West Allis

Street Lighting Planning Study

9/3/2019

Agenda

- April 16th, 2019 Common Council – City Street Lighting Infrastructure
  1. Current State of Low vs High Voltage
  2. Reasons to Convert to Low Voltage (Parallel) Circuitry
  3. Potential Solutions
- Data Collection
  1. Inventory
  2. Energy
  3. Maintenance
  4. Rebate Opportunities
- Construction Methodology
  1. City Forces
  2. Contractor Forces
  3. WE Energies Contract
- Analysis
  1. Construction Cost Estimates
  2. City Labor Cost Estimates
  3. Data Extrapolation
- Recommendation

West Allis

Street Lighting Planning Study

April 16th, 2019 Common Council –

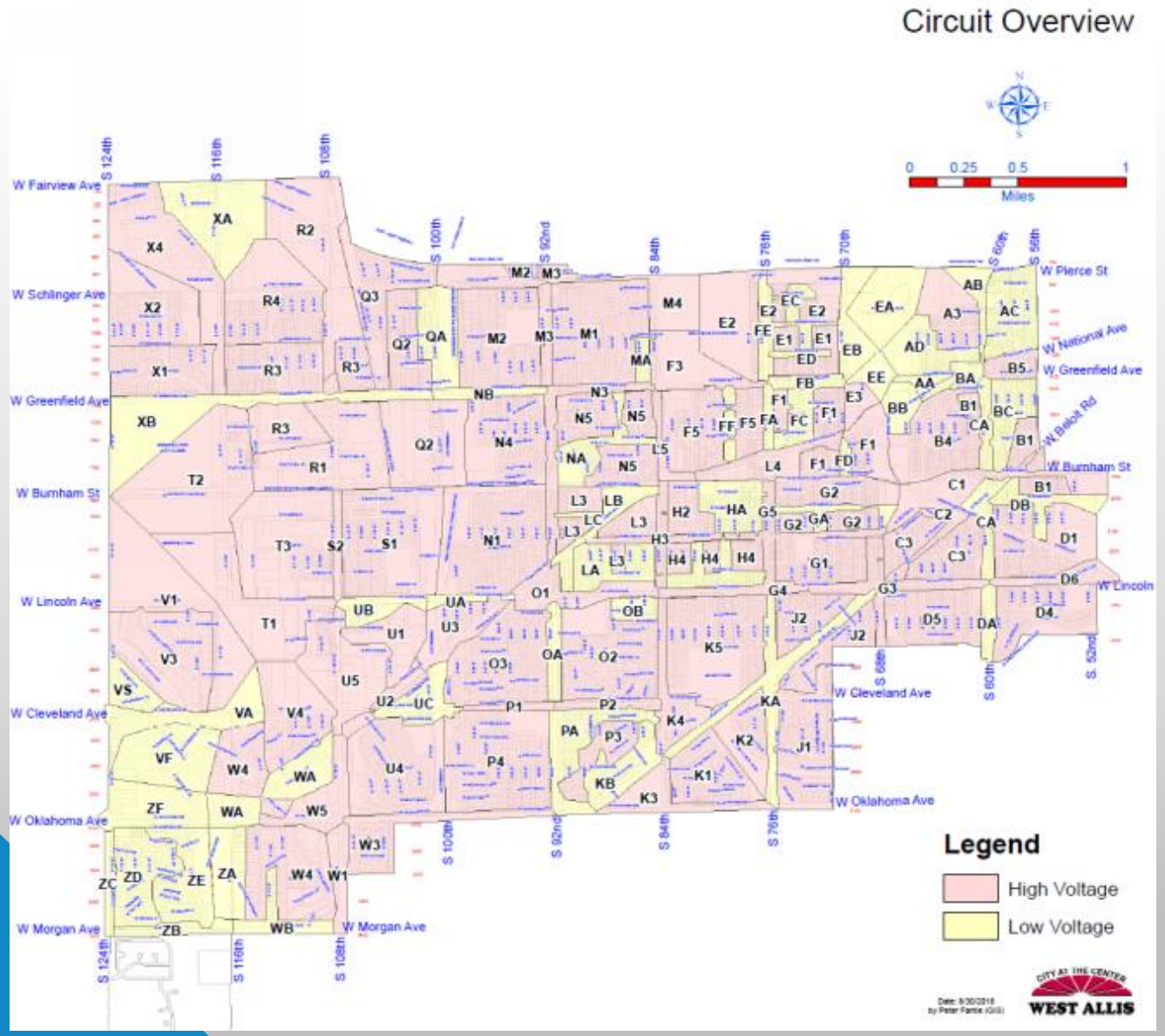
City Street Lighting Infrastructure Recap

Common Council Meeting Recap

Current State of Low vs High Voltage

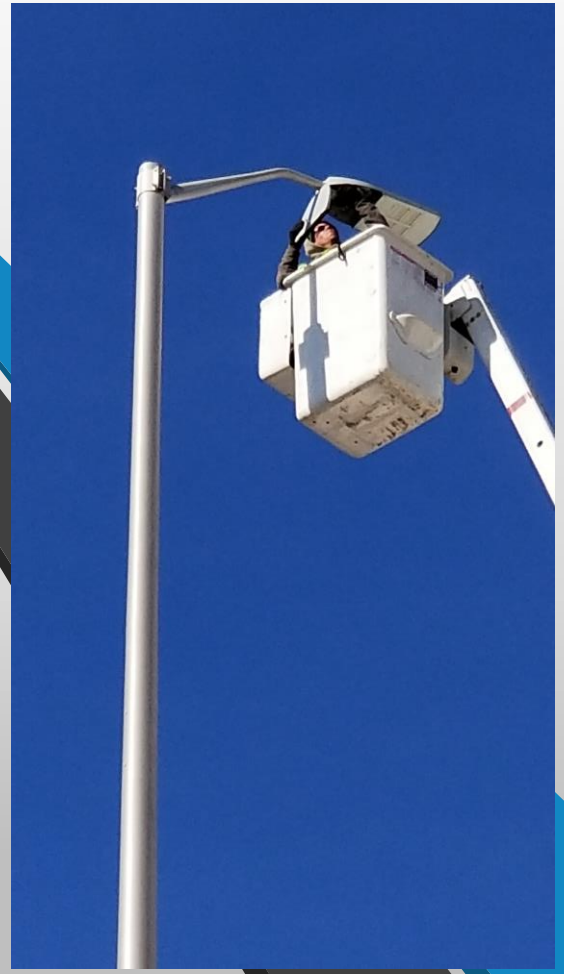
- West Allis is one of a few communities that maintains their electrical infrastructure in-house (streetlights and traffic signals).
- West Allis and Milwaukee are the only municipalities in Wisconsin that are currently utilizing the series (high voltage) systems for their streetlights.
- 53 parallel (low voltage) circuits have been installed and are functional, which is approximately 7% of the City's street lighting.
- Approximately 23 substations, which control 76 separate circuits, of series (high voltage) circuitry remains to be converted to low voltage.

Common Council Meeting Recap



Common Council Meeting Recap

Reasons to Convert to Low Voltage (Parallel) Circuitry



Safety

- 4,800 volts vs 120-240 volts. This also reduces contractors and the public's exposure to high voltage lines .

Maintenance

- Costly and time-consuming repairs - labor and material costs when outages occur are prohibitive to our limited resources.

Blackouts

- When failure occurs, entire circuit loses power (streets will have no lighting).

Bidding

- When working with contractors on CIP (Capital Improvement Program) projects, often receive no bids.

Materials

- Many parts are no longer being manufactured (cable, ballast, transformers, bulbs, open circuit protectors, substations). Specifically low-pressure sodium luminaires.

Common Council Meeting Recap

Potential Lighting Solutions

Solar

- Option was evaluated and ultimately dismissed due to maintenance and cost considerations

Individual Luminaire Retrofits using Transformers

- Option was evaluated and considered a last resort due to wasted cost and expenses

