Worldwide Pollution Control Association

WPCA-Duke Energy FGD Wastewater Treatment Seminar

March 7, 2013

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WPCA Duke Energy – Waste Water Seminar
March 7, 2013

Rich Marsan
Mark Ehrnschwender

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STEAG's Success Is Based on a Strong Power Plant Portfolio

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Bergkamen 780 MW

Köln-Godorf 211 MW

Fenne 466 MW

Voerde 2234 MW

Bexbach 780 MW

Leuna 162 MW

Walsum 560 + 790 MW

Weiher 724 MW

Herne 960 MW

Lünen 507 MW

Mindanao 232 MW

Iskenderum 1,320 MW

Termopaipa 165 MW

Defining the term ZLD`

What does ZLD mean?

- **All point sources of waste water?**
- **Does this include the condenser water?**
- **Cooling Tower?**
- **Does this include Boiler blow down?**
- **Does this include WFGD liquid?**

A clear definition is required!

What are the liquid sinks? Where can I utilize the waste water?

Zero Liquid Discharge

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Uses for Waste Water:

- For DFGD
- Utilization in the DFGD unit.
- Boiler Make-up feed water.

- For WFGD
- Consumption back into the WFGD.

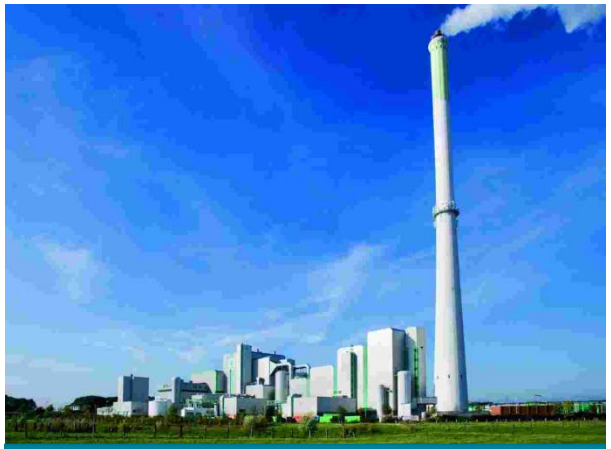
DFGD Concept – STEAG Plants

Herten Power Plant

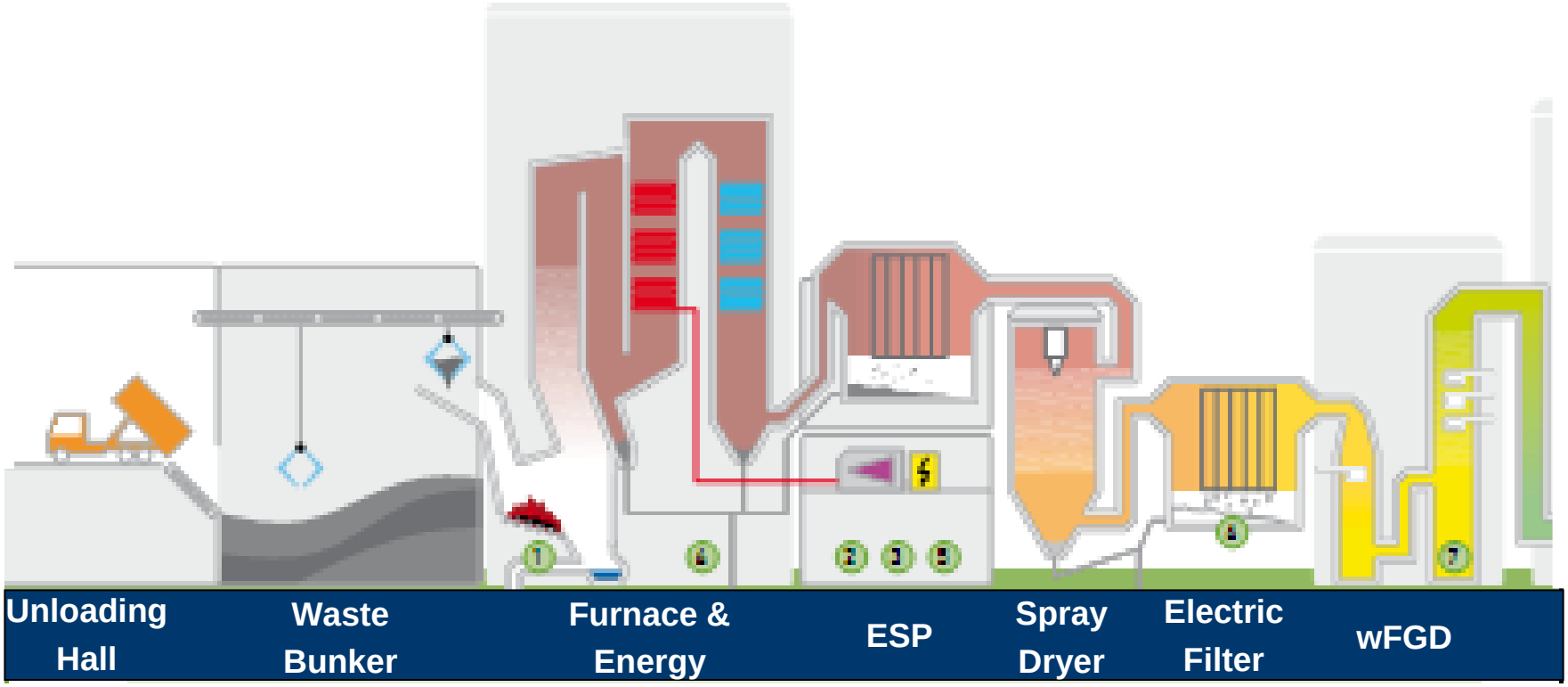
- 2 X 15 MW's
- Garbage Plant
- Uses Spray Drying Technology
- STEAG Integrator / A/E roll
- STEAG Ownership / Operation

