TC 9.9 Mission Critical Facilities, Data Centers, Technology Spaces, and Electronic Equipment
Conference Program Listing (Current as of June 2021)

City	Date	Type	Paper Seq	Forum Seq	Seminar Seq	Program Title	Chair	Speakers	Paper Topic
2021 Annual Virtual	On Demand	Seminar 71			1	The Continuing Evolution of the ASHRE Data Center Environmentals Guidelines		Dustin Demetriou	History of the ASHRAE Thermal Guidelines and IT Equipment Power Trends
					2			Roger Schmidt	Research on High RH and Gaseous Pollutants Impact on IT Equipment Reliability
					3			Paul Artman	Expanded Guidelines for Data Center and IT Air Cooling
					4			Dave Moss	Liquid Cooling White Paper and Updates to the ASHRAE Water Cooling Classes
	On Demand	Seminar 65			1	Sound and Vibration Issues with Mission Critical Facilities		Paul Bauch	Data Center Sound and Vibration Control Issues
					2			Dan LaForgia	Generator Noise Control
	On Demand	Seminar 39			1	Demand for Variable Speed Equipment in Data Center Applications		Tom A. Bise	Fan Array Technology: Efficiency, Basics, Inductions Motors with VFDs and ECMs
					2			George Paich	Custom Air Handlers
					3			Tim Chadwick	Data Center Mechanical Equipment Design, Redundancy and Variable Speed Applications
	6/30/21	CPS 3	2			Air Quality and Handling in Mission Critical Facilities		Dustin Demetriou	Development of Detailed Server Digital Twin Models for Enabling a Data Center Digital Twin for Design, Control and Operation (VC-21A-C015)
			3					Anthony Hoevenaars	EC Fan Array Implementation – How to Capture the Energy Savings without Sacrificing Power Quality (VC-21A- C016)
	6/29/21	Seminar 8			1	Energy Management Best Practices, Case Studies and Lessons Learned from Real-World Data Center Operation	Eric Yang	Jingjing Liu	Harnessing the Power of Data Analytics for Reliable and Efficient Data Center Operations at LBNL's High- Performance Computing Center
					2			John Dumler	Is Your Legacy Data Center Ready to Improve Energy Efficiency through the Use of Data Analytics, AI/ML and Intelligent Controls Optimization?
					3			Mark Seymour	Classic Pitfalls to Avoid in Data Center Operation
2021 Winter Virtual	On Demand	Seminar 88			3	Whole Greater Than the Sum: Coupling Building Simulation Techniques	Mike Koupriyanov	James VanGilder	Coupling Potential-Flow and Flow-Network Models for Fast Data Center Thermal Analysis
	On Demand	Seminar 77			1	Smart Indoor Environmental Models for Data Centers	Wangda Zuo	Mark Seymour	It's Always Smart to be Accurate – or Is It?
					2			Dustin Demetriou	Using Compact Models for Improving IT Equipment Modeling in Data Center Simulations
					3			James VanGilder	A Compact Rack Model for Data Center Modeling
	On Demand	CPS 13	2			Approaches for Maintaining Effective Ventilation and Avoiding Adverse Air Quality in Work Environments		Brad Cochran	Avoiding Adverse Air Quality in Hyperscale Data Centers Due to Re-entrainment of Diesel Exhaust (VC-21-C031)
	2/11/21	Seminar 32			1	Climate Control Solutions for What is Next, Moving from Hyperscale to The Edge	Herb Villa	Suzanne Krantz	Climate Control Solutions for What's Next
					1			Robert McFarlane	The Origin of ANSI/ASHRAE Std. 90.4, Its Purpose and Format and Using the Electrical Loss Component (ELC) Metric

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	2/10/21	Seminar 14			2	What You Need to Know About ANSI/ASHRAE Standard 90.4: The Energy Standard for Data Centers	Nick Gangemi	Vali Sorell	Understanding the Mechanical Load Component (MLC) and Tradeoff Options in ANSI/ASHRAE Std. 90.4
					3			Timothy Peglow	The Relationship between Standards 90.1 and 90.4, and the Importance of 90.4 to Mission Critical Facilities
Orlando	2/2/20	CPS 8	4			Utilizing Waste Heat and Thermal Management	Gurunarayana Ravi	Alejandro Lavernia, Maryam Asghari, Jacob Brouwer	Absorption Cooling for Data Centers Powered by Solid Oxide Fuel Cell Waste Heat (OR-20-C024)
			5					Naoki Aizawa	Study on a Cooling System with Power Usage Effectiveness of 1.02x for Server Rooms (OR-20-C025)
	2/4/20	Seminar 55			1	The Future of Data Center Infrastructure Management Tools	Nick Gangemi	Christian Pastrana	The State of Modern Data Center Infrastructure Management Tools
					2			Dustin Demetriou	ASHRAE DCIM Compliance for IT Equipment
					3			Mark Seymour	Getting DCIM to Talk through Metrics: Bursting the Data Bubble
	2/5/20	Seminar 63			1	Ventilation Effectiveness Metrics, Part 2: Equipment	Malcolm Cook	Mark Seymour	Ventilation Effectiveness Is Inappropriate for Data Centers, True or False?
