Eaton:
EnergyAware UPS (Dual Purpose UPS)

20200623/Abby Lin

AbbyLin1@eaton.com

0266142117

Powering Business Worldwide

Powering Business Worldwide

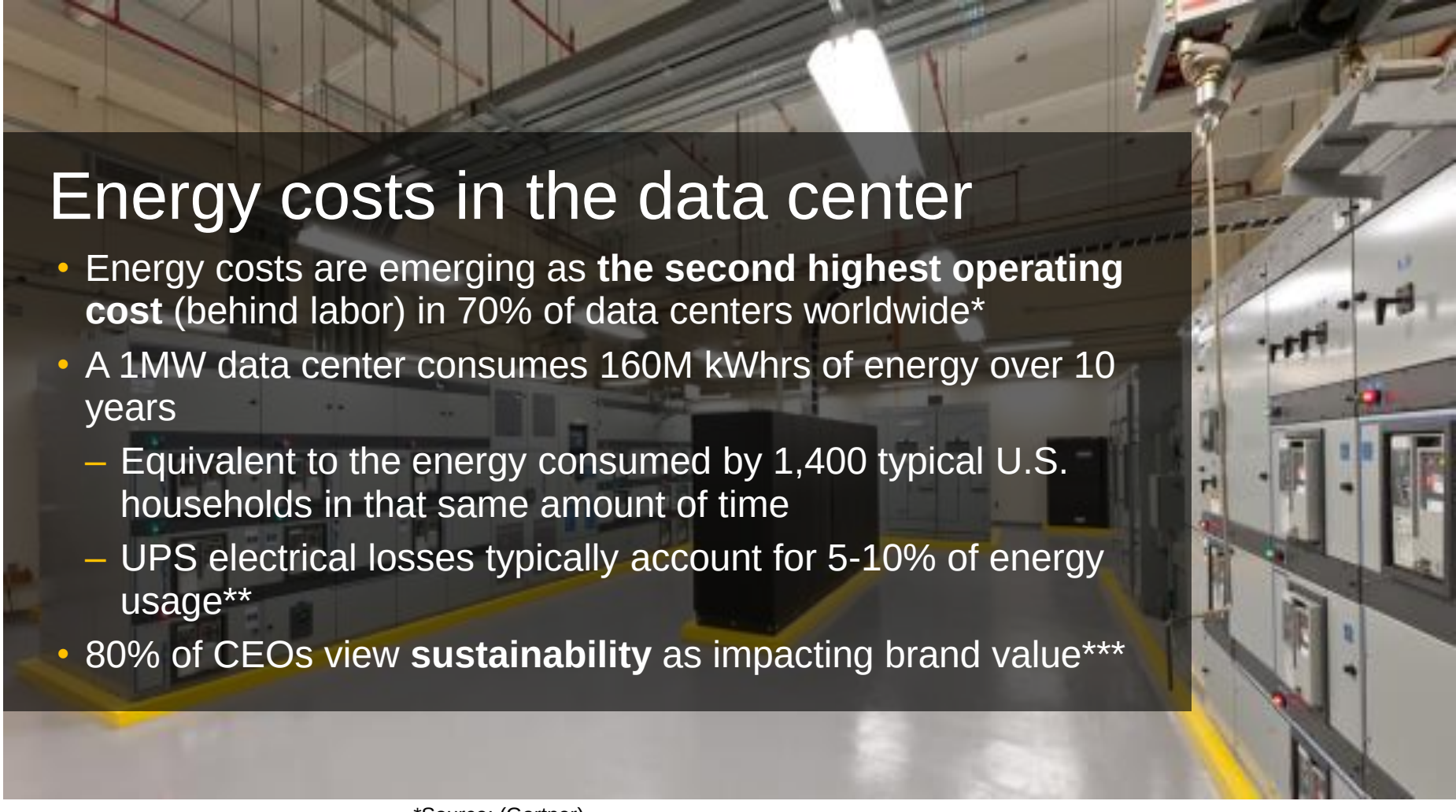
What else can a UPS do?

Providing true energy management technology that is reliable and efficient.

