ComEd Emerging Tech: Energy-Water Nexus Update

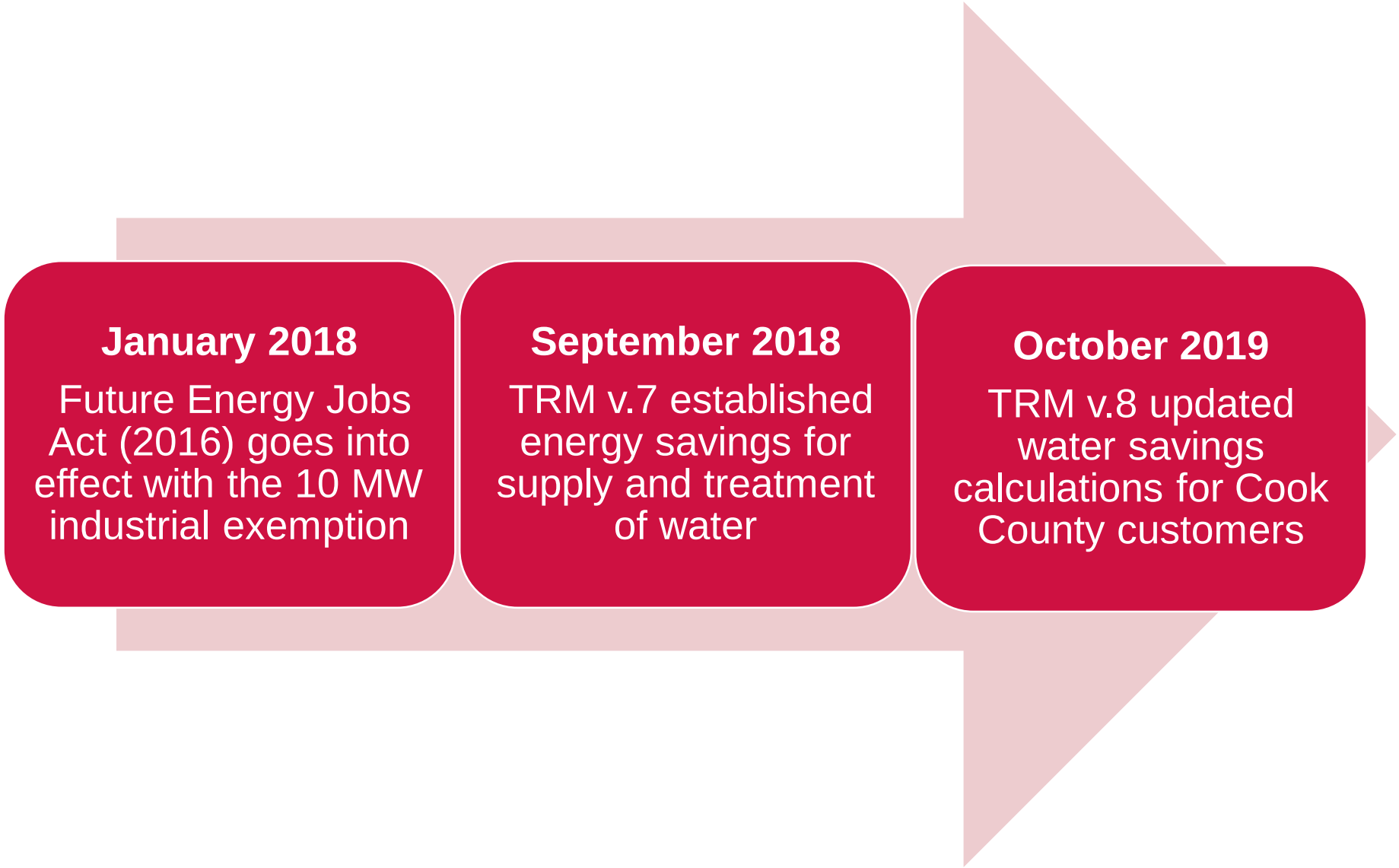
Jim Fay, Mark Milby

November 19, 2019




ComEd
Energy Efficiency Program

The Energy-Water Nexus Landscape is in Flux



Energy-Water Nexus Projects

Project Goals

Analyze, characterize and define the water channel for ComEd's service territory including all water that is coming in and going out of the system including pumping, transportation, consumption, reuse, conditioning, purification, etc.

Identify which technologies, processes and products are being considered by manufacturers, specifiers and customers and how quickly they are likely to be available and adopted