Contract with WE Energies

- Option is considered as part of this study

Complete Circuit Conversions

- Option is considered as part of this study

West Allis

Street Lighting Planning Study

Data Collection

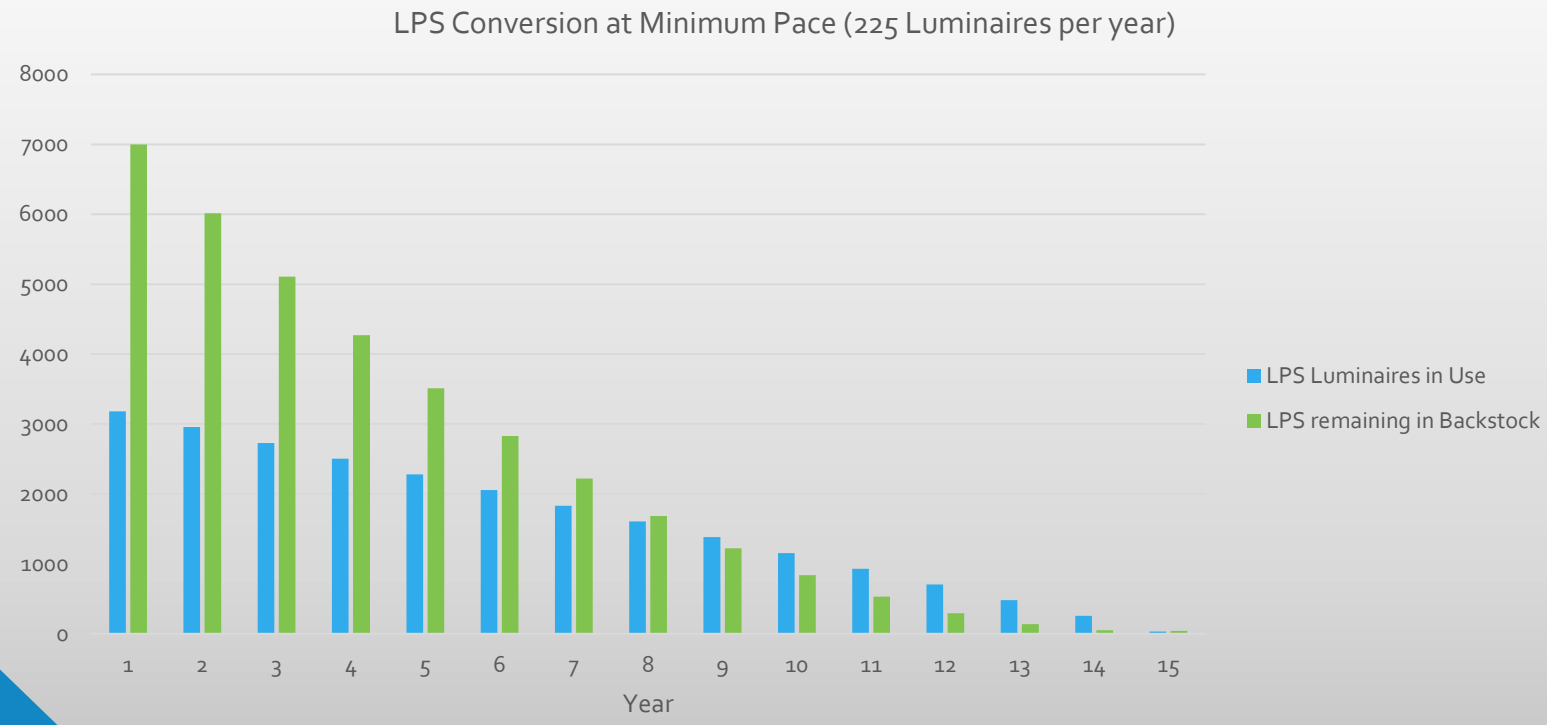
Data Collection

Low Pressure Sodium Luminaires

- City of West Allis has approximately 3,180 LPS luminaires in use.
- February 2019 – DPW had to make an emergency purchase of 7,000 LPS bulbs for the series circuits (high voltage). These bulbs will no longer be available in the United States.
- LPS bulbs have a typical 3-year life span, therefore approximately 1,000 LPS bulbs must be replaced per year.
- Stock of LPS bulbs will begin to run out in 7 years if nothing is done.
- By year 10 all LPS streetlights will go dark and will not be repairable.

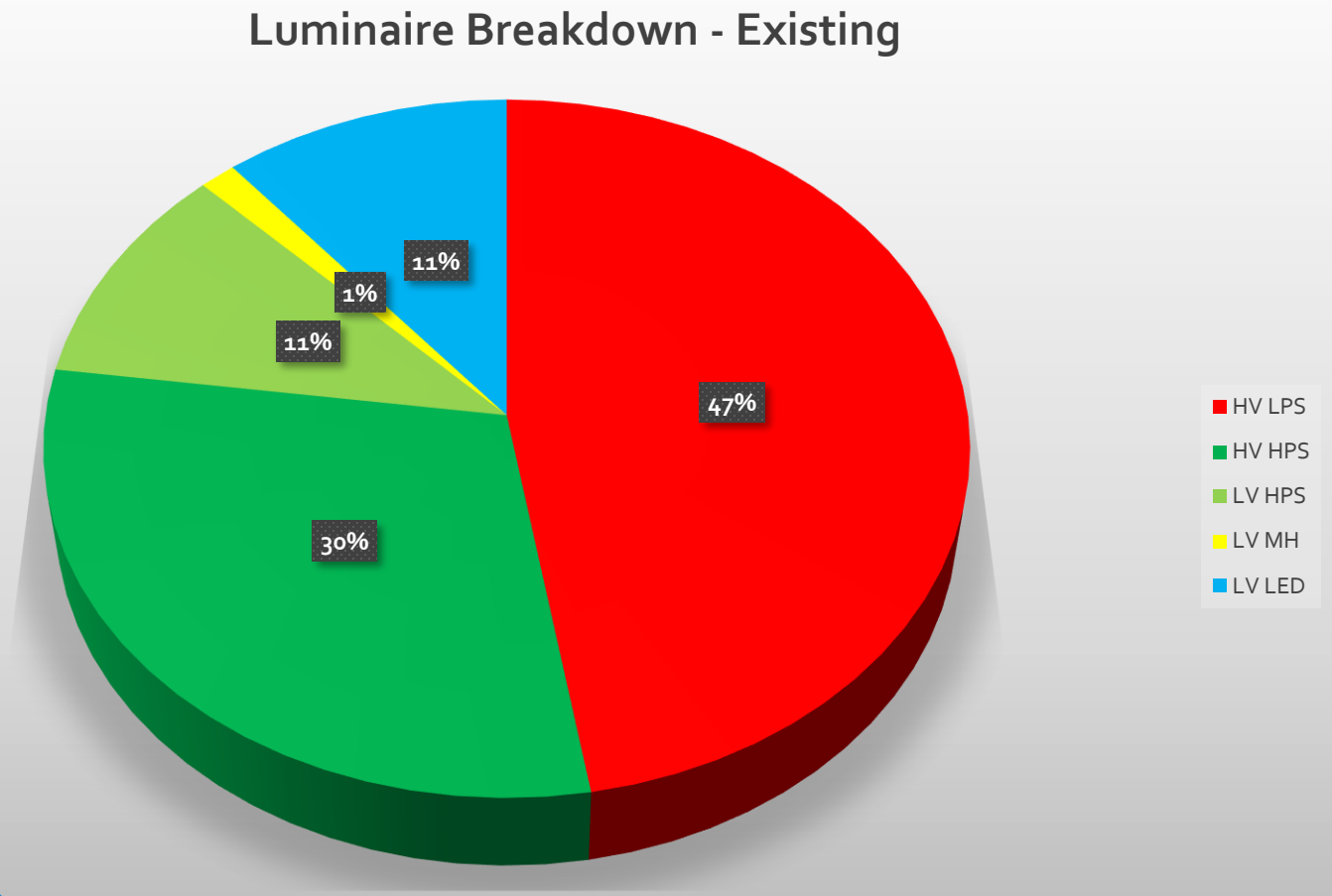
Data Collection

Low Pressure Sodium Luminaires

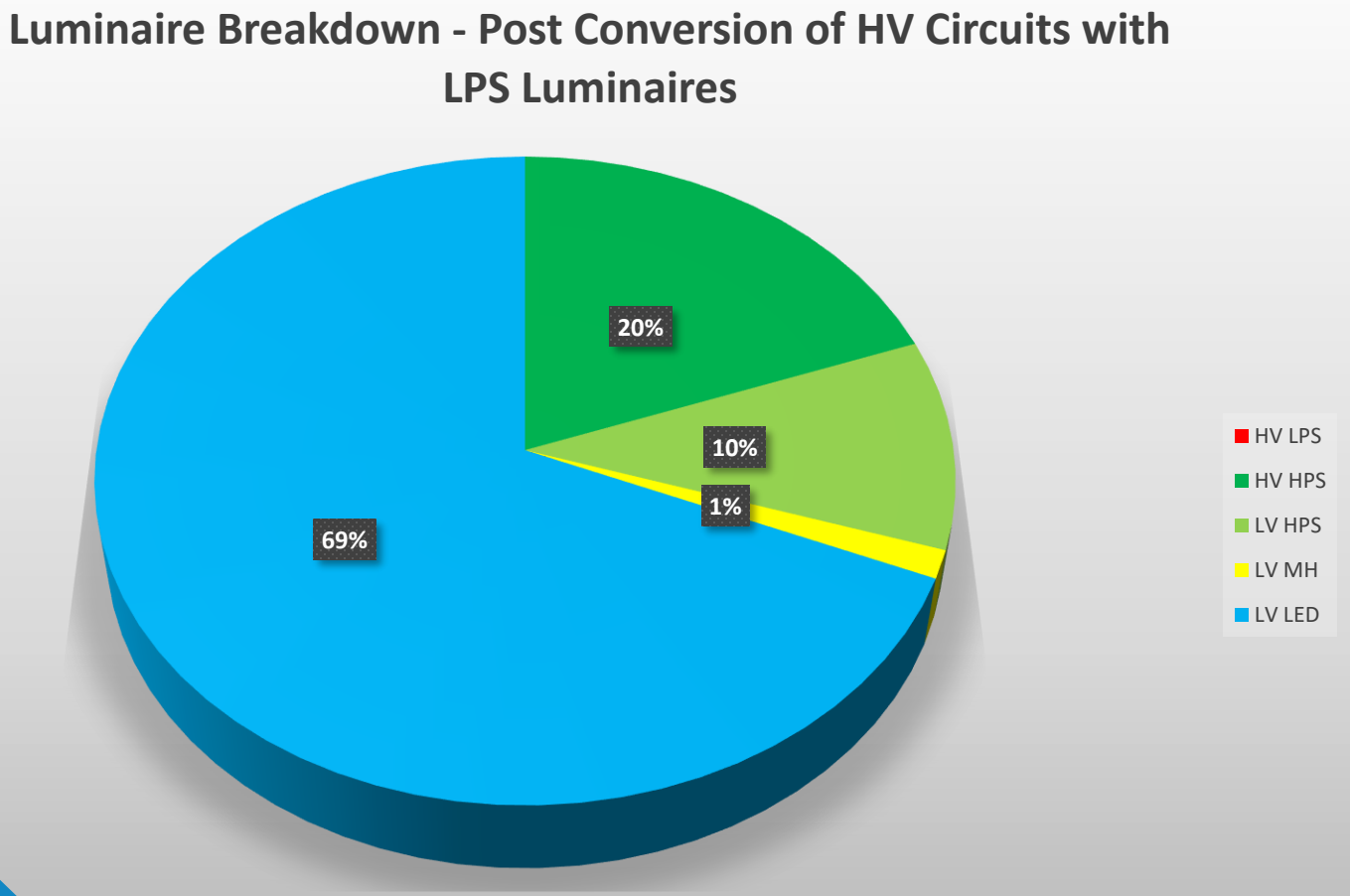


- To fall short of this minimum pace means either:
  - City must budget more the next year to catch up
  - Perform Retrofits via individual transformers