Powering Business Worldwide

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

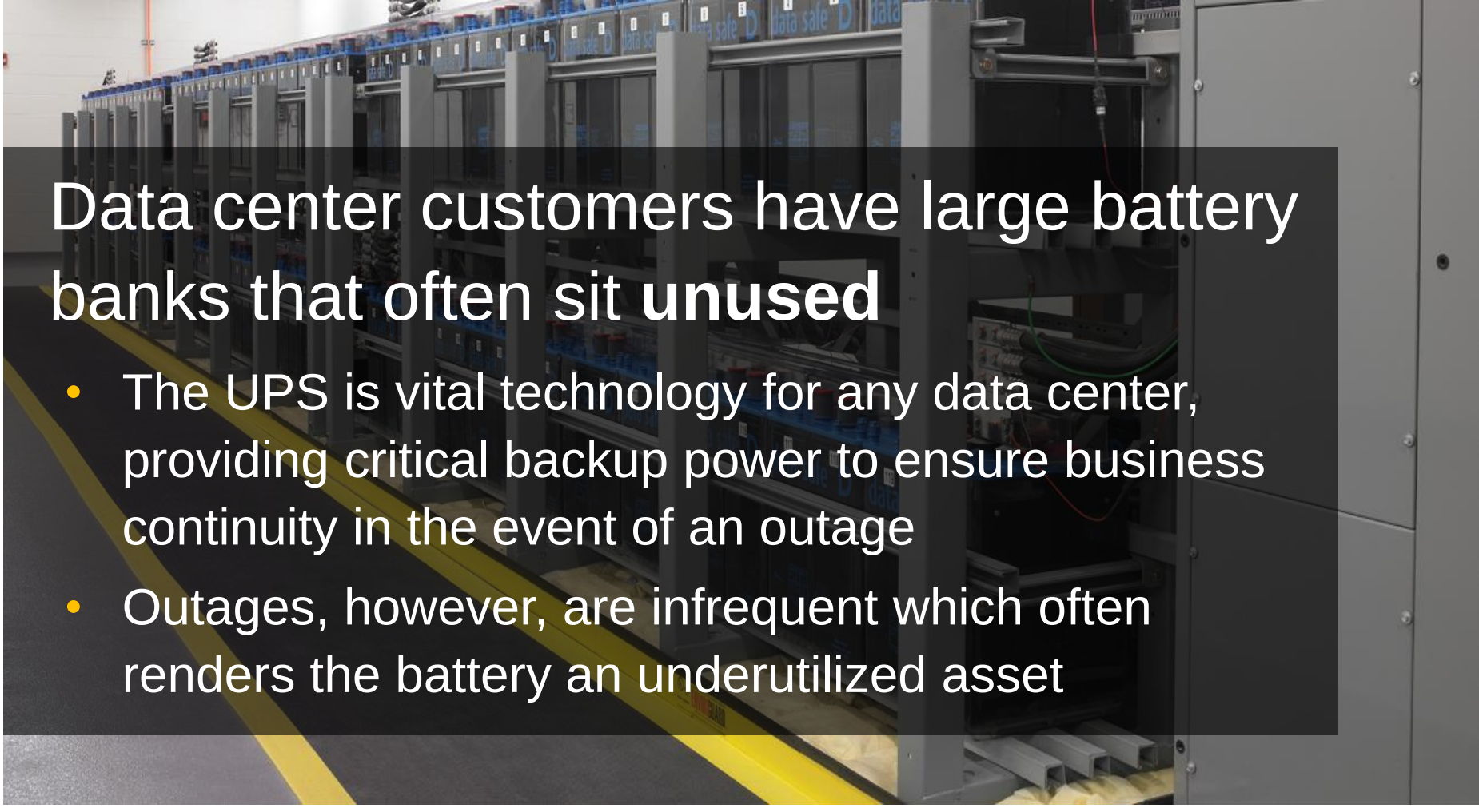
- Energy costs are emerging as **the second highest operating cost** (behind labor) in 70% of data centers worldwide*
- A 1MW data center consumes 160M kWhrs of energy over 10 years
  - Equivalent to the energy consumed by 1,400 typical U.S. households in that same amount of time
  - UPS electrical losses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

