



ECO WASTE SOLUTIONS



- **Managing** Risk
- **Eliminating** Waste
- **Maximizing** Resources



our company: **Eco Waste Solutions**



Eco Waste Solutions (EWS) is a Canadian environmental technology company focused on point-of-need waste management solutions.

EWS' Eco Waste incineration systems offer a sustainable waste management alternative for customers, typically in remote locations, where traditional waste disposal options are not feasible.

These technologically-advanced yet easy-to-use systems are field-proven in extreme locations such as high-arctic regions, tropical climates and high elevations. This track record, in addition to environmental performance and product durability sets EWS apart from other incinerator suppliers worldwide.

EWS is a privately held enterprise, based in Burlington, Ontario. Established in 1994, we have earned a strong following within a number of key industries by demonstrating leadership in design-quality, environmental integrity and excellent customer service. Our clients in the mining industry, oil & gas industry and the military have demanding and highly specific requirements. We understand that these industries require vendors that offer robust reliable equipment that allows them to uphold commitments to environmental protection and worker safety. These are important values to EWS also. Our company has made great efforts to balance these goals with the need to be cost-effective. The result is a product line that has excellent credentials and is quickly becoming known as the benchmark in our industry.

Our business centers on partnering with our clients to produce a customized solution. Our in-house expertise includes project planning services, regulatory guidance, engineering, product design and fabrication. Project implementation services include dedicated project management and controls, permitting assistance, installation supervision, system start-up, operator training, technical support, contract and/or demand maintenance.

our credentials

Environmental Technology Verification (ETV) Program

The ETV Program is a joint Environment Canada - Industry Canada initiative delivered by ETV Canada Inc. The ETV Program is designed to support Canada's environment industry by providing credible and independent verification of technology performance claims.

The Eco Waste Oxidizer (ETV 97005) and Bio Waste Oxidizer (ETV 00005) air emission data performance claims have been verified by Environment Canada's ETV Program.

Quality Assurance Certification ISO 9001:2008

EWS is committed to Quality Assurance. Our quality policy is customer-centric and ensures that continuous improvement is achieved using valuable customer feedback. To make certain that this process continues EWS follows an ISO 9001:2008 Quality Management System.

Global Patents

EWS has been awarded patents in Canada, the U.S. and in Europe for its unique thermal waste treatment process.



eco waste solutions experience: field proven

20 years of experience working in remote locations and extreme climates

The majority of our projects are in remote regions of North and South America. In these locations, traditional waste management options are not always appropriate, and in some areas have caused considerable environmental damage. Alternative options, such as shipping waste elsewhere, are simply not practical and may increase the risk of accidental contamination and exposure to liability. A point-of-need solution is the only sound sustainable approach for many remote camps and communities.

In many cases, disposal of waste by incineration is mandated by local environmental regulations in order to protect local wildlife that may otherwise be attracted to the waste disposal site. In some regions dangerous predators pose a significant threat to worker safety. Incineration can help minimize this risk.

In addition, some EWS clients apply the technology to treat biomedical waste and/or animal carcasses.

Upon request, we would be happy to provide you with references in your industry.



Managing Risk

■ waste disposal: a complex problem



Waste Oil & Hazardous Liquids



Medical Waste



Sewage Sludge/Latrine Waste



Non-hazardous Solid Waste

■ addressing waste disposal requirements

EWS has made significant investments in Research & Development to innovate our technology. However, our products have been **fully commercialized and successfully operated since 1994**.

EWS offers a range of customized packages to meet specific waste management needs. The product line includes: small two-stage controlled air batch incinerators in capacities from 100 – 10,000 kg of solid waste per cycle, containerized mobile incinerators, liquid waste processors and continuous operation systems in modules of up to 100 tonnes per day.

Waste heat recovery is available with any of the packages. Systems can produce a range of valuable by-products including **hot water, steam and power**. Our engineering team will design, integrate and develop a total package including maximum achievable control technology air pollution control equipment, continuous emissions monitoring and our industry-leading controls package with the best in data monitoring and recording. This equipment is proven to meet the strictest air emission requirements in the world today.

The Eco Waste Oxidizer system can process a range of waste materials generated on-site. Waste materials do not require special treatment before processing. The following is a list of some of the potential waste streams that can be effectively processed in our system.