Asdonkshof

- 1 X 22 MW's
- Garbage Plant
- Uses Spray Drying Technology
- STEAG Integrator / A/E roll
- STEAG Ownership / Operation

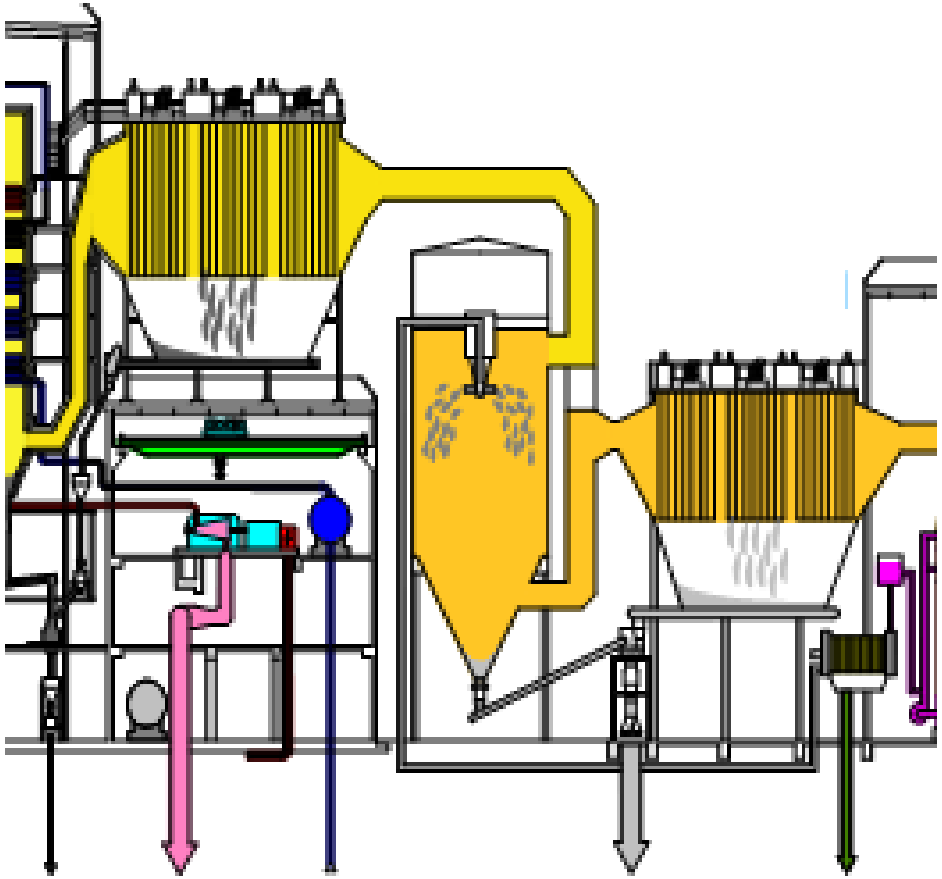


Asdonkshof Plant Arrangement



Asdonkshof Plant

- **Use of Spray Dryer in system with Sodium for emissions control.**
- **Uses the Wet FGD waste water for quenching.**



DFGD Issue for utilities

- **Waste water Quality of the Wet FGD.**
- **Cliffside is a good example of the utilization and a proof of utility concept. Except substituting a wet FGD instead of dry.**
