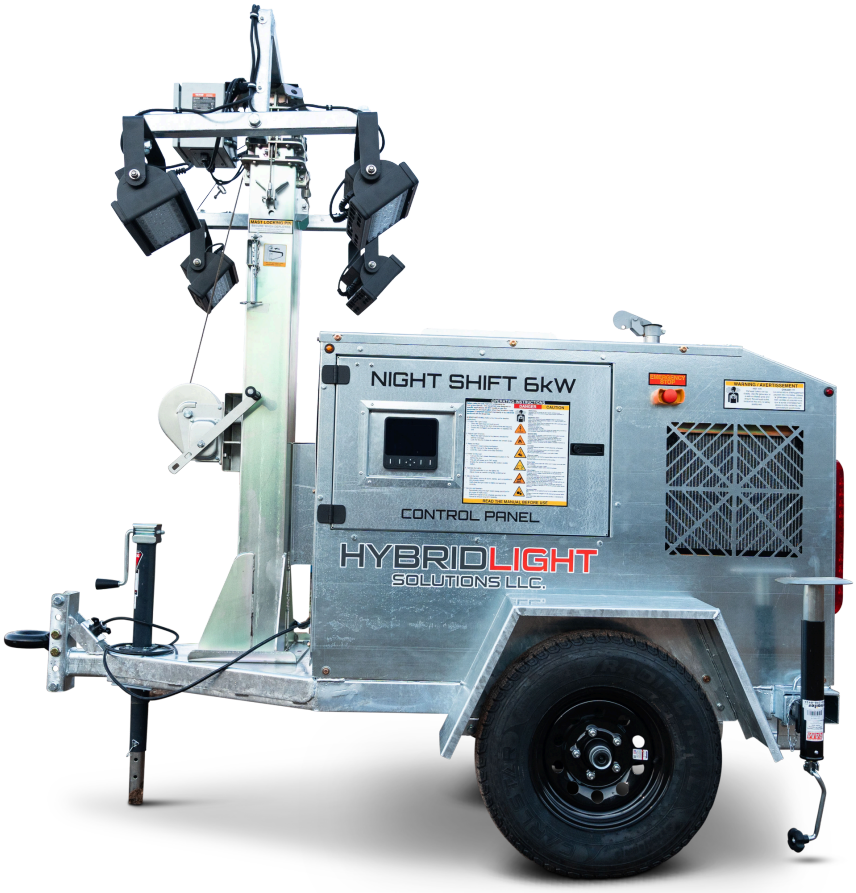
HYBRIDLIGHT SOLUTIONS

Night Shift 6kW ROI Analysis, Including Labor and Maintenance Costs



V1.0

Executive Summary

The HLS NS6 Hybrid Light Tower offers significant fuel savings over traditional light towers and reduces labor and maintenance costs. By accounting for reduced fuel fills, fewer oil changes, and automatic operation features, the total cost of ownership further tilts in favor of the hybrid model. This comprehensive ROI analysis demonstrates that despite a higher initial investment, the HLS NS6 provides substantial long-term savings and operational efficiencies that justify its cost.

1. Introduction

In addition to fuel savings, other operational factors significantly impact the total cost of ownership for light towers:

- **Labour Costs**: Time and expense associated with fuel refills, maintenance, and manual operation.
- **Maintenance Costs**: Frequency and cost of oil changes and other routine services.
- **Operational Efficiency**: Automatic controls reduce wasted operation time and labor.

This analysis incorporates these factors to provide a more comprehensive ROI comparison between the HLS NS6 Hybrid Light Tower and traditional light towers.

