

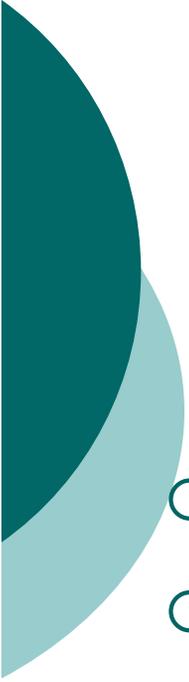


# **Southeastern Power Administration**

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## **Southwestern Federal Hydropower Conference**

**Hydropower Pump-back Projects/Perspectives**



# Southeastern Power Administration

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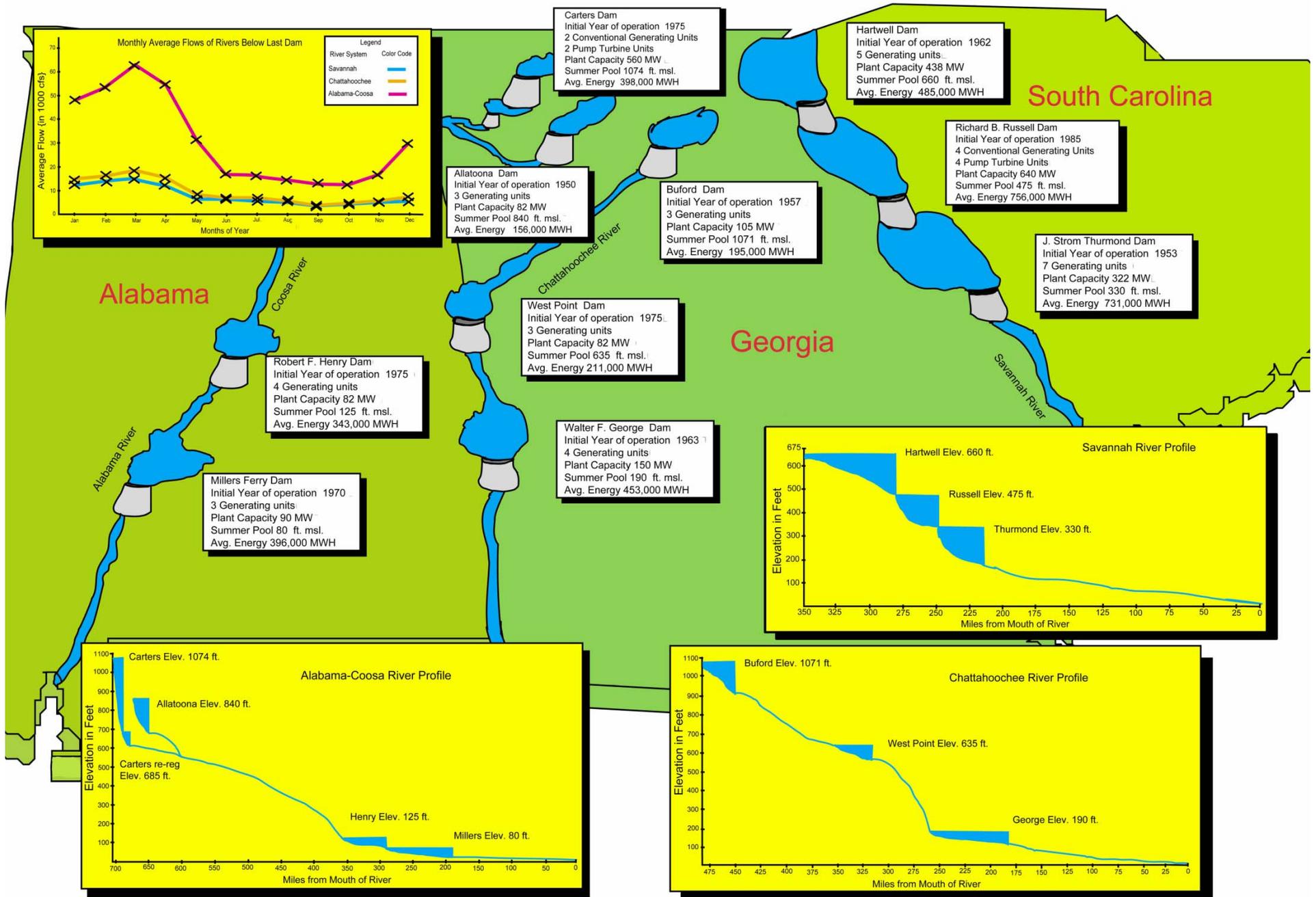
## Presentation Points

