GENERAC®
INDUSTRIAL POWER

WHITE PAPER

Connecting Distribution Centers to the Grid

Abstract

Generators are an important component of any commercial or industrial energy management program – particularly for critical operations at distribution centers.

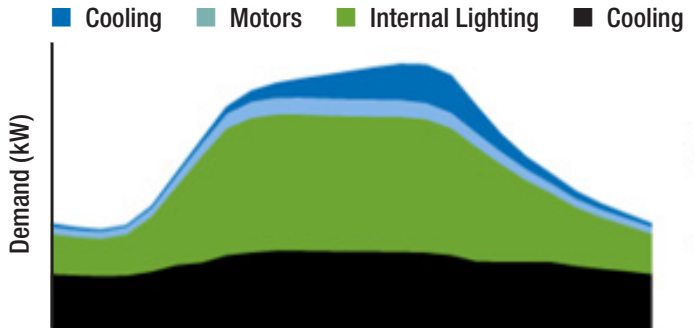
Standby generators protect inventory and ensure continuity of operation during power outages. However, upfront capital expenditures (Capex) may detract from generator investments. Generac's commercial and industrial customers increasingly rely on turnkey solutions that put the generator to work – offsetting Capex and reducing electricity operating expenditures (Opex).

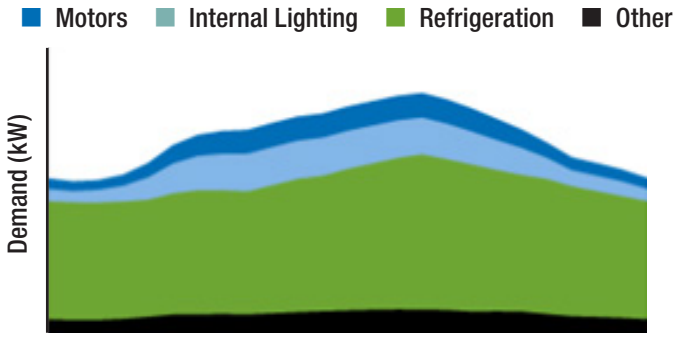
As part of a comprehensive energy management program, generators can provide independent control of electricity consumption, reduce energy costs and in some cases generate revenue – all while maintaining backup power for resiliency. This paper will address energy optimization at distribution centers and the economics of monetizing a generator.

Introduction

Distribution centers are the hub of our global networks for finished and unfinished goods. As these facilities become more automated, their electric demand and dependence on the grid are increasing.

What's consuming the power at distribution centers? According to E Source, from the US Energy Information Administration, non-refrigerated warehouses in the U.S. consume an average of 6.1 kilowatt-hours (kWh) of electricity and 13,400 BTU of natural gas per square foot annually. Lighting and space heating account for nearly 80% of total energy use. Refrigerated warehouses consume an average of 24.9 kWh of electricity and 9,200 BTU of natural gas per square foot per year. In total, energy costs can comprise in excess of 15% of Opex at the typical distribution center.

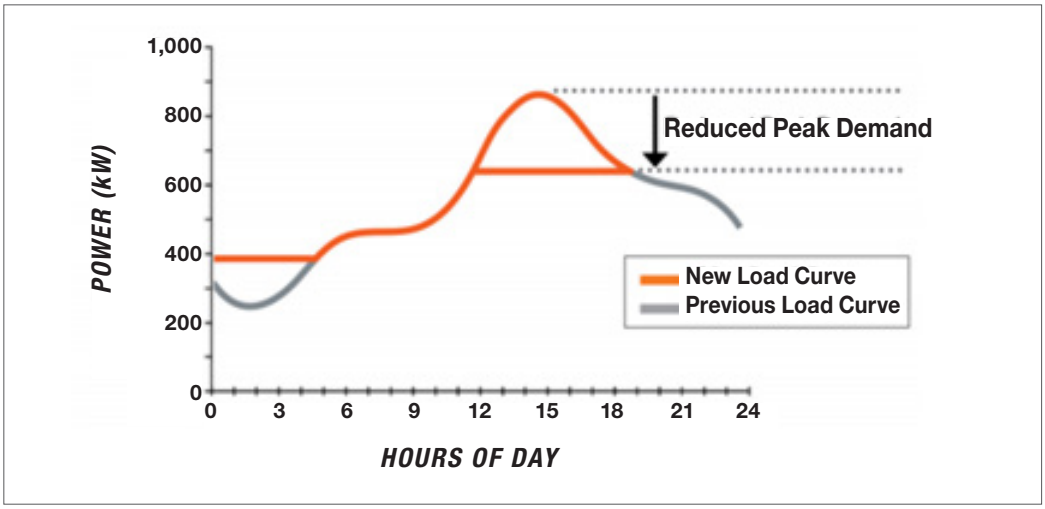




Notes: kW = kilowatt
a. 24-hour period = midnight to midnight

E Sourse; data from California Energy Commission (2002)

[1] OUC Biz Energy Advisor. Site: https://ouc.bizenergyadvisor.com/article/warehouses



According to S&C, in the past year, 50% of companies experienced an outage lasting longer than one hour. And 98% of organizations state that one hour of downtime costs over $100,000. Momentary outages cost the U.S. economy $52 billion annually. As outages become more prevalent, small businesses, large scale operations, communities and economies are impacted. Power outages can result in inventory loss, spoilage and disruption to critical infrastructure.

