PSECC Ltd – United Kingdom

Portsmouth Sustainable Energy & Climate Change Centre

Alset Power Company Inc - USA

TEN Waste-to-Energy & Recycling plants for

ACCRA & Kumasi

USA – EXIM Bank Funding

Alan Brewer MSc – Joseph Okyere - Aaron Armah

President of Ghana Nana Akufo-Addo

PSECC have been working with the Presidents team since January 2018 on Waste Management options for Ghana.

Alset Power
Company Inc from the USA has been selected as the Gasification Technology provider and fund arranger for the $630 million for the eight Waste-to-Energy plants in total for ACCRA & Kumasi.

Four New Waste-to-Energy plants for ACCRA are now possible each processing 500 tonnes per day of Municipal Solid Waste (MSW). A further four plants can be funded and built for Kumasi over the next year – additional $300 million provided.

Madam Cecilia Abena Dapaah
Minister of Sanitation

In 2019 the Cabinet has given approval for the engineering and construction of modern fit-for-purpose landfill sites in Accra and Kumasi, the Minister of Sanitation and Water Resources.

Alset Power Company Inc can enhance this programme with Funding for Four Waste-to-Energy & Recycling Centres and 100 Waste Trucks & Dumpsters

Kumasi also four plants and 200 trucks and dumpsters

Climate Change Mitigation

A New Sustainable WASTE & Energy Future for GHANA

Government does NOT payback the funding

This project will help towards the effects of Climate Change in GHANA

1. Waste-to-Energy plants - cleanest Technology in the World, 200 New Trucks, Renewable Electricity, from 500 MSW tpd - Recycling 15 tonnes of Glass & 15 tonnes of Metal. Two stream process – Waste from ERA Group and also people will be paid to bring tyres and plastic to the waste plants.

2. Clean up of Beach Areas – help to assist tourism

3. Mini Grid Solar PV & Solar Farms security of supply of Renewable electricity

4. Help towards less crop wastage and food security issues

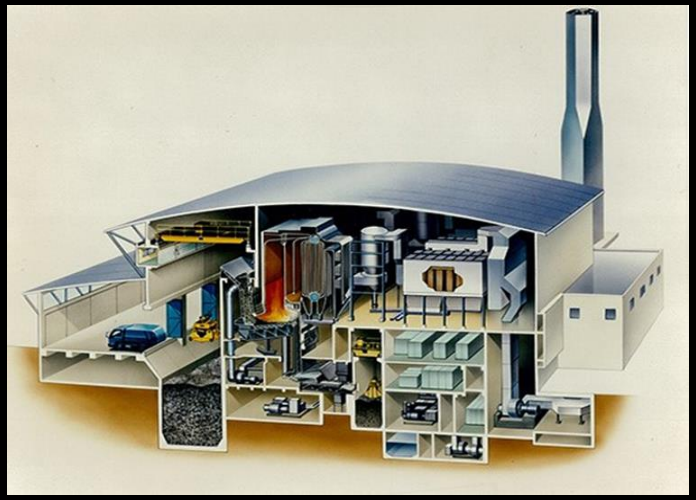
5. Create 1,000 jobs or more for the population of Ghana and create industry

6. Lead toward a Sustainable Circular Economy

PSECC Ltd have twenty three years experience in Energy & Waste sectors – Policy & Strategy formulation for Cities and Counties under Agenda 21 Sustainable Development programming.

PSECC Ltd & Alset Power Company Inc wish to assist ACCRA & Kumasi in Ghana in the Waste & solar & Mini Grid sectors and to provide funding & Gasification technology to build four Gasifier Waste-to-Energy & Recycling Plants and two 20MW solar farms & 160MW of Mini Grids for Ghana resulting in Renewable Energy generation and No more long term Landfill, Climate Change Mitigation.

This could support the Government's much needed Renewable Energy electricity generation. PPA's can be from ECG and the solar farms PPA from ECG or Private Cement / Mining companies if ECG cannot issue any PPA.



No money from Government required – four waste plants and 200 trucks & Dumpster containers for ACCRA & KUMASI

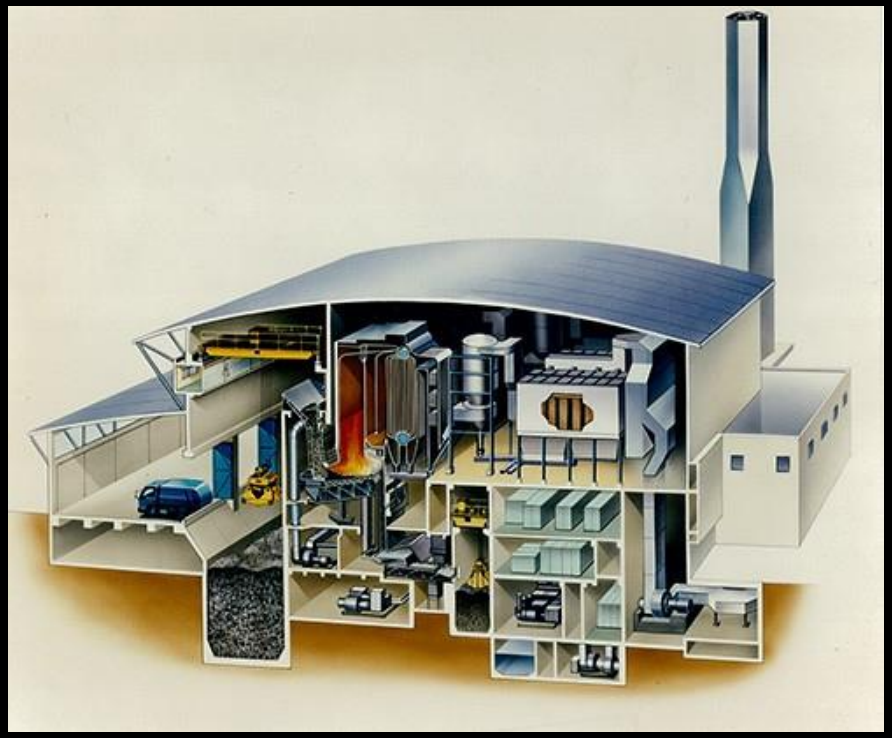
Alset Power pay off the loan made to the Government - There is no PCOA involved - there is no watered down version of a sovereign guarantee with this transaction.