- **Eliminates many of the HAZ mandates.**

Waste Water Treatment Options

- **Dilemmas Faced by Operators**
  - **Uncertainty of inlet water quality**
  - **Change of fuels changing waste water treatment inlet parameters**
  - **Various Discharge Requirements**
  - **Different Waste Water Treatment Designs**

- **Goals for Operators**
  - **Investigate a range of proven wastewater treatment options to minimize discharge**
  - **Establish strategies for treatment implementation**

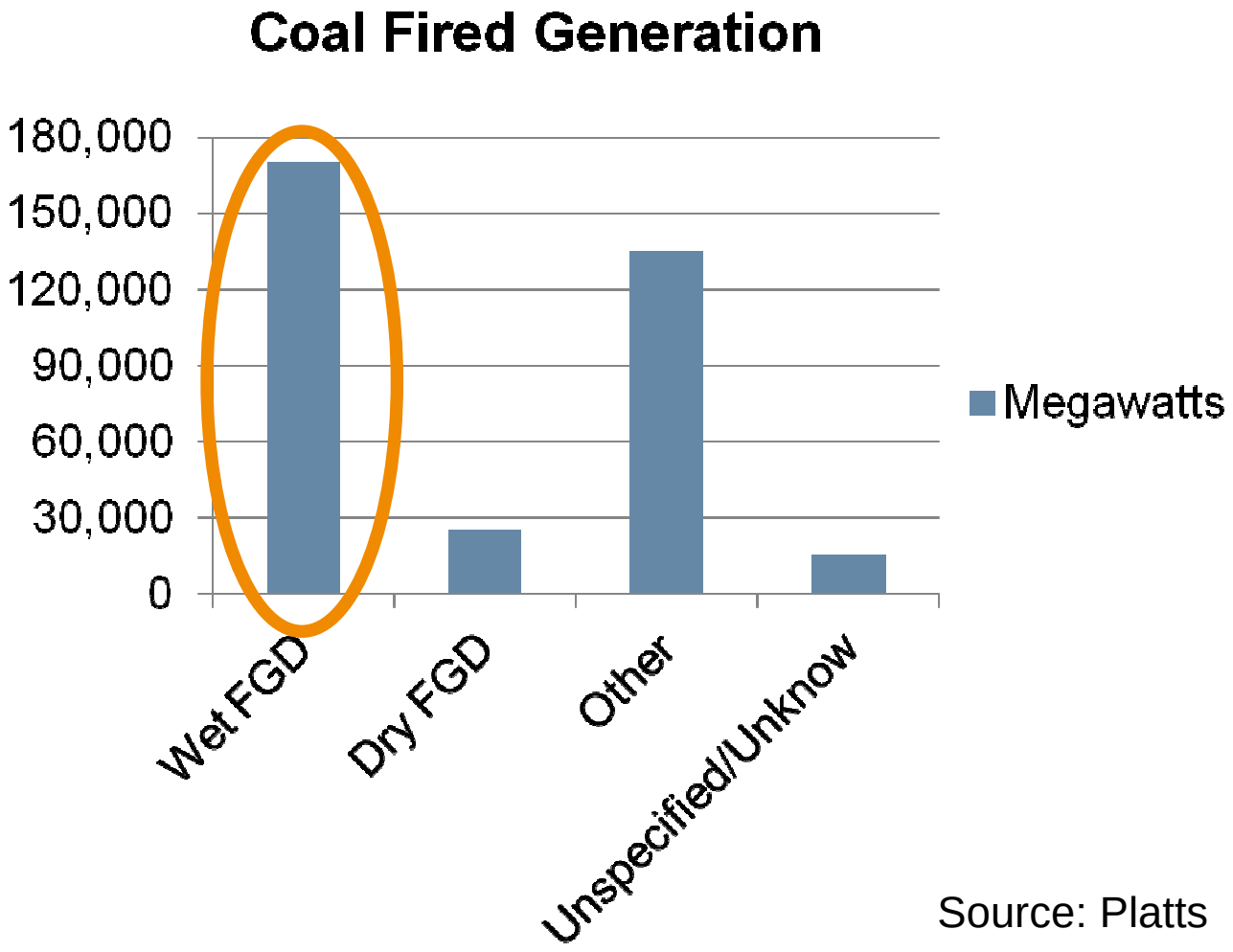
Why is Waste Water Becoming More Important?

