



U.S. Army Research, Development and
Engineering Command



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.



**INTELLIGENT POWER MANAGEMENT
DISTRIBUTION SYSTEMS (IPMDS)**

April 2011

1. IPMDS Overview
2. Background
3. Automatic Load Balancing
4. IPMDS
5. Testing/Fielding Schedule

Description

- IPMDS – Intelligent Power Management Distribution System
- Man portable, ruggedized power distribution system
- Automatic load balancing
- Electrical hazard warnings
- Use with Tactical Quiet Generators (TQGs), 15kW – 100kW
- 208 V, 3 phase, Wye configured, 50/60 Hz

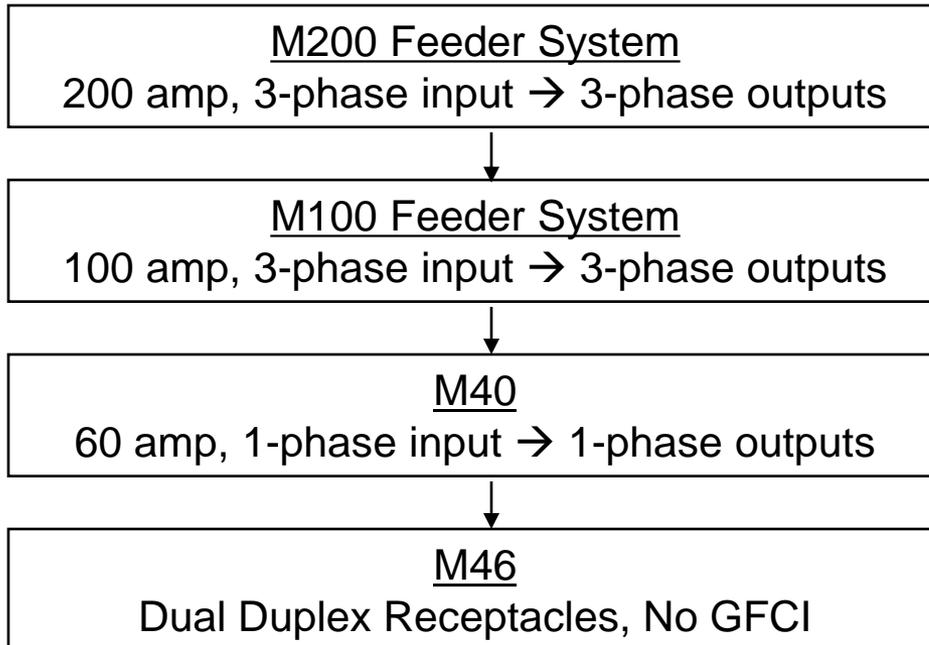
Benefits

- Reduce burden on the warfighter during power grid set up
- Increase power grid reliability
- Reduce injuries due to electrical hazards
- Near-term solution
- No increase in power distribution system footprint

Background

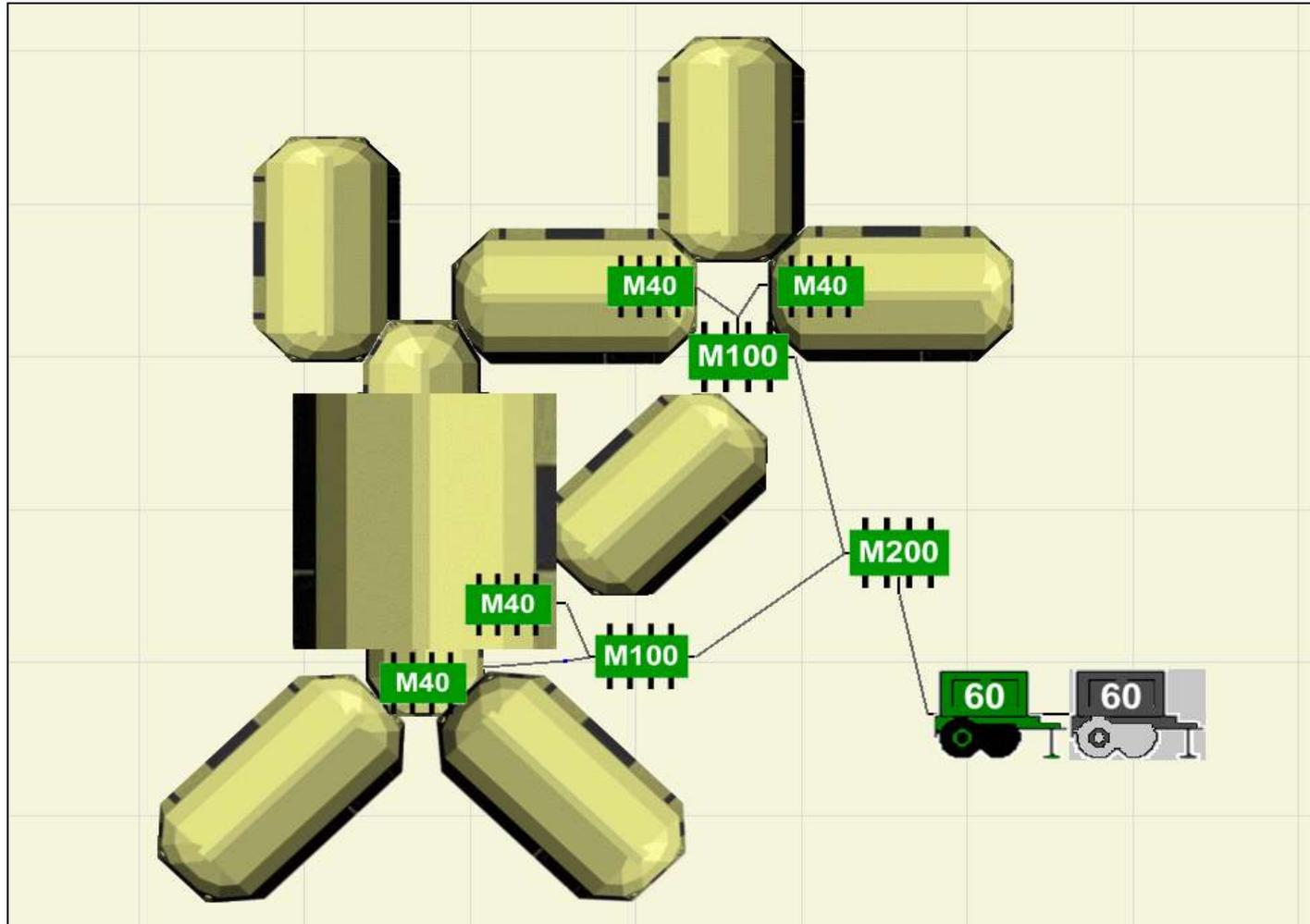
PDISE (Power Distribution Illumination System, Electrical)

