

CITY STREET LIGHTING INFRASTRUCTURE

April 16th, 2019
Common council

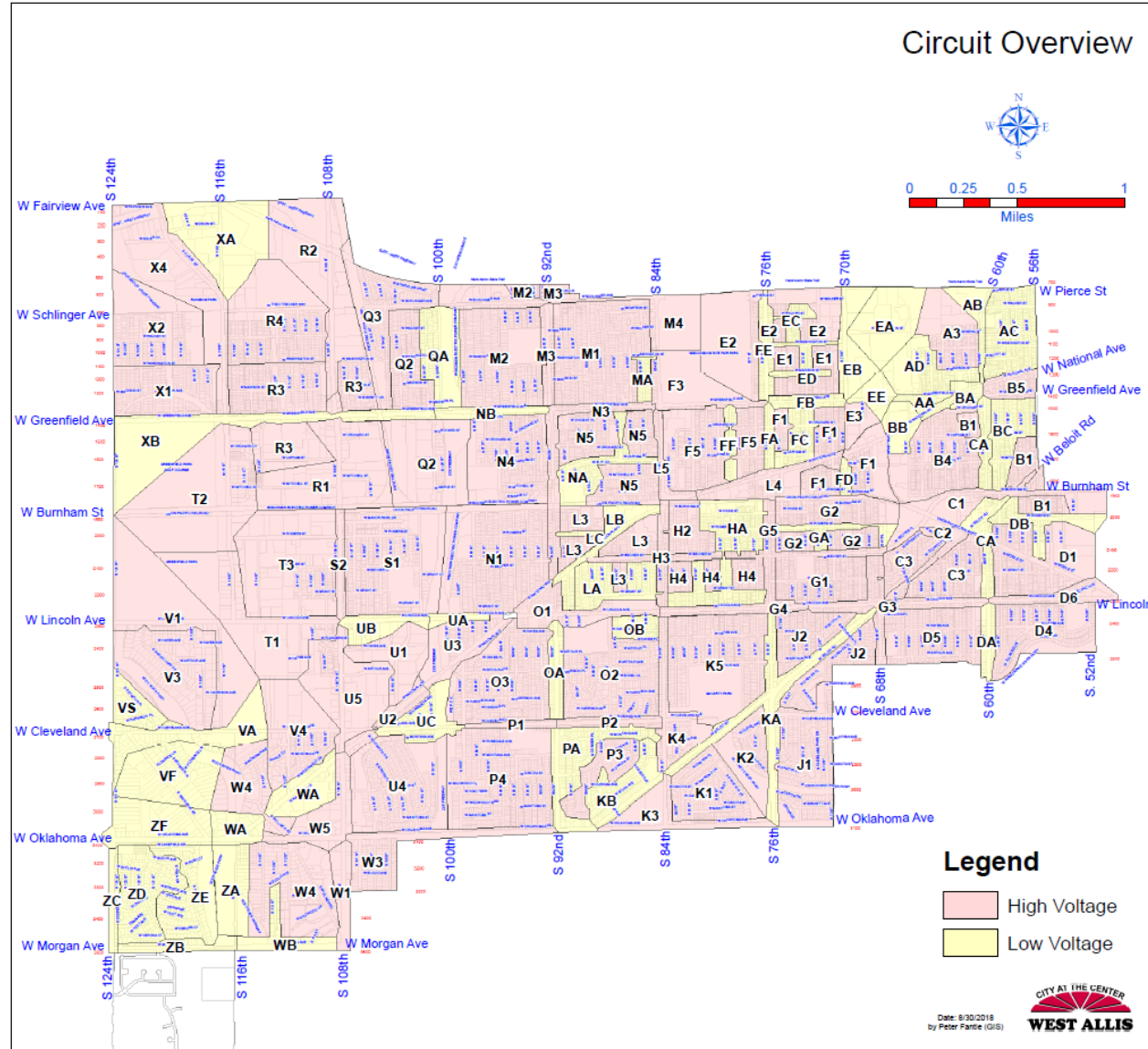


West Allis Public Works - Electrical

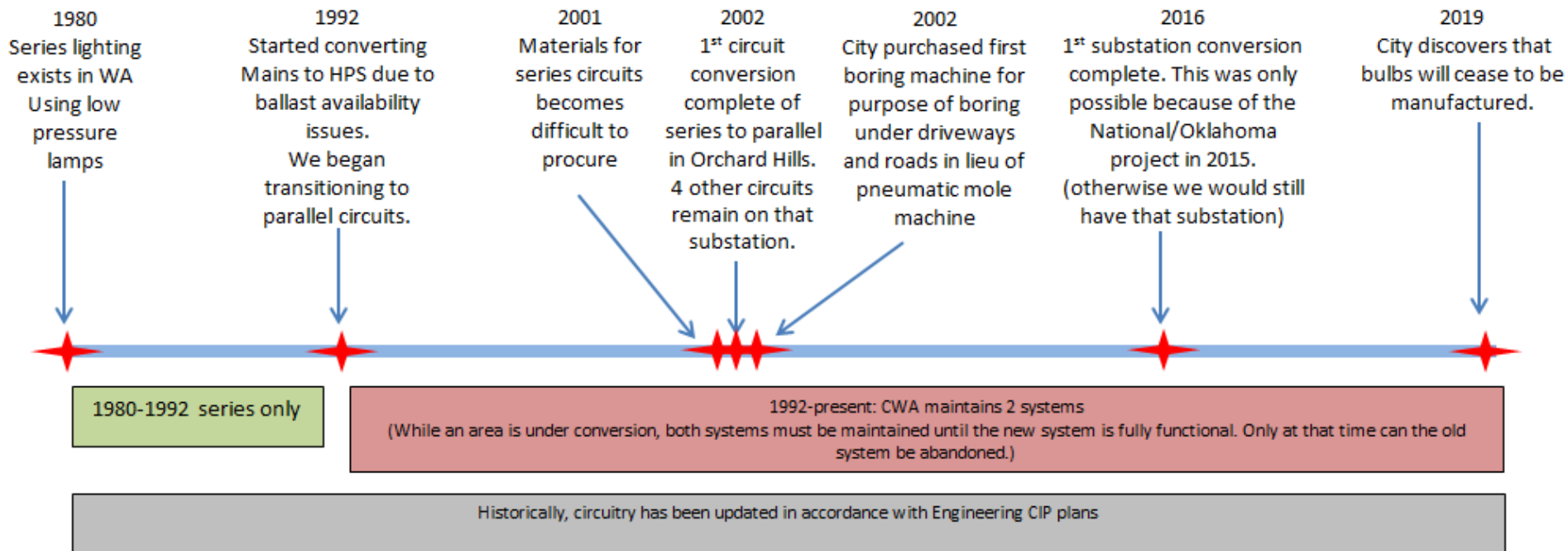
- West Allis is one of few communities that maintains their electrical infrastructure in house (street lights and traffic signals).
- West Allis and Milwaukee are the only municipalities in the state that are currently utilizing the series (high voltage) systems for their street lights.
- Most or all other communities contract through We-Energies.
- Milwaukee is currently in the process of converting their system in house.
- 53 parallel (low voltage) circuits have been installed and are functional, which is approximately 7% of the City's street lighting.