- 51% of Coal Fired Generation expected to have FGD for SO_2 control
- Plants are using scrubbers for co-benefit to meet other environmental mandates, i.e. mercury
- Waste Water Discharge Regulations are becoming more stringent and focusing on different constituents, i.e. Selenium
- Natural Gas Cost Driving Factor in Viability of Operating Coal Plants
- Coal Fired Plants are being forced to move in direction of zero discharge

Regulatory Atmosphere

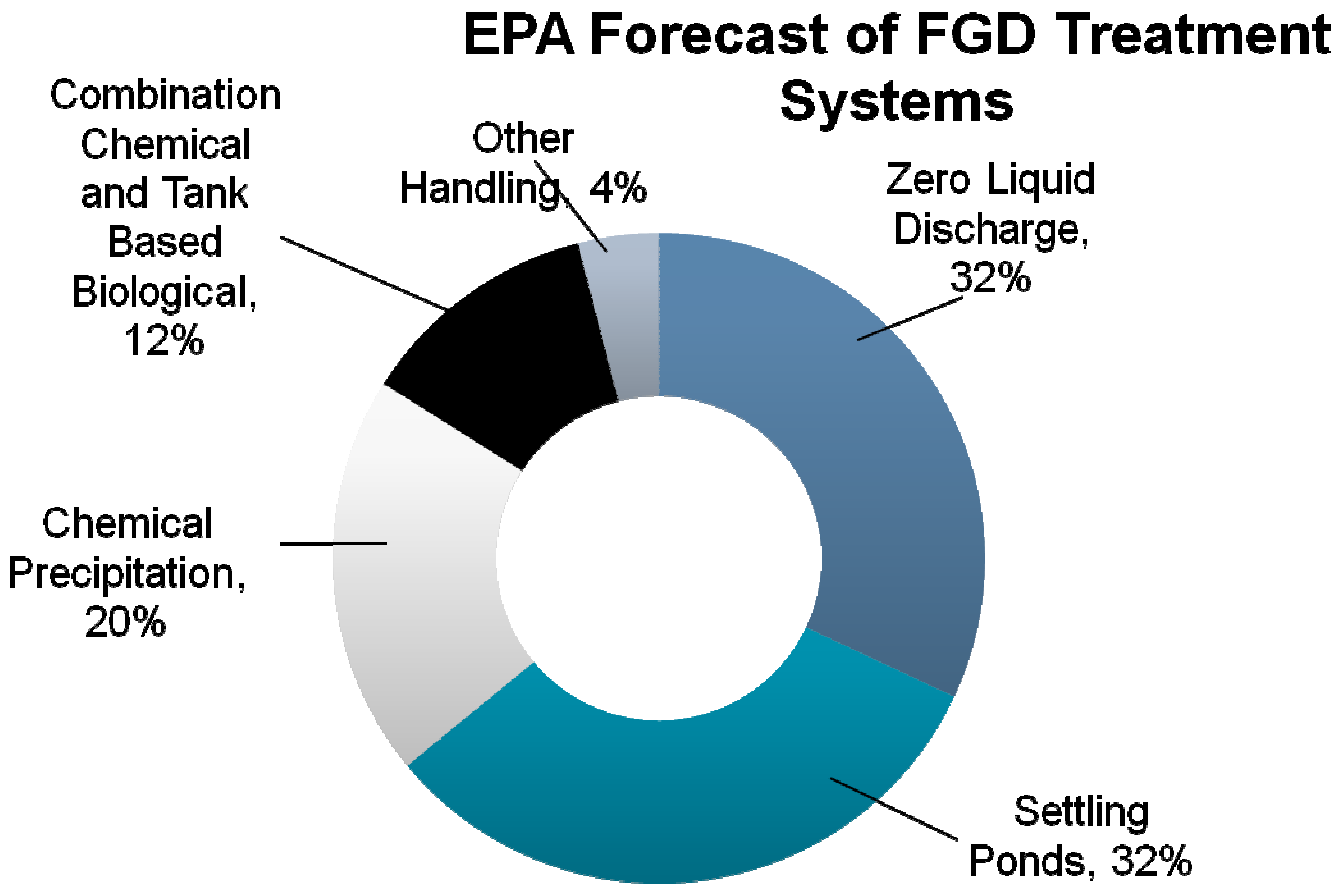
- **Regulations Vary by State**
- **Discharge in most cases is cleaner than inlet conditions**
- **Expected standard is 12 ppt Hg and 6 ppb Se; Great Lakes Region is moving towards <1ppt for Mercury.**
- **Current drinking water standard is 2 ppb for Hg, 50 ppb for Se**

