Risk Management of Coal Transport, Storage and Handling systems in Power Plants

2014 Evolving Coal & Mining Industry
Towering new vision for Risk Management

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Karachi Insurance Institute

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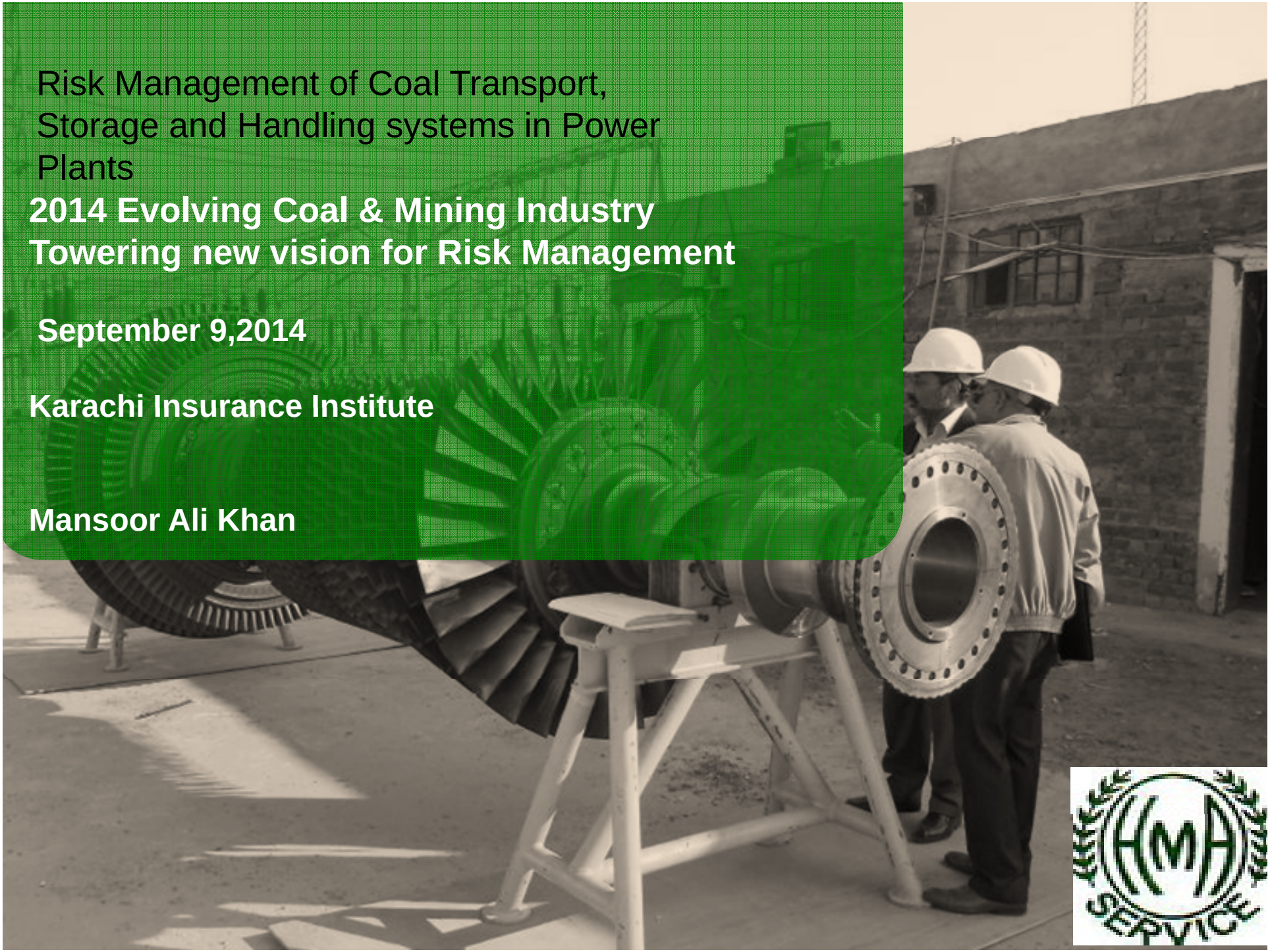
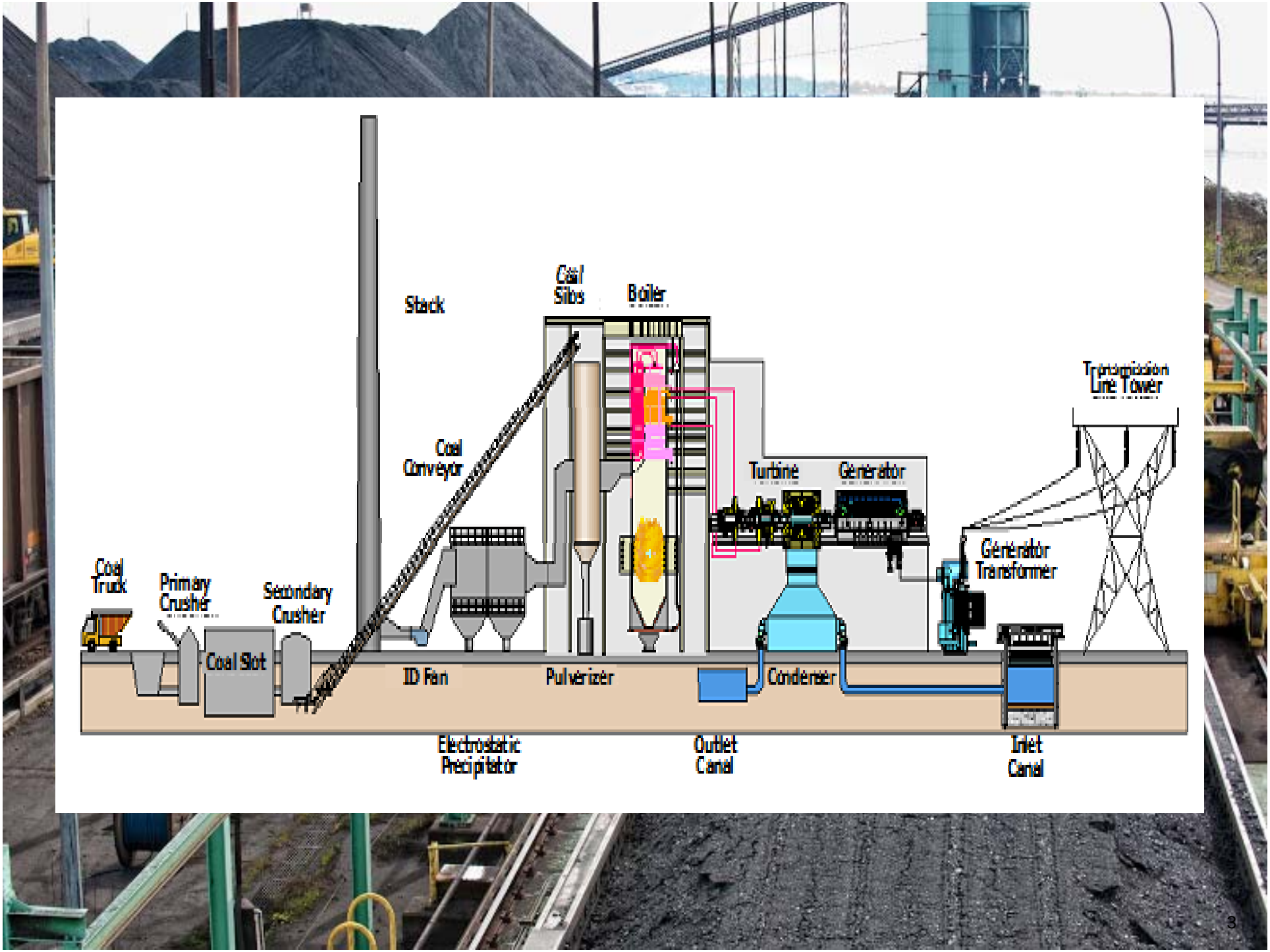