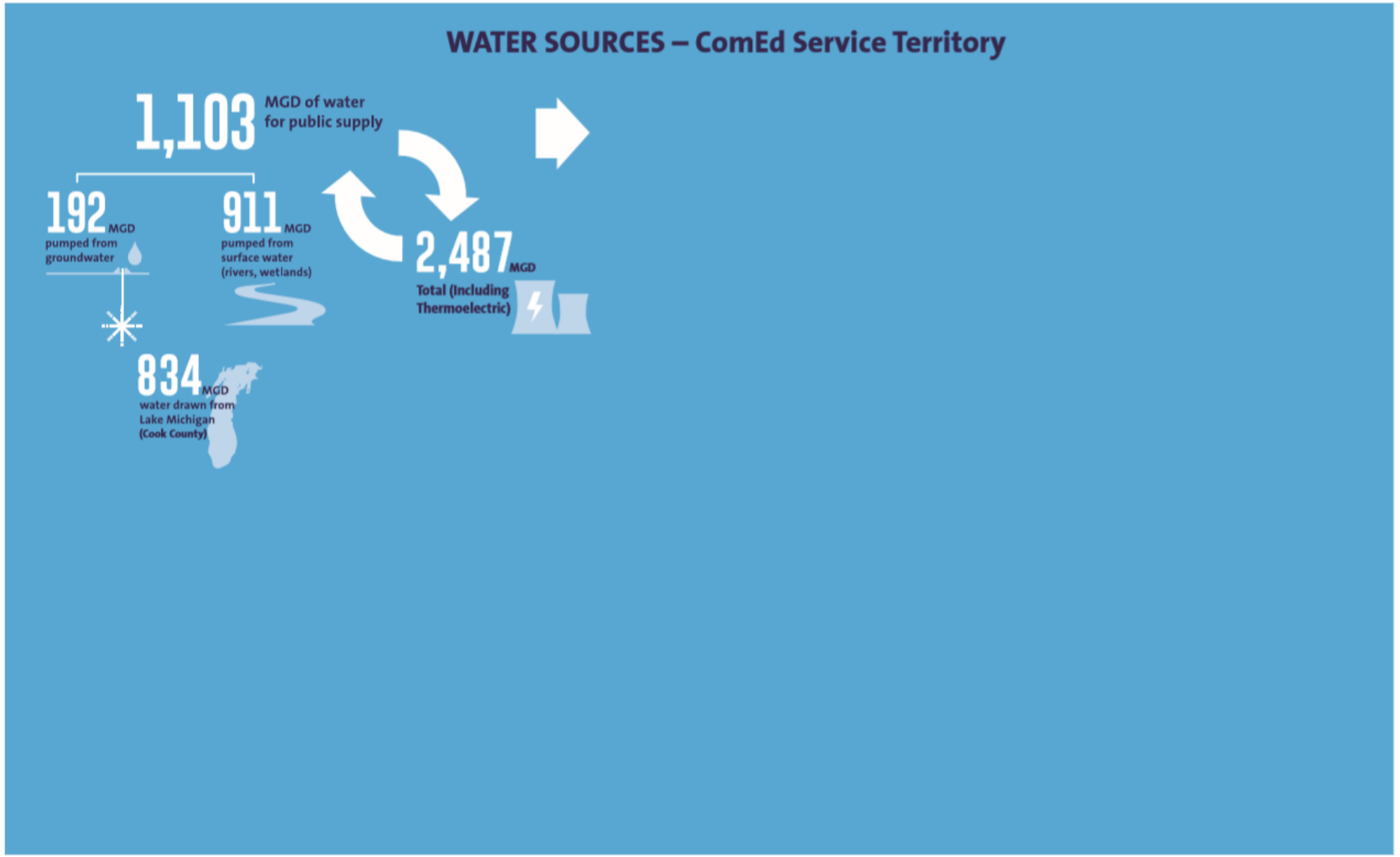
Understand how the consumption of water and electricity will be impacted by new technologies, processes, products and possible regulatory requirements

