

2ndLife Batteries®

**Making Energy Storage Projects
“Pencil Out”**

**More Energy For Less Cost
Through Knowledge™**

TAKE AWAYS

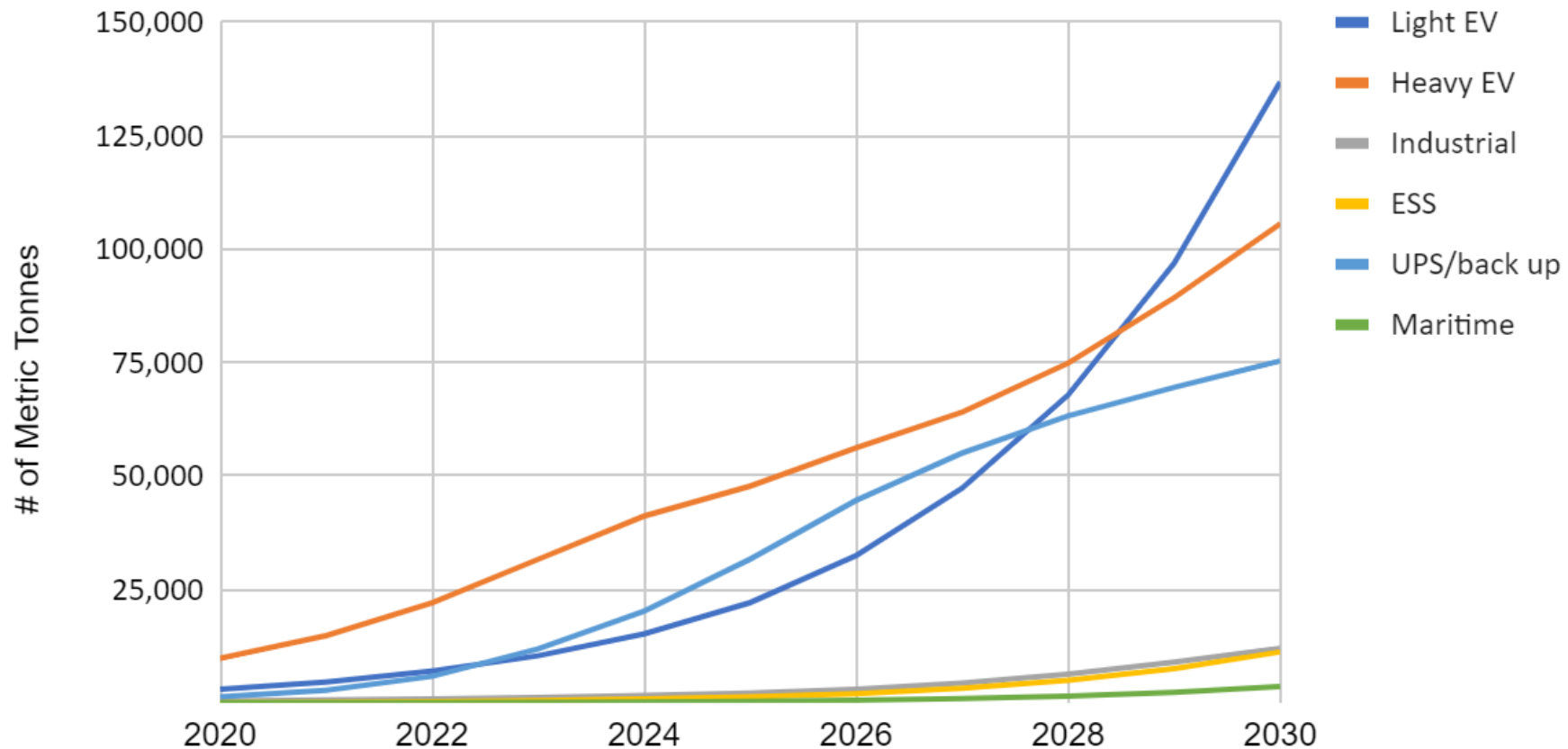
- Battery Recycling
 - Pros and Cons of Lead-acid & Lithium-ion
- 2ndLife Batteries®
 - Values and Opportunities for Solar
- Jeeves Demand Charge Optimizer as a Service
 - Opportunities in EV Charging & Industry

Corporate History

- 2016: first sales of 2ndLife systems as Energy Storage Application
 - Spun off from WeRecycleBatteries.com that shipped millions of lbs of batteries for recycling since 2010
- Shipped 8.5MWH of 2ndLife Batteries
 - Lead-acid systems and in Q1-Q2 2022 Li-ion
 - Various applications
 - If categorized as solar energy storage @ 50% DoD
 - power 200 homes for 8 hours for 3+ years
- 2021-2022 focus on Li-Ion batteries

