How Edge Computing is Changing UPS and Battery Design Criteria

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Traditional Focus

- Highly centralized
- More is better
  - High density
  - Long runtimes, big battery banks
  - Generators
  - Big spaces
  - Keep it cool
  - The more redundancy the better
  - 24/7 in-person oversight

Edge Focus

- Distributed, close to users
- Space utilization is key
  - Don’t have the same footprint available as you would when building a traditional datacenter
  - Where is it?
  - Real estate available?
- Need to start making choices:
  - How much power is really needed?
    - Still plan for growth or right-size from the start?
  - Rack space
    - Server choices matter

Edge Focus

- Once you have your power requirements and rack needs, what do you do with the remaining space?
- Cooling
  - Traditional methods still work?
  - Can installed equipment allow for wider operational temperature range?
- Generator
    - What do you really need for battery runtime?

Edge Focus

- Power Back-up
  - Can you still get any redundancy?
  - Traditionally, you would need space for two complete UPS systems to have redundancy available

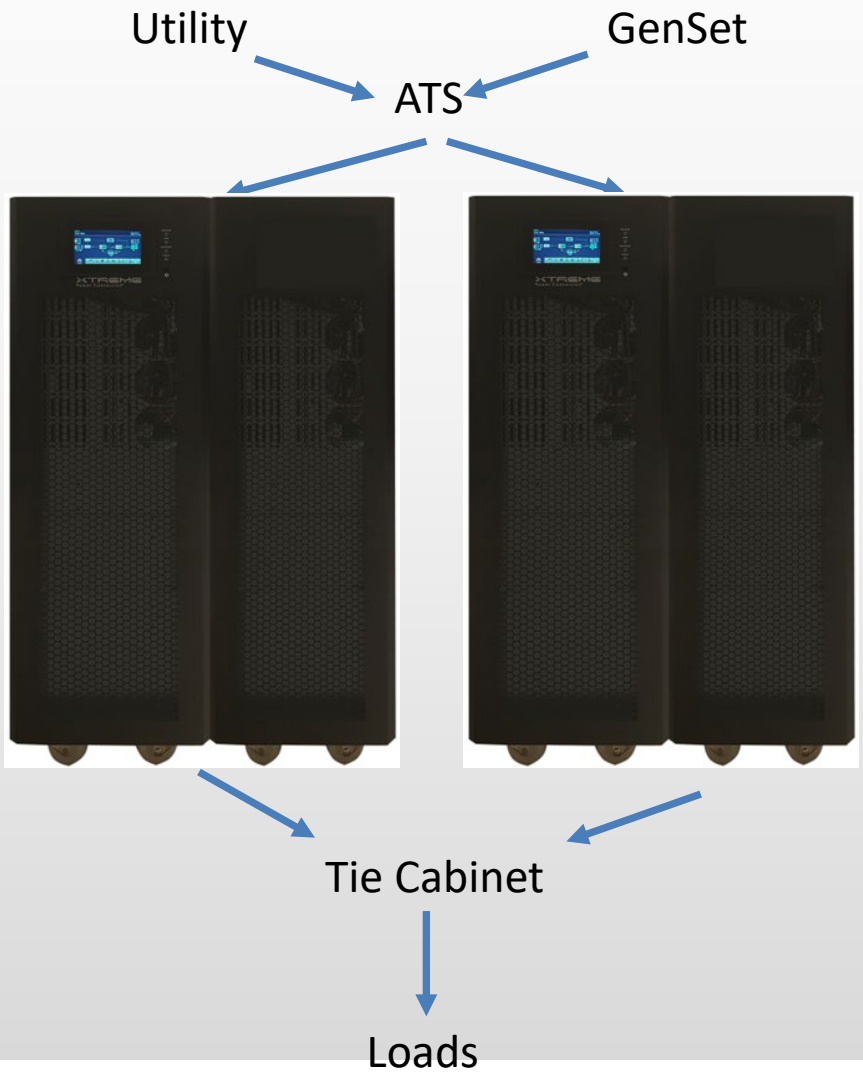
Traditional Tier System

Tier 1

Basic protection level

- Single UPS
- Single distribution path

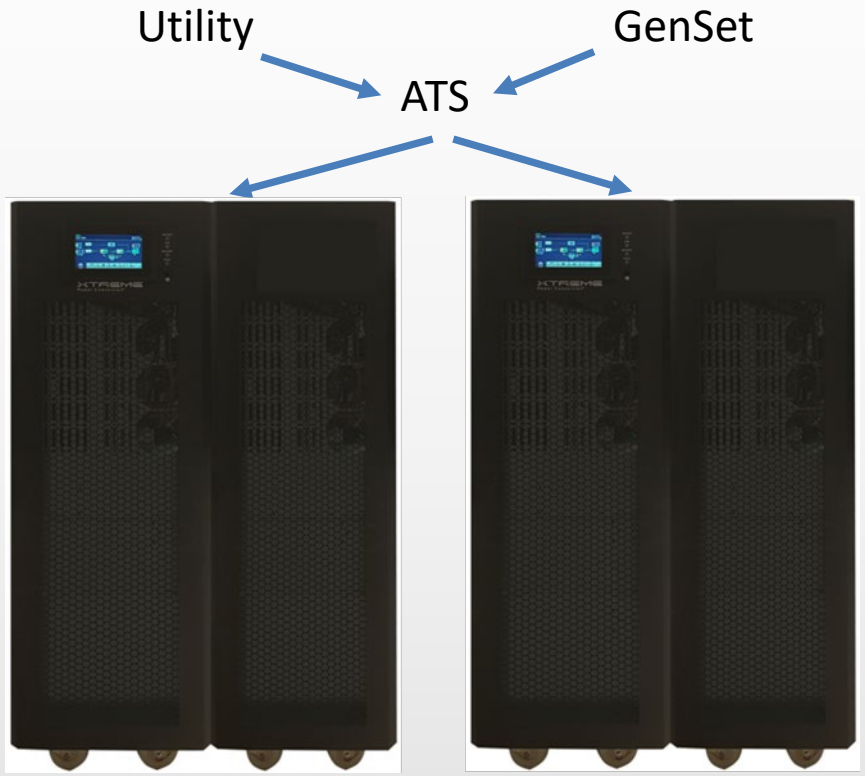
Tier 2



Next level protection

- Adds redundant UPS
- Twice the space needed for
- Tie Cabinet?