- Approximately 291 miles of series (high voltage) circuitry remains to be converted to low voltage.
- This series circuitry system consists of 23 substations which control 76 separate circuits.



Current state of Low vs High Voltage



Timeline of events 1980 – present



Emergency Bulb Purchase

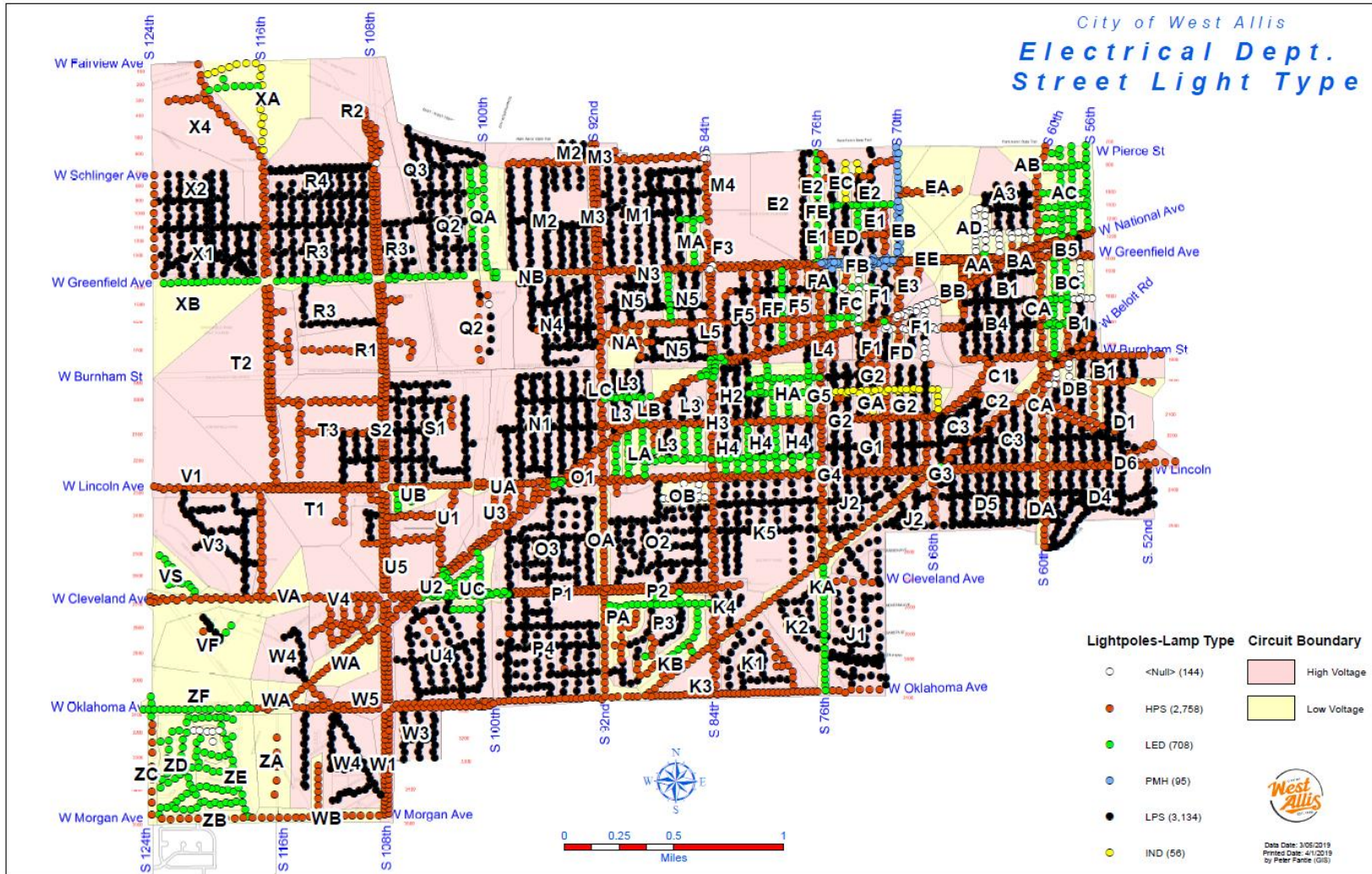
- February 2019 – DPW had to make an emergency purchase of low pressure sodium light bulbs for the lights on the series circuits (high voltage). These bulbs will no longer be available in the United States, we have purchased all the remaining low pressure sodium bulbs available.
- We estimate that the bulbs can be replaced at a rate of approximately 1,000 per year, so the remaining series lights would all have replacement bulbs installed in the next 6 years.