- Principal distribution system for the U.S. Army
- Fielded by Project Manager Mobile Electric Power (PM-MEP)
- M400, M200, M60, M40, M46 and Universal Adapter.
- Currently greater than 10,000 pieces of PDISE equipment are in the field.

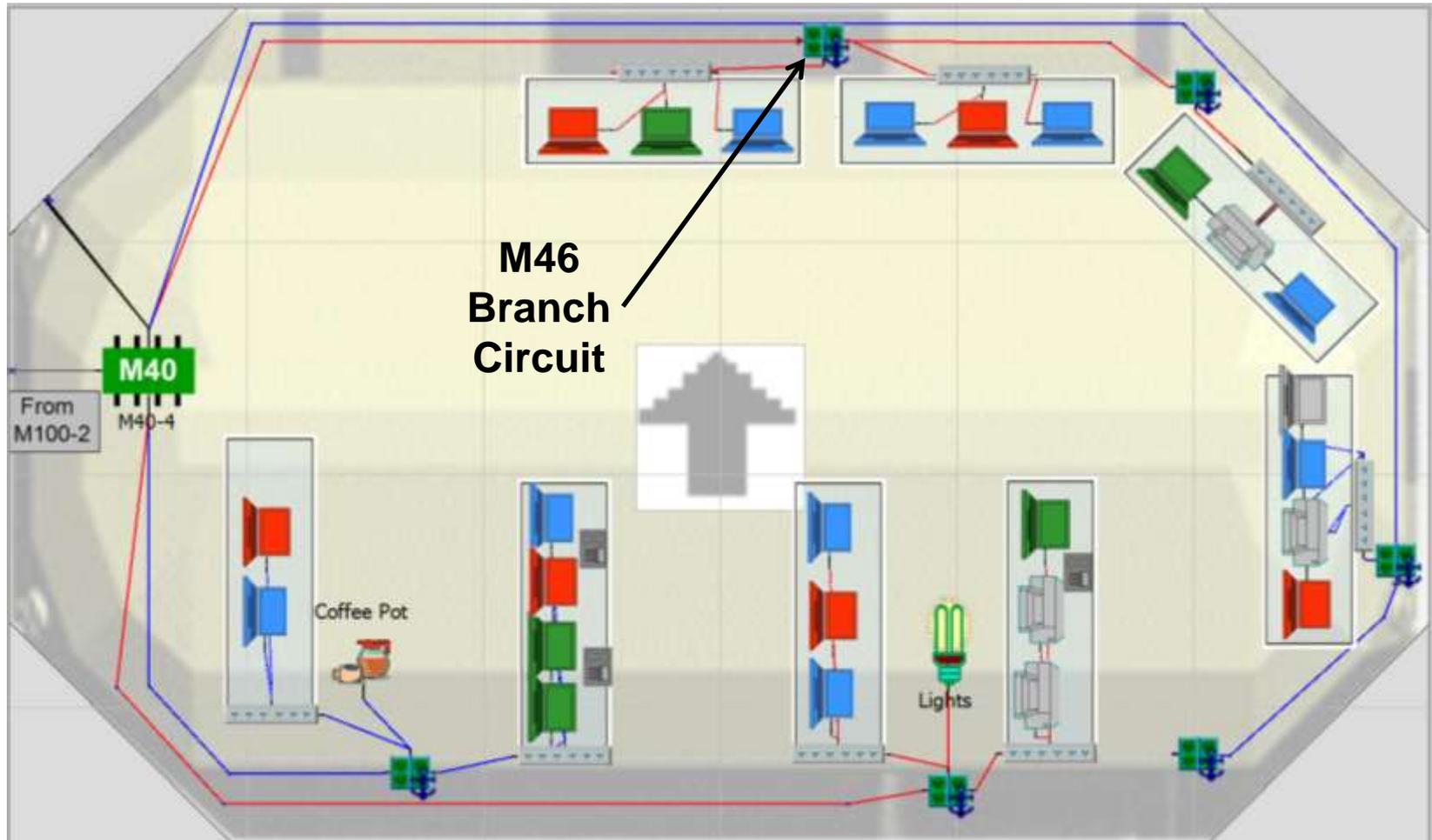


M200, M100, M60, and M40

Example Main TOC



Example Main TOC



Mission: Identify path to provide improved, near-term power distribution capabilities to soldiers.

Team: IPT consists of CERDEC, PM-MEP and CASCOM with support from Power & Energy IPT as needed.

Field Survey:

2007

– IPM IPT interviewed units returning from Iraq and Afghanistan.