					2			James VanGilder	The Capture Index Cooling-Performance Metric for Data Centers
					3			Mike Koupriyanov	Air Distribution and Cooling in a Battery Storage Facility
	2/5/20	Seminar 70			2	Leveraging Computational Models to Make Smart Controls	Duncan Phyfe	Mark Seymour	Data Center Controls Are Simple: Why Use Modeling?
					3			Wangda Zuo	Applying Equation-Based Modeling for Energy Efficient Data Center Cooling Operation
					4			James VanGilder	Using a Physics-Based Model to Control Cooling Airflow in Data Centers
Kansas City	6/23/19	CPS 2	1			Specialty Buildings: Data Centers and Sports Facilities	Gurunarayana Ravi	Tianzhen Hong	Development of a New Prototype Energy Model for Data Centers
			2					Richard Pavlak	Improving Data Center and Telecommunication System HVAC Design from Lessons Learned from Retro-Commissioning
	6/24/19	Seminar 28			1	Balancing Energy and Effectiveness	Gang Tan	Mark Seymour	Energy Efficient or Effective Data Center Cooling: Is It Either/Or?
	6/25/19	Seminar 47			2	Modeling Transient Events, Part 2: The Indoor Environment	Duncan Phyfe	James W. VanGilder	A Compact Cooling-Unit Model for Transient Data Center Simulations
	6/25/19	Seminar 52			5	Modeling Transient Events, Part 1: External Factors Which Affect the Indoor Environment	Duncan Phyfe	Wangda Zuo	Modeling the Transient Event of Data Center Cooling during the Power Outage

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Atlanta	1/13/19	CPS 5	1			Analysis of HVAC Systems for Specific Applications	Ratnesh Tiwari	Kazuhiro Matsuda, Morito Matsuoka, and Ying-Feng Hsu	Power Consumption Simulator of Data Center by using Computa- tional Fluid Dynamics and Machine Learning
	1/13/19	Seminar 16			1	The Best of Engineer's Notebook 3rd Edition	Kelley Cramm	Daniel H Nall	Data Centers, Cooling Towers and Thermal Storage
	1/14/19	Seminar 24			1 2 3	ASHRAE Thermal Guidelines Driving Data Center Performance & Innovation	Joseph Gangemi	Dustin Demetriou Paul Finch Mark Seymour	The Real Opportunity of the Thermal Guidelines and their Impact on IT Equipment Design Data Center Site Selection, Business Decisions and Thermal Guidelines that Facilitate the Bold Decision to Enter the Wholesale Market and Adopt a Free Cooling Strategy Validating the Design Concept for a Data Center Without Mechanical Cooling in the Southern UK
	1/15/19	Seminar 59			1 2 3	Transient Temperature Changes in the Data Center: Should We Be Worried?	Joseph Gangemi	James W. VanGilder Kourosh Nemati Mark Seymour	Data Center Temperature Rise following the Loss of Primary Power The Impact of Airside and Waterside Failure on Data Center Lab Cooling Performance Modeling Transient Behavior in a Data Center: When is it Needed?
