On farm manure to energy – sustainable growth




December 2014

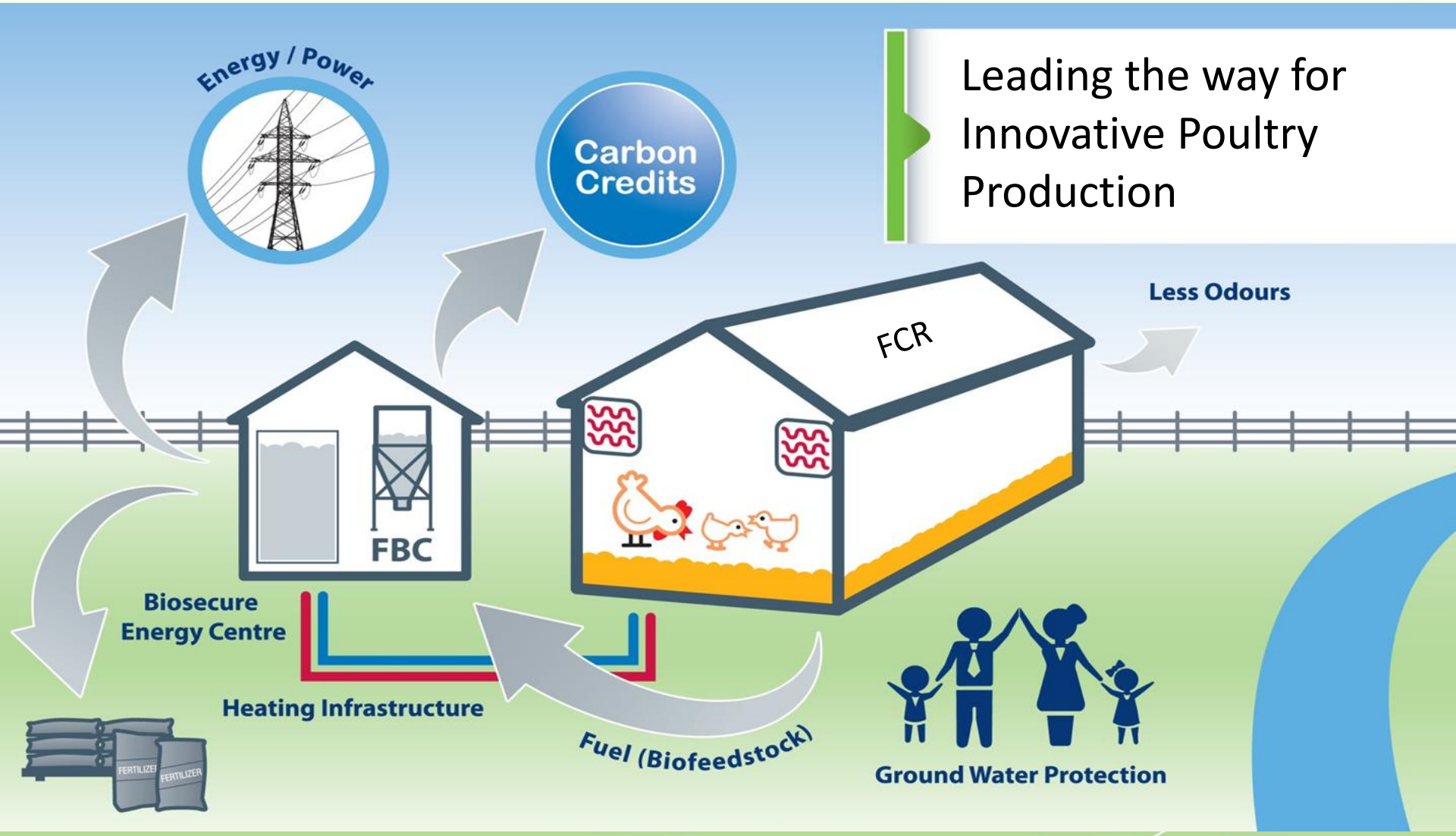
Introduction

- bhsl Background
- bhsl Process
- bhsl Benefits
- Environmental Study
- Maryland Project 2015