EXIM
EXPORT-IMPORT BANK OF THE UNITED STATES

Funding is over ten years @ 3% interest Rate with a one year Grace period. Funding starts to be paid back from commencement of an operational waste-to-Energy plants – 3 to 4 year payback, Solar farms – 5 year payback.

The Government sign off for the funding BUT Alset Power Company Inc pay off the Debt - payback is about four years. You cant compare the current debt of the Government to this Alset Power offer - Alset Power pay off this money so it is NOT a new funding Debt for the Government.

The Government simply need to sign off the Mandate letter agreeing the principal of the projects and funding method and Alset Power pay back the loan to the USA EXIM Bank.



Population of Ghana is 30.781 million in 2020, producing 0.47 kg per person of MSW each day – 14,180 tonnes per day or 5.175 million tonnes per annum (tpa).

ACCRA population is 4 million producing 1,880 tonnes per day of MSW or 686,200 tonnes per year.

Kumasi will also have Four plants in a second development programme commencing alongside ACCRA's Waste plant development programme.

Our Feedstock target is 2,000 tonnes per day (tpd) of MSW in ACCRA or 730,000 tonnes per annum (tpa) same also for Kumasi. Ghana public also bring waste to the plants – tyres and plastic to increase the calorific value of the waste ensuring good power generation at all times.

Alset Power Company Inc from the USA has been selected as our Gasification Technology and funding provider for eight x $75 million plants for ACCRA and Kumasi in total for GHANA totalling $630 million.

No more Roadside Dump sites

ACCRA streets will be cleaned up

Current Landfill sites will close

No more Landfills
Old Dump sites cleared

People especially children could bring waste to the plant and be paid

Modern Engineered Landfill sites have already been approved

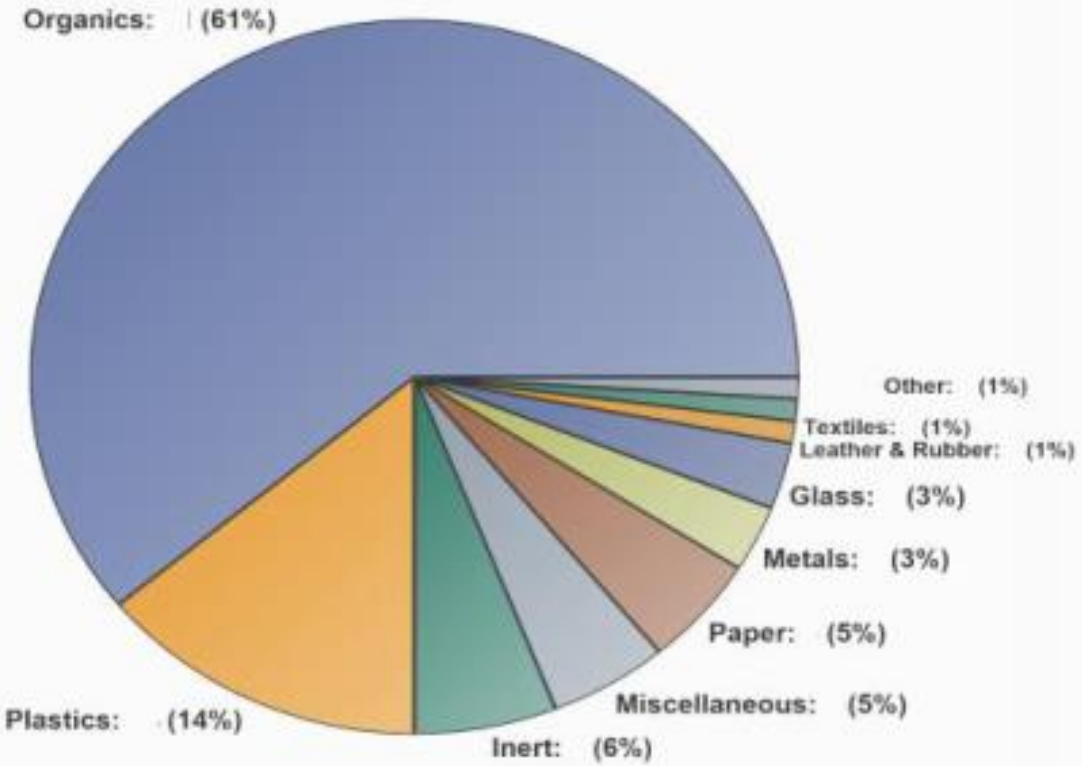
Alset Power Company Inc wish now to provide funding for Four Waste-to-Energy & Recycling plants for ACCRA & 100 to 200 New Trucks & Dumpsters. This can then be rolled out for Kumasi and other Districts and Regions.

