

CLEAN ENERGY GENERATION SYSTEM

FIELD OF INVENTION

The present invention relates to a clean energy generation and storage system using fluid and a plurality of spherical floatable-loads circulating within the system to generate clean energy.

BACKGROUND

Many nations are awakening to the real threat of climate change and are implementing urgent measures to reduce use of fossil fuel and replacing them with renewable energies especially wind and solar. However, both these renewable energy source face the same problem of intermittency as the amount of wind and solar are unpredictable and resulting in constant disruption. In adopting such renewable energies, we have to also rely heavily on Battery Electrical Storage System (BESS) which is costly, flammable and expensive to maintain. In the case of solar renewables, the life-span of the PV panel and batteries is currently short (estimated to last about 10-years) and both the PV-Panels and batteries in itself are likely to create another huge problem in the near future with the environmental need to recycle them when they are replaced (especially once its efficiency drop) by cheaper (and more efficient) panels/batteries.

Various green energy solutions using solar cells and wind turbines have been proposed. A recent snow storm in Texas has shown that wind turbines cannot work in freezing temperatures. Both wind turbines and solar cells require scarce resources to manufacture and upon expiry of useful life, disposal of wind turbines and PV-Panels poses more challenges.

In Singapore, and places where land costs are very high, green energy solutions such as wind turbines, solar farms as well as pumped hydro with hydroelectric dams are not feasible. It is desirable that a clean yet cheap resource to generate energy in land scarce Singapore be proposed which does not take up too much land. Since Singapore
5 has many high rise buildings, it is proposed that a system of generating electrical energy taking advantage of the natural gravitational forces and the abundance of tall buildings and vertical air-space be considered.

DISCUSSION OF PRIOR ART

10 US 6,445,078 discloses a system of gravity generation of electricity which includes upper and lower water reservoirs with a conduit between the reservoirs and a pump to continuously pump water from the lower reservoir to the upper reservoir. A number of water containers are positioned side-by-side and mounted for up and down travel
15 between the upper and lower reservoirs. When the containers have attained their upper most position at the upper reservoir, they are engaged by limit switch mechanisms to fill the containers with water from the upper reservoir. The filled containers travel by gravity to their lower most position to the lower reservoir wherein additional limit switch mechanisms are employed to drain the containers into the bottom reservoir. As the
20 containers travel downwards, they engage and drive an electric generator to generate electricity. Once the containers are at their lower most position and have been fully drained, they are driven back to the upper reservoir for refill.

US Publication No. 2009/0115195 A1 describes a gravity power generation mechanism
25 using a gravity energy conversion unit to convert the gravitational potential energy into the kinetic energy. The gravitational energy conversion unit produces positive torques by adopting outward-spreading single directional swing arms and reduces the negative torques by cooperating with the folding action of the single directional swing arms, so as to perform a long-time, effective and continuous energy conversion of converting gravity
30 potential energy into the kinetic energy. Next, the kinetic energy will be transmitted to a power generating unit to perform another energy conversion of converting the kinetic

energy into the electric energy. And finally, a power supply system is used to transmit out the electric energy.

SUMMARY OF INVENTION

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A first object of the Invention is a Clean, Uninterrupted and Self-contained Energy Generating System, consisting of :-

The Energy Generation System

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The Energy Generation System, comprising at least two rotatable wheels with a connecting belt mounted on the said wheels, said belt with a plurality of Load Collectors;

The Load Return System

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The Load Return System consists of :-

a. A Top Reservoir, to receive and accumulate a plurality of Spherical Floatable Loads ("Spherical Loads");

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b. A Bottom Reservoir to receive and accumulate said Spherical Loads;

c. A Load Return System containing fluid for said Spherical Loads released from Load Collectors and accumulated at the Bottom Reservoir to be returned to the Top Reservoir;

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wherein energy is generated by a process of the Load Collectors receiving Spherical floatable Loads from the Top Reservoir, moving the Load Collectors downwards and said spherical loads returned to the Top Reservoir to repeat the process.

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Preferably, the Load Collectors release their Spherical Loads at the Discharge Point, and the empty Load Collectors are moved upwards to the top, by the opposite downwards gravitational pull of descending Load Collectors with their Spherical Loads.

- 5 Preferably the Top Reservoir receives spherical loads from the Load Return Tube, which then move from the Top Reservoir into the Load Distributor, to be loaded at the Loading Point into the plurality of empty Load Collectors ascending to the top of the Energy Generation System to receive another Spherical Load.
- 10 Preferably the Bottom Reservoir receives Spherical Loads released from the Load Collectors at the Discharge into the Load Receiver which then transfer the spherical loads into the Bottom Reservoir.