bhsl Company Background

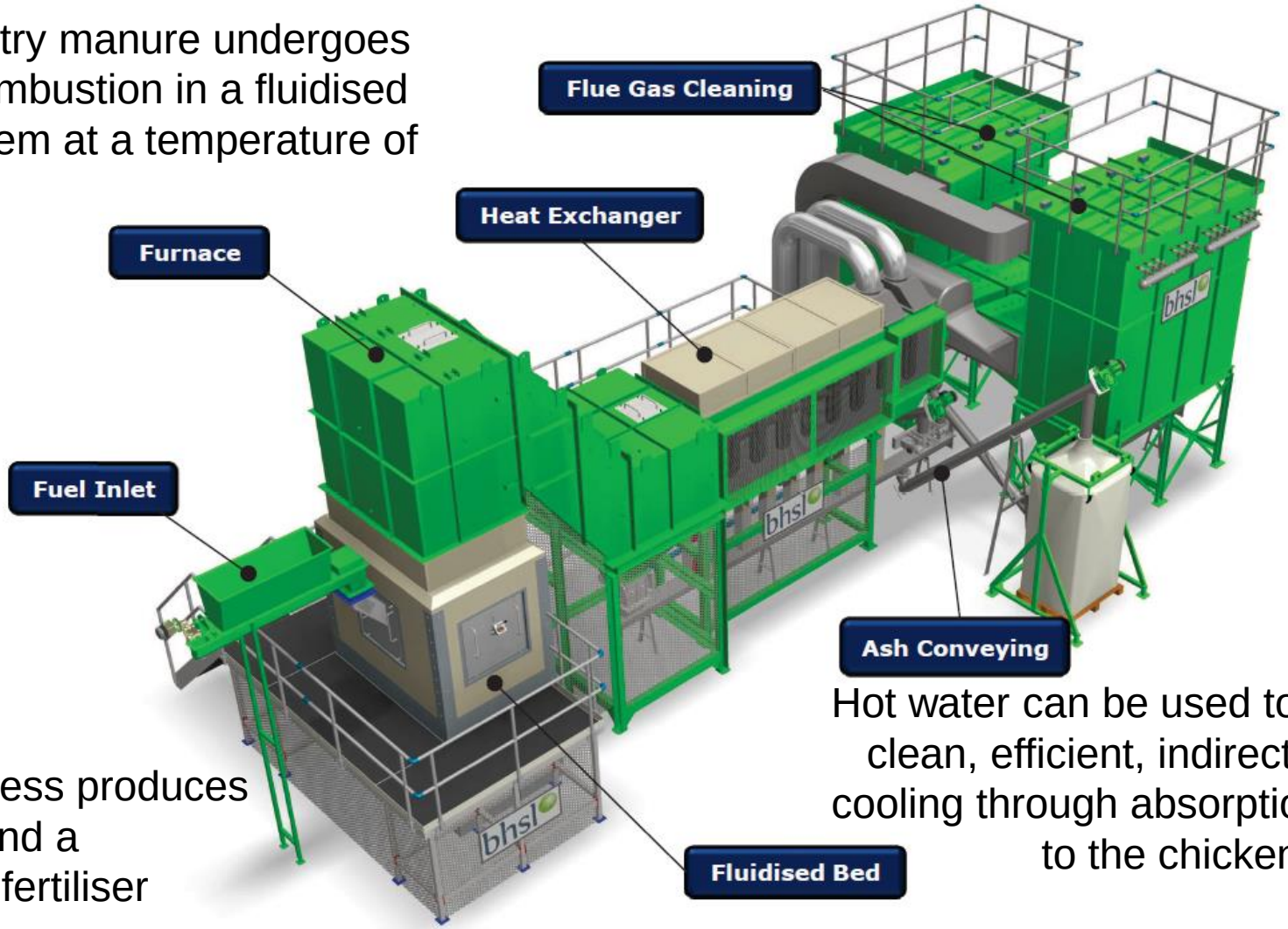
- Irish Green Energy Company
- Founded in 2004
- Family-run Business with History in Poultry Industry since 1960
- On-site and Energy Solution for the Poultry Industry
- Contracts and Installations:
  - UK
  - US
  - Ireland
  - South Africa

