

# Workshop on Future of DC Distribution Systems for Stationary and Mobile Applications

**Day 1: Wednesday October 2<sup>nd</sup>**

**Conference Room: NREL ASPEN A&B**

Start	Item
8:15	Breakfast – Participants check in at NREL East Security Entrance for Shuttle to ASPEN A&B Conference Rooms at NREL
8:30	<b>Welcome – Context for the Workshop and Agenda Review.</b> <ul style="list-style-type: none"> <li>NREL and Eaton hosts</li> </ul> <b>Welcome – Morning Session – Current State-of-the-Art</b> Introduction – TBD
9:00	<b>Panel 1 - Current State-of-the-Art of Stationary DC Distribution</b> <ul style="list-style-type: none"> <li>Moderator: TBD</li> </ul> The panel will focus on the DC distribution related to EV charging with DC/DC chargers, DC microgrids, DC datacenters, PV and Energy storage farms. The goal is to understand what the current practices are and what the new trends are. Challenges faced by the designers and installers will be useful. If there are pilot projects in this area it will be great provide some details.
10:00	Coffee Break
10:15	<b>Panel 2 - Current State-of-the-Art of Mobile DC Distribution</b> <ul style="list-style-type: none"> <li>Moderator: TBD</li> </ul> The panel will focus on the DC distribution related to light, medium, and heavy-duty vehicles, aerospace applications, ship-board power systems and any others related to mobility. The goal is to understand what the current practices are and what the new trends are in DC distribution. Challenges faced by the designers and OEMs will be useful. If there are pilot projects in this area it will be great provide some details.
11:15	<b>Panel 1 &amp; 2: Interactive Conversation</b> All Participants
12:00	Lunch break – TBD
1:00	<b>Welcome – Afternoon Session -Technical Challenges</b> Introduction– TBD
1:15	<b>Panel 3 - Technical Challenges in DC Distribution Architectures - Stationary and Mobile</b> <ul style="list-style-type: none"> <li>Moderator: TBD</li> </ul> There are common features in stationary and mobile DC architectures but there are significant differences as well. The goal here is to identify the challenges faced with different architectures being adapted or proposed. The panel presenters will provide their insights into the challenges they face and the trends in the respective industry to address them. The end goal is for the participants to go away and build the right products.
2:30	<b>Panel 3 - Interactive Conversation</b> <ul style="list-style-type: none"> <li>All Participants</li> </ul>
3:15	Break
3:30	<b>Panel 4 - Technical Challenges in DC Solid State and Hybrid Breakers – Stationary and Mobile</b> <ul style="list-style-type: none"> <li>Moderator: TBD</li> </ul> Solid state and hybrid DC switches (breakers and contactors) are being proposed for various applications. What are the challenges for low-current-low-voltage and high-current-higher-voltage switches? What are broadly recognized as current and voltage limits for the switches. Is there a need for standards that can help product development? The goal here is to identify the use cases for these devices in both stationary and mobile applications and the panel presenters will provide their insights into the challenges they face and the trends in the respective industry to address them. The end goal is for the participants to understand the gaps and what could be available in near time for pilot projects.
4:30	<b>Panel 3: Interactive Conversations</b> <ul style="list-style-type: none"> <li>All Participants</li> </ul>

4:50	<b>Closing comments/Summary – TBD</b>
5:00	<b>Adjourn</b>
5:30	<b>Travel to Dinner at TBD</b>
6:00	<b>Eaton Hosted Dinner at TBD</b>

**Day 2: Thursday October 3<sup>rd</sup> Conference Room TBD: 14142 Denver West**

Start	Item
8:15	Departure for NREL's FLATIRONS Campus from NREL
8:45	Meet at NREL's FLATIRONS Campus if you are on your own
9:00	FLATIRONS Campus tour starts
10:00	End of tour
10:30	<b>Eaton Colleagues Only: Meet at 14142 Denver West Parkway</b> Welcome - Brian Carlson and (Armen/Mark V)
11:00	<b>Intro to "Business Brainstorming"</b> History of Innovation Efforts - Mark Roser, Brian, and Calvin <ul style="list-style-type: none"> <li>• Prior approaches to innovation workshops</li> <li>• Shots on Goal approach</li> </ul> History of PCS Business – Brian Carlson <ul style="list-style-type: none"> <li>• How the scope of products was decided</li> <li>• The breadth of their product offerings</li> </ul> History of Mobility Business – Aerospace (Armen), Mobility (Mihai) <ul style="list-style-type: none"> <li>• How the scope of products was decided</li> <li>• The breadth of their product offerings</li> </ul> Goals for today – Mark Roser <ul style="list-style-type: none"> <li>• Identifying possible customer targets</li> <li>• Aligning with possible Eaton technology solutions</li> <li>• Delivering a prioritized list of new businesses in the DC distribution</li> </ul>
11:30	<b>Developing our list of priorities / Pugh Matrix</b> <ul style="list-style-type: none"> <li>• Our evaluation Criteria</li> <li>• "How will we make our prioritization decisions?"</li> <li>• Group agreement on weighting factors for the matrix</li> </ul>
	<b>Introduce existing and brainstorm possible additional Eaton solution areas</b> <ul style="list-style-type: none"> <li>• List of possible solutions</li> <li>• Open for additional topics and focus areas</li> </ul> Divide into small teams: <ul style="list-style-type: none"> <li>• Target of 2 groups</li> </ul>
12:00	Lunch break
1:00	Individual group warm-up: <ul style="list-style-type: none"> <li>• Introductions between group members</li> <li>• Members share their knowledge of what Eaton is doing in the area</li> </ul>
1:15	Small group-1 diverge on unmet market needs: <ul style="list-style-type: none"> <li>• "Different hats" – members will take turns sharing how the opportunity appears to different applications</li> <li>• Capture – unmet needs, barriers, what will people pay a premium for</li> </ul> Converge on highest alignment and highest value market needs

	<ul style="list-style-type: none"> <li>Convergence by discussion and / or voting for what are the top needs that align with “Why Eaton”</li> </ul>
2:00	Market Needs Report-Out: <ul style="list-style-type: none"> <li>4-minute sharing by each group to the whole room</li> </ul>
1:15	Small group-2 competitive analysis <ul style="list-style-type: none"> <li>Members share their knowledge of what competitors are doing</li> <li>Building the ‘perfect competitor’ exercise</li> <li>‘Capture the flag’ exercise</li> </ul>
	Converge on highest competitive priorities <ul style="list-style-type: none"> <li>Top opportunities for Eaton</li> <li>Top threats to Eaton</li> </ul>
2:20	Competitive Analysis Report-Out: <ul style="list-style-type: none"> <li>4-minute sharing by each group to the whole room</li> </ul>
2:45	Identify gaps and overlaps between groups <ul style="list-style-type: none"> <li>Groups will discuss where there is overlap or unintended gaps</li> <li>Groups adjust their focus / boundaries to address any gaps / overlaps</li> </ul>
3:00	Coffee break
3:15	Small group-1 & 2 converge on their key value-proposition elements <ul style="list-style-type: none"> <li>Discuss how the