Emergency Bulb Purchase Continued

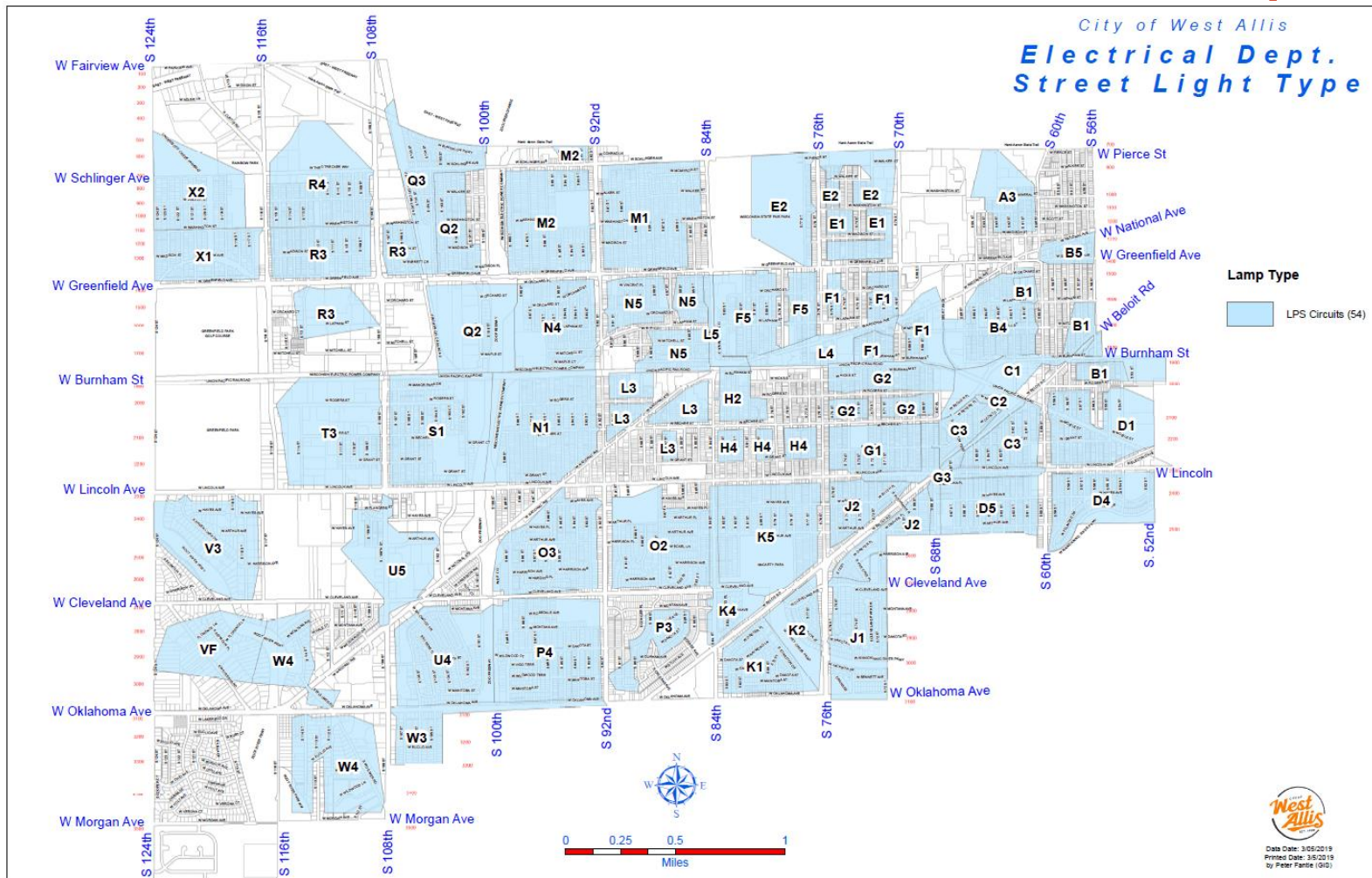
- BUT! In year 7, 1/3 of the lights will begin to go out. The following year another 1/3 will go out, and by year 9 over 3,000 street lights will go out and WILL NOT BE REPAIRABLE.
 - Bulbs are replaced before they burn out because after 3 years they have a greater than 20% chance of failure; after 4 years they have a greater than 50% chance of failure.
 - Leaving bulbs in longer strains our electrical system because bulbs are weaker at the end of their life and require more energy.
 - 3 year replacement schedule also allows us to control the time of year this work takes place, and work can be done in a controlled manner that is routed efficiently.
 - Already stopped replacing bulbs in areas where we know conversion will soon take place.



