



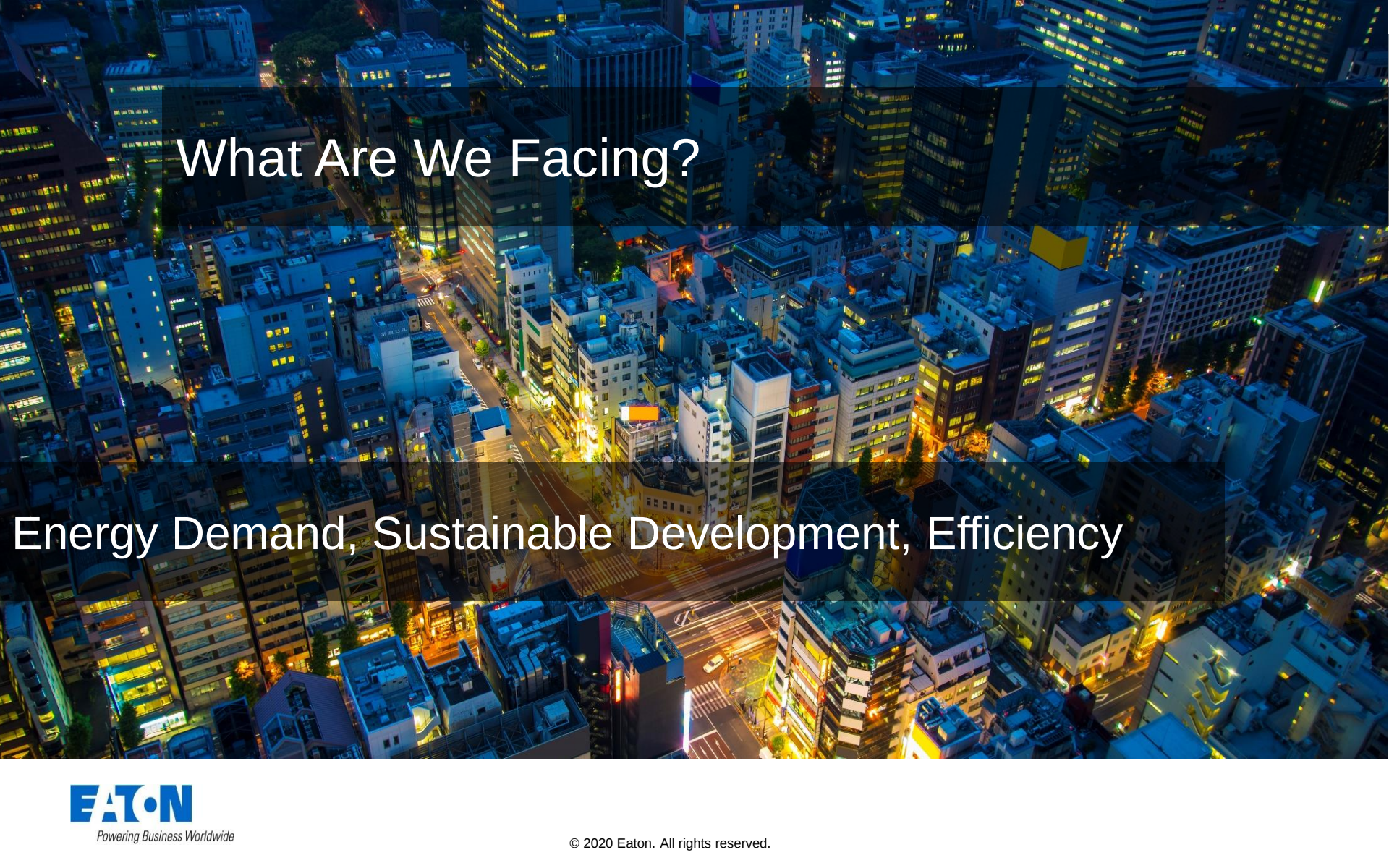
Eaton: EnergyAware UPS (Dual Purpose UPS)

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What Are We Facing?

Energy Demand, Sustainable Development, Efficiency



Powering Business Worldwide

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What else can a UPS do?

Providing true energy management technology that is reliable and **efficient**.

Grid operators seek new opportunities to meet explosive demands for power

- Explosive growth in demand for power is creating added strain on electrical infrastructure
- In response, grid operators implement financial incentives (demand charges, Time-of-use rates, penalties/tariffs) that promote utilization of Distributed Energy Resources (DERs) to support demand