Overviw


Energy / Power
Carbon Credits
Leading the way for Innovative Poultry Production
Less Odours
FCR
FBC
Biosecure Energy Centre
Heating Infrastructure
Fuel (Biofeedstock)
Ground Water Protection
FERTILIZER
FERTILIZER

Process

The poultry manure undergoes clean combustion in a fluidised bed system at a temperature of 1600˚ F



Hot water can be used to provide clean, efficient, indirect heat, or cooling through absorption chiller to the chicken houses

The process produces energy and a valuable fertiliser

Remote Management


Operations Centre


24/7 Support


Reporting

Optimal Ventilation

- A clean source of ***abundant*** heat or cooling to optimize environmental conditions.

Broiler Welfare

- The ability to control moisture levels in the house directly effects litter conditions and the production of ammonia.

- Ammonia is a leading contributor to disease, poor welfare, and poor bird performance in the poultry industry.

Optimum Ventilation

- Current biomass installations are designed to reduce fuel costs.
- But substantial performance improvement is found from Optimum Ventilation and Extra Heat.

Site	Heat Use	Performance	Value
bhsl Clients	Between 2 and 3 times more heat used	Reporting very significant performance benefits	
Other biomass	Using low cost fuel	Low 300 EPEF to 410	30p / m2 / week (from 106p to 136p or 28%)
Straw System Anecdote	Double the heat	325 to 399 EPEF	23% better performance

Farmer of the Year!

Chicken litter can be a problem to dispose of, but two farmers are investing to use it as a source of renewable energy. *Philip Clarke* and *Olivia Cooper* report

Nigel Joice with his 500kW biomass boiler. He hopes for regulatory change to allow him to burn litter.

Biomass boilers ready to turn litter into a profit

Two of the country's largest broiler producers are leading the drive towards burning poultry litter on their farms as a way of producing sustainable, green energy from what is currently a waste product.

Nigel Joice produces 840,000 birds at his Uphouse Farm in Norfolk, while Stephen Hay, of Hay Farms, produces broilers on 12 sites in England. Both have recently installed biomass boilers that are capable of burning chicken litter to produce hot water which is then circulated to the poultry sheds for heating.

But under current legislation, the units are limited to burning woodchip, as poultry litter is still classified as a waste material when combusted and cannot legally be burned on farm, though they are optimistic that will change soon.

At Uphouse Farm, Mr Joice has installed two 500kW burners, supplied by Biomass Heating Solutions from Ireland. The woodchip is stored in two 400t clamps and automatically fed along a conveyor into the boilers at the rate of about 5t a day in the summer and 10t a day in the winter.

The boiler has a fluidised bed combustion chamber, with a bed of sand through which the primary combustion air is blown from below. The sand is preheated to a temperature of 850C, so the litter will ignite and burn efficiently, despite its relatively low energy value and high moisture content. The burners will work at up to 60% moisture, producing 6% fly ash and 2% clinker, which is self-cleaned and can be sold for fertiliser and breeze block production, respectively.

The water is held in a 75,000 litre buffer tank and is pumped through a district main that has been installed around Uphouse Farm delivering hot water to all 16 sheds at 82C. Draper recirculation units in the apex of each house distribute warm air to the growing birds, while the hot water is returned to the boilers, where it arrives at 78C for reheating.

Mr Joice reckons on a 50% cost saving compared with using gas, and has calculated a seven-year payback on the £1.8m investment. The environmental impact is also minimal and he is able to claim support under the government's Renewable Heat Incentive scheme.

