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## **Cumulative Impacts**

### Grand Gulf ESP

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#### DOCKETED USNRC

2006 DEC 15 PM 3: 19

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RULEMAKINGS AND
ADJUDICATIONS STAFF



## Background

- Identified and described by CEQ in 40 CFR Part 1508.7
- Defined as incremental impact of Federal action under review, plus other past, present, and future Federal or non-Federal actions
  - Aggregated small impacts from variety of sources may have detectable or destabilizing effects on resources
  - Future changes in resource condition may increase importance of small impact from proposed action



## **Operational Rules**

- Issues considered cumulatively included all issues analyzed for site impact and site suitability
  - Construction
  - Operation
  - Fuel Cycle ®
  - Transportation
  - Decommissioning
- Only issue not analyzed in detail for cumulative effects was design basis accidents
  - Extremely unlikely to occur both at GGNS Unit 1 and proposed site
  - Regulatory guidance applies to individual reactors (not collections of reactors)
- Spatial and temporal context were appropriate to each issue
  - Included continued operation of Grand Gulf Nuclear Station Unit 1
  - Temporal horizon covered operation and decommissioning of proposed new facility



### Land Use

#### Context:

- Counties around proposed new facility and transmission system
- GGNS Unit 1
- Existing and expected changes in land use for 40 years

#### Parameters:

- Land conversion for new workers and related population growth
- Offsite land use changes from new transmission system to accommodate the total new facility generating capacity

- Small impacts from land conversion growth accommodated by other counties
- Impacts from transmission system land use conversion <u>Not</u>
   <u>Resolved</u> no information on expanded/alternative right-of-way



## Air Quality (1)

#### Context:

- Regional air quality
- Pollutant emissions from GGNS Unit 1
- Transmission system

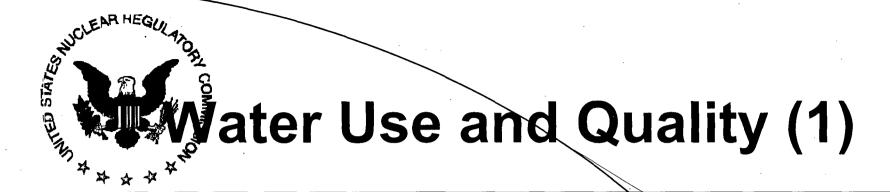
#### Parameters:

- Construction emissions
- Pollutant emissions during operation
- Cooling tower heat, water vapor, and drift plumes from the new facility



## Air Quality (2)

- Small impact of construction emissions \ limited duration within an attainment area
- Small impact of operational pollutant emissions same magnitude as existing GGNS Unit 1, occurs within an attainment area
- Small impact of plumes same magnitude as existing GGNS Unit 1



#### • Context:

- Existing GGNS Unit 1 operation
- Projected regional population growth for 40 years

#### • Parameters:

- Surface water use
- Groundwater use
- Surface water quality
- Groundwater quality

# Vater Use and Quality (2)

- Small impacts for surface water use onsite streams entirely within site; Mississippi River flow is very large relative to use, flow is regulated and shoreline managed by US Army Corps of Engineers
- Impacts on groundwater use <u>Not Resolved</u> effects of drawdown of Catahoula aquifer (defined by U.S. EPA as a sole source aquifer warranting protection) on domestic water users not quantifiable given existing data
- Impacts on surface water quality <u>Not Resolved</u> chemical discharges from the proposed new facility have not been fully quantified
- Impacts on groundwater quality <u>Not Resolved</u> Effects of aquifer drawdown on Catahoula aquifer water quality not quantifiable given existing data

## errestrial Ecosystems (1)

#### Context:

- Region surrounding GGNS
- Transmission rights-of-way
- Other federal and state actions in region
- GGNS Unit 1 operations

#### • Parameters:

- Collective impacts to habitats, plants and wildlife, and threatened and endangered species from onsite facility construction plus offsite transmission system improvements
- Collective impacts to habitats, plants and wildlife, and threatened and endangered species from transmission line operation, right-of-way maintenance, and cooling tower operation



- Impacts on habitats and species from construction <u>Not Resolved</u> - lack of information on changes to existing transmission rights-of-way to accommodate full generating capacity of new facility
- Small impacts on habitat and species from operation - same order of magnitude as existing GGNS Unit 1



## **Aquatic Ecosystems (1)**

#### Context:

- Region surrounding GGNS
- Transmission rights-of-way.
- Other federal and state actions in region
- GGNS Unit 1 operations

#### • Parameters:

- Collective impacts to habitats, plants and wildlife, and threatened and endangered species from onsite facility construction plus offsite transmission system improvements
- Collective impacts to important aquatic species and habitats, including threatened and endangered species, from impingement and entrainment; and the amount, temperature, and chemical composition of discharge water



- Small impacts on habitats and species from construction
  - impacts small size and temporary in nature
  - wetland protection requirements will be met
- Small impacts on habitat and species from operation
  - existing GGNS Unit 1 does not take water directly from Mississippi River
  - combined discharge plumes small relative to size of river
  - chemical discharges would be regulated by MDEQ under NPDES permit
    - requires cumulative analysis
    - permit limits set to ensure protection of aquatic species



## Socioeconomics (1)

#### Context:

- Variably sized region that includes all potential areas of workforce settlement
- Existing GGNS Unit 1
- 40-year operating and decommissioning horizon
- Projected population growth from all sources

#### Parameters:

- Collective impacts on physical assets (roads, buildings, aesthetics)
- Collective impacts on regional demography
- Collective impacts on regional economics and taxes
- Collective impacts on infrastructure (transportation systems, housing, recreation, public services, and education)



