Composite Technologies Corporation, New Mexico State University, and Arco Oil and Gas Company among his clients.

Mr. Camba was employed by Ishida Aerospace Research, Inc. from 1990-93, where he was involved with the TW-68 Tilt-Wing aircraft as a Project Engineer and Senior Engineer in Flight Technology. During that time, he was responsible for design definition improvement, critical product testing, technical performance data, and cost, competitive and market analyses. He also participated in the aircraft propulsion system negotiations while ensuring critical performance efficiencies.

From 1987-1990, Mr. Camba was an Engineer in Flight Technology at Bell Helicopter-Textron, Inc., where he worked with the company's technical contractor, managing development of hover technology and integration of the work with ongoing projects. He also directed the development of several menu-driven software packages, which greatly enhanced methodologies.

From 1984-86, while earning his Masters Degree in Aerospace Engineering, he was a Research Assistant and Research Associate with Texas A&M University in the Department of Aerospace Engineering and the Center for Strategic Technology. During this time, he was involved in improving manufacturing techniques for propeller blades and modeling icing behavior in helicopter rotors.

During his undergraduate years at Texas A&M, as the Maintenance Director of the University Flying Club and a member of its Board of Directors, Mr. Camba's changes to the maintenance program significantly improved both the organization's financial standing and aircraft availability.

Mr. Camba has a B. S. in Aerospace Engineering, Fluid Mechanics and an M. S. in Aerospace Engineering, Fluid Mechanics and Aeroacoustics, from Texas A&M, and has completed coursework toward an MBA in Management and Marketing from Texas Christian University. He is fluent in Spanish and holds a private pilot's license (single engine land).



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4. Technology Areas

Over the years, Candent has developed a technology strategy with projects pushing the leading edge of the state of the art in a number of areas, including the following:

- a. *Energy Recovery* - Waste heat energy recovery systems for gas turbines, large diesels, and combustion systems ranging in power from 1.0MW to 65MW
- b. *Small Gas Turbines* - Highly efficient, low cost, multi-fuel and bio-fuel capable small gas turbine engines, ranging in power between 300kW to 2,000kW
- c. *Amphibious Vehicles* - Highly versatile, all terrain, 2 to 4 person (or larger), amphibious vehicles for the military and governmental agencies, as well as the all-terrain vehicle market for sportsmen, hunters, and other outdoor enthusiasts
- d. *Microturbines* - Highly efficient, low cost, multi-fuel and bio-fuel capable micro turbines in the 15kW to 275kW power range
- e. *Hybrid Marine Propulsion* - Hybrid Electric Drive propulsion systems for marine applications, such as military and commercial boats from 30 ft. up to 105 ft. LOA
- f. *Small Heavy Fuel Engines* - Small, heavy fuel reciprocating engines for small water craft propulsion as well as electrical generators from 3kW up to 10kW.

Each of the technology areas mentioned above has related projects that can be ideally located in the Industrial Park located at the NW Beaches International Airport in the vicinity of Panama City, Florida. A good option is to bundle either all or a select number of projects, all of which would be collocated in the Panama City area for lower initial investment and greater management and business efficiency.

5. Projects

The project summary descriptions are provided in the subsequent paragraphs, in priority sequence, and are shown as stand-alone projects, with the exception of the Hybrid Marine Propulsion project, which is of necessity tied to the 300kW Turbine Generator project. Certainly, consolidation or bundling of projects into one major enterprise will results in greater business efficiencies.

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5.1. Amphibious Vehicle

5.1.1. Background.

Candent Technologies has been working with Fast Track, a Texas company who owns the patent on the propulsion system for an amphibious tracked vehicle, where the treads themselves provide the propulsion both on land and in the water, enabling land speeds on the order of 60 mph, and hull planing speeds of 26 kts plus in the water. Candent will license the patented track propulsion system and use the technology in its own designs, which include two and four passenger versions of all-terrain, amphibious vehicles. These vehicles can provide unique capability to our special forces in the military applications, due to their great versatility, which includes their transport compatibility with military fixed and rotary wing aircraft, and their capability to truly transition from water to land or land to water "on the fly" without stopping, as well as their ability to traverse through swamp land, sand, mud, ice, and snow. The capabilities of the vehicle also make it very appealing for many other governmental agencies involved in law enforcement and rescue operations, as well as hunters and other outdoorsman in the civilian markets.

5.1.2. Project Approach, Staffing and Siting

The project will initially focus on the design, development, testing, and productionizing of the vehicle, and then will transition to production. Total lapsed time is about 36 months to production, and two years of production cover the initial five year period. It is estimated that annual production rates could reach as much as 1,000 vehicles per year. The estimated first five years staffing requirements include the following:

- a. Management: 3 personnel
- b. Clerical: 3 personnel
- c. Engineering: 8 personnel
- d. Procurement: 4 personnel
- e. Production: 48 personnel

The total number of required personnel is estimated at 66, based on the breakdown given above. These estimates assume an average annual production rate of 200 vehicles for the first two production years (4th and 5th years). The project space requirements include administrative area of 6,000 sf and production area of 10,000 sf for a total space of 16,000 sf.

