Cooling Environments
Immersion Project

OCP Immersion Solutions:
Integrating Cooling, Power, Hardware, and Economics

Requirements		*Power Distribution*		*Total Cost of Ownership*		*Hardware Mgmt*	*FMEA*	
								
Amy Short, PhD	Peter Cooper, PhD	Kevin Gero	Oriol Chavanel	Andy Young, PhD	Edi Roytman	Mick Jones	Nick Beardsley	Khaled Morsy
Denvr Dataworks	**Promersion**	**Murata**	**Hypertec**	**Asperitas**	**Marvell**	**Vertiv**	**GRC**	**BVPI**

Five Workstreams – One Deployment Challenge

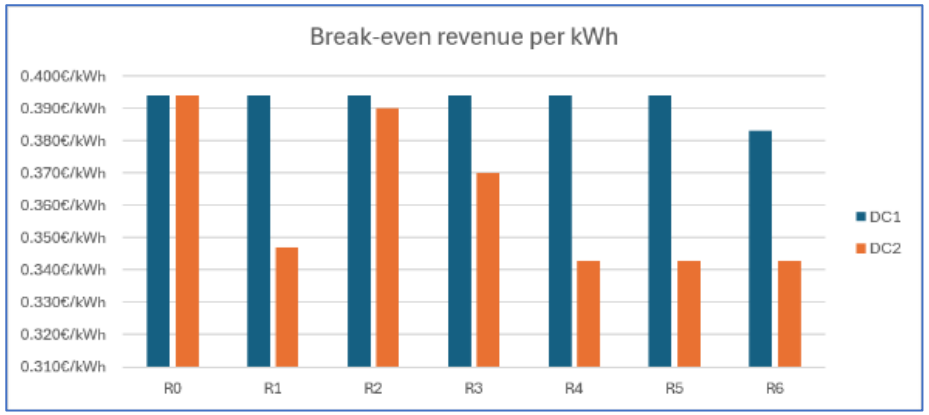
Building the technical, operational and economic foundation for imemrsion at scale

- **Total Cost of Ownership (TCO)** → **Economics**: Confident investment decisions
- **Hardware Management** → **Operations**: Simpler, more reliable operations
- **Power Distribution** → **Infrastructure**: Power architectures for higher density
- **Failure Mode & Effect Analysis (FMEA)** → **Safety**: Safer, more resilient deployments
- **Immersion Requirements** → **Foundation**: Performant, interoperable ecosystem

Total Cost of Ownership (TCO)

Quantifying the economics of advanced cooling

Download the TCO Tool V1.31



PURPOSE

Turn technical choices into economic insight

- Compare cooling and deployment architectures
- Quantify costs, losses and overheads
- Identify tradeoffs and break-even points

PROGRESS

TCO v1.31 Update Expands the Toolkit

- More configurable, top-down model
- Expanded cooling library
- Break-even hosting rate and overhead/loss visibility



NEXT STEPS

Broaden the model for next-gen infrastructure

- Add DC power architectures
- Expand industry-sourced equipment data
- Grow cross-workstream integration and user guidance

Hardware Management

Enabling interoperable cooling infrastructure

Join the Community

PURPOSE

Create a common management framework

- Standardize monitoring and control
- Connect IT and cooling infrastructure
- Enable interoperability across vendors and equipment types

PROGRESS

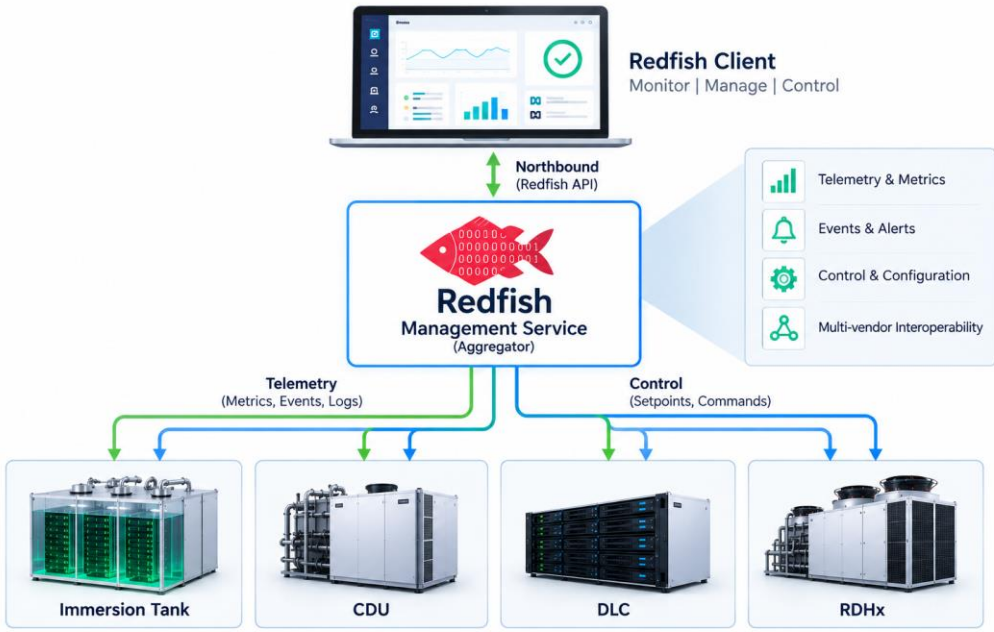
Building the foundation for interoperability

- Liquid Cooling Baseline Profile established
- CDU mockup + Interop Profile complete
- Immersion mockup + profiles advancing
- Agentic AI helper proof-of-concept complete

NEXT STEPS

Expand the model for next-gen infrastructure

- Validate and iterate immersion profiles
- Extend to hybrid and enclosed systems
- Expand equipment and redundancy profiles



Power Distribution

Enabling power architectures for the next generation

Access the Base Spec

Join the Community

PURPOSE

Enable safe, efficient & scalable power delivery

- Support high-density compute in immersion
- Define consistent design and deployment guidance

PROGRESS

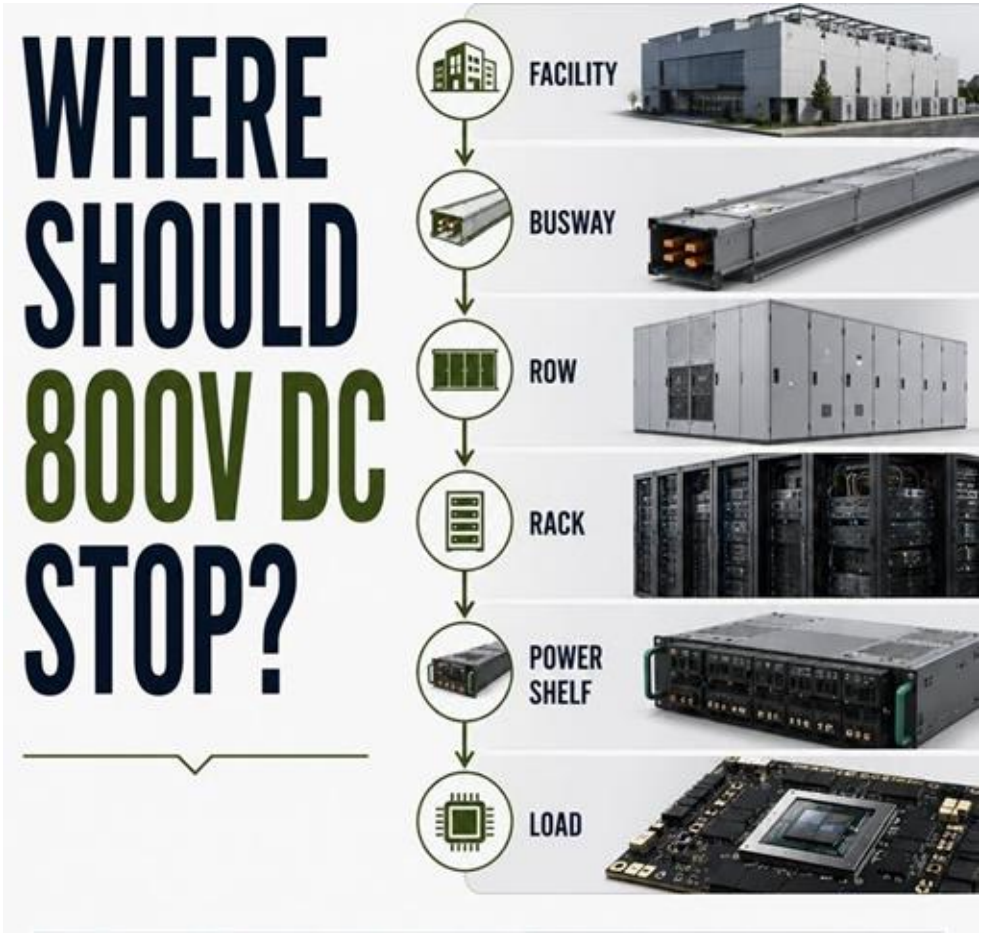
NEW Base Spec Published!

- Practical guidance for ORv3 designs for immersion systems
- Scope – Power shelves, PSUs, busbars, connectors & tank interface

NEXT STEPS

Explore higher-power next-gen architectures

- Will the servers keep to use the 50V standard or will they jump to accept a DC 800V input?
- Power Capacitor Shelf / Capacitor Bank Unit and AC Smoothing



Failure Mode & Effect Analysis (FMEA)

Assessing risk and recommending safeguards

Join the Community

PURPOSE

Understand risk at the system level

- Identify credible failure modes
- Trace pathways and consequences
- Evaluate safeguards and mitigations

PROGRESS

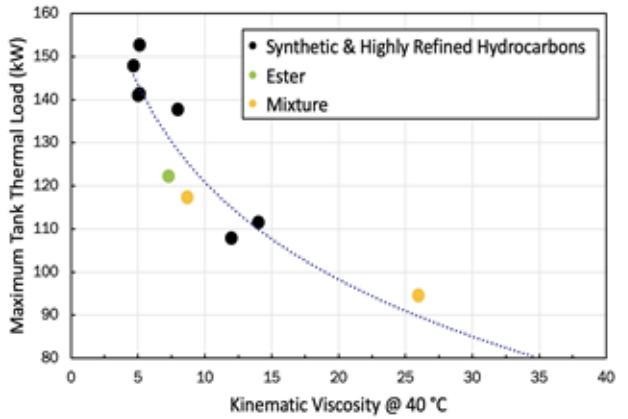
Building an Evidence-Based Risk Model

- System boundaries and scoring defined
- Bottom-up failure analysis reviewed
- Ignition FMEA + Fault Tree being integrated

NEXT STEPS

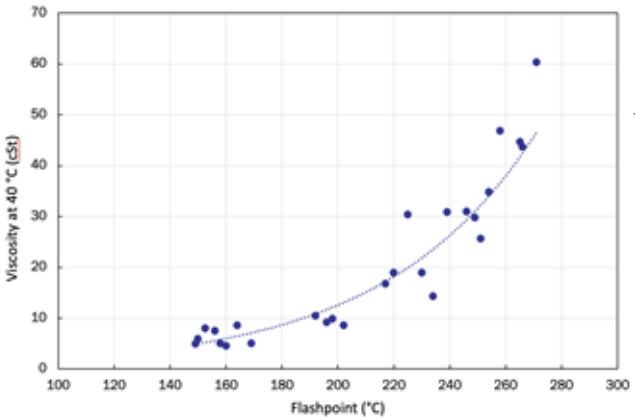
Translate analysis into recommendations

- Map critical fault pathways and identify layered safeguards
- Harmonize findings into mitigation guidance
- Publish whitepaper focused on ignition risk



Lower viscosity Fluid

Improved Performance



Reduced flash point

Immersion Requirements

Common expectations for safe, interoperable and deployable products

Marketplace Onboarding

Join the Community

PURPOSE

Create a common baseline

- Safe and fit-for-use products
- Comparable expectations across the ecosystem
- Enable path to OCP Marketplace

PROGRESS

Requirements v2.1 is evolving

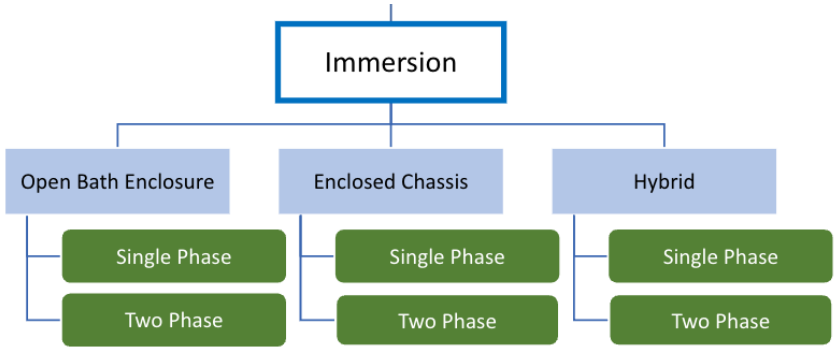
- Fluid-type definitions complete
- Collaboration with Fluid Specification to update disclosure req.
- Equipment & facility safeguards are the current focus

NEXT STEPS

Move from requirements to adoption

- Advance disclosures, safeguards and codes alignment
- Broaden tank, system and monitoring expertise





Join OCP Solutions today!

Chair: Amy Short *(amy.short@ocproject.net)*

Co-Chairs: Andy Young and Kevin Gero

Immersion Requirements



Amy Short, PhD
Denvr Dataworks



Peter Cooper, PhD
Promersion

Power Distribution



Kevin Gero
Murata



Oriol Chavanel
Hypertec

Hardware Management



Mick Jones
Vertiv

Total Cost of Ownership Modeling (TCO)



Andy Young, PhD
Aspiritas



Eduard Roytman
Marvell

Failure Mode & Effect Analysis (FMEA)

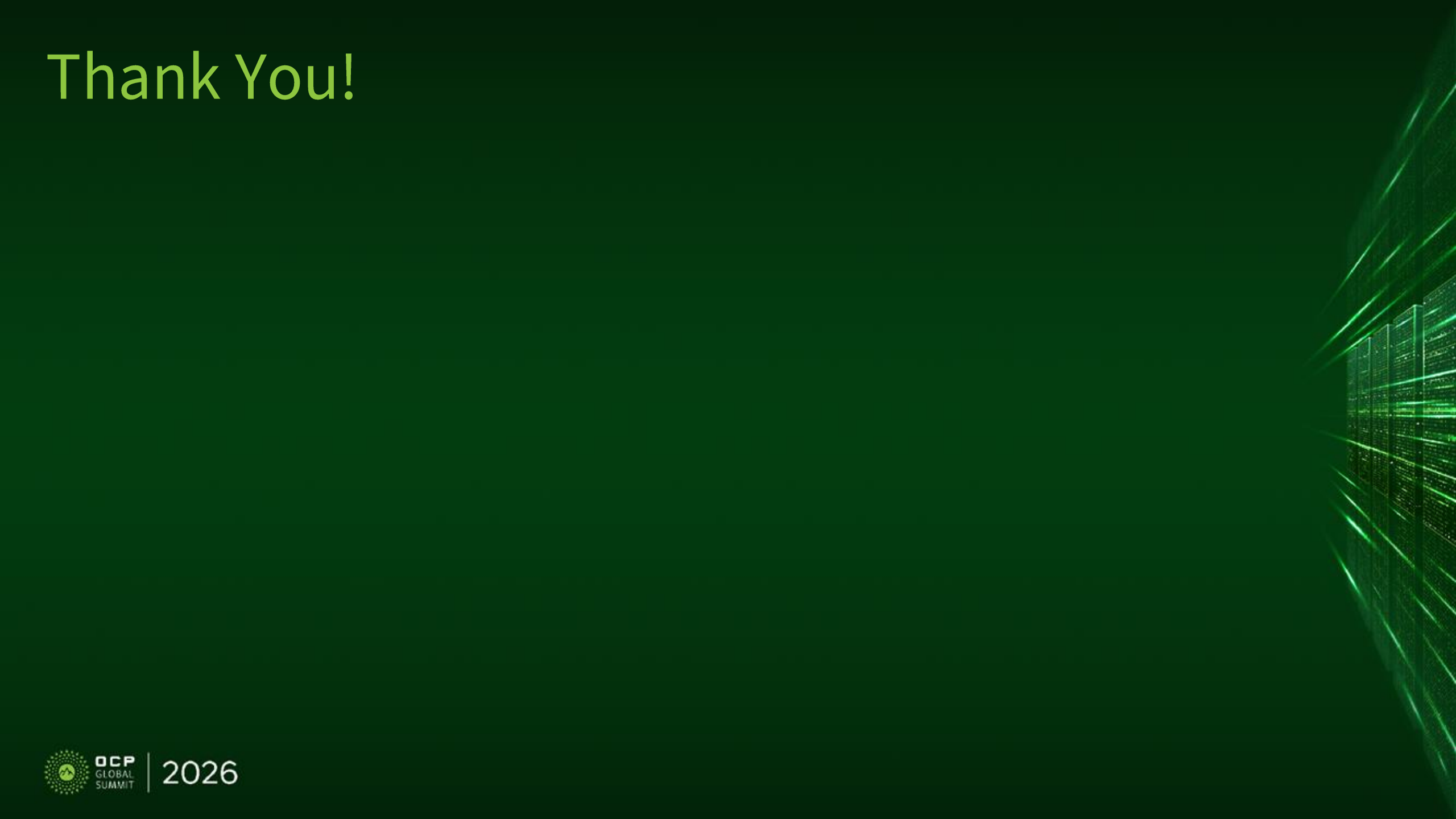


Nick Beardsley
GRC



Khaled Morsy
BVPI

Thank You!



Power Distribution

Enabling power architectures for the next generation

Access the Base Spec

Join the Community

1. **Will the servers keep to use the 50V standard or will they jump to accept a DC 800V input?**
    a. Present
        i. First Stage → AC - 15-35kV AC to 480V AC (SST - Solid State Transformer)
        ii. Second Stage → AC – 3-Phase 480V coming inside the DataCenter [WYE vs DELTA] through (BUSWAY)
        iii. Third Stage → DC – 50V through (POWERSHELF PSUs).
        iv. Fourth Stage → DC – 50V or 800V? (Server) – *Infineon seems doing it.

    a. Future
        i. First Stage → 15-35kV AC to 800V DC (SST – Solid State Transformer)
        ii. Second Stage à 800V DC (Server)

1. **Power Capacitor Shelf / Capacitor Bank Unit and AC Smoothing**
    a. Is it necessary below 150kW?
    b. Is there any way we can cool it down with liquid cooling?