## Socioeconomics (2)

- Small impacts on physical systems and infrastructure under likely settlement scenario - increases are temporary and diffuse
  - Moderate impacts if more workers than expected settle in Claiborne and Jefferson Counties
- Small impacts on demography under likely settlement scenario increases are temporary and diffuse
  - <u>Large</u> impacts if more workers than expected settle in Claiborne County
- <u>Large beneficial</u> impact on tax revenues significant increase for Claiborne County
  - Moderate beneficial in Warren County
- Moderate impact on infrastructure and community services construction/expansion of existing infrastructure could be necessary

## Historic and Cultural Resources

#### Context:

- Variably sized region that includes all potential areas of workforce settlement
- Existing GGNS Unit 1
- Transmission rights-of-way

#### Parameters:

Impacts to historic and cultural resource values

#### • Conclusion:

 Small impacts on resource - applicant committed to manage discovery and protection/mitigation process during construction

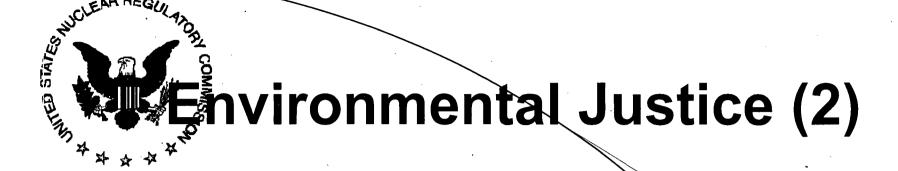
## Environmental Justice (1)

#### Context:

- Variably sized region that includes all potential areas of workforce settlement
- Existing GGNS Unit 1
- 40-year operating and decommissioning horizon
- Projected population growth from all sources

#### Parameters:

- Unusual resource dependencies, practices, or environmental pathways, pre-existing health conditions
- Social and economic impacts
- Infrastructure and community services



- Small impacts regarding dependencies and health no unusual dependencies, practices, or vulnerabilities affecting minorities or low income groups
- Large beneficial impacts from tax revenues realized for Claiborne County
- Moderate impacts on infrastructure and community services
   if workers settle more heavily than expected in Claiborne
   County resulting in increased demands on infrastructure and services



## Nonradiological Health

#### Context:

Existing GGNS Unit 1 operation

#### Parameters:

- Microbial organisms
- Occupational health
- Noise and dust emissions
- Effects of electromagnetic fields

- Small impacts of microbial organisms biocides used at GGNS Unit 1 towers; appropriate industrial hygiene practices would be used at proposed new facility towers
- Small impacts on occupational health nuclear industry accident rates are below national industry average
- Small impacts of noise and dust temporary and mitigated
- Impacts of EMF are <u>Not Resolved</u> lack of scientific and regulatory consensus

# Radiological Impacts of Normal Operations

#### Context:

- Existing GGNS Unit 1 operation
- Regulatory standards for protection of human health and environment
- 80-km radius of Grand Gulf ESP site

#### Parameters:

- Dose to public and biota
- Occupational dose
- Radiological emissions

- Small impacts for radiological dose to public and biota combined dose for public, biota, and at site boundary (maximally exposed individual) within regulatory standards
- Small impacts for occupational dose within regulatory standards
- Small impacts for radiological emissions within limits set by NRC and State of Mississippi



### Fuel Cycle

#### Context:

All users of nuclear reactor fuel in the US

#### Parameters:

- Fuel use by light-water reactors
- Fuel use by gas-cooled reactors

- Small impacts for light-water reactors usage small based on existing designs and likely improvements
- Impacts for gas-cooled reactor designs <u>Not Resolved</u> lack of information on fuel use for these designs



## Fuel Transportation

#### Context:

- Existing GGNS Unit 1 operation
- Life cycle of new facility

#### Parameters:

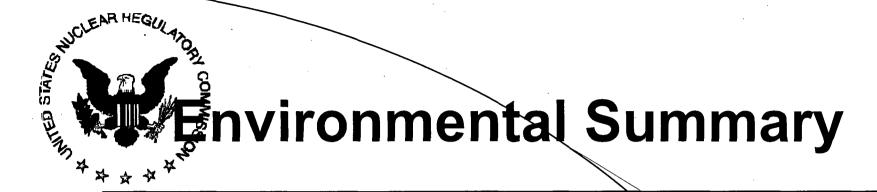
- Radiation dose to public from unirradiated fuel, spent fuel, and radiological waste from operation of light-water reactors
- Radiation dose to public from unirradiated fuel, spent fuel, and radiological waste from operation of gas-cooled reactors

- Small impacts for light-water reactors all doses and health impacts within regulatory limits
- Impacts for gas-cooled reactor designs <u>Not Resolved</u> lack of information on fuel use for these designs



## Decommissioning

- Context:
  - Existing GGNS Unit 1 operation
- Parameters:
  - Radiation dose to workers and public
  - Waste management
  - Water quality
  - Air quality
  - Ecological resources
  - Socioeconomics
- Conclusions:
  - Impacts from decommissioning are <u>Not Resolved</u> lack of information regarding decommissioning for the proposed new facility



- Most impact areas were <u>Small</u>
- Socioeconomic and Environmental Justice have the potential for Large beneficial or Moderate adverse impacts
  - Mitigation may be warranted (e.g., assistance with infrastructure and public services in Claiborne County)
- Several impact areas were <u>Not Resolved</u>
  - Information was not available to resolve these issues and would have to be provided by an applicant referencing the ESP at the CP/COL stage
- For issues that were resolved, the staff will verify the continued applicability of assumptions at the CP/COL stage