Powering Business Worldwide



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

Powering Business Worldwide

Energy Storage Services

Basic UPS Function
- Backup Power

- Demand Charge Management
- Time of Use Rate Management

Potential additional Services (Future Phase)
- Frequency Regulation

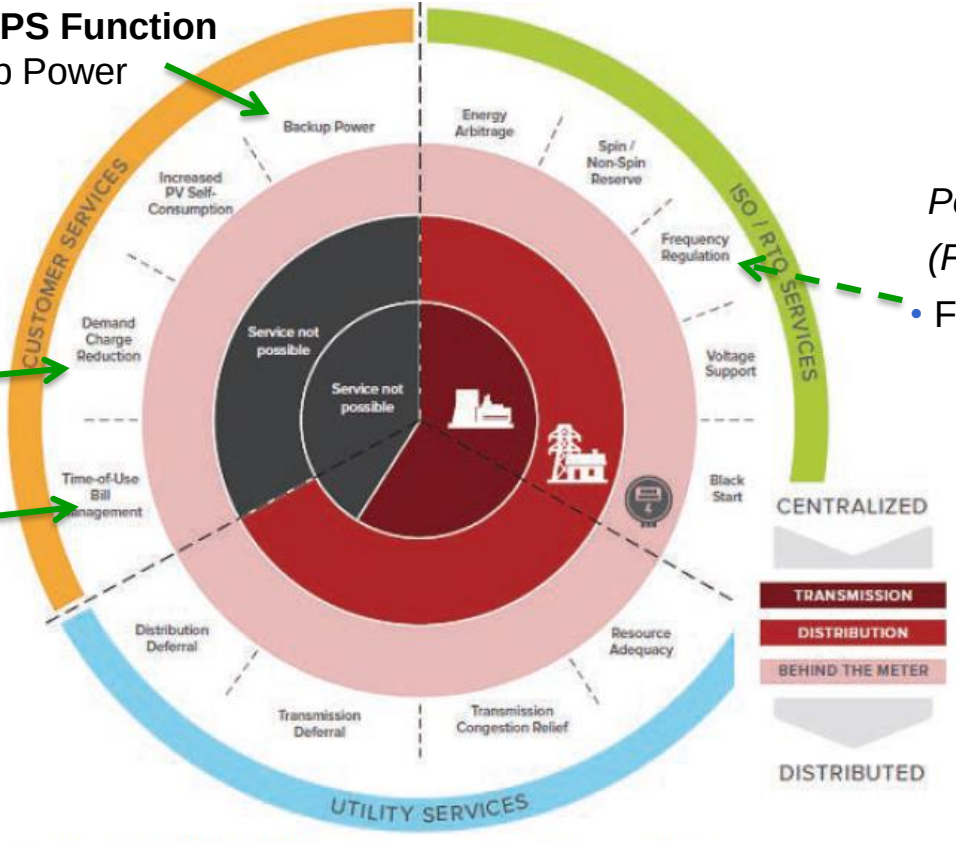


Figure 10. Microgrid services (RMI 2015).

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

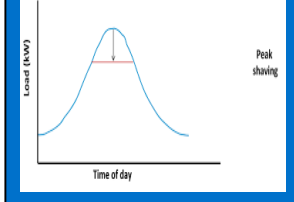
Powering Business Worldwide

+

Tomorrow

Energy & Grid Aware Solutions

Smart Energy Consumption



Peak shaving; TOU

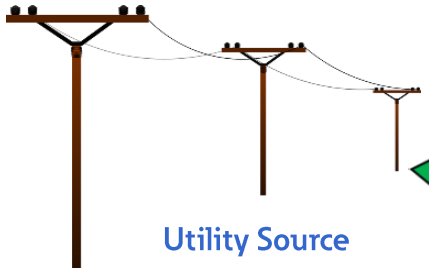
Revenue Generation

Frequency Regulation

Green Contribution

Generator Replacement

EnergyAware UPS (Dual Purpose UPS) System components



Utility Source

EnergyAware UPS

Critical Load

Controller & Software engineering

Lithium batteries

Power Meter

Inputs:

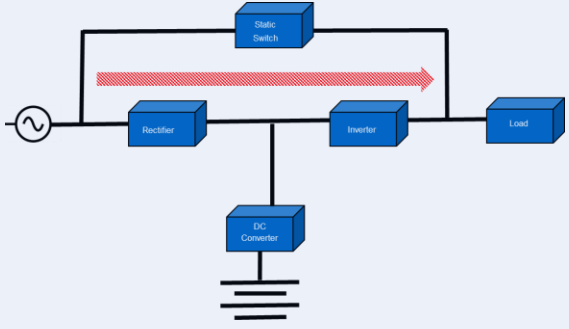
- Min UPS Backup Time
- Peak Pricing/Limits
- Time of use Rates
- Demand Charges
- Freq Reg Signal