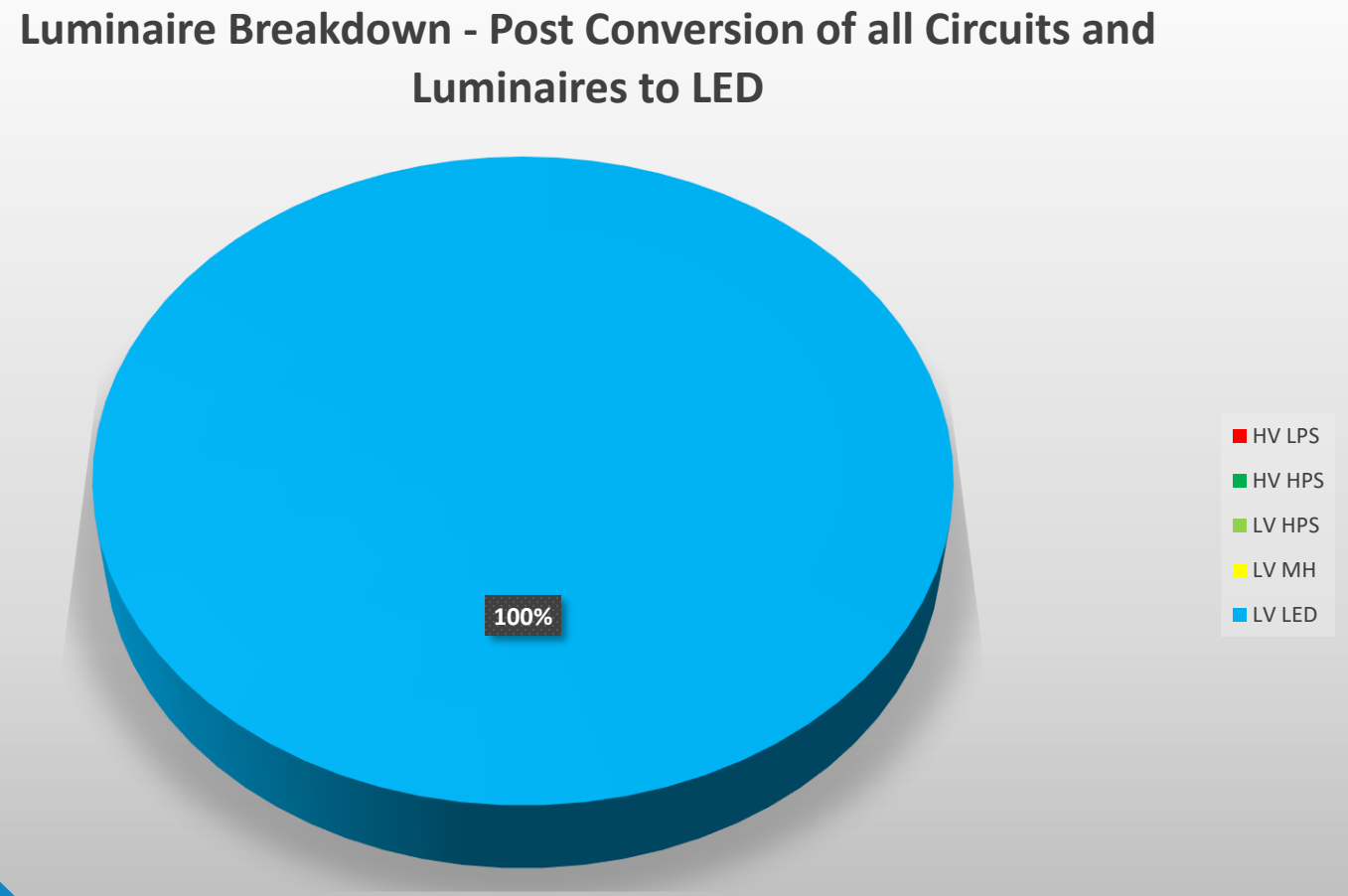
Data Collection



Data Collection

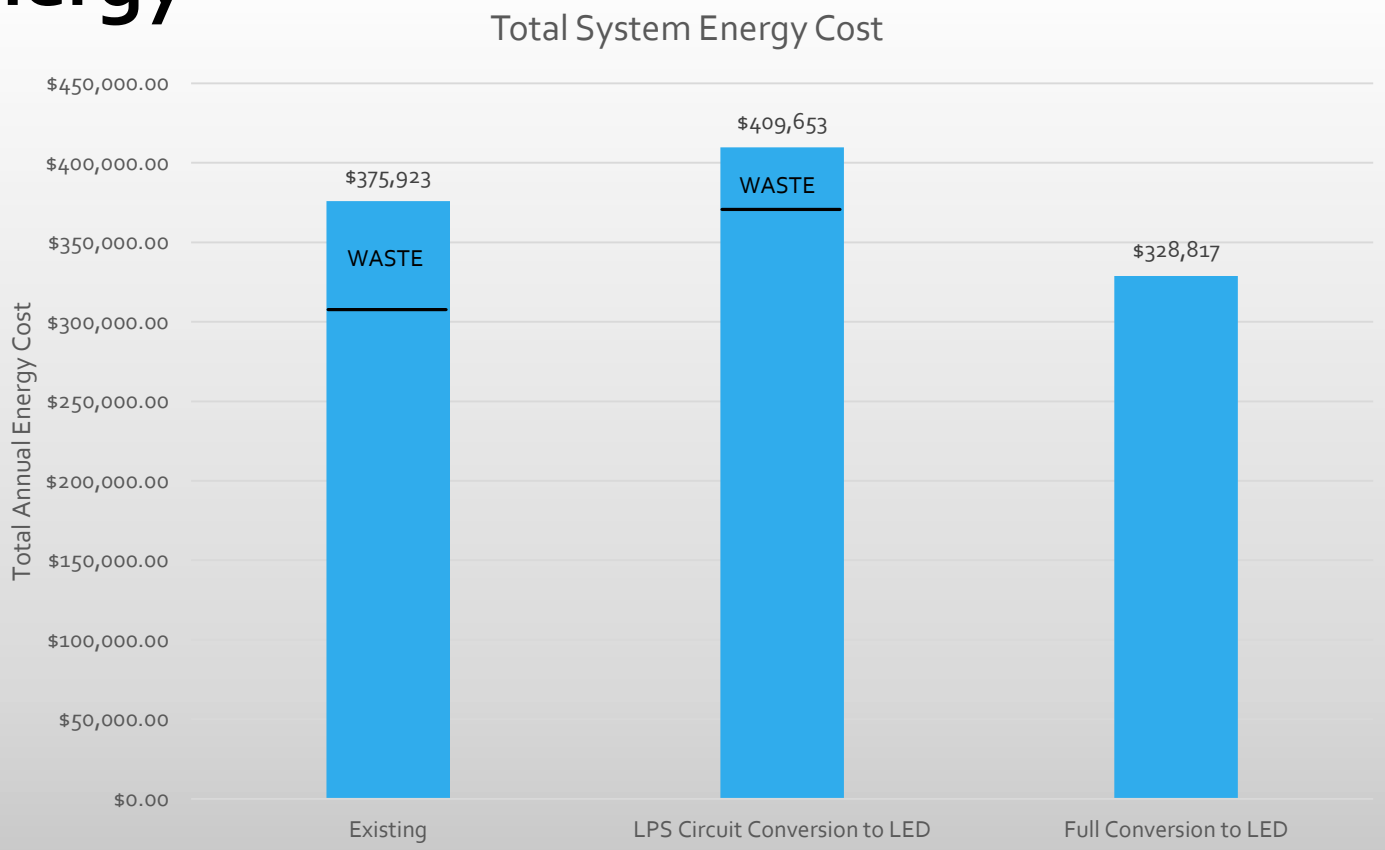


Data Collection



Data Collection

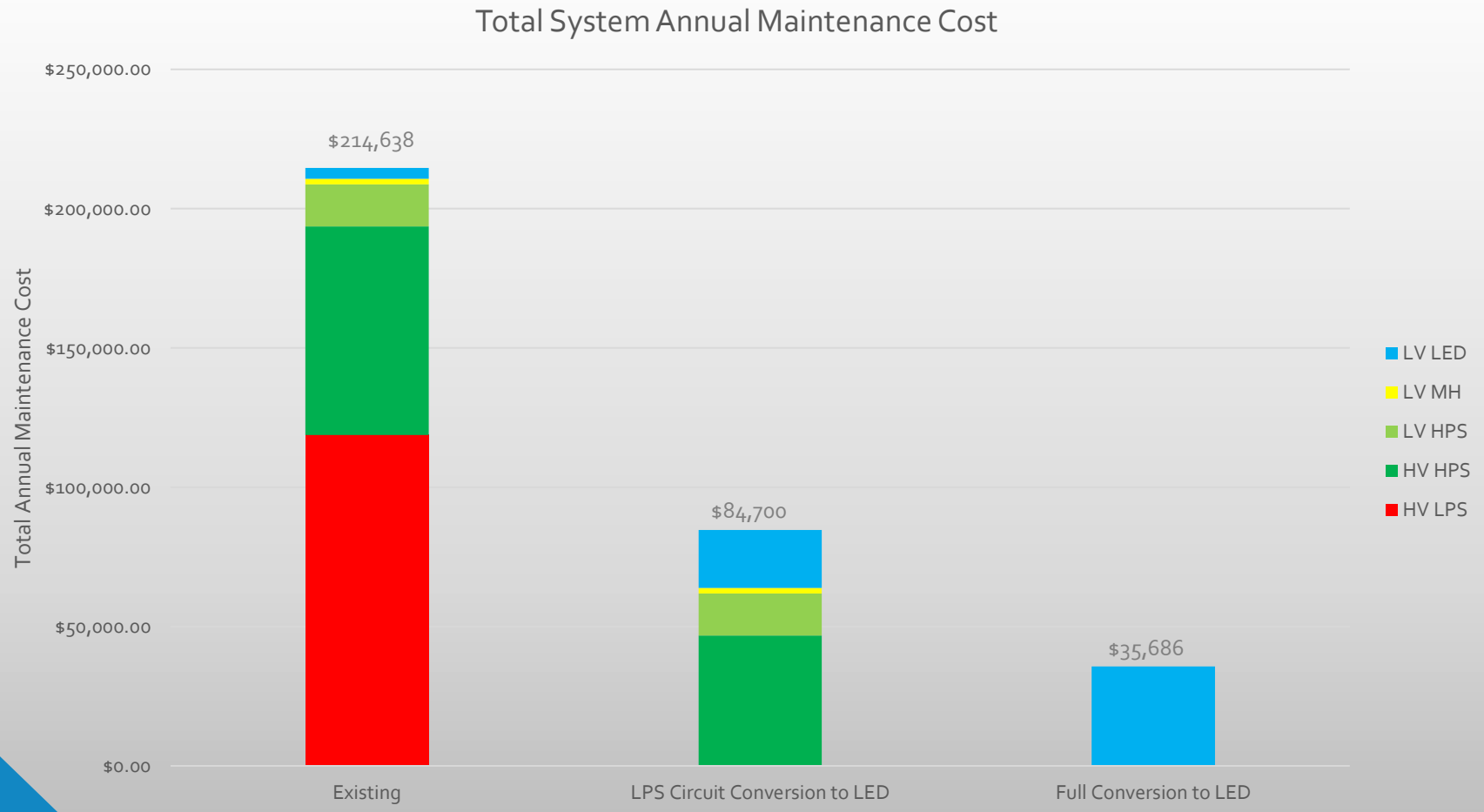
Energy



- Wasted energy refers to ballast and heat loss for HPS, LPS and MH luminaires
- Energy increases due to low operating wattages of Low Pressure Sodium luminaires

Data Collection

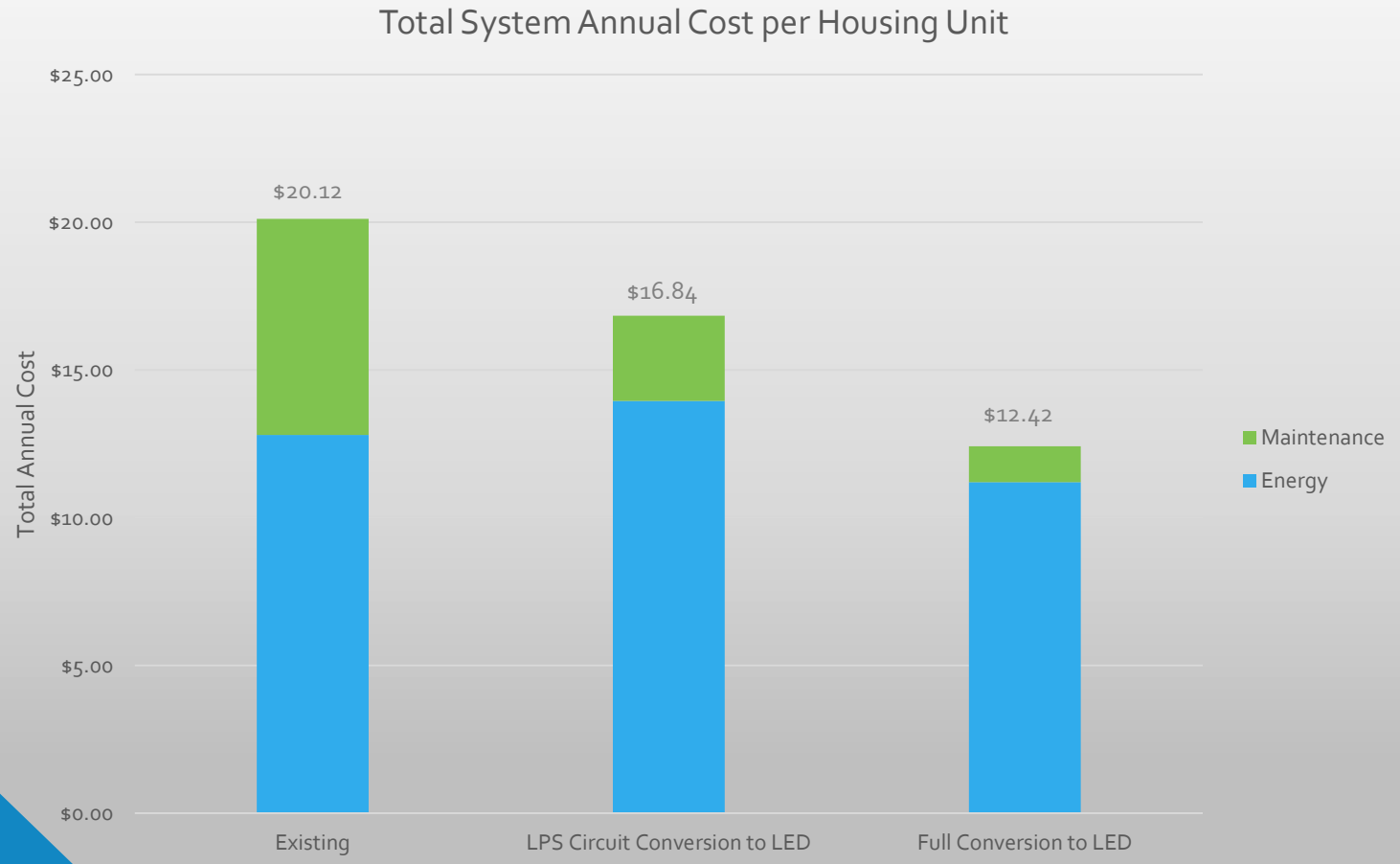
Maintenance



- LED streetlighting maintenance cost is approximately 1/4th the cost of HPS, and 1/7th the cost of luminaires on high voltage series circuiting.

Data Collection

Operational Costs



Data Collection

Rebate Opportunities - Focus on Energy

Output	Luminosity Range	Incentive
Low	<4,999	$20
Mid	5,000-9,999	$35
High	10,000-29,000	$50
Very High	>30,000	$120

- $222,200 Total Focus on Energy Rebate available

- Luminaire retrofit with mogul screw base (OV20 retro-fits), are not available for rebate incentives.

West Allis

Street Lighting Planning Study

Construction Methodology

Construction Methodology

City Work Force and Equipment

- Current Work Force and Equipment
  - Primary duties includes routine maintenance, emergency repairs, and supporting CIP projects
  - 11 – Total staff dedicated to operations and maintenance of City electrical systems (traffic signals, street lighting, electrical work, other)
  - 1 – Boring rig purchased in early 2019 / 1 – Hydro-vac trucks are shared with other departments

- 2019 High Voltage Circuit Conversion
  - 2 Ongoing Projects (Circuits F-1 and A-3)
  - Routine maintenance and other daily activities frequently disrupts staff's commitment to these projects
  - Operations tasks are not being addressed while staff is focused on circuit conversions

Construction Methodology

City Work Force and Equipment

- Full Capacity for City Staffing
  - 6/8 – Additional positions would need to be hired and dedicated to circuit conversions
