Russell Energy Corporation

Energy Security Through Innovation

An American Company

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www.russellenergy.com

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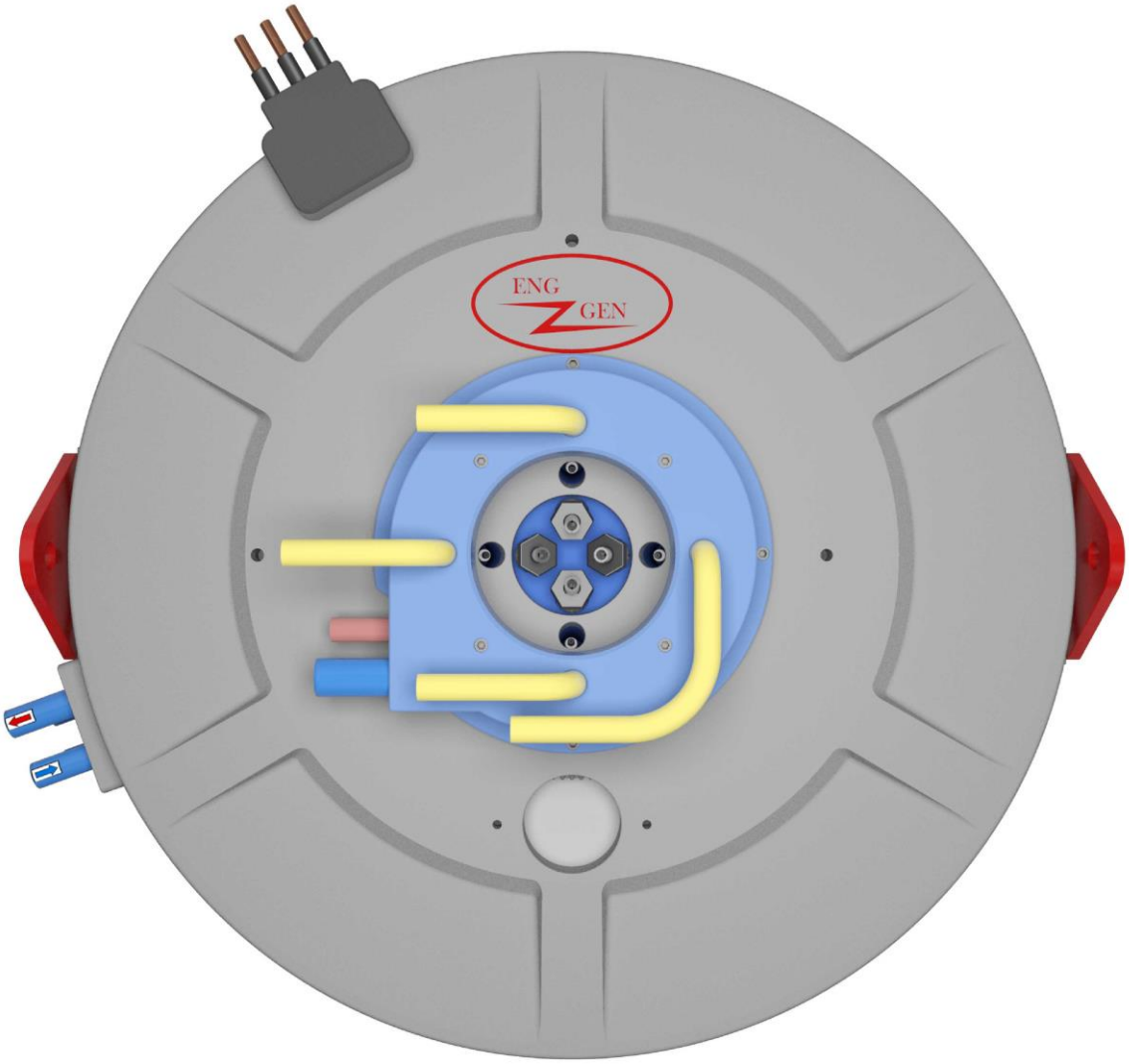


An understated and often overlooked fact is without sufficient energy mankind would be living in a primitive society barely able to maintain basic necessities. The health of a nation's economy is directly linked to energy. Therefore the underlying fear that drives geopolitical forces, countries, economies, societies, businesses and individuals is the lack of energy to sustain the present and provide for the future.

This document proposes a viable energy solution based upon fact, logic and proven technology.

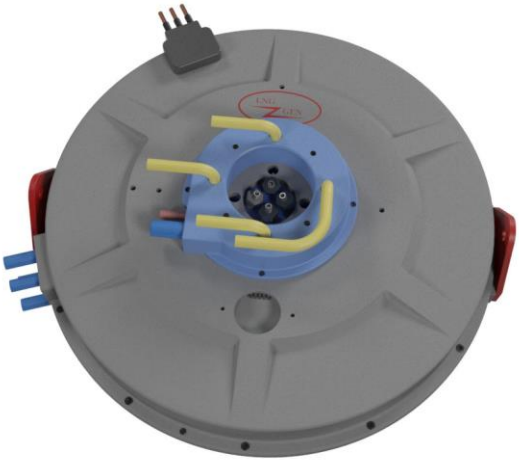
Confident that the Engine/Generator (Eng/Gen) will conserve energy resources, reduce pollution, create jobs for Americans and be of benefit to all people, the Russell Energy Corporation (REC) is proud to introduce this technology to the world.

1.0 SUMMARY

1.1 Developer of Engine/Generator Technology

The Russell Energy Corporation is developing, testing and commercializing the Russell Eng/Gen technology invented and patented by Robert L. Russell. The Eng/Gen is the first and only patented combination of an innovative new, highly efficient and powerful rotary internal combustion engine, with an integrated high efficiency electric generator in a single waterproof and dustproof housing.

The Russell Energy Corporation has 6 U.S. patents, 25 active patents in 17 countries, and 18 foreign patents pending on the revolutionary shaftless "Stationary Block Rotary Engine/Generator" technology.