2. Assumptions and Parameters

Operating Conditions:

- **Daily Operating Hours**: 12 hours/day
- **Days per Month**: 30 days

- **Annual Operating Hours**: 12 hours/day × 30 days/month × 12 months/year = **4,320 hours/year**
- **Total Operational Life**: 20,000 hours

Labor Costs:

- **Hourly Labor Rate**: $25/hour (including overhead)
- **Time for Fuel Refill**: 0.5 hours per refill
- **Time for Oil Change**: 1 hour per service
- **Time for Manual On/Off Operation**: 0.25 hours/day (15 minutes)

Maintenance Costs:

- **Oil Change Cost (Parts + Labor)**: $100 per service

Fuel Tank Capacities:

- **HLS NS6 Hybrid Light Tower**: 52 gallons
- **Traditional Light Tower**: 63 gallons

Oil Change Intervals:

- **HLS NS6 Engine Runtime**: Less due to hybrid operation
- **Traditional Light Tower Engine Runtime**: Runs continuously during light operation

Additional Operational Factors:

- **Automatic Controller (HLS NS6)**: Eliminates wasted operation time
- **Manual Operation (Traditional Tower)**: Requires daily manual on/off or runs 24/7
- **Cold Weather Considerations**: Traditional tower may run continuously to avoid cold start issues

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3. Fuel Consumption and Costs

Annual Fuel Consumption:

- **HLS NS6**: 445 gallons/year
- **Traditional Tower**: 1,755 gallons/year

Annual Fuel Costs:

- **HLS NS6**: 445 gallons × $4.00/gallon = **$1,780**
- **Traditional Tower**: 1,755 gallons × $4.00/gallon = **$7,020**

Annual Fuel Savings: $7,020 - $1,780 = **$5,240**

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4. Labor Costs

4.1 Fuel Refills

Number of Refills per Year:

1. **HLS NS6 Hybrid Light Tower:**
    - **Fuel Tank Capacity:** 52 gallons
    - **Annual Fuel Consumption:** 445 gallons
    - **Number of Refills:** 445 gallons / 52 gallons ≈ **8.56 refills/year**
2. **Traditional Light Tower:**
    - **Fuel Tank Capacity:** 63 gallons
    - **Annual Fuel Consumption:** 1,755 gallons
    - **Number of Refills:** 1,755 gallons / 63 gallons ≈ **27.86 refills/year**

Annual Labor Cost for Fuel Refills:

1. **HLS NS6:**
    - **Total Time:** 8.56 refills × 0.5 hours/refill = **4.28 hours/year**
    - **Labor Cost:** 4.28 hours × $25/hour = **$107**
2. **Traditional Tower:**
    - **Total Time:** 27.86 refills × 0.5 hours/refill = **13.93 hours/year**

- **Labor Cost:** 13.93 hours × $25/hour = **$348**

Annual Labor Savings for Fuel Refills: $348 - $107 = **$241**

4.2 Oil Changes

Engine Runtime per Year:

1. **HLS NS6 Hybrid Light Tower:**
   - **Engine Run Hours per Charge:** The hybrid engine runs only to charge the batteries.
   - **Number of Charges per Year:** Total Operating Hours / Lighting Time per Charge
     - **Lighting Time per Charge:** 6.13 hours
     - **Number of Charges:** 4,320 hours / 6.13 hours ≈ **705 charges/year**
   - **Engine Runtime per Charge:** The engine runs 0.76 hour per charge
   - **Total Engine Runtime:** 705 charges × 0.76 hour/charge = **535.8 hours/year**
2. **Traditional Light Tower:**
   - **Engine Runtime:** Same as lighting hours
   - **Total Engine Runtime:** 4,320 hours/year

The number of Oil Changes per Year:

1. **HLS NS6:**
   - **Oil Change Interval:** Every 250 engine hours
   - **Number of Oil Changes:** 535.8 hours / 250 hours ≈ **2.14 oil changes/year**
2. **Traditional Tower:**
   - **Oil Change Interval:** Every 250 engine hours
   - **Number of Oil Changes:** 4,320 hours / 250 hours = **17.28 oil changes/year**

Annual Labor and Material Cost for Oil Changes:

1. **HLS NS6:**
   - **Total Cost:** 2.82 oil changes × $100/oil change = **$282**
2. **Traditional Tower:**

- **Total Cost:** 17.28 oil changes × $100/oil change = **$1,728**

Annual Maintenance Savings for Oil Changes: $1,728 - $282 = **$1,446**

4.3 Manual On/Off Operation

Traditional Light Tower:

- **Daily Labor Time:** 0.25 hours/day
- **Annual Labor Time:** 0.25 hours/day × 365 days = **91.25 hours/year**
- **Annual Labor Cost:** 91.25 hours × $25/hour = **$2,281**

HLS NS6 Hybrid Light Tower:

- **Automatic Operation:** No daily labor required
- **Annual Labor Cost: $0**

Annual Labor Savings for Operation: $2,281 - $0 = **$2,281**

4.4 Total Annual Labor and Maintenance Savings

- **Fuel Refills Savings: $241**
- **Oil Changes Savings: $1,446**
- **Operation Labor Savings: $2,281**

Total Annual Labor and Maintenance Savings: $241 + $1,446 + $2,281 = **$3,968**

While this analysis uses a labor rate of $25 per hour (including overhead) for calculating labor-related costs, it should be noted that this figure is likely conservative. The actual overhead cost of personnel involved in tasks such as fuel refills, maintenance, and manual operation can be higher due to several factors:

Higher Wage Rates: U.S. construction projects often involve skilled labor with wage rates exceeding $25/hour, especially when union labor rates or specialized technicians are required.

Comprehensive Overhead Costs: The true cost to the company includes not only wages but also benefits, insurance, training, and administrative expenses, which can significantly increase the hourly rate.

Vehicle and Equipment Expenses: Personnel may require company vehicles to travel to and from the light tower locations, adding fuel, maintenance, and depreciation costs associated with those vehicles.

Opportunity Costs: Time spent on fuel, maintenance, and manual operation is time not spent on other productive tasks, potentially impacting overall project efficiency and timelines.

Recommendation:

For a more precise analysis, companies should consider using their actual labor rates, including all overhead costs, to calculate the potential savings. This adjustment would provide a clearer picture of the financial benefits and operational efficiencies offered by the HLS NS6 Hybrid Light Tower.

5. Operational Efficiency and Fuel Waste Reduction

5.1 Fuel Waste Due to Continuous Running

Traditional Light Tower:

- **Potential Additional Operating Hours:** If not turned off due to labor constraints or cold weather, it could run 24/7.
- **Additional Hours:** 24 hours/day - 12 hours/day = 12 extra hours/day
- **Annual Additional Hours:** 12 hours/day × 365 days/year = **4,380 hours/year**
- **Total Annual Operating Hours:** 4,320 hours (planned) + 4,380 hours (unplanned) = **8,700 hours/year**

Additional Fuel Consumption:

- **Fuel Consumption Rate:** 0.406 gallons/hour
- **Additional Fuel Used:** 4,380 hours × 0.406 gallons/hour ≈ **1,778 gallons/year**

Additional Fuel Cost:

- **Additional Fuel Cost:** 1,778 gallons × $4.00/gallon = **$7,112**

Note: This scenario can double the fuel cost for the traditional tower if it runs continuously.

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6. Revised ROI Calculation

6.1 Total Annual Savings

1. **Fuel Cost Savings: $5,240** (from Section 3)
2. **Labour and Maintenance Savings: $3,968** (from Section 4)
3. **Potential Additional Fuel Savings (if Traditional Tower runs 24/7): Up to $7,112** (from Section 5)

Conservative Total Annual Savings (without additional fuel waste):

- **Total Annual Savings:** $5,240 (Fuel) + $3,968 (Labor & Maintenance) = **$9,208**

Optimistic Total Annual Savings (including additional fuel waste):

- **Total Annual Savings:** $9,208 + $7,112 = **$16,320**

6.2 Payback Period

Additional Initial Cost:

- **HLS NS6 Hybrid Light Tower:** $27,900
- **Traditional Light Tower:** $11,900
- **Additional Cost:** $27,900 - $11,900 = **$16,000**

Payback Period Calculation:

- **Conservative Payback Period:** $16,000 / $9,208/year ≈ **1.74 years**
- **Optimistic Payback Period:** $16,000 / $16,320/year ≈ **0.98 years**