"I've always thought of chicken manure as being something more than waste and that there was a better way of using it than just giving it to arable farmers," he told *Poultry World*. "I also wanted to be in control of my own power costs. If we can get the Environment Agency to say litter is not waste, then we're in business."

STRONG ARGUMENTS

Strong economic and environmental arguments have also persuaded Stephen Hay, of Hay Farms, to install a biomass boiler at one of his broiler units near Stratford-upon-Avon in Warwickshire, with a view to burning chicken litter.

"Feed, chick and energy costs are our three biggest costs on farm – we can't do much about the first two, but we can control the energy input," he told last April's South West Chicken Association conference in Devon.

He approached Biomass Heating Solutions to install a boiler and generator on site, to produce his own heat and electricity. He also built a large, biosecure barn in which to house the equipment and store the litter. "All the air in the store goes through the combustors, so there is no smell or biosecurity risk."

One tonne of shavings-based litter will produce 1,920kW of heat, and each crop's litter will heat and power the next crop of chickens.

The combined heat and power unit produces 300kWh of thermal and 40kW of electricity, which can be used on site or sold to the National Grid. The 500kWh boiler produces enough hot water to eliminate any requirement for gas, so Mr Hay's gas bills have dropped from £65,000 a year to nil, and his £43,000 electricity bill has halved.

The boilers supply 10 houses – a total of 381,000 birds – with a thermal demand of 800kW an hour. "I want to put in another combined heat and power unit to produce enough electricity for the site; I want to be self-sufficient in energy. Because the fuel stock is on the farm, we are in control of our energy costs."

Each house has four fan-assisted radiators to distribute the heat. With drier litter, reduced ammonia and carbon dioxide levels, and a more even house temperature, bird performance has also improved.

Mr Hay and his sons plan to roll the system out across the entire business. "At today's energy prices, the investment has an eight-year payback, including the Renewable Heat Incentive and Feed-in Tariff. In effect, we have capitalised our energy costs for the next 20 years."

Currently the boiler burns 5t in summer and 10t in winter to warm the shed.

So says **Nigel Joice**, broiler producer and NFU poultry board vice chairman

Rising costs needed stemming

My search for a farm-based energy system to provide heat and power to poultry

Full farm based solution to energy generation and litter disposal

What has [illegible] a full [illegible]

water efficiently to all poultry houses.

Within the houses this hot water is then exchanged into hot air using Paul Draper's Recirculation System which has given us a wonderfully even spread of heat across our chicken houses – sounds simple but project management of this tested Patrick (my son) and I to our limits, because all the

Environmental Study

Environmental impacts of poultry production when using poultry manure as a fuel on broiler farms

Project report for bhsl, April 2013

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Environmental Study

- bhsl funded study
- Aim- evaluate environmental impact
- Method- Life Cycle Assessment (LCA)
- *"From Cradle to farm gate"*