The current waste situation in various areas of Ghana

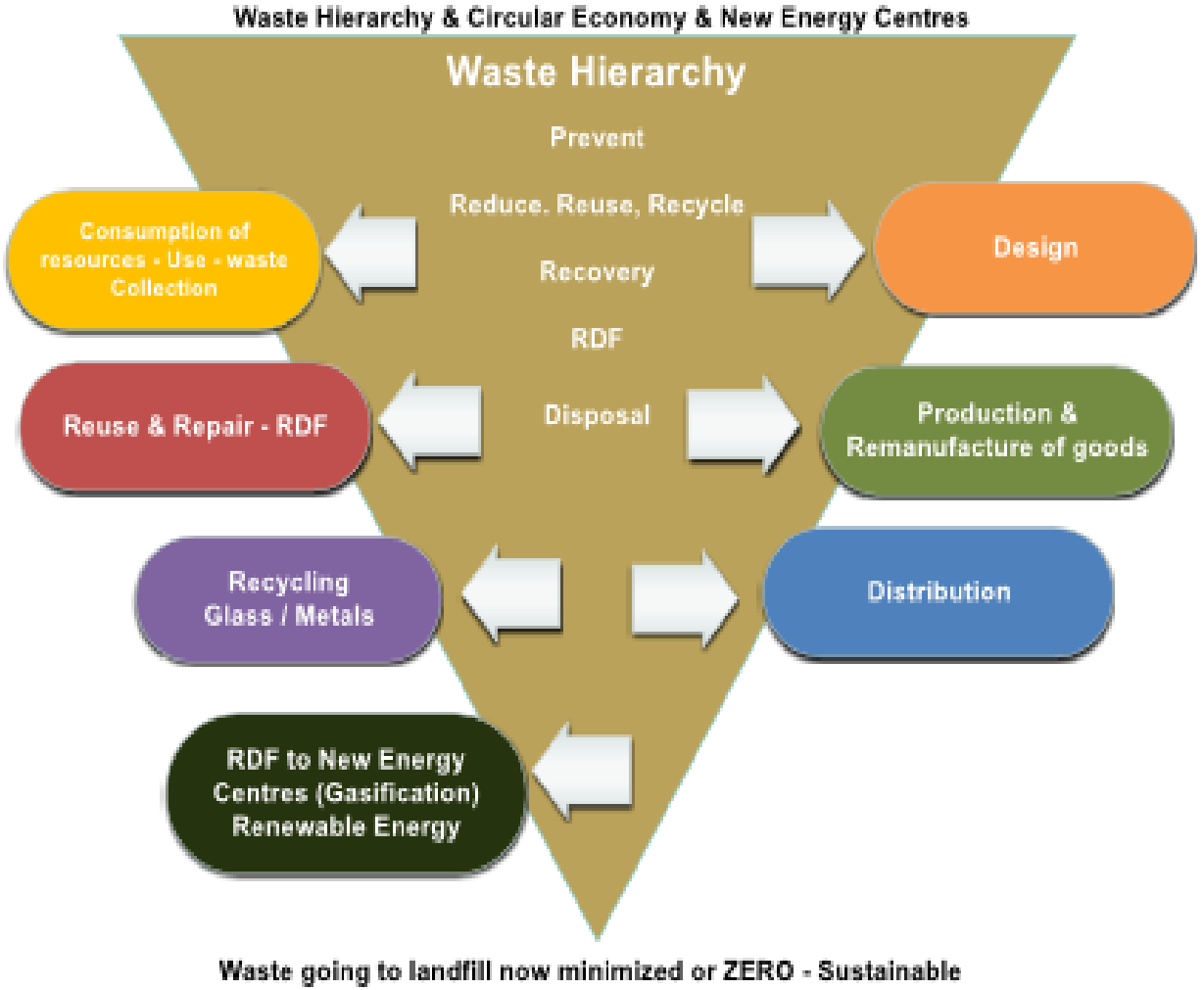
Alset Power are able to take this waste away from dump sites
&
Coastal Beach areas

A very good Clean Gasification Waste-to-Energy & Recycling solution now is possible for Ghana

GHANA - MSW Breakdown - 2015



Waste Management Hierarchy - Long Term appoach



Our Waste-to-Energy Plants with Low Emission and Zero waste to Landfill .

The Start of the process we can expect

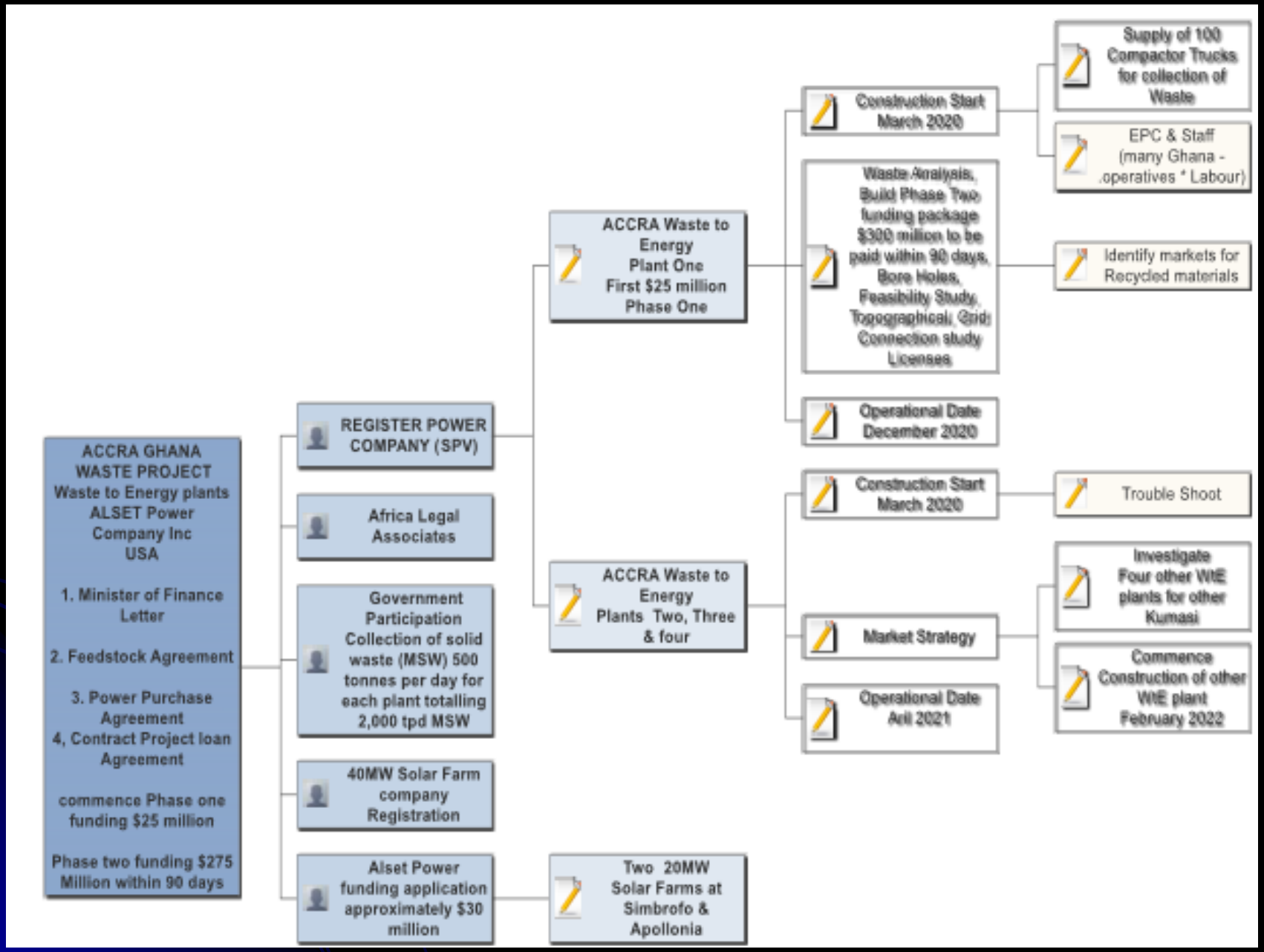
1. Minister of Finance Mandate letter to us agreeing to proceed
2. Commercial Contract
3. Medium Term Project funding contract – (will get assistance to complete these documents from Alset Power and then they send over to the Government of GHANA for signing}.