  - Additional boring rig and hydro-vac truck(s) may be required to keep pace to complete 225 LPS luminaire conversions per year
  - Existing staff would focus on routine maintenance, emergency repairs, and supporting CIP projects

- Staffing and Equipment Challenges
  - Current vacant positions remain unfilled
  - Competitive job market makes hiring and retaining electrical staff difficult

Construction Methodology

Circuit Conversion by City Forces

- Assumes that nothing is outsourced
- Completely dependent on ability for City to hire and maintain adequate staff levels
- Circuit conversions can be coupled with roadway improvement projects
- Anything less than 225 LPS luminaires converted per year will require individual transformer retro-fits

Construction Methodology

Circuit Conversion by Contractor Forces

- Assumes that everything is outsourced
- No additional City staff required
- Flexibility provided on speed of circuit conversions
- Some concerns with contractor capabilities with these unique high voltage systems
- Anything less than 225 LPS luminaires converted per year will require individual transformer retro-fits
  - These retro-fits are assumed to be performed by City staff

Construction Methodology

WE Energies Ownership

- Assumes that WE Energies will assume ownership of all circuits they convert
- City assumes higher annual cost after all conversions than paying for maintenance and energy with fixed rate
- No additional City staff required to oversee circuit conversion
- Will gradually decrease maintenance obligation as systems are shifted to utility-operated
- Concerns with cost controls and prioritizing if construction is managed by WE Energies
- Anything less than 225 LPS luminaires converted per year will require individual transformer retro-fits
    - These retro-fits are assumed to be performed by City staff