Tier 3

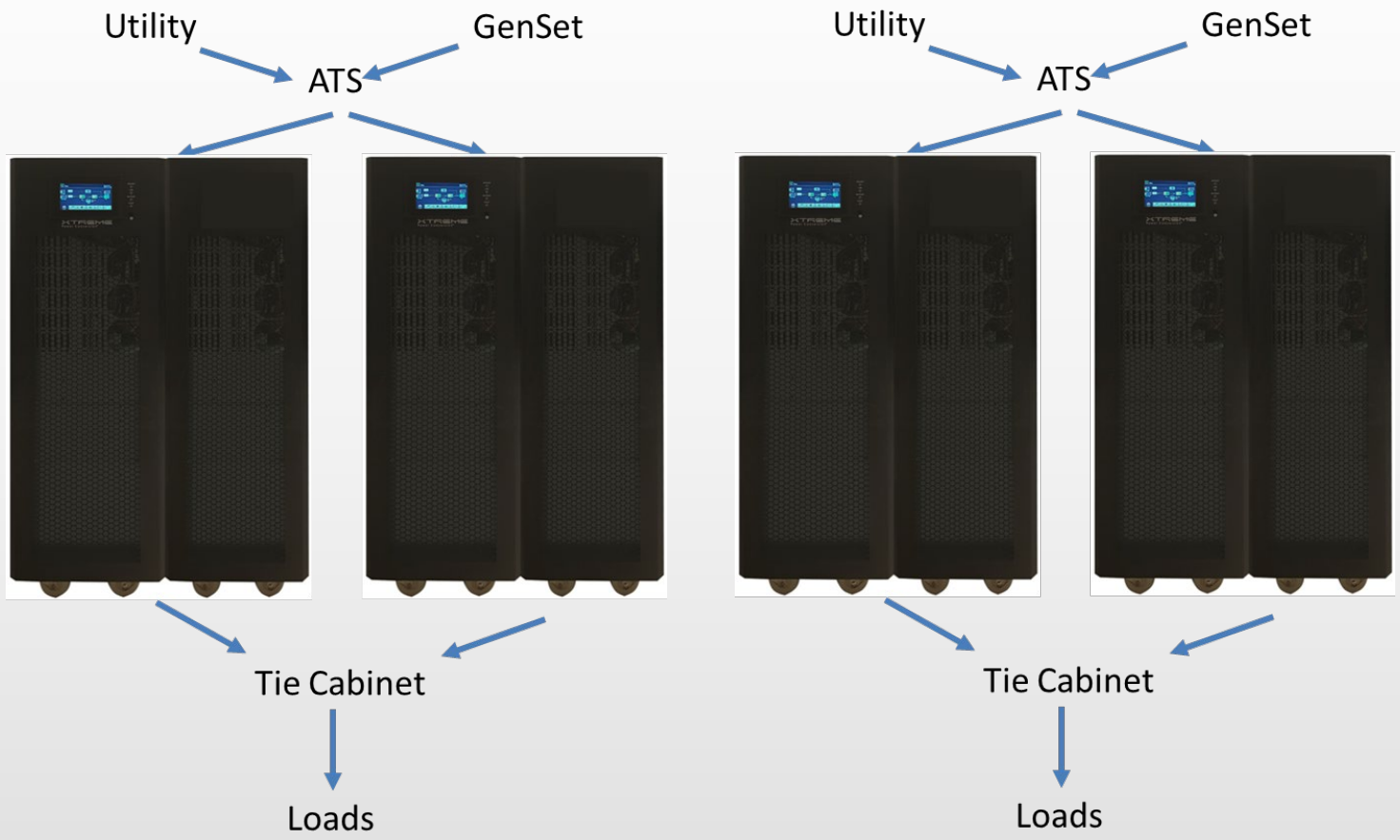


Utility

Next level protection

- Redundant UPS in path one.
- Second path utility direct.
- Add static switch box