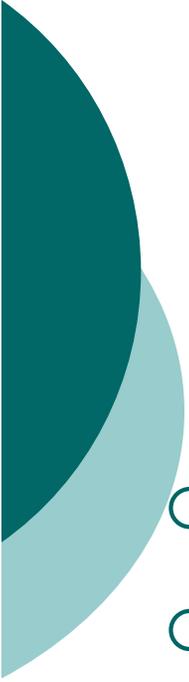
- System Overview
- Pump Storage Facilities
- Marketing Issues
- Operational Considerations
- Pump Storage as a Generation Resource

# Southeastern Power Administration



# Southeastern Power Administration GA-AL-SC System





# Southeastern Power Administration

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## Presentation Points

- System Overview
- Pump Storage Facilities
- Marketing Issues
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- Pump Storage as a Generation Resource

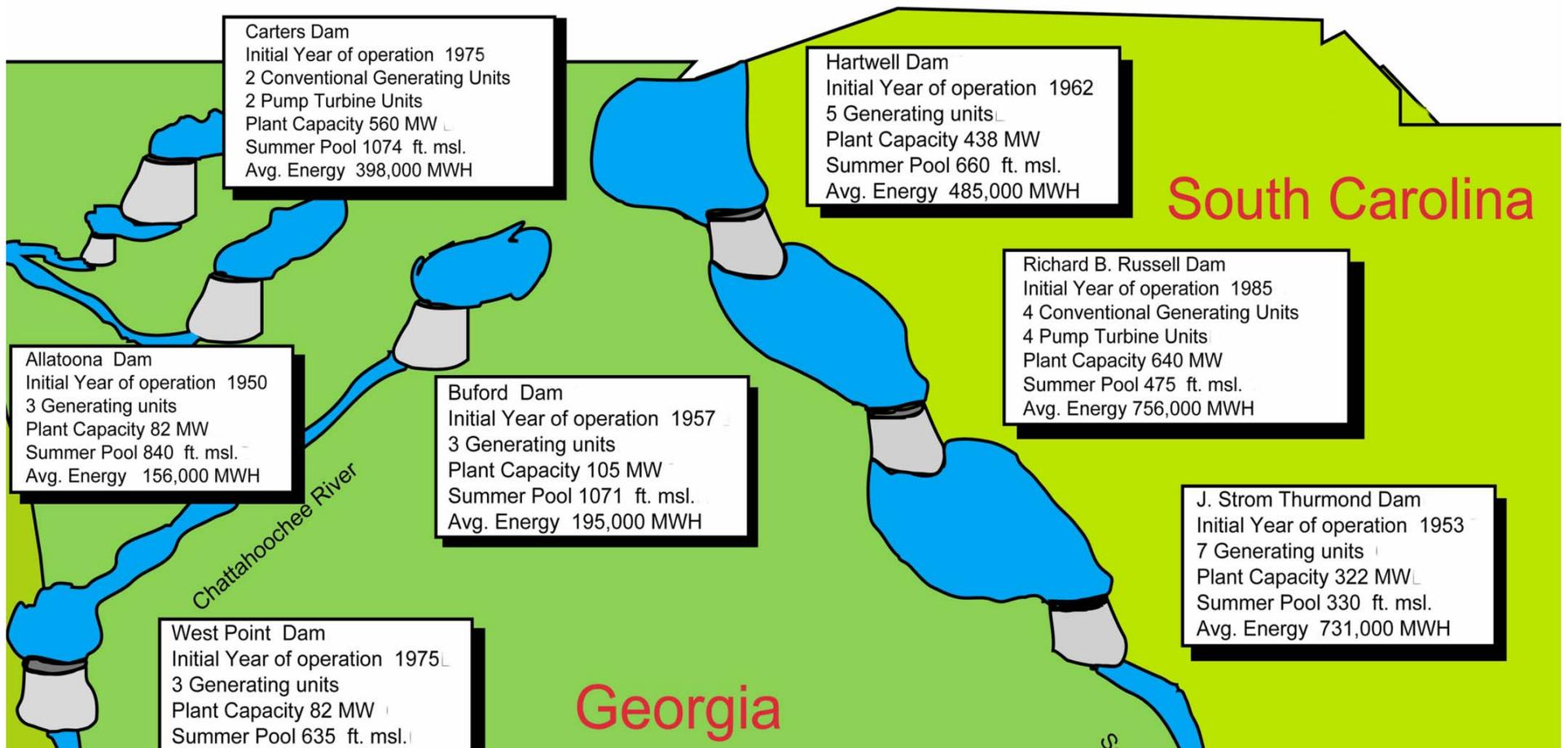


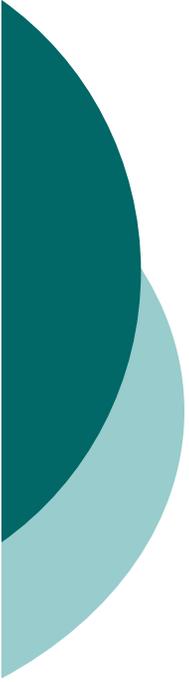
# Pump Storage Facilities

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- **Generation marketed from two pump storage facilities**
  - **Richard B. Russell Project**
  - **Carters Project**

# Pump Storage Facilities





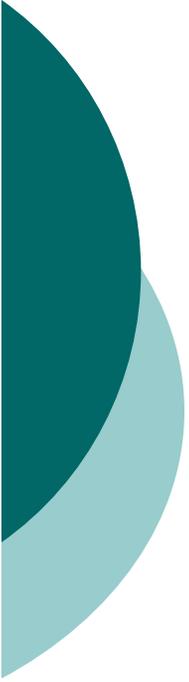
# Richard B. Russell Project Information

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- **Location** : Upper Savannah River between the Hartwell and Thurmond projects
- **Operated by:** Savannah District COE