The funding will be in two phases totalling $300 for the for ACCRA waste plants and a further $150 million for Mini Grid systems and solar farms.

1. Phase one Fast Track - $25 million - Full Feasibility study and site preparation for first waste-to-Energy plant

2. Phase two - $425 million Implementation for 4 plants for ACCRA & two solar farms. Once we have all the documents from the Government, ECG OR Private Cement / Mining company PPA of $100 MWh & tipping Fee $18 per tonne or possible more to allow for paying people to bring waste in a two stream process line at each plant.

3. The collection company in each Zone - MSW Feedstock Agreement also required and once the Alset Power documentation has been completed two to three weeks after that submission date to EXIM Bank the first $25 million will be released to Alset Power to commence the construction phase one. The remaining funds available within 90 days.


ACCRA GHANA WASTE PROJECT
Waste to Energy plants
ALSET Power Company Inc
USA
1. Minister of Finance Letter
2. Feedstock Agreement
3. Power Purchase Agreement
4, Contract Project loan Agreement
commence Phase one funding $25 million
Phase two funding $275 Million within 90 days
REGISTER POWER COMPANY (SPV)
Africa Legal Associates
Government Participation Collection of solid waste (MSW) 500 tonnes per day for each plant totalling 2,000 tpd MSW
40MW Solar Farm company Registration
Alset Power funding application approximately $30 million
ACCRA Waste to Energy Plant One First $25 million Phase One
ACCRA Waste to Energy Plants Two, Three & four
Two 20MW Solar Farms at Simbrofo & Apollonia
Construction Start March 2020
Waste Analysis, Build Phase Two funding package $300 million to be paid within 90 days, Bore Holes, Feasibility Study, Topographical, Grid Connection study Licenses
Operational Date December 2020
Supply of 100 Compactor Trucks for collection of Waste
EPC & Staff (many Ghana - operatives * Labour)
Identify markets for Recycled materials
Construction Start March 2020
Market Strategy
Operational Date Aril 2021
Trouble Shoot
Investigate Four other WtE plants for other Kumasi
Commence Construction of other WtE plant February 2022

Once Ministers letter has been signed, contract signed, a Feedstock agreement in place with the collection company and the PPA of $0.10 KWh or $100 MWh & Tipping Fee of $18per tonne has been issued then the construction process of the Waste-to-Energy plants can begin in late February or early March 2020. We have brought down the FiT / PPA from $185MWh 2018 original agreement to use Gasification technology from NCE in Oman.

Gasification solution for Waste to Energy

We can provide the much needed funding for GHANA to build five Waste-to-Energy plants and 40MW of Solar Farms and ECG can issue the required Power Purchase Agreements (PPA's) - we can obtain also possible PPA for the solar farms from ECG or from Private Cement or Mining companies if that helps the Government.