TOP VIEW

BOTTOM VIEW

1.2 The Technology, its Applications and Uses

The Eng/Gen is substantially smaller, lighter, more powerful, efficient, dependable and durable than current internal combustion engines coupled to an external generator. It is also less expensive to purchase, operate and maintain than conventional units or turbine generator systems. The Eng/Gen's unique design provides trouble free operation, minimal maintenance, reduced fuel consumption and lower CO_2 and NO_x emissions.

The Eng/Gen can use any liquid or gaseous fuels such as gasoline, ethanol, diesel, JP-8 military fuel, natural gas, syngas, biogas, propane or even hydrogen. "Plug-And-Play" modularity provides flexibility for tailoring outputs across a wide range of demand requirements. From single units starting at 5 kW to large multi unit Eng/Gen systems capable of producing premium power for one megawatt and greater applications, the Eng/Gen is the most logical choice.

Because of its size, weight and power density advantages, it is ideally suited for transportation and auxiliary power generation use. The Eng/Gen will allow end users to generate electric power on site, more efficiently, reliably and in a more environmentally acceptable manner. This new technology, by merit of its advantages, will drastically change the way we do things as it moves us closer to a clean all electric society. Any application that requires electricity can be served by the Eng/Gen.

1.3 Problems Addressed by the Eng/Gen Technology

Growing concerns about reliable electrical power generation, transmission, distribution and price volatility in deregulated markets has created new interest in making use of all forms of distributed generation capacity. Users of independently owned, efficient Eng/Gen generation equipment will benefit by lowering demand for grid-supplied electricity during high price and peak use periods.

At the same time, utilities are focusing on reducing capital outlays. Targeted deployment of distributed generation can meet growing customer demand for power while reducing the need for costly transmission and distribution upgrades, or the construction of new central-station plants. The Eng/Gen provides a new and better way to serve energy users by giving them more control, choice, and flexibility in meeting their electrical power demands. Also, the Eng/Gen offers energy providers flexibility in addressing the stringent requirements for energy efficiency, environmental protection, and other site-related issues.

The Department of Defense (DoD) has a great need for reliable electrical power in the battlefield and at all U.S. military bases on foreign lands. This requirement cuts across all services, all locations, and will extend into the foreseeable future. The DoD needs improved power generation systems that are portable, lightweight, highly efficient and capable of operating on JP-8 military fuel. Because of the heavy emphasis on mobility, a great deal of attention is given to weight and volume reductions. The significant improvements in the weight, overall size, output power, efficiency, dependability and durability offered by the Eng/Gen are major selling points for portable and stationary military applications.

1.4 Technology Development, Testing and Evaluation

Two formal design studies have been performed by two highly respected independent engine design and consulting firms. They both verified the Eng/Gen's design and operability merits and found no fatal flaws. A computerized 3D baseline operating model of the Eng/Gen has been prepared. All components and parts have been designed and dimensioned to verify unit interaction.

The above studies determined that the Eng/Gen would produce approximately 100 kW/liter, as compared to the approximate 50 kW/liter produced by conventional engines (like those found in cars today).

Because approximately 80% of the heat energy produced in a conventional engine is used just to run the engine, there are numerous opportunities for additional efficiencies. Some of the positive design features of the Eng/Gen not considered in the above studies are;

- A low speed, high torque engine designed to operate at a relatively fixed speed with an optimized combustion process
- An application designed to compliment the positive features of the engine in order to provide maximum output and efficiency
- Eliminating 50% of the piston strokes or movements during each combustion cycle
- Eliminating energy losses during exhaust
- Eliminating energy losses during intake
- Providing for low energy losses during the low pressure pre-compression phase
- Providing low friction bearings to reduce internal friction losses
- Providing for increased combustion efficiency

These features plus others contribute to extremely high efficiency and power output. We believe that output levels greater than 100 kW/liter can and will be achieved.

The Russell Energy Corporation has recently discussed the Eng/Gen design with an internationally recognized and highly respected powertrain and vehicle engineering company. They indicated that they believe the design integration of the engine and the generator provides some very interesting synergies and merits further studies. The Russell Energy Corporation intends to further develop the Engine/Generator design, taking it from a prototype to a working production program.

The product development plan includes the following abbreviated overview;

Phase 1: Concept Study - Russell Engine
Phase 2: Proof of Concept (Prototype Engine Development and Testing, 2 units)
Phase 3: Engine/Generator Development for High Volume Manufacturing/Assembly (Durability Testing of 10 to 15 Prototypes + Calibration and Combustion Development)
Phase 4: Reliability Growth (30+ prototypes built and tested using "Make Like Production" processes + Calibration and Combustion Development)

1.5 Anticipated Benefits from Technology Development and Commercialization

The predicted high efficiency (40+ %) of the Eng/Gen system will reduce reliance on base-load power plants, inefficient traditional internal combustion generator sets, microturbines, and the yet to be developed fuel cells. Widespread commercialization will benefit the environment via reduced fuel consumption, reduced particulates, air pollutants, and greenhouse gases. The Eng/Gen will create new markets for remote and localized distributed generation facilities and thereby reduce the need for costly new transmission lines. Because of its small footprint, vibration free operation and reduced emissions it is anticipated that these new localized distributed generation facilities will blend into more populated areas without objection.

Additional markets include electronics, electrical control industries and ancillary equipment suppliers. With scale-up, this power generation technology could lead to substantial new industrial growth providing thousands of high paying jobs and re-establishing American technological leadership in power generation and transportation (series-hybrid electric vehicle drive systems).

Many areas of the world have not extended their power grids beyond major cities. In many cases even the urban coverage of electrical power is insufficient relative to the growing demand.

The unmet need in rural areas worldwide represents an even larger potential market worth hundreds of millions of dollars. The U.S. economy and the American job market would be greatly enhanced by the growing U.S. export sales that would be provided by this technology.

The Eng/Gen market is targeted at;

A) Military Applications
All branches, all stationary & portable applications that require large amounts of electricity. Examples include, base camp operations, field hospitals, food, laundry, personal and communication services, strategic and tactical applications and equipment; including land, sea, and air combination vehicle drive systems with integrated remote electrical power generation capabilities.