Waste Materials Suitable for Processing in Eco Waste Solutions Technology

■ Solid Waste	Description	Origin
Food Waste	Food, food packaging and containers, plastic and paper waste from food preparation	Kitchen and dining areas
Domestic Waste	General refuse such as paper, plastics, cans, bottles, cardboard, newsprint	Dormitory areas or households, recreation facilities, office areas, warehouse, plant and production facilities
Packaging	Cardboard boxes, paper, plastic containers, plastic film, styrofoam, poly-weave bags	Consumer goods and industrial and/or commercial supplies
Wood Waste	Skids, pallets, crates, including wood materials contaminated with chemical residues	Industrial and Commercial: Construction activity, inbound supplies, reagent and chemical packaging.
Absorbents	Rags, wipes, spill cleanup materials	Industrial
Filters – Air and Fluid	Filters coated with fine particles and trapped solids, saturated with water or fluids (glycol, lube oils, fuel)	From water treatment facility, or generated at industrial sites from maintenance of vehicles, machinery and equipment
Medical Waste	Bandages, dressings, gloves, swabs, syringes, sharps	Medical clinic or first aid centre
Tires & Rubbers	Tires, belts, hoses	From vehicles and equipment maintenance shops
■ Liquid Waste	Description	Origin
Glycol	Used antifreeze	From vehicles and equipment maintenance shops
Used Oils	Used lubricating and hydraulic oils, including synthetics	From vehicles and equipment maintenance shops
■ Semi-Solid Waste	Description	Origin
Sewage Sludge	Dry filter cakes	From sewage treatment plant dewatering equipment
Kitchen grease, oils	Solid kitchen fats, grease, used cooking oil	Kitchen grease traps, fryers

Eliminating Waste

our technology

EWS has field-proven advanced waste management solutions, in mobile and fixed packages, and innovative waste-to-energy applications. We address the needs of large and small populations, and have provided solutions for global armed forces, communities and resource industry operations.



■ Cleaner Burning:

- **Best Available Technology:** utilizes 2-second retention at 1832°F (1000°C) for maximum pollution control
- **Tested, Proven and Verified:** Air emissions tested by accredited independent laboratories including Environment Canada, with verification under the ETV (Environmental Technology Verification) program
- **Air emissions meet US EPA Standards** with lowest levels of Dioxins & Furans
- Ash residual meets US EPA TCLP standards: non-toxic, non-hazardous, non-leaching
- Waste input is reduced by over 90% to safe, inert residual

■ Better Built:

- **Simple to use:** 1 button operation, automated operation does not require oversight
- No special handling/pre-processing of waste
- Robust, heavier grade materials, and few moving parts for long equipment life
- Easy in-field maintenance
- **Proven in-the-field, reliable with maximum uptime**
- Strict quality control standards
- ISO 9001:2008 certified manufacturer

■ More Advanced:

- **Patented in the US, Canada and EU:** process designed to achieve the cleanest possible emissions commercially available today
- **Award-winning** company recognized for world-leading clean technology
- Modular design is **scaleable** to meet a range of capacities, without the need for lengthy on-site construction projects
- Innovation: **4th Generation Control Technology** (PLC based, real-time remote monitoring, graphic interface with touch-screen)
- Innovation: **Mobile/Containerized system:** Modular Concept evolved to meet NATO standards including EU-compliant air pollution control package, continuous emission monitors all in a rugged, "plug & play" containerized design with special base-frame to minimize infrastructure (eliminates need for a concrete pad)

batch process overview

Batch processing involves the conversion of waste materials as a single batch load without disturbance to the waste bed and without adding more waste until the completion of the cycle. This design produces a much cleaner emission and removes the need for constant attendance to the process which is fully automated after loading and starting the machine.

The EWS batch feed system technology utilizes a starved-air (pyrolysis) combustion process to burn the waste. In the first stage a burner is used to elevate the temperature of the Primary Chamber, to the point of sustained combustion at 600°C-850°C (1200°F -1560°F). In this stage, which is designed to utilize minimal oxygen levels, the process becomes self-fueling and continues until the original waste volume and weight is reduced by over 90%. The original solid waste is gasified (converted to gas) while the non-combustible portion remains as residual ash which is non-hazardous, non-leaching and essentially inert.