OUTLINE

- COAL AS A FUEL – PAKISTAN'S PERSPECTIVE
- COAL POWER PLANT INITIATIVES
- TRANSPORTATION, HANDLING, STORAGE & CONVEYANCE
- HAZARDS AND RISKS
- DETECTION, PROTECTION and PREVENTION MEASURES
- POWER PLANT COAL RELATED ACCIDENTS


Stack
Coal Silos
Boiler
Transmission Line Tower
Coal Conveyor
Turbine
Generator
Coal Truck
Primary Crusher
Secondary Crusher
Generator Transformer
Coal Silo
ID Fan
Pulverizer
Condenser
Electrostatic Precipitator
Outlet Canal
Inlet Canal

Coal Power Initiatives – Pakistan in 2014

- Gadani Power Park – 10,000 Mw
- Punjab – 6 x 660 Mw Power Plants
- Bin Qasim – 2 x 660 Mw
- Thar Coal – Minemouth plants 660 & 1000 Mw

Coal - Pakistan

- Traditionally used in Brick kiln,ovens.
- 185 billion tons estimated reserves
- Potential for 100,000 Mw
- Annual consumption – 6 million tons
- 154 Mw Lakhra Power plant
- 1990s Thar Coal Development – Gordon Wu
- OMC Lobby
- Federal / Provincial issues
- Cement Industry – Due to Gas shortages