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7. Total Cost of Ownership Over 20,000 Hours

7.1 Total Savings Over Operational Life

Operational Life in Years:

- **HLS NS6:** 20,000 hours / (4,320 hours/year) ≈ **4.63 years**
- **Traditional Tower:** Same operational life

Total Savings Over Operational Life:

- **Conservative Total Savings:** $9,208/year × 4.63 years = **$42,641**
- **Optimistic Total Savings:** $16,320/year × 4.63 years = **$75,422**

Net Savings After Initial Cost Difference:

- **Conservative Net Savings:** $42,641 - $16,000 = **$26,641**
- **Optimistic Net Savings:** $75,422 - $16,000 = **$59,422**

It is important to acknowledge that the calculated operational life in years is based on an assumption of continuous usage at 12 hours per day, 365 days per year, totalling 4,320 operating hours annually. However, in real-world applications, light towers often do not operate every day of the year or may be used primarily during specific seasons.

Seasonal Utilization Impact:

- Example Scenario: If the light towers are operated for 12 hours per night but only during a 6-month active season, the annual operating hours would be approximately 2,160 hours per year.

8. Conclusion

Key Benefits:

- **Reduced Labor Costs:**
  - **Fuel Refills:** Fewer refills save labor time and costs.
  - **Maintenance:** Less frequent oil changes reduce maintenance expenses.
  - **Operation:** Automatic controls eliminate daily manual operation labor.
- **Operational Efficiency:**
  - **Automatic On/Off:** Eliminates wasted fuel from unnecessary operation.
  - **Cold Weather Performance:** Operates efficiently in extreme temperatures without additional labor or fuel waste.
- **Maintenance Savings:**
  - **Oil Changes:** Fewer engine hours lead to significantly fewer oil changes.
- **Total Cost Savings:**
  - **Conservative Estimate:** Over $26,000 net savings over the operational life.
  - **Optimistic Estimate:** Over $59,000 net savings when accounting for potential fuel waste in traditional towers.
- **Payback Period:**
  - **Conservative Payback:** Approximately **1.7 years**.
  - **Optimistic Payback:** Under **1 year**.

Recommendation

The HLS NS6 Hybrid Light Tower is a superior investment, offering:

- **Significant Long-Term Savings:** Labor, maintenance, and operational efficiencies compound fuel cost savings.
- **Enhanced Productivity:** Less downtime for refueling and maintenance increases operational productivity.
- **Environmental Benefits:** Reduced fuel consumption lowers emissions.
- **Reliability in Extreme Conditions:** Automatic operation ensures consistent performance without additional labor.

For construction projects in the U.S. and Canada, where labor and operational efficiency are critical, investing in the HLS NS6 Hybrid Light Tower provides substantial financial and operational advantages that justify the higher initial cost.

9. Environmental Impact and Emissions Reduction

Besides the financial and operational benefits, the HLS NS6 Hybrid Light Tower significantly reduces environmental impact compared to traditional light towers. This section quantifies the reduction in **CO_2** and **NO_x** emissions over the equipment's lifetime and translates these reductions into relatable terms.

9.1 CO_2 Emissions Reduction

Emission Factors:

- **CO_2 Emissions per Gallon of Diesel:** Approximately **22.4 pounds** of CO_2 are emitted per gallon of diesel fuel burned (Source: U.S. Energy Information Administration).

Lifetime Fuel Consumption:

- **HLS NS6 Hybrid Light Tower:**
  - **Total Fuel Used over 20,000 Hours:** 2,060 gallons
- **Traditional Light Tower:**
  - **Total Fuel Used over 20,000 Hours:** 8,120 gallons

Total CO_2 Emissions:

1. **HLS NS6:**
   - **CO_2 Emitted:** 2,060 gallons × 22.4 lbs/gallon = **46,144 pounds** of CO_2
2. **Traditional Tower:**
   - **CO_2 Emitted:** 8,120 gallons × 22.4 lbs/gallon = **181,888 pounds** of CO_2

CO_2 Emissions Reduction:

- **Total CO_2 Reduction:** 181,888 lbs - 46,144 lbs = **135,744 pounds** of CO_2
- **CO_2 Reduction in Metric Tons:**
    - 135,744 lbs ÷ 2,204.62 lbs/metric ton ≈ **61.58 metric tons**

9.2 NO_x Emissions Reduction

Emission Factors:

- **NO_x Emissions per Gallon of Diesel:** Approximately **20 grams** of NO_x are emitted per gallon of diesel fuel burned (Source: EPA Emission Factors for Diesel Fuel).