Tier 4

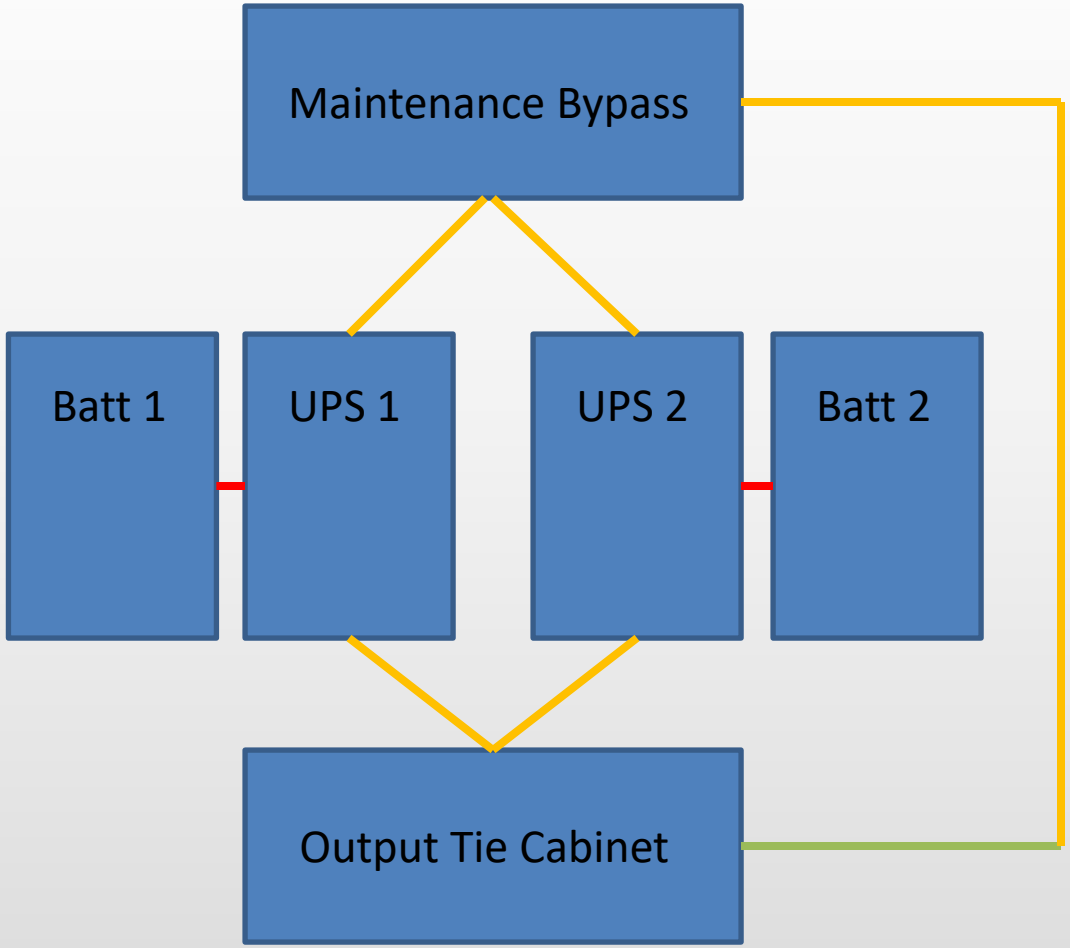


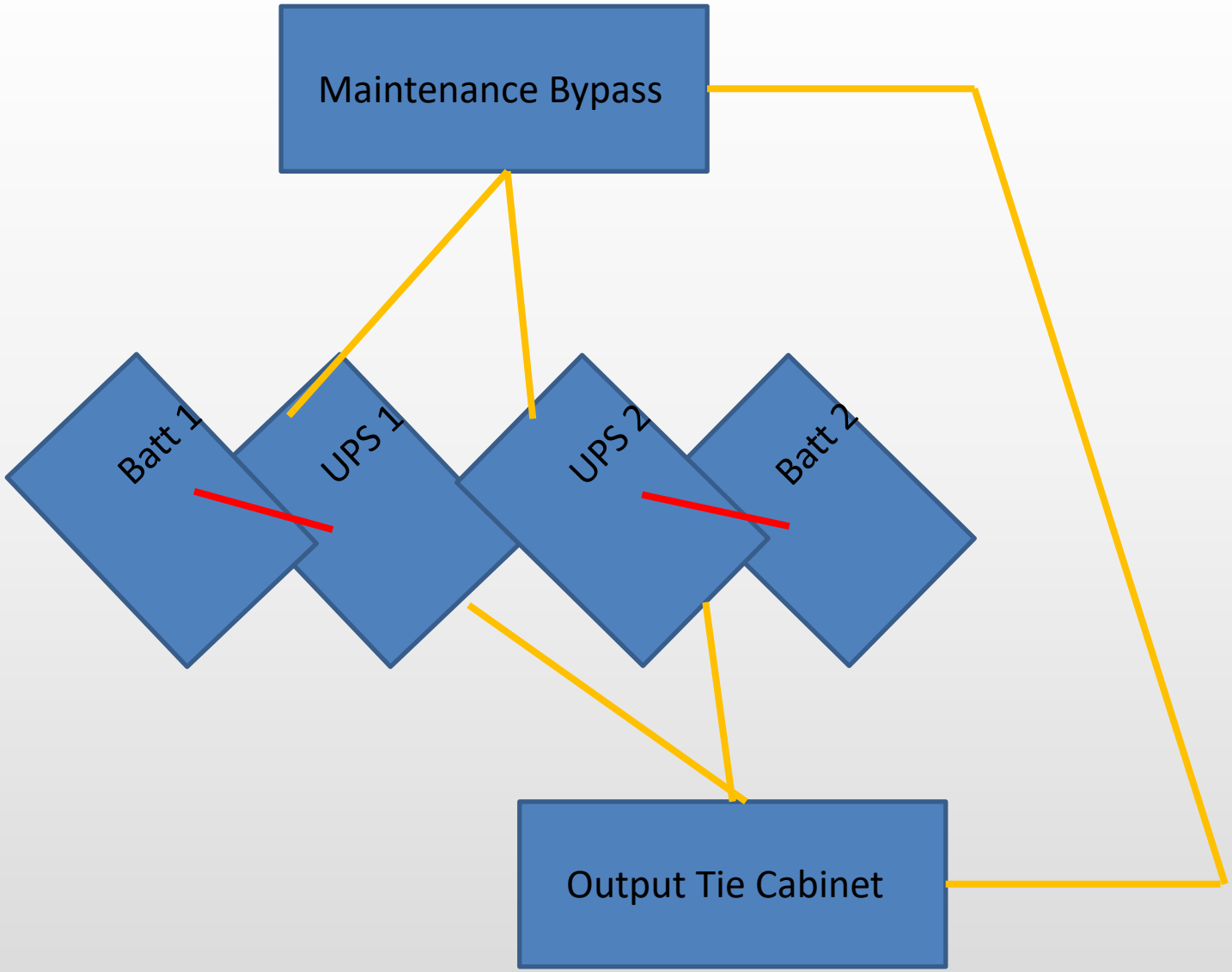
Next level protection

