



# Energy Improvements in Pittsfield

Energy Management Roundtable for  
Water and Wastewater Utilities

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# Acknowledgements

- City of Pittsfield, Massachusetts
  - Bruce Collingwood, P.E. – Commissioner of Public Utilities
  - Thomas Landry – Wastewater Treatment Plant Superintendent
- MassDEP
- Western Mass. Electric Co. (WMECO)

# Agenda

- Wastewater Treatment Plant Energy Projects
  - CHP Installation (Generation)
  - Aeration Upgrade (Efficiency)
  - PV Installation (Generation)
- Water Turbine Projects
  - Coltsville Flow Control Station Project
  - Ashley WTP Hydropower Feasibility Study

# Pittsfield WWTP History

- 1890 Filtration Beds
- 1937 Trickling Filter/  
Settling Tanks
- 1960 Primary  
Treatment
- 1976 Secondary  
Treatment
- 1986 Sludge Handling



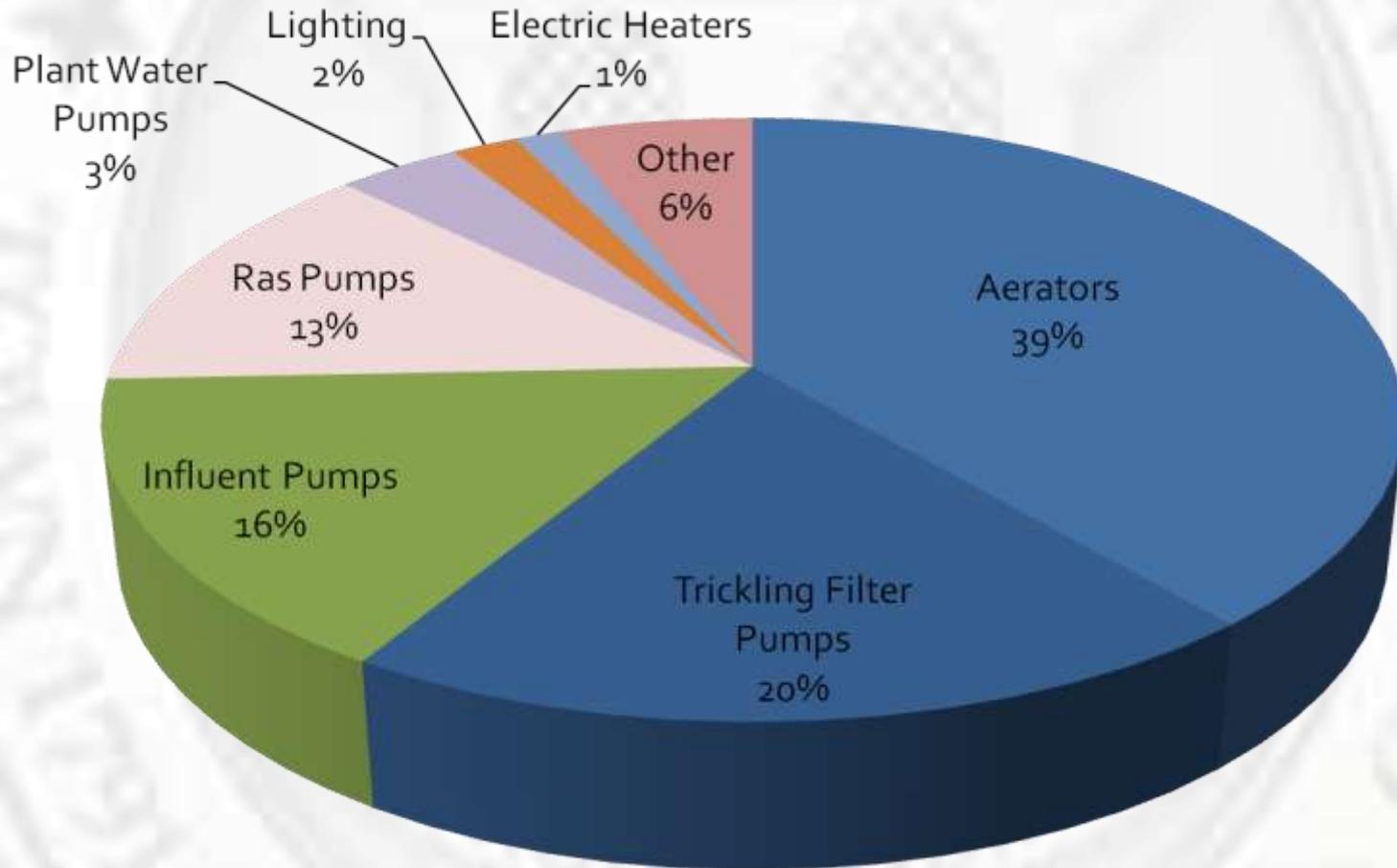
1937



2011

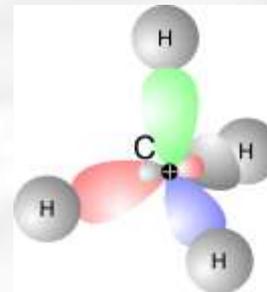


# WWTP Energy Audit

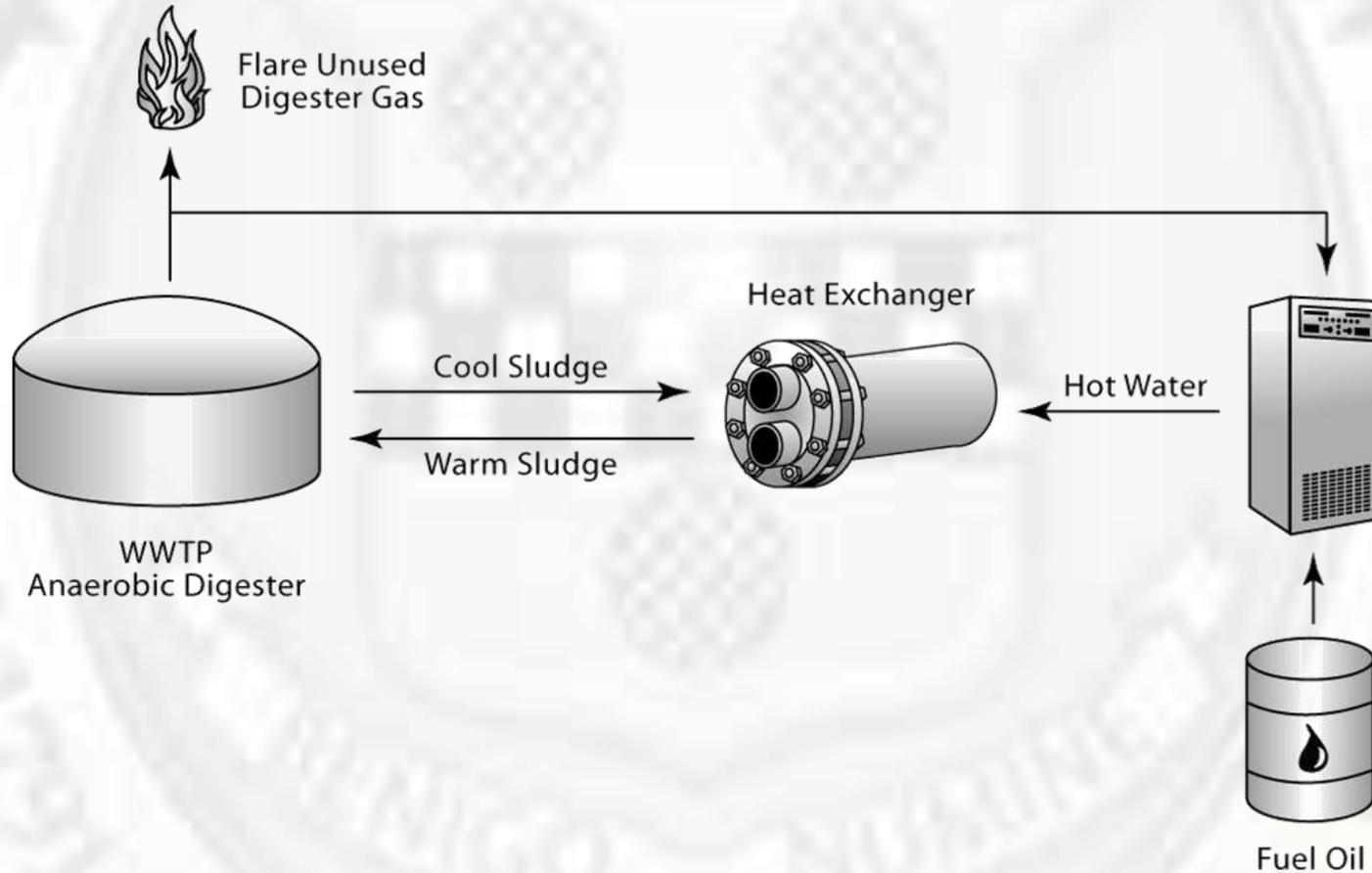


# WWTP Project #1 – CHP Installation

- Combined Heat and Power (CHP)
  - “Co-generation”, “the production of two forms of useful energy from a single fuel source”
  - Increases energy utilization from 35% to 85%
  - Microturbines
- Digester Gas – Good Biogas  
65% Methane