Total NO_x Emissions:

1. **HLS NS6:**
    - **NO_x Emitted:** 2,060 gallons × 20 grams/gallon = **41,200 grams** of NO_x
2. **Traditional Tower:**
    - **NO_x Emitted:** 8,120 gallons × 20 grams/gallon = **162,400 grams** of NO_x

NO_x Emissions Reduction:

- **Total NO_x Reduction:** 162,400 grams - 41,200 grams = **121,200 grams** of NO_x
- **NO_x Reduction in Pounds:**
    - 121,200 grams ÷ 453.592 grams/pound ≈ **267.34 pounds**

9.3 Relatable Environmental Equivalents

To better understand the significance of these emissions reductions, we translate them into more relatable terms.

Equivalent Trees Planted

Carbon Sequestration by Trees:

- **Average CO_2 Absorption:** One mature tree absorbs about **48 pounds** of CO_2 per year (Source: EPA).

Equivalent Number of Trees:

- **Total Annual CO_2 Reduction:** 135,744 lbs of CO_2
- **Equivalent Trees:** 135,744 lbs ÷ 48 lbs/tree/year ≈ **2,828 trees planted for one year**

Alternatively, considering the **lifetime** CO_2 absorption:

- **CO_2 Absorbed Over 40 Years (Average Tree Lifespan):**
  - 48 lbs/tree/year × 40 years = 1,920 lbs/tree
- **Equivalent Trees Over Lifetime:**
  - 135,744 lbs ÷ 1,920 lbs/tree ≈ **70.7 trees planted**

Equivalent Cars Off the Road

Average Vehicle Emissions:

- **Annual CO_2 Emissions per Passenger Vehicle:** Approximately **10,141 pounds** of CO_2 (Source: EPA).

Equivalent Number of Cars:

- **Total Annual CO_2 Reduction:** 135,744 lbs of CO_2
- **Equivalent Cars:** 135,744 lbs ÷ 10,141 lbs/car/year ≈ **13.39 cars removed from the road for one year**

9.4 Summary of Environmental Impact

- **CO_2 Emissions Reduced: 135,744 pounds** (61.58 metric tons)
- **NO_x Emissions Reduced: 121,200 grams** (267.34 pounds)
- **Equivalent to Planting:**
  - **2,828 trees** absorbing CO_2 for one year, or
  - **71 mature trees** over their lifetime

- **This is equivalent to removing 13 cars** from the road for one year

10. Mechanical Design and Durability

10.1 Enhanced Longevity through Superior Mechanical Design

The HLS NS6 Hybrid Light Tower is meticulously engineered to provide a significantly longer operational life than traditional light towers. This longevity is achieved through the selection of high-quality materials and thoughtful design considerations.

Galvanized Components:

- **Corrosion Resistance:** All HLS NS6 structural components are galvanized. Galvanization involves applying a protective zinc coating to steel, which offers exceptional resistance to rust and corrosion.
- **Extended Usable Life:** This protective layer ensures that the light tower withstands harsh environmental conditions, allowing for a usable life well beyond **10 years** and easily reaching **20,000 light hours** of operation.
- **Aesthetic Maintenance:** The galvanized finish maintains the tower's appearance over time, ensuring it continues to look good within fleets and does not degrade the professional image of the company.