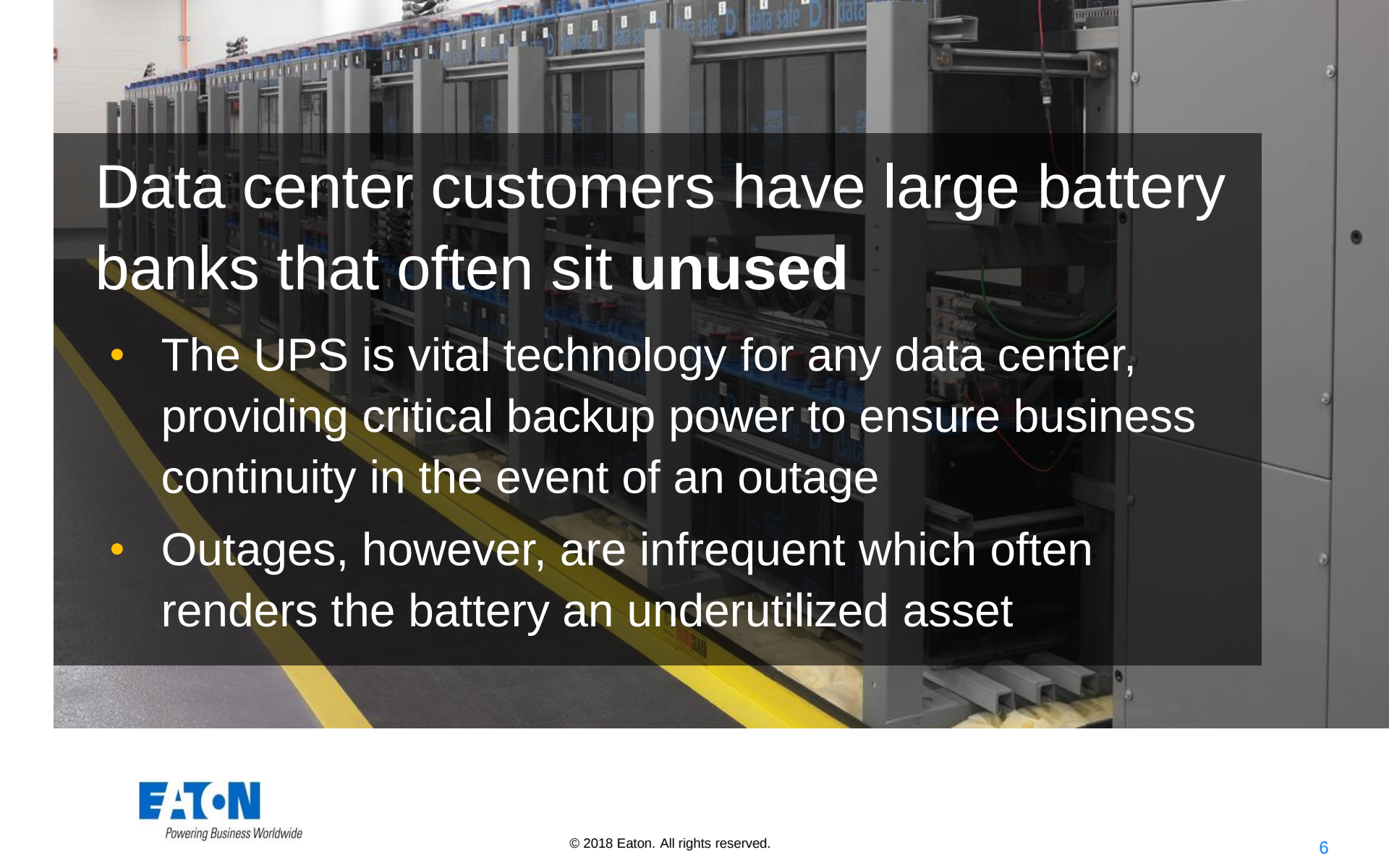
Energy costs in the data center

- Energy costs are emerging as **the second highest operating cost** (behind labor) in 70% of data centers worldwide*
- A 1MW data center consumes 160M kWhrs of energy over 10 years
 - Equivalent to the energy consumed by 1,400 typical U.S. households in that same amount of time
 - UPS electrical losses typically account for 5-10% of energy usage**
- 80% of CEOs view **sustainability** as impacting brand value***

*Source: (Gartner)

**Source: “*The Invisible Crisis in the Data Center: The Economic Meltdown of Moore’s Law*,” Uptime Institute

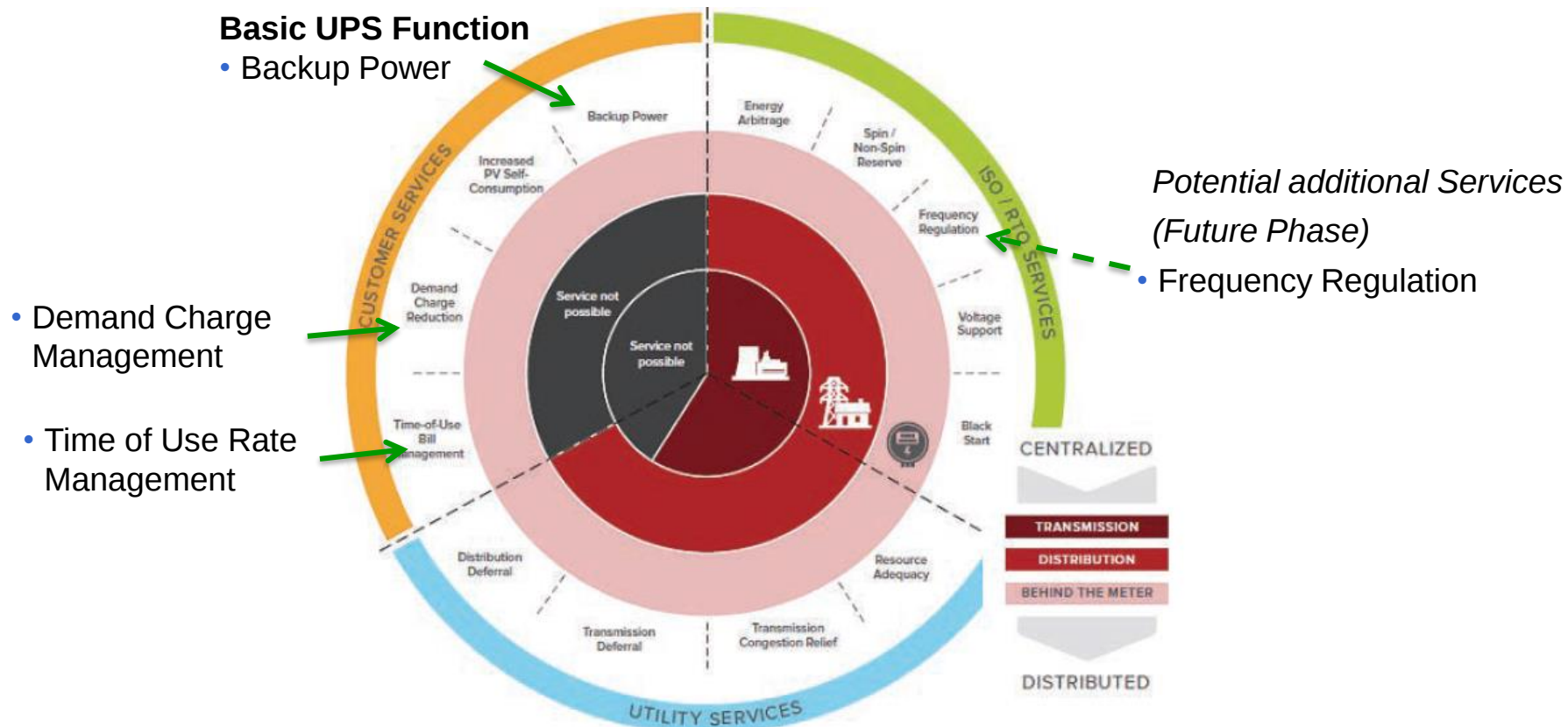
***Source: (McKinsey)