Power

Information

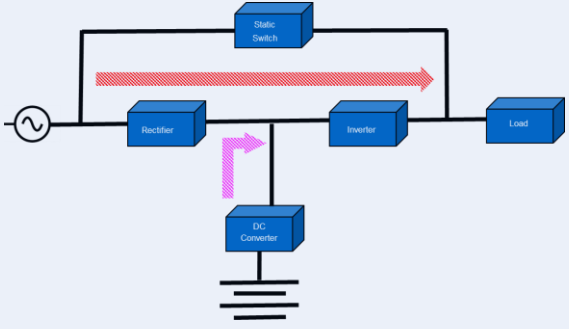
Operating modes:
(in terms of Energy Storage)

UPS Mode



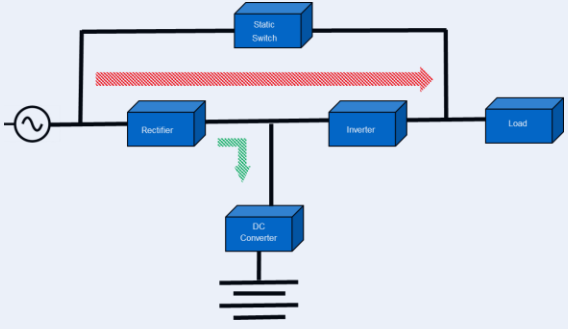
- ✓ **UPS supporting load**
- ✓ **Battery fully charged**
- ✓ **Static switch off**

UPS Mode + Peak shaving + Load shifting operation



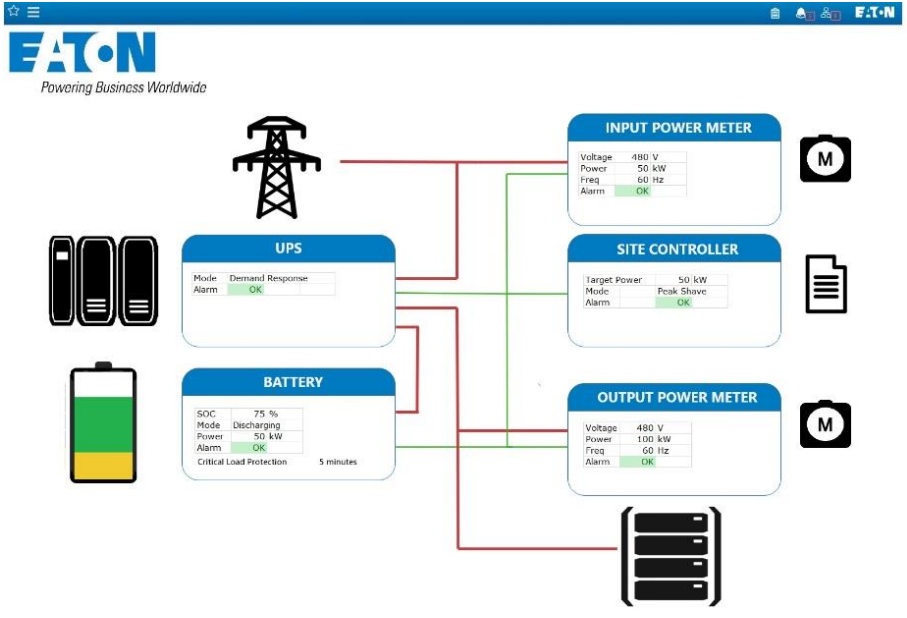
- ✓ **UPS still supporting load**
- ✓ **Battery discharged to reduce utility demand**
  (provide partial power to load)