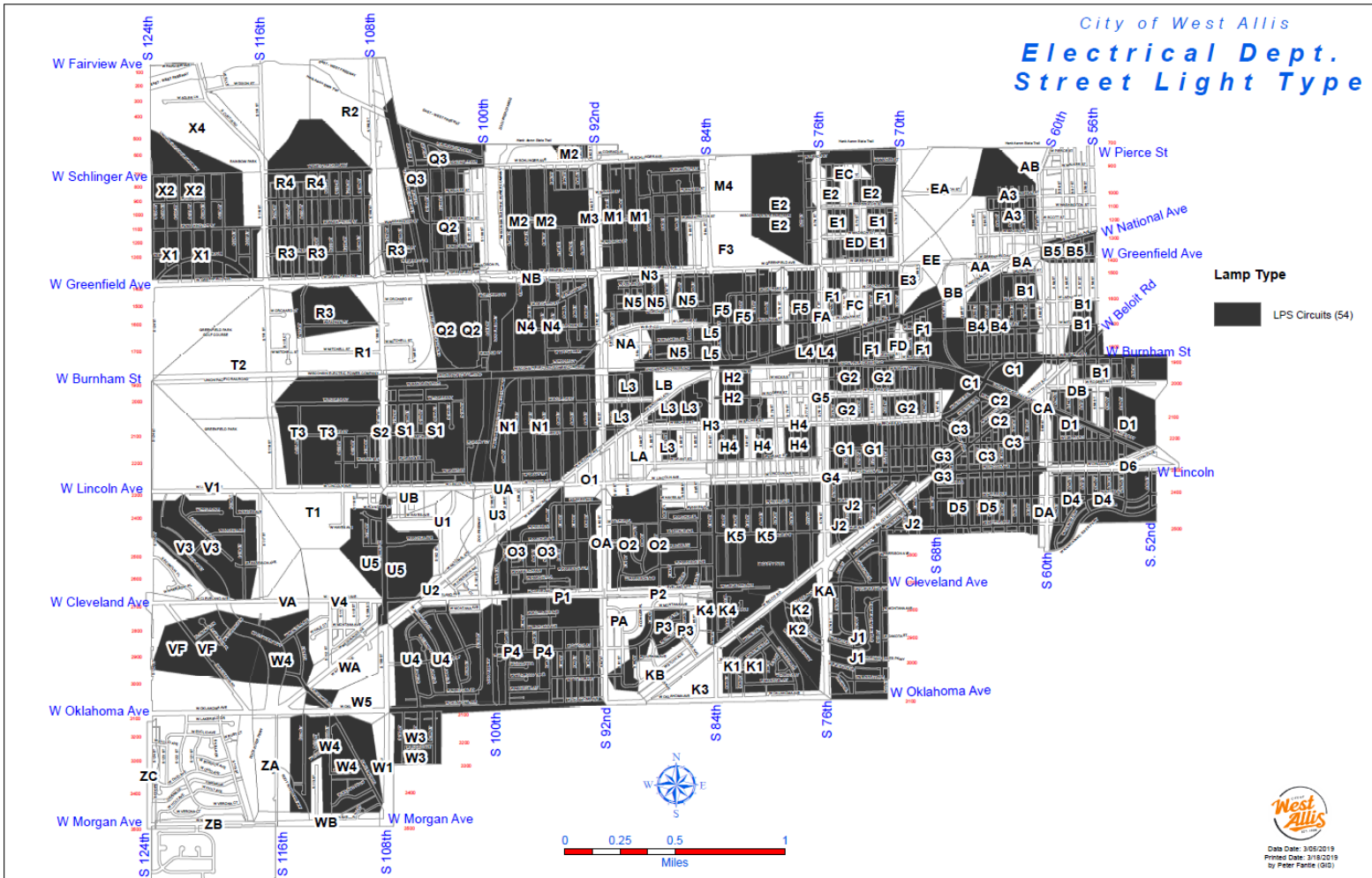
Breakdown By Lamp Type



Areas of Low Pressure Sodium Lamps

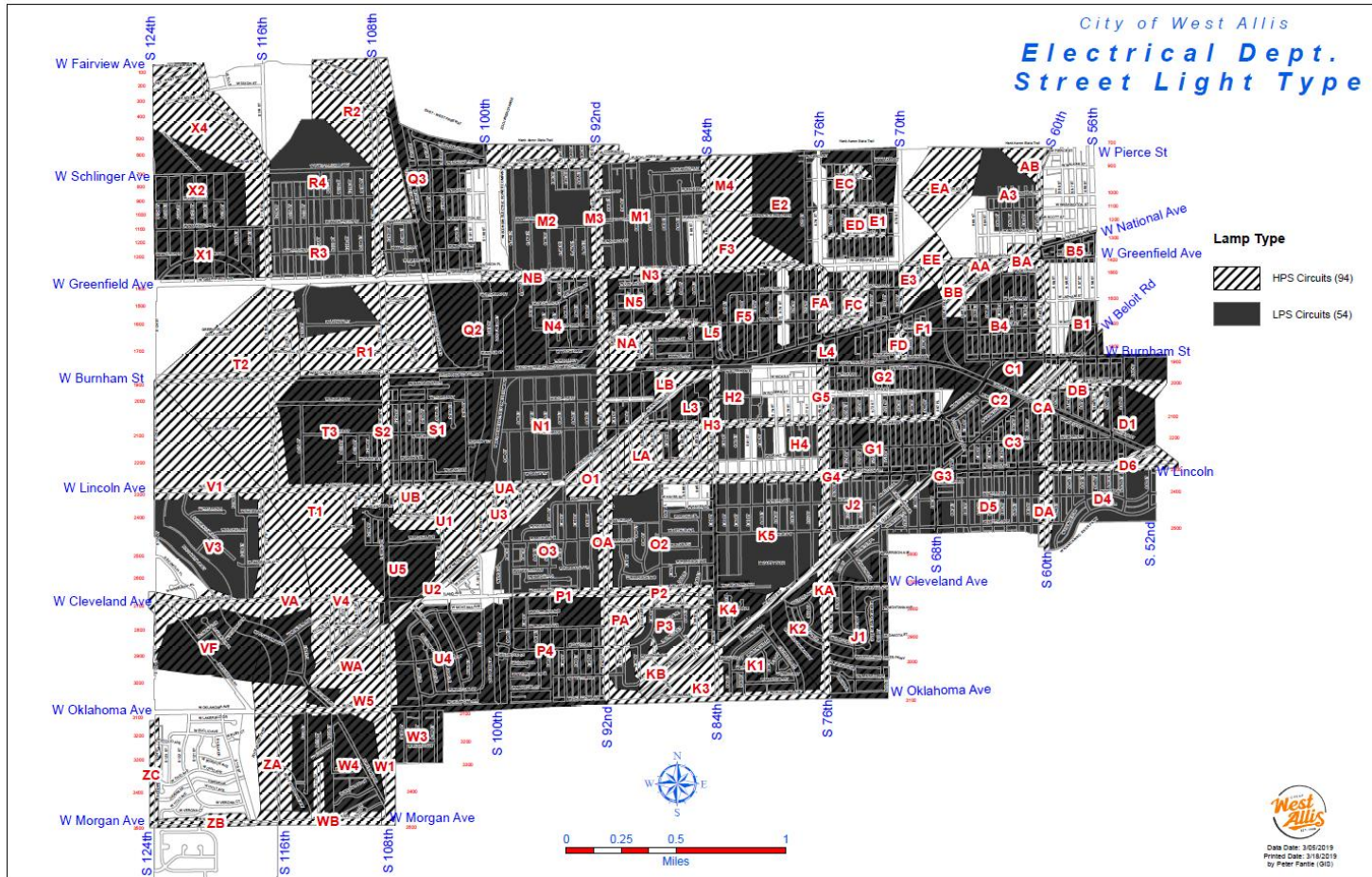


Potential Black Out



Areas shaded in black would potentially experience a black out in 7-8 years.

Potential Black Out



Bulbs for the striped areas will be available until 2025. We still have time to develop a plan. However, we may need to make another 'emergency' purchase to service these lights should no plan be put to action.