As waste burns in the Primary Chamber, the gases generated, enter the high temperature, richly oxygenated and turbulent conditions of the Secondary Chamber for cleansing. This stage of the process is complete after the gases are retained for two seconds at an internal temperature of 1000°C (1832°F). EWS' proprietary control system ensures a consistent, thorough processing and the cleanest possible thermal treatment. The process is fully automated and does not require an operator in attendance to oversee the complete cycle once in progress.

After the completion of the burn and cooling cycles, residual materials are removed by manual or automated means and the complete process is repeated.

These packages may require an Air Pollution Control (APC) system, or Scrubber, to meet local environmental regulations. All EWS systems can be outfitted with an APC to further cleanse and neutralize exhaust gases to ensure compliance with local air emission standards.

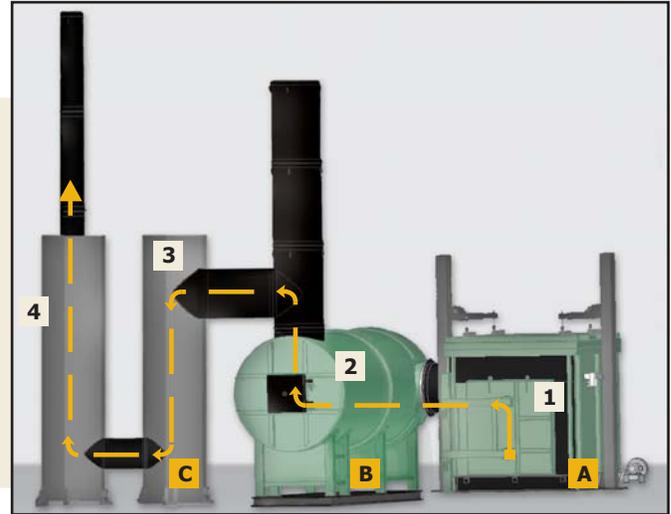


Eliminating Waste

ECO Model Process Overview

- A. Primary Chamber**
solid waste combustion
- B. Secondary Chamber**
combustion of gases from Primary Chamber
- C. Optional Air Pollution Control**
(Wet Scrubber Shown)
additional cleansing of gases if required

1. movement of gases to secondary chamber
2. high temperature and turbulent environment
3. rapid quench cooling gases
4. scrubbing of gases



batch models

ECO Model

The ECO Model is a custom-sized waste disposal system processing **from 1 to 10 tonnes per day**. The ECO Model features one or two large Primary Chambers that can accommodate unsorted waste including large bulky items.

The ECO Model operates in a **one-batch-per-day fashion**. The burn cycle is generally 8 to 12 hours followed by a 6 to 10 hour cool down. The complete process, including time for loading and ash removal, takes place over 24 hours. This model can be outfitted with various options to automate waste loading.

This model has an **extremely low labour requirement** as the Operator only interfaces with the equipment once a day. Once the ash residual from the previous day's waste is removed, the operator loads the entire batch to the system (the chamber is cold and not active). This process of ash removal and loading of waste takes less than 1 hour for most configurations.



ECO Mobile

The ECO Mobile combines the EWS patented process with the **transportability** of a skid-mounted incinerator package.

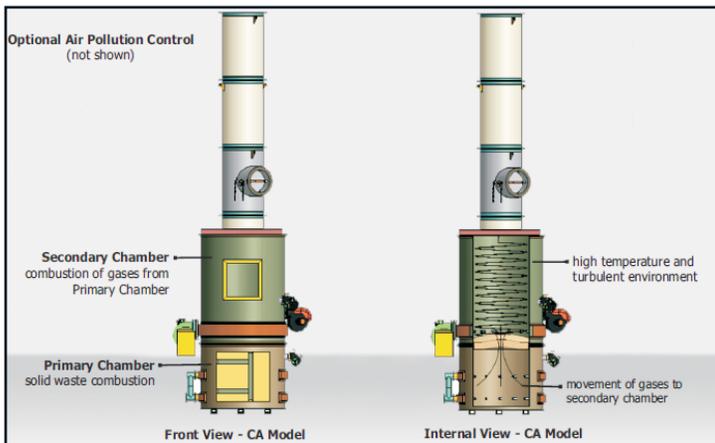
This pre-configured and pre-tested Eco Waste Oxidizer is permanently housed in a 20' or 40' ISO shipping container. The **"plug-and-play"** design allows the unit to be setup and operational with minimal assembly, within hours. After the utility hook-ups and stack assembly are complete, the unit is ready for operation. Similarly, this **self-contained** unit allows for easy disassembly and transportation to another location.