- SBCT1
- SBCT2
- SBCT3
- 28th CSH
- 21st CSH
- 4th Psy Ops
- 782 BSB
- 659 Eng. Equipment
- 4th ID
- III Corps
- 82nd Airborne
- 35th Signal Brigade

–Created online questionnaire to receive input from additional users.

1. Lack of knowledge regarding power grid set-up; poor set-up was primary cause of problems with power grids.

IPMDS makes power grid setup more user friendly.

2. Improper balance of loads across three phases of generator sets was very prevalent.

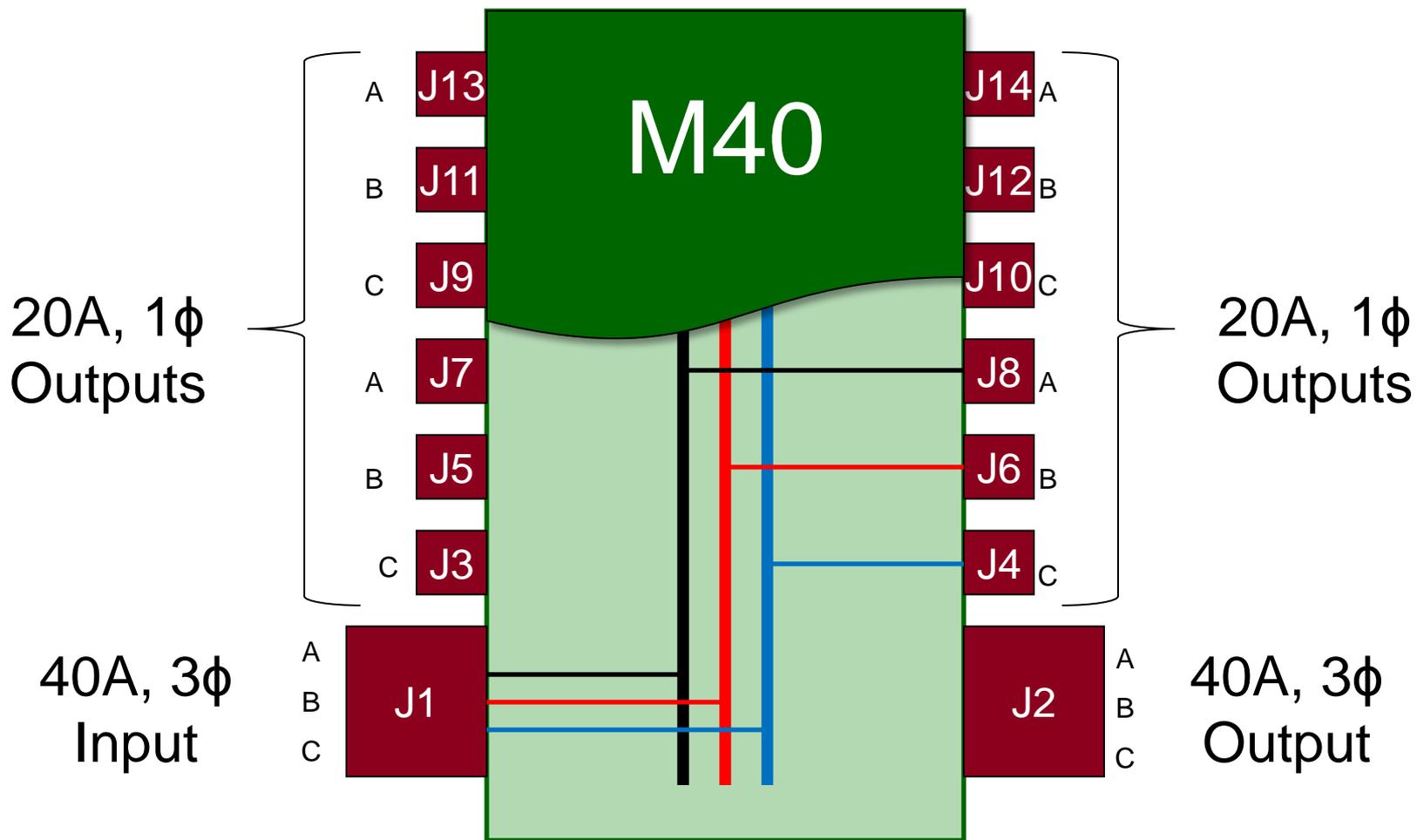
IPMDS automatically balances the loads and allows for maximum utilization of the distribution equipment.