Coal Consumption Examples

50 Mw plant – 1000 Mtpd – 300,000 Mtpy

500 Mw plant – 4000 Mtpd – 1,200,000 Mtpy

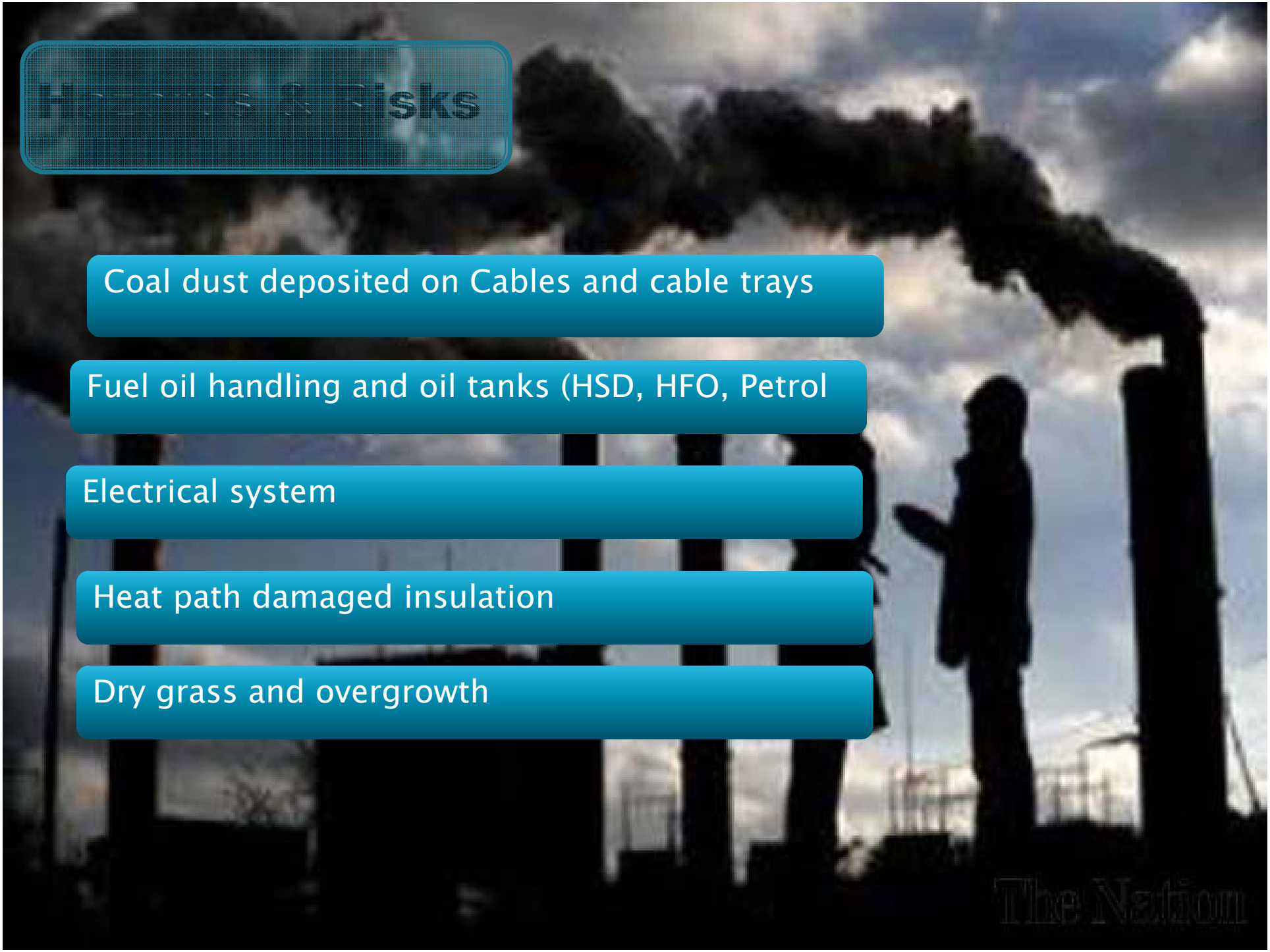
2880 Mw plant – 18,500 Mtpd – 5,500,000 Mtpy