The ECO Mobile integrates all of the Eco Waste system components including the Primary Chamber, Secondary Chamber, Stacks and Main Control Panel. The ECO Mobile can include a fully containerized Scrubber or Air Pollution Control (APC) module to **meet any global air emission standard**. Other optional features such as batch or continuous waste loading devices, continuous emission monitoring systems (CEMS) and waste storage are also available as fully mobile containerized modules.



Batch Feed Systems

CA Model Process Overview



CA Model

The CA Model is similar to the ECO Model in function; however, it has a **smaller footprint**. The Secondary Chamber is stacked on top of the Primary Chamber to save space. This unit has the **same rugged construction** and all of the **advanced features** of the ECO Model. The CA Model is suited for smaller volumes of waste generated at a remote site such as an exploration camp or a seasonal project site. This model is available in three standard sizes.

This unit is manually loaded and has short batch times of 2 to 6 hours (depending on waste type). It is capable of processing multiple batches in a 24 hour period.



Eliminating Waste

■ continuous feed **process overview**

The process of continuous-feed differs from the batch process. The waste is charged into the continuous-feed Primary Chamber after it has achieved operating temperature of 600°C-850°C (1200-1560°F). The loading method and configuration may vary but as the name implies waste must be supplied to the system on a continuous basis. Typically the waste is delivered to the system using a mechanical materials handling device such as a skid steer loader or conveyor. A waste charge or load is deposited in the first stage of the system via a hopper. The hopper directs waste towards the Primary Chamber where it is moved by a mechanical ram or platen that will push the waste into the system. The Operator is isolated from the heat of the process by a guillotine style door. Although this process may be highly automated, generally the Operator is required to be available to load the ram hopper every 20 minutes or so during the burn cycle.

Within the Primary Chamber the waste bed moves slowly along the stepped floor grate as it is pushed by a series of transfer rams. In this phase, which takes place over up to 6 hours, the solid waste is transformed into a gas that is drawn into the Secondary Chamber. What remains in the continuous-feed Primary Chamber is sterile non-combustible material such

as metals and glass and a non-toxic, non-leaching ash that is safe for disposal or re-use.

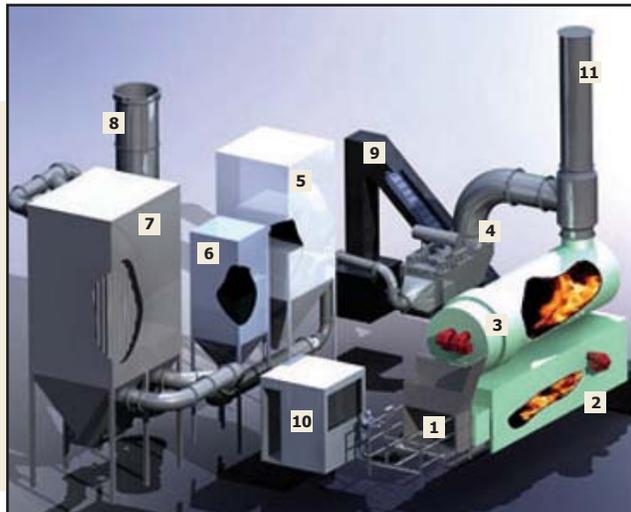
In the Secondary Chamber the combustion gases are exposed to a highly-oxygenated and extremely turbulent environment for a minimum of 2 seconds retention time at a temperature of 1000°C to complete the combustion reaction. The entire process is monitored and controlled by the EWS proprietary 4G control system.

Given the increased turbulence of the continuous-feed Primary Chamber compared to that of a batch incinerator the off-gases may require an Air Pollution Control (APC) system. The emission levels mandated by local environmental regulations and the waste composition will dictate the design selection of the APC. Typically the APC design includes stages to cool, neutralize and capture entrained particulate matter within the exhaust gas stream, before they can exit the stack.

The ash produced by a continuous-feeding system requires continuous-ash-discharge. Most commonly this function is performed by a wet ash conveyor system that will operate automatically.