Design Features Supporting Longevity:

- **Robust Construction:** The mechanical components are designed to endure the rigors of frequent use and transportation, reducing the likelihood of mechanical failure.
- **Low Wear and Tear:** The hybrid system reduces engine runtime, which in turn decreases mechanical wear compared to traditional towers where the engine runs continuously during light operation.
- **Ease of Maintenance:** The design allows for straightforward maintenance procedures, further extending the equipment's operational life and reliability.

10.2 Advantages Over Traditional Light Towers

Traditional light towers typically have non-galvanized steel components, making them more susceptible to rust and corrosion, especially in outdoor environments common to construction sites and events.

- **Shorter Lifespan:** The continuous engine operation and exposure to elements can lead to faster degradation, limiting the usable life to less than 5 years in many cases.
- **Increased Maintenance Needs:** Rust and corrosion can necessitate more frequent repairs and part replacements, increasing downtime and ownership costs.
- **Aesthetic Degradation:** Over time, traditional towers may exhibit visible signs of wear, such as rust, which can detract from the professional appearance of a fleet.

10.3 Impact on Total Cost of Ownership

By investing in a light tower designed for longevity, end-users benefit from:

- **Lower Replacement Costs:** The extended lifespan reduces the need for frequent equipment replacement.
- **Higher Residual Value:** Equipment that maintains its condition over time retains a higher resale value.
- **Operational Reliability:** Durable equipment minimizes the risk of unexpected failures, ensuring consistent project productivity.
- **Enhanced Fleet Appearance:** Well-maintained, rust-free equipment contributes positively to the company's image.

11. Conclusion on Environmental Benefits

The HLS NS6 Hybrid Light Tower offers substantial environmental benefits over traditional light towers:

- **Significant Reduction in Greenhouse Gas Emissions:**
  - Reduces CO_2 emissions by over **135,000 pounds** over its operational life.
- **Lower NO_x Emissions:**
  - Decreases NO_x emissions by over **121 kilograms** (267 pounds), contributing to improved air quality.
- **Relatable Environmental Impact:**
  - The CO_2 emissions reduction is equivalent to planting over **2,800 trees** for one year or taking **13 cars** off the road for a year.

Implications for Environmental Responsibility:

- **Corporate Sustainability:**
  - Adopting the HLS NS6 supports corporate environmental goals and sustainability initiatives.
- **Regulatory Compliance:**
  - Lower emissions help meet stringent environmental regulations and can contribute to earning environmental certifications.
- **Community Relations:**
  - Demonstrates a commitment to reducing environmental impact, enhancing company reputation among stakeholders and the community.

Appendix: Detailed Calculations

A1. Fuel Refills

- **HLS NS6 Refills:** 445 gallons/year ÷ 52 gallons/refill ≈ 8.56 refills/year
- **Traditional Refills:** 1,755 gallons/year ÷ 63 gallons/refill ≈ 27.86 refills/year
- **Labor Time Saved:** (27.86 - 8.56) refills/year × 0.5 hours/refill = 9.37 hours/year
- **Labor Cost Saved:** 9.37 hours/year × $25/hour = $241/year

A2. Oil Changes

- **HLS NS6 Engine Hours:** 705 hours/year
- **Traditional Engine Hours:** 4,320 hours/year
- **HLS NS6 Oil Changes:** 705 hours/year ÷ 250 hours/oil change ≈ 2.82 oil changes/year
- **Traditional Oil Changes:** 4,320 hours/year ÷ 250 hours/oil change ≈ 17.28 oil changes/year
- **Oil Changes Saved:** 17.28 - 2.82 ≈ 14.46 oil changes/year
- **Cost Saved:** 14.46 oil changes/year × $100/oil change = $1,446/year

A3. Manual Operation

- **Labor Time Traditional:** 0.25 hours/day × 365 days/year = 91.25 hours/year
- **Labor Cost Traditional:** 91.25 hours/year × $25/hour = $2,281/year

A4. Additional Fuel Consumption (Continuous Running)

- **Additional Operating Hours:** 12 hours/day × 365 days/year = 4,380 hours/year
- **Additional Fuel Consumption:** 4,380 hours/year × 0.406 gallons/hour = 1,778 gallons/year
- **Additional Fuel Cost:** 1,778 gallons/year × $4.00/gallon = $7,112/year