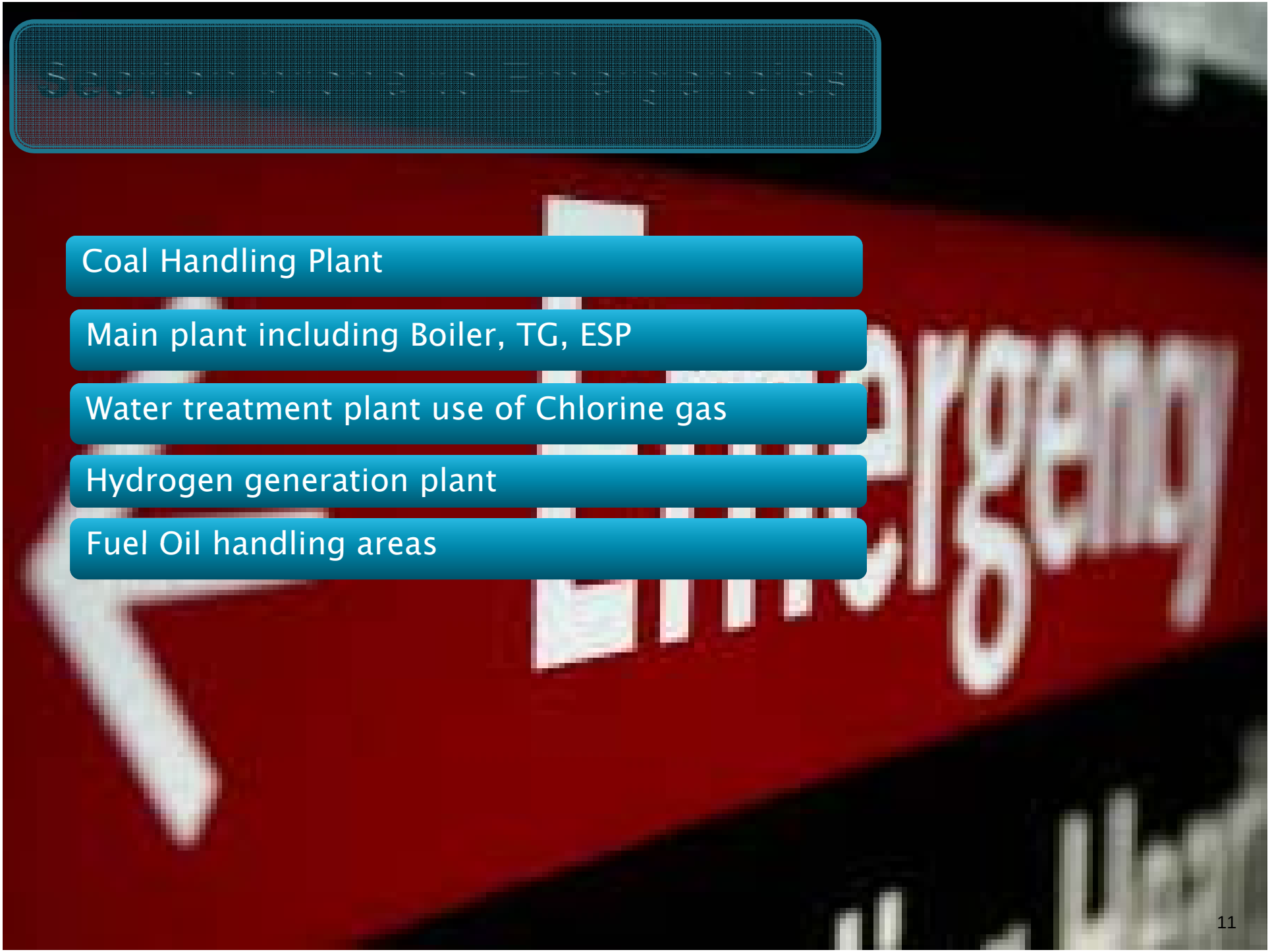
Transportation & Misc.issues

- 2 Seaports for Imported coal
- Overcrowded highways – Load limitations
- Inefficient Rail road system
- Inadequate Rolling Stock
- Located close to Urban population
- Environmental & Health degradation
- Lack of technical and supply chain expertise

AERIAL OF 2880 Mw COAL FIRED PLANT


Fast spreading fires – Spontaneous heating
Slow Isolated Fires
Explosions
Uncontrolled release of toxic corrosive / flammable liquid
Bursting of pipeline / vessels
Breach of dams / ash dykes
Flooding
Coal dust in mills and Boilers


Coal dust deposited on Cables and cable trays
Fuel oil handling and oil tanks (HSD, HFO, Petrol
Electrical system
Heat path damaged insulation
Dry grass and overgrowth



- Coal Handling Plant
- Main plant including Boiler, TG, ESP
- Water treatment plant use of Chlorine gas
- Hydrogen generation plant
- Fuel Oil handling areas

Release of Gases / Dust

- Chlorine in water treatment plant
- Hydrogen in turbo generated area of main plant
- Pulverized coal dust from mills and associated piping
- Fly ash from chimneys and ash ponds , ESP hoppers and bottom ash system
- Coal dust in transfer points, CHP, Crusher and mill area
- Flue gas from the ducts