Meeting Business Objectives

When specifying a generator for a distribution center, the traditional path is a single stationary diesel genset. This solution meets most business objectives, complies with life safety load requirements, backs up critical assets and enables the facility to draw full load during an outage. A typical standby diesel generator may run fewer than 5 hours per year over the course of a 10-20 year life-cycle. For corporate accountants, this “insurance policy” may actually be considered a stranded asset.

Pressure to reduce Opex has driven innovation in generator utilization – transforming from stranded to revenue generating asset. In addition to the business objectives noted above, generators can offset utility energy charges through programs such as peak shaving and demand response.

Onsite generation enables a customer to independently determine when to curtail load (peak shaving), reducing power consumption during periods of maximum demand – and highest electric rates. To relieve the stress on the grid, utilities may call on – and credit – customers to reduce consumption. This is commonly referred to as demand response through curtailment. Generators can also parallel to the grid, selling revenue to the power market, which helps to offset Capex; and are a compelling option to meet environment, social and corporate governance (ESG) objectives.

Beyond peak shaving and demand response, grid support services are also becoming critical in the U.S. Aging infrastructure, intermittent renewables and unplanned growth have created congestion on utility distribution systems. These circumstances present an opportunity for distributed generator assets to be utilized in all of the above applications – beyond standby.

It is important to note that most demand response programs call on the generator fewer than 200 hours per year. In general, DR programs pay end-users to enroll assets, regardless of whether the generator is dispatched. Short of a monthly test, there are no requirements to run outside of stated Energy Emergency Alert (EEA) events.

Natural Gas Generators in Beyond Standby Applications

Generators used in non-standby or non-emergency applications must be configured to meet federal, state and local emissions requirements. Both diesel and gaseous gensets are allowed in these applications, although diesels must meet EPA Tier IV certification, which can add in excess of 30% to the cost of the system.

Whether diesel or gas, standby or continuous duty, all generators require routine maintenance. Additional run hours associated with non-emergency applications must be taken into account during technology selection and project economic analysis.

[2] S&C’s 2018 State of Commercial & Industrial Power Reliability Report
[3] Intelligence Consulting (ITIC)
[4] Lawrence Berkeley National Lab

Offsetting Capex

Installed costs for backup power generation systems vary, depending on the application and site specific conditions. Regional fuel prices for natural gas and diesel also factor. Projects may range from $300/ kW to $500/kW including installation costs. Generac and its energy partners have developed financial solutions and service offerings to help reduce upfront costs and decrease the total lifetime investment.

How Does This Work?

As an example of typical project economics, we'll share the case of a distribution center in Texas. With a peak load of 1MW, the genset installation is comprised of two Generac SG625 natural gas gensets, 1.25 MW total. The installation is sized to accommodate peak load and potential derates on hot summer days.

The facility energy manager may choose to enroll these assets in Electric Reliability Council of Texas' (ERCOT) Four Coincident Peak (4CP) and Emergency Response Service (ERS) programs, both of which are "behind the meter." For the purpose of this analysis, we have not included economic dispatch to the utility through programs such as Load Resource Program (LRP).

GENERATOR PARTICIPATING IN ERCOT PROGRAMS SAVINGS + REVENUE		
4CP Savings ($/yr)	ERS-10 DR Revenue ($/yr)	LR DR Revenue ($/yr)
$45,000	$40,583	$80,583

** Energy savings and revenue streams are indicative for discussion purposes. Actual outcomes vary based on site load and market participation. Generator sizing (peak load, interval data) and ERCOT event modeling are required.*

- 4 Coincident Peak (4CP): Credit for voluntary reduction in energy consumption during 4 peak summer months. Typical credit: $5/kWm.
- Emergency Response Service (ERS): Qualified loads are aid for availability for emergency services. Typical rate: $8.21/ MWh. Estimated 6,589 hours/year in our sample scenario.

4CP energy savings, combined with ERS revenues may return a net $80,583 annually to the end-user in this scenario. This particular customer would achieve payback in roughly four years.

Conclusion

Commercial and industrial energy consumers should consider generators as a key component to any energy management program. In addition to providing resiliency – standby power for critical operations – generators can facilitate energy savings (reducing Opex) and produce revenue (offsetting Capex). These types of installations are becoming increasingly common as aging infrastructure leaves electric reliability in question in many parts of the country.

Proper generator sizing, emissions permitting and integration with building management systems are important considerations. A technical sales and application engineering team can provide a through techno economic analysis to help you evaluate the proper generator; and model loads and revenue streams that will be unique to each utility program.

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