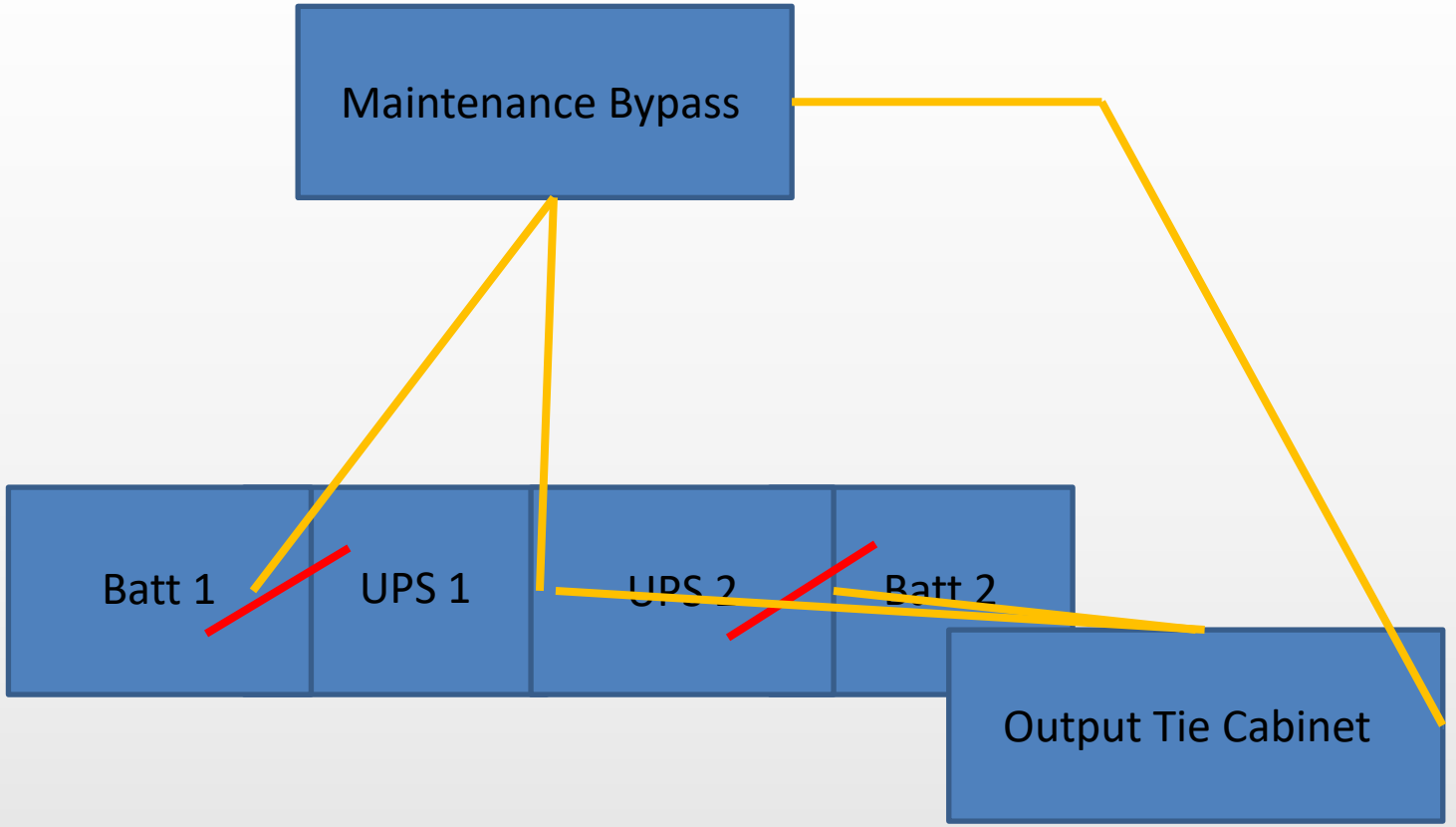
- Adds redundant UPS to second distribution path; I.e. a Tier two in both A & B paths

