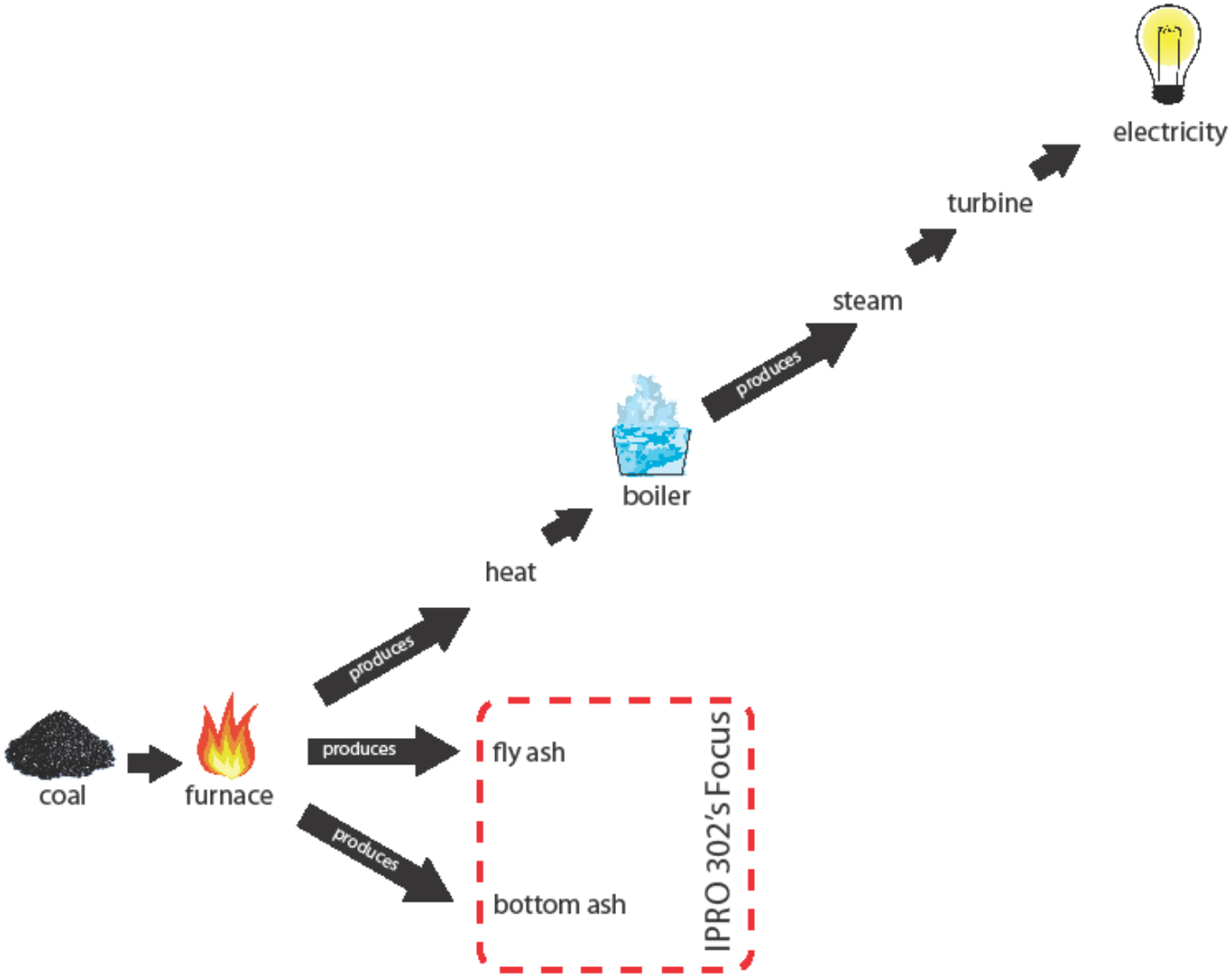

IPRO
302
ccr solutions

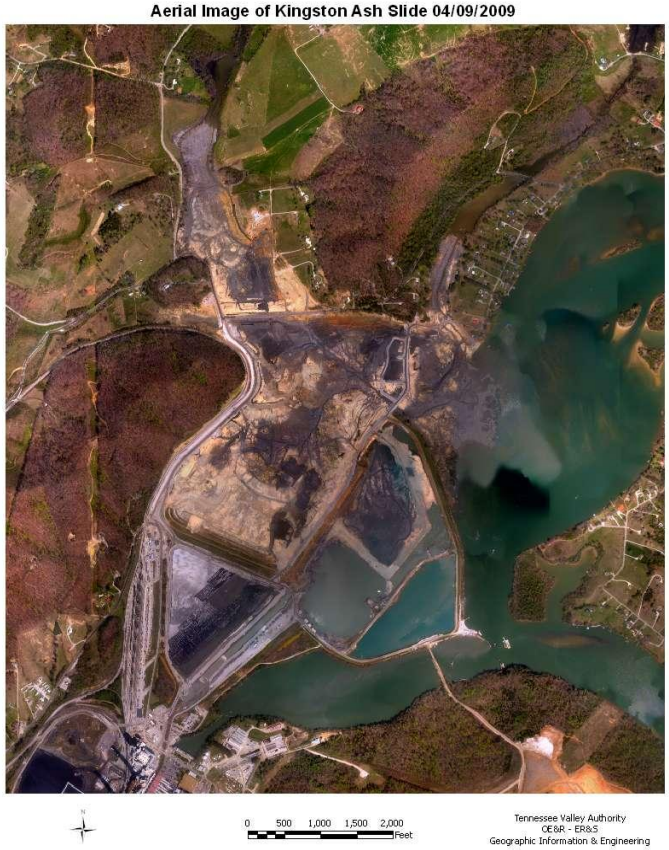
COAL IS A MAJOR ENERGY SOURCE



TVA/KINGSTON DISASTER

2006 Aerial Photo

Aerial Photo of the Spill



PRIMARY GOAL

Recommend a viable ash pond closure solution based on the assumptions provided by Sargent and Lundy(sponsor):

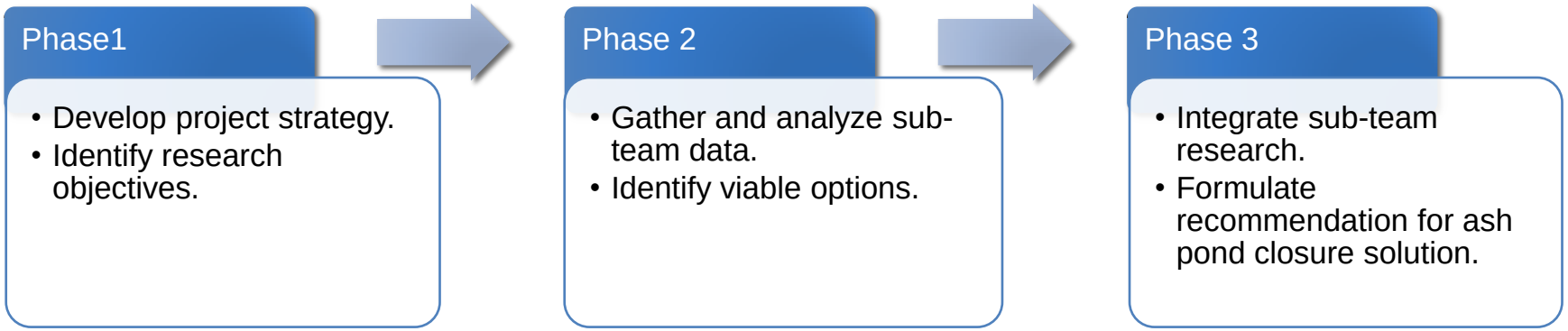
- 500 MW Power plant
- 200 tons/hr coal consumption
- 15 tons/hr bottom ash production
- 30 acre X 10’ deep ash pond
- 2000 gpm ash sluice water

PROJECT OBJECTIVES

Evaluate the impacts of eliminating an ash storage pond from a power plant including:

- Current status of CCR and wastewater regulations
- Alternatives for ash disposal and reuse.
- Alternatives for water treatment and disposal.
- Cost and other implications (environmental, space, etc) of unlined ash pond closure.