Types of Waste

- MSW
- Tires
- Plastic
- Yard Waste
- Dried Sludge

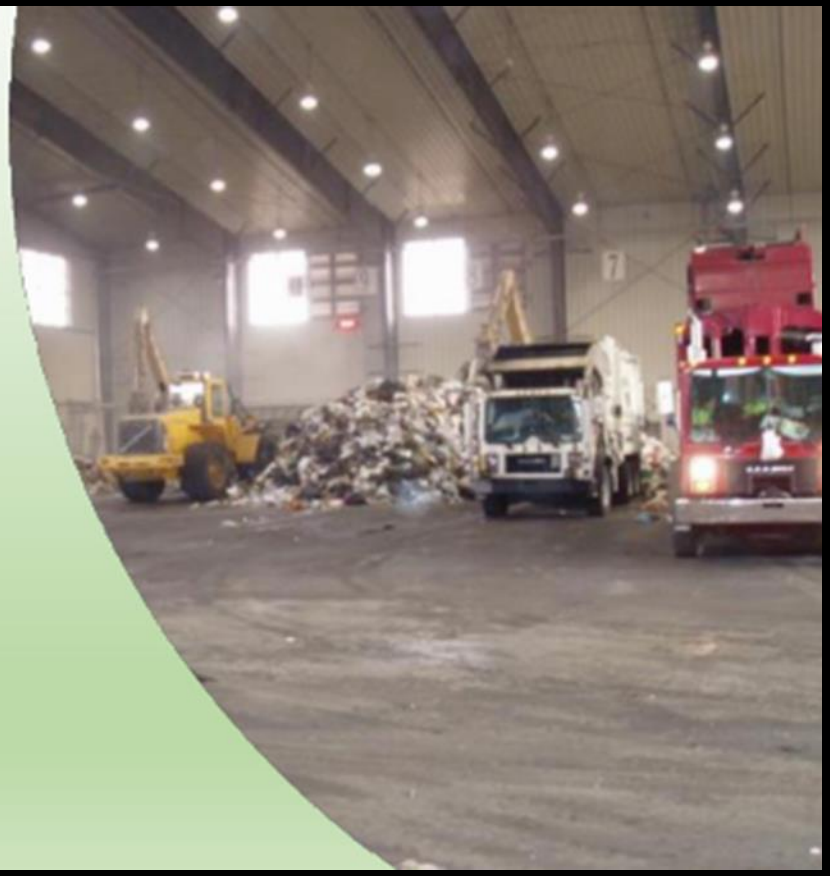
No more Landfill

New Trucks will take waste to the New Waste-to-Energy plants

Trucks provided - compactor trucks - capacity 30 tonnes

Tipping Floor

- Size of Gymnasium
- Enclosed
- Sloped Floor
- ID Fans aid in drying MSW and controls smell
- Heated Floor-100-140 degrees
- Front Loader Churns and moves MSW/FUEL to Conveyor

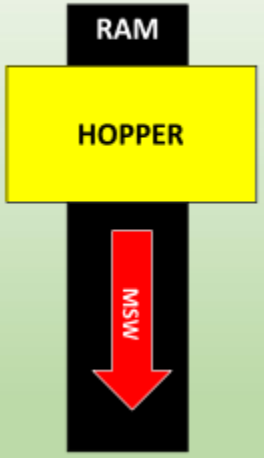


Drying of MSW

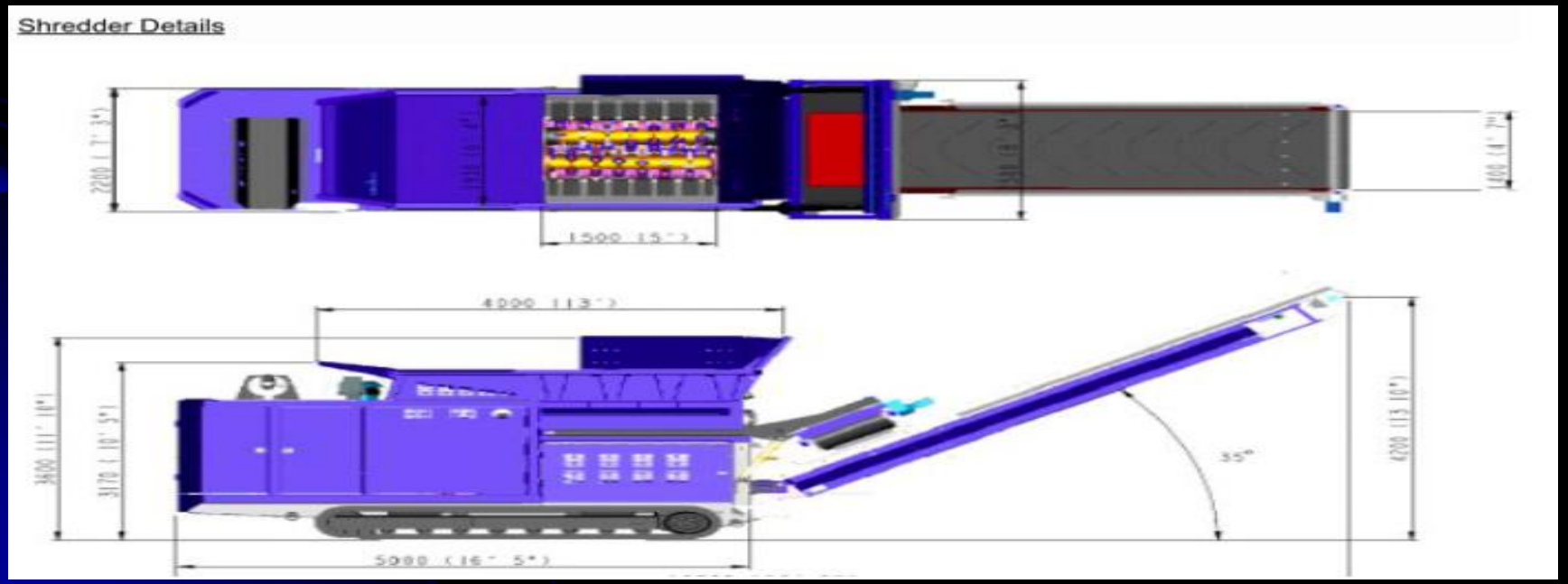
- For best results MSW needs to be <25% moisture
- We have several options available
- Our engineers will work with you to design the proper equipment to meet your needs

Conveyor to Hopper to Ram

- Conveyor transports MSW to Hopper (Giant Funnel)
- Hydraulic Ram constantly loads Gasifier (5 HP)
- MSW passes through Gate to achieve **Oxygen Deprived** environment

