



Ministry of Energy and
Mineral Resources



**LED Street Lighting Project
Tale of Two Indonesian Cities
*Best Practices & Lessons Learned***

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Pilot LED Street Lighting Retrofit Project (LED Retrofit Project)

- Implement LED Retrofit Project in Batang and Semarang (Pilot Cities) and several power stations of State Owned Utility (PLN)
- **Goal**: Pilot Cities to become demonstration projects for replication throughout Indonesia.
- Document results in a ‘Best Practices and Lesson Learned’ Report

ADB \$1.24 Million Funding

- \$400,000: vendor-installed LEDs at PLN locations
- \$200,000: LED lamps installed by Pilot Cities
- \$640,000: TA performed by *Econoler* (selected by ADB) to implement the LED Retrofit Project under a Contract with PLN

Current State of Municipal Street Lighting in Indonesia

Most current street lighting in Indonesia is relatively inefficient, largely due to:

- Purchase of inefficient luminaires (older, lower initial-cost technologies)
- Poor design, product quality, installation and O&M
- Poor power quality
- No national standard applicable to LEDs

LEDs Retrofitted and Measured in Pilot Cities

	Circuits			LEDs	
	Retrofitted	Measured		Retrofitted	Measured
Batang	20	5	25%	257	64
Semarang	19	5	26%	259	68
Total	39	10	26%	516	132

Measured KVA (Demand) Savings

	Baseline KVA	Measured	
		KVA	SAVINGS
<u>Batang:</u>	4.236	1.749	59%
	2.898	1.303	55%
	3.160	0.952	70%
	1.651	0.803	51%
	1.678	0.733	56%
Total Batang	13.623	5.540	59%
<u>Semarang:</u>	2.678	1.496	44%
	4.274	2.207	48%
	7.029	3.386	52%
	2.204	1.673	24%
	3.582	2.280	36%
Total Semarang	19.765	11.042	44%
Total Municipalities	33.389	16.582	50%

Measured Annual Savings and Payback Estimates

	kWh Rate (IDR)	Annual Savings		Total Pilot LEDs Purchased			Payback Years
		Total Pilot kWh	Total Pilot USD	#	USD Unit Price	USD	
BATANG:	1,395	115,685	\$ 12,415	257	\$ 243	\$ 62,538	5.0
USD kWh Rate	\$0.11						
SEMARANG:	1,398	110,160	\$ 11,846	259	\$ 459	\$ 118,976	10.0
Total Municipalities	1,397	225,846	\$ 24,261	516	\$ 352	\$ 181,514	7.5

Maintenance Savings:

- LEDs currently possess a significant longer 10 -12 year lifetime compared to 3-4 years for HPS and other current lamp technologies
- Eliminates the need for two HPS replacements over the next 10 years, and results in maintenance savings
- Payback improved: **Batang to 3.6 years; Semarang to 7 years**

Realized vs. Measured Savings

- Batang: 51% Realized vs. 59% Measured
- Semarang 18% Realized vs. 44% Measured

Shortfalls caused by PLN not billing based on actual electricity (kWH) consumption, even though circuits have registered meters?

Lessons Learned: Municipal Street Lighting LED Retrofits in New Market

1. LEDs should reduce electricity by >50% plus lamp replacements for < 4-yr. payback with ~50% less wattage and improved lighting levels and quality
2. Easy for Municipalities to self-install LEDs
3. Vendor installed with controls cost lot more
4. A significant portion of LED savings may not be realized by Municipalities due to:
 - Utility not billing based on actual kWh consumption
 - LEDs retrofitted with same wattage as replaced lamps
 - Poor quality LEDs purchased

Lessons Learned: Municipal Street Lighting LED Retrofits in New Market

4. Municipalities have no budget or access to finance for city-wide street lighting LED retrofit program
5. Must require lowest-cost procurement and cannot commit to multi-year savings-based payments
6. Limited LED local knowledge and capacity:
 - Vendor ‘threshold’ capabilities required in procurement
 - Vendors must meet independent lab testing requirements
 - Existing street lighting standards are not applicable Poor quality (low cost) LEDs purchased that fail
 - Do not understand M&V or have proper meters

Scale-up Solutions: Municipal Street Lighting LED Retrofits in New Market

1. Develop/publish a national street lighting standard that covers LEDs and incorporates *'Best Practices'*
2. Provide a nation-wide capacity building program based on multiple demonstration LED Projects
3. Develop savings-based project finance products:
 - Credit guarantee of municipality payments
 - Energy Savings Insurance (guarantee) product
4. Establish National EE Finance Team to develop LED savings-based projects, structure financing, and assess/manage perform risks