

# RPS Technologies Overview

## *HYDROELECTRIC*

Presented by:

James A. Beshar, P.E., President



**Albany Engineering  
Corporation**

**“View from 40,000 feet”**

# Water

We all need water. Nothing on earth can live without it. Even though we can't see it, there is a lot of water in the air. Sometimes it falls to earth as rain or snow. Then we can see it and feel it.

Now, let's see how we can make water work for us.



A dam has been built across the river valley to hold the water back. After the water has been used in the electric power plant, it flows as a river down to the sea.

*"Thanks to Richard Scarry."*

# Types of Renewable Resources

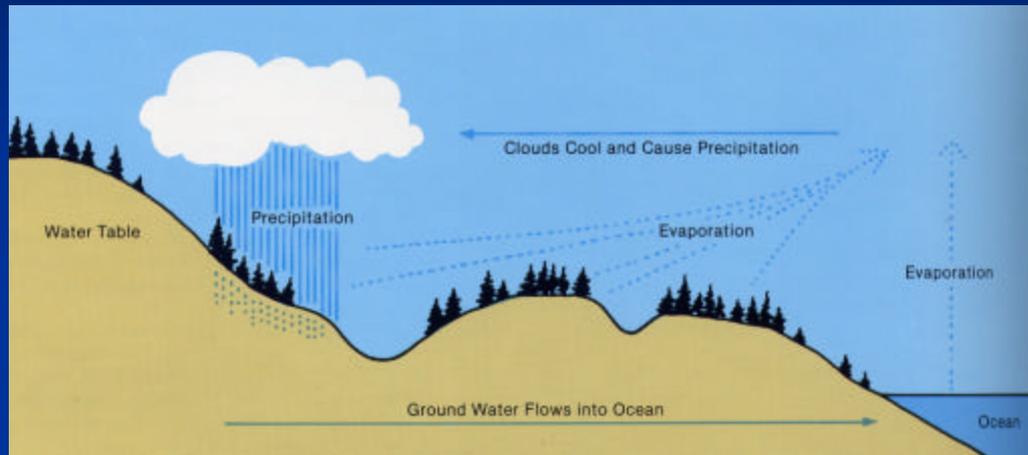
(Weinberger, 2003)

<b>Type 1</b> Truly Renewable	Solar, Wind, Hydro, Tidal
<b>Type 2</b> Virtually Renewable	Biomass, Landfill gas, MSW
<b>Type 3</b> Indirectly Renewable	Storage and conversion fueled by renewable resources such as pumped storage and fuel cells

# Current Renewable Status in NYS

- All NYS renewable resources
  - 6,014 MW
- All hydro capacity
  - 5,492 MW (216 projects)
- Hydro (excluding Niagara, St. Lawrence and Blenheim-Gilboa)
  - 1,480 MW (213 projects)
- Other renewable resources
  - 522 MW