SO_2 Control Technologies

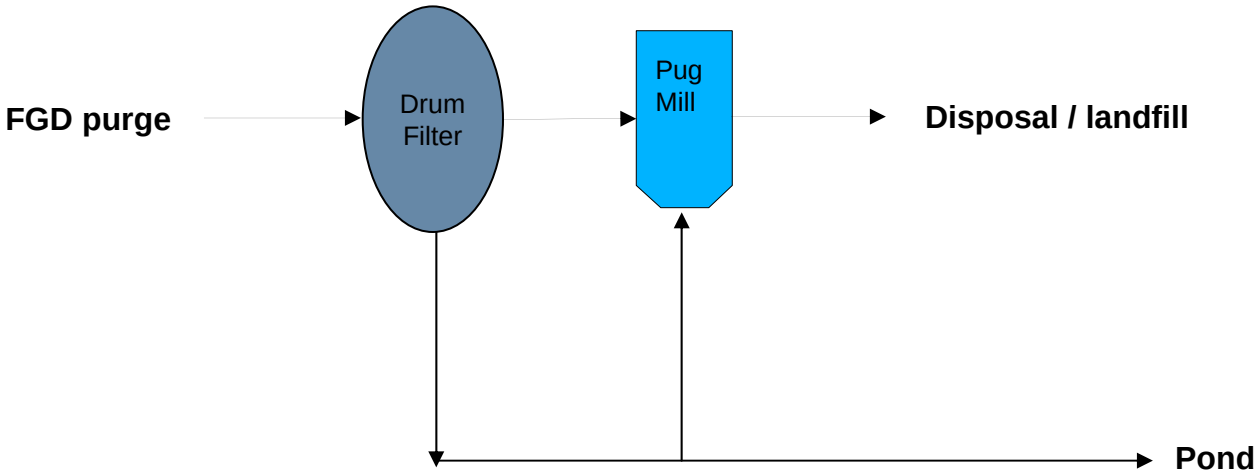


Source: Platts

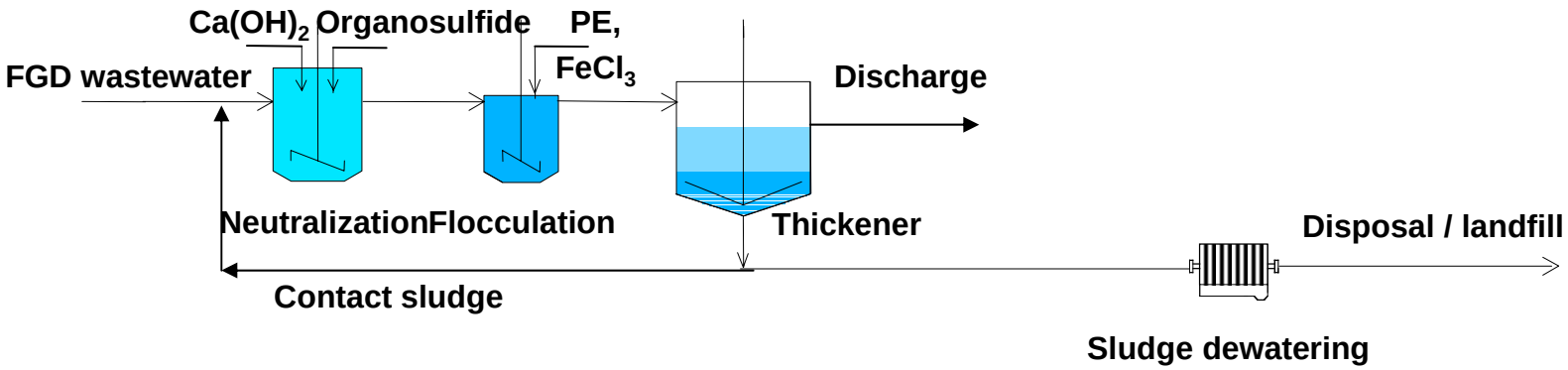
Waste Water Control Technologies



Phase 0 of Waste Water Treatment