Recyclable & Second-Life Li-ion Market Forecast

Available Lithium-Ion Reuse & Recycling Tonnage By Application



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Recycling Cost/KWh - 2019

2019 & 2029 Project Li-Ion Recycling costs/kwh				
	Total KWH	Total	Recycling 2019 Cost/kwh	Recycling Cost/KWH in 2029 Inflation @ 3%/year
Lithium-Ion Iron Phosphate (LFP)				
1MWH – Full Truck - LA to Syracuse NY	1,001.60	-\$36,821.98	-\$36.76	-\$49.40
38.4KWH – Small Shipment - Miami to Syracuse NY	38.4	-\$1,327.52	-\$34.57	-\$46.49
Lithium-Ion - Nickel Manganese Cobalt (NMC)				
1MWH – Full Truck - LA to Syracuse NY	1,001.60	-\$13,021.98	-\$13.00	-\$17.47
38.4KWH – Small Shipment - Miami to Syracuse NY	38.4	-\$663.60	-\$17.28	-\$23.22
Lead-Acid – Full Truck - Miami to Syracuse NY	175.25	\$4,244.00	\$24.22	\$16.30

Recycling Lead-Acid Batteries

We Pay!!!!

Types	Hazmat Shipping - Yes or NO
Wet Lead-Acid	UN2794 - YES
Non-Spillable Absorbed Glass Mat	UN2800 - Hazmat - NO Exempt Worldwide
Non-Spillable Gel Cell	UN2800 - Hazmat - NO Exempt Worldwide

Recycling

Lithium-ion Batteries 1 of 2

Recycling Value - **MAYBE** Payable
(Or You Pay US!!!)

Acronym	Cathode Name & General Formulation
LCO	LCO Lithium Cobalt Oxide (LiCoO_2)
NMC	Lithium Nickel Manganese Cobalt Oxide (LiNiMnCoO_2)
NCA	Lithium Nickel Cobalt Aluminum Oxide (LiNiCoAlO_2)

Recycling

Lithium-ion Batteries 2 of 2

NEGATIVE Recycling Value - You PAY US!

Acronym	Cathode Name & General Formulation
LFP	Lithium-Ion Ferrous Phosphate, (a.k.a. Lithium Iron Phosphate) (LiFePO ₄)
LTO	Lithium Titanate (Li ₄ Ti ₅ O ₁₂) <i>Note LTO is sometimes blended in LFP</i>

Lithium-ion Ferrous (Iron) Batteries

ADVANCE PAY for LFP recycling

Good Technology	Negative Cost to Ship & Recycle
On New Sales plan ahead - collect recycling as part of Warranty program	HAPPY Customer buys again because you have the funds to offset the recycling of old product.
Second-Life Revenue offset Recycling costs with Leasing	Plan ahead, and replace batteries under lease so they are returned with 50-70% capacity.

Surprise, AZ - 1MWH Li-ion for Utility Distributed Solar Energy Management



Surprise, AZ - 1MWH Li-ion Explosion 2019



DO NOT USE THIS!

Used Li-ion Batteries for Uncertified Energy Storage

PROBLEMS

- FIRE & EXPLOSION HAZARDS
- NOT UL or CSA TESTED & CERTIFIED
- Li-ion batteries don't have a Battery Management System to maintain fire safety to meet UL standards



Resolutions

- Needs extensive expensive testing to meet Fire codes and building codes
- Needs UL 9540, and UL 9450a to connect to the Grid
- Needs UL 1973 & BMS (energy storage)
- UL 1974 if from EV battery pack

USE These 2ndLife Batteries®



EnerSys™ 190AH @ 12V
AGM Lead-Acid



Stryten™ (formerly Exide
GNB) ABSOLYTE™ AGM Lead-
Acids 800H - 1600AH using 2V
cells