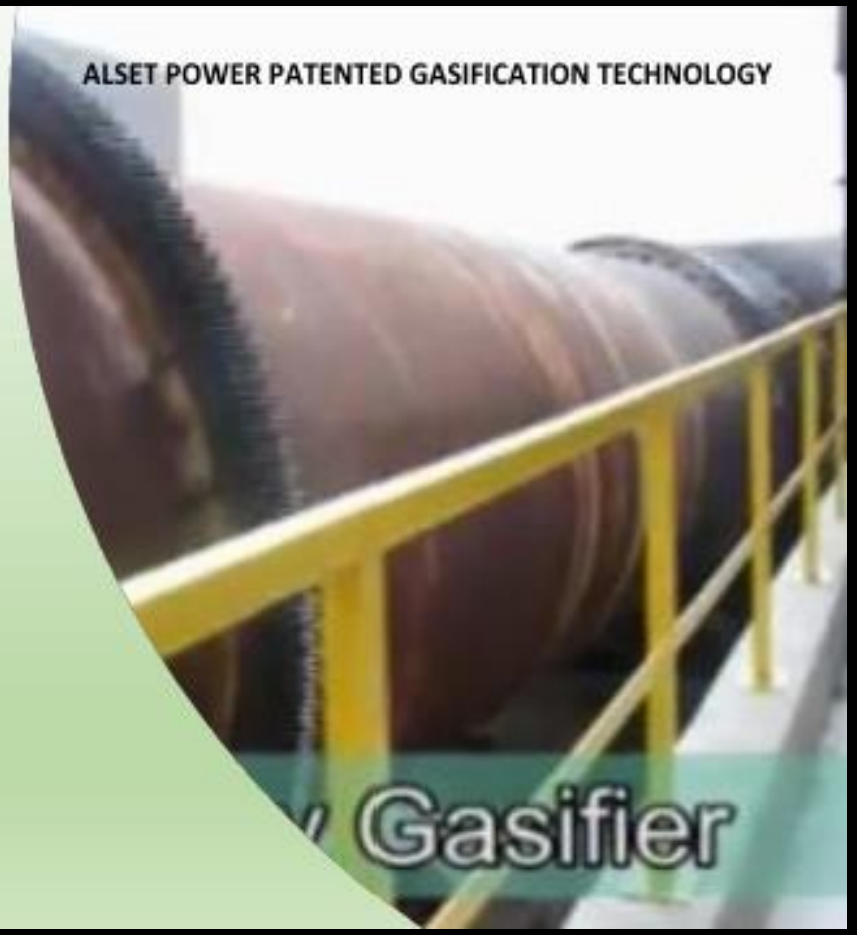


Use Landfill waste for other Waste-to-Energy plants – clear old Dump sites



Gasifier

- 120ft long
- Sloped 4˚
- Rotates at 2 RPM
- No external fuel source except at initial start up
- Time in RG—45 mins
- MSW entrance temp 400˚F
- MSW exit temp 850˚F



ALSET POWER PATENTED GASIFICATION TECHNOLOGY

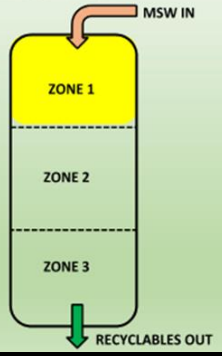
Gasifier Cont.

3 Zones in Gasifier

- Zone 1—Heating/Drying
- Zone 2—Gasification
- Zone 3—Cooling

ALSET POWER PATENTED GASIFICATION TECHNOLOGY

Gasifier Zone 1

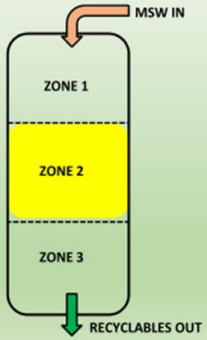


Zone 1

- MSW enters gasifier
- Approximately 400 degrees
- MSW heats and dries
- Prepares MSW for Gasification

ALSET POWER PATENTED GASIFICATION TECHNOLOGY

Gasifier Zone 2

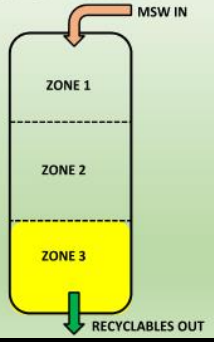


Zone 2

- All Organics are reduced to Syngas—We give up all paper, plastics, etc…
- Syngas Composition—Nitrogen, Hydrogen, Oxygen, Methane, Carbon Monoxide

ALSET POWER PATENTED GASIFICATION TECHNOLOGY

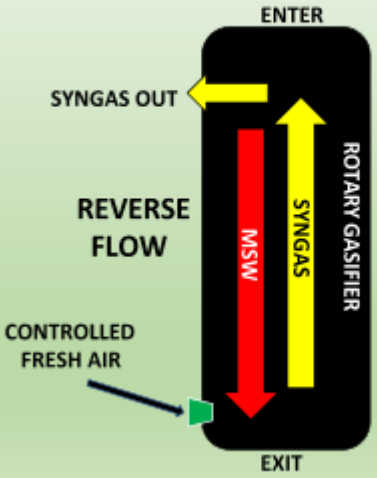
Gasifier Zone 3



Zone 3

- Fresh air introduced
- Increases Syngas
- Assists Syngas in Reverse Flow
- Cools byproducts for exit from Gasifier

Gasifier Cont.



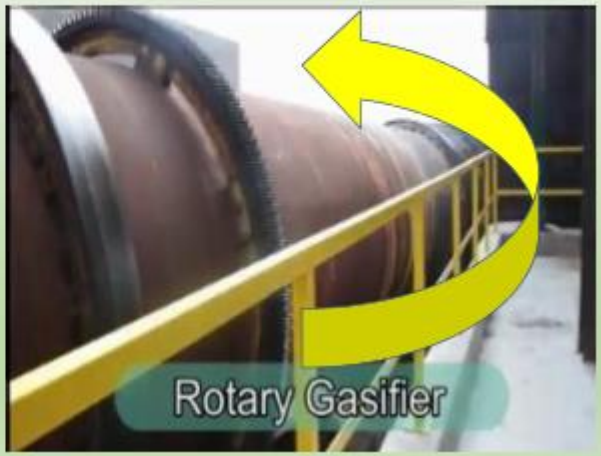
- System is Reverse Flow—As MSW works down the Gasifier, Syngas works back up to front
- Controlled amount of Fresh Air:
  - ❑Increases Syngas
  - ❑Increases Syngas temperature
  - ❑ diverts flow to beginning of Gasifier
  - ❑Cools byproducts
- Syngas helps heat MSW—Then is extracted through the Hood

ALSET POWER PROPRIETARY AUTOMATION CONTROL

ALSET POWER PATENTED GASIFICATION TECHNOLOGY

Gasifier Cont.