Phase I of Waste Water Treatment
1 stage Process



Phase II Waste Water Treatment

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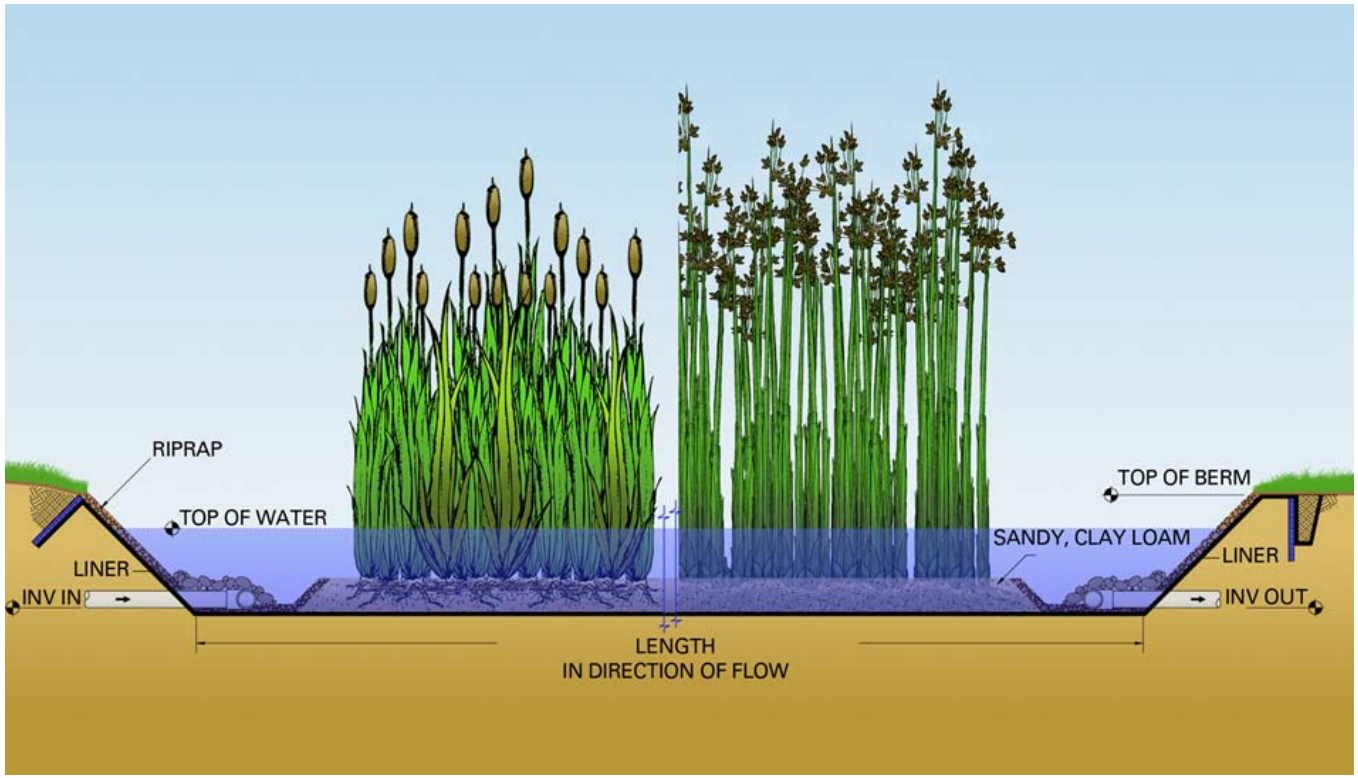
Constructed Wetlands