# CHP - Old Digestion Process

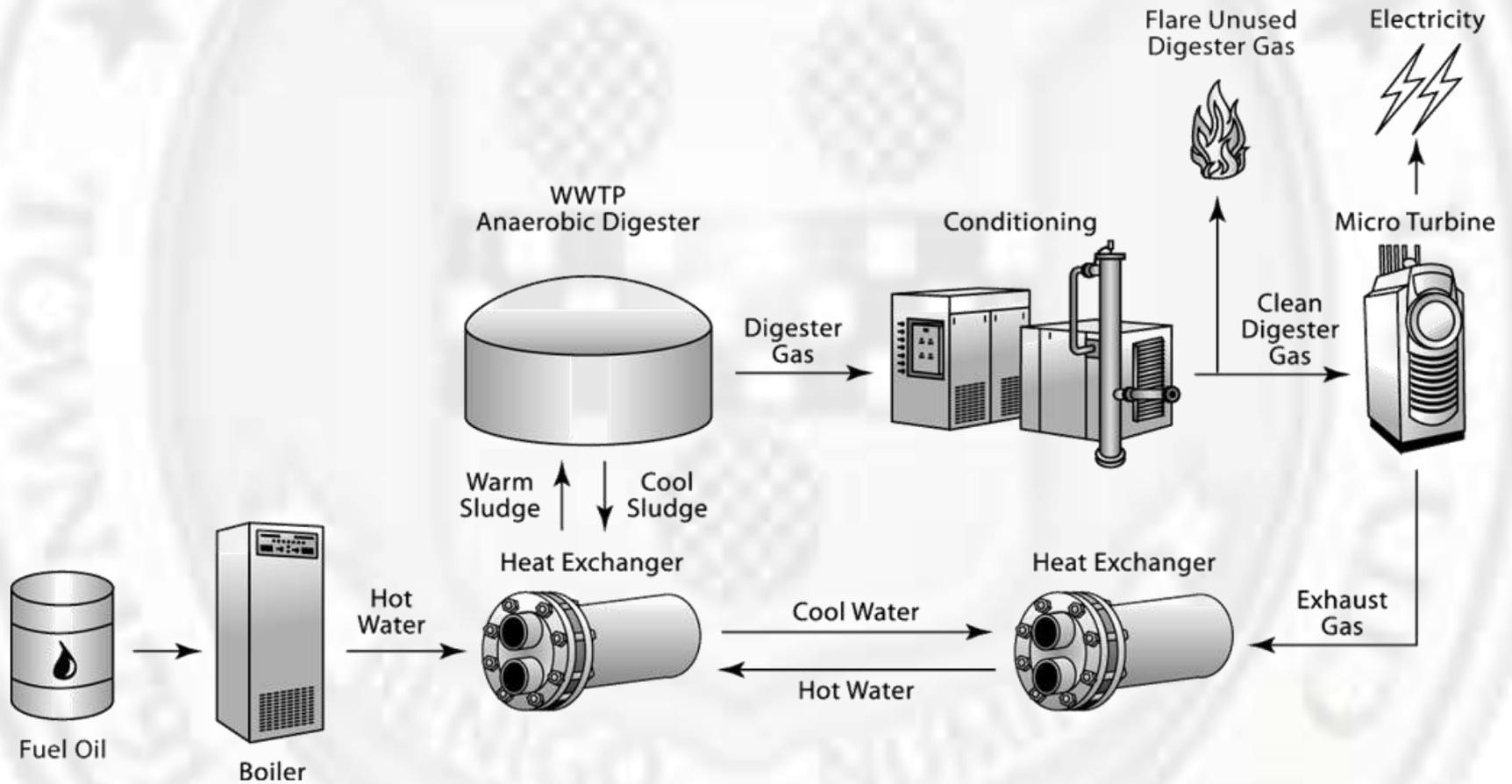


# CHP - Process Optimization

- Sludge Feeding
- Temperature
- Mixing
- Gas Pre-treatment



# CHP - New Process



# CHP - Summary

- \$2.5 M Construction Contract
- Three 65-kW Microturbine Configuration
- 30% Reduction in Electric Bill
- Net Savings \$230,000/year
- Payback period of 5 to 8 years (pre-ARRA)
- Other Potential Revenue Streams (REC's incentives, etc.)



# Project #2 – Aeration Upgrade

- Old Mechanical Aerators
  - Reliable
  - Inefficient Technology
  - Largest Power Demand at WWTP
  - 39% of Total Power Demand
  - \$250,000/year Electrical
- Convert to Fine-bubble, **Turbo-blower** system



# Aeration – Turbo Blowers

- High-speed (to 40,000 RPMs)
- Jet Technology
- Airfoil and Magnetic Bearings Developed Overseas
- Fully integrated VFDs, Controls



# Aeration – Turbo Blowers

## Advantages

- Small footprint
- Light-weight
- Good turndown
- No bearing lubrication
- Self contained units
- Quiet, low vibration
- 15% - 20% more efficient than conventional blowers

## Concerns

- New Technology, Less than 10 years
- Limited Number of US Installations
- US Service Network Limited
- Emerging Market



# Aeration – Summary

- \$2.5 M Construction Contract
- Three (3) 150-hp Turbo Blowers
- 919,000 KWhr/yr power reduction
- ~20% reduction in overall WWTP demand
- ~\$130,000/year savings
- Flexible Design



# Project #3 – PV Installation

- 5 acres
- 2 MW system
- 1,500 MW-hr/yr
- 30% of WWTP
- \$220,000/yr savings
- \$450,000/yr RECs !



# PV – Overview

- \$7.3 M Contract
- Site Work
- Panel Installation
- Inverters
- Connection to Grid



# Summary

	<b>MWh/yr</b>
<hr/> Historic Demand	4,446
CHP	(-1,572)
Aeration	(-919)
PV	(-1,500)
	<hr/> (-3991)
<hr/> Projected Net Demand	455
<b>Overall Reduction</b>	<b>90%</b>