Data center customers have large battery banks that often sit **unused**

- The UPS is vital technology for any data center, providing critical backup power to ensure business continuity in the event of an outage
- Outages, however, are infrequent which often renders the battery an underutilized asset

Energy Storage Services



Copyright 2015 Rocky Mountain Institute. From *The Economics of Battery E*
<https://www.rmi.org/insights/repor>

Figure 10. Microgrid services (RMI 2015).

UPS of New Generation: Eaton EnergyAware UPS (Dual Purpose UPS)

- Same architecture of UPS, extended functions.
- Eaton EnergyAware UPS is not only UPS, but also Energy Storage.

Today



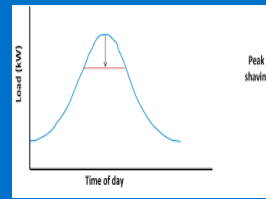
Powering Business Worldwide



Tomorrow

**Energy & Grid Aware
Solutions**

**Smart Energy
Consumption**



Peak shaving; TOU

**Revenue
Generation**



Frequency Regulation

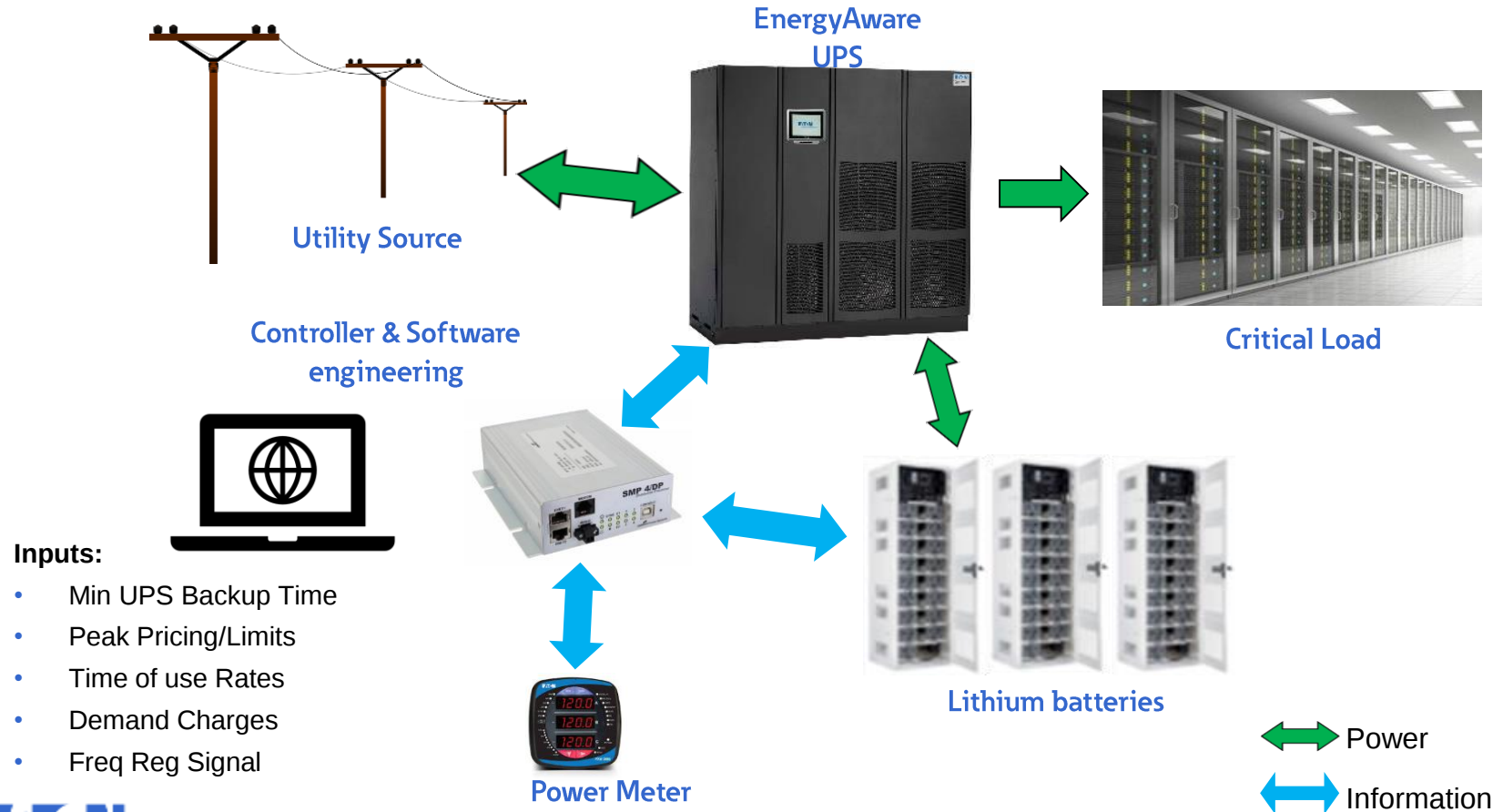
**Green
Contribution**



Generator
Replacement

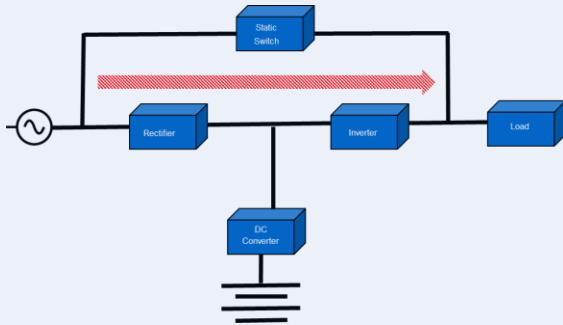
EnergyAware UPS (Dual Purpose UPS)