B) Homeland Security Applications
The security of our nation demands dependable electrical power at all times. A network of efficient stationary power generation stations would augment existing generation facilities, while portable generation vehicles provide the basic security of electricity at all times and in all places. Whenever electrical service is interrupted from high demand, natural disaster, equipment maintenance or failure, portable generation equipment can bring relief. This approach will also relieve and protect the national grid from overload conditions during times of stress.

C) Essential Services
Examples of essential services that require electricity at all times would include; hospitals, police and fire stations, air traffic control facilities, emergency radio stations, water pumping stations, cold food storage facilities, electronic data storage facilities, all military facilities worldwide etc.

D) Transportation
In all vehicle applications, such as cars, trucks, busses, semi tractors, commuter trains, boats, ships, and even light planes, the advantages offered by the Eng/Gen technology are unparalleled. Because of its small size, light weight, high power density, and vibration free operation, coupled with its great efficiency, dependability, durability, and affordability the Eng/Gen will change the way we move. A Series-Hybrid electric drive system with the Eng/Gen will eliminate all unnecessary fuel consumption as well as all unnecessary air and heat pollution. This can save tens of millions of gallons of gasoline, and hundreds of thousands of tons of CO_2 emissions daily in the U.S. alone. An added benefit to the above system is the fact that all vehicles using this system can provide emergency electrical power outside of the vehicle if needed. This feature increases homeland and personal energy security.

E) Personal Energy Security
Capable of operating efficiently using home heating/cooking fuels such as natural gas and propane, or transportation fuels like gasoline or diesel, the Eng/Gen will provide the personal peace of mind that only comes with electricity. Whether used as a backup power supply or a full time generation system (capable of selling power back to the grid), your family will have peace of mind knowing that you have the electricity you need for light, water, heat, refrigeration, cooking, communications and entertainment.

F) Global Energy Solutions
Many remote rural communities worldwide do not have the benefit of electrical power simply because it is not economically practical to bring power lines to them. In these areas, the Russell Energy Corporation envisions fleets of small off-road, all wheel drive tanker trucks, powered by the Eng/Gen and Series-

Hybrid Electric Drive Systems. Using the Eng/Gen and the onboard batteries of the Series Hybrid Drive System, they will provide no waste electrical power for basic needs like lighting, heating, cooking, refrigeration for food and medicines, communications and entertainment. When the tankers fuel is low, a new tanker will be called and the original will be exchanged and returned for re-fueling and service before going to the next village or town. This system will also be ideal for worldwide disaster relief, remote mining operations, scientific explorations, etc.

The above are some examples of the endless applications and opportunities that this technology will make possible. Any application that requires electricity could be served by the Eng/Gen.

2.0 THE ENG/GEN TECHNOLOGY

2.1 Eng/Gen Technology Overview

(For the best description of the Eng/Gen technology, please go to www.russellenergy.com and view the 15 minute animated and narrated presentation)
Simply stated;

1. The Russell Eng/Gen is a low rpm multi-cylinder twin cam rotary internal combustion engine, operating at a relatively constant speed driving multiple magnets across stationary coil windings integrated within a single, compact, waterproof and dustproof enclosure to produce electricity.
2. The upper case of the Eng/Gen contains a large rotating mass (the Upper Cam Plate of the Cam Track Armature Assembly) with an upper ring gear attached which is used to provide external rotating power for mechanically driven ancillaries such as blowers or pumps if required.
3. The rotating Cam Track Armature Assembly is the armature of the integrated generator.
4. Stationary cylinders guide pistons that propel the Cam Track Armature Assembly in a rotational path by way of endless twin cam tracks machined into the two cam plates of the Cam Track Armature Assembly. The infinitely variable cam track configuration provides the most fuel efficient and power dense method of transforming the piston's linear motion into the rotary motion of the Cam Track Armature Assembly.
5. In conventional engines, limitations on peak cylinder pressure are cylinder head gasket sealing and crankshaft main bearing loads. As the Eng/Gen has no head gaskets or crankshaft, it can sustain higher cylinder pressures than conventional engines providing greater flexibility to maximize combustion efficiency.
6. There is less heat rejection to the cylinder walls because the unique cylinder purge system cools and cleans the cylinder walls internally, providing an improved combustion environment for enhanced combustion efficiency.
7. The cam track system allows for many advantages not possible in conventional engine designs. The piston stroke can be custom tailored and made as long as necessary to harvest the maximum energy from each combustion event regardless of the type fuel used. The cam track configuration also provides infinitely variable control of the piston movement to maximize the mechanical energy output and control NO_x emissions. This system also allows multiple firings of each cylinder during each revolution of the Cam Track Armature Assembly, providing unheard of power density.

8. The design substantially reduces size, weight, parts count, noise, vibration and the need for rugged and costly mounting structures.
9. There is no starter motor because starting initiates by motoring the generator.
10. The unitary design lends itself to Plug-and-Play versatility and modular expandability.
11. Integration of the engine and generator eliminates bearings, shafts and dynamic seals further increasing overall efficiency and system simplicity.

2.2 Eng/Gen Technology Description

2.2.1 Design Capacity of the Eng/Gen models mentioned in the presentation at (www.russellenergy.com)

The 4x2 Eng/Gen design shown in the presentation (4 cylinders each firing 2 times per revolution = 8 combustion events per revolution) produces a nominal 73 kW of electricity from within the sealed housing. This one piece water proof and dust proof Eng/Gen is ideally suited for both stationary and portable applications. Engineering studies have predicted the size and weight to be 60% less than conventional designs, with an output of 100 kW/liter. It is designed for low speed (aprox. 1,200 rpm), vibration free operation with a longer than normal service life when compared to traditional internal combustion engines or traditional internal combustion engines with external generators.

A 6x2 variation of the design is also mentioned in the presentation. It is a 6 cylinder Eng/Gen with each cylinder firing 2 times in a single revolution. NOTE: It is the same physical size as the 4x2 shown in the presentation, but it will produce 12 combustion events per revolution and as sized, 110 kW of electrical output power. The example of the 6x2 is given to show that as the output increases, the advantages associated with size and weight become disproportionately greater. The bigger, the better!