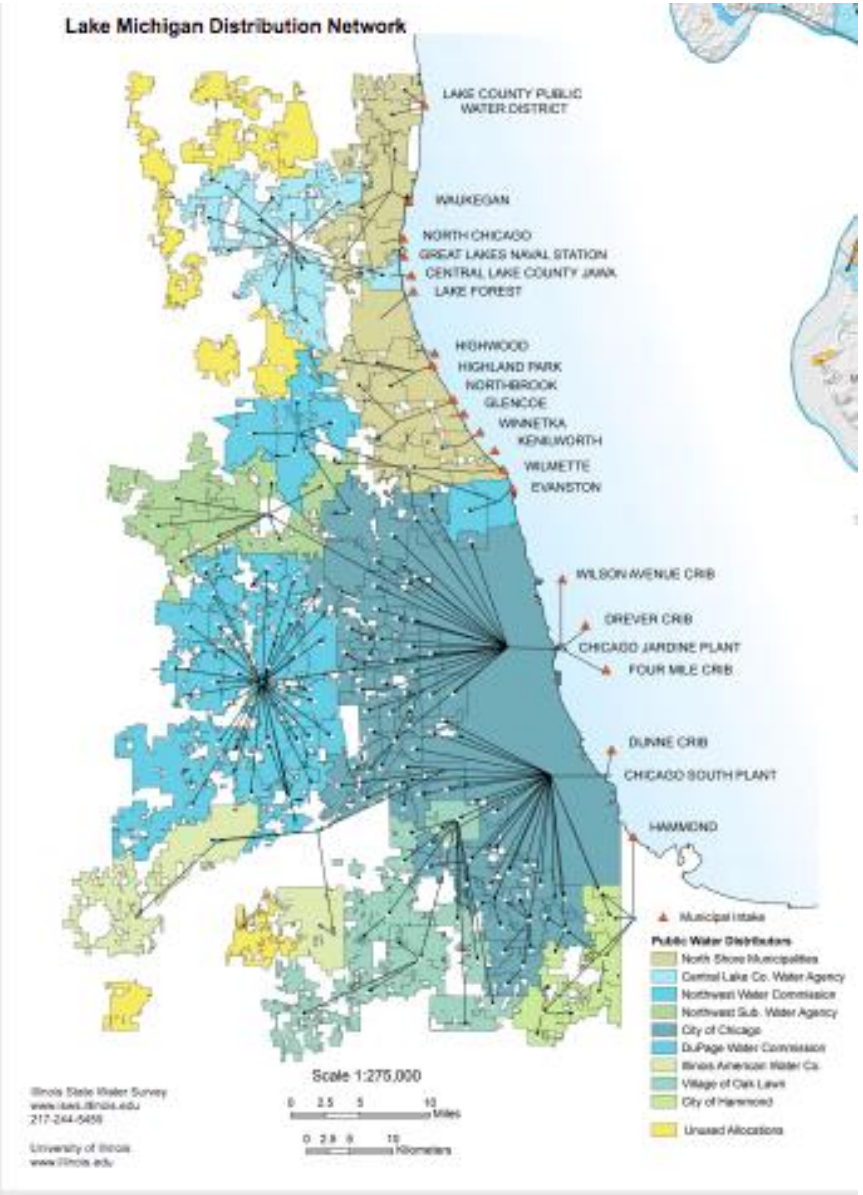
Project Scope

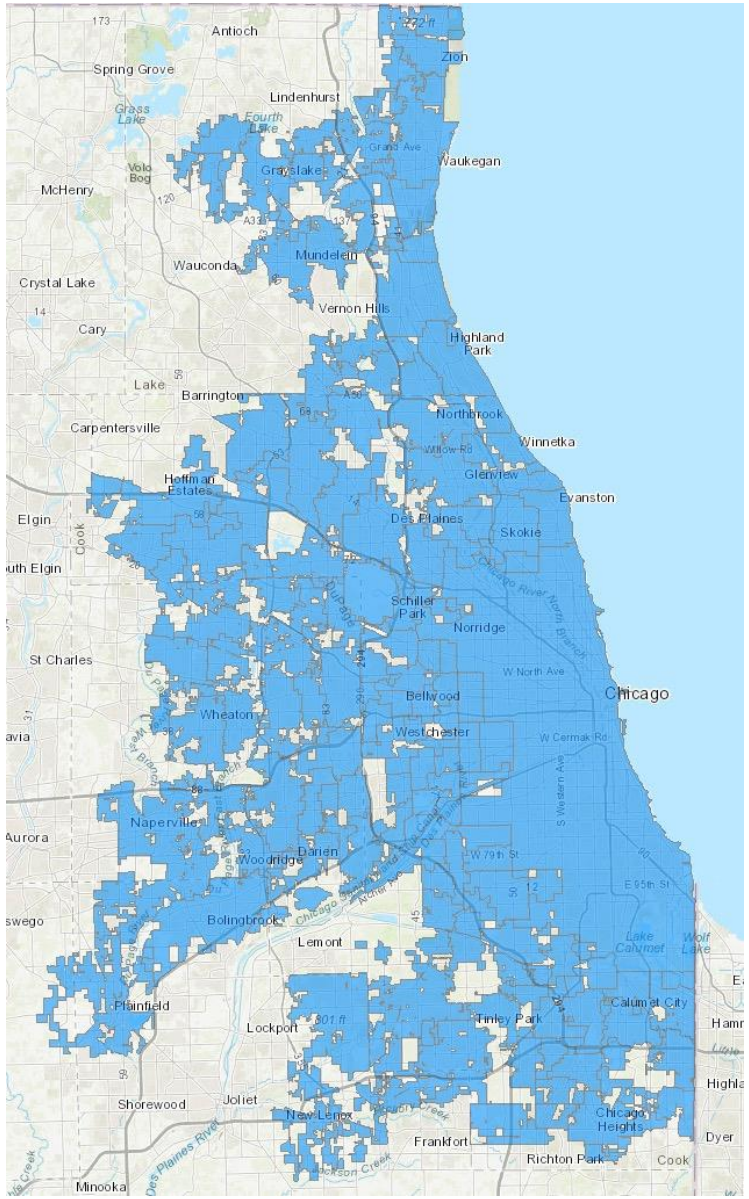
- ✓Indexed library of research on the water channel in the ComEd service territory
- ✓In-depth interviews
  - 12 interviews with water consultants and representatives from municipalities and government agencies
  - 27 interviews with industry representatives and facility managers
- ✓Delphi Study
  - 21 participants from 21 different companies with varied expertise in water, wastewater, pumps, VFDs, aeration, software, biogas, and water conservation
- ✓Data Models and Forecasts
  - Utilizing various dataset from the region to map out the current and forecasted water consumption, distribution and treatment
- ✓Final Report
  - Summarizing findings, implications and recommendations

Preliminary Results

- ✓Opportunity to save a minimum of **10 GWh** of energy in a variety of areas
- ✓Most significant savings lie with **municipal water channel partners** and **certain manufacturing facilities**
- ✓Post treatment pumping, filtration and aeration are key areas of focus
- ✓**Pumps, motors and controllers** show the greatest savings potential with the shortest time for implementation


WATER SOURCES – ComEd Service Territory
1,103 MGD of water for public supply
192 MGD pumped from groundwater
911 MGD pumped from surface water (rivers, wetlands)
2,487 MGD Total (Including Thermoelectric)
834 MGD water drawn from Lake Michigan (Cook County)