Source: Natural Systems International

Phase II Waste Water Treatment
2 stage Process

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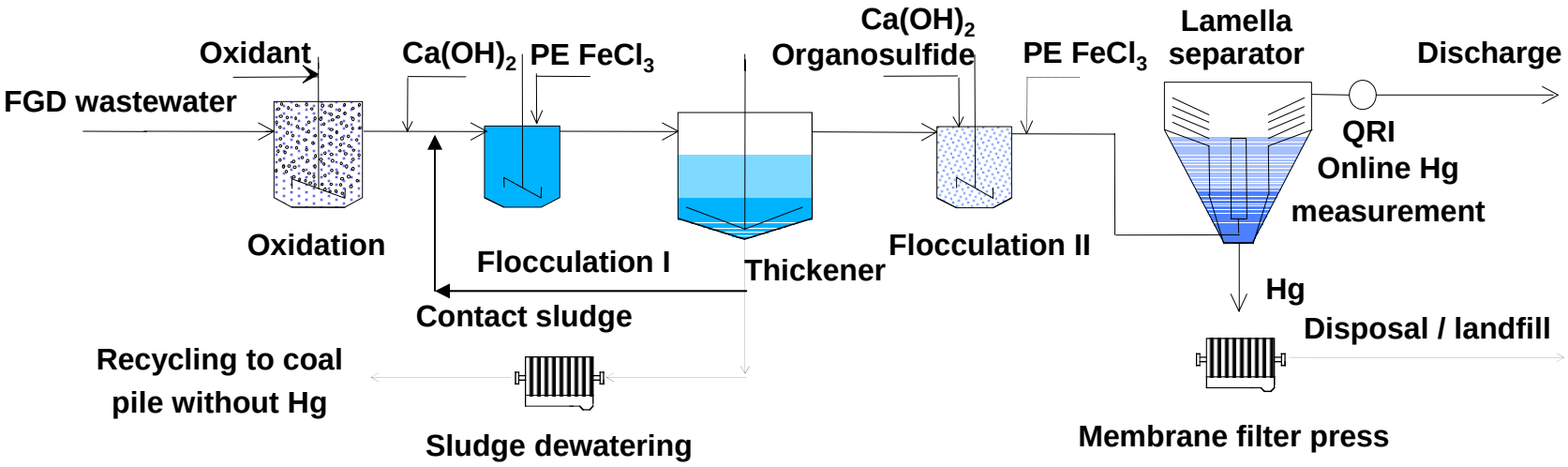

- **STEAG's latest Installation is a Walsum Power Station. Complete system.**
- **Significant reductions in Mercury & other heavy metals.**
- **No Stack arrangement.**