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

Peak Shaving

Figure 16. RTP DR Configuration Operational HMI Example

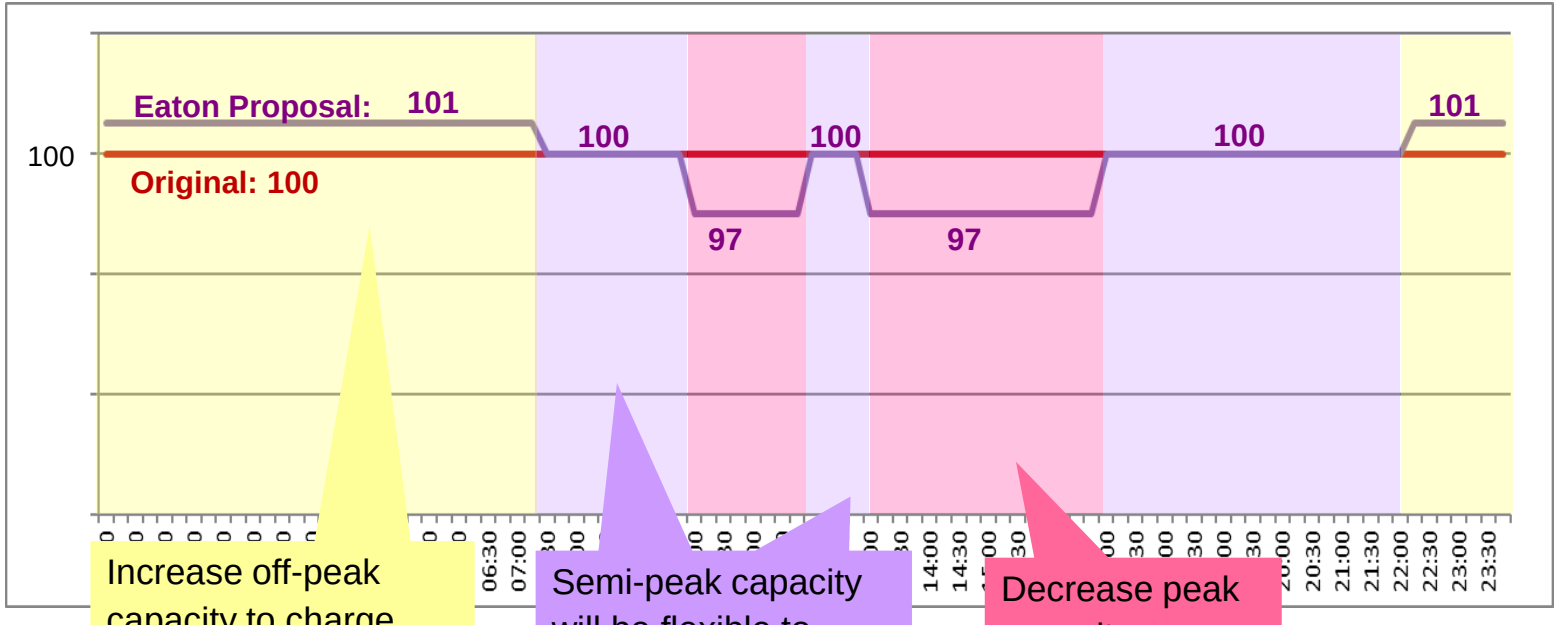
Real Case Study

Powering Business Worldwide

Real Case Simulation: Lower Contracted Capacity

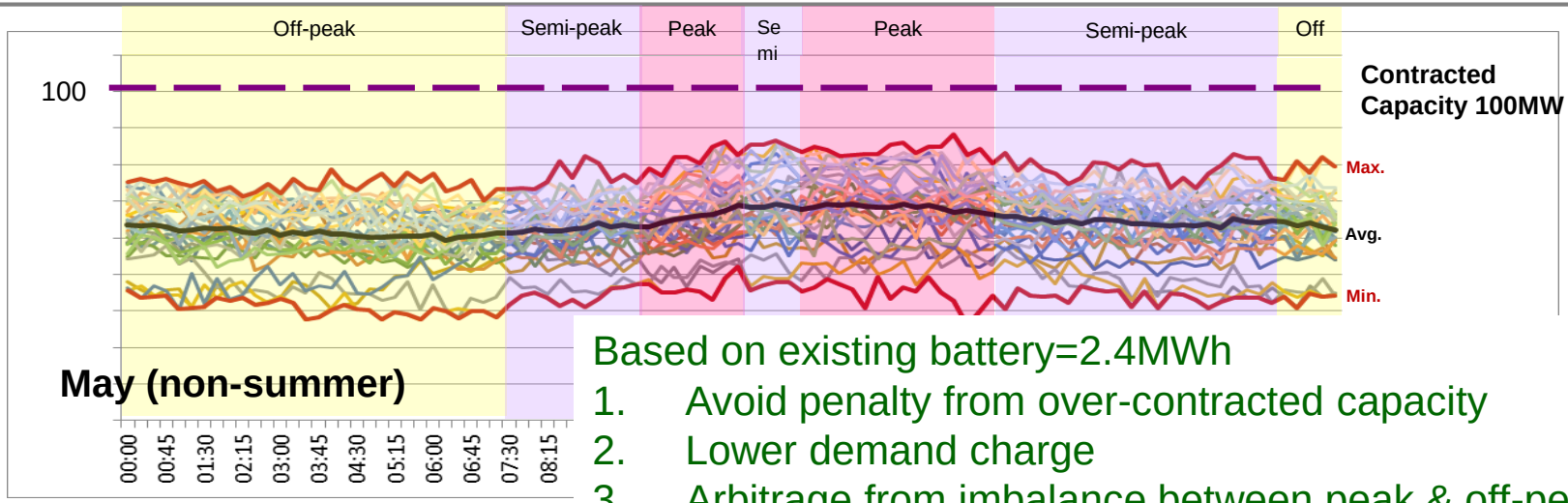
Contracted Capacity rate	Summer (NTD)	Non-summer (NTD)
Peak	217.3	160.6
Semi-peak	160.6	160.6
Off-peak	43.4	32.1