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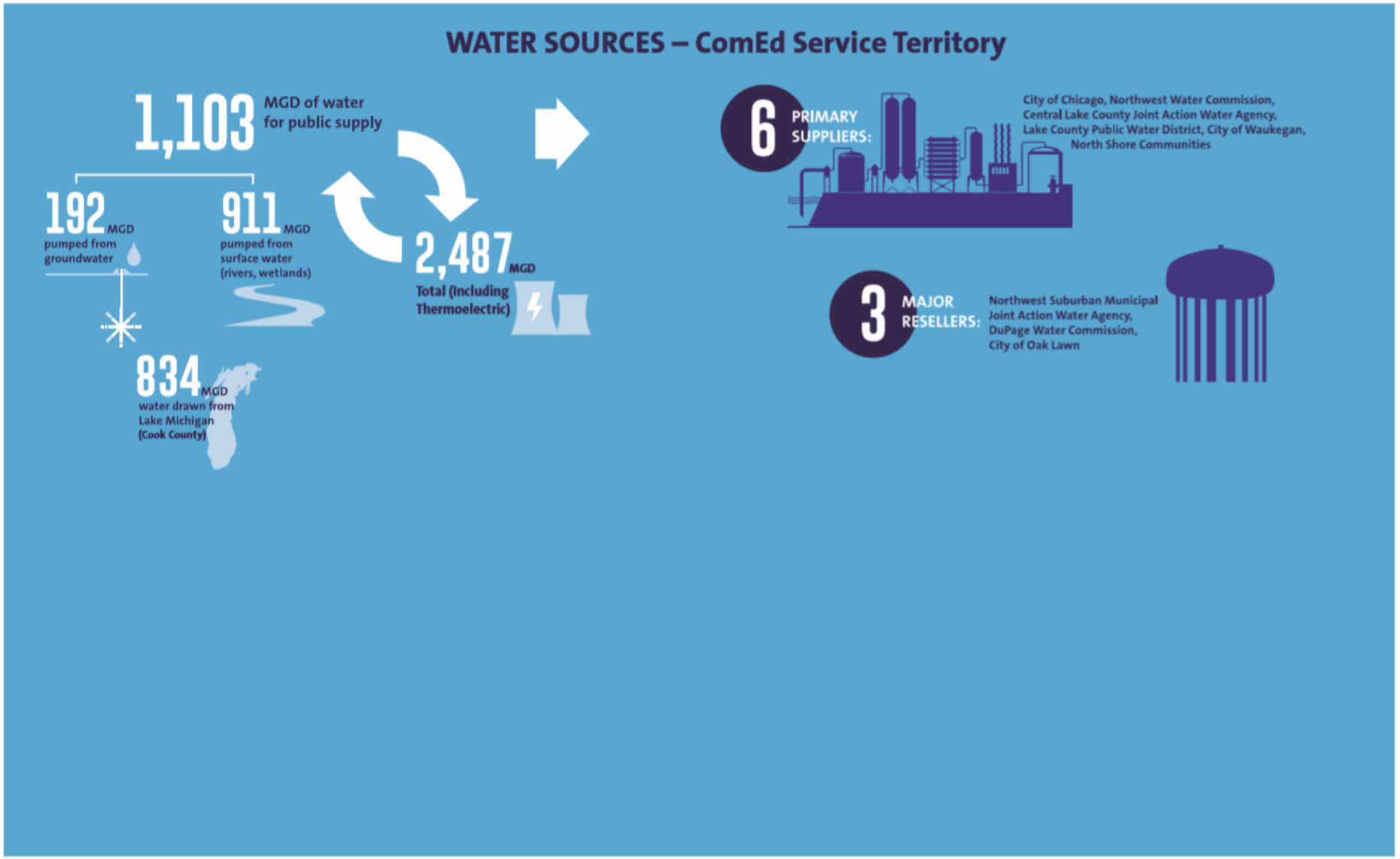
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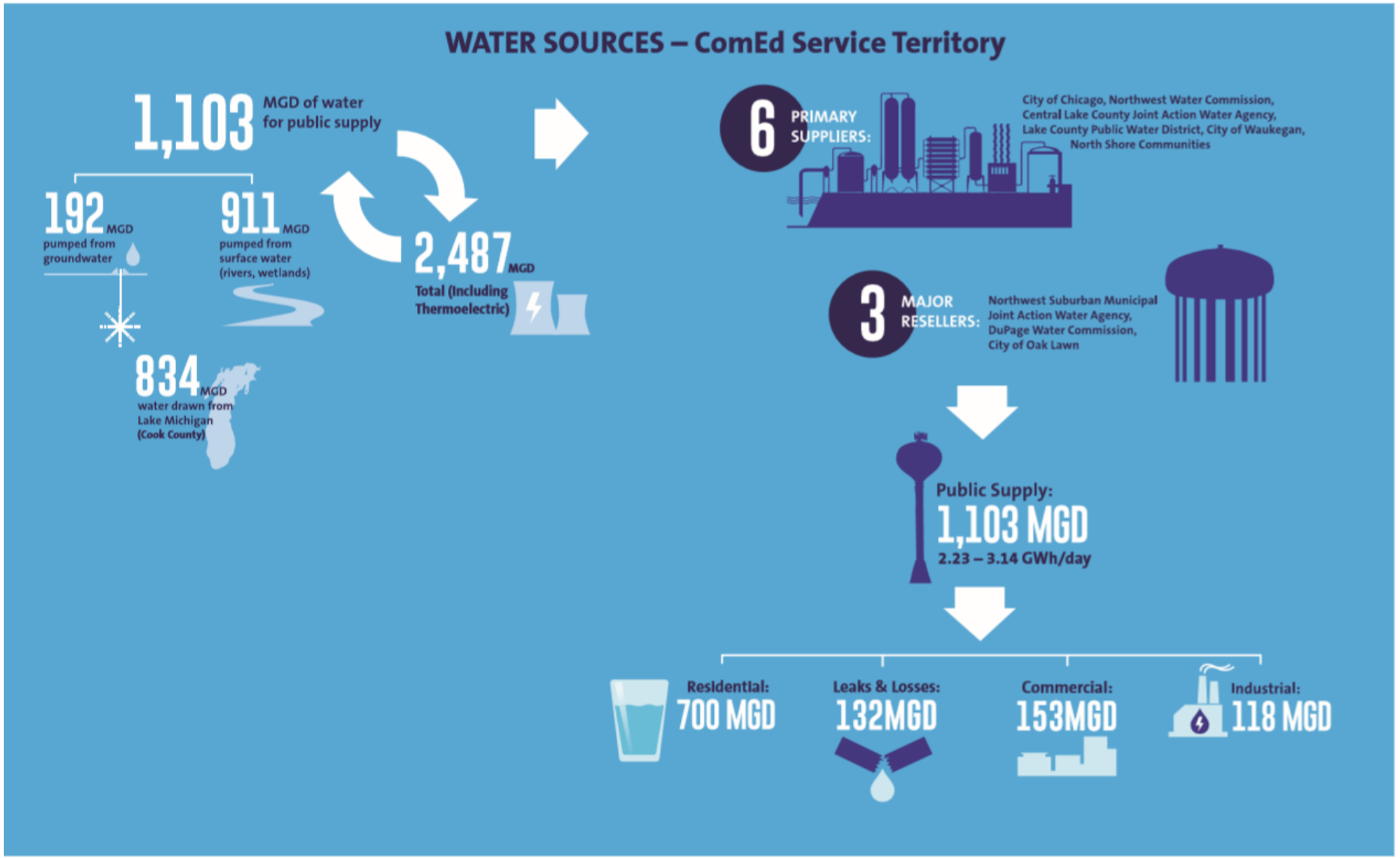
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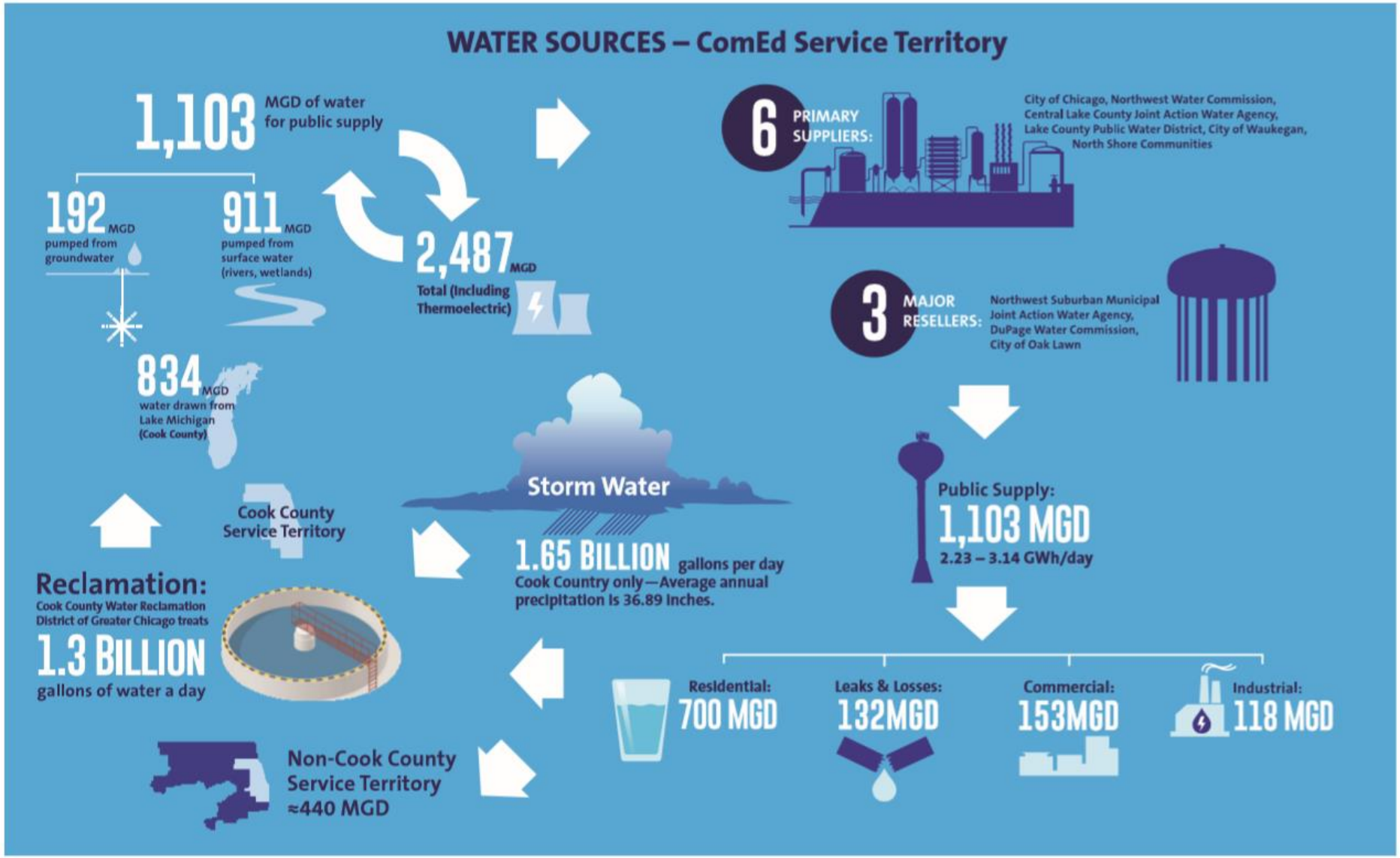
Public Supply:
1,103 MGD
2.23 – 3.14 GWh/day
Residential:
700 MGD
Leaks & Losses:
132MGD
Commercial:
153MGD
Industrial:
118 MGD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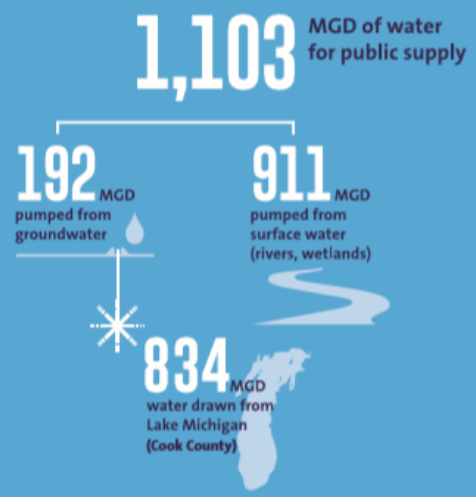
Storm Water
Cook County Service Territory
1.65 BILLION gallons per day
Cook Country only—Average annual precipitation is 36.89 Inches.
Public Supply:
1,103 MGD
2.23 – 3.14 GWh/day
Reclamation:
Cook County Water Reclamation District of Greater Chicago treats
1.3 BILLION
gallons of water a day
Residential:
700 MGD
Leaks & Losses:
132MGD
Commercial:
153MGD
Industrial:
118 MGD
Non-Cook County Service Territory
≈440 MGD