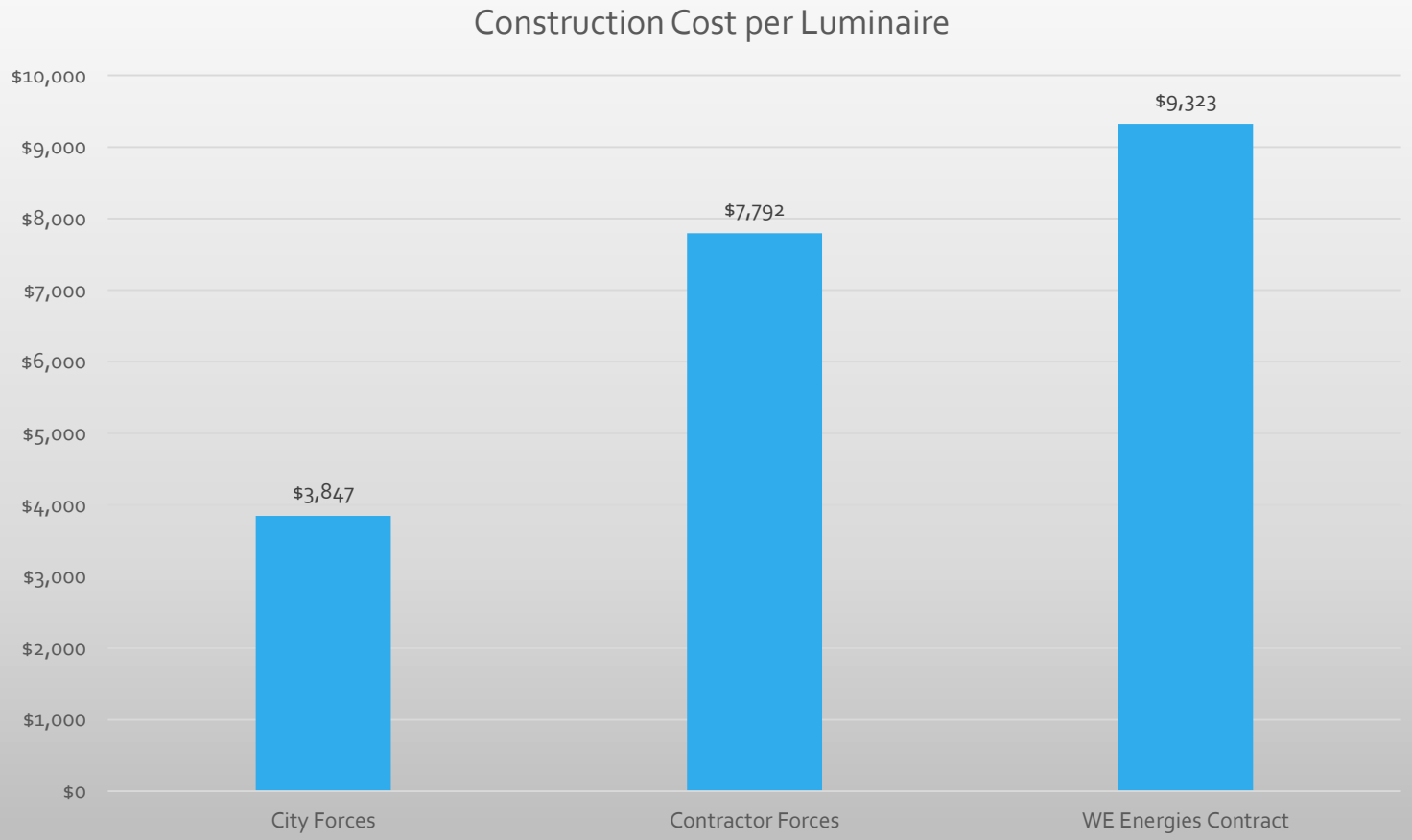
West Allis

Street Lighting Planning Study

Analysis

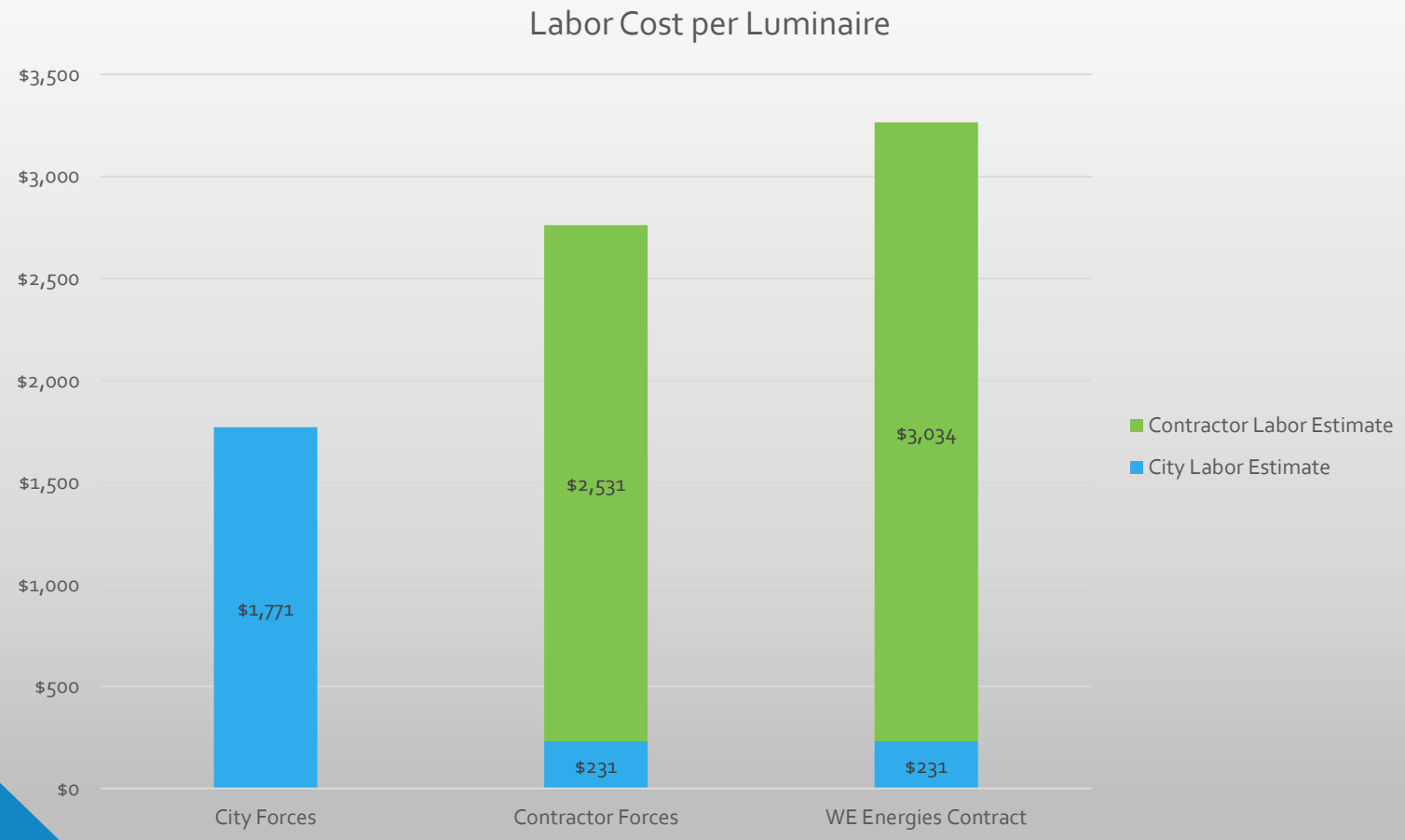
Analysis

Construction Cost Estimate

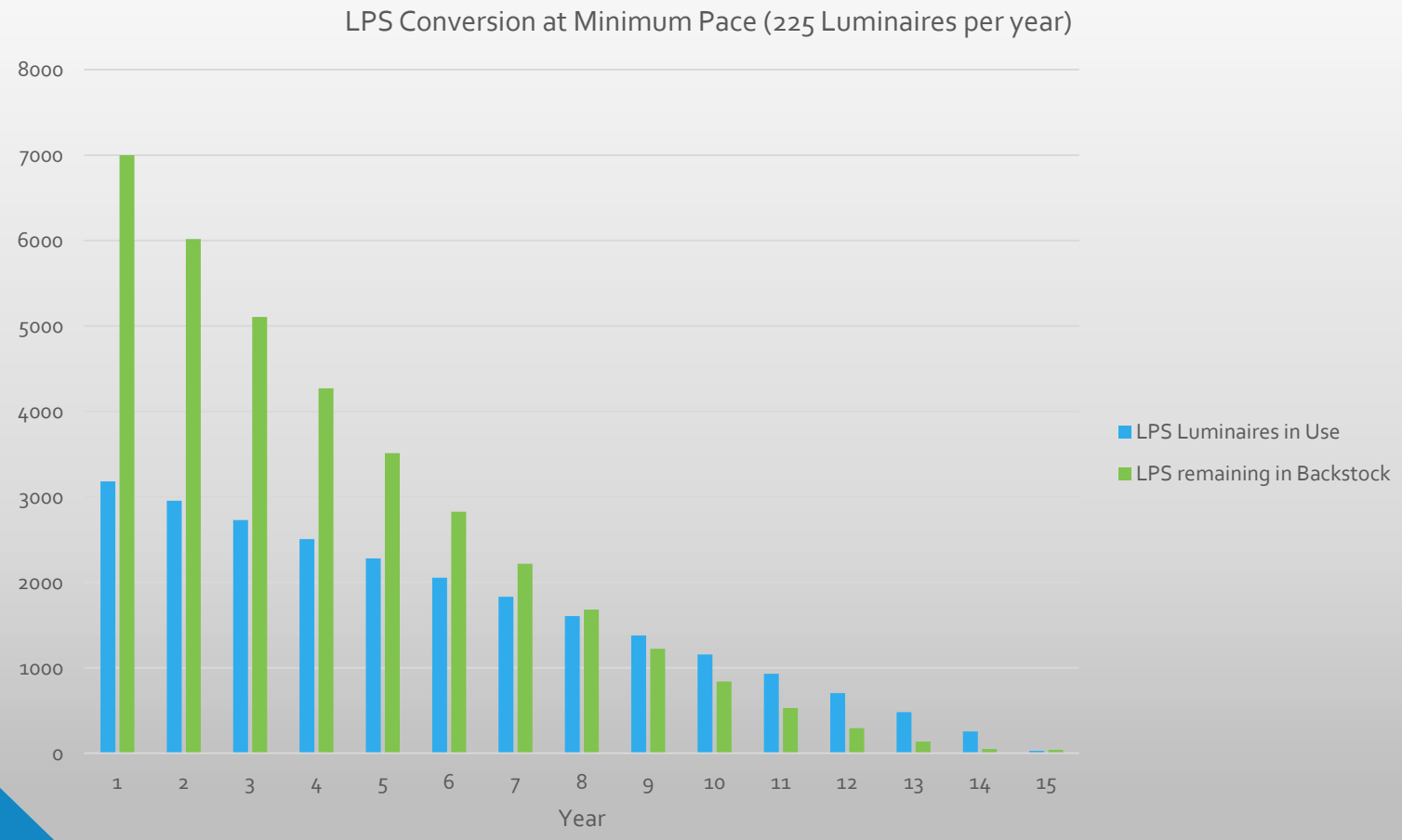


Analysis

Labor Cost Estimate

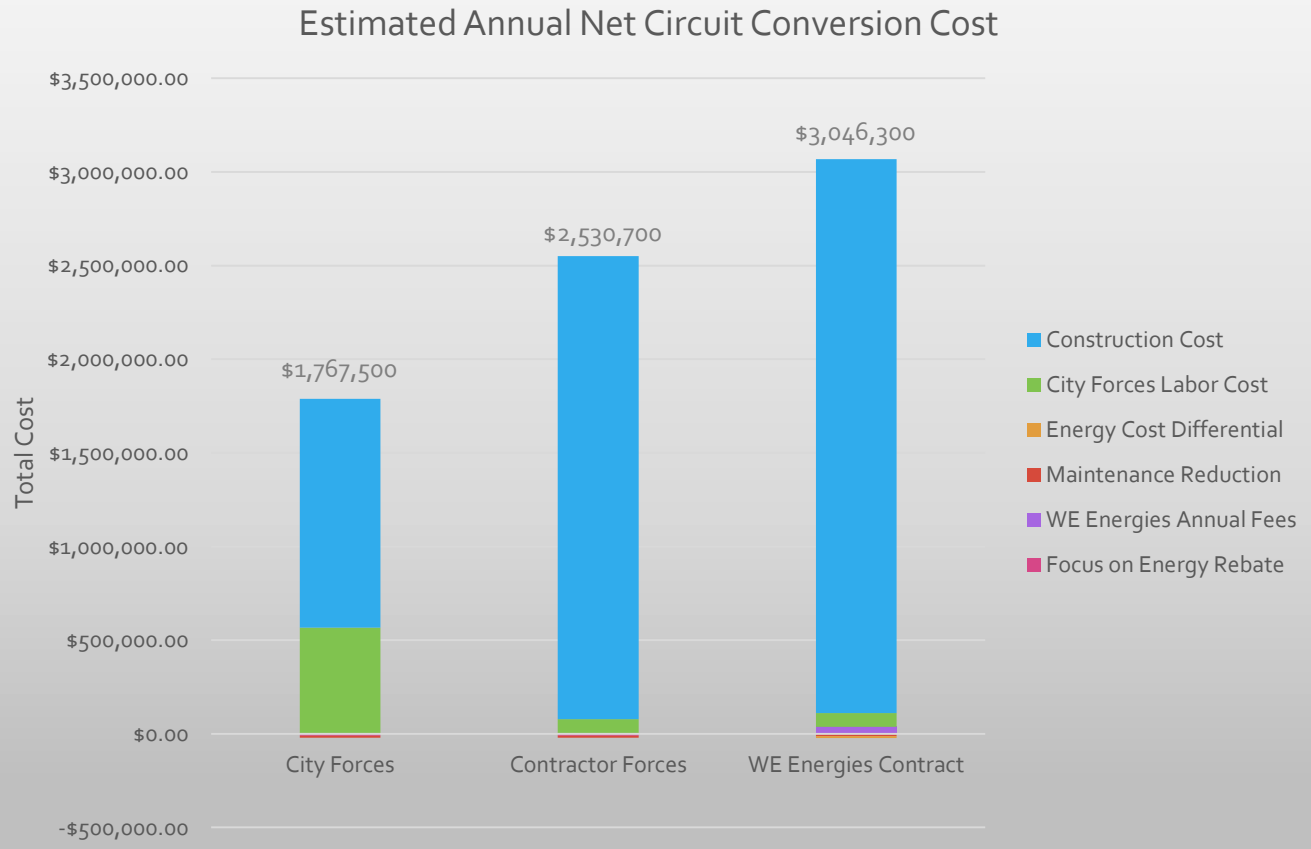


Analysis