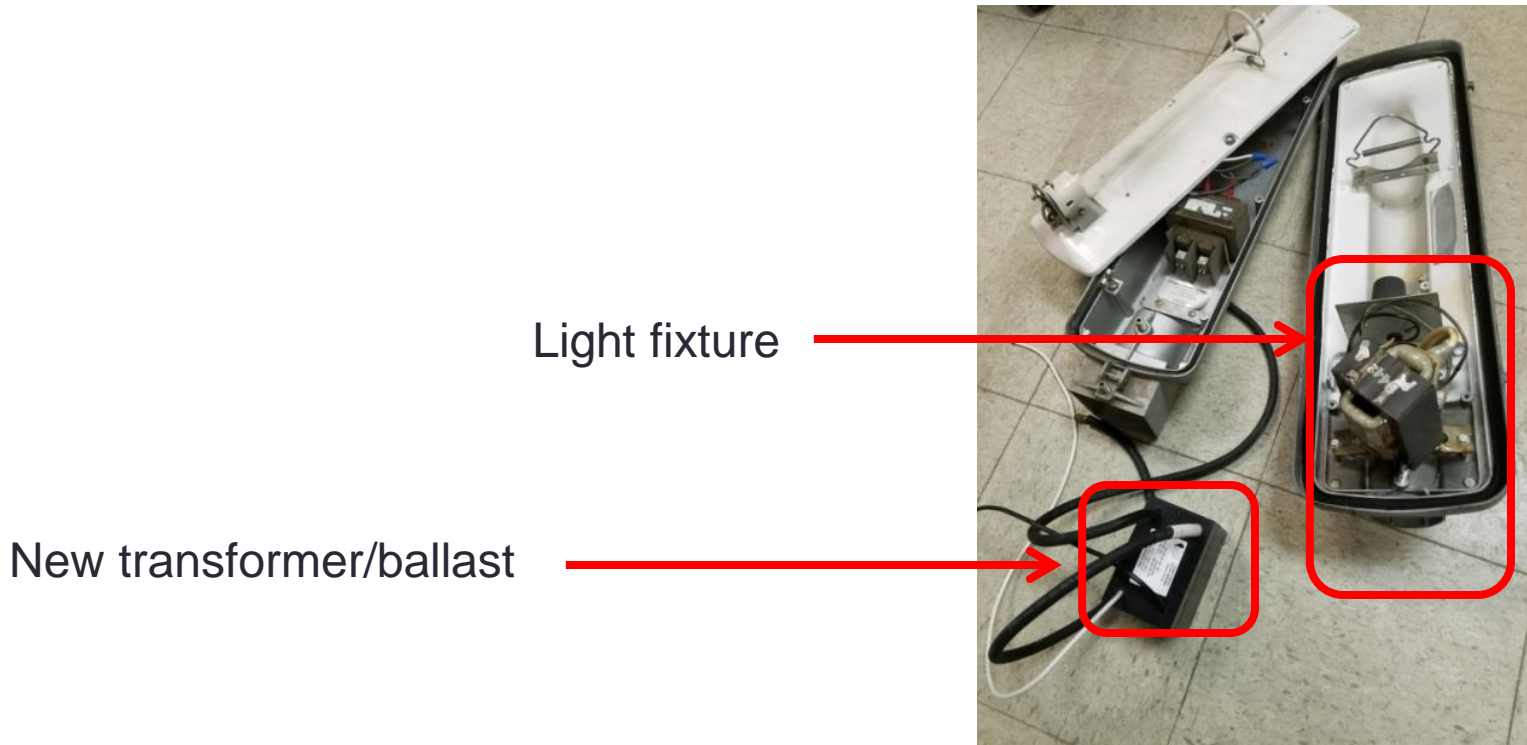
Other Street Light Options - Concerns

- Solar
 - Multiple Styles:
 - Panel on each pole – prohibitive due to required maintenance (keeping panels clean and clear of obstructions like snow and vegetation)
 - Large panel feeding several poles - would require complete circuitry conversion
 - Solar panels generally require specific poles, which is an additional cost
 - Limited sun exposure during winter months
 - Initial costs are exorbitant.
- Contract with We-Energies
 - To work with We-Energies would mean to discard all City electrical infrastructure.
 - We'd have to pay them to replace with new infrastructure which would be installed by their contractor.

Other Street Light Options – Concerns (cont.)

- **Can we just put LED bulbs in our existing poles?**

- LED bulbs require a transformer due to the high voltage. This means a transformer is needed for every pole, and could create logistic difficulties in mounting and retrofitting the transformers.
- The lifespan of an LED bulb is unknown at this time, it is estimated they will last 8 to 10 years. But this technology is so new, that the bulbs have not yet started going out.
- Estimated cost for bulb and transformer is \$609 per pole
- For all 3,232 poles the cost would be \$1,968,320
- Still relies on the aging series system to function



Reasons To Covert To Low Voltage (Parallel) Circuitry

- Currently, City of West Allis Street Lighting circuits are mainly high voltage, series circuits. This is problematic because...
 - Inefficient - requires more power than LED components.
 - Costly and time consuming repairs - labor and material costs when outages occur are prohibitive to our limited resources.
 - When failure occurs, entire circuit loses power (streets will have no lighting).
 - When working with contractors on CIP (Capital Improvement Program), often receive no bids.
 - Historically, when a series circuit was replaced, the old components were stored to be used as replacement parts. Presently, low sodium lamps are obsolete. Our understanding is that by 2025 high pressure sodium lamps will also be obsolete (2,808 high pressure lamps in West Allis).
 - Outdated - many parts are no longer being manufactured (cable, ballast, transformers, bulbs, open circuit protectors, substations).



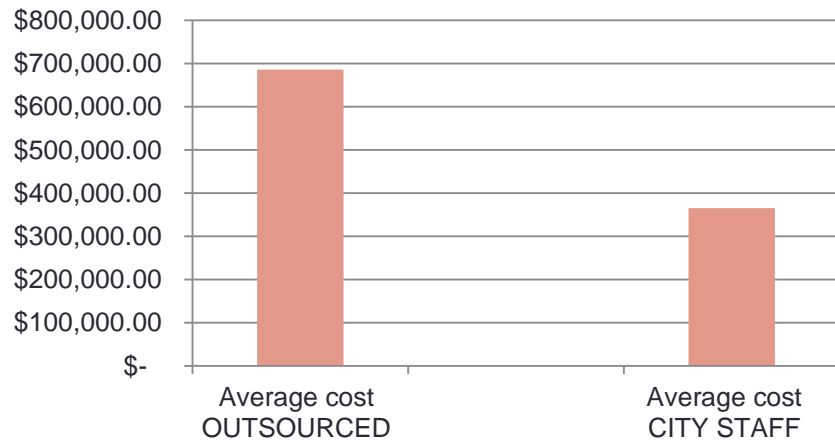
Benefits Of Converting To Parallel Circuitry