SOLUTION PROCESS



TEAM STRUCTURE

TEAM LEADER

- Nicole Firnbach

REGULATIONS SUB-TEAM:

- Shana Burnett (Sub-team leader)
- Chad Parker
- Jennifer Agosto

CURRENT BOTTOM ASH HANDLING SUB-TEAM:

- Graham Port (Sub-team leader)
- Nicole Firnbach
- Dan Gardner

WATER TREATMENT SOLUTIONS SUB-TEAM:

- Sheena Enriquez (Sub-team leader)
- Dan Kipp
- Robert Herman

ALTERNATIVE BOTTOM ASH HANDLING SUB-TEAM

- Joseph Sanchez (Sub-team leader)
- Susan Rafalko

EPA REGULATIONS

- After TVA/Kingston incident, EPA is proposing major regulation changes.

- Two Proposals under EPA consideration:
  - Subtitle C labels bottom ash as hazardous material, and in many cases requires ash pond closure and post closure care.

  - Subtitle D maintains a non-hazardous status, yet adds more regulations and may be most expensive.

- Further analysis will include regulatory impacts on power plants based on given assumptions.

CURRENT BOTTOM ASH HANDLING

- Mechanical
  - Submerged Flight Conveyor. (SFC): Horizontal flights move the accumulated ash up a dewatering ramp where it falls through a discharge chute to a truck or bunker.

- Hydraulic
  - Hydraulic Sluice System: A Hydraulic system collects ash from the furnace in a water impounded hopper and then transports it in a sluice pipeline to a pond.

  - Recirculation System: A complete recirculation system replaces the ash pond with dewatering bins which separates the water and ash, a settling tank and surge (storage) tank.

WASTEWATER SOLUTIONS

- Ash pond water contains high concentrations of toxic metals.
- Wastewater disposal or spillage raises fears of possible drinking water contamination.
- Possible solutions include Metfloc heavy metal chemical removal and Ion exchange trace metal removal systems.
- Submerged scraper conveyer may also be used to remove metals from bottom of ash pond.

ALTERNATIVE ASH SOLUTIONS

- Dry CCR technology eliminates need for ash pond storage.
- Greater heat recovery maximizes system fuel efficiency.
- The VAX and DRYCON systems are best examples.
- Further cost analysis of system investment and implementation is primary objective moving forward.