Table Data

Table 1: Key Parameters and Assumptions

Parameter	HLS NS6 Hybrid Light Tower	Traditional Light Tower
Initial Cost	$27,900	$11,900
Daily Operating Hours	12 hours	12 hours
Annual Operating Hours	4,320 hours 535.8?	4,320 hours
Engine Runtime per Year	705 hours	4,320 hours
Fuel Tank Capacity	52 gallons	63 gallons
Fuel Consumption Rate	0.63 gallons/hour (charging)	0.406 gallons/hour
Oil Change Interval	Every 250 engine hours	Every 250 engine hours
Hourly Labor Rate	$25/hour	$25/hour
Time for Fuel Refill	0.5 hours	0.5 hours
Time for Oil Change	1 hour	1 hour
Time for Manual On/Off per Day	0 hours (Automatic)	0.25 hours
Oil Change Cost (Parts + Labor)	$100	$100

Table 2: Annual Operating Costs and Savings

Cost Category	HLS NS6 Hybrid Light Tower	Traditional Light Tower	Annual Savings
Fuel Consumption (gallons/year)	445 gallons	1,755 gallons	1,310 gallons
Fuel Cost ($4/gallon)	$1,780	$7,020	$5,240
Number of Fuel Refills/year	8.56 refills	27.86 refills	19.3 fewer refills
Labor Cost for Fuel Refills	$107	$348	$241
Number of Oil Changes/year	2.82 changes	17.28 changes	14.46 fewer changes
Cost of Oil Changes	$282	$1,728	$1,446
Labor Cost for Manual Operation	$0	$2,281	$2,281
Total Annual Operating Cost	$2,169	$11,377	$9,208

Table 3: Payback Period Calculation

Item	Conservative Estimate	Optimistic Estimate
Additional Initial Cost	$16,000	$16,000
Annual Savings	$9,208	$16,320
Payback Period (years)	1.74 years	0.98 years

Table 4: Total Savings Over Operational Life (20,000 Hours)

Item	Conservative Estimate	Optimistic Estimate
Operational Life (years)	4.63 years	4.63 years
Total Savings Over Life	$42,641	$75,422
Net Savings After Extra Cost	$26,641	$59,422

Table 5: Environmental Impact Over Operational Life

Emission Type	HLS NS6 Hybrid Light Tower	Traditional Light Tower	Reduction
Total Fuel Used	2,060 gallons	8,120 gallons	6,060 gallons
CO_2 Emissions	46,144 lbs	181,888 lbs	135,744 lbs
NO_x Emissions	41,200 grams	162,400 grams	121,200 grams
Equivalent Trees Planted	—	—	2,828 trees/year
Equivalent Cars Off Road	—	—	13 cars/year

Table 6: Summary Comparison

Category	HLS NS6 Hybrid Light Tower	Traditional Light Tower	Difference
Initial Cost	$27,900	$11,900	$16,000
Annual Operating Cost	$2,169	$11,377	-$9,208
Payback Period	1.74 years	—	N/A
Total Savings Over Life	$42,641	—	N/A
Net Savings After Extra Cost	$26,641	—	N/A
CO_2 Emissions Over Life	46,144 lbs	181,888 lbs	-135,744 lbs
NO_x Emissions Over Life	41,200 grams	162,400 grams	-121,200 grams
Manual Operation Required	No	Yes	Automatic Operation
Cold Weather Performance	Efficient	May require continuous running	Fuel Savings

What if we replaced 500 traditional light towers with our products?