Environmental Study

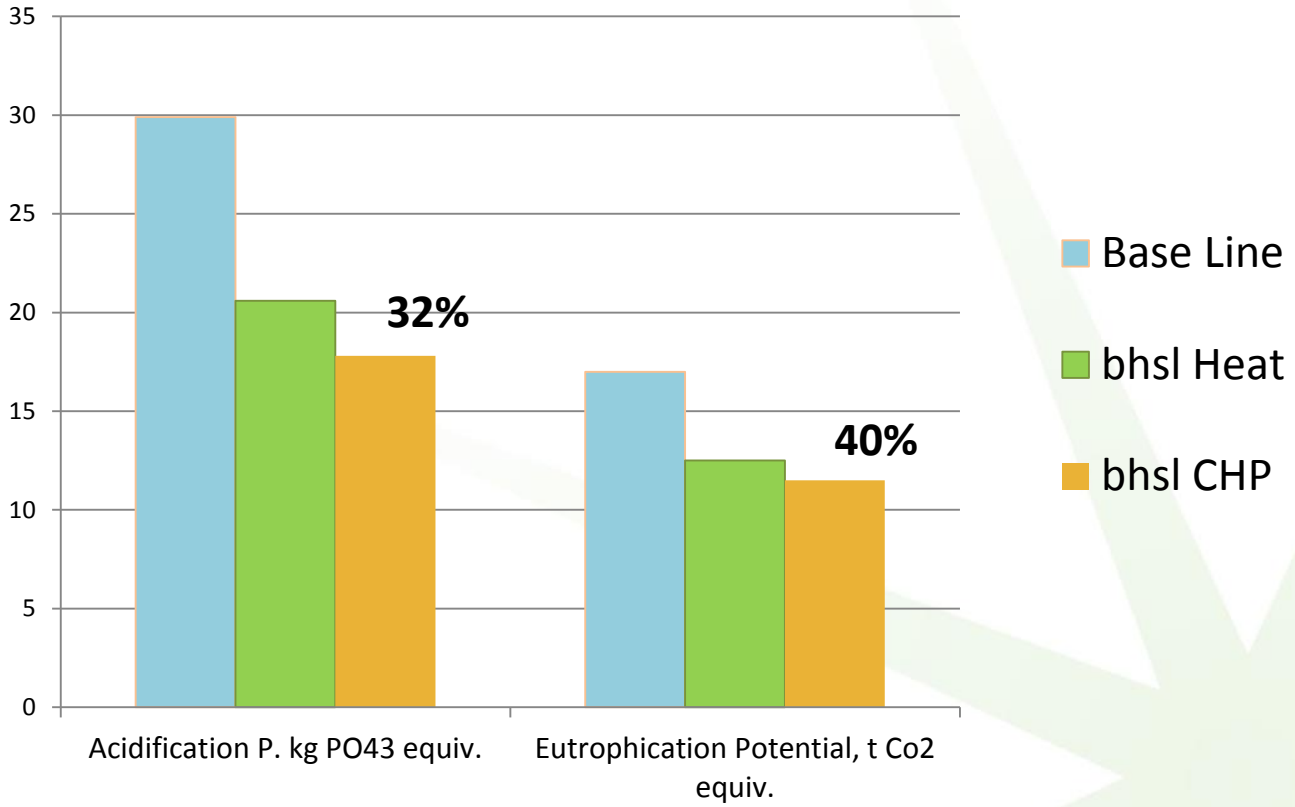
- Reduction of fossil fuel use
- Electric required to run system
- Trace gas emissions
- Changing transport burdens
- Changes in fertilizer use
- Changes in emissions from manure storage and from field
- Long term changes in soil carbon storage

Environmental Study

- **Eutrophication Potential (EP)** is used to assess the over-supply (or unnatural fertilization) of nutrients as a result of nutrients reaching water systems by leaching, run-off or atmospheric deposition
- **Acidification Potential (AP)** is mainly an indicator of potential reduction of soil pH .

Calculated using the method of the Institute of Environmental Sciences (CML) at Leiden University

Environmental Study



- Main reductions as a result of considerable reductions of ammonia emissions
- To a lesser extent, nitrate leaching from soils

Ash Utilization

- Since April 2011, bhsl has collaborated in extensive tomato crop trials by Dr Mark Reiter of Virginia Tech

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- Phosphate from bhsl ash is plant available and a suitable alternative to commercial Triple Super Phosphate (TSP).
- A form of pelletizing (agglomeration) ensures the ash can be applied using existing farm machinery
- Precision Agriculture

State of Maryland Award

- Bhsl awarded State of Maryland Grant of $970k Oct 2014 -to build demonstration unit in Rhodesdale, Maryland
- Animal Waste Technology Fund (AWTF)