Phase III Waste Water Treatment

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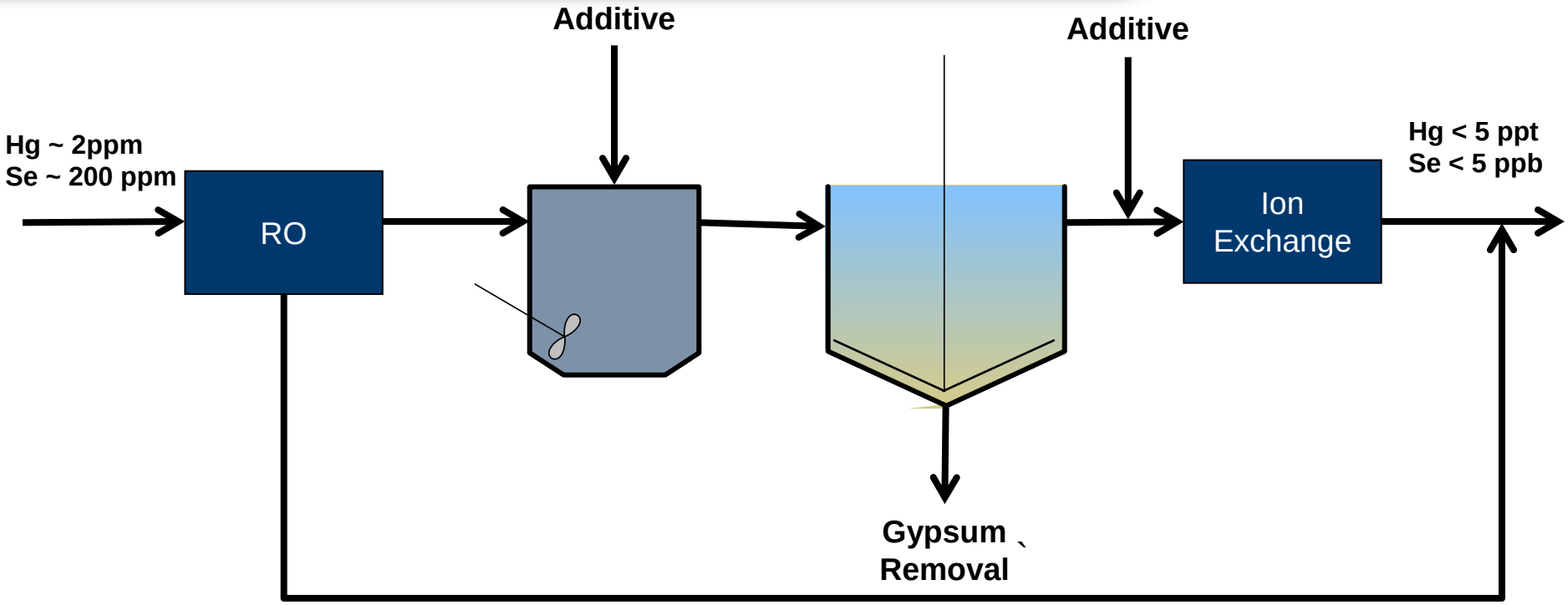
Bioreactor

Source: Duke Energy Roxboro Plant

Phase III Waste Water

- **Zero Liquid Discharge (ZLD)**
- **Produce up to 100 – 200 tons per day of residue**
- **Corrosive environment – exotic materials**
- **Calcium chlorides is the greatest component**
- **Very Energy Intensive**
- **Liquid Evaporated using steam or electrical**
- **Reverse Osmosis**

Current STEAG Development
The Selenium/Mercury Removal Step



- Drinking water has a limit mercury limit of 12 ppt!
- Water can be reused into the cooling tower / boiler feed make-up – Beginning steps of Zero Liquid Discharge (ZLD).
- STEAG has a prototype operation at STEAG's Herne plant in Germany. Planning a Trailer Demonstration size unit in the US.
- Biggest Concern – Understanding Waste Water Quality!

Conclusions

- **Regulations will not get less stringent!**
- **It is critical to understand the characteristics of the waste water stream?**
- **A complete review of usable areas where wastewater could be utilized? Evaporative**
- **The chemistry of the waste water?**
- **There will be significant amount of solid waste produced. What do you do with it?**

Questions

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