Recharge Batteries during Off-peak Demand Period (Arc 2.3132)

(The analysis below was extracted from one of the assessment reports by the Clemson University Industrial Assessment Center (IAC). This is only an example recommendation and hence, not all the background information and sources for numbers are included here.)

Est. Electric Consumption Savings	= ***0 kWh/yr***
Consumption Cost Savings	= ***$1224/yr***
Est. Electric Demand Savings	= ***240 kW/yr***
Est. Electric Demand Cost Savings	= ***$2960/yr***
Est. Total Cost Savings	= ***$4184/yr***
Est. Implementation Cost	= ***$0***
Simple Payback Period	= ***0 months***

Recommended Action:
It is recommended to charge forklifts (batteries) during off-peak utility rate period.

Background:
The plant currently charges forklift batteries as required, during any time of day. The summer on peak hours are 1-9 pm, the winter on-peak hours are 6am-1pm. This means for roughly one third of the charging time the on-peak rate is used. Since the off-peak rate is 3 cents per kWh and the on-peak rate is 6 cents per kWh, this gives an average rate of 4 cents per kWh, charging during off-peak times is half as expensive as on-peak charging.

Anticipated Savings:
A typical forklift battery has a capacity of approximately 40 kWh. Assuming a 75% efficient charger and that the duty cycle per shift is 75% of the battery, this means that the electrical energy required per shift is 40 kWh. If charging is done once per shift over a 4-hour period, the demand is 10 kW. The plant operates 6 days a week for 51 weeks of the year, resulting in 12,240 kWh of annual energy use for charging the battery for one forklift.

The plant currently has 10 gas and electric forklifts. They will be changing to all electric. For this cost-saving calculation, all 10 forklifts are assumed. The electrical energy cost for charging one forklift at a rate of 4 cents per kWh is $490, giving a cost of $4896 for all ten forklifts. Moving to all-off-peak charging would cost $3672, for a cost savings of $1224.

Additionally, there would be a demand saving since on-peak charging incurs demand charges at $17 per kW in the summer and $10 per kW in the winter. There is no off-peak demand charge. Assuming at any hour two of the ten forklifts might be charging, then there would be 20 kW of demand during on-peak hours. There are four months (Jun-Oct) which count as summer and eight months (Oct-May) which count as winter. As such, over the year the total demand charge would be:

$$\mathbf{20\ kW \times (4\ months \times \$17/kW + 8\ months \times \$10/kW) = \$2960}$$

All this demand charge would be saved by switching to off-peak hours, thus the EDCS is $2960.

The total cost savings (ECCS + EDCS) would be $4184.

<u>Implementation Cost</u>:
The plant has a contract with the forklift providers. Assuming the provider can supply enough batteries and there are enough charging stations to accommodate all batteries during off-peak times, there is zero implementation cost.

IC = $0

<u>Simple Payback Period</u>:
With zero implementation cost, and no time delay for implementation, the payback is immediate.

SPP = 0 months