LPS Conversion at Minimum Pace (225 Luminaires per year)
8000
7000
6000
5000
4000
3000
2000
1000
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Year
LPS Luminaires in Use
LPS remaining in Backstock

Analysis

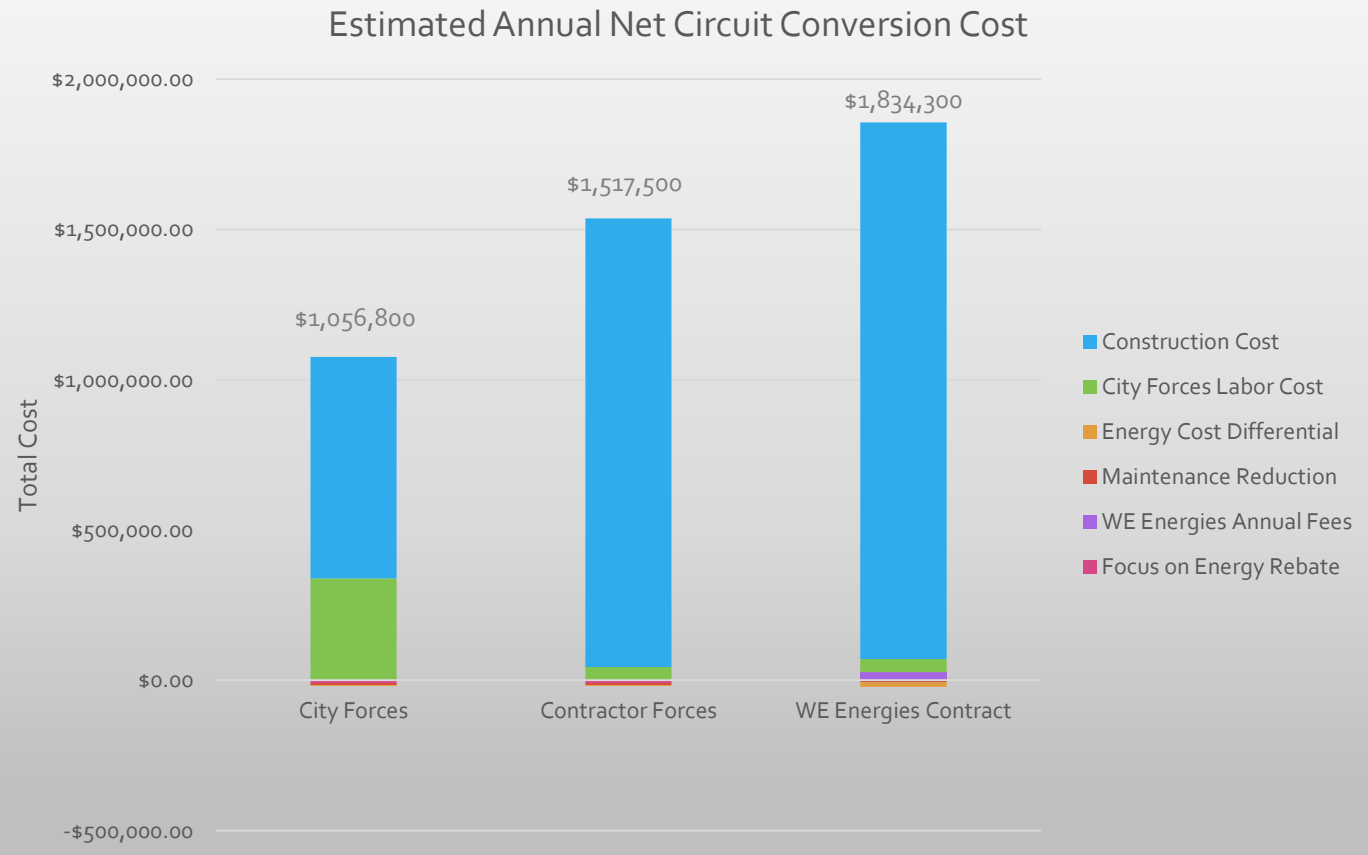
High Voltage Low Pressure Sodium Circuits Priority 1 (13 Years)