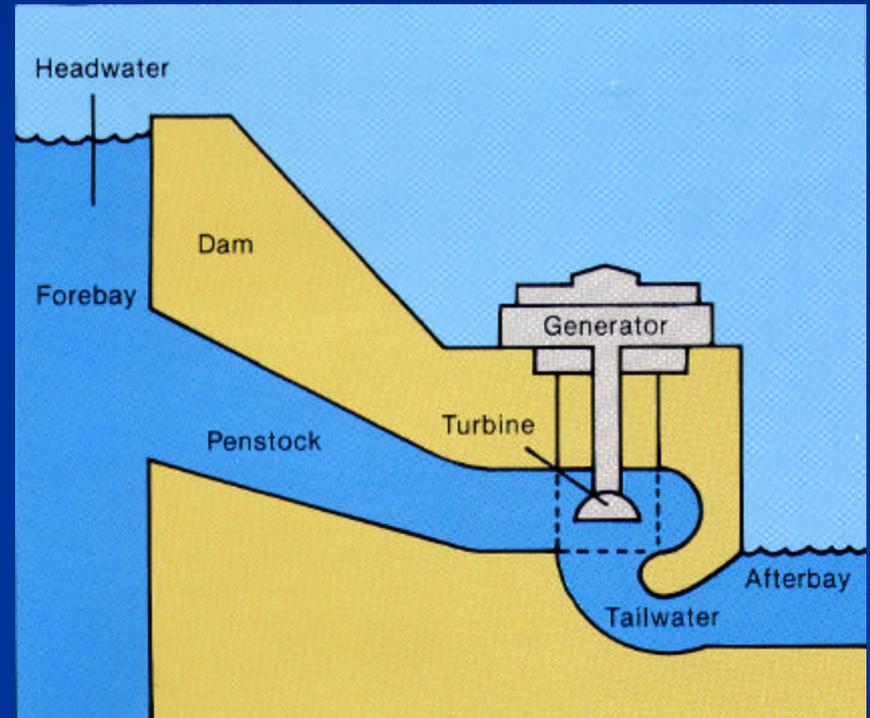
# Hydro as a Renewable Resource



- River flow + change in elevation = HYDRO
- Technically, all hydro is a renewable resource
  - Not all hydro is considered “green” power
- Definition of “green” hydropower varies
  - In Europe, hydro is considered “green” if it is less than 30 MW and operates run-of-river
  - In NYS, ...?

# Hydro Basics

- Potential energy of falling water spins turbine/generator and produces electricity
- Very reliable technology
- Most is run-of-river
- Head (drop) range is 8- to 1,200-feet
- Flow range is 5 to 375,000 cubic feet per second.



# Hydro Information

- Conventional hydro
  - Run-of-river
  - Peaking (storage-and-release)
- Pumped storage
  - Depends on available energy source for pumping
- Size ranges in NYS varies from 30 kilowatts to 2,400,000 kilowatts

# History

- 1908

- More than 300 hydro plants in NYS

- 2003

- Approximately 220 hydro plants in NYS

# Longevity

- Average age of pre-PURPA hydro plants in NYS is about 80-years
- Oldest plant was built in 1897, *106-years old!*
- Productive life unlike any other energy generation technology



# Energy Development Density

(for 1,000 MW)

Thermal (gas turbine)	150 Acres
Hydro	1,000 Acres
Photovoltaic	10,000 Acres
Wind	60,000 Acres

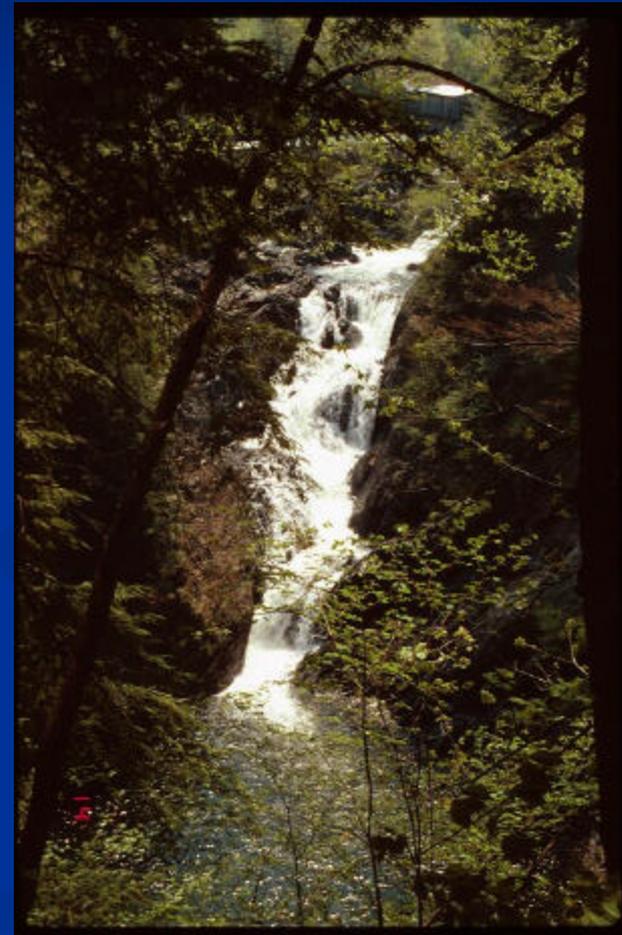
# Hydro Development Timeframe

- Planning and regulatory phases
  - 6 months to 36 months
- Construction phase
  - 6 months to 24 months

# Hydroelectric Potential

(According to NYSERDA, 1980)

- Undeveloped sites with dam
  - 441 sites
  - 1,552 MW
- Undeveloped sites without dams
  - 315 sites
  - 2,360 MW



# Hydroelectric Potential

(According to USCOE, 1997)

- Incremental capacity
  - 44 sites
  - 160 MW
- Undeveloped sites with dams
  - 212 sites
  - 495 MW
- Undeveloped sites without dams
  - 96 sites
  - 652 MW