Lithion™ Valence LFP
Battery Available late
Q1-Q2 2022

2ndLife Sourcing

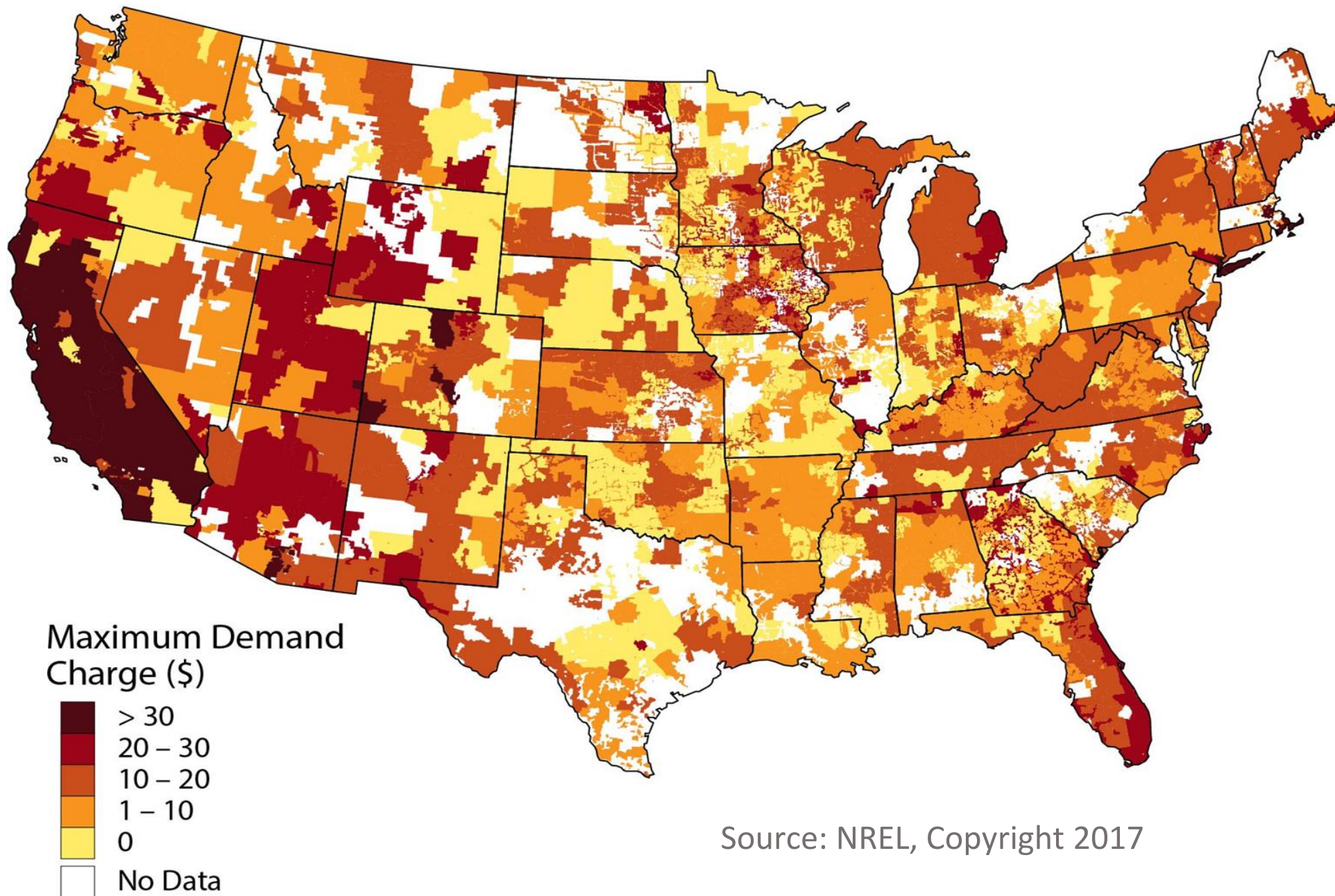
- SAFETY FIRST!
- Sources are proprietary but in general are:
 - Backup batteries that have had low cycling, and have years left
 - Overstock
 - Soon Electric vehicle sources
- Lead batteries have existing stationary storage testing and certification.
- Li-ion - much different path and with expensive re-certification costs

Projects - Quebec based Solar Company

- 4000AH x 196 KWH
Off-Grid System -
Installed Nov 2018
 - 96KWh @ 50% DOD
- 5 Bank Branches --
Reliable power in
Democratic Republic
of Congo; shipped in
2020. 1200AH x 48V =
57.6 KWH systems