- **When outages occur, they will affect a smaller area. Residents expect City Infrastructure to be operational.**
 - (Strategic Goal #1 Image/Brand/Destination)
- **Safer to work with – 4,800 volts vs 120-240 volts. This also reduces contractors and the public's exposure high voltage lines .**
 - (Strategic Goal #2, Quality of Life)
- **Fewer outages may have secondary effect of lowering crime and the perception of crime.**
 - (Strategic Goal #3 Citizen Engagement)
- **Standardizing pole and fixture types as we update our City's infrastructure will reduce inventory stock and improve replacement time. Ex: specialized pole could take up to 14 weeks to receive.**
 - (Strategic Goals # 4, Economic Vitality and Sustainability and #5 Excellence in Government)
- **Parallel circuitry system would eliminate troubleshooting of recycled series parts, making installation and repairs more efficient. Additionally, fewer specialized parts are required for parallel circuits and these new circuits can easily be converted to LED in the future.**
 - (Strategic Goal #5, Excellence in Government)



Street Lighting Analysis

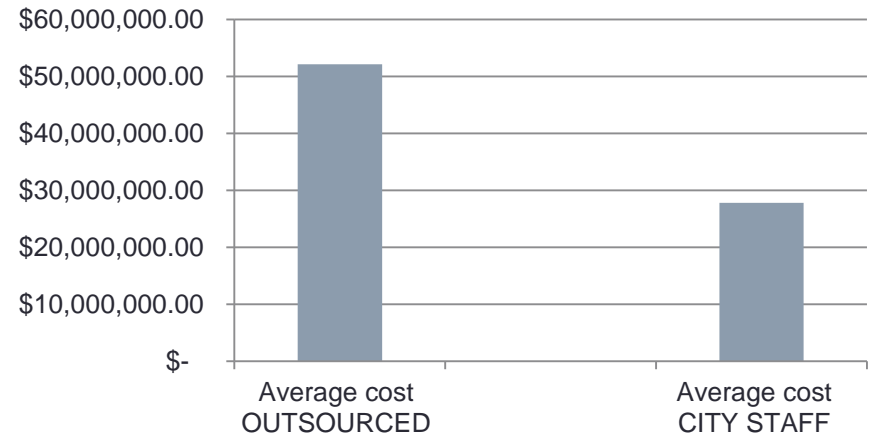
1 Full Circuit



\$685,750

\$365,467

All 76 Circuits



\$52,117,034

\$27,775,502

Per analysis with Finance Department it was determined that using City Staff is approximately half the cost of outsourcing.

Electrical Staffing and Responsibilities

City of West Allis Electrical staffing:

- 1 Superintendent
- 1 Lead Electrician
- 5 Electrical Mechanics (+1 vacant)
- 2 Maintenance Repairer (vacant)
- Utility Locate Technician (vacant)

City of West Allis Electricians are responsible for the following maintenance:

- Cable
 - 37.13 miles - Low Voltage / 291.35 miles of High Voltage (Total: 328.48 miles)
- Conduit
 - 70.97 miles are in use / 6.66 miles for future use (Total: 77.63 miles)
- Pull Boxes
 - 596 Boxes
- Traffic Signals
 - Controlled Intersections
 - 73 West Allis Controlled / 23 Other Entity Controlled
 - 817 Pedestals
 - 1100 Signal Lights
 - 619 Walk Signals
 - 222 Loop Detectors
 - 9 Flashing Beacons
- Street Light Poles
 - 6,527 Single Arm / 296 Double Arm / 135 Ornamental (Total:6,959)
- Alley Lights
 - 750 Public / 45 Private (Total:795)
- Communication Vaults
 - 30 West Allis / 123 Other Entities (Total:153)
- Communication Fiber
 - 2.01 miles West Allis / 24.44 miles Other Entities (Total:26.45 miles)
- Electrical systems at all City buildings and muni lots, City parks, and Beloit Rd Housing



Electrical Dedicated Crews

Conversion

- 2 Electricians
- 2 Maintenance Repairers (both vacant)
- Convert series circuits to parallel, 1 circuit at a time (expose utilities, directional bore, relocate poles/bases, pull wires, make connections and add fixtures)
- 76 circuits remain to be converted
- Other options will be provided as part of conversion plan (June 2019)

Utility Marking

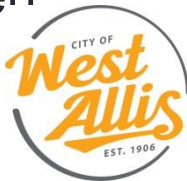
- 1 Utility Locate Technician (vacant)
- **During peak seasons an Electrician will also be required to keep up with demand**
- Responsible for marking all underground utilities as requested via Digger's Hotline (requests from private and commercial enterprises).
- 2018 produced 5,679 requests for underground utilities to be located. Our deadlines are time sensitive and mandated.

Maintenance and CIP

- 3 electricians
- 1 electrician (vacant)
- Perform all necessary maintenance on previous slide
- Perform CIP work in accordance with Engineering plans

Maintenance Work

- Grounds – Maintain operation of existing street lights
 - Trouble shoot/identify/isolate/repair
 - Requires 2 Electricians daily
 - City currently has 15 circuits that are interrupted due to fault and are in need of repair
- Traffic Signal and Street Light Knockdowns
 - Combined this occurs on average 1.6 times per week
 - Takes approximately 4 hours to repair
 - Requires 2-3 Electricians, dependent on damage
 - Must respond within a reasonable timeframe
- Outages
 - Approximately once a week we repair any outages that have been reported or observed by our crew (varies from week to week)



CIP Work

- With contracting out CIP, we are still required to coordinate with the various contractors to perform repairs and required system modifications to high voltage cables to ensure the areas maintain service and that the project stays on schedule.
 - Proposed 2019 CIP work will affect 14 of our high voltage series circuits.
 - Currently, only 1 of this year's projects has plans submitted by a Designer.
 - Difficult to project the scope of work and plan accordingly when no timeline or design is submitted.
 - It is expected that City staff will be involved in more CIP work this year.