Another object of the invention is a Load Return System which consists of an elongate
15 Vertical Load Return Tube, with a bottom end connected by a Bottom Release Valve of the Bottom Reservoir and a Bottom Reservoir Valve at the end connecting to the Bottom Return Tube from the Load Receiver.

Preferably the Load Return System opens a Bottom Release Valve when the Top
20 Release Valve is in a closed mode, to allow the spherical loads to rise up to the top of the Load Return System through the fluid inside the Vertical Load Return Tube.

Preferably when the Spherical Loads in the Load Return System are floating upwards, the Load Return System opens the Top Release Valve after closing the Bottom Release
25 Valve.

Alternatively the Load Collectors are moved by chains and two or more wheels.

A final object of the invention is a method of generating clean energy using the Clean
30 Energy Generating System, wherein the Clean Energy Generating System operates a cycle to move:-

- a. A plurality of Spherical Load inside the Load Collectors ~~Receivers~~ move downwards within the Energy Generation System, to rotate at least two rotatable wheels of the Energy Generation System, generating electrical energy through the Electrical Generator System.
- b. The spherical loads in the Load Collectors are released from the into the Load Receiver at the Discharge Point as it reaches the bottom of the Energy Generation System,
- c. Said spherical loads accumulated in the Bottom Receiver;
- d. Said spherical loads are ~~released and~~ returned to the Top Reservoir through the Load Return system, to re-start the next the Energy Generating System cycle

The above objects and other objects, features, and advantages of the present invention will be readily appreciated by one of ordinary skill in the art from the following detailed description of the best mode for carrying out the invention when taken in connection with the accompanying drawings

BRIEF DESCRIPTION OF THE DIAGRAMS

For a better understanding of the invention, its advantages, and the objects attained by its use, reference should now be made to the accompanying drawings. The accompanying drawings illustrate one or more embodiments of the invention and together with the description herein, serve to explain the workings and principles of the invention. The diagrams by no means restrict the invention to only what is shown.

Fig 1 shows an illustration of a preferred embodiment of the invention (namely the Energy Generation System, the Load Return System and the Electrical Generator System).

Fig 2 shows the 1st Phase in the working of the invention.

Fig 3 shows the 2nd Phase in the working of the invention.

5 Fig 4 shows the 3rd Phase in the working of the invention.

Fig 5 shows the 4th Phase in the working of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT OF THE INVENTION

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The present inventive Clean, Uninterrupted and Self-contained Energy Generating System converts gravitational energy into kinetic energy by dropping the desired-loads which drive a Wheel-Belt-Assembly but with the use of buoyancy force principle the spherical loads are floated back to the top-level of the system to complete the cycle for energy-generation and then continue the next cycle of energy-generation achieving a Closed-Cycle system. This invention allows variation of load to meet the required electrical output. As the loads are made of very stable materials (such as Lead) and are reused within the Closed Energy Generating system, it is expected to last for a very long period of time (exceeding 50-years). All parts within the system can also be easily reconfigured, dismantled and redeployed in another location and in another different scale of energy production without any degradation.

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The present invention can be implemented in a tall structure such as unused building converted to perform the invention. For instance, two or more number of lift shafts may be converted to implement this invention.

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The present invention will integrate with the Electrical Generator System comprising of flywheel, a motor, gears, generators and an Electrical-control components to convert energy generated by the system into electrical energy for direct usage or to be stored in an electrical power storage facility.

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The control system may also be managed by software designed for the smooth operation of the systems.

The various components of the invention is described with reference to Fig 1.

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Fig 1 shows a cross section of the Clean Energy Generating System.

The main parts of the Clean Energy Generating System are now described with reference to Fig 1.

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The System is housed in a tall structure. The present invention is scalable and has a small footprint.

The system is supported by vertical support frames, within which is an energy generation system using spherical loads, a system discharge the loads to generate energy and return the spherical loads. The structure has an top reservoir, a bottom reservoir. The energy generation system **can take** the form of a Light-weight-structure) with wheels and belt in which a plurality of spherical load collectors spaced apart on the belt. The spherical load collectors would circulate downwards and then upwards continuously. A plurality of spherical loads would be contained in the top reservoir and loaded into each spherical load collector from the feeder/s of the Load Distributor. When the spherical load collector reaches the Discharge point in the Energy Generation system, the spherical load collector would discharge its spherical load into a load receiver.