5.1.3. Funding Requirements

The initial five year standalone funding requirement for this project is estimated at \$18.8 million, and includes capital expenses such as physical plant, machinery, payroll, subcontracts, prototype hardware, and various other associated costs.



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5.2. Turbine Generator

5.2.1. Background

Under the auspices of a Navy/Marine Corps Systems Command contract (Small Business Innovation Research - SBIR Program), Candent Technologies has been developing a 300kW turbine driven generator for a Marine Corps directed energy, non-lethal weapon system. Candent just recently received a contract for SBIR Phase II, a 24 month program, through which a prototype will be designed, built, and demonstrated, and which should make it possible to develop, in parallel, commercial variants for the oil and gas and power generation industries, including standby, mobile, and baseline power, as well as for marine auxiliary power and military mobile power.

5.2.2. Project Approach, Staffing and Siting

The project will focus on the design, development, testing, and productionizing of the commercial generator set (genset), and then will transition to production. Total lapsed time is about 42 months to production, plus 18 months of production cover the initial five year period. It is estimated that annual production rates could reach as much as 200 gensets per year. The estimated first five years staffing requirements include the following:

- a. Management: 3 personnel
- b. Clerical: 3 personnel
- c. Engineering: 8 personnel
- d. Procurement: 4 personnel
- e. Production: 127 personnel

The total number of required personnel is estimated at 145, based on the breakdown given above. These estimates assume an average production rate of 200 systems per year. The project space requirements include administrative area of 6,000 sf and production area of 10,000 sf for a total space of 16,000 sf.

5.2.3. Funding Requirements

The initial five year standalone funding requirement for this project is estimated at \$20M, and includes capital expenses such as physical plant, machinery, payroll, subcontracts, hardware, and various other associated costs.



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5.3. Waste Heat Energy Recovery System

5.3.1. Background

Candent Technologies, under contract to a US Navy Small Business Innovation Research (SBIR) Phase II contract, is currently developing a waste heat energy recovery system for the US Navy DDG51 (Arleigh-Burke Class) destroyer. The program is sponsored by NAVSEA PEO Ships, PMS 320. Candent is collaborating with Rolls-Royce Marine NA in this project. The energy recovery system uses the exhaust waste heat from the three onboard Ship Service gas turbine driven generators (SSGTG), rated at 3.0MW each, and generates up to 3.0MW (1.0MW per SSGTG) additional electrical power for shipboard systems. This technology will be a great push for the energy efficiency improvements that the US Navy is trying to achieve. It is expected that the Navy will fund the follow on Engineering/Manufacturing Development (EMD) program. The current plan is for Sea Trials to occur in the FY2019 time frame. The energy recovery system is also suitable for use with commercial land based gas turbine generators (about 2,500 rated at around 3.0MW currently in use) of the same size, as well as larger units up to 50MW.

5.3.2. Project Approach, Staffing and Siting

The project will focus on the design, development, testing, and productionizing of the prototype generator set (genset), and then will transition to production. Total lapsed time is about 42 months to production, plus 18 months production cover the initial five year period. It is estimated that annual production rates could reach as much as 24 gensets per year. The estimated first five years staffing requirements include the following:

- a. Management: 3 personnel
- b. Clerical: 3 personnel
- c. Engineering: 8 personnel
- d. Procurement: 4 personnel
- e. Production: 96 personnel

The total number of jobs is estimated at 114. These estimates assume an average production rate of 24 systems per year. The project facilities' space requirements include administrative area of 6,000 sf and production area of 10,000 sf for a total space requirement of 16,000 sf.

5.3.3. Funding Requirements

The initial five year standalone funding requirement for this project is estimated at \$20.9 million, and includes capital expenses such as physical plant, machinery, payroll, subcontracts, hardware, and various other associated costs. It is expected that US Navy funding should offset at least \$5.0M, leaving a balance of \$15.9M.



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5.4. Hybrid Marine Propulsion

5.4.1. Background

This project is tied to the 300kW Turbogenerator described in paragraph 4.2 above. The Turbogenerator is used to power an electric drive system on the Euro Marine Limited (EML) PI-65 patrol boat and its commercial derivatives. Candent is working with EML and GE (marketing support only at this time) on this project. This 65 ft boat is currently diesel powered, however, Candent has completed the preliminary design of a gas turbine driven version, which uses two current production GE CT5 helicopter engines rated at 2,900 hp each, driving the propellers through two Candent designed and supplied transmissions, the latter having mounted one 125kW electric motor each, powered by the 300kW Turbogenerator, which together comprise the Hybrid Electric Drive system, which in turn will propel the boat at hull speed for upwards of 2100 NM, or with the main turbines running at speeds in excess of 50kts.