System components



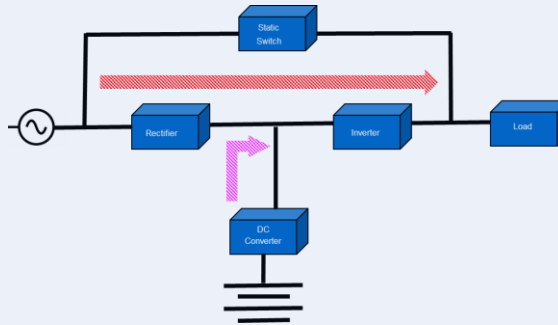
Operating modes: (in terms of Energy Storage)

UPS Mode



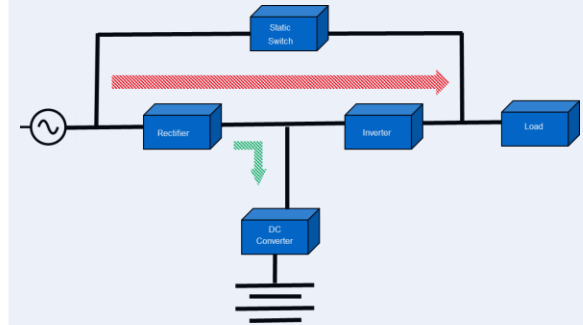
- ✓ UPS supporting load
- ✓ Battery fully charged
- ✓ Static switch off

UPS Mode + Peak shaving + Load shifting operation



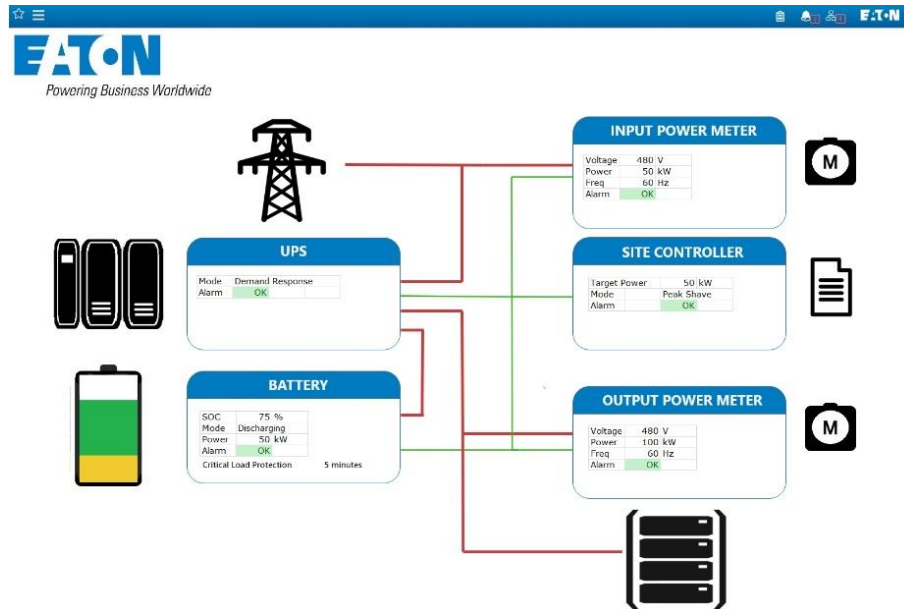
- ✓ UPS still supporting load
- ✓ Battery discharged to reduce utility demand (provide partial power to load)

UPS Mode + Adding demand + Ancillary service to grid



- ✓ UPS still supporting load
- ✓ Battery charge to increase utility demand

EnergyAware UPS Dashboard User Interface



Main Dashboard Screen



Lithium Battery Configuration Screen

Demand Charge Management

Figure 17. TOU DCM Configuration Operational HMI Example

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Time-of-Use Demand Charge Management Configuration

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Eaton

		Enable Dynamic Capability		Start	End	Enable Dynamic Capability
Unit Identification			Season 1 (S1)	4/1	9/30	☐
			Season 2 (S2)	10/1	3/31	☐
Rated Power	300.0 kW			Start	End	
Available Peak Shaving Power	72.9 kW		S1 On Peak Period	05:00	10:00	☐
Discharge Ramp Rate Up	kW/s	☐	S1 Off Peak Period	10:01	04:59	☐
Discharge Ramp Rate Down	kW/s	☐	S2 On Peak Period	05:00	20:00	☐
Charge Ramp Rate Up	kW/s	☐	S2 Off Peak Period	20:01	04:59	☐
Charge Ramp Rate Down	kW/s	☐	S1 Target Power	110.0 kW		☐
Mode Transition Time	Seconds	☐	S2 Target Power	150.0 kW		☐
Mode Transition Timeout	Seconds	☐		On Peak	Off Peak	
Priority		☐	S1 Energy Charges			\$/kWh ☐
Enable TOU DCM	OFF	☐	S1 Demand Charges			\$/kW ☐
Apply TOU DCM Parameters	OFF	☐	S2 Energy Charges			\$/kWh ☐
			S2 Demand Charges			\$/kW ☐