Explosion Hazards in Coal Plants

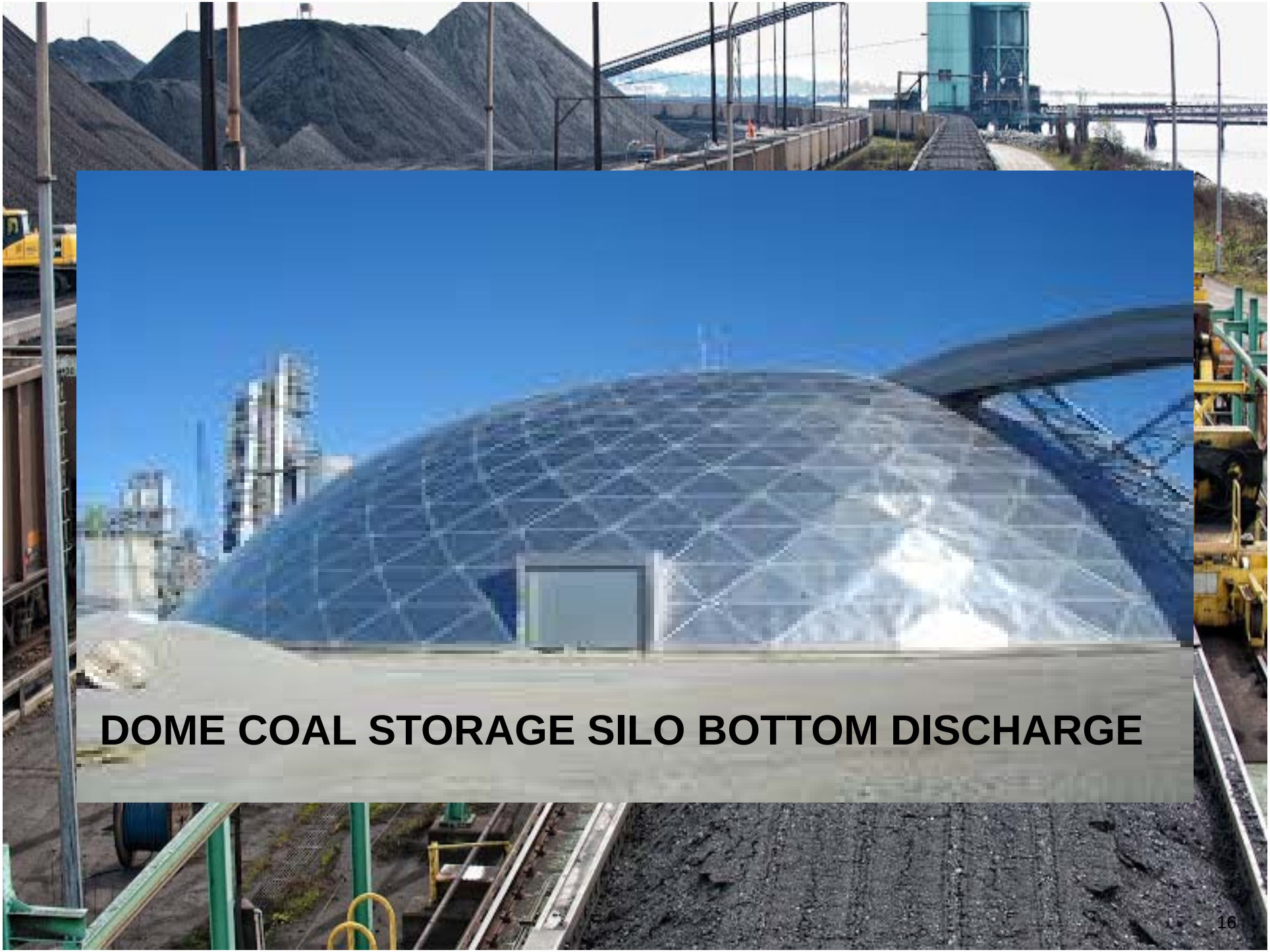
- Hydrogen plant
- Turbo generators where hydrogen is used for cooling of TG
- Transformer (Oil Cooled)
- Boiler (Coal/Oil Fired)
- Coal dust in Mills and Boilers

Detection Sytems

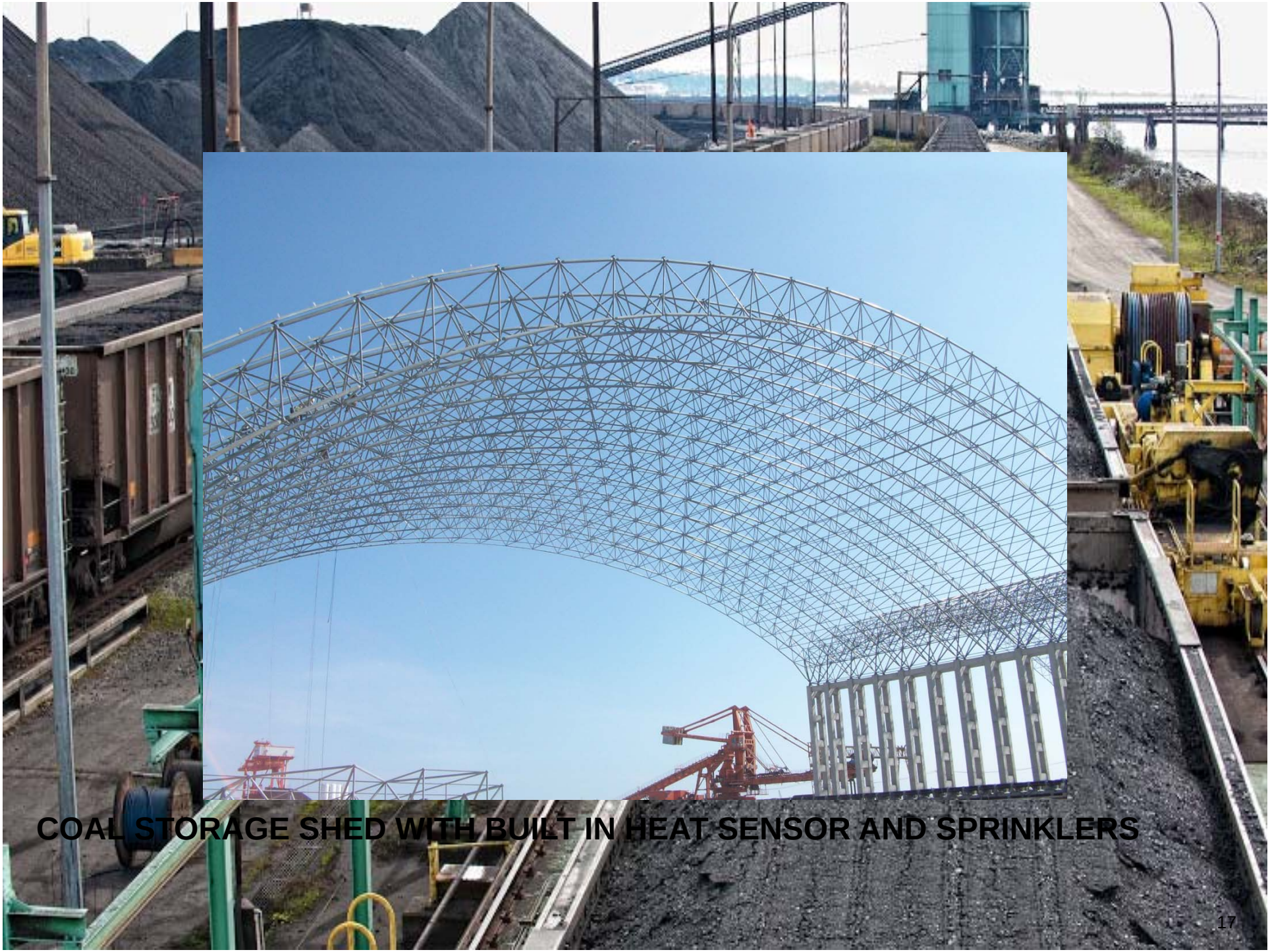
- Many plants employ outdated system – Heat bulb Sprinklers
- Integrated CO monitoring system can now give 48 hours advance information about a fire linked to PLC & SCADA systems
- Thermal imaging & IR scanners
- CO and fire is now preferable to smoke detection
- Location of sensors is of importance