<u>Units</u>	<u>Type</u>	<u>Nameplate Capacity</u>	<u>Year On Line</u>
# 1-4	Conventional	75 MW	1985
# 5-8	Pump Units	75 MW	2002

- **Maximum Plant Capability:** 648 MW
- **Reservoir Conservation Pool:** 5 feet
- **Reservoir Conservation Storage:** 126,000 Acre-feet



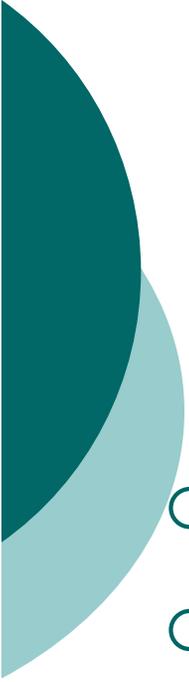
# Carters Project Information

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- **Location:** Coosawattee River near Calhoun GA
- **Operated by:** Mobile District COE

<b><u>Units</u></b>	<b><u>Type</u></b>	<b><u>Nameplate Capacity</u></b>	<b><u>Year On Line</u></b>
# 1-2	Conventional	125 MW	1975
# 3-4	Pump Units	125 MW	1977

- **Maximum Plant Capability:** 600 MW
- **Reservoir Conservation Pool:** 52 feet
- **Reservoir Conservation Storage:** 143,000 Acre-feet

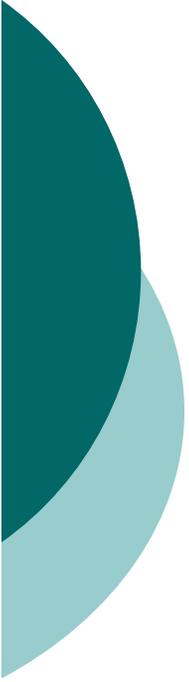


# Southeastern Power Administration

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## Presentation Points

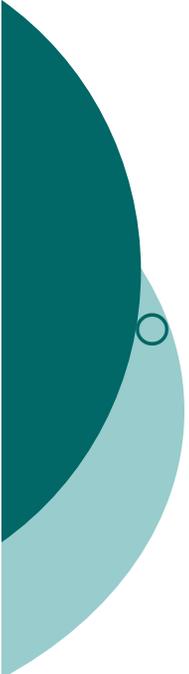
- System Overview
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# Marketing Issues