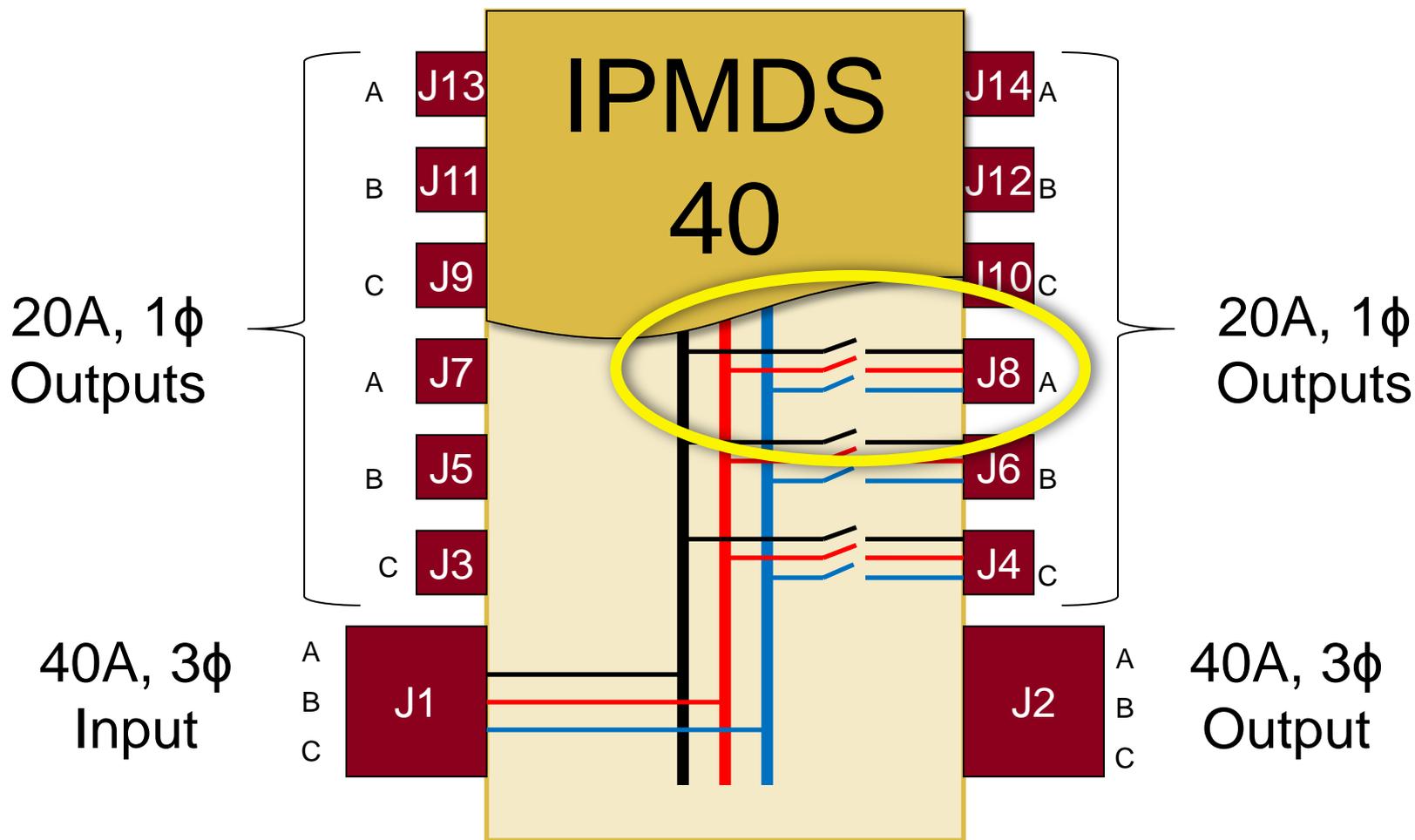
3. Uninterruptible Power Supplies (UPS) are insufficient to cover power outages.

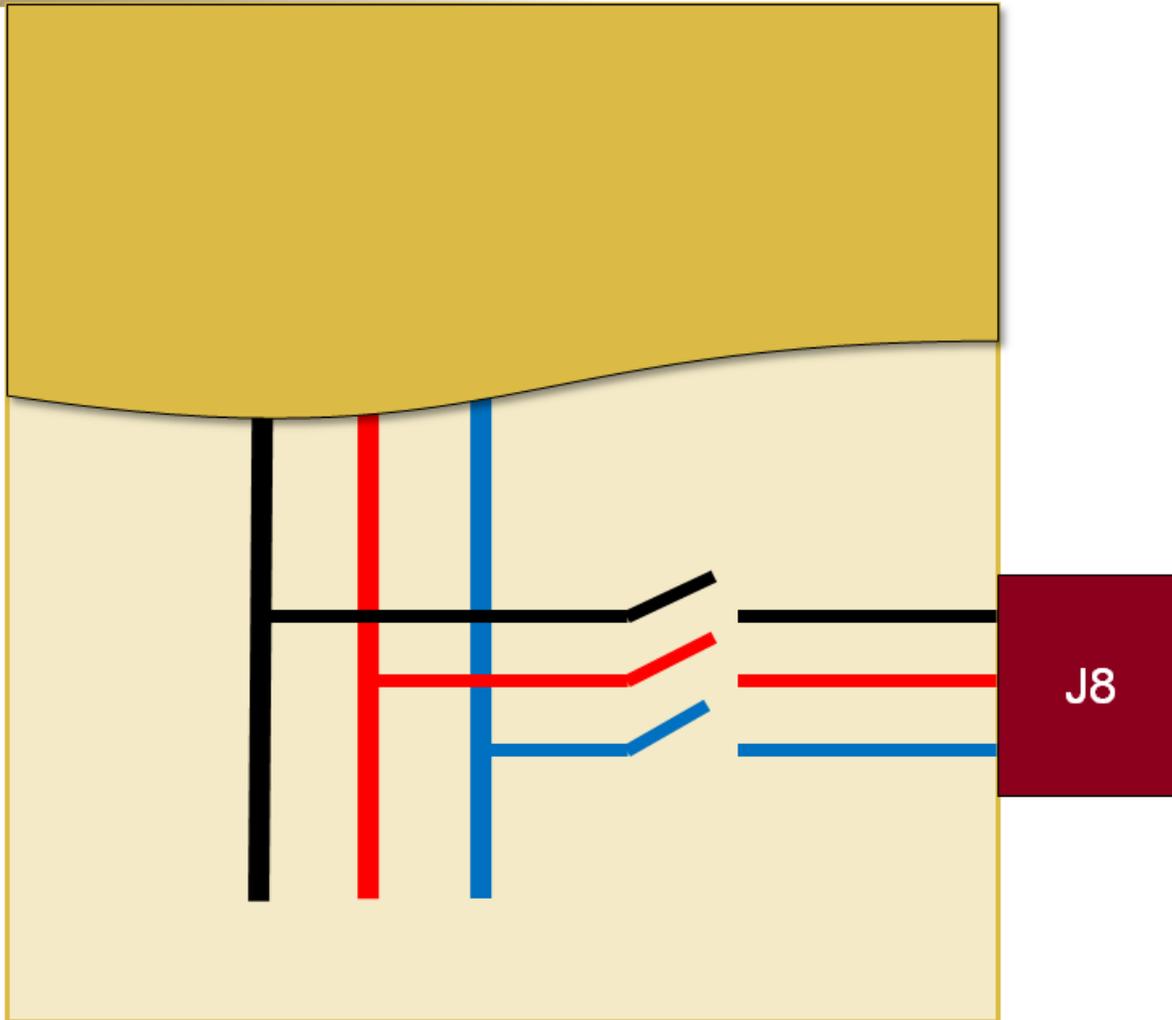
IPMDS can help avoid power outages due to circuit breaker tripping from a single phase overload and certain generator failures.