- Constant churning of MSW/Fuel transfers energy raising temp
- Organics reduced to Syngas
- Low temp prevents melting of inorganics
- Inorganics remain in original state
- Remaining byproduct exits Gasifier through Gate



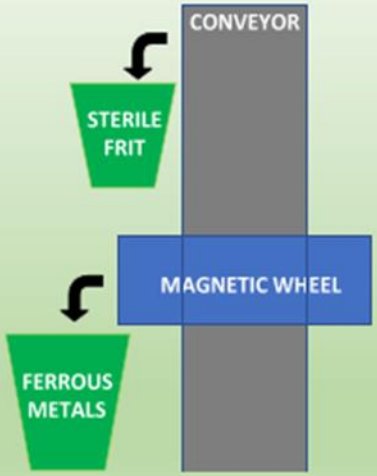
Our Byproducts are 100% Recyclable

- Other technologies use very high heat to combust MSW
- High heat creates incomplete combustion
- Incomplete combustion creates optimum conditions for Dioxins to form
- By gasifying, Dioxin formation is limited to Syngas leaving byproducts clean and ready for reuse

*****NO LANDFILL*****

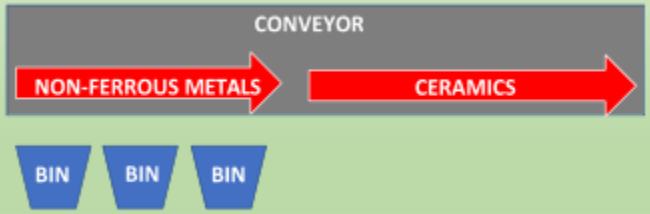
Recyclables Retrieval

- Byproduct exits Gasifier onto Vibrating Screen
- Frit **(7%)** passes through screen into bin for recycle—Asphalt
- Ferrous Metals removed by Magnetic Wheel to Bin for recycle

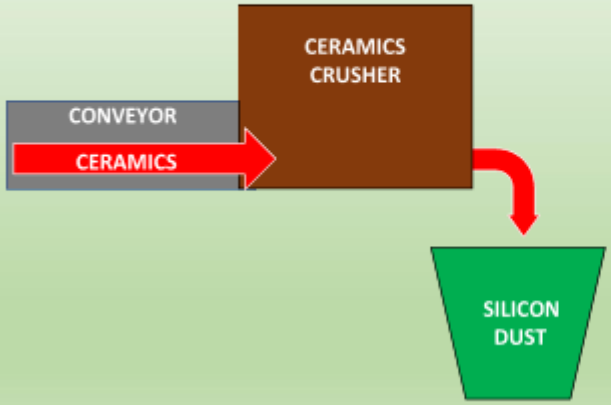


Recyclables Retrieval Cont.

- Non-Ferrous Metals are **hand picked** and sorted for recycle



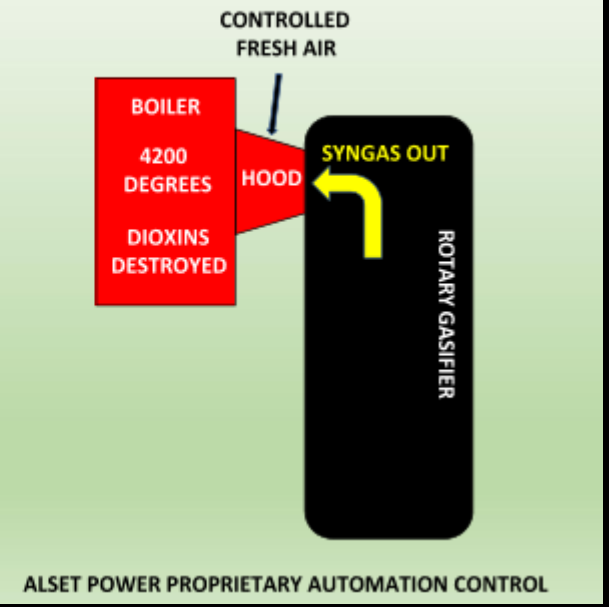
Recyclables Retrieval Cont.



- Ceramics & Glass continue to crusher—Pulverized to Silicon Dust and collected in Bin for recycle—Concrete additive
- All materials are free of toxins and safe for recycle with no further processing

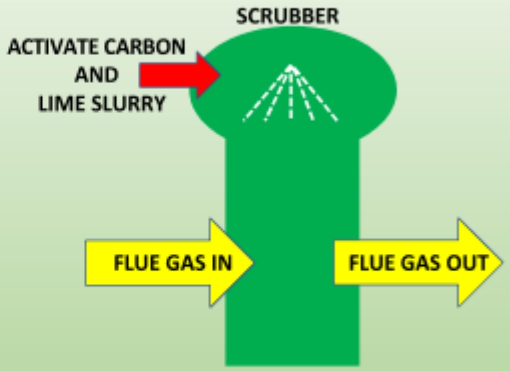
Syngas

- Reverse Flow allows Syngas to increase heat to 1800˚F
- Syngas is ignited as it enters Boiler—This is the only Flame in the entire process
- Alset Power patented technology allows combusted Syngas to reach 4200˚F
- High temp destroys Syngas and 95% of toxins including Dioxins



Flue Gas—Mist Scrubber

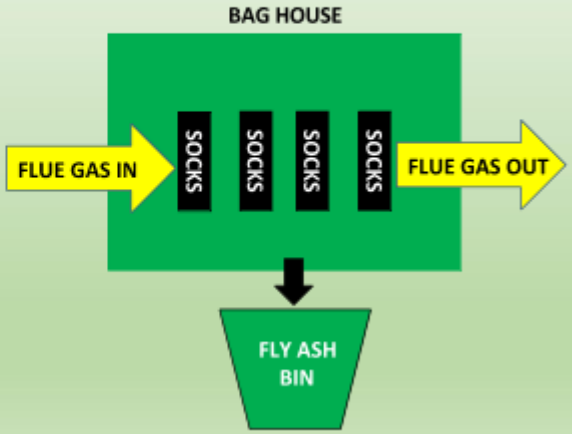
- Remaining Flue Gas moves to **Scrubber**
- Flue Gas is sprayed with Activated Carbon and Lime Slurry to remove Acidic Gasses and Heavy Metals
- Slurry also cools Flue Gas for transport to Bag House
- Rapid cooling prevents Dioxin reformation