Going Forward...

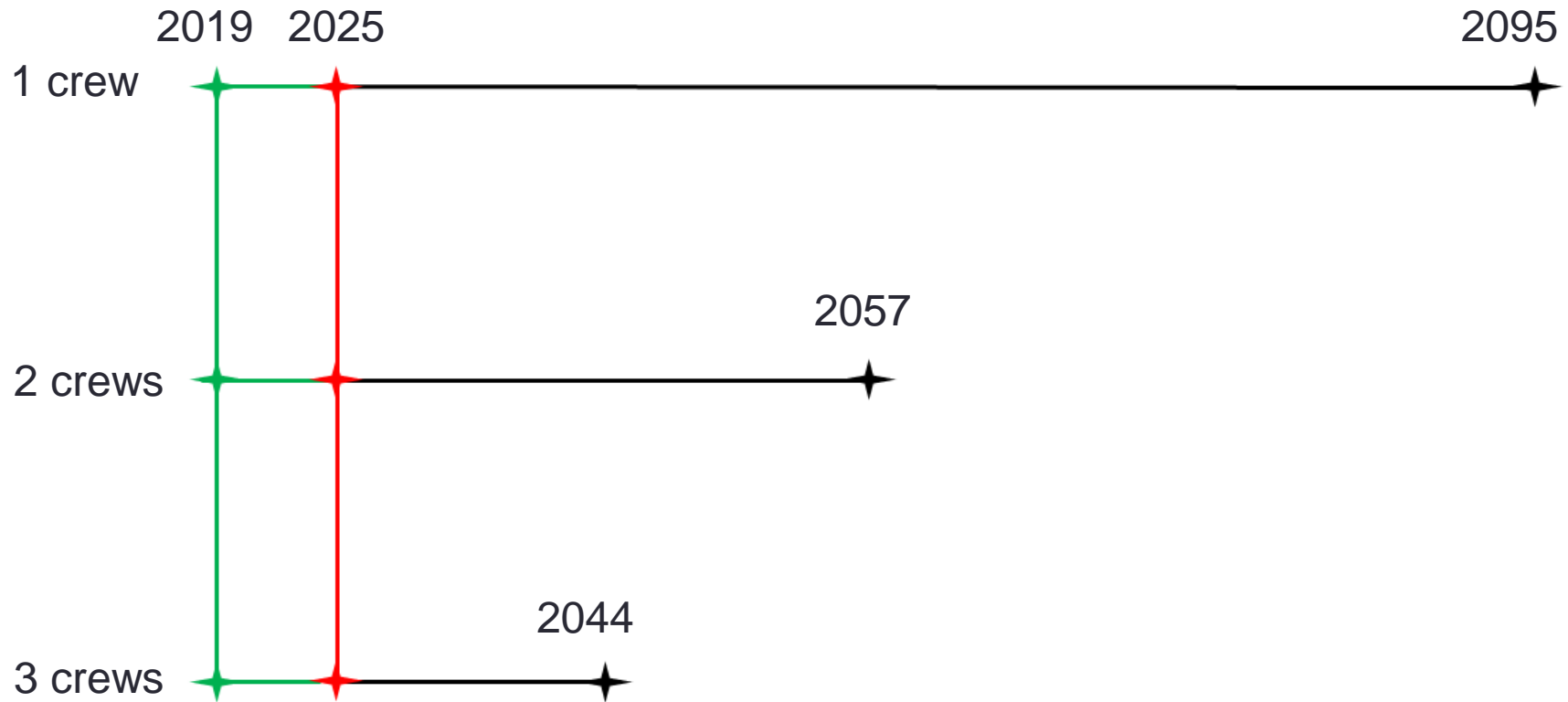
- Minimum – we need a 4 person crew to perform circuitry conversion
 - We have the positions approved and budgeted to create a 4 person crew to perform this work. Three of the 4 positions needed are still vacant (Electrical Mechanics 1 of 2 positions yet to be filled. Maintenance Repairers 2 positions currently being recruited.)
- We estimate that this dedicated 4 person crew can complete 1 circuit conversion in approximately 1 year.
- With 76 circuits remaining, this project would be complete in 2095.



Going Forward...(cont.)

- Given the urgency of the 'potential black out', within 6 to 8 years large portions of the city would not have street light service.
- That means if a black out occurs in 2025 when bulbs can no longer be replaced, that portion of the city could be without service until 2095.
- At this time it is unknown how fast the new directional boring machine can perform. Once we become familiar with the machine the pace could potentially increase. Reconfiguring the crew sizes may also increase productivity.

Potential Timelines



Next Steps

- Recruit for vacant positions
- Train staff on new machine
- Wait for plan on CIP work (Designer)
- Await Conversion Plan Recommendations (expected by June 2019)
- Questions / Concerns / Comments