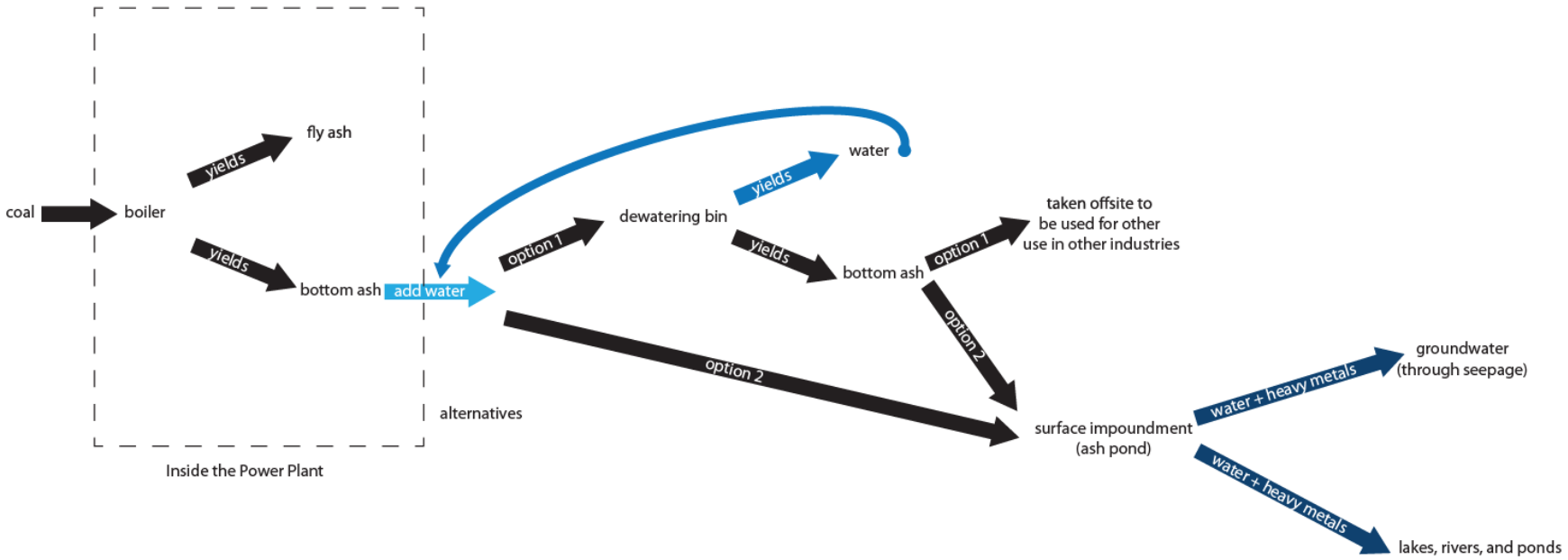
ANTICIPATED CHALLENGES

- Perform a relevant cost analysis of systems mentioned within the report.
- Analysis of the specific demands of an actual plant as specified by Sargent and Lundy.
- Establish contacts with local power plants and CCR management systems manufacturers.
- Confirm the neutrality and credibility of all data sources.
- Challenges are significant, but our team is confident in our project’s success.

QUESTIONS?

APPENDIX

IPRO 302's GUIDE TO BOTTOM ASH MANAGEMENT



Pros and Cons:

Pros

- Submerged Flight Conveyor –
  - Proven bottom ash system
  - Most common system
  - Most cost-effective
  - Less energy and water consumption than sluice systems
  - Modular design simplifies field erection and reduces installation cost• Continuous Removal of Ash
  - Lower Power Consumption
  - Easily Incorporates mill rejects
  - No ash storage pond
- Recirculation –
  - Allows zero discharge of water into the environment
  - Minimal system make up water usage
  - Shortest outage time for converting existing sluice system
  - Easily incorporates mill rejects
- Hydraulic Sluice System –
  - Hopper storage: 8 to 12 hrs
  - No internal hopper moving parts
  - Easy conveyor routing and maintenance
  - Emergency gravity discharge possible• No ash retention ponds

Cons

- Submerged Flight Conveyor –
  - The high discharge rate of ash over the head pulley during backlog recovery.
  - Poor dewatering of ash on the dewatering slope, resulting in slurry being discharged.
  - Ash spillage over the side wall at the intersection between horizontal and incline during backlog recovery.
  - Potential stalling of the SSC drive due to inadequate drive power during "backlog recovery" conditions.
- Recirculation –
  - Expensive Installation
  - Large yard footprint (its big)
- Hydraulic Sluice System –
  - Water treatment
  - Higher disposal costs
  - Cooling water requirements
  - Significant energy losses
  - Significant energy consumption
  - Maintenance intensive

Wastewater Solutions

- Contaminated Water
  - High concentration of heavy metals
    - Has negative effects on the environment
  - Sits in holding ponds outside
    - Possibility of a spill
    - Ends up in lakes, rivers and streams
    - Can leach into groundwater
      - Negatively affects our drinking water

Possible Wastewater Solutions

- Metfloc
  - Heavy metal chemical removal system
- Ion Exchange Treatment
  - Trace metal removal system
- Submerged Scraper Conveyor
  - Scrapes the bottom of the pond

Pros & Cons

- Pros:
  - Eliminate the need for an ash pond/water
  - Capture more heat from the bottom ash and circulate it back to the boiler- greater heat recovery.
  - Lower maintenance
  - Resulting ash is more environmentally friendly in comparison to other methods?
- Cons:
  - DRYCON & VAX are fairly new, not enough case studies, non-biased information, etc.
  - Initial investment costs are high.