	1/15/19	CPS 17	1 2 3			Numerical Techniques for HVAC Design	Ratnesh Tiwari	Rehan Khalid and Aaron Wemhoff Kosuke Sasakura, Takeshi Aoki and Takeshi Watanabe Naoki Aizawa	Comparison of Approaches for Calculating Annualized Data Center Energy Metrics Study on the Prediction Models of Temperature and Energy by using DCIM and Machine Learning to Support Optimal Manage- ment of Data Center Cooling System with Low Power Usage Effectiveness Below 1.02x for Server Rooms
	1/16/19	Debate 4				Intelligent, Efficient and Resilient Data Centers: What is Needed? Rules of Thumb, Science or Just Technology?	Bahgat Sammakia	Roger Schmidt, Kanad Ghose, Dereje Agonafer, Mark Seymour	
Houston	6/25/18	Seminar 23			1	Faster, Cheaper, More Accessible: The Latest Research in Airflow and Thermal Modeling of Indoor Environments	James VanGilder	Dustin Demetriou	Use of Proper Orthogonal Decomposition to Study Data Center Thermally: Aware, Energy-Based Load Placement
	6/27/18	CPS 15	2			Not Just Blowing in the Wind	Chris Laughman	Essam E. E Khalil	Transient Air Flow Regimes in a Large Scale High Density Data Centers
Chicago	1/22/18	Seminar 25			1 2 3	Modeling and Metrics for Data Center Performance	Nick Gangemi	Mark Seymour Christian Pastrana Kourosh Nemati	The Performance Indicator: A Data Center Cooling Performance View Using Modeling and Metrics to Improve the Citigroup Flextech Upgrade Quantifying Data Center Cooling Performance
	1/23/18	Seminar 46			1	CFD Modeling throughout the Building Lifecycle	Jinchao Yuan	Mark Seymour	Is a Reactive Approach to Data Center Overheating Sufficient?

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Chicago	1/23/18	CPS 14	1			Cooling Mission Critical Facilities	Nick Gangemi	M. Matsuoka, Kazuhiro Matsuda, and Hideo Kubo	Effective Cooling of Server Boards in Data Centers By Liquid Immersion Based on Natural Convection Demonstrating PUE below 1.04 (CH-18-C052)
			2					Kazuhiro Matsuda, Morito Matsuoka, and Yuichiro Miyake	Proposal of Cooling System for High Performance Computing by Drip-Feeding Cooling (CH-18-C053)
			3					Naoki Aizawa	Cooling System with Nearly Zero Cooling Power for Server Rooms (CH-18-C054)
			4					Sophia Flucker, Robert Tozer, Beth Whitehead, Deborah Andrews, and Jon Summers	Data Center Sustainability Index (CH-18-C055)
			5					Micah Sweeney, Mukesh Khattar, and Ron Domitrovic	Efficient Cooling and Heat Recovery with VRF Systems in Embedded Data Centers (CH-18-C056)
	1/24/18	Seminar 56			1	Using Optimization for Airflow Management in Data Centers and Operating Rooms	James W. VanGilder	Cheng-Xian (Charlie) Lin	Optimization Study of Stanchion Layout and Flow Partitioning to Achieve Uniform Airflow through Perforated Tiles in Data Centers
					2			Ramin Rezaei	Optimizing Supply Airflow Location in Data Centers Using CFD
					3			James W. VanGilder	Improving Data Center Efficiency with Active Airflow Control
Long Beach	6/25/17	Debate 1				Cumbersome and Correct vs. Half-Baked and High-Speed	Nick Gangemi	Mark Seymour , James W. VanGilder, Nick Gangemi	
	6/27/17	Seminar 40			1	Delivering a Successful Critical Facility/Data Center Project by Fostering a Healthy Relationship between the Owner, Engineer and Commissioning Agent	Nick Gangemi	Vali Sorell	The EOR's Perspective on Delivering a Successful Critical Facility/Data Center Project By Fostering a Healthy Relationship with the Owner and Commissioning Agent
					2			Terry Rodgers	The CxA's Perspective on Delivering a Successful Critical Facility/ Data Center Project by Fostering a Healthy Relationship with the Owner and Engineer
	6/28/17	Seminar 60			1	Power Trends Update: Aligning Future Facility Capability and ITE Power	Nick Gangemi	Matt Archibald	Datacom Equipment Workloads, Configurations and Applications
					2			Susan Smith	Datacom Equipment Power Trends
					3			Jerrod Buterbaugh	Data Center Solutions and Examples
	6/28/17	CPS 20	4			District and Central Plant Efficiency	Steven Taylor	Amir Radmehr, John Fitzpatrick, and Kanchan Kelkar	Evaluating and Improving the Chilled Water System of a Data Center Using Flow Network Modeling (LB-17-C071)
	6/28/17	Seminar 59			3	Don't Be Scared: CFD for Everyday Design	James W. VanGilder	Mark Seymour	Garbage In, Garbage Out: Is Conceptual Data Center CFD Design Any Use?