# Impediments to Hydro

- High capital cost
- Extensive regulatory oversight
  - More than 20 Federal, State and Local agencies are involved in the process
- In NYS there is a significant real estate tax burden
  - Can be as much as 50% of gross revenue

# Issues

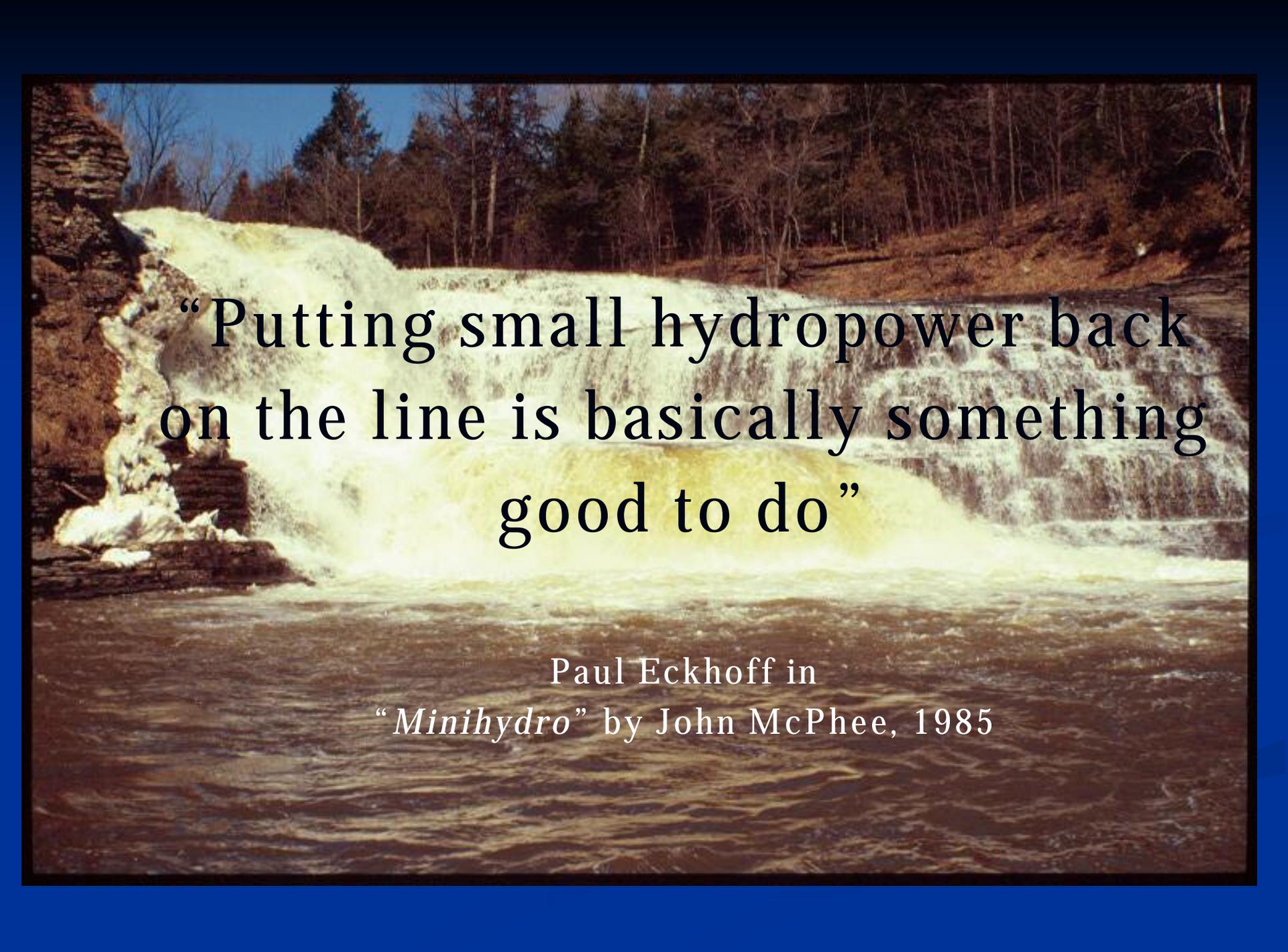
- Environmental
  - Primarily related to fish
- Aesthetics



# Summary

- “Trailing edge of technology”
  - It’s been around a very long time, so it’s reliable and well known
- Much developed, but much potential
- Already provides a significant contribution to NYS energy mix





“Putting small hydropower back  
on the line is basically something  
good to do”

Paul Eckhoff in  
“*Minihydro*” by John McPhee, 1985