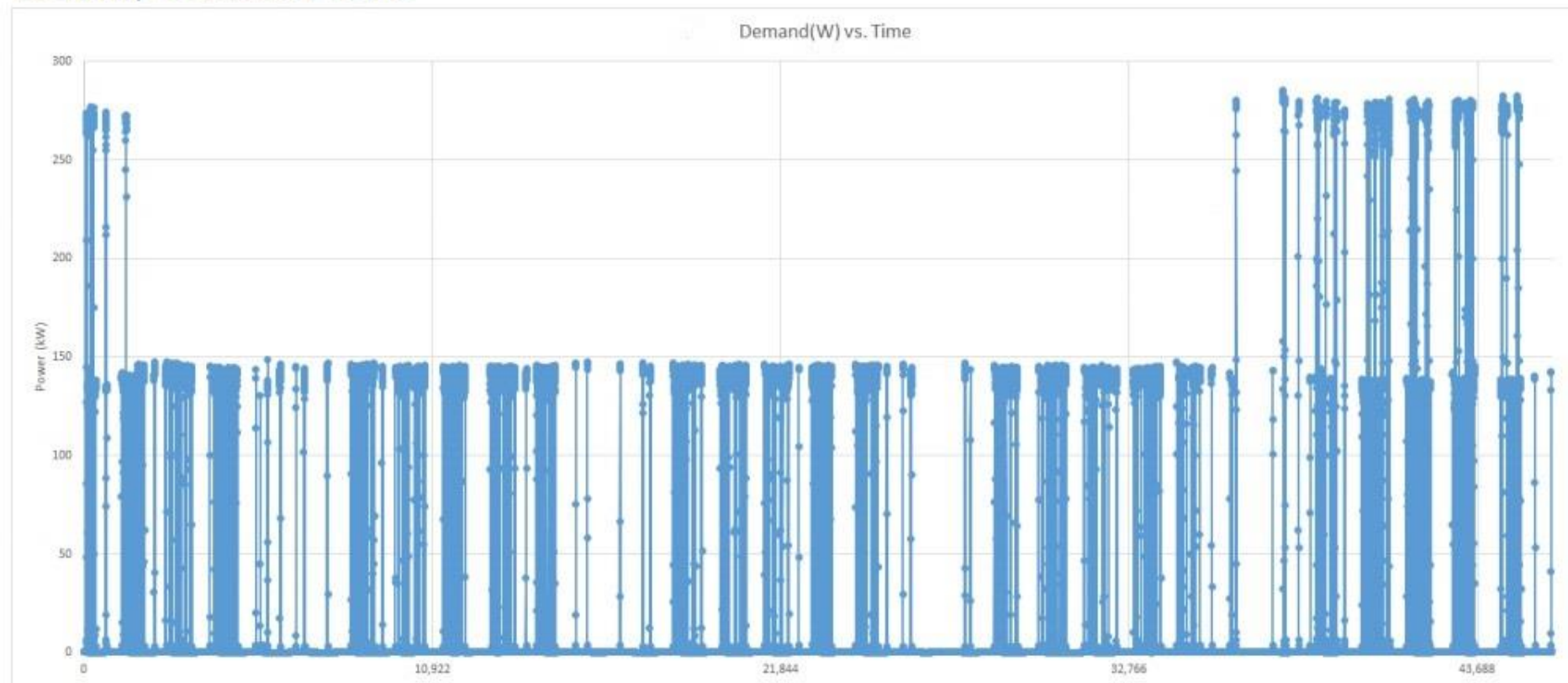
Maximum Demand Charges by Utility Territory



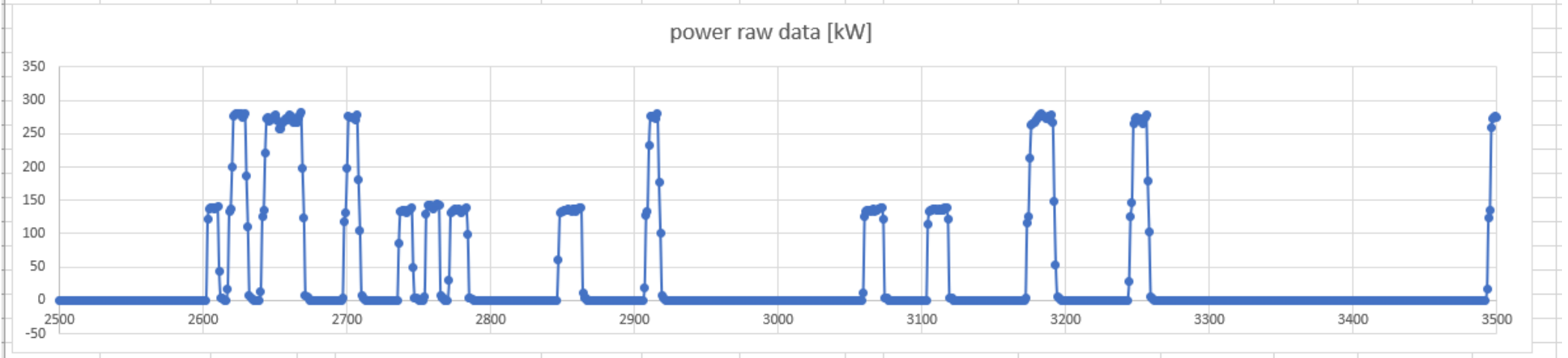
Source: NREL, Copyright 2017

1 Month of Demand Charge Power Spikes

Monthly Demand Profile







Sample Test Data





Thank You

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