Protection System

- Dust control – Electrostatic precipitators – Glass bag filters
- Fire Control – Sprinkler system – FM 200
- Emission control – Ventilator fans
- Spill control – Conveyor shrouds
- Traffic management – Earth moving equipment Stacker / Reclaimers – Conveyor belts – Driver/ Operator training
- Coal crushers and Grinding plants – Water sprays
- Fire retardant low smoke cables
- Personal safety – PPEs



DOME COAL STORAGE SILO BOTTOM DISCHARGE

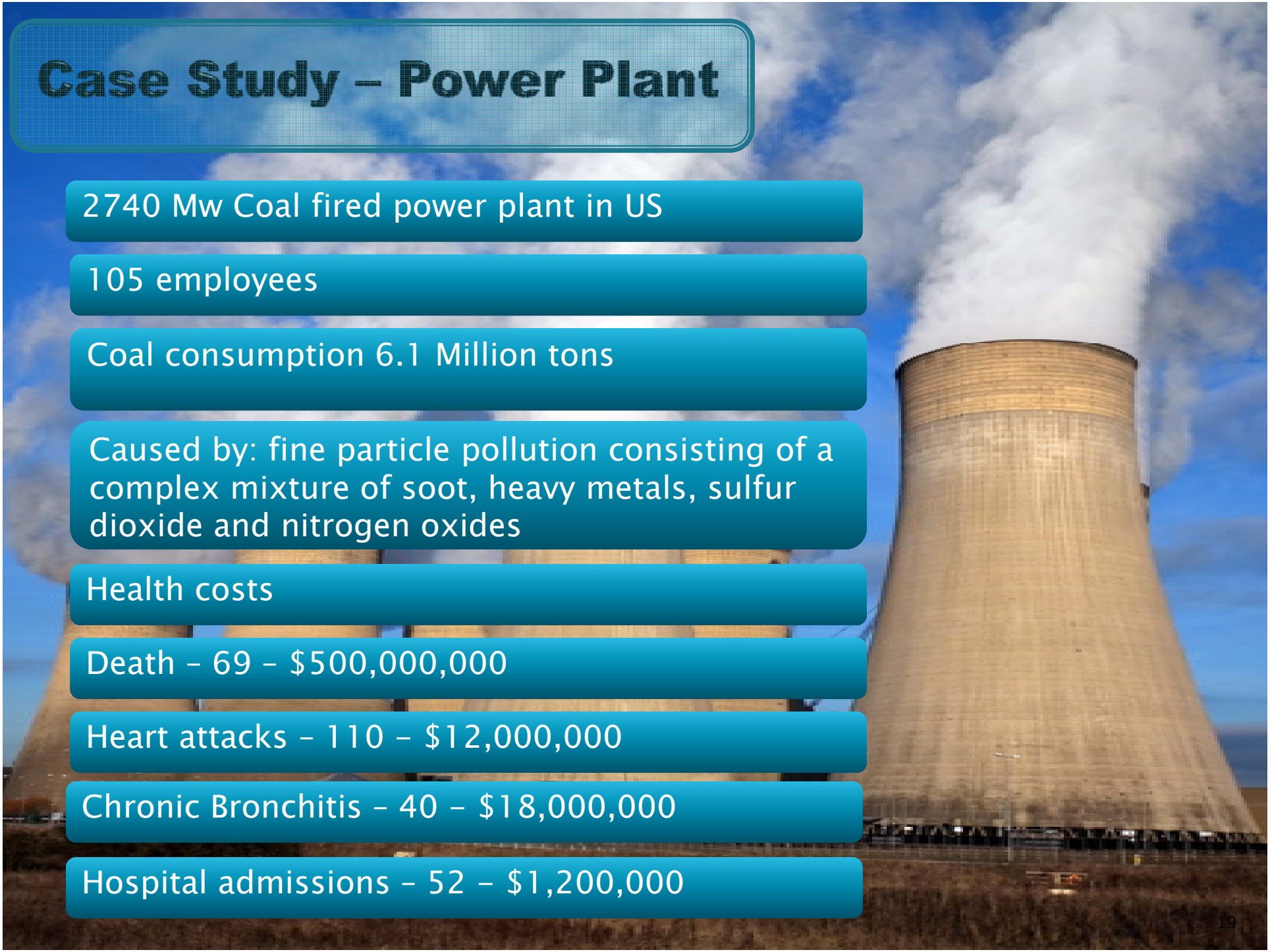


COAL STORAGE SHED WITH BUILT IN HEAT SENSOR AND SPRINKLERS

Emergency equipment & Facility

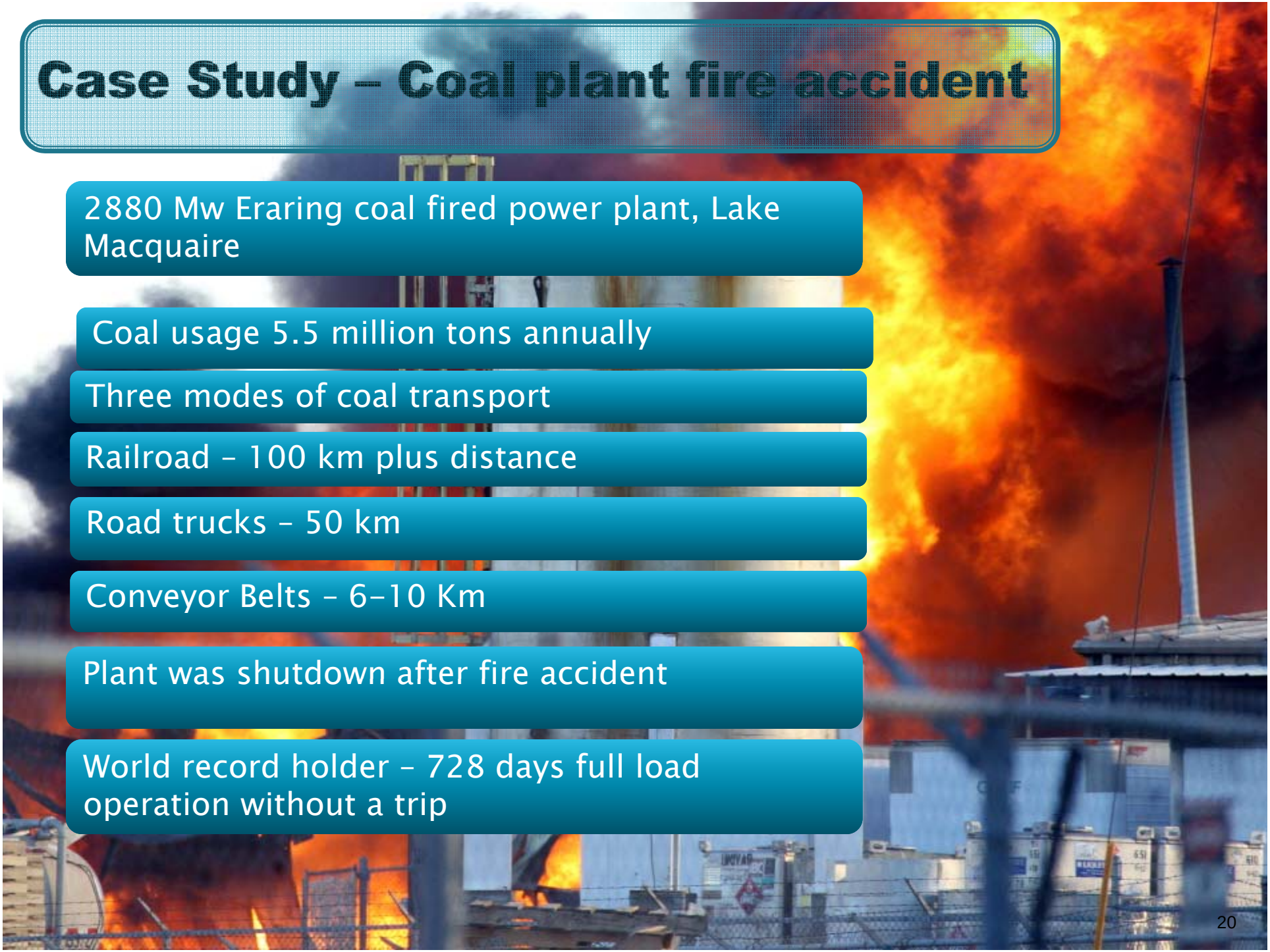
- Fire fighting equipments
- Emergency medical suppliers
- Toxic gas detectors
- Wind direction (wind sock) / Speed indicators
- Self contained breathing apparatus
- Protective clothing
- Containment facilities around tank / vessels
  Interfaces and lines of communication with off site officials, neighboring industries