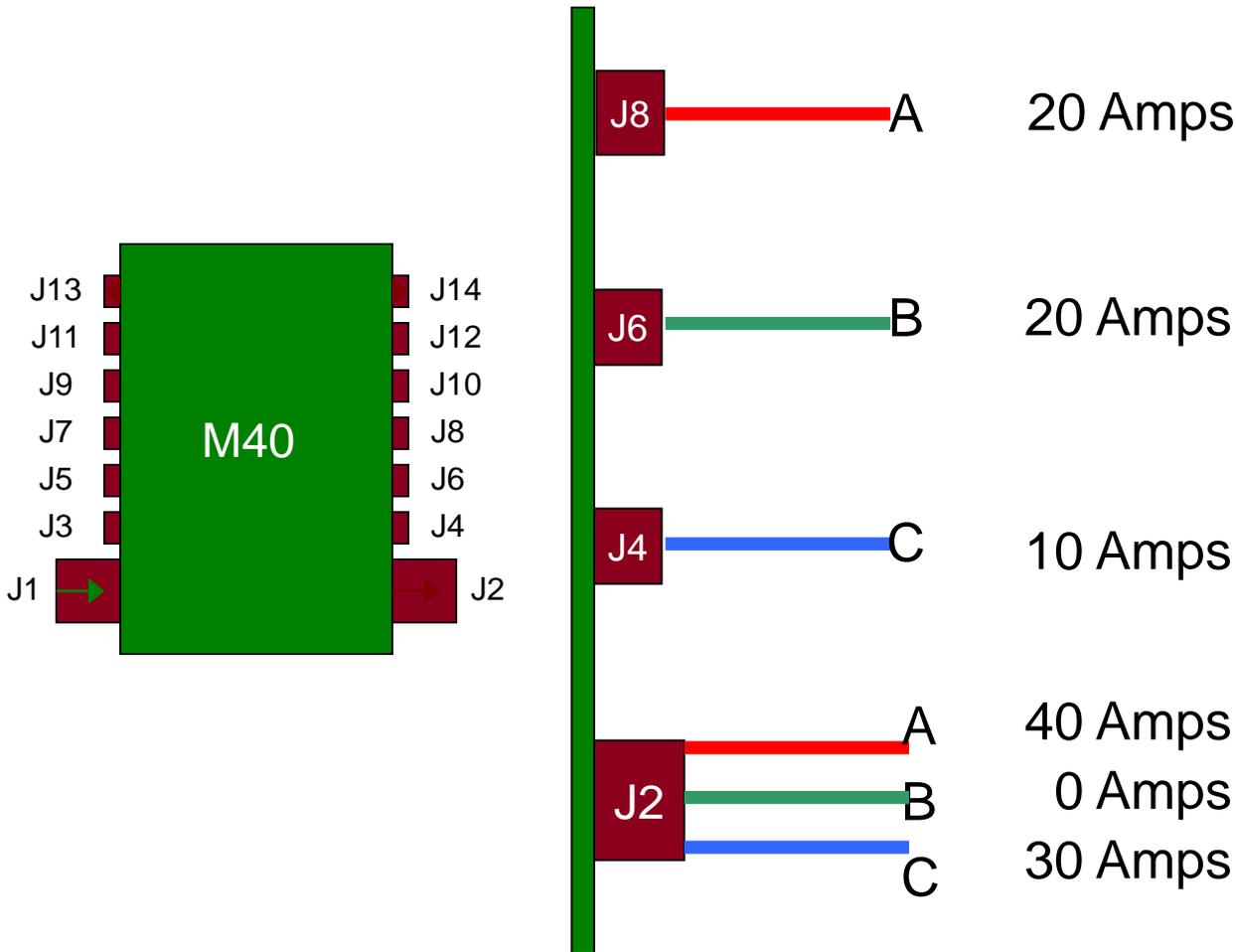
Automatic Load Balancing

- **What is automatic load balancing?**
 - Autonomously ensures the load is shared equally across all three phases.
 - With IPMDS it is achieved through a controller and switching devices inside the distribution box.
- **Why is load balancing important?**
 - Circuit breaker trip avoidance
 - Vibration
 - Stator core heating
 - Voltage imbalance