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- **Carters Project**: Generation began in 1975  
no issues or problems were encountered
- **Russell Project**:
  - **Conventional Units (#1-4)**
    - Began operation in 1985
  - **Pump Units (#5-8)**
    - Began operation in 2002
  - In 1988 the State of South Carolina and other resource agencies filed an injunction seeking to stop installation of the pump units
  - In 1992 the parties developed a testing and monitoring plan (T&MP) that would be used for an environmental evaluation of pump unit operation

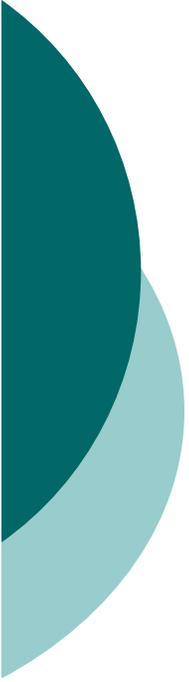


# Marketing Issues

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## Russell Continued:

- **The T&MP specified three phases of testing during which data on environmental impacts could be collected**
- **Phase I took place between July 1992 and August 1993**
  - This phase allowed for short duration pump tests and was used to collect data during the mechanical and electrical certifications of the units
- **Phase II took place between August 1993 and August 1994**
  - This phase was used to evaluate environmental impacts during periods of two unit pumping operations
  - A completion report was required for this phase of testing
- **Phase III took place between April 1996 and October 1996**
  - This phase was a simulated commercial operation of the units
  - A completion report was required for this phase of testing

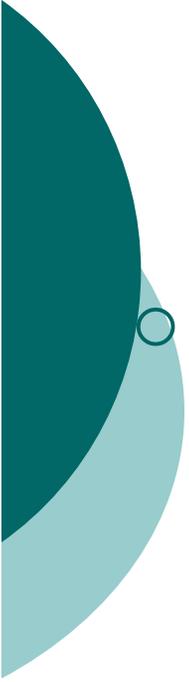


# Marketing Issues

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- **Russell Continued:**

- Based on data collected during the testing periods, in 1999 the Savannah District issued a Environmental Assessment indicating No Significant Impact as a result of pump unit operation
- In 2002 the Federal District Court in Charleston, South Carolina lifted the injunction which had prevented operation of the pump units and the Savannah District declared the units commercially available



# Marketing Issues

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## Russell Continued:

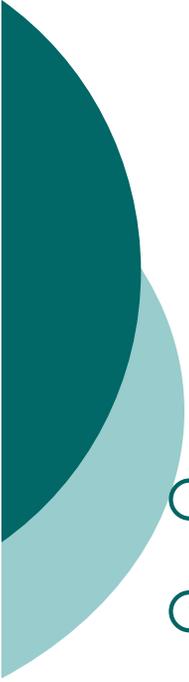
- When the additional pumping capacity was made available at Russell, Southeastern marketed the resource as had been previously published in the Agency's Power Marketing Policy
- Customers were provided a minimum energy increase which would provide for 20 hours-use per week of the additional capacity, during months without pumping restrictions



# Marketing Pumping Generation

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- When sufficient stream flow is available at the pumping facilities, stream flow is used to support pump unit operations
- During periods of low flow or adverse hydrology, power production from pumping facilities is maximized prior to purchasing on peak replacement energy