Case Study – Power Plant

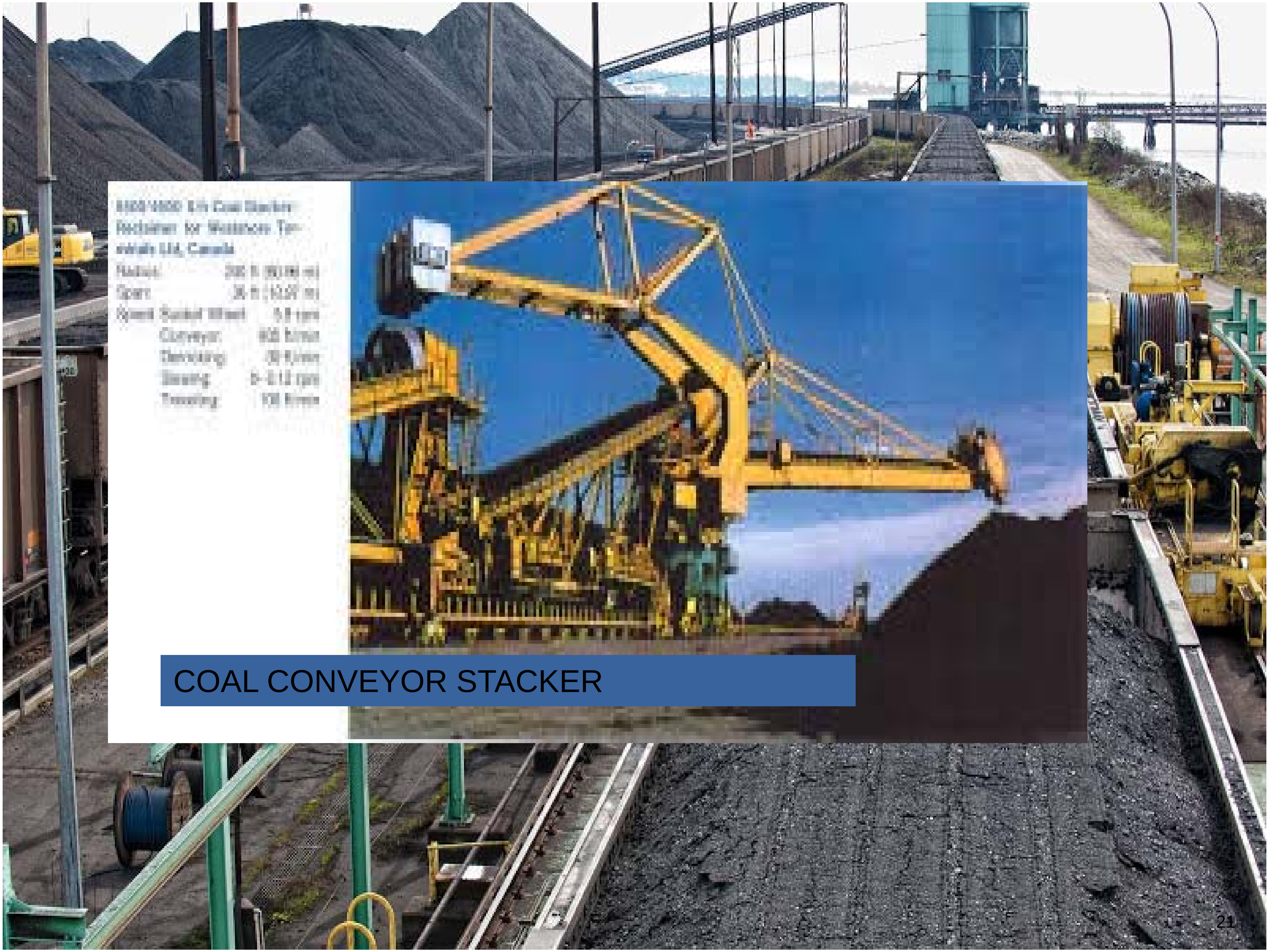


- 2740 Mw Coal fired power plant in US
- 105 employees
- Coal consumption 6.1 Million tons
- Caused by: fine particle pollution consisting of a complex mixture of soot, heavy metals, sulfur dioxide and nitrogen oxides
- Health costs
- Death – 69 – $500,000,000
- Heart attacks – 110 – $12,000,000
- Chronic Bronchitis – 40 – $18,000,000
- Hospital admissions – 52 – $1,200,000

Case Study – Coal plant fire accident



- 2880 Mw Eraring coal fired power plant, Lake Macquaire
- Coal usage 5.5 million tons annually
- Three modes of coal transport
- Railroad – 100 km plus distance
- Road trucks – 50 km
- Conveyor Belts – 6–10 Km
- Plant was shutdown after fire accident
- World record holder – 728 days full load operation without a trip



COAL CONVEYOR STACKER

OPEN YARD COAL RECLAIMER


WHEEL LOADER MOUNTED COAL DUST DISPOSAL CHUTE


COAL FEEDING CONVEYOR TO
COAL MILLS

WHEEL TYPE COAL RECLAIMER

PLANT WAS SHUT DOWN AND SOLD ON ENVIRONMENTAL RISK GOUNDS

Thank you! Questions?