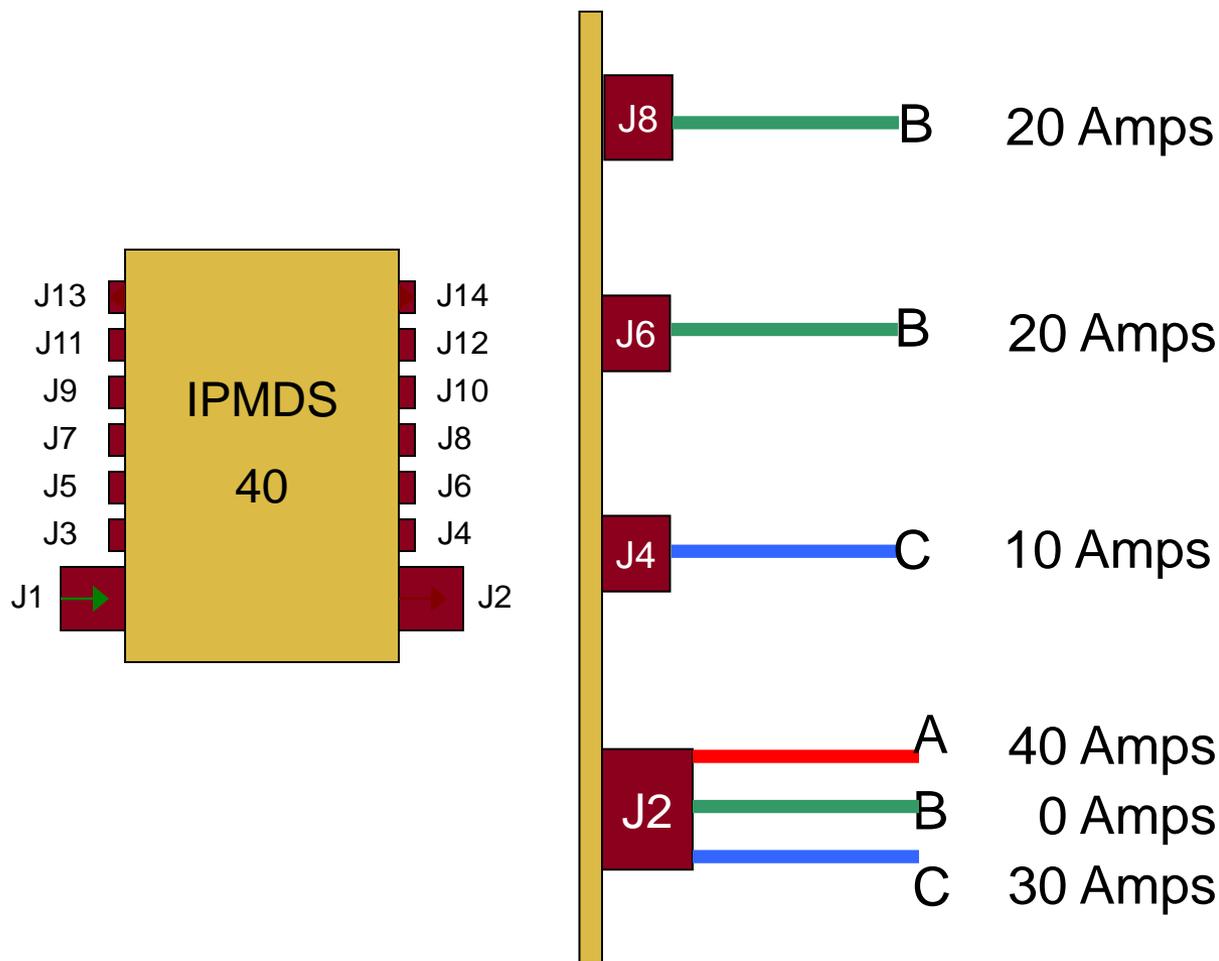




Unbalanced Load

A - 60 Amps
B - 20 Amps
C - 40 Amps
<hr/>
120 Amps

Exceeds Phase A, 40 amp current limit
→ Trip Breaker



Balanced Load

A - 40 Amps
B - 40 Amps
C - 40 Amps
<hr/>
120 Amps

IPMDS switches J8 from phase A to B and avoids circuit breaker trip