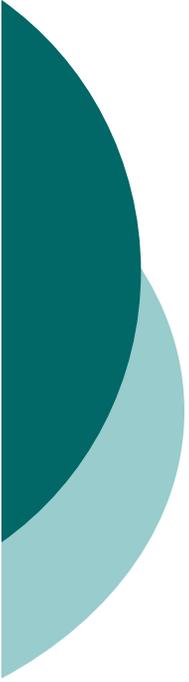


# Southeastern Power Administration

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## Presentation Points

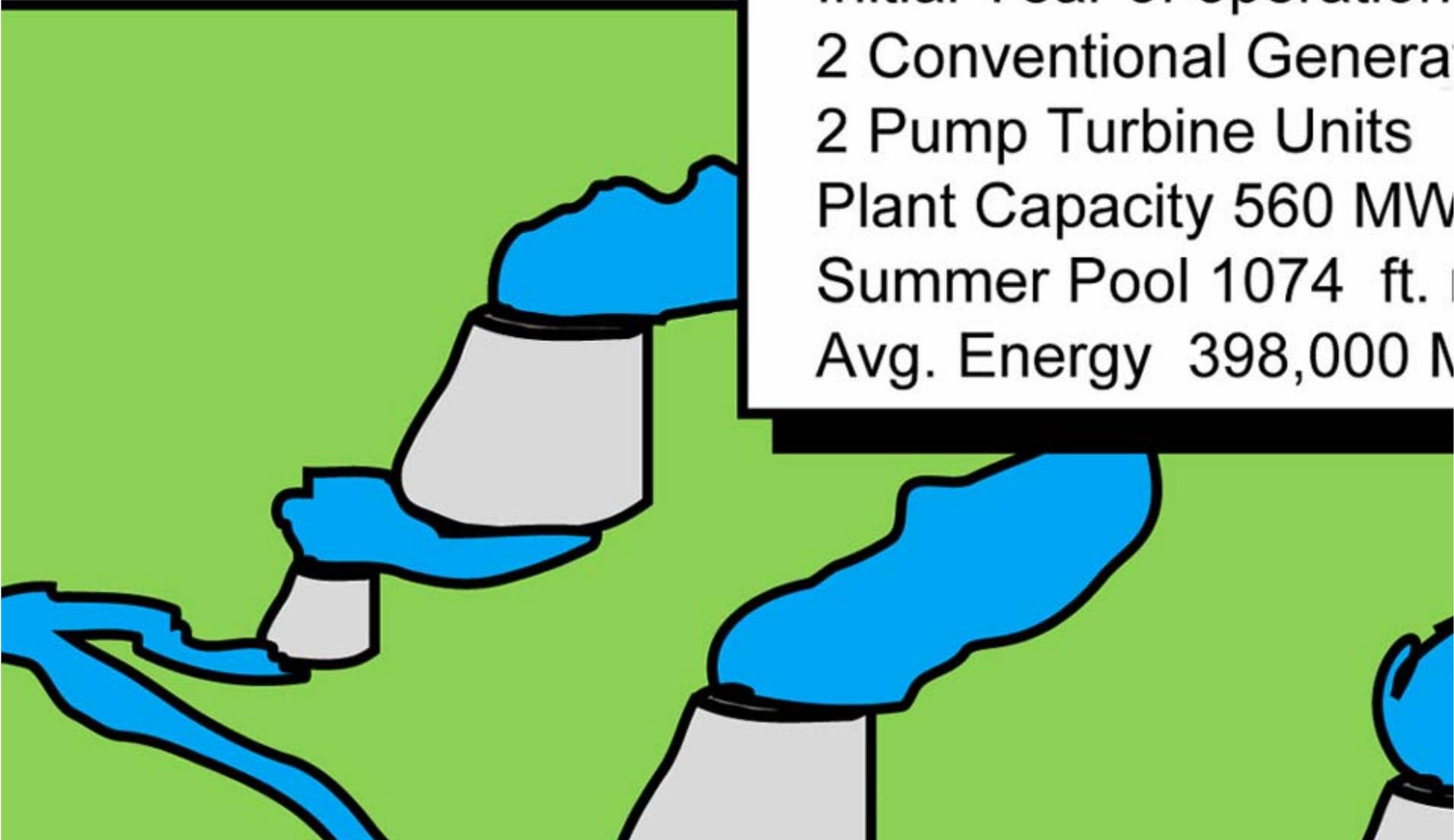
- System Overview
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- Pump Storage as a Generation Resource



# Carters Project Operations

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- **Generation:** No restrictions
- **Pumping Operations:** No restrictions
- Project discharges into and pumps from a re-regulation dam
  - Elevation of re-reg must be monitored and careful planning and coordination of daily and weekly generation/pump cycles is necessary to ensure project operation satisfies desired objectives



## Carters Dam

Initial Year of operation

2 Conventional Genera

2 Pump Turbine Units

Plant Capacity 560 MW

Summer Pool 1074 ft.