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The load received passes through a bottom return tube (Valve-A) leading to a bottom reservoir. The spherical loads are then contained in the bottom reservoir and as described in a later section, these spherical loads are to then passed through a **vertical** load return tube to be returned to the top reservoir. From thereon, the spherical loads would go through another cycle in the Energy Generation System to generate energy.

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The Clean Energy Generating System has a number of Synchronised-valves which would open and close to release fluid and or spherical loads from the bottom reservoir, through the Load Return System, back to the top reservoir after moving downwards through the Energy Generating System.

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Energy Generation System

The Energy Generation System may consists of Wheels and Belt to carry a plurality of Load Collectors hingely connected to the Belt. The connecting Belt then turns the
10 wheels with the Load Collectors to receive a number of spherical loads which then by its weight and gravitational force moves the Load Collectors downwards. The Belt **connects and drives** the top wheel and a bottom wheel. The downward movement of the load inside the Load collectors drives the lower wheel that will integrate to a Electrical Genertor System to generate electrical energy.

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Water (or other fluid)

Water (or other fluid) is selected as the medium for conveying the spherical loads upwards and within the system because of its density and low costs. In temperate
20 countries where water may freeze, a mixture of water and anti-freeze **additive** may be considered. Other fluids which meet the low costs and density requirements vis-a-vis spherical loads may be proposed.

Spherical loads

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The material proposed for the core weight of the floatable spherical load in this invention is lead. A number of other suitable materials which are appropriately heavy and cheap may be used.

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Load collectors

The load-collectors would receive the spherical loads from the spherical loads collected in from the top reservoir via the Load Distributor. The load collectors are hingely
5 connected to the belt of the wheel and belt assembly. When the load collector reaches the bottom of the belt and wheel system, the bottom release-flaps in each load collector would open to discharge the spherical loads in that load collector into a load receiver.

Load Receiver

10 The Load Receiver would receive the spherical loads which would then move the spherical loads through a Bottom Return Tube at the base of the load receiver into a bottom reservoir. The Load Receiver is partially filled with water, and has a Bottom Reservoir valve which opens and closes, to allow water and spherical loads to be
15 moved downwards into the bottom reservoir.

Top Reservoir

The Top Reservoir is an enclosure to receive the spherical loads and to discharge the
20 same through a Load Distributor into the plurality of load collectors of the wheel and belt component. It is connected by an open and close Top Release Valve to in the Load Return System which operates to allow spherical loads to return from the Bottom Reservoir through the Vertical Load Return Tube.

Load Distributor

25 Spherical loads are accumulated from the Top Reservoir and loaded into load collectors from the Load Distributor.

Bottom Reservoir

The Bottom Reservoir is an enclosure to receive the spherical loads which are discharged from the load collectors having accumulated there after discharge from the Load Collectors. The Bottom Reservoir is connected to the Load Return System by an open and close Bottom Release Valve which operates to open to allow spherical loads to return from the Bottom Reservoir.

Vertical Load Return Tube

The Vertical Load Return Tube is an elongate vertical tube with a number of valves which open and close to move the spherical loads within the Load return system to release the spherical loads which have accumulated at the bottom reservoir back to the top reservoir, for another new cycle of loading onto the load collectors.

The elongate vertical tube has a bottom release valve connected to the bottom reservoir and a Top release valve connected to the Top reservoir.

While the spherical loads are brought down by the spherical load collectors and then discharge into a load receiver at the bottom of the Clean Energy Generating System, the spherical loads are brought to the top reservoir by a Load Return system. The Vertical Load Return Tube is an elongate vertical tube with a bottom valve and a top valve. The bottom valve opens and closes to allow the spherical loads to be released and move into the vertical Load return tube. The spherical loads then float upwards. When sufficient number of spherical loads are pushed upwards to gather at the top of the elongate vertical tube, the top valve opens (after the closing of the bottom valve) to allow spherical loads to be released into the top reservoir via the Top Return Tube. As a fluid medium is used, the spherical loads would float up the elongate Vertical Load Return Tube before being released into the top reservoir, thus being conveyed upwards to the top reservoir, to begin the next new cycle of energy generation, with minimal use

of power or energy, either from the Clean Energy Generation System or from another energy source.

Control System

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Such a synchronised Uninterrupted Closed Clean Energy Generating System would require proper coordination and controlled timing and movements to ensure smooth operations. While such a control system is necessary, such control systems are known and includes computers,(sensors, timers, RFID) a motor to pump water into the circulation system and other devices including sensors to monitor operating parameters. As such, no further details or features of the Control system are given.