⊖

90%

⊕

Peak Shaving

Figure 16. RTP DR Configuration Operational HMI Example

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Real Time Pricing Demand Response Configuration

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EATON

Unit Identification			Enable Dynamic Capability	Enable Dynamic Capability		
				Start	End	
Rated Power	300.0	kW	On Peak Period 1	10:00	22:59	☐
Available Peak Shaving Power	72.9	kW	Off Peak Period 1	23:00	09:59	☐
Discharge Ramp Rate Up		kW/s	Target Power 1	100.0	kW	☐
Discharge Ramp Rate Down		kW/s	Time Duration 1	30	Minutes	☐
Charge Ramp Rate Up		kW/s	Battery Charge Delay Time 1	1	Minutes	☐
Charge Ramp Rate Down		kW/s	On Peak Period 2	00:00	00:00	☐
Mode Transition Time		Seconds	Off Peak Period 2	00:00	00:00	☐
Mode Transition Timeout		Seconds	Target Power 2	0.0	kW	☐
Priority			Time Duration 2	0	Minutes	☐
Enable RTP DR	ON		Battery Charge Delay Time 2	0	Minutes	☐
Apply RTP DR Parameters	ON					

←

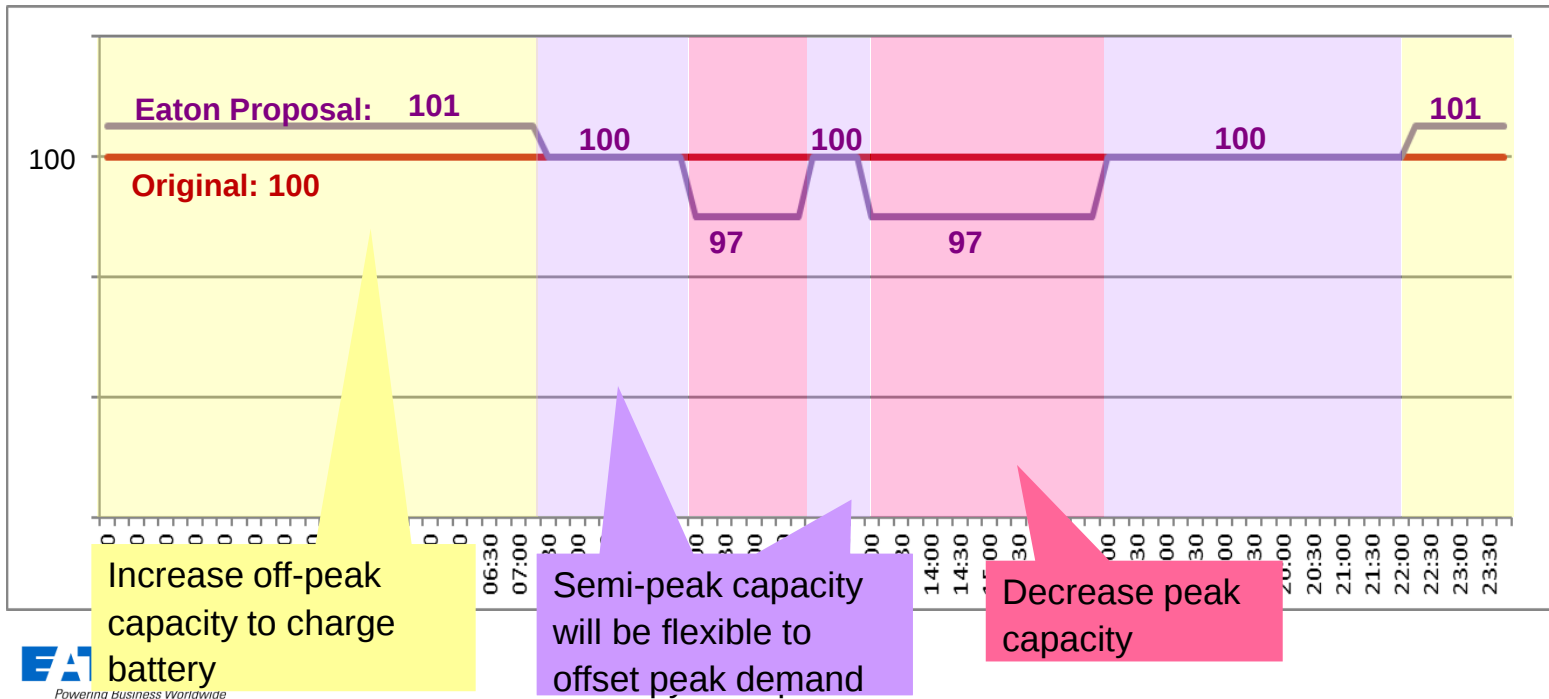
80 %

→

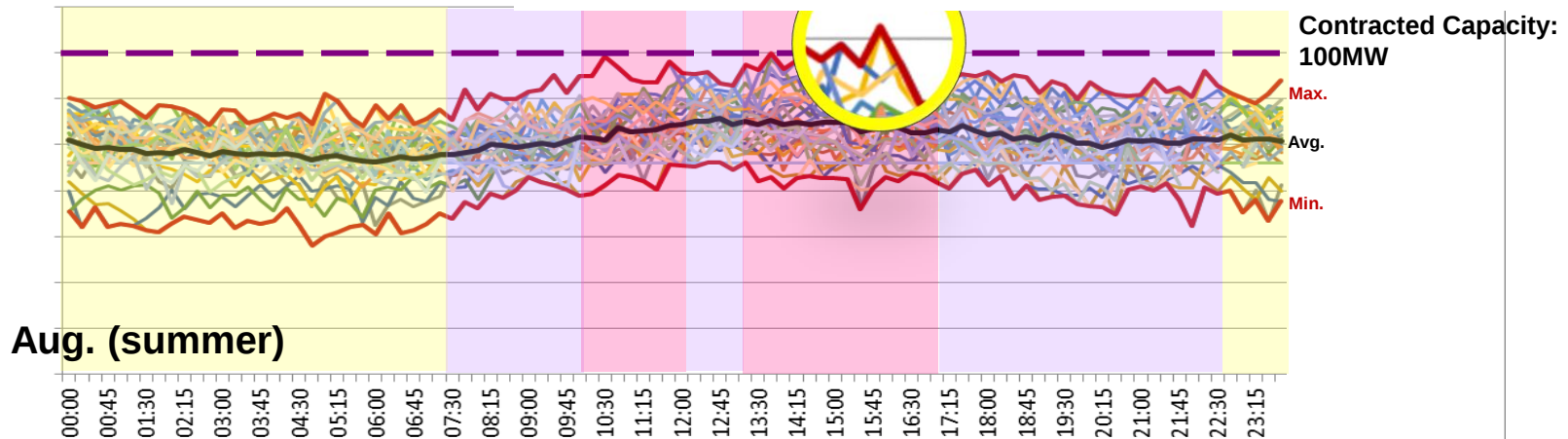
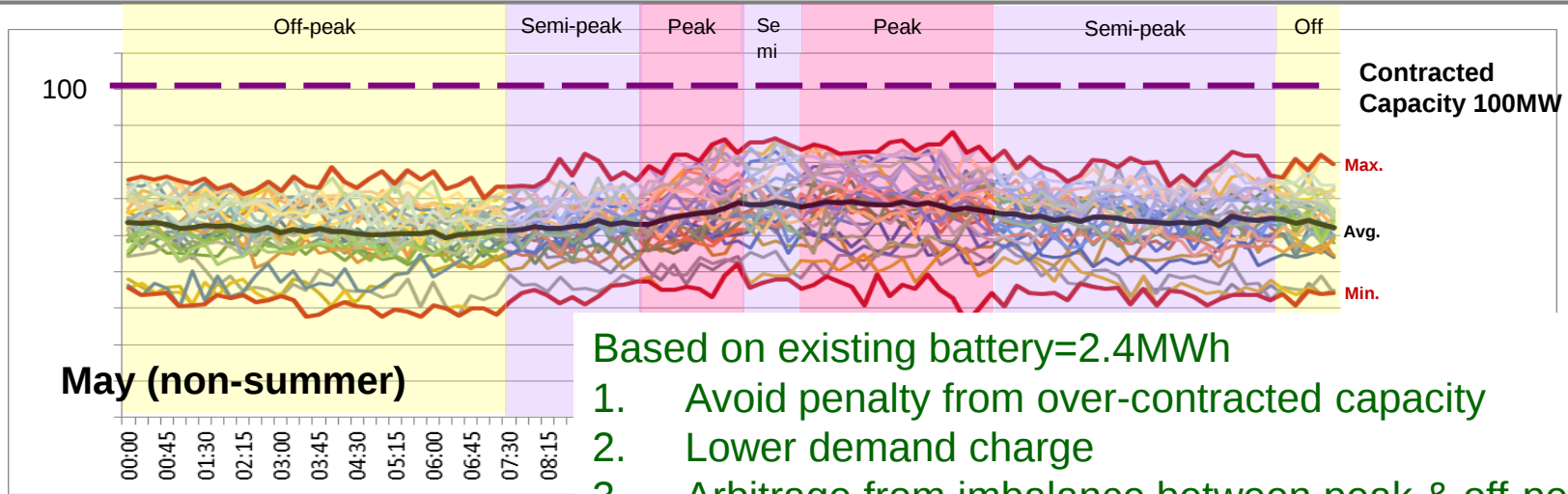
Real Case Study