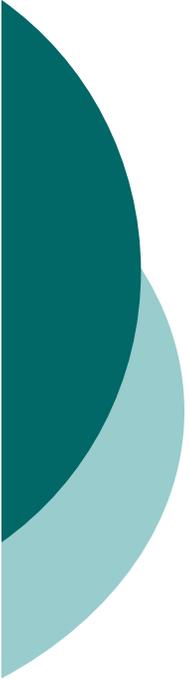
Avg. Energy 398,000 M



# Richard B. Russell Project Operations

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- **Generation:** No restrictions
- **Pumping Operations:**
  - Fish deterrent systems used during Phase III Environmental Testing must be operated and maintained for the life of the pumped storage units
    - Sound Repulsion System
    - Fish Attraction Lighting
    - Bar Screens at the Pumping Intakes
  - Pump mode operation only permitted during nighttime hours, one hour after sunset to one hour before sunrise
  - Springtime Pumping Restrictions
    - March: - Limited to any one pump unit
    - April: - No Pumping
    - May: - Limited to any one pump unit



# Richard B. Russell Project Operations

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- When a Drought Level Two is declared during March, April or May, all pumping restrictions are lifted
- Pre-Pump Generation Requirements:
  - June, July, August, and September: Generate at least 6 unit hours of not less than 60 megawatts within 12 hours prior to pumped storage operations
- Pumping is restricted to two units during the months of June, July, August, and September, prior to installation of the J. Strom Thurmond (JST) Fish Habitat Replacement Oxygenation (O2) System in JST lake
- Environmental Monitoring of pump storage operation at the project

Summer Pool 660 ft. msl.  
Avg. Energy 485,000 MWH

South

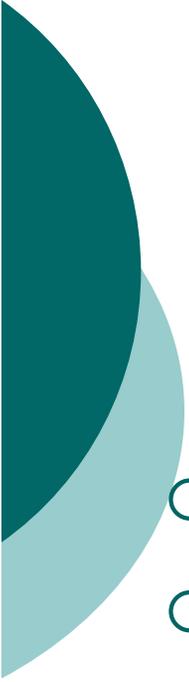
Richard B. Russell Dam  
Initial Year of operation 1985  
4 Conventional Generating Units  
4 Pump Turbine Units  
Plant Capacity 640 MW  
Summer Pool 475 ft. msl.  
Avg. Energy 756,000 MWH

in 1957

ft.  
msl.  
MWH

J. Strom Thurmond Dam  
Initial Year of operation 1961  
7 Generating Units  
Plant Capacity 1,100 MW  
Summer Pool 475 ft. msl.  
Avg. Energy 1,100,000 MWH

Georgia



# Southeastern Power Administration

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## Presentation Points

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# Benefits of Pump Storage Facilities

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- Provide operational flexibility typically unavailable from conventional hydro due to water availability considerations and other project requirements
- Pumping energy provides additional generation from existing network resources (lower risk of transmission curtailments)



# Benefits of Pump Storage Facilities

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- During FY 2008 Southeastern delivered over 700,000 MWH of pumped energy to Customers
- Provides significant cost savings when compared to the alternative of replacement energy purchases