Las Vegas	1/29/17	CPS 2	1			Modern Optimization Techniques for Hydronic Systems in Data Centers		Sophia Flucker, Beth Whitehead, Robert Tozer, and Deborah Andrews	Energy and Water Environmental Trade-Offs of Data Center Cooling Technologies (LV-17-C004)
			2					Thomas Carter, David Sickinger, Zan Liu, Kevin Regimbal and David Martinez	Thermosyphon Cooler Hybrid System for Water Savings in an Energy-Efficient HPC Data Center: Modeling and Installation (LV-17-C005)
			3					Christian Pastrana	Case Study: Using Simulation Techniques to Optimize Migrations in an Existing Mission Critical Data Center (LV-17-C006)

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Las Vegas	1/29/17	Seminar 14			2	Data Driven Energy Auditing, Measurement and Verification		Wenli Yu, and Liangcai Tan	A Smart Data Center Energy Expert System for Automatic Measurement, Energy Audit and Energy Efficiency Improvement
	1/31/17	Seminar 42			1	Power and Cooling Considerations for Back of Rack Ecosystems within the Data Center		Jon Fitch	Rack Level Power Solutions and Its Associated Challenges and Deployment Best Practices
					2			Dave Moss	Top of Rack Networking Solutions and Its Associated Challenges and Deployment Best Practices
					3			Dustin Demetriou	IT Equipment Exhaust-Side Deployment Challenges and Considerations
	1/31/17	Seminar 54			2	Cutting-Edge Japanese Technologies SHASE Annual Award for HVAC System and Equipment in 2016		Yosuke Mino	Implementation of Environment-Friendly Office Building with High-Efficiency Data Center
	1/31/17	Seminar 59			1	Recent Research in Data Center Cooling		Mark Seymour	Does Designing and Operating an Efficient Data Center Guarantee Performance?
					2			H. Ezzat Khalifa	Computer Room Air-Handler Bypass: A Novel Approach for Reducing the Cooling Infrastructure Power Consumption in Air- Cooled Data Centers
					3			Cheng-Xian (Charlie) Lin	Evaluation of Strategies for Uniform Airflow through Perforated Tiles in Data Centers
					4			James VanGilder	Thermal Design of Modular Mission Critical Systems
St. Louis	6/26/16	CPS 2	3			Airflow Requirements and Modeling Approaches	Joy Altwies	Cheng-Xian Lin, Long Phan, and Bin Liu	A Hybrid Turbulence Model Coupling Strategy for CFD Simulation of a Data Center Model (ST-16-C005)
	6/28/16	Seminar 41			1	Fellows Debate: Productivity is the Measure of Indoor Air Quality	Larry Spielvogel	William Bahnfleth, Bjarne Wilkens Olesen, Don Beaty, Richard Rooley, Derrick A. Denis and Donald Weekes	
	6/29/16	Seminar 58			1	Improved Modeling Characteristics of a Data Center without Compromising Physics or Breaking The Bank	Nick Gangemi	Mark Seymour	Improving Model Calculation Time without Sacrificing Physics
					2			Zachary Pardey	The Compact Modeling of Raised-Floor Stanchions
					3			Cheng-Xian Lin	Data Center Modeling Using Response Surface Methodology
Orlando	1/24/16	Seminar 11			2	New CFD Techniques for Design of Air Distribution Systems	Atila Novoselac	Cheng-Xian Lin	Reduced Order Modeling of Airflow and Thermal Fields in a Data Center
					3			James VanGilder	Faster and Simpler CFD for Data Center Applications
	1/25/16	TPS 3	1			Data Center Energy Performance Metrics	Chuck Curlin	James VanGilder	Measurement of Perforated Tile Airflow in Data Centers (OR-16-007)
			2					Sophia Flucker, CEng and Robert Tozer,	The Business Case for Sustainability in Data Centers (OR-16-008)
	1/25/16	CPS 11	1			Achieving Net-Zero Energy Use in Data Centers	Calina Ferraro	John C. Peterson, Tahir Cader, and Roy Dragseth,	Data Center Water Energy Recovery (OR-16-C036)
			2					Dan Comperchio and Sameer Behere	Data Center Great Debate: Competing Ideas for Maximizing Design Efficiencies (OR-16-C037)

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Orlando	1/27/16	Seminar 64			1	Pursuing Energy Efficiency May Put Your Data Center IT At Risk	Nick Gangemi	Husam Alissa	A Holistic Approach to Characterizing Mission Critical Facility Cooling Performance
					2			Kourosh Nemati	Analysis of Cooling Performance of an Enclosed Hybrid-Cooled Server Cabinet