Real Case Simulation: Lower Contracted Capacity

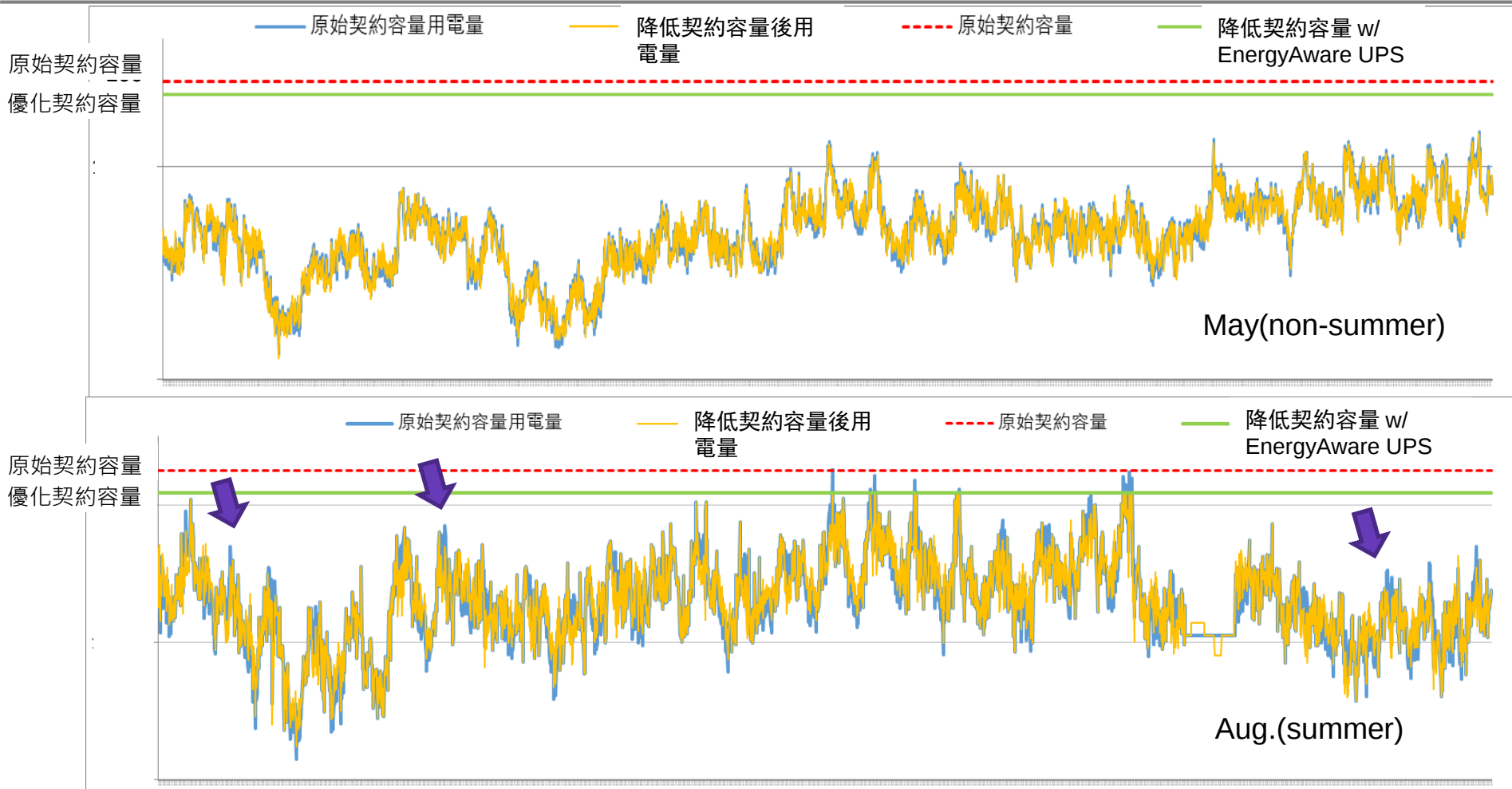
Contracted Capacity rate	Summer (NTD)	Non-summer (NTD)	Contracted Capacity (MW)	Proposal	Original
Peak	217.3	160.6	Peak	97	100
Semi-peak	160.6	160.6	Semi-peak	3	0
Off-peak	43.4	32.1	Off-peak	1	0



Real Case Simulation: Power Consumption (whole month data)

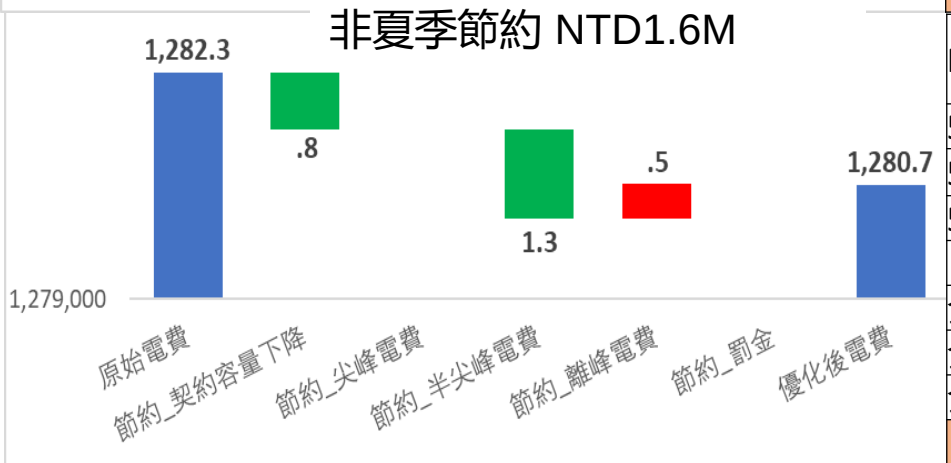
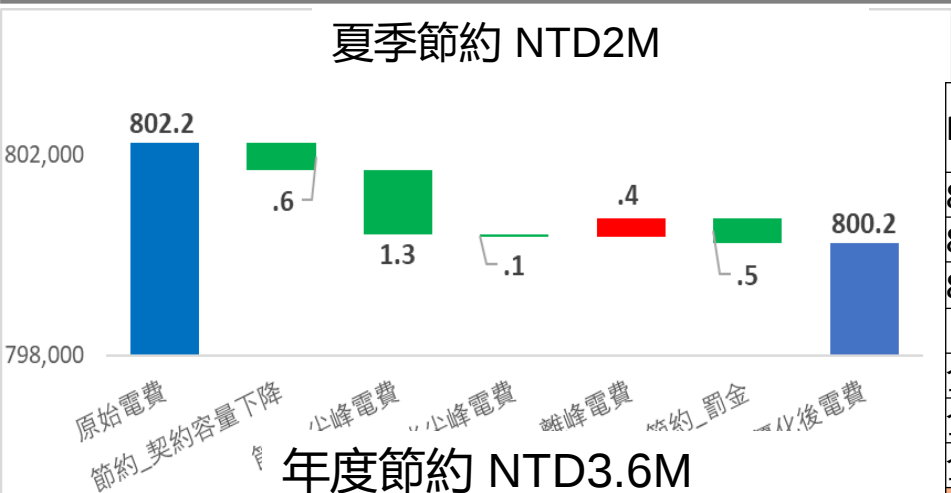


Real Case simulation: Optimize Contracted capacity (-640kW) w/ Bat'=2.4MWh



Annual Economic Benefit

Bat'=2.4MWh w/ 契約容量降低640kW



MNTD	原始用電量	使用EnergyAware 用電量	Saving
8月_流動電費	177	177	
8月_罰款			
8月_基本電費	23	23	
	201	200	
全部夏季流動	708	707	1
全部夏季罰款			
全部夏季基本電費	94	93	1
802			800
			2

