

Water Conservation at Clearway Community Energy

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UNIVERSITY OF MINNESOTA
Driven to DiscoverSM

Company Background



- **District energy company**
 - Hot water, steam, chilled water
 - Notable customers: US Bank Stadium, Target Center, IDS Center, Fairview Health Services
- **Heat ~75% and cool ~50% of sq. ft. in the downtown business district**
- **29,500,000 gal/yr city water**
- **87,000,000 gal/yr well water**



Minneapolis energy center (MEC)

Goals

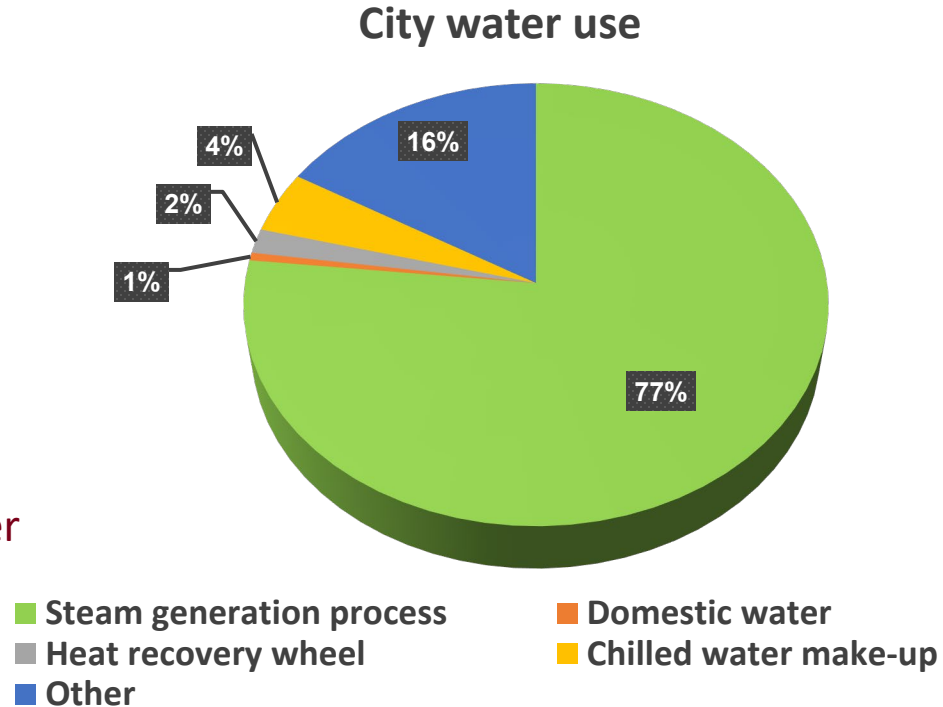
- Minimize overall water usage
- Decrease sewer water discharge
- Reduce operating costs
- Reduce customer costs