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Harnessing of Energy generated

15 The clean energy generated is harnessed using mechanisms known in the art and as such would not be described herein.

Operations of the Clean Energy Generating System

20 The operations of the Clean Energy Generating System would be described in relation to Fig 2 to 5.

Fig 2 shows the 1st phase in the working of the invention. Spherical loads are released from the Top Reservoir into the Load Distributor which directly discharges sufficient weight of the spherical loads into a 1st Load Collector directly below an discharge outlet of the Load Distributor. Once the 1st Load Collector is loaded, the Energy Generation System would move the 1st Load Collector downwards and a 2nd Load Collector would move forward so that the top of the 2nd Load Collector is directly below the discharge outlet of the Load Distributor. Again the Load Distributor discharges sufficient weight of the spherical loads into the 2nd Load Collector. As the

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Load Collectors are loaded with objects with heavy weight, the Load Receivers would rapidly descend downwards.

Fig 3 shows the 2nd phase in the working of the invention. When the Load Collectors reaches the bottom (" Bottom-discharge point ", being the lowest point of the Energy Generation System), the release flaps in the base of Load Collector would open to release the spherical loads into a Load Receiver. The Load Receiver would continue to receive spherical loads until a sufficient weight of spherical loads are contained in the Load Receiver. A Bottom Return Tube with an Open and Close Discharge Valve would then be opened to allow the spherical loads to be discharged moved from the Load Receiver through a Bottom Return Tube into a Bottom Reservoir.

Fig 4 shows the 3rd phase in the working of the invention.

When sufficient weight of spherical loads are contained in the Bottom Reservoir, the Discharge Valve will closed to activate the Replacement Fluid (from a Fluid Make-Up Tank) to fully fill the empty volume within the Bottom Reservoir. Then Bottom Release Valve connecting of the Bottom Reservoir to the Vertical Load Return Tube would be opened to allow spherical loads to float through into the Vertical Load Return Tube to the top Return Tube. In the meantime, when the Bottom Release Valve (Valve B) is opened to allow the spherical loads to float upwards through the Vertical Load Return Tube, the Top Release Valve-A (which leads to the Top Reservoir) is closed, so that all the spherical loads going through the Release and Return System may reach the top. This is to partly ensure the Water in the Vertical Pipe will not flow backwards.)

Fig 5 shows the 4th phase in the working of the invention.

When all the spherical loads are floating at the top, and remaining spherical loads are still rushing upwards through the Vertical Load Return Tube, the Top Release Valve (Valve C) at the upper-end of the Vertical Load Return Tube is only allowed to opened (to allow Spherical loads to enter into the Top Return Tube after the Bottom Release

Valve (Valve-B) is fully closed. Top Release Valve would close after all the Spherical loads have floated pass the Valve-C into the Top Reservoir through the Top Return Tube .

- 5 Once the spherical loads have floated through the Vertical Load Return Tube into the Top Reservoir, water inside the Bottom Reservoir will be partially drained (by pumps) into the Water Make-Up Tank to the defined water-level below the lowest-point of the Bottom Return Tube.

- 10 The steps are continuously repeated resulting in two cycles :-

(a) Generation of energy through downward-movement of the Loads in the Load Collectors

- 15 This is achieved by movement of spherical loads from the Top Reservoir through the Energy Generation System, thereby generating energy from the gravitational movements of the falling-loads in the Load Collectors.

- Release of spherical loads (which are floatable) into the bottom reservoir allows the
- 20 empty and light Load collectors to easily float to the top, using water as a medium of flotation.

(b) Return of Spherical Loads to Top Reservoir

- 25 This is achieved by release of accumulated spherical loads at the Bottom Reservoir through the Vertical Load Return Tube using floatation of the spherical loads in a fluid medium to move the spherical loads from the Bottom Reservoir to the Top Reservoir.

- Once the empty Load Collectors reaches the top, it is ready to receive another Load of
- 30 Spherical Loads as it circulate back to the Loading Point. Once the Spherical Loads

reach the Top Reservoir, these are then ready to be loaded with the Spherical Load to start another cycle.

Other embodiments

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While a preferred embodiment of the Energy Generation System has been described, it should be apparent, however, that various modifications, rearrangements, substitutions, alterations and adaptations to those embodiments may occur to persons skilled in the art with the attainment of some or all of the advantages of the present invention.

10 Accordingly, it should be clearly understood that the present invention is not intended to be limited by the particular features and structures hereinbefore described and depicted in the accompanying drawings. It is therefore intended to cover all such modifications, alterations and adaptations without departing from the scope and spirit of the present invention as defined by the appended claims.