Contracted Capacity (MW)	Proposal	Original
Peak	97	100
Semi-peak	3	0
Off-peak	1	0



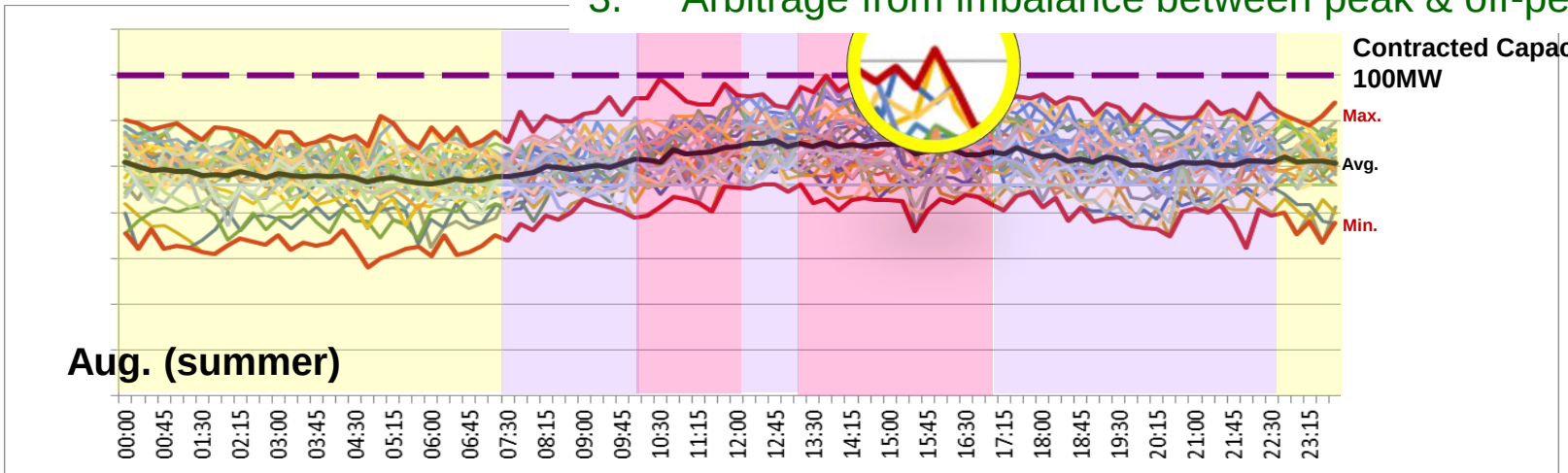
Powering Business Worldwide

Real Case Simulation:
Power Consumption (whole month data)