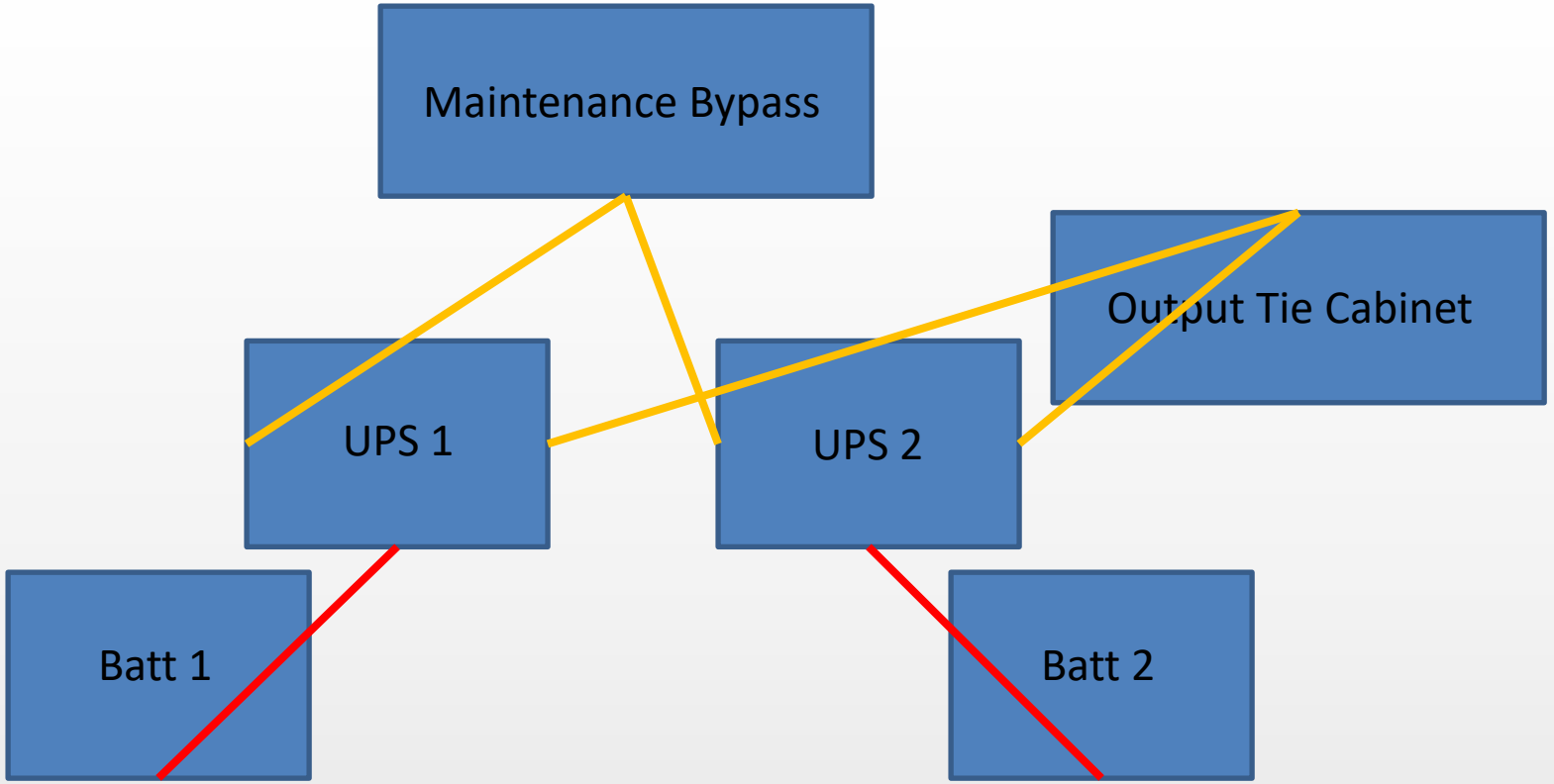
Edge Focus

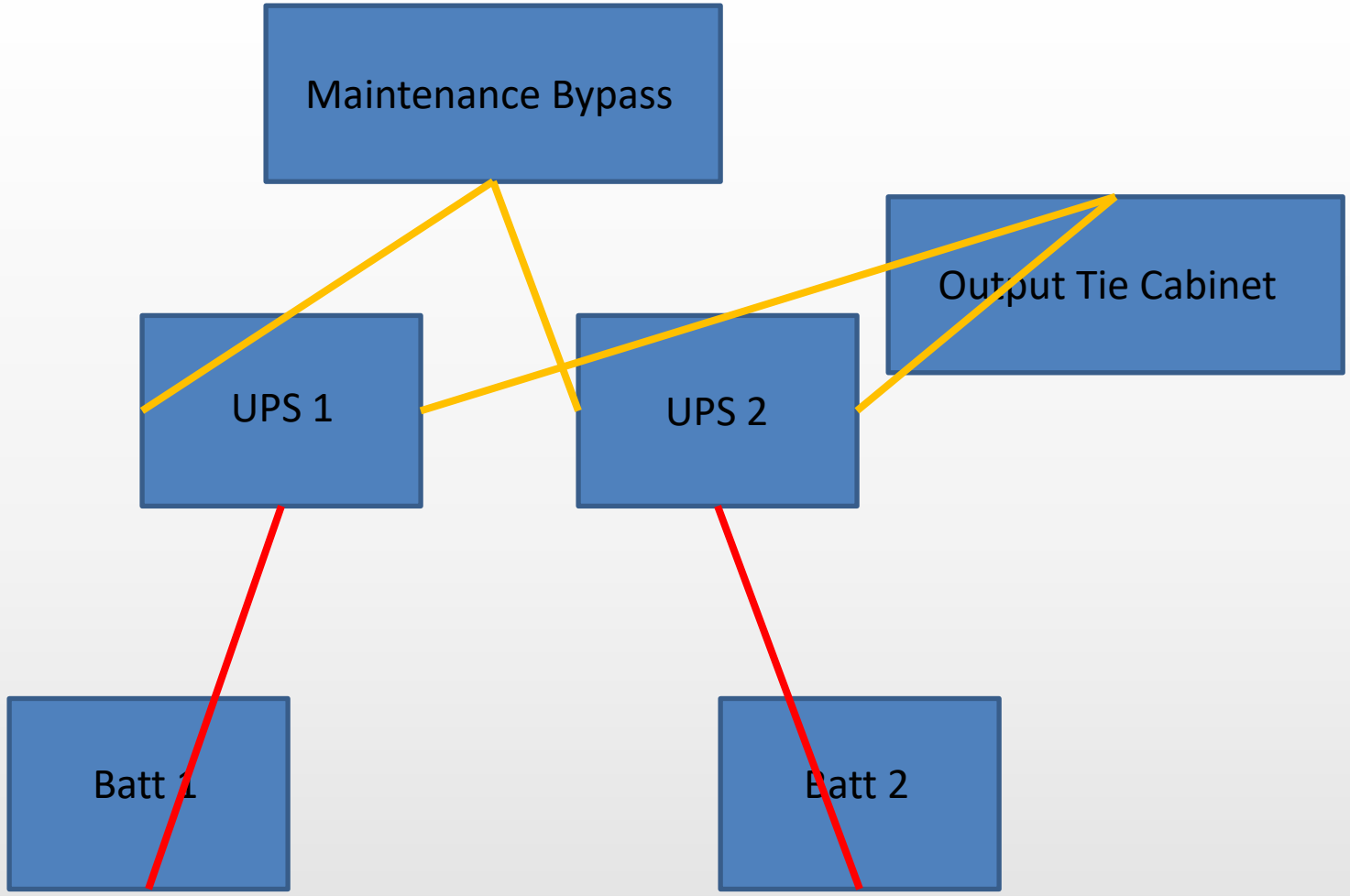
- However, with today's modular designs you don't have to give up hope of redundant resiliency:

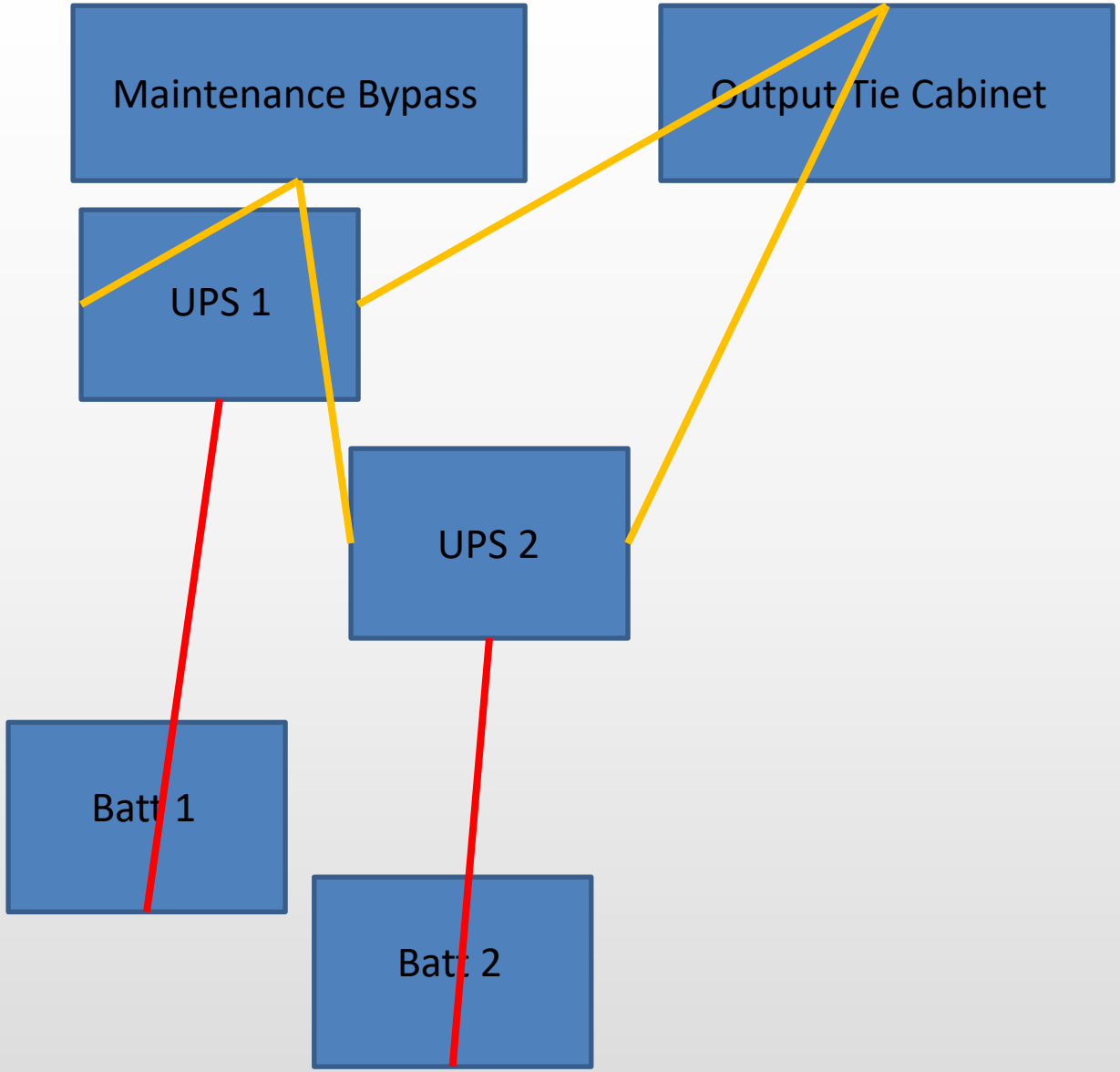

Maintenance Bypass
Batt 1
UPS 1
UPS 2
Batt 2
Output Tie Cabinet

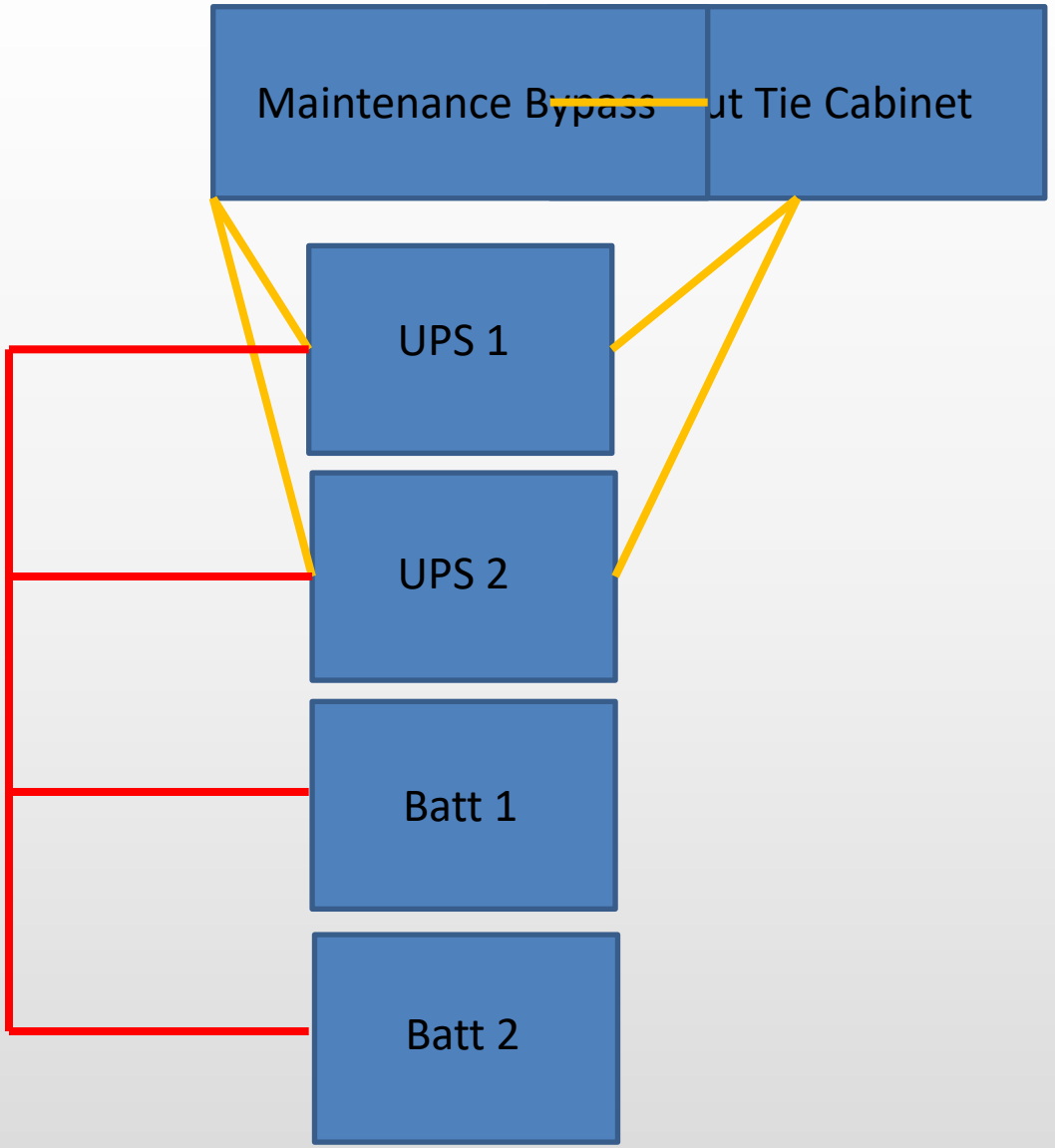

Maintenance Bypass
Batt 1
UPS 1
UPS 2
Batt 2
Output Tie Cabinet

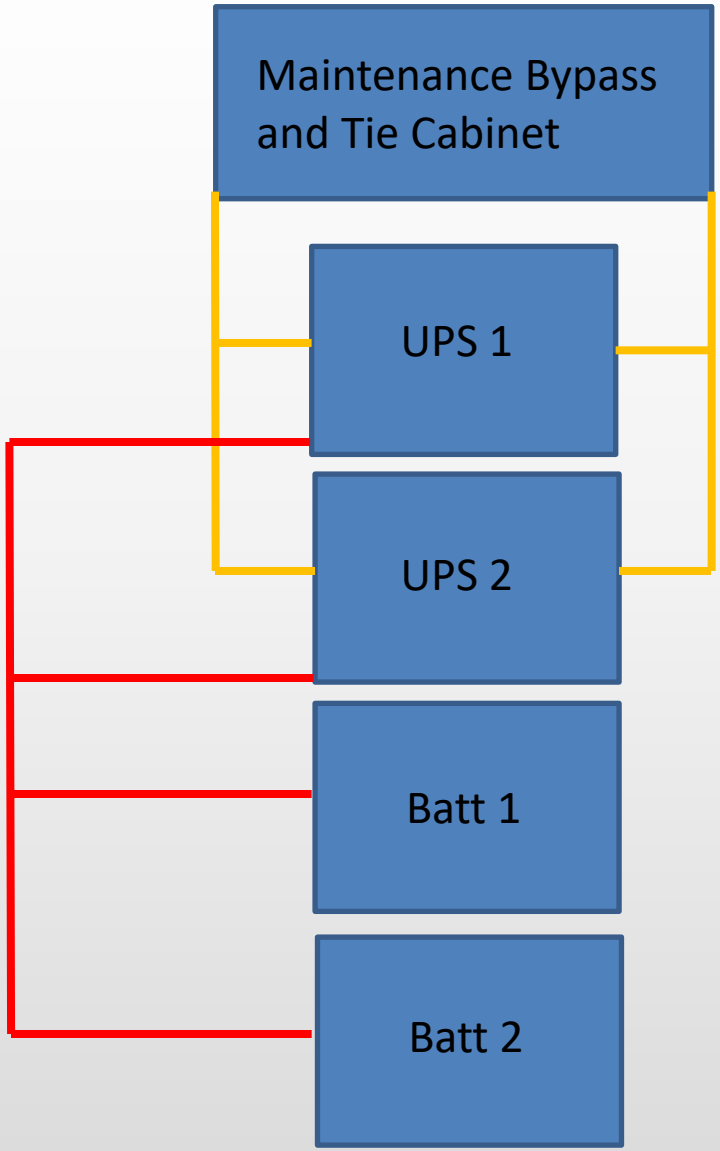

Maintenance Bypass
Batt 1
UPS 1
UPS 2
Batt 2
Output Tie Cabinet

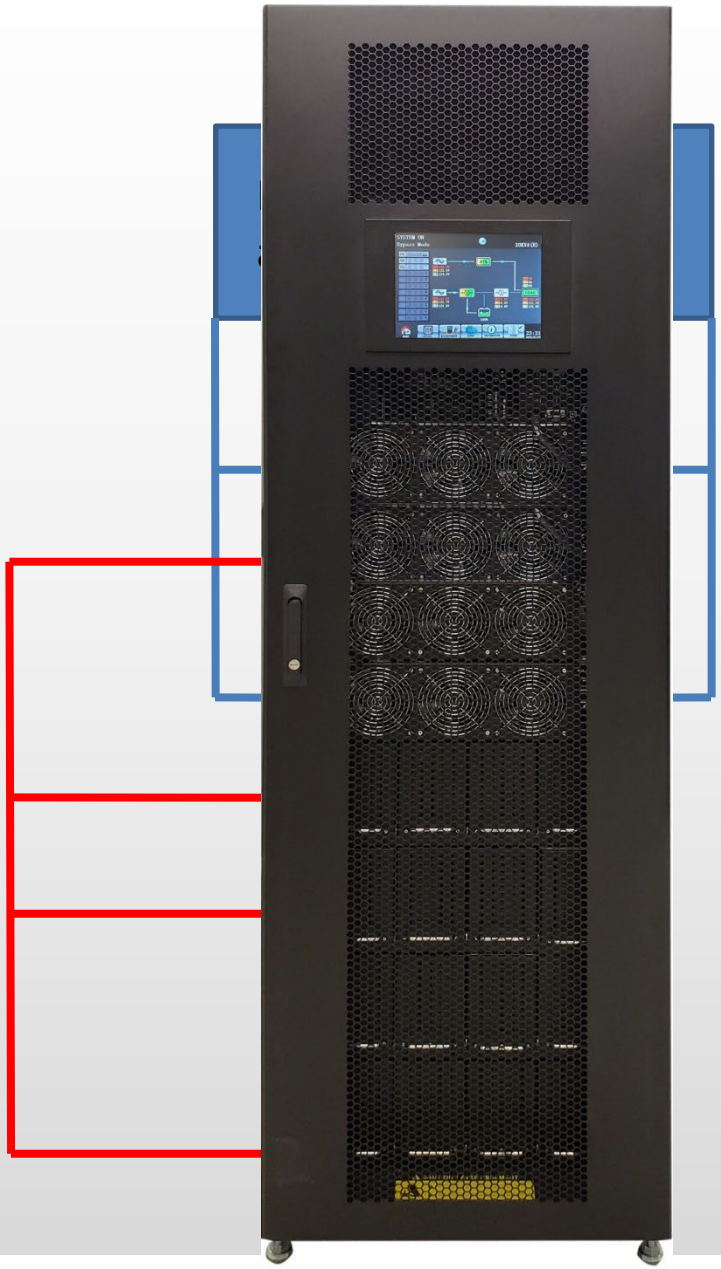

Maintenance Bypass
Output Tie Cabinet
UPS 1
UPS 2
Batt 1
Batt 2


Maintenance Bypass
Output Tie Cabinet
UPS 1
UPS 2
Batt 1
Batt 2


Maintenance Bypass
Output Tie Cabinet
UPS 1
UPS 2
Batt 1
Batt 2


Maintenance Bypass
ut Tie Cabinet
UPS 1
UPS 2
Batt 1
Batt 2


Maintenance Bypass and Tie Cabinet
UPS 1
UPS 2
Batt 1
Batt 2



XTREME Power Conversion®

Today UPS can include:

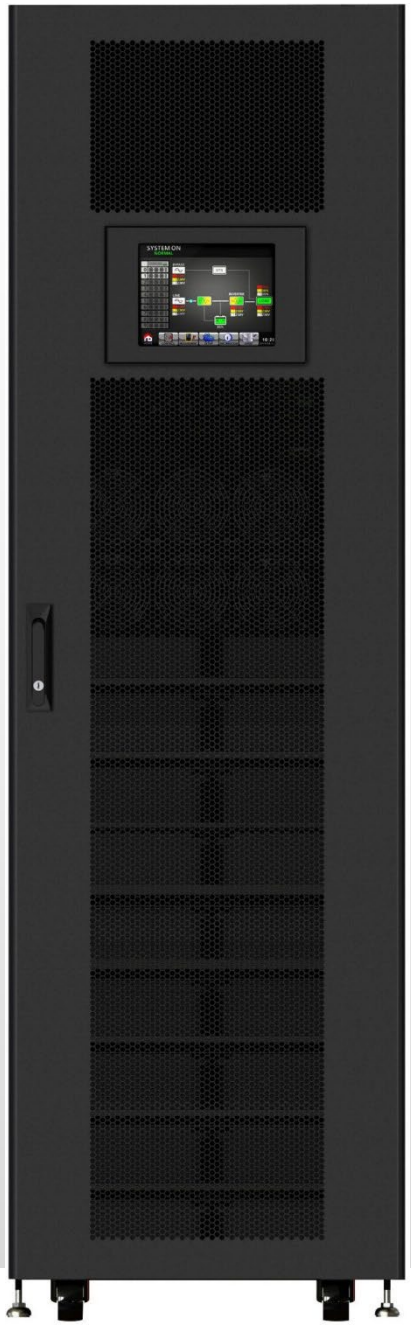
- Rectifier
- Inverter
- Static Bypass
- Internal Batteries
- Internal Maintenance Bypass

All in a 24” wide cabinet!

X-TREME Power Conversion®

Today’s UPS capabilities:

- Can add another module for redundancy = Tier 2
- Additional battery modules even make the battery redundant.
- All hot-swappable!