ALSET POWER PROPRIETARY AUTOMATION CONTROL

Flue Gas—Bag House

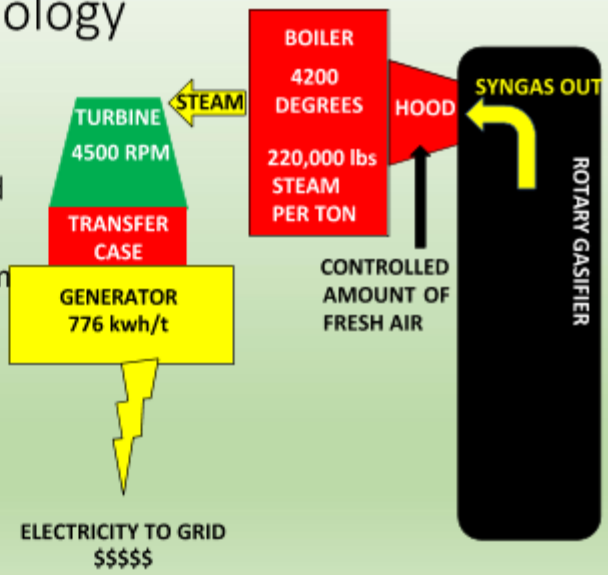
- **Bag House** filters small particulates remaining in Flue Gas
- Intermittent shaking allows **Fly Ash** to drop from Filters (Socks)
- Fly Ash **(2%)** is deposited in Bin for recycle—Mixed with Frit for Asphalt



ALSET POWER PATENTED BURNER/BOILER TECHNOLOGY

Money—Boiler Technology

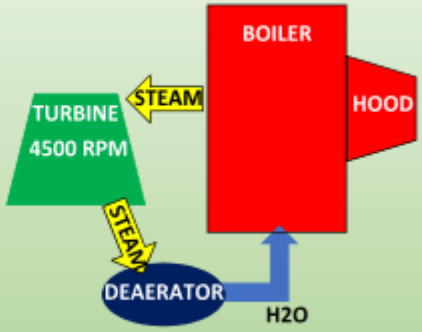
- Alset Power Patented Technology combusts Syngas to **4200˚F** using a controlled amount of Fresh Air and an Eternal Flame
- Boiler creates **220,000** Lbs of steam per ton of MSW
- Steam reaches **750˚F** at **750 psi**
- The Steam powers the Turbine
- Turbine powers Generator
- Electricity is sold to Grid



ALSET POWER PROPRIETARY AUTOMATION CONTROL

Closed Loop Water Process

- Alset Power Patented Burner/Boiler Technology is Closed Loop
- Water never comes in contact with combusted gasses
- Steam is transferred to Deaerator
- Air removed then Water refills Boiler
- Water remains clean and ready for reuse



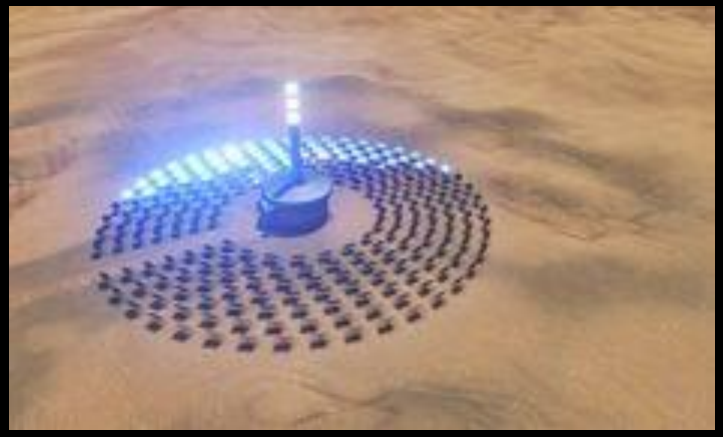
Raising the Calorific Value

- Our engineers will work with you to raise the Calorific Value of the MSW to reach the highest level possible
- Possible additions:

TIRES

PLASTICS

DRIED SLUDGE



$150 million for Mini Grid systems throughout the Islands and Districts in Ghana.

Alset Power can provide funding and build either two 20MW Solar Farms.

Simbrofo & Apollonia

A PPA of $0.07 KWh is required from ECG or a private Cement / Mining company.

Phase two could see further solar farms being built over the next five years

Wind Turbines – help GHANA move away from Coal & Hydro generation

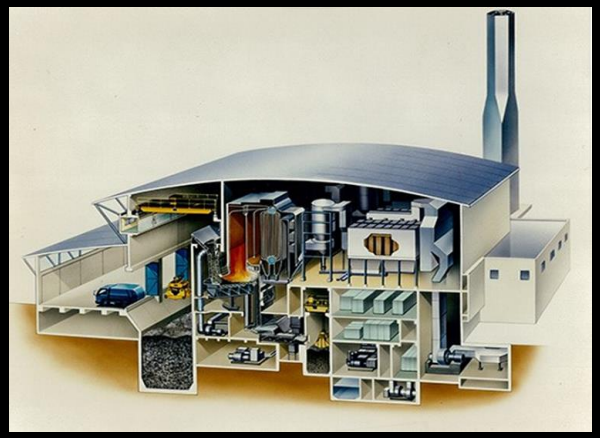
GHANA is currently experiencing a prolonged drought largely as a result of below-average precipitation from the seasonal rains (November-March).

Our New Energy plants can help

The significant rainfall deficit, which has resulted in decreased agricultural production.

Consequently, households are sharply depleting food stocks and are increasingly dependent on market purchases, driving up the prices of staple foods such as maize.

Previous droughts in Zambia have been increasing people's vulnerabilities. 192,000 people in Southern province have been estimated to face Crisis and 54,000 Emergency level.



A New Sustainable Energy Future for GHANA