WATER-ENERGY NEXUS – ComEd Service Territory



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Pumping

Raw surface water pumping:
0.013 – 0.040 GWh/day
Raw groundwater pumping:
0.018 – 0.053 GWh/day

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Water Purification & Treatment

3 MAJOR RESELLERS: Northwest Suburban Municipal Joint Action Water Agency, DuPage Water Commission, City of Oak Lawn

Groundwater Drinking Water:

Microfiltration: 0.011 – 0.033 GWh/day
Ultrafiltration: 0.088 – 0.265 GWh/day
Reverse Osmosis: 0.329 – 0.986 GWh/day
Membrane Bioreactors: 0.003 – 0.0075 GWh/MG
Electrodialysis Reversal: 0.0043 GWh/MG

Surface Drinking Water:

UV Disinfection: 0.00002 – 0.00009 GWh/MG
Ozone Disinfection: 0.0004 – 0.001 GWh/MG
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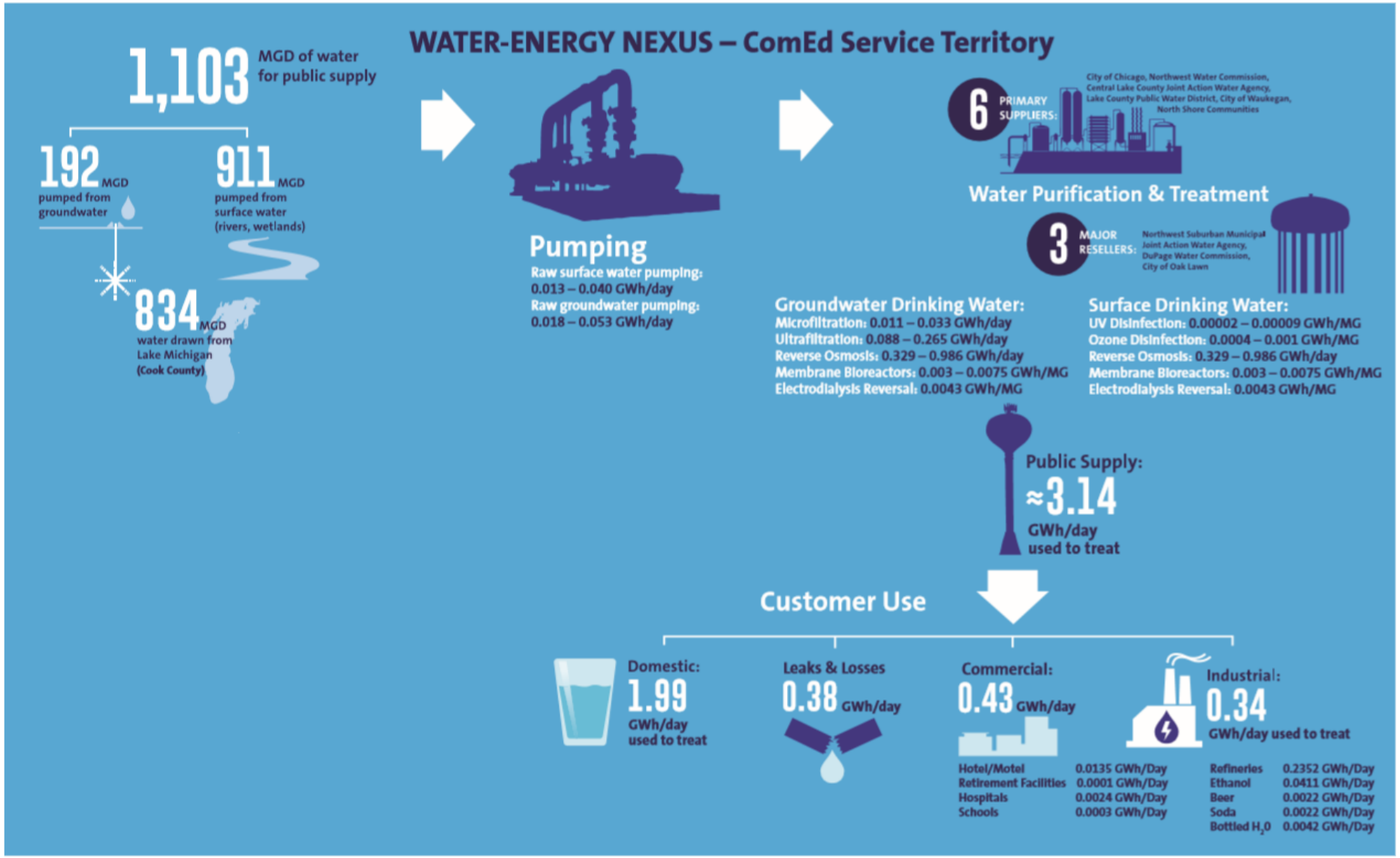