■ ECO CF Model **Process Overview**

1. Continuous Loading System
2. Primary Combustion of waste
3. Combustion of Volatile Gases
4. Waste heat Boiler - Heat Recovery
5. Emission Controls - Acid Neutralization
6. Emission Controls - Metals/Organics
7. Emission Controls - Dust/Particulate
8. Exit of Clean Gaseous Emissions
9. Ash Removal - Conveyor
10. Controlling and Monitoring of Process
11. Emergency Bypass Stack



ECO CF Models

Standard sizes ranging from 250kg/hour to 4000 kg/hr. Custom sizing is also an option. These modular packages, of up to 100 tons per day, can be combined to meet larger requirements. All CF Models have the advantage of being modular and transportable - not requiring in-field construction. Smaller models are available as containerized packages.

Eliminating Waste

Liquid Waste

Eco Waste Solutions liquid waste equipment is available as a stand-alone system processing only liquid waste or it may be a combination system to process both liquid and solid waste.

In the EWS solid-liquid waste oxidizer, **waste oils and lubricants are processed as a fuel**, using a specialized burner package. The heat is used to treat the off-gases from the burning of solid waste. Used oils, normally treated as a waste, become a valuable fuel source offsetting the requirement for clean fuel. **This approach reduces the need for fossil fuels, and lowers the overall carbon footprint of the process.**

Other waste liquids with a higher water content and/or lower heat value can also be processed. These liquids may be emulsified with higher heat value liquids or processed as an aqueous liquid waste. The Liquid Waste Oxidizer, a custom designed thermal oxidation system, can be supplied as a stand-alone reactor or in combination with an ECO Model.

The Liquid Waste Oxidizer uses a liquid injection system to deliver the liquid waste to the oxidation reactor vessel where it is atomized into small droplets, vaporized and the by-products are oxidized in the presence of high temperatures (>1863°F/1000°C) and excess oxygen.



This equipment can also be configured as a permanently containerized mobile Liquid Waste Oxidizer or a mobile solid-liquid waste incinerator.



Maximizing Resources

■ net zero: zero waste, energy-from-waste

zero waste

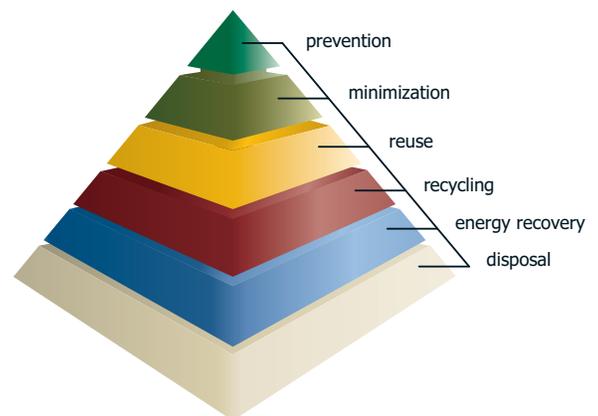
Waste volume is reduced by over 90%. The remaining ash residual (bottom ash) from processing non-hazardous waste is non-leaching and essentially inert. After enduring the combustion process, metals and glass remain intact but are sterilized and safe to handle. Preservation of metals and glass allows for post-treatment recycling. The remaining ash can be used as a replacement aggregate in low grade concrete applications such as road base, embankment fill and parking curbs.

energy-from-waste

The high cost of fossil fuels and renewable energy incentives have improved the economics of investment in heat capture technologies, even on small scale systems.

The Eco Waste Solutions approach to converting waste to energy is based on combustion and waste heat recovery. This has been demonstrated in hundreds of installations to be reliable and predictable. There are many emerging technologies being applied on a demonstration basis to create energy from waste. While these show promise, there is substantial risk involved in adopting these inventions. Our clients require a solution to pressing waste management needs above all. Experimenting, particularly in remote locations, is not acceptable. By contrast, EWS offers a form of recovering valuable energy from waste that is fully commercialized and proven.