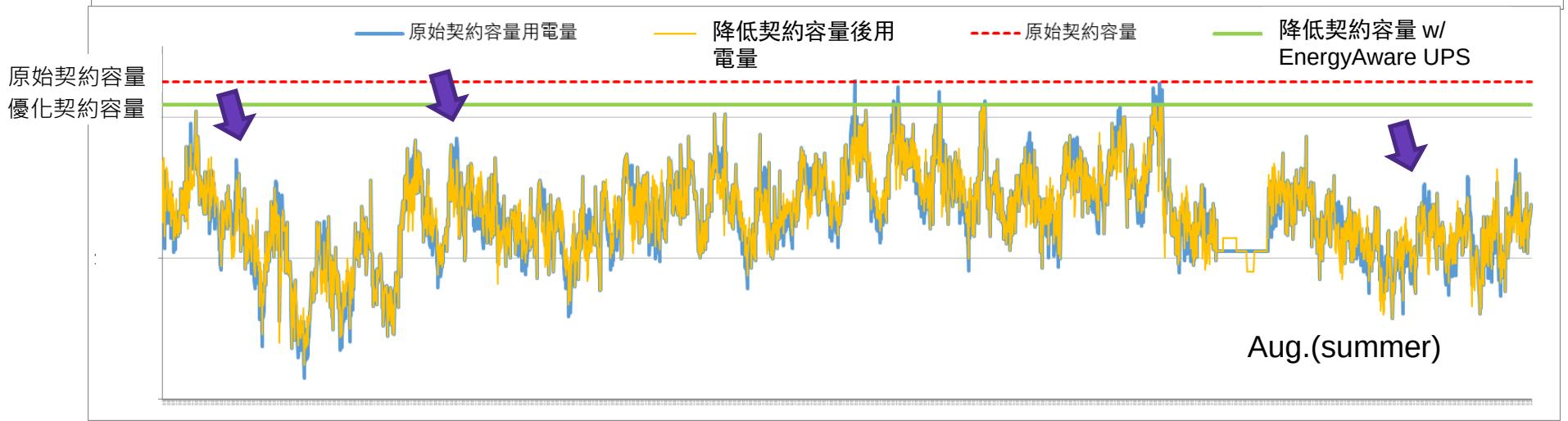


Based on existing battery=2.4MWh

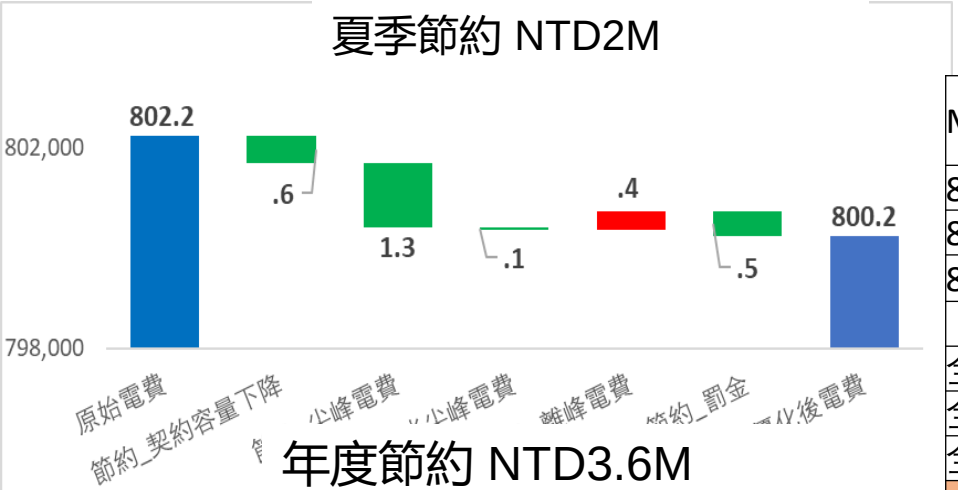
1. Avoid penalty from over-contracted capacity
2. Lower demand charge
3. Arbitrage from imbalance between peak & off-peak rates