MNTD	原始契約容 量	契約容量105800 用電量	Saving
5月_流動電費	143	143	
5月_罰款			
5月_基本電費	17	17	
	160	160	
全部非夏季流動	1,144	1,143	1
全部非夏季罰款			
全部非夏季基本電費	139	138	1
1,282			1,281
			1.6

Eaton is the leading the way in this innovative technology

Data Center Dynamics 2018 Global Award for Mission Critical Innovation



“Microsoft wants to put our assets to work ‘round the clock.”
- Brandon Middaugh, Senior Project Manager, Distributed Energy, Microsoft

Eaton & Microsoft: Turning tried-and-true UPS technology into a value generating asset

台灣再生能源發展條例2019修改版

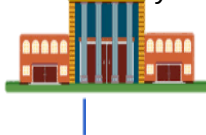
第 12 條 政府機關（構）、公立學校或公營事業於新建、增建、改建公共工程或公有建築物時，其工程條件符合再生能源設置條件者，應優先裝置再生能源發電設備。



Green Energy
Subscription



Substation
Monetary



契約容量
>5000kW

前項所稱工程條件符合再生能源設置條件者，由中央主管機關會同中央目的事業主管機關定之。

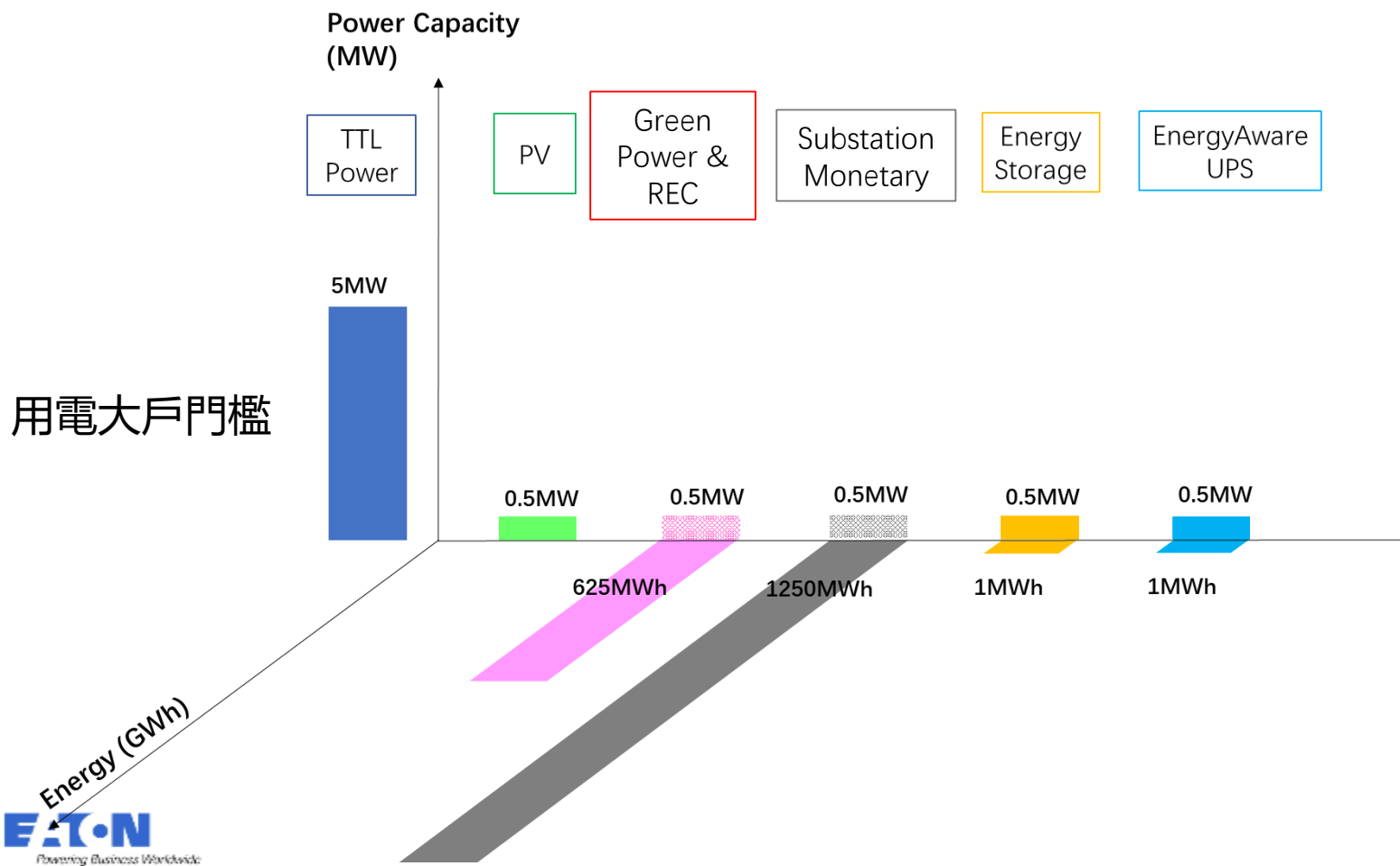
電力用戶所簽訂之用電契約，其契約容量在一定容量以上者，應於用電場所或適當場所，自行或提供場所設置一定裝置容量以上之再生能源發電設備、儲能設備或購買一定額度之再生能源電力及憑證，並依前開規定辦理者，應向主管機關繳納代金，專作再生能源發展之用。

≥10%
裝置容量

前項契約容量、一定裝置容量、一定額度、設置再生能源發電設備之種類、儲能設備之類別、代金之繳納與計算方式、辦理期程及其他相關事項之辦法，由中央主管機關定之。

為符合地方發展特性及規劃，地方政府得訂定並辦理較前項所稱之辦法更加嚴格之自治法規。

用電大戶條款圖解



Thanks for your Attention.