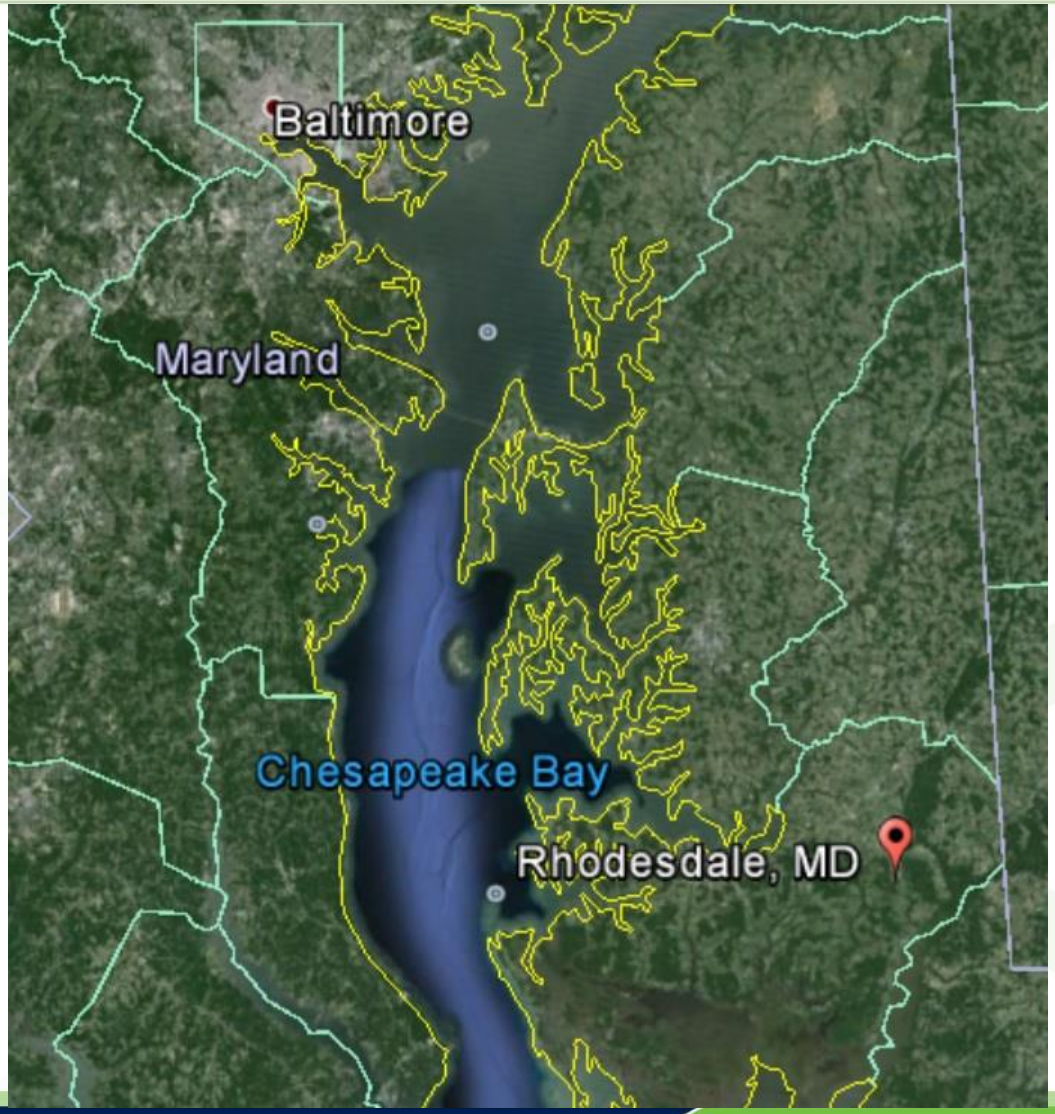
MARYLAND
FOUNDED 1634
Department of Agriculture

State of Maryland Award

- Installation commences Q2 2015
- Heating and Cooling solution

State of Maryland Award

- Commissioning Q3 2015
- 12 Month Monitoring & Demonstration



Thank you for your time

Any Questions?