					3			Mark Seymour	Filling the Engineering Gap: Balancing Data Center Availability, Capacity and Efficiency
Atlanta	6/29/15	Seminar 28			1	Optimization for Data Center and ITE Integration	Robin Steinbrecher	Robin Steinbrecher	IT Equipment: New Components and Usage Impacting Power Trends
					2			Nishi Ahuja	Real Time Monitoring and Availability of Platform Telemetry for Efficient Data Center Cooling
	6/29/15	CPS 9	1			Fault Diagnosis and Commissioning Existing Buildings	Alan Neely	Zhiguang He and Zhen Li	A Fault Diagnosis Warning System of Refrigeration Systems Based on Fault Direction Space Method for Data Centers (AT-15-C031)
	7/1/15	Seminar 53			1	Calibrating Operational CFD Models for Real Data Centers	Nick Gangemi	H. Ezzat Khalifa	Importance of Tile Momentum Correction in CFD Simulation of Data Center Temperature Field
					2			James VanGilder	Developing a Calibrated CFD Model of a 7,400 Ft^2 Raised- Floor Data Center
					3			Mark Seymour	Critical CFD Decisions to be Able to Calibrate a Model for Effective Operational Data Center Cooling Performance Management
Chicago	1/25/15	TPS 2	1			Data Center Initiatives	Joy Altwies	Robert Topper and Kenneth Kessler	Energy Saving Potential of Flash Heat Transfer (CH-15-004)
			2					Atieh Talebzadeh, Mahdi Moradian, Yunan Han, Abhishek Patnaik, David Swenson and David Pommerenke	Dependence of ESD Charge Voltage on Humidity in Data Centers: Test Methods (CH-15-007)
			3					Atieh Talebzadeh, Abhishek Patnaik, Xu Gao, Mahdi Moradian, Yunan Han, David Swenson and David Pommerenke	Dependence of ESD Charge Voltage on Humidity in Data Centers: Data Analysis Inequality (CH-15-005)
			4					Xu Gao , Atieh Talebzadeh , Mahdi Moradian, Yunan Han , David Swenson and David Pommerenke	Dependence of ESD Charge Voltage on Humidity in Data Centers: Estimation of ESD Related Risk in Data Centers Using Voltage Level Extrapolation and Chebyshev's Inequality (CH-15-006)
	1/25/15	Seminar 7			1	Controlling a Minimum Impact Data Center	Joseph Kilcoyne	Alex Mathers	Using Automation to Minimize the Risk of Downtime and Equipment Failures in Economizing Data Centers
					2			Jeff Stein	Advanced Control Sequences to Optimize Energy Performance of Economizing Data Centers
	1/25/15	CPS 3	1			Modern Data Center Design	Charles E. Henck	Anirudh Deodhar, Harshad Bhagwat, Amarendra K Singh, Anand Sivasubramaniam, Umesh Singh and Sankaranarayanan Dharmarajan	Fast Prediction of Control Insights in Air-Cooled Data Centers Using Proper Orthogonal Decomposition (CH-15-C008)
			2					Mark Seymour	How Do I Choose from a Myriad of Options to Upgrade My Data Center and Improve Cooling Efficiency? (CH-15-C009)
			3					Christian Pastrana and Mark Seymour	Aisle Containment: Just How Important Is It to Worry about By-Pass and Leakage Paths? (CH-15-C010)
			4					Matthew F Renner and Mark Seymour	Are Simulation Models of the Air Delivery for Operating Data Centers Accurate Enough to be Useful? (CH-15-C011)

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Chicago	1/26/15	Seminar 23			1	Data Center and IT Equipment Liquid Cooling: Performance Capabilities, Implementation and Emerging Technologies	Robin A. Steinbrecher	Dustin Demetriou	Liquid Cooling Performance Capability
					2			Thomas Howe	Conventional Liquid Cooling Deployment Considerations
					3			Michael K. Patterson	Considerations of Non-Conventional Liquid Cooling Immersion Technologies
	1/26/15	TPS 6	2			Energy Efficient, Hydronic HVAC Systems	Pam Androff	Robert Tozer, Ph.D. and Sophia Flucker	Data Center Trigeneration with Absorption Refrigeration and Economizer Technologies (CH-15-024)
			3					Robert Tozer, Ph.D. and Sophia Flucker	Data Center Energy Efficiency Improvement Case Study (CH-15-025)
	1/26/15	Seminar 29			1	The Need for Energy Modeling Software for Data Centers	Nick Gangemi	Vali Sorell	The Need for Energy Modeling Software for Data Centers
					2			Jeff Sloan	The Need for Energy Modeling Software for Data Centers