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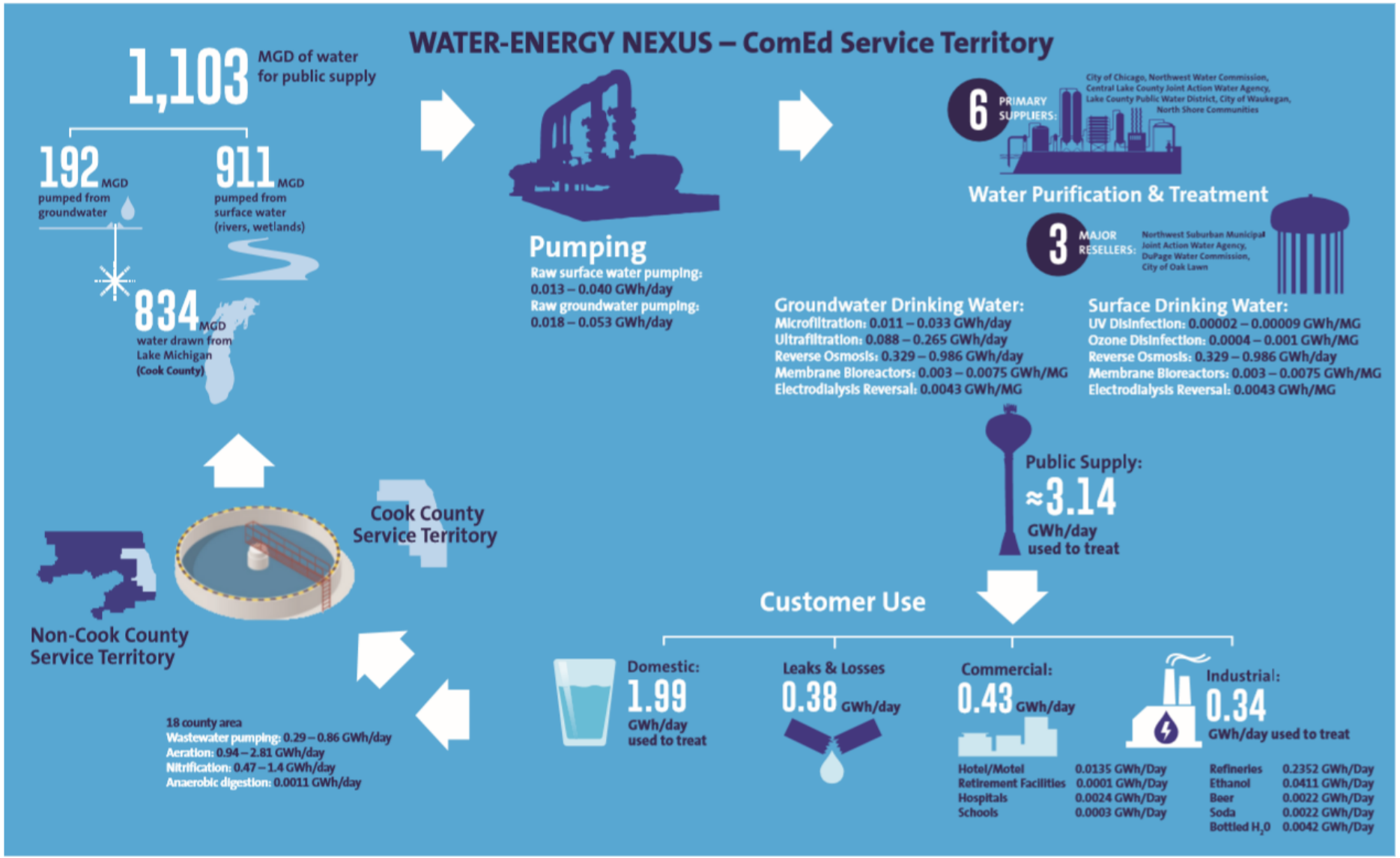
Public Supply:
≈3.14 GWh/day used to treat
Customer Use
Domestic: 1.99 GWh/day used to treat
Leaks & Losses 0.38 GWh/day
Commercial: 0.43 GWh/day
Hotel/Motel 0.0135 GWh/Day
Retirement Facilities 0.0001 GWh/Day
Hospitals 0.0024 GWh/Day
Schools 0.0003 GWh/Day
Industrial: 0.34 GWh/day used to treat
Refineries 0.2352 GWh/Day
Ethanol 0.0411 GWh/Day
Beer 0.0022 GWh/Day
Soda 0.0022 GWh/Day
Bottled H2O 0.0042 GWh/Day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18 county area
Wastewater pumping: 0.29 – 0.86 GWh/day
Aeration: 0.94 – 2.81 GWh/day
Nitrification: 0.47 – 1.4 GWh/day
Anaerobic digestion: 0.0011 GWh/day
Cook County Service Territory
Non-Cook County Service Territory