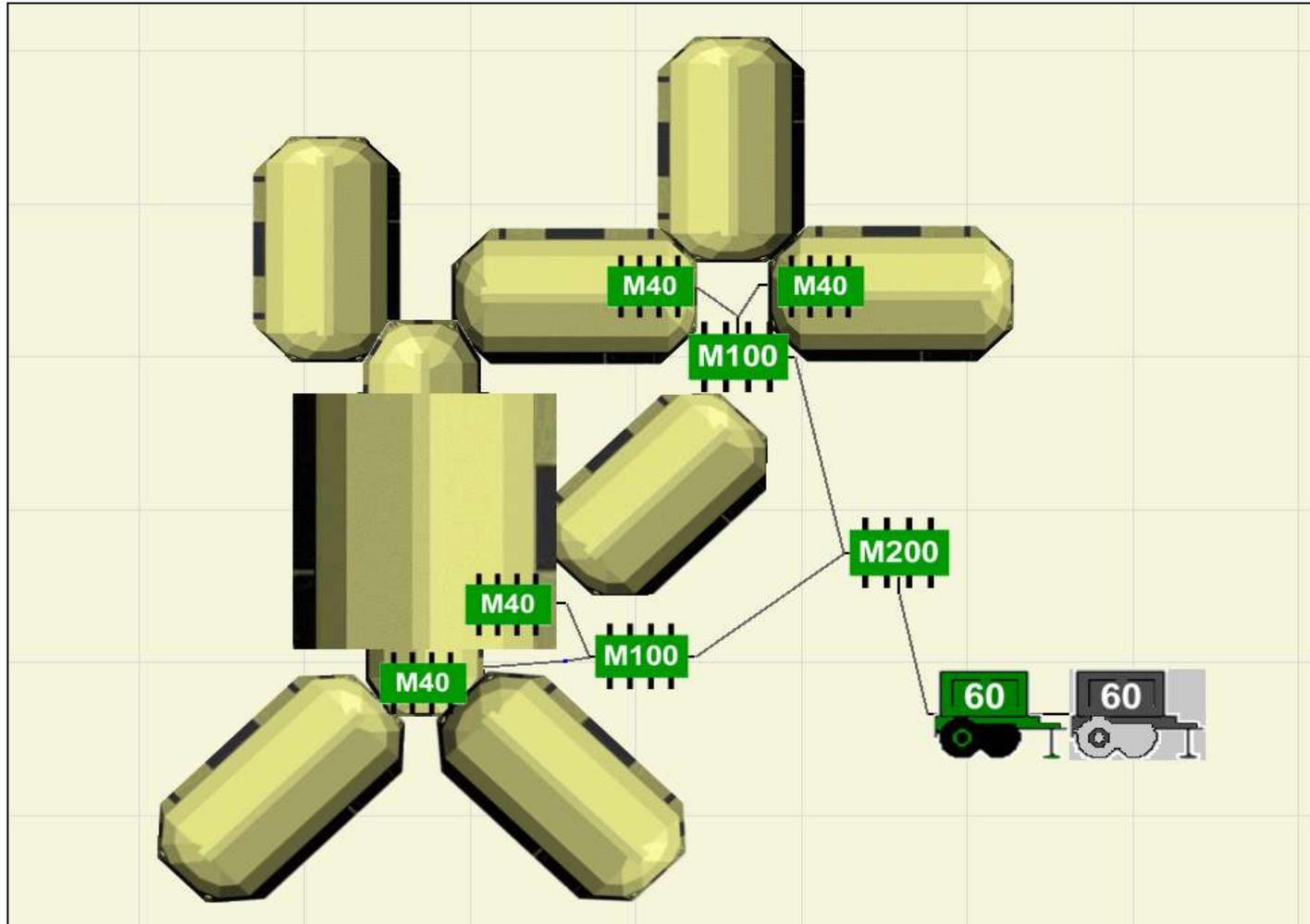
→ **System Operational**

IPMDS Program

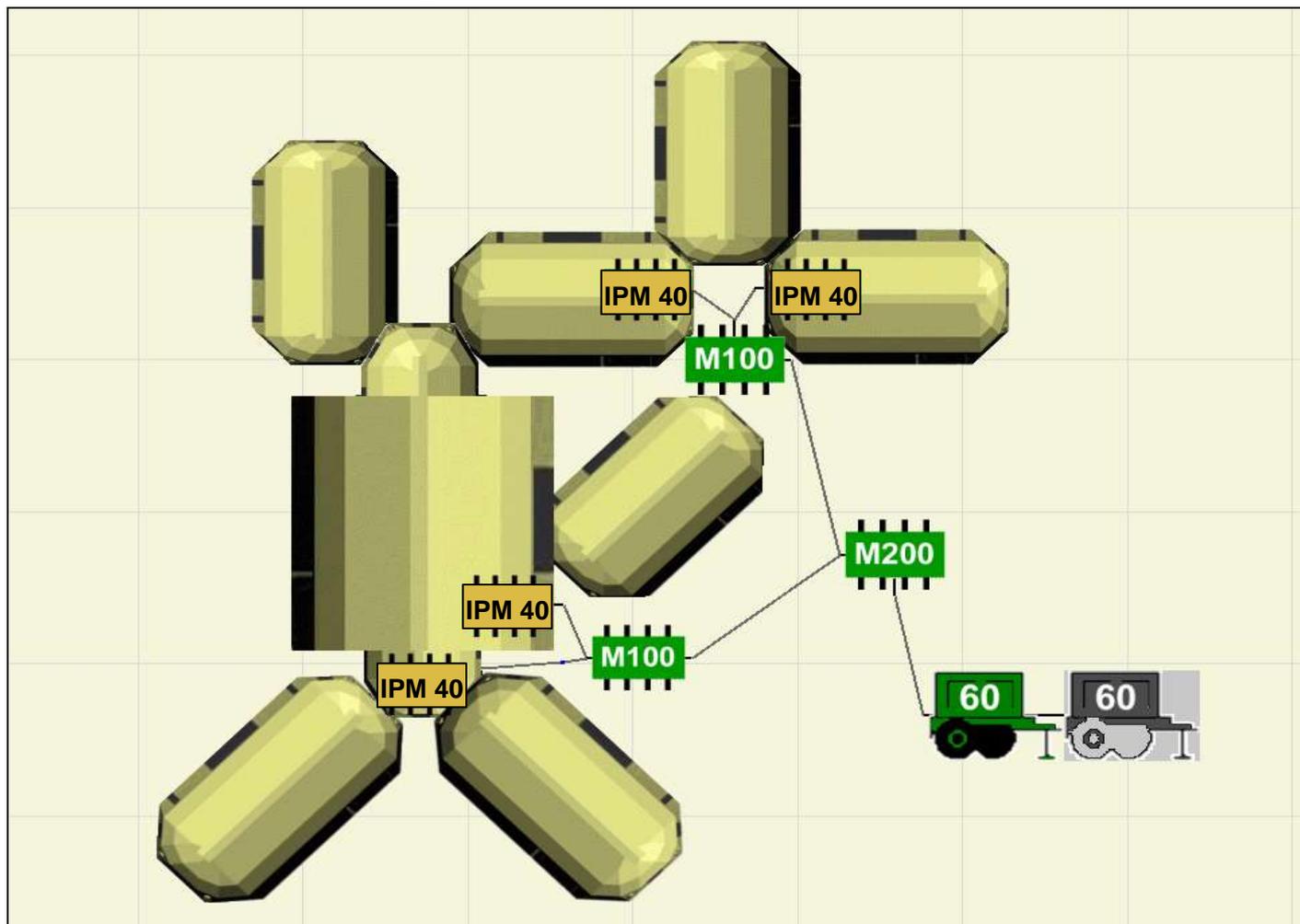


- IPMDS programs, managed by CERDEC and funded by PM-MEP and OSD
 - 200A
 - 100A and 40A
- Focus on IPMDS 40
 - Greater potential to improve the load balance
 - Less weight penalty