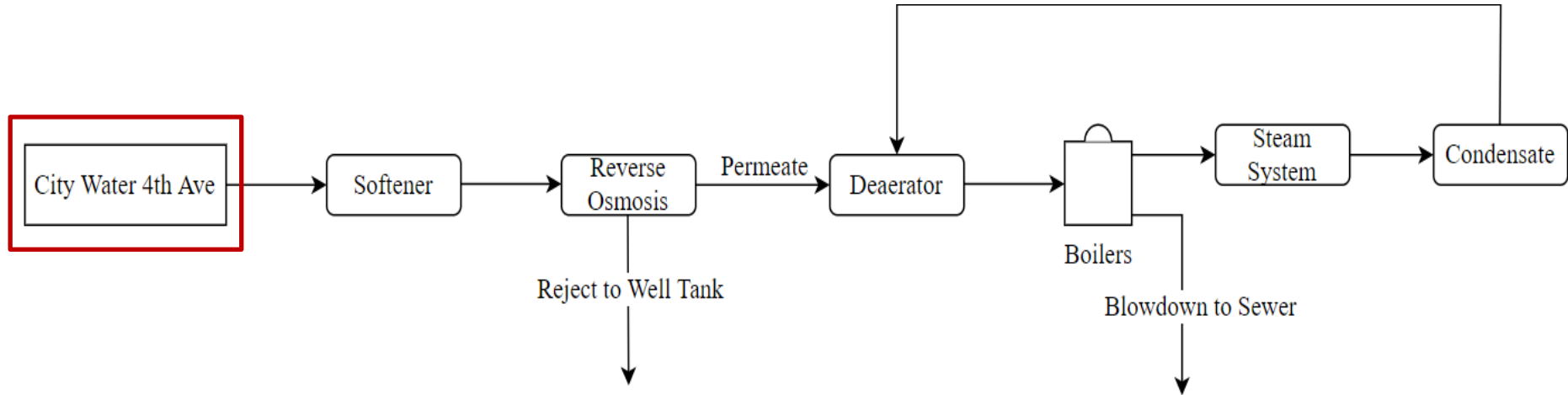
Condenser water pipes

Water Balance

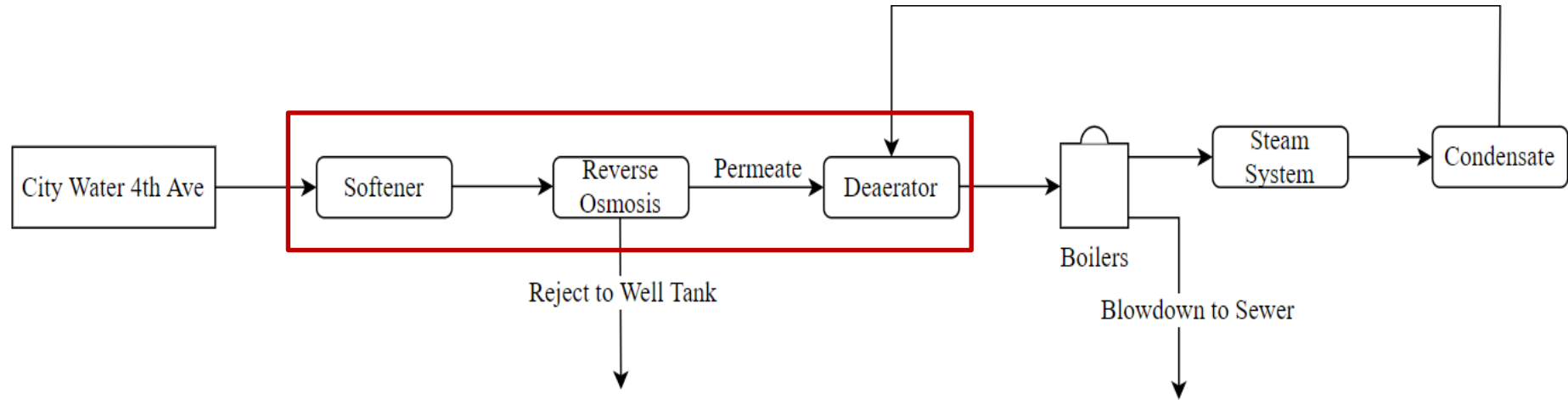
- Created water map of facility
- Calculated associated costs
- Focused on city water conservation
- Investigated steam generation process
 - Consumes 77% of total city water
 - Uses 22,600,000 gallons/yr