2.2.2 Physical Size, Mass, Volume, Shape

Outside enclosures can be small and lightweight because there are no rotational forces transferred to the mounting structures. Without ancillaries, the 6x2 - 110 kW model has an outside diameter of 36.4", is 17.7" high, weighs approximately 1,250 lbs. and has approximately 282 parts (including fasteners) with no exotic materials or unique manufacturing requirements. This is a stackable Plug-and-Play technology that is readily expandable with multiple Eng/Gen units and is scalable to megawatt capacities. Manufacturing costs are targeted at under $200/kW.

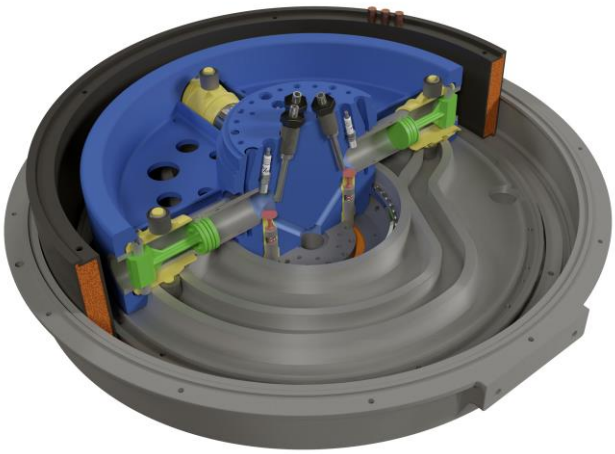
2.2.3 Eng/Gen Life

The projected life of the Eng/Gen is substantially longer than the 2,000 operating hours of a typical two stroke internal combustion engine mechanically coupled with a generator. The projected life is also substantially longer than typical large four cycle engine and generator combinations. This is due primarily to the increased dependability, durability and operating life of the ball and needle/roller bearings which are used in the Eng/Gen, as opposed to the simple sleeve bearings used in conventional engines. Reduced internal friction as well as the reduced amount of wearing surfaces also provides for increased service life. The Eng/Gen has no crank shaft or crankshaft bearings, no piston rods or rod bearings, no cam shafts or cam shaft bearings, no timing chains, sprockets or dynamic seals. It only has one mechanical valve assembly per cylinder. It has far fewer parts to wear out. Vibration is a source of noise and fatigue in any mechanical structure. A longer quieter service life should also be expected because the Eng/Gen is virtually vibration free. The actual operating life will to be verified with bench testing.

2.2.4 Maintenance

Maintenance requirements are predicted to be far less than those of conventional engines and generators. Because of the low speed operation, the low number of moving parts, and the use of low friction ball bearings and needle bearings, maintenance should be minimized. Maintenance schedules will be confirmed during testing after oil and bearing surface analysis has been completed.

2.2.5 Engine Design Advantages



The engine's pistons reciprocate within stationary cylinders as they transfer combustion energy to twin rotating cam tracks that make up the Cam Track Armature Assembly. The motion of the pistons within the cylinders is generally similar to that of a conventional two cycle engine with the exception that the pistons are not connected to a crank shaft and are therefore capable of stopping or moving in a completely variable fashion at any point in the combustion process. There are many advantages related to combustion efficiency, power output and emissions control that are directly associated with this novel design flexibility.

Another design advantage for the Russell Engine lies in its application, the production of electricity. A conventional engine, like the one used in your car to produce mechanical power, is required to operate at speeds ranging from 600 rpm to 6,000 rpm. The most efficient speed for that engine to operate (the sweet spot) is around 3,000 rpm. The typical driver rarely operates his vehicle at engine speeds of 3,000 rpm.

The Eng/Gen is designed to operate within a very narrow speed range of only a few hundred rpm. It is designed to always operate in the sweet spot, only varying its speed to optimize the combustion process based on changing load conditions. This design feature will insure maximum combustion efficiency and power output with minimal fuel consumption and emissions production.

2.2.6 Cam Track Design

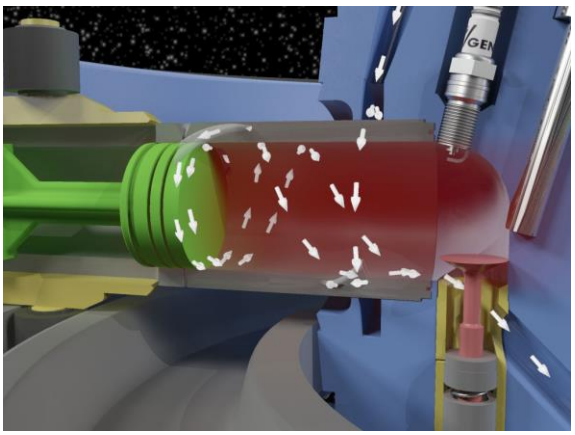
The infinitely variable cam track configuration provides the most efficient transformation of the linear motion of a piston, into the rotary motion of the Eng/Gen's Cam Track Armature Assembly. The cam track has unlimited shape design capabilities. Unlike a conventional crankshaft engine design which allows no flexibility to modify or optimize piston motion, the cam track design will allow for complete optimization of the piston motion and the combustion process. Controlling the speed of the piston after combustion can effect exhaust emissions. Controlling the piston stroke can improve output power and efficiency. Allowing the piston to stop during exhaust will reduce internal energy losses while providing better cooling and a cleaner environment for the next combustion. The cam system allows multiple firings of each cylinder during each revolution. The number of firings per revolution is only limited by the overall size of the Eng/Gen design. Therefore, as a general rule, as the Eng/Gen gets larger in physical size, it will operate slower but with greater rotating energy.

2.2.7 Eng/Gen Materials

The Eng/Gen is designed to allow the greatest flexibility regarding the choice of materials, while ensuring that no exotic materials are required in its production. For example; in applications where weight is a factor, many of the Eng/Gen components can be made of lightweight aluminum. In stationary applications where weight is not a factor, many of the major parts can be made from low cost cast iron. Parts subjected to higher pressure would be made from suitable steels.

2.2.8 Reduced Energy Losses /Complete Combustion, Reduced Emissions /Increased Power

Prolonged dwell at the bottom of the piston stroke allows for the free exhaust of spent gases while the piston is substantially stationary relative to its position in the related cylinder. This feature will greatly reduce the internal energy losses that are typical in conventional engines where the piston is made to force the exhaust gases from the cylinder, while under great pressure. Reduced internal energy losses equals increased usable output power and reduced fuel consumption.



The prolonged dwell also allows each piston carrying cylinder to be internally cooled and purged of all spent gases while the piston is substantially stationary relative to its position in the cylinder. The internal cooling and purge cycle removes all of the hot spent gases from the previous combustion. This improves the next combustion and provides for increased expansion of the cooler cylinder gases to increase output power, while reducing fuel consumption and pollution.

Low pressure pre-compression of the cylinders is another advantage of this engine design and its unique combustion process. While the piston is still relatively stationary at the bottom of its stroke during the dwell, cooling air continues to enter the cylinder. The exhaust valve closes first causing the cylinder to pre-compress a large volume of air at low pressure and with low energy losses. This action provides greater cylinder pressure and air volume during combustion, further increasing output power and efficiency.

2.2.9 Patented Cylinders

These unique cylinders are designed to use the inside diameter of the cylinder walls to guide the one-piece solid pistons. There are no angular pressures exerted on the inside cylinder walls as with conventional engines using “crank shaft and connecting rods”. Therefore, there is reduced friction and the piston rings maintain a square proximity to the cylinder walls to provide improved sealing and reduced “blow by”. This feature prolongs the integrity and life of the engine lubricating oil.

The patented cylinders are also designed to use the outside diameter of the cylindrically shaped cylinder to guide and provide a bearing surface for the sleeves. The sleeves are connected to the pistons by a fixed position pin that passes through slots on either side of the cylinder walls. The sleeves are used to convert the linear motion of the pistons into rotary motion by way of their interaction with the cam tracks integrated into the Cam Track Armature Assembly.

2.2.10 Cylinder Pressures

The Eng/Gen does not have head gaskets or main bearing caps, which limit the typical internal combustion engine's ability to withstand high cylinder pressures. Therefore, the Eng/Gen can withstand higher cylinder pressures allowing for greater flexibility in optimizing output power, combustion efficiency and emissions reduction.

2.2.11 Charging the Cylinder/ Fuel Injection System

The Eng/Gen design (as seen in the presentation) allows for the use of direct fuel injection into the cylinders. Direct Injection of the fuel into the cylinders provides increased power output, improved combustion, reduced fuel consumption and reduced emissions.

2.2.12 Combustion

The engine has a dwell at the top of the piston stroke whereby the ignited air/fuel mixture in the cylinder is allowed to combust more completely while the piston is substantially stationary relative to its position in the related cylinder. With a dwell at the top of the piston stroke, the ignited air/fuel mixture in the cylinder is allowed to expand more completely to generate increased internal cylinder pressure while the piston is substantially stationary. The piston then rapidly accelerates, controlling the production of NO_x emissions while providing extreme torque and low rpm operation of the Cam Track Armature Assembly with no gearing required.

2.2.13 Piston Action and Vibration

For every action of a piston there is an equal yet opposing action of another piston, oriented on the same axis plane at 180 degrees, the direct opposite side of the engine. This means the operation of the Eng/Gen will be virtually free of vibration. Vibration free operation is not only more pleasant to the senses, it provides for lower energy losses, reduced friction, a longer service life and increased power output with reduced fuel consumption.

2.2.14 Seals

The only dynamic seals used in the Eng/Gen are the Piston Rings, which are typically not problematic. (In contrast to static **seals, dynamic seals** exist where there is relative motion between the mating surfaces being **sealed**.) Static O ring seals are used in low pressure areas to prevent the leakage of fluids from the Eng/Gen case. Low pressure requirements on these static seals means leakage or failure problems are eliminated.

2.2.15 Valve System

In these times when conventional engines tout the use of 4 valves per cylinder the Russell Eng/Gen uses only one mechanical valve per cylinder. Yet the Eng/Gen design will provide better breathing while reducing engine load and the substantial energy losses associated with operating 4 valves per cylinder. It will also reduce the cost, complexity and the parts count.

2.2.16 Cooling Systems / 2 Required

The cooling system provided for the engine portion of the Eng/Gen is comprised of 3 components;

1) The main hub of the stationary Engine Block, where most of the heat from combustion is localized, is liquid cooled (water or oil).

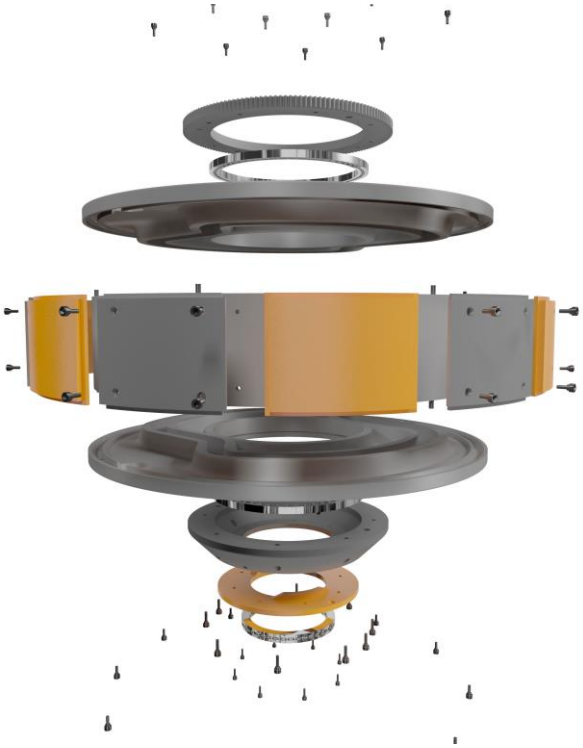
2) The inner cylinder walls, the combustion chambers, exhaust valves and the exhaust system are all cooled by the purge and cooling air that is circulated through the cylinders after each combustion.

3) The entire interior of the case (which encloses the cylinders, the cylinder sleeves, the sleeve bearings, the exhaust valve cam followers, the exhaust valve cam plate, the cam track armature assembly with bearings, the armature magnets and the inside diameter of the sealed generator coil) is cooled and lubricated with a constant spray of light lubricating oil.

The generator coil must be cooled in order to insure that the Eng/Gen can operate at maximum output capacity during continuous duty operations. Therefore the outside diameter of the sealed coil is continuously cooled by circulating any suitable liquid or gaseous medium around the coil (preferably the same cooling medium as is used for the engine block). The outer case halves are each provided with a cooling passage to allow the coolant for the coil to be circulated independently in each case half and in opposite directions around the generator coil to ensure uniform cooling of the coil.

2.2.17 Cam Track Armature Assembly

The rotating mass of the engine, called the cam plates are securely attached to the armature ring which has the armature magnets attached to its outside diameter. The entire assembly is referred to as the Cam Track Armature Assembly. The engine, which produces extremely high torque at low rpm, drives the Cam Track Armature Assembly past the stationary coil windings secured to the outer case halves. It is this action of driving the magnets of the Cam Track Armature Assembly past the stationary Coil that produces electricity. All of the high torque produced by the engine is absorbed and evenly distributed throughout the entire case in the process of making electricity. The case can therefore be made of lighter materials while eliminating concerns caused by heavy unevenly distributed loads.



2.2.18 Generator Design/Operations

The Eng/Gen's generator design is "tried and true" technology. One feature of this design is the generator, which is built around the outside diameter of the engine. This makes the generator diameter much larger than a typical stand alone unit. In this application bigger is definitely better. Because of the large diameter of the generator, it can produce greater amounts of electrical power with increased efficiency and at low operating speeds. This is a perfect marriage of form and function as the engine is built to produce extreme torque, at low rpm.

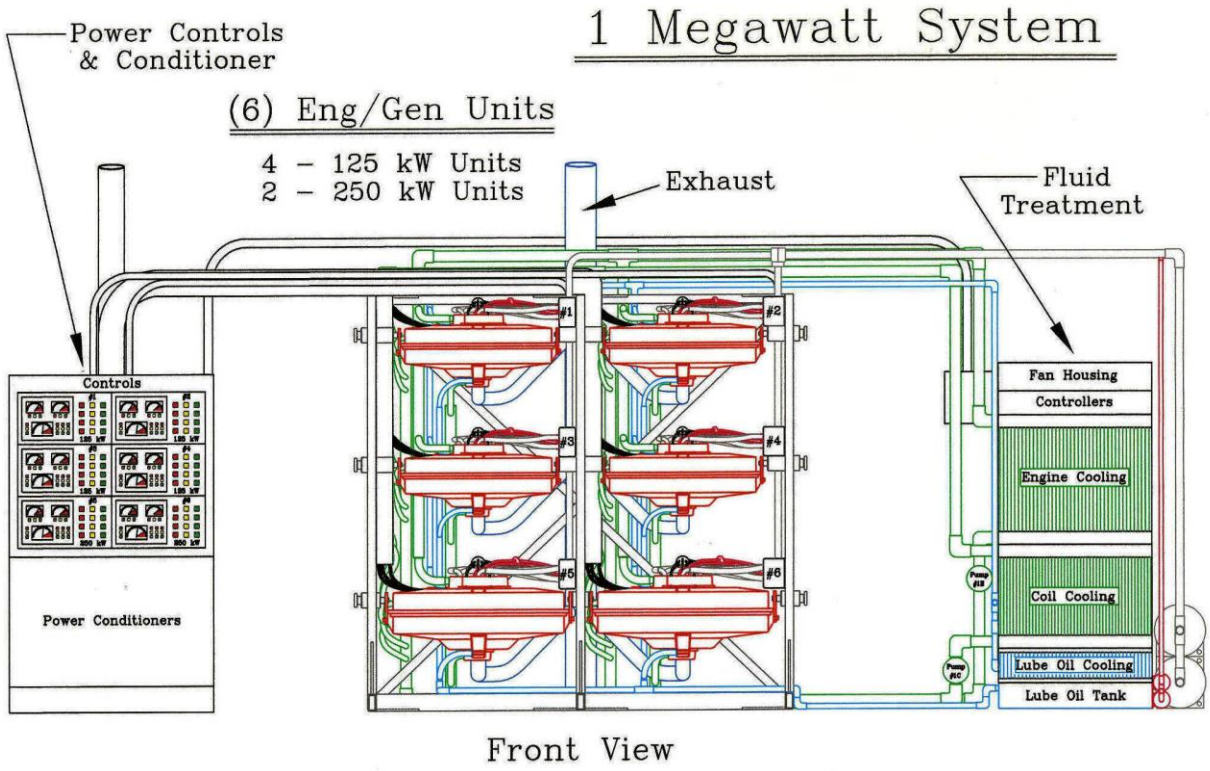
During normal operation the Eng/Gen will only run when it is producing electricity and doing work. The Eng/Gen is not designed to idle (run with no load). The electricity produced by the Eng/Gen must be used to do work or be stored for later use. The Eng/Gen can operate at light loads with no adverse effects. As load is increased on the generator, it has the same effect as applying braking forces to the engine. Sensors in the case that monitor speed will alert the

automated control panel that the Eng/Gen is slowing down and seamlessly the control panel will call for increased fuel to maintain the desired operating speed, which my vary to ensure optimal efficiency in all load situations. This design will not allow waste.

2.2.19 Electrical Control System

The electronics (controls, sensors, and power conditioning equipment) required for the operation of the Eng/Gen are all very straight forward. Components will be selected to meet the requirements specified by the Eng/Gen detailed design. It is a prime consideration that the sensors and all control components are chosen based on quality, dependability, price, and proven longevity. Power conditioning is of key importance for all generation devices. The power conditioning system used with a single Eng/Gen unit must meet or exceed the maximum rated output load of that unit. This technology is commercial-off-the-shelf (COTS).

Systems designed to control the total output of multiple Eng/Gen units (see below) will be capable of handling the entire rated load capacity of all the units in that system, running at full load simultaneously. They will also be able to seamlessly transfer loads evenly between any of the multiple Eng/Gen units, which may be of varied output capacities. This feature will allow specific units to be shutdown for maintenance without disrupting the operation of the entire system. These systems will also be designed to allow future growth through attachment to additional systems. The systems will be of standardized sizes and made for expandability.



3.0 Technology Development Status/Needs

The Eng/Gen technology development is at Technology Readiness Level 5 "Basic technology components are integrated with realistic supporting elements and can be tested in a simulated environment." This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology.

Several studies have been conducted to make analytical predictions. These studies provide an independent technical assessment of the engine portion of the Eng/Gen. The evaluations included thermodynamic analysis to predict and develop engine performance, dynamic analysis to evaluate major structural considerations, and tribological analysis to evaluate any potential problems in the technology's major structural feature . . . . the cam track. Engineering analyses have concluded:

- Primary development risk factors can be managed by careful design optimization
- Performance is predicted to be competitive with or superior to conventional engines
- The cam can be designed to withstand predicted loads
- The most significant technical risk involves predicting emissions. These will need to be determined in the finalized prototype design that will be tested.

Each part and component has been sized in an integrated Eng/Gen unit. Analytical and laboratory studies are required to physically validate analytical predictions by bench testing prototype units. Laboratory bench-scale testing is required to confirm that all components will work together to achieve predicted operating specifications.

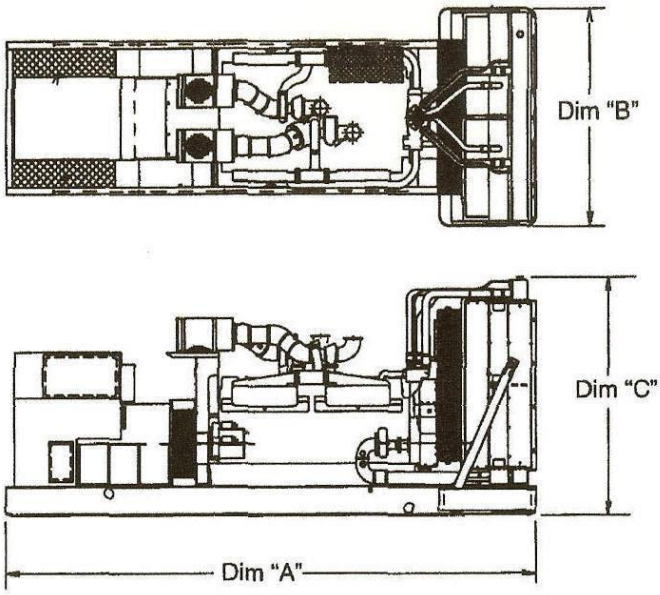
4.0 ENG/GEN SIZE, MAJOR PARTS, WEIGHT AND MODULAR DESIGN

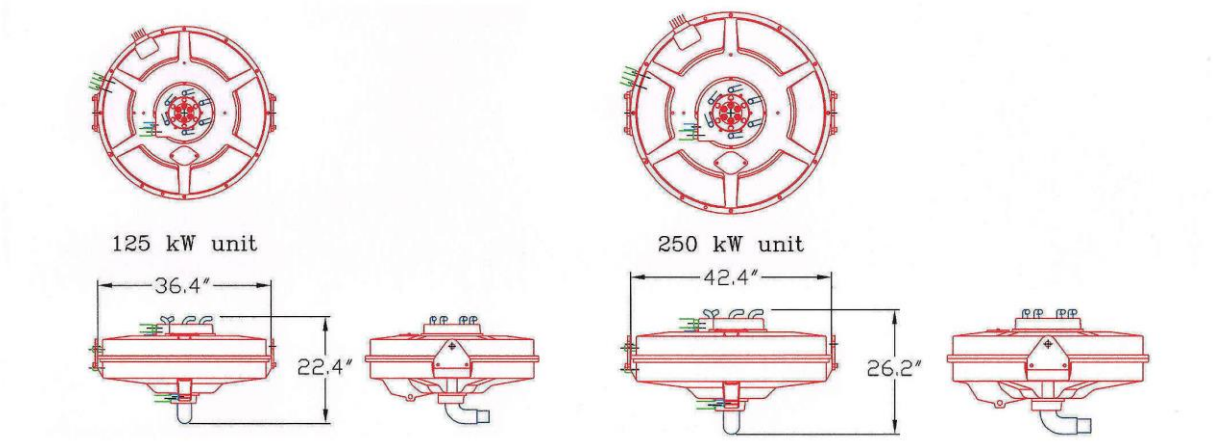
There are 282 basic parts (not counting ancillaries) comprising a 125 kW Eng/Gen. This compares to 1,150 basic parts (not counting ancillaries) in a typical four cycle 125kW, internal combustion engine mechanically connected to a separate generator as shown in Figure 1.

The illustrations in **Figure 1**, (right) show a conventional engine and generator configuration.

In a typical 125 kW unit;
A = 8' - 8"
B = 3' - 7"
C = 5' - 1"
Weight = 2700 lbs. total

In a typical 250 kW unit;
A = 11' - 4"
B = 5' - 0"
C = 5' - 11"
Weight = 6,090 lbs. total





In **Figure 2** (above) a size comparison of a 125 kW Eng/Gen versus a 250 kW Eng/Gen (both shown without ancillaries), is presented. There is only a 16.5% difference in size!

In a 125 kW Eng/Gen unit;	In a 250 kW Eng/Gen unit;
Diameter = 3' - 0.4"	Diameter = 3' - 6.4"
Height = 1' - 10.4"	Height = 2' - 2.2"
Weight = 1,250 lbs.*	Weight = 1,456 lbs.* (estimated @ +16.5%)

*Note: weights of the Eng/Gen units are shown without ancillaries (radiator, fans, fuel pumps etc.) accurate sizing of the ancillaries and weight calculations will be done with prototype development.

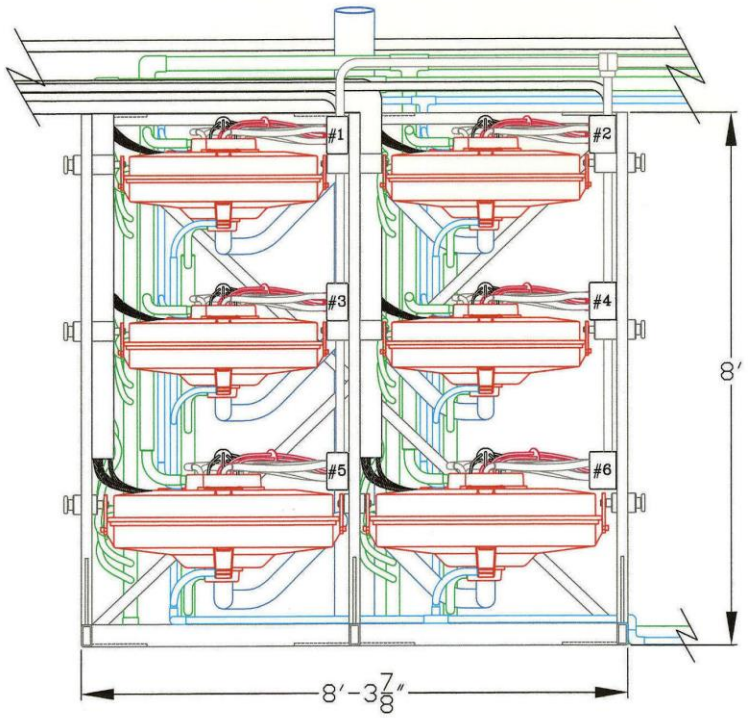
The illustration in Figure 2 clearly shows the advantages related to size and weight for the Eng/Gen. As the output increases, the benefits of size and weight increase disproportionately. This illustrates the highly beneficial scaling capability of the Eng/Gen technology. The bigger, the better!

Figure 3

1 Megawatt System

(6) Eng/Gen Units

1 thru 4 = 125 kW Units
5 thru 6 = 250 kW Units



The modular design concept is shown (above) in Figure 3. In the above modular design the advantages of efficiency should be clear. Running a single conventional one megawatt generator is not practical if the demand is only 125 kW. The Eng/Gen system shown, allows the ability to operate one or more individual units to produce the power needed. The advantages related to efficiency and dependability are obvious. When demand is low, any of the units in the system can be shut down, maintained or even replaced without interrupting the power output of the entire system.

5.0 TECHNOLOGY DEVELOPMENT PLAN

5.1 Development Objectives

The objective is to use the current 3D baseline conceptual design as a starting point for bringing the technology to a Technology Readiness Level 8 "Eng/Gen system completed and qualified through test and demonstration." At completion of the development plan, the technology will be proven to work in its final form and under expected conditions. TRL8 represents the end of true system development where the Eng/Gen will be tested, evaluated and verified that it meets design specifications. At this point, performance validation is complete and the technology will be ready for commercial roll out.

5.2 Development Plan

Russell Energy Corporation will initiate work on executing the four phase development concept plan described below.

Phase 1: Concept Study - Russell Engine

- Conceptual Design including power cylinder assembly, cam plate features, combustion system, arrangement of fuel injectors, spark plugs, exhaust valves and in-cylinder charge motion
- Cycle Simulation construct computer model to be used extensively in the conceptual phase of development to assess engine performance, cam track options for piston motion. Parametric studies of the model will allow various compression and expansion profiles to be evaluated and an optimum combination to be selected.
- Create a high level DFMEA (Design Failure Mode and Effect Analysis) to identify the areas of highest risk which will require more in-depth studies for the detailed design and subsequent durability development of the engine.
- Schedule; 8 - 10 weeks
- Engineering costs: $125,000 - $175,000

Phase 2: Proof of Concept Objectives

- Develop a 1st generation Engine design; develop cost effective prototype; design and detail components for procurement
- Procure and assemble 2 prototype Engines; identify manufacturing/assembly issues
- Bench testing; prove-out concept, identify initial durability issues
- Schedule; 10 – 14 months
- Engineering costs: $1.8M - $2.2M; Hardware costs: $0.5M- $1.2M

Phase 3: Mechanical Development Objectives - Eng/Gen

- Detailed design; productionize most components/systems/ solve performance and durability issues, design for manufacturing processes and high volume assembly, integrate component and assembly supplier feedback
- Procure and assemble prototypes; identify manufacturing/assembly issues
- Bench testing; durability testing (10-15 Eng/Gens), calibration and combustion development
- Schedule; 10-14 months with a 6-8 month overlap with Phase 2
- Engineering costs: $1.8M - $2.6M; Hardware costs: $1.0M - $1.5M

Phase 4: Reliability Growth Objectives

- Detailed design; all components/systems designed for production, develop solutions for durability issues, integrate component and assembly supplier feedback
- Procure and assemble prototypes; procure components using "Make Like Production" (MLP) processes; identify manufacturing/assembly issues
- Bench testing; durability testing (30+ Eng/Gens), calibration and combustion development
- Schedule; 12-24 months; 2-3 month overlap includes long lead MLP parts
- Engineering costs; $2.6M - $3.0M; Hardware costs: $2M - $10M depending on suppliers

6.0 BUSINESS STRATEGY

6.1 Mission Statement

The Russell Energy Corporation strives to provide the benefits and security of electrical power to all people in the most dependable, affordable and environmentally considerate manner possible.

We are dedicated to the advancement of American job growth, a growing American economy, product quality, and an earned reputation for business integrity.

6.2 Business Model

The Company's principal goal is to transform its patent portfolio into a product development and licensing business which results in significant job creation in the U.S. A primary focus is to use a strategic partnership model to commercialize the patented Russell Eng/Gen technology. This includes developing collaborative agreements with experts and innovators in the design, development, testing, manufacturing, marketing, servicing and the distribution of Engine/Generator units and ancillary support products.

To complete development of prototype units and to commercialize the Eng/Gen, the company is seeking capital from strategic partners for preferred treatment as a supplier, manufacturer, markets and/or service supplier. At least one strategic partner will have manufacturing capabilities in place which can be used to produce the Eng/Gen. Through strategic alliances and licensing, the company will forgo investment in manufacturing infrastructure necessary to support the launch of the initial 125 kW market introduction unit and other products of various power output. The timing for obtaining marketing or licensing arrangements will depend on successful achievement of product development milestones and demonstration products identified in the product development plan. A relatively small amount of capital and time is needed to complete the design and manufacture of a commercial prototype suitable for field demonstration to document readiness for broad scale commercialization.