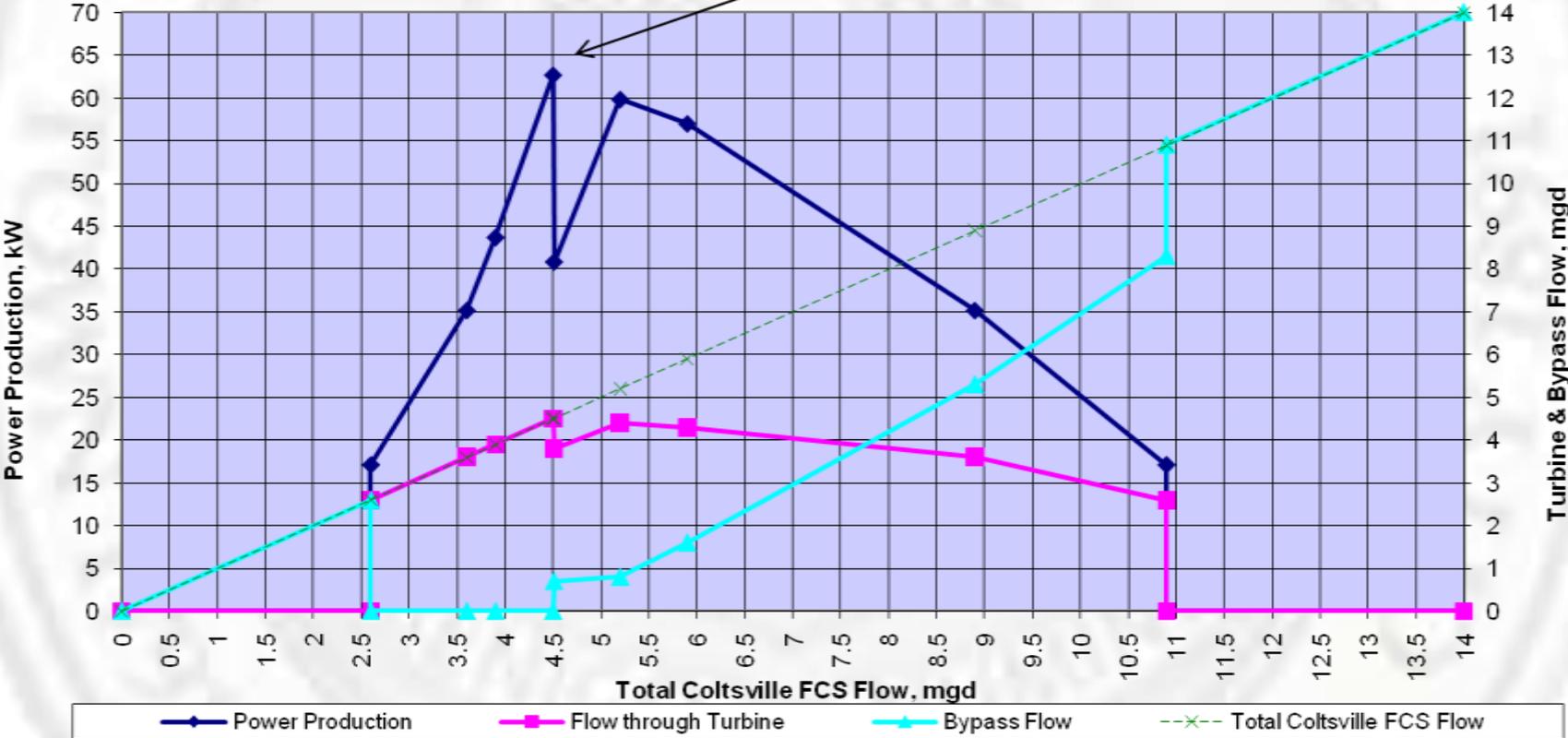
# Coltsville Flow Control Station Project

- Project to replace old flow control station
- 2 to 14 mgd flows w/ ~60 psi pressure reduction
- \$3 million construction
- 62 kW Cornell hydro turbine
- Revenue generated:
  - ~\$14,000 sale of power
  - ~10,000 Class I REC's



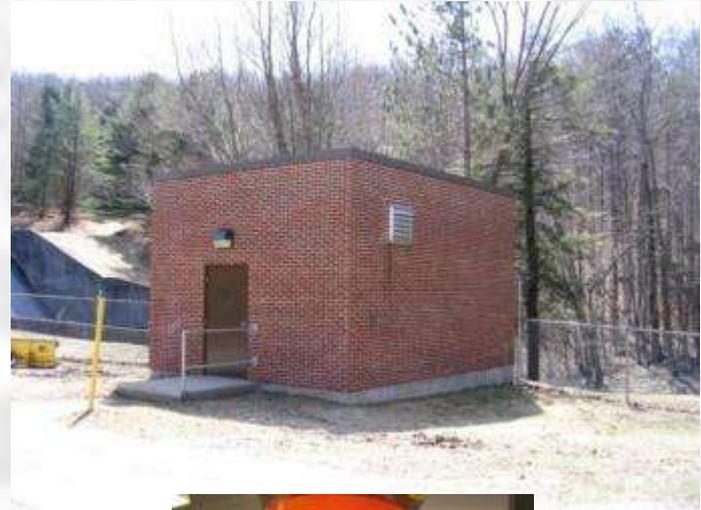
# Coltsville Flow Control Station Project