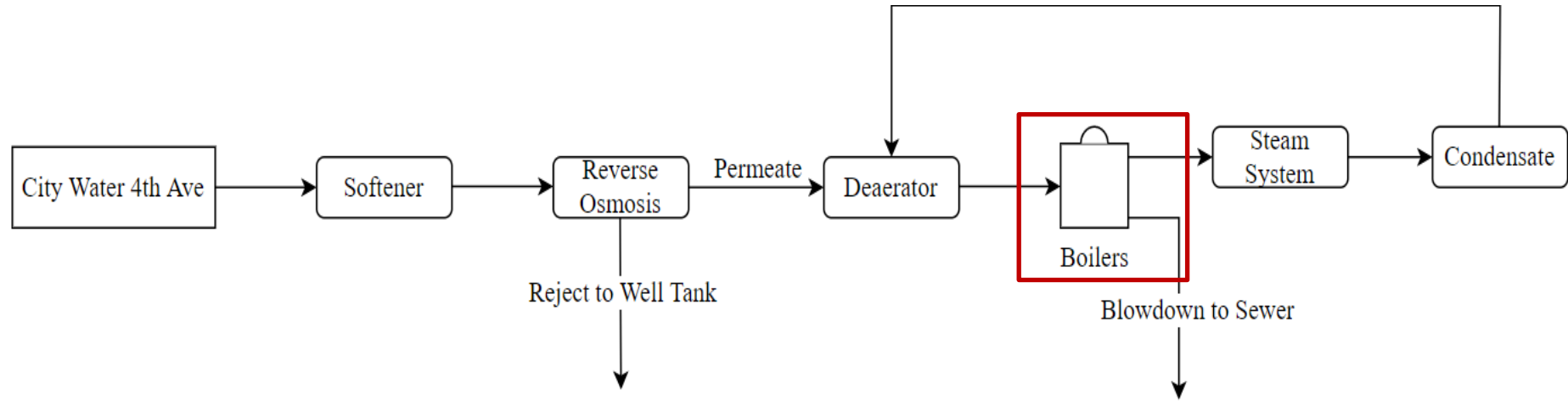
Steam Generation



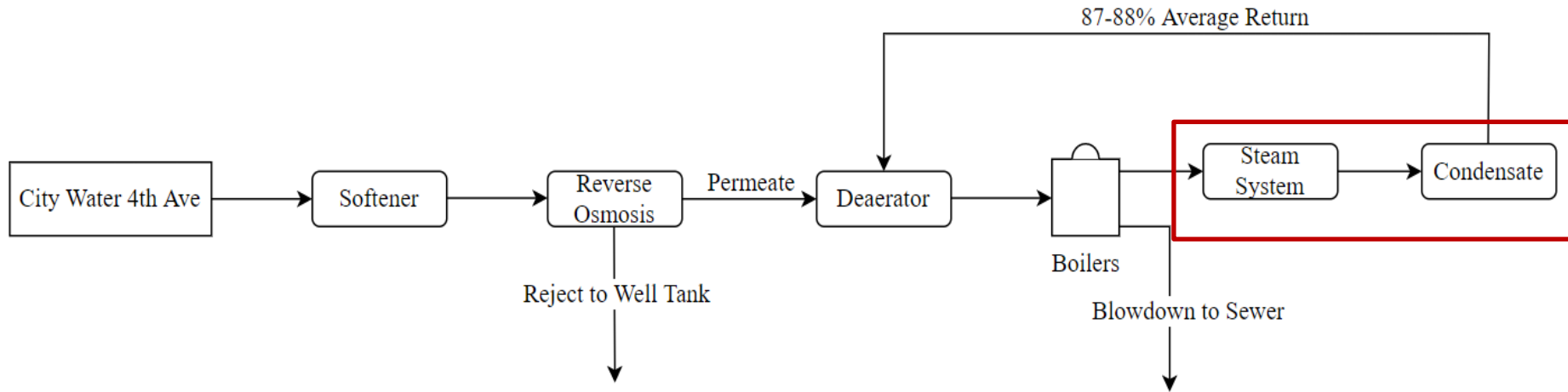
Steam Generation



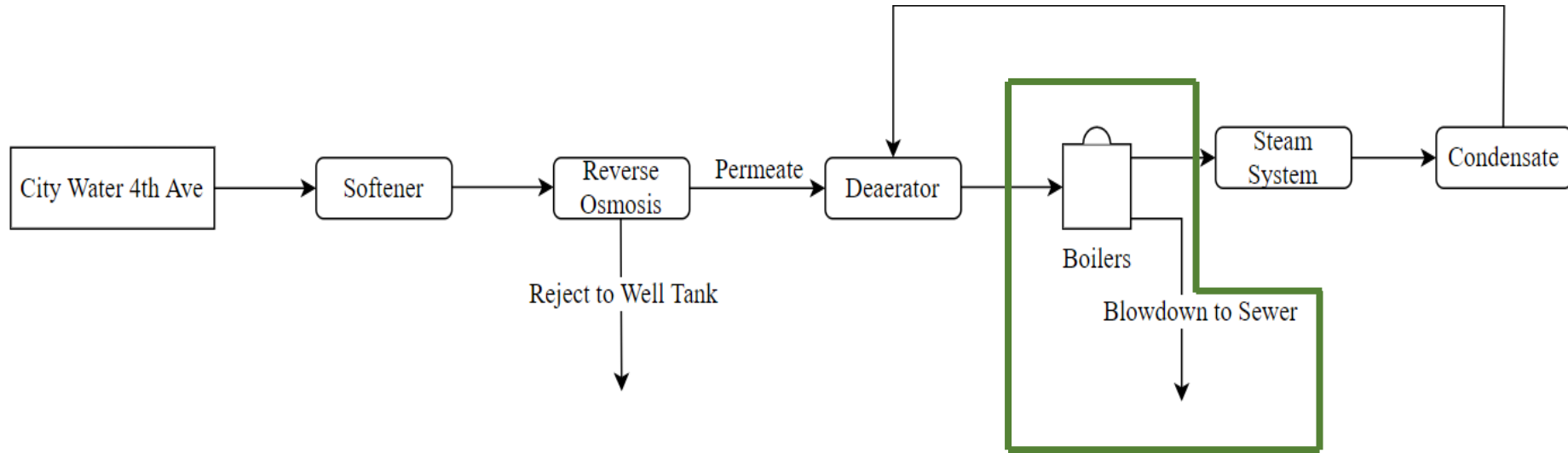
Steam Generation



Steam Generation



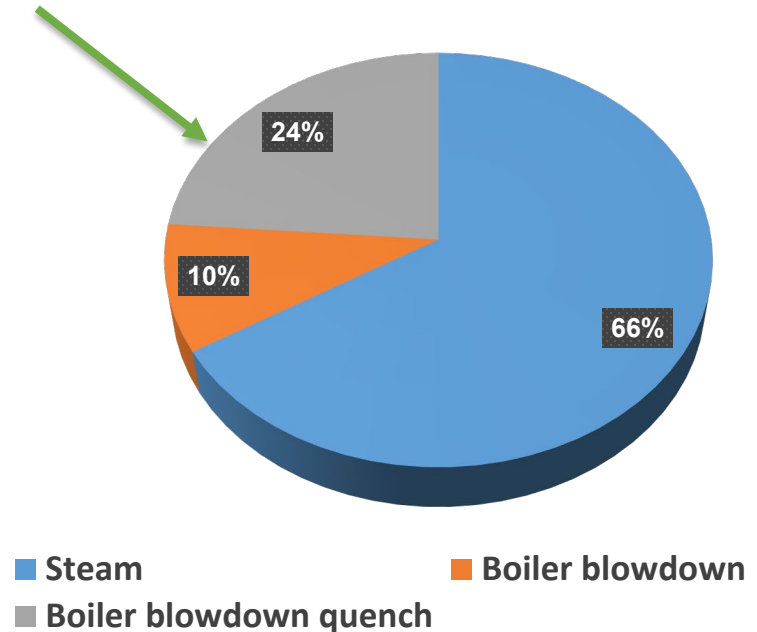
Steam Generation



Boiler Blowdown

- **Blowdown is the removal of water to minimize scale and corrosion**
 - Discharge temperature from boiler >220°F
 - Maximum allowed sewer temperature 140°F
- **Cooling process uses 5,400,000 gallons of city water**

Steam generation process



Recommendation

- Utilize cooling tower water in lowering the temperature of boiler blowdown
 - Sampled continuously by chlorine analyzers
 - Discharged directly to sewer
- Redirect water to cool the blowdown water
- Reduce city water use and sewer discharge



Chlorine Analyzers

Solutions

Recommendation	Annual reduction	Total cost	Annual savings	Payback period	Status
Reuse cooling tower water	5,400,000 gal	\$ 39,000	\$ 62,000	7.5 months	Recommended
Install air-compressor with VFD	144,000 kWh	\$ 44,700*	\$ 17,000	2.7* years	Recommended
Clean chiller tubes mid-cycle	46,900* kWh	\$ 78,000*	\$ 11,000*	7.2* years	Investigating
Install boiler fan with VFD	Unknown	Unknown	Unknown	Unknown	Investigating
Reduce steam vented from deaerator	Unknown	None	Unknown	Immediate	Further study required

*preliminary numbers, still investigating

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Personal Benefits

- Worked on projects that mattered
- Gained valuable experience and insight from industry professionals
- Prepared for career in sustainability and energy efficiency