waste hierarchy



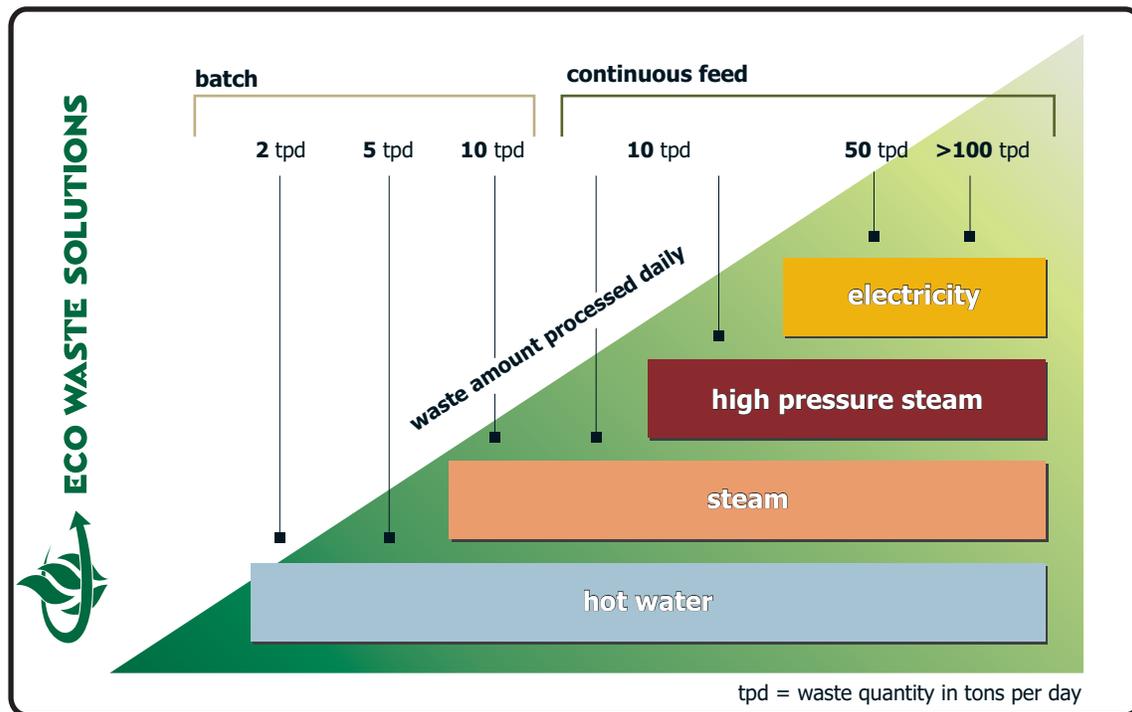
EWS has taken the long accepted method of using a modular continuous-feed dual chamber incineration system with a waste heat recovery boiler, and advanced it by incorporating the latest in efficient lower cost air pollution control technologies and heat recovery systems to ensure regulatory requirements are consistently met while maximizing energy recovery. EWS has applied the same innovative thinking to Waste-to-Energy that it has used to establish its equipment as the leader in robust, clean-burning, small scale systems and state-of-the-art mobile packages.



Maximizing Resources

eco waste solutions: waste-to-energy & heat recovery

Communities, camps, and industrial operations of any size can process waste to recover heat, using the Eco Waste Solutions system. Plants need not be large scale or dependant on waste from outside sources. The modular approach minimizes construction time and maximizes the opportunities to convert waste to energy.



Batch Operations:

Small scale energy recovery is challenging. Generation of electrical power by processing small quantities of waste is not feasible. However, there are still opportunities to capture the heat and create useful by-products such as hot water, or space heating/cooling. The high economic, social, and environmental cost of fossil fuels has improved the economics of smaller scale projects.

- **Hot air is available for space heating or process use e.g. sludge drying**
- **Simple hot water heat exchanger provides "free" hot water for showers, kitchens, etc.**
- **Can be fired using waste oils to eliminate reliance on clean diesel and solve another waste problem**

Continuous Feed Operations:

Rather than experimenting with new technologies such as plasma and syn-gasification, EWS has taken this long accepted method of using a modular continuous feed system and marrying it to off-the-shelf equipment such as waste heat recovery boilers. We have advanced this mature technology by incorporating the latest in efficient lower cost air pollution control technologies and heat recovery systems to ensure regulatory requirements are consistently met while maximizing energy recovery. EWS has applied the same innovative thinking to Energy-From-Waste that it has used to establish its equipment as the leader in robust, clean-burning small scale equipment and state-of-the-art mobile packages.

- **Heat available 24 hours, constant and stable**
- **Waste heat recovery boilers can be added to the package to generate steam, hot water and/or electrical power**