Facility rating: 62 kW



# Ashley WTP Hydro Facility

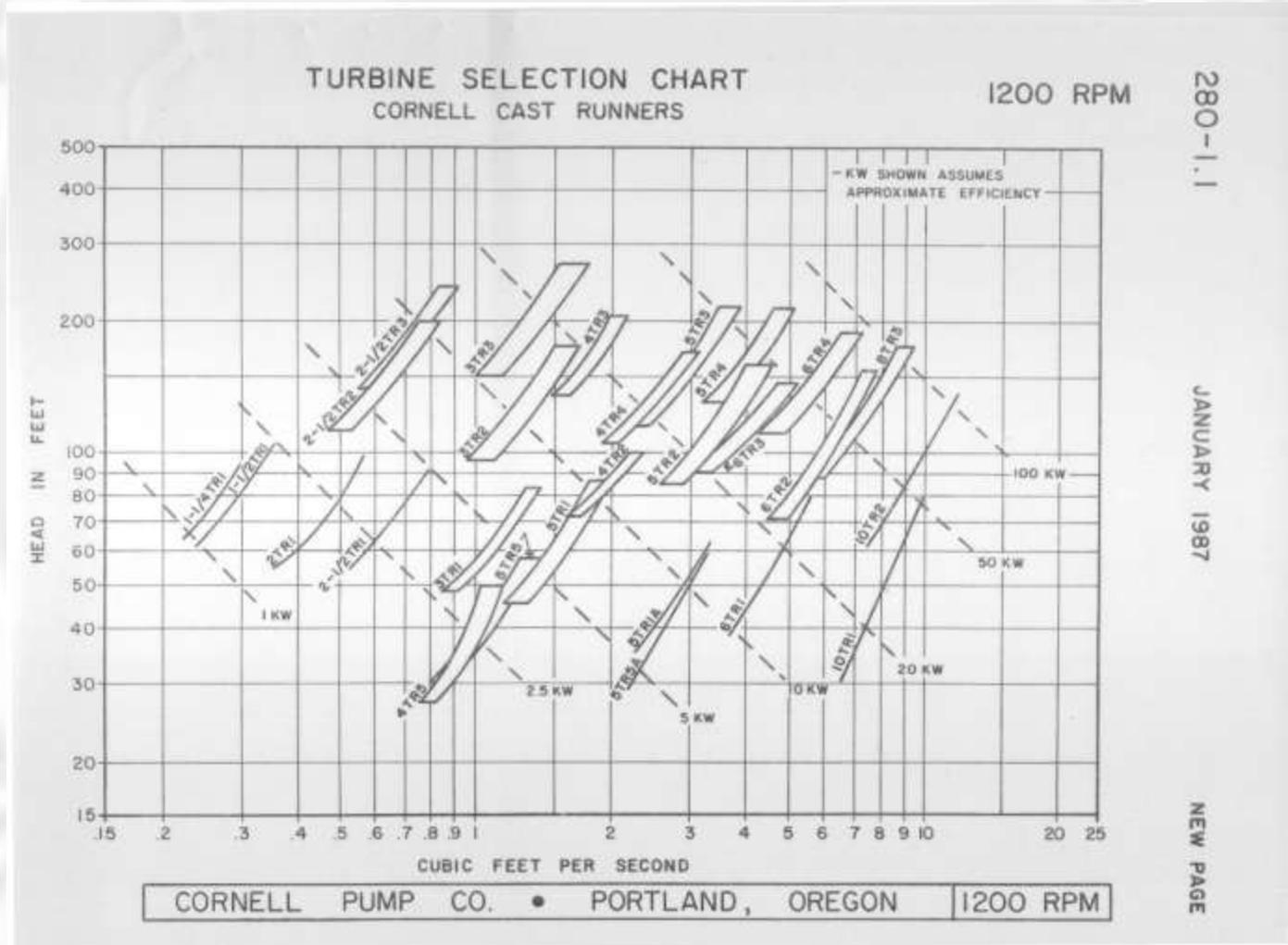
- Existing hydro turbine at Ashley WTP (1985)
- Byron Jackson vertical 2 stage Francis type turbine
- 2.1 mgd flow with 130 psi available head
- 38 kW avg production
- Supplies 58% of WTP power needs
- ~\$50,000 in annual savings



# Ashley WTP Hydro Feasibility Study

- \$35,000 MCEC Grant to look at improving turbine efficiency
- Evaluated:
  - Increasing flow through turbine
  - Parallel turbine for smaller flows
  - Replacement turbine for smaller flows
- Recommendations:
  - Repair existing
  - Apply for Class II REC's: ~\$7,000

# Hydro Power Selection Curve





Thank You