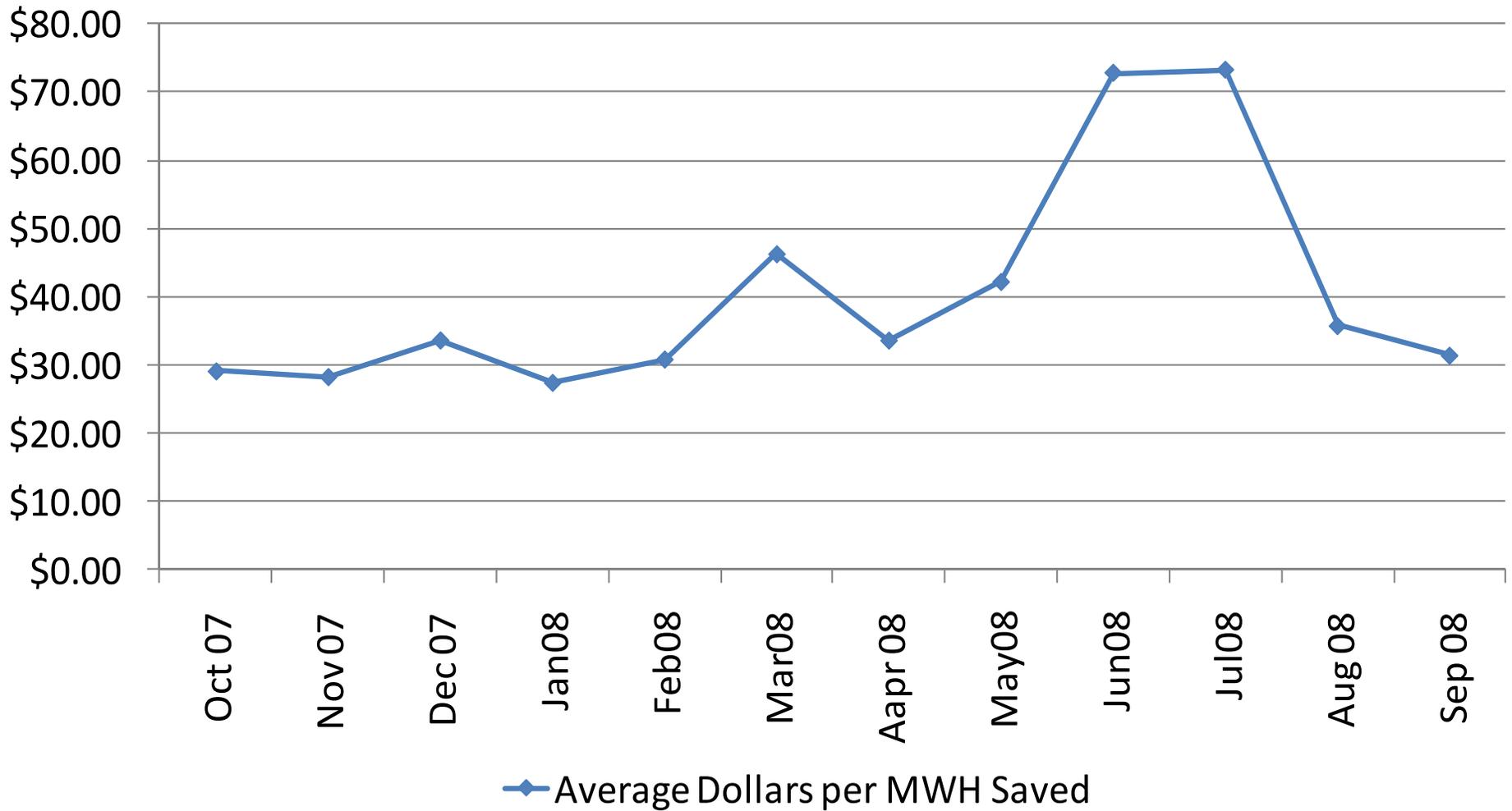
# Cost Savings Realized During the Current Drought

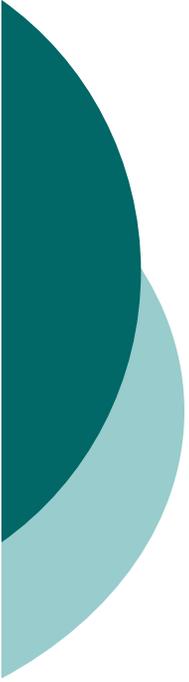
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- From FY 2006 through May of 2009 cost savings realized utilizing pumping energy vs. purchasing on peak replacement energy:

**Approximately \$60 Million Dollars**

# Avg Monthly Cost Savings for FY 2008 (Dollars per MWH) Pumping Energy vs. On Peak Replacement Energy





# Pump Storage Challenges

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- The delay in availability of the pump units at Russell due to the litigation resulted in a reduced level of firm network resource capability until transmission system upgrades take place
- Pump unit outages have a greater impact on system operations
- Due to their complex nature, unit outages can be of longer duration
- Funding for the purchase of pumping energy



# Southeastern Power Administration

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Questions ?