Green Stormwater Infrastructure – Greenprint Partners

- ✓ “A cost-effective, resilient approach to managing wet weather impacts that provides many community benefits… green infrastructure reduces and treats stormwater at its source while delivering environmental, social, and economic benefits.”
  - EPA website, “What is Green Infrastructure?” www.epa.gov/green-infrastructure/what-green-infrastructure

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Images, L-R:

- https://www.sccgov.org/sites/cwp/Pages/Green-Stormwater-Infrastructure.aspx
- https://www.soils.org/discover-soils/soils-in-the-city/green-infrastructure
- https://www.nrpa.org/parks-recreation-magazine/2017/april/green-infrastructure-stormwater-management-in-parks/

Project Goals

Identify top municipalities in the ComEd service territory with the greatest energy savings potential and likelihood of green stormwater infrastructure (GSI) adoption

Calculate the energy savings potential and potential for adoption of GSI for the selected municipalities

Outline the potential barriers to adoption and the likelihood that a cost-effective intervention could be shown to influence municipality decision making around GSI

Municipality Selection

Criteria	Weight
Population between 25,000-200,000	Exclusionary
Presence of a combined sewer system	Exclusionary
CMAP Flood Susceptibility Index score	3
Presence of combined sewer outfalls	1
Number of combined overflow events annually	1.5
Collects a stormwater fee to fund system improvements	5
Wastewater treatment plant energy use	3

Top Ranked Cities

1. Aurora
2. Calumet City
3. Elgin
4. Evanston
5. Highland Park
6. Joliet
7. Niles
8. Waukegan
9. Wilmette

The top nine municipalities were interviewed to understand how likely they are to pursue GSI, their barriers to adopting GSI and the level of intervention needed to accelerate adoption of GSI

Potential Energy Savings from GSI for Top Nine Municipalities

Municipality	Potential Energy Savings from GSI (kWh/yr.) [TRM v.7]	Potential Energy Savings from GSI (kWh/yr.) [TRM v.8]
Aurora	530,225 – 1,590,674	530,225 – 1,590,674
Calumet City	322,001 – 966,003	48,320 – 144,960
Elgin	280,484 – 841,452	42,090 – 126,269
Evanston	449,955 – 1,349,866	67,521 – 202,563
Highland Park	4,993 – 14,979	4,993-14,979
Joliet	600,960 – 1,802,880	600,960 – 1,802,880
Niles	434,674 – 1,304,022	65,228 – 195,684
Waukegan	11,294 – 33,882	11,294 – 33,882
Wilmette	121,425 – 364,276	18,221 – 54,664

Source: Greenprint Partners, 2019

Preliminary Results

✓ The 9 municipalities interviewed represent **1.38-8.26 GWh** of potential savings

✓Potential to create $30M in economic development value over 40 years

✓Potential to achieve an average crime reduction of 2%

✓Potential to add an average of 150 acres of green space to each municipality

Challenges, Opportunities and Next Steps

Challenges

- ✓ A million gallons is a lot of water to save
- ✓ Identifying cost effective measure and program opportunities
- ✓ Reduced savings potential for Cook County customers
- ✓ Cost of installation and maintenance a major barrier for implementing new technologies and infrastructure
- ✓ ROI and ability to measure real savings for new technologies
- ✓ New partners for EE industry

Measure from TRM v.8	Cook County Savings Potential (kWh/yr.)	Outside of Cook County Savings Potential (kWh/yr.)
WaterSense Toilet	12	21
Tunnel Washers	3,121	5,324
Dipper Wells	504	859

- ✓ Areas of interest - currently evaluating market potential
  - Green stormwater infrastructure
  - Municipal water systems leak detection
  - Industrial high-water users
  - Income Eligible opportunities
  - TRM v.8 measures
    - Toilets
    - Dipper wells
  - Water treatment for cooling towers
  - Pressure optimization
  - Irrigation opportunities