- Construction cost for contractor and WE Energies includes labor and materials

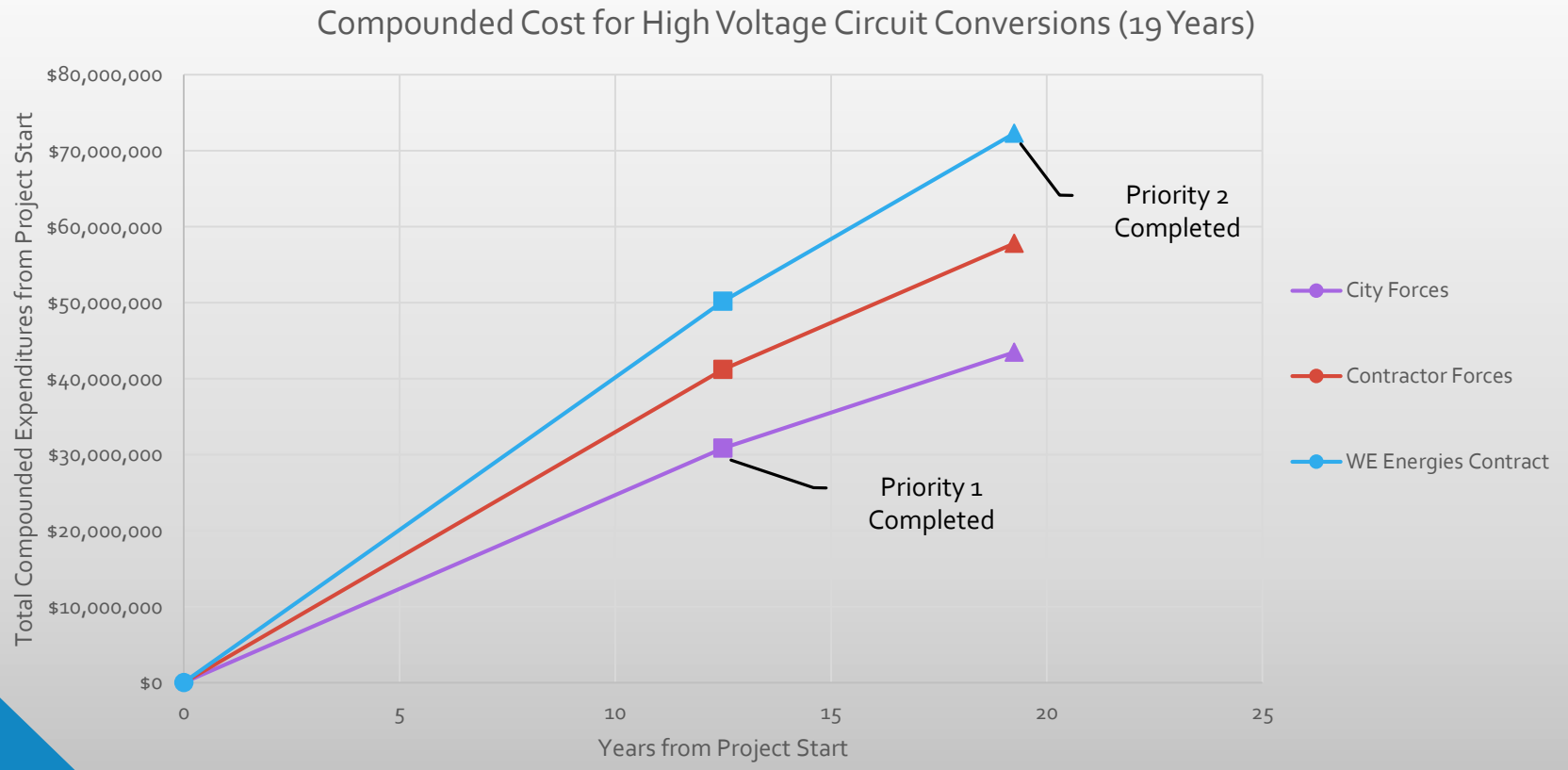
Analysis

High Voltage High Pressure Sodium Circuits Priority 2

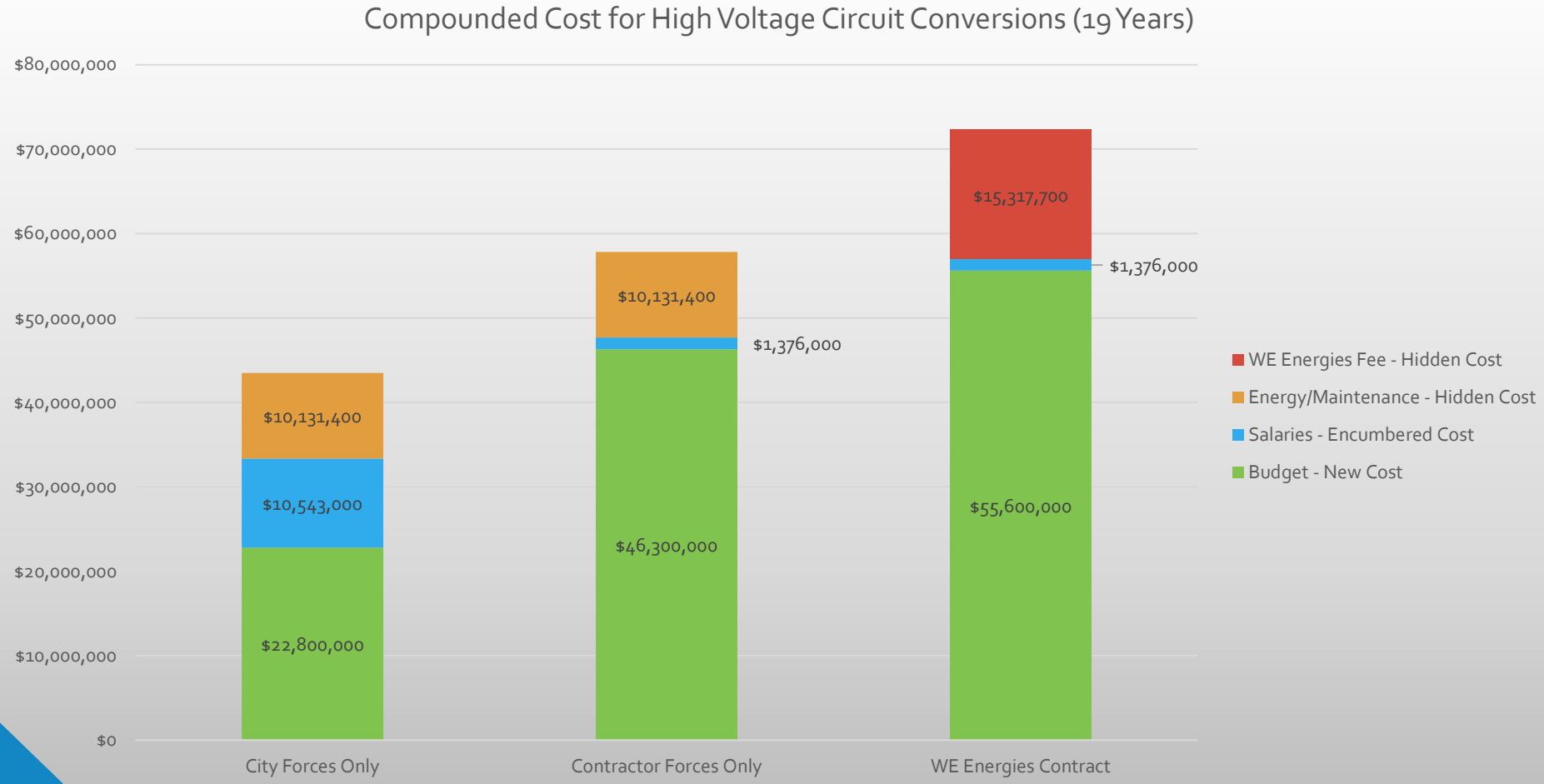


- Construction cost for contractor and WE Energies includes labor and materials

Analysis


Compounded Cost for High Voltage Circuit Conversions (19 Years)
Total Compounded Expenditures from Project Start
$80,000,000
$70,000,000
$60,000,000
$50,000,000
$40,000,000
$30,000,000
$20,000,000
$10,000,000
$0
0
5
10
15
20
25
Years from Project Start
Priority 2 Completed
Priority 1 Completed
City Forces
Contractor Forces
WE Energies Contract

Analysis


Compounded Cost for High Voltage Circuit Conversions (19 Years)
$80,000,000
$70,000,000
$60,000,000
$50,000,000
$40,000,000
$30,000,000
$20,000,000
$10,000,000
$0
$10,131,400
$10,543,000
$22,800,000
$10,131,400
$1,376,000
$46,300,000
$15,317,700
$1,376,000
$55,600,000
City Forces Only
Contractor Forces Only
WE Energies Contract
WE Energies Fee - Hidden Cost
Energy/Maintenance - Hidden Cost
Salaries - Encumbered Cost
Budget - New Cost

Analysis

Alternative	Years Until Priority 1 Completion	Years Until Total Completion	Annual Construction Budget (Initial) - New Money	Total Construction Budget - New Money
City Forces Perform All Work	13	19	$1,300,000	$22,800,000
Contractor Forces Perform All Work	13	19	$2,500,000	$46,300,000
We Energies Contract	13	19	$3,000,000	$55,600,000

West Allis

Street Lighting Planning Study

Recommendation

Recommendation

Conclusions from the Study

- Focus on LPS as highest priority while working on eliminating high voltage circuits. 225 LPS luminaires need to be retrofit each year in order to avoid blackout. HPS and remaining high voltage circuits are a second priority.