- Available in both 208VAC or 480VAC
- Single or three-phase
- Very adaptable to today’s small space needs.



XTREME Power Conversion®

Battery Evolution

- Battery technology has progressed as well, giving data centers new attractive options

- Lead-Acid
  - Tried and true
  - You know what you are getting
  - Very flexible
  - Can get as long of a runtime as you need
  - Significant downsides for smaller spaces

Lithium

- Wider temp range than lead-acid
- Best suited for short runtimes
  - Get to generator
  - Compact size for similar runtime vs lead-acid
- Much higher cycle count
  - Can last up to 15-20 years with standard usage
- Light-weight compared to just about any other battery
- Come with built in battery management
  - Remote monitoring
- Reduced maintenance. Great for remote sites.

Lithium

- They do have their downside
  - Safe to say there are not inexpensive
  - Safety concerns
  - Local code issues?
  - Pay attention to the UL listing that the battery carries. May not be able to place cabinets side-by-side.
  - What will push for electric vehicles do to supply of lithium?
  - Are they “green”?
  - World political environment?

Nickel-Zinc

- Wide temperature range
- Safe technology
- Form factor similar to lead-acid
- Can get longer runtimes
- Higher recharge rates
- High cycle counts

Nickel-Zinc

- Readily available raw materials
- Recyclable
- Higher recharge rates
- High cycle counts
- Built in management

- Younger technology
- More expensive than lead, less than lithium

Sodium Batteries

- Advantages similar to lithium
- Extremely safe
- Ideal for short runtimes – 2-3min
  - Bridge to generator start
- Very high cycle count
- Wide temperature range
- Will charge as fast as you can give it current
- Built in BMS

Sodium Batteries

- Raw materials are readily available
- Highly recyclable

- Newest of the alternative technologies
- Currently limited production capacity
- Slightly more expensive than lithium

	Lead-Acid	Lithium-Ion	Nickel-Zinc	Sodium
High Cycle Life	👎	👍	👍	👍
Extended Temperature Range	👎	👍	👍	👍
Charging Speed				
Thermal Safety	🤔	😱	😎	😎
Long Runtime Applications	👍	👎	👍	👎
Supply Chain Security	👍	👎	👍	👍
Price	$	$ $ $	$ $	$ $ $

Thank you!

Questions?