Example Main TOC with PDISE



Example Main TOC with IPMDS



1. No larger or heavier than the M40 (4.9 cu. ft. and 55 lbs)
2. Compatible with PDISE (MIL-STD connectors)
3. Ruggedized for harsh environmental conditions
 - Operating: -50 to 135 F
 - Solar loading, sand/dust, rain, humidity, salt fog
4. Automatic load balancing
5. Switching time between phases < 18 ms

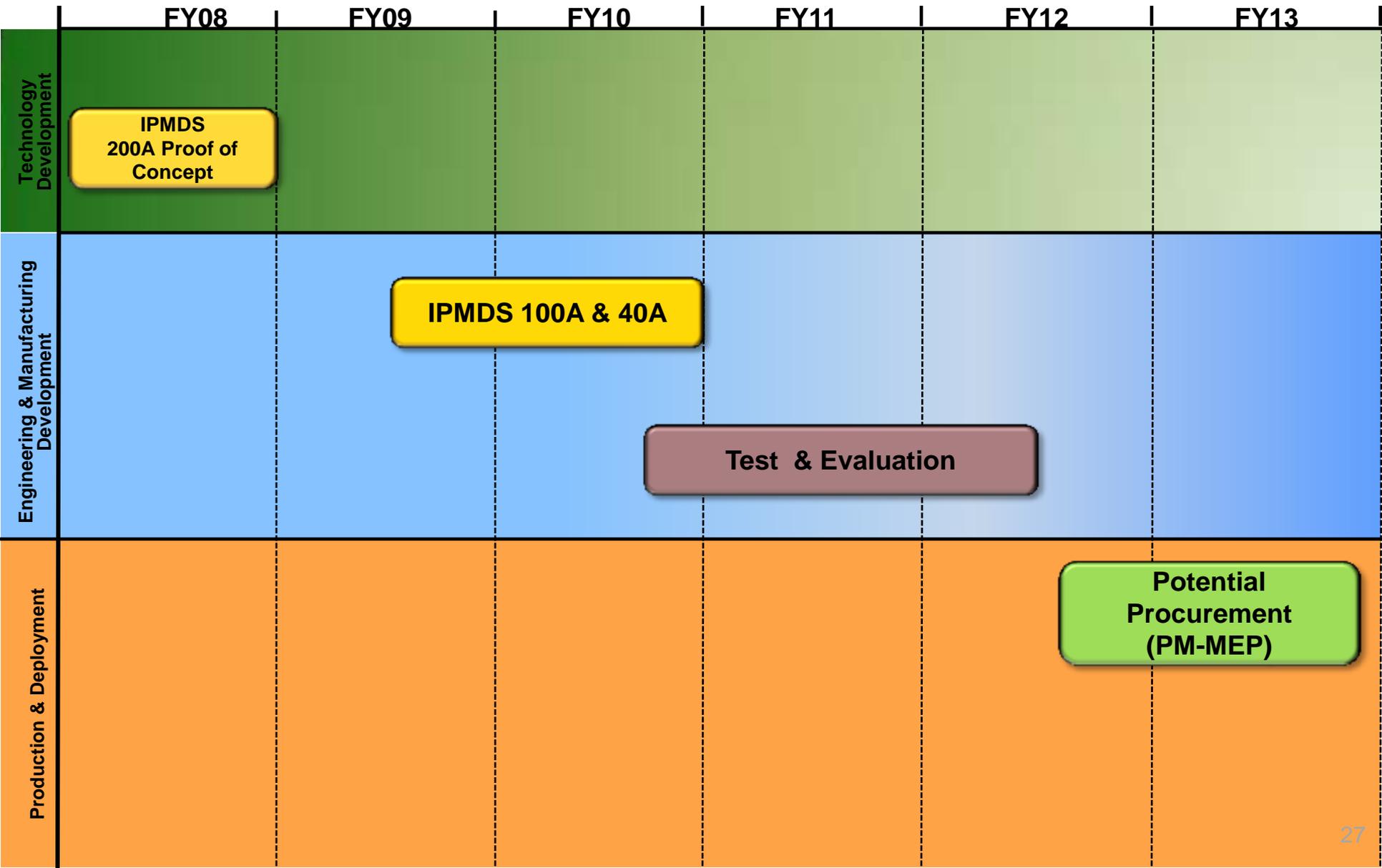
6. Provide a warning:
 - Voltage is out of safe operating range
 - Frequency is out of safe operating range
 - Input phase is missing
7. De-energize outputs:
 - Input phases are out of sequence
 - Break in ground conductor
8. Battleshort
9. Electronics bypass

- *Availability of Power*

- Reduce time to establish effective power grid.
 - Decrease circuit breaker trips.
 - Decrease wear on generators.
 - Reduce vibration
 - Avoid additional heating of the stator core
- Maintain mission readiness.

- *Increased Safety of Power Grid*
 - Warn user of improper setup
 - De-energize outputs in case of electrical hazard
 - Reduce injury due to electrical hazards.
- Near-term solution.
 - Increase capabilities sooner.

Schedule



Questions

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