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

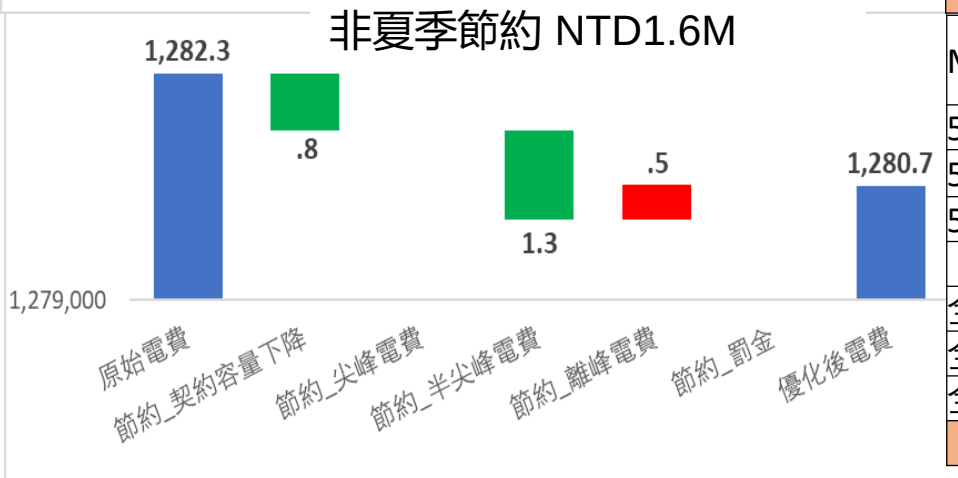


Annual Economic Benefit
Bat'=2.4MWh w/ 契約容量降低640kW



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**

年度節約 NTD3.6M



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

PV

ESS

Green Energy Subscription

Substation Monetary

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。

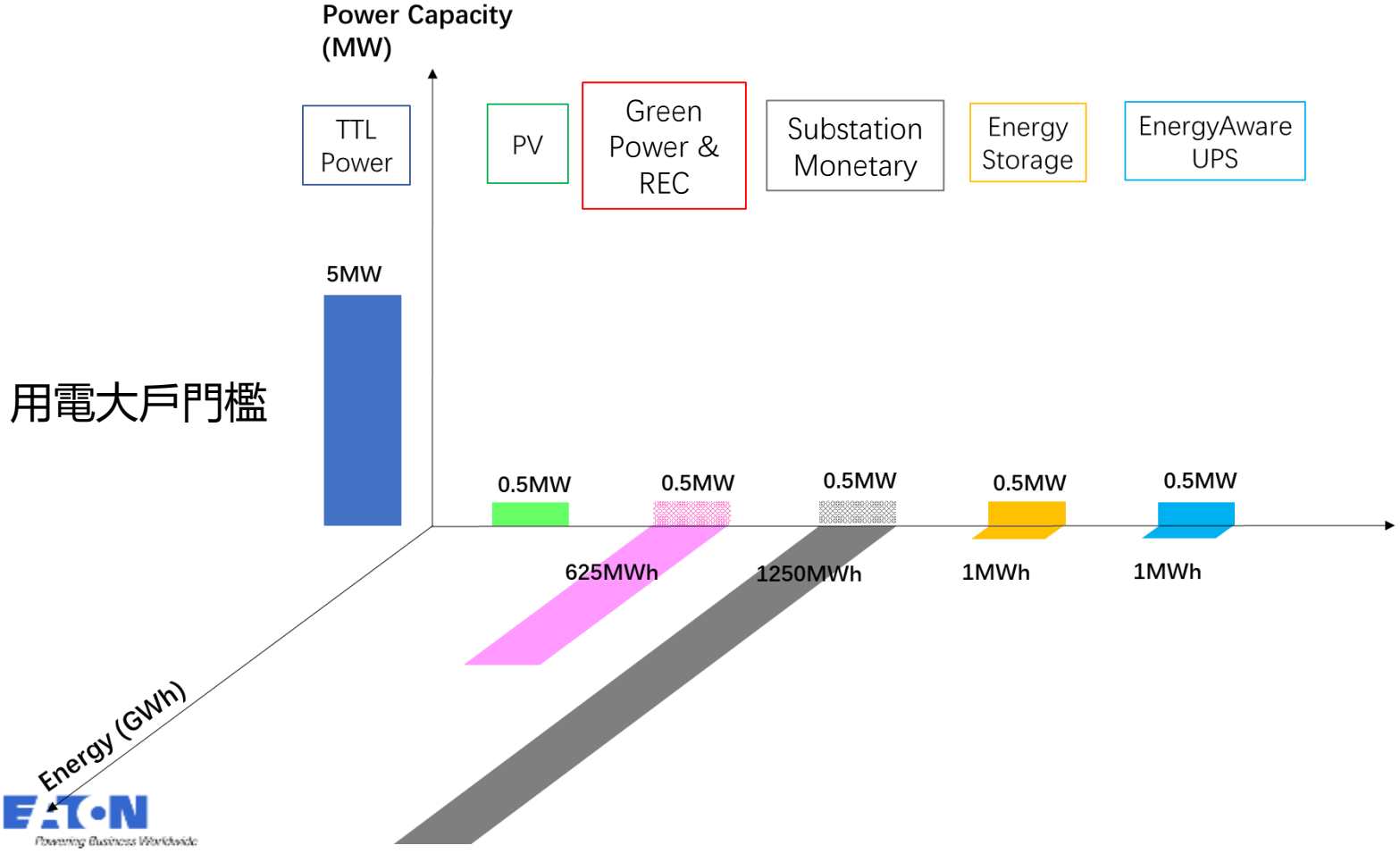
前項所稱工程條件[契約容量 >5000kW]件者，由中央主管機關會同中央目的事業主管機關定之。

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，[≥10% 裝置容量]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。

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或儲能設備之種類、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


Power Capacity (MW)
TTL Power
PV
Green Power & REC
Substation Monetary
Energy Storage
EnergyAware UPS
5MW
用電大戶門檻
0.5MW
0.5MW
0.5MW
0.5MW
0.5MW
625MWh
1250MWh
1MWh
1MWh
Energy (GWh)

Thanks for your Attention.