- Speed = Savings in the long term

- City forces can be leveraged to lower costs in the long term, but need to consider:
  - Hiring challenges
  - Maintaining a high rate of progress
  - Staffing considerations
  - Consistent budgeting

- Contractor forces are expendable but will cost more for similar work

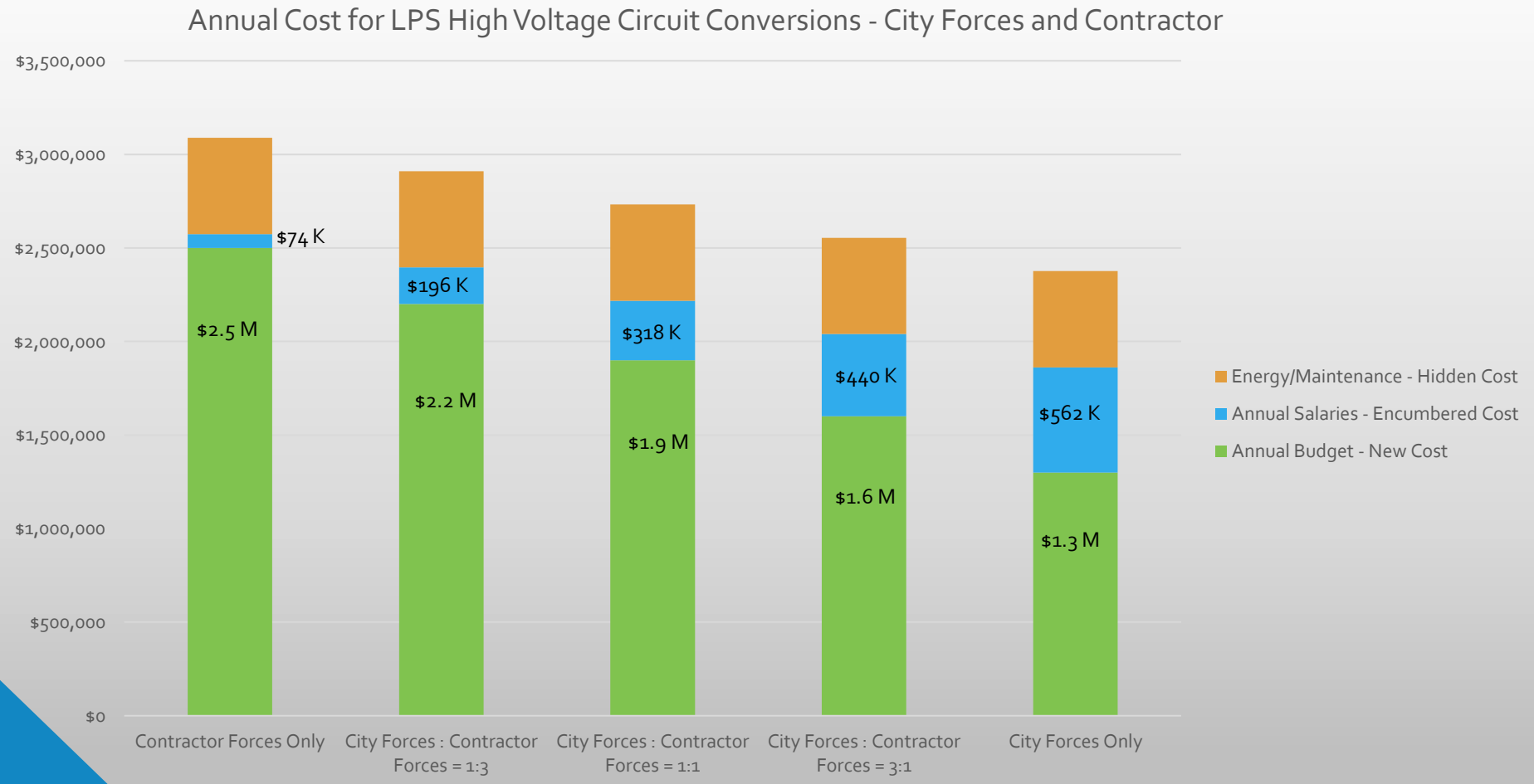
- WE Energies ownership is not a great fit for retrofitting existing lighting systems

- A blend of contractor and City forces is likely the best option to get started

- Future adjustments can be made to shift the balance to more vs less contractor support in later years

Recommendation

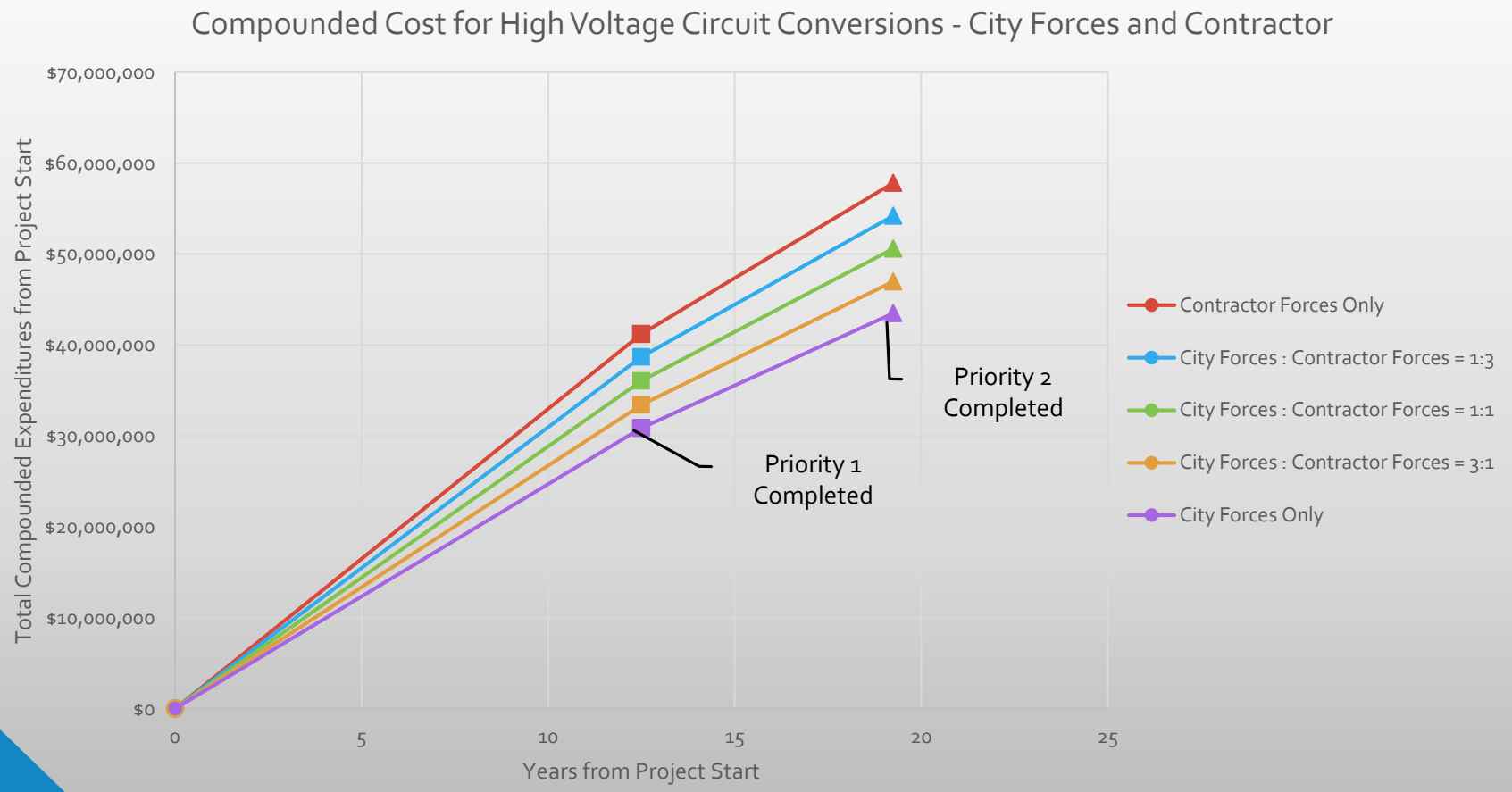
Circuit Conversion by Combined Forces



- Construction Budget Includes FOE rebates

Recommendation

Circuit Conversion by Combined Forces



Recommendation

Conclusions from the Study

- Assumes City Forces will accomplish nearly all circuit conversions

Recommendation

Conclusions from the Study

Budget Recommendation

$1.5 M - $2 M Annually for 13 years

- Exact budget will fluctuate annually based on circuit sizes and city work force capabilities
- Circuits with the largest amounts of LPS luminaires must be highest priority to relieve stress on backstock supply
- Circuits with smaller amounts of LPS luminaires will inflate annual budget (year 13)
- City should reassess budgeting after 13 years, at which point Low Pressure Sodium bulbs will be completely removed
- City should reassess budgeting and plan if High Pressure Sodium bulbs become discontinued

Analysis

Conclusions from the Study

Retrofit Only - Individual Transformers

- Will be necessary if additional funding cannot be secured for circuit conversion, or if work force is incapable of keeping pace with 225 low pressure sodium luminaires per year
- Current City staff is capable of performing up to 400 retrofits per year
- Estimated cost for bulb, transformer and miscellaneous items is $650 per pole
- For all 3,180 poles the cost would be $2,067,000
- Still relies on the aging high voltage series system to function

West Allis

Street Lighting Planning Study

Questions and Discussion