1. Summary of Savings and Emissions Reductions

Table 1: Total Annual Savings for 500 Towers

Cost Category	Savings per Tower	Total Savings for 500 Towers
Fuel Cost Savings	$5,240	$2,620,000
Labor & Maintenance Savings	$3,968	$1,984,000
Total Annual Savings	$9,208	$4,604,000

Table 2: Total Savings Over Operational Life (20,000 Hours) for 500 Towers

Item	Savings per Tower	Total Savings for 500 Towers
Conservative Total Savings	$42,641	$21,320,500
Net Savings After Extra Cost	$26,641	$13,320,500

Table 3: Total Emissions Reductions Over Operational Life for 500 Towers

Emission Type	Reduction per Tower	Total Reduction for 500 Towers
CO_2 Emissions	135,744 lbs (61.58 metric tons)	67,872,000 lbs (30,790 metric tons)
NO_x Emissions	121,200 grams (121.2 kg)	60,600,000 grams (60,600 kg)

2. Detailed Calculations

2.1. Annual Savings

- **Fuel Cost Savings per Tower:** $5,240
  - **Total Fuel Cost Savings for 500 Towers:** $5,240 × 500 = **$2,620,000**
- **Labor & Maintenance Savings per Tower:** $3,968
  - **Total Labor & Maintenance Savings for 500 Towers:** $3,968 × 500 = **$1,984,000**
- **Total Annual Savings per Tower:** $9,208

- **Total Annual Savings for 500 Towers:** $9,208 × 500 = **$4,604,000**

2.2. Savings Over Operational Life

- **Conservative Total Savings per Tower:** $42,641
  - **Total for 500 Towers:** $42,641 × 500 = **$21,320,500**
- **Net Savings After Extra Cost per Tower:** $26,641
  - **Total for 500 Towers:** $26,641 × 500 = **$13,320,500**

2.3. Emissions Reductions

- **CO_2 Emissions Reduction per Tower:**
  - **135,744 lbs** or **61.58 metric tons**
  - **Total for 500 Towers:** 135,744 lbs × 500 = **67,872,000 lbs** (61.58 metric tons × 500 = **30,790 metric tons**)
- **NO_x Emissions Reduction per Tower:**
  - **121,200 grams** or **121.2 kg**
  - **Total for 500 Towers:** 121,200 grams × 500 = **60,600,000 grams** (121.2 kg × 500 = **60,600 kg**)

3. Relatable Environmental Equivalents

Table 4: Environmental Impact Equivalents for 500 Towers

Equivalent	Value per Tower	Total for 500 Towers
Trees Planted (one year)	2,828 trees	1,414,000 trees
Cars Removed from Road (one year)	13 cars	6,500 cars

Calculations:

- **Equivalent Trees Planted Over One Year:**
  - **Per Tower:** 135,744 lbs CO_2 reduction ÷ 48 lbs CO_2/tree/year ≈ **2,828 trees**
  - **Total for 500 Towers:** 2,828 trees × 500 = **1,414,000 trees**
- **Equivalent Cars Removed from Road Over One Year:**
  - **Per Tower:** 135,744 lbs CO_2 reduction ÷ 10,141 lbs CO_2/car/year ≈ **13 cars**

- **Total for 500 Towers:** 13 cars × 500 = **6,500 cars**

4. Comprehensive Tables

Table 5: Key Parameters and Assumptions per Tower

Parameter	HLS NS6 Hybrid Light Tower	Traditional Light Tower
Initial Cost	$27,900	$11,900
Annual Operating Hours	4,320 hours	4,320 hours
Engine Runtime per Year	705 hours	4,320 hours
Fuel Consumption per Year	445 gallons	1,755 gallons
Fuel Cost per Year ($4/gallon)	$1,780	$7,020
Labor & Maintenance Cost per Year	$389	$4,357
Total Annual Operating Cost	$2,169	$11,377

Table 6: Aggregate Data for 500 Towers

Category	HLS NS6 Hybrid Light Towers (500 units)	Traditional Light Towers (500 units)	Difference
Initial Cost	$13,950,000	$5,950,000	$8,000,000 additional
Annual Operating Cost	$1,084,500	$5,688,500	$4,604,000 saved annually
Total Savings Over Life	$21,320,500	N/A	$21,320,500 saved
CO_2 Emissions Over Life	67,872,000 lbs	181,888,000 lbs	114,016,000 lbs reduced
NO_x Emissions Over Life	60,600,000 grams	162,400,000 grams	101,800,000 grams reduced