5.4.2. Project Approach, Staffing and Siting

The project will focus on the final design, development, testing, and demonstration of the prototype turbine and Hybrid propulsion system. The demo can commence in about 24 months, followed by production as early as 12 months later. Total lapsed time is about 26 months. It is estimated that annual production rates could reach as much as 24 boats per year. The estimated first five years staffing requirements include the following:

- a. Management: 3 personnel
- b. Clerical: 3 personnel
- c. Engineering: 8 personnel
- d. Procurement: 4 personnel
- e. Production: 63 personnel

The estimated total number of jobs is 81. These estimates assume an average production rate of 24 systems per year. The space requirements include administrative area of 5,600 sf and production area of 8,000 sf for a total space of 13,600 sf.

5.4.3. Funding Requirements

The initial five year standalone funding requirement for this project is estimated at \$28.8 million, and includes capital expenses such as physical plant, machinery, payroll, subcontracts, hardware, and various other associated costs. This estimate assumes that Candent will purchase the engines from GE and supply a complete propulsion system to EML.



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5.5. Small Heavy Fuel Engine/Generator

5.5.1. Background

Candent Technologies has been developing a small, heavy fuel, direct injection reciprocating engine, currently rated at 5kW, for the US Navy, under a Phase II SBIR contract, through which Candent is building a small (X Class) Unmanned Surface Vehicle (USV) prototype, intended to serve as an ISR (Intelligence Surveillance and Reconnaissance) platform for Special Forces operating in riverine and littoral environments. Candent is also supplying the engine to Cornerstone Research Group, a company developing the 5kW auxiliary power unit for the USMC Amphibious Combat Vehicle (ACV).

5.5.2. Project Approach, Staffing and Siting

Candent intends to continue development of the engine for use in mobile power units for the US Military, to replace the current Tactical Quiet Generator (TQG) fleet, which is diesel driven and very heavy in comparison (800 lbs for a 5kW TQG versus less than 150 lbs for a Candent Heavy Fuel Engine powered design). The project will continue development, testing, and demonstration of a family of generator systems ranging in power from 3kW to 15kW. The demo can commence in about 18 months, followed by production as early as 12 months later. Total lapsed time is about 30 months. It is estimated that annual production rates could reach as much as 200 units per year. The estimated first five years staffing requirements include the following:

- a. Management: 3 personnel
- b. Clerical: 2 personnel
- c. Engineering: 4 personnel
- d. Procurement: 2 personnel
- e. Production: 24 personnel

The expected number of jobs required total 35 personnel. These estimates assume an average production rate of 24 systems per year. The space requirements include administrative area of 5,600 sf and production area of 8,000 sf for a total facility space requirement of 13,600 sf.

5.5.3. Funding Requirements

The initial five year standalone funding requirement for this project is estimated at \$14.2 million, and includes capital expenses such as physical plant, machinery, payroll, subcontracts, hardware, and various other associated costs.



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5.6. Microturbine Generator

5.6.1. Background

This project is an offshoot of the Candent Technologies 300kW Turbogenerator, which is being developed for the USMC under SBIR contract. The Microturbine generator is a 100kW scaled down version of the larger 300kW unit, and would be used in the military to power directed energy weapons such as lasers, as well as for auxiliary power unit s in numerous marine and ground vehicles, and mobile electrical power applications.

5.6.2. Project Approach, Staffing and Siting

Candent plans to start with the larger 300kW design and scale it down to 100kW as the anchor for a generator family ranging in power from 50kW up to 200kW. These units can be used to power various size directed energy weapon systems, and can also be used as mobile power units much smaller and lighter that comparable size diesel driven units (about 5:1 on weight, 3:1 on volume). The project length should be about 36 months to production, plus 24 months of production rounding out the initial five year period. Initial production rate is estimated at 60 units per year, with potential growth to 200 units. The unit will also have a market potential as a marine auxiliary power unit. The estimated first five years staffing requirements include the following:

- a. Management: 3 personnel
- b. Clerical: 3 personnel
- c. Engineering: 8 personnel
- d. Procurement: 4 personnel
- e. Production: 36 personnel

The estimated total job requirement is 54. The project space requirements include administrative area of 5,600 sf and production area of 8,000 sf for a total facility space requirement of 13,600 sf.

5.6.3. Funding Requirements

The initial five year standalone funding requirement for this project is estimated at \$19.6M, and includes capital expenses such as physical plant, machinery, payroll, subcontracts, hardware, and various other associated costs.



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6. Summary

The projects described above, as stand-alone and shown in table 1 below, will, when funded as separate entities, require an aggregate funding in the amount of \$122.4M over the first five year interval, and would generate 495 jobs.

Individual Project Totals							
	Amphibian	Turbogen	Energy Rec	HED Marine	SHF Genset	Microturb	Total
Jobs	66	145	114	81	35	54	495
Funding	\$18,779,266	\$ 20,030,516	\$ 20,855,516	\$ 28,825,016	\$ 14,215,080	\$ 19,645,516	\$ 122,350,910

If on the other hand it is possible to consolidate or bundle the projects, then common plant and facilities, management, administrative support, etc., can render much better business efficiencies, reducing the total required funding down to \$89M, while still generating an estimated number of 399 jobs.

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PLAN CONTINUED IN PART 2