	1/27/15	Seminar 42			1	Data Centers: Getting Outside Your Comfort Zone and Pushing the Envelope into New Metrics and New Focus Areas	Michael K. Patterson	Jon T. Fitch	Data Centers: Getting Outside Your Comfort Zone and Pushing the Envelope into New Metrics and New Focus Areas
					2			Michael K. Patterson	Beyond PUE: Extending Efficiency Metrics into the IT Equipment with ITUE and TUE
	1/28/15	TPS 11	1			Air Flow in Data Centers	Stephanie Kunkel	Zachary Pardey and James VanGilder	Proposal for Standard Compact Server Model for Transient Data Center Simulations (CH-15-036)
			2					Jim Fink	Bypass Airflow in Raised Floor Data Centers (CH-15-037)
			3					Yuji Kohata	Characteristics of the Air-Cooled Package Air Conditioners with Refrigerant Pump Cycle for Data Centers (CH-15-038)
			4					Anirudh Deodhar	Coordinated Real Time Management of Return Air Temperature Controlled Cooling Units in Data Centers (CH-15-039)
			5					Robert Tozer and Sophia Flucker	Data Center Air Segregation Efficiency (CH-15-040)
Seattle	6/29/14	TPS 1	3			Theoretical Approaches to Air Quality for Specific Locations and Two Phase Flow Through Pipe	Jennifer E. Leach	Mahdi Moradian	Determination of the Effect of Humidity on the Probability of Electrostatic Discharge Failure or Upset in Data Centers (SE-14-003)
	6/29/14	Seminar 5			1	IT Equipment Power and Cooling Trends and Deployment Best Practices	Nick Gangemi	Jason Matteson	IT Equipment Power and Cooling Trends and Deployment Best Practices
					2			Robin Steinbrecher	IT Equipment Power and Cooling Trends and Deployment Best Practices
					3			David Moss	IT Equipment Power and Cooling Trends and Deployment Best Practices
	7/1/14	Seminar 32			1	Developing Airflow and Thermal Models for Data Centers: Comparing and Contrasting the Design and Operation Use Cases	Nick Gangemi	James VanGilder	Airflow and Thermal Modeling for the Design of Data Centers
					2			Mark Seymour	Calibration: Developing a Useful Airflow and Thermal Model to Maximize DC Availability Capacity and Efficiency

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New York	1/19/14	TPS 1	1			Hydraulic Modeling as a Tool to Enable Design Resiliency and Quantify Pump Energy Savings for Data Center Chilled Water Systems	Nick Gangemi	Michelle Contri and Thomas A. Davidson	Hydraulic Modeling as a Tool to Enable Design Resiliency for Data Center Chilled Water Systems (NY-14-001)
			2					Thomas A. Davidson and Michelle Contri	Hydraulic Modeling as a Tool to Quantify Pump Energy Savings in Data Center Chilled Water Systems (NY-14-002)
	1/19/14	Seminar 4			1	CFD for Data Center Applications Part 1 – Modeling Advancements	Nick Gangemi	John Zhai, Knud Hermansen and Saleh Al-Saadi	Experimental Validation Of Data Center Rack Models
					2			James VanGilder, Xuanhang (Simon) Zhang and Christopher M. Healey	An Enhanced Potential Flow Model For Data Center Applications
					3			H. Ezzat Khalifa	A Hybrid CFD/Lumped-Capacitance Model For Simulating Data Center Transients
	1/21/14	Seminar 36			1	CFD for Data Center Applications, Part 2 – Applications	James VanGilder	Mark Seymour	Prediction Is Better Than Cure: CFD Simulation for Data Center Operation
					2			Reza Ghias	Practical Use of CFD to Address the Design Challenges and Failure Scenarios in Data Centers
	1/22/14	Seminar 47			1	A Look at DCIM Solutions and Their Integration Challenges in Today's Data Centers and a Look at What Tomorrow Offers		David Quirk	Integration Challenges and End User Expectations
					2			Don Beaty	Challenges with Multi-industry Protocols and Future Considerations
					3			Jack Glass	Case Study of a Major Control Change within an Operating Data Center in a High Rise Building
	1/22/14	CPS 26	2			Data Center Control and Fire Safety in Tall Buildings	Bill Dietrich	Kishor Khankari	Analysis of Air Leakage From Hot Aisle Containment Systems and Cooling Efficiency of Data Centers (NY-14-C093)
			3					Daniel S. Hallett	Control Strategies for Data Centers: Trends Around the Globe (NY-14-C094)