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ADVANTAGEOUS EFFECTS OF THE INVENTION

The present invention is scalable and having a small area footprint may be implemented in a tall and narrow structure even in a lift shaft in old buildings. It may be independently housed as an attached structure added to the side or back of tall buildings. In land
20 scarce Singapore, this invention would be easily and readily implemented to generate electrical energy for the users in the vicinity of such energy generating system.

The present invention may also be designed and built to fit any confined space inside a building, be it an office building or an apartment.

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Finally, the low set up cost with use of relatively low costs (fully recyclable spherical loads and close-system fluid design in the Load return system would mean this inventive energy generating system may be easily set up and operated by a small group of owners in a building or even a condominium.

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Thus this present invention gives it a massive Cost and operational advantage over other types of clean and ~~green~~ renewable energy systems in Singapore as well as other countries.

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CLAIMS

1. A Clean, Uninterrupted and Self-contained Energy Generating System, consisting of:-

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a. An Energy Generation System, comprising at least two rotatable wheels with a connecting belt mounted on the said wheels, said belt with a plurality of Load Collectors;

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b. A Top Reservoir, to receive and accumulate a plurality of Spherical Loads;

c. A Bottom Reservoir to receive and accumulate said Spherical Loads;

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d. A Load Return System containing fluid for said Spherical Loads released from Load Collectors and accumulated at the Bottom Reservoir to be returned to the Top Reservoir;

wherein energy is generated by a process of the Load Collectors receiving Spherical
20 Loads from the Top Reservoir, moving the Load Collectors downwards and said spherical loads returned to the Top Reservoir to repeat the process.

2. A Clean Energy Generating System of Claim 1, wherein energy is generated when Spherical Loads are received into the Load Collectors from the Top Reservoir, the
25 weight of Spherical Loads in each Load Collectors turning the Energy Generator to generate energy as the Load Collectors moves downwards towards the bottom of the System due to gravitational pull.

3. A Clean Energy Generating System of Claim 1, wherein said Load Collectors release
30 their Spherical Loads at the bottom of the Energy Generator, and the empty Load

Collectors are circulated upwards to the top, by the opposite downwards gravitational pull of descending Load Collectors with their Spherical Loads.

4. The Clean Energy Generating System as claimed in Claim 1, wherein the Top Reservoir receives spherical loads from the Release and Return System, which then move from the Top Reservoir into the Load Distributor, to be discharged from a discharge point in the Load Distributor into the plurality of Load Collectors ascending to the top of the Energy Generator to receive another Spherical Load.

5. The Clean Energy Generating System as claimed in Claim 1, wherein the Bottom Reservoir receives Spherical Loads released from the Load Collectors into a Discharge Point of Load Collectors, which then releases the Spherical Loads from the Load Collectors to a Load Receiver which move the spherical loads into the Bottom Reservoir.

7. The Vertical Load Return Tube as claimed in Claim 1 consisting of an elongate vertical tube, with a bottom end connected by a Bottom Release Valve (Valve-B) of the Bottom Reservoir and a Discharge Valve at the end of the discharge outlet leading from Load Receiver.

8. The Load Return System as claimed in Claim 1, wherein the Top Release Valve (Valve-C) is Closed while the Bottom Release Valve (Valve-B) is opened to allow fluid to float the spherical loads upwards through the Vertical Load Return Tube to the top of the Load Return System.

9. The Load Return System as claimed in Claim 1 wherein the Spherical Loads in the Load Return System are floating upwards, the Load Return System opens Top Release Valve and at the same time closes Bottom Release Valve.

10. The Clean Energy Generation System as claimed in Claim 1, wherein the Load Collectors are moved by a belt and two or more wheels.

11. The Spherical Loads as claimed in Claim 1, wherein the Spherical Loads are selected from materials which allows it to float in the fluid used in the System.

12. The Fluid used in the Load Return System as claimed in Claim 1, wherein the fluid is water.

13. The Fluid used in the Load Return System as claimed in Claim 1, wherein the fluid is selected to allow the Spherical Loads to float upwards.

14. A method of generating clean energy using the Clean Energy Generation System as claimed in Claim 1, wherein the Clean Energy Generation System operates a cycle to move:-

- a. A plurality of Load Loaded unto the Load Collectors move downwards in the Energy Generation System, to move at least two rotatable wheels of the Energy Generation System, generating Kinetic energy with the downward movements of the Load Collectors,
- b. The spherical loads in the Load Collectors are released from the Load Collectors when the Load Collectors reaches the bottom of the Energy Generation System,
- c. Said spherical loads accumulated in the Bottom Receiver;
- d. Said spherical loads are released and returned to the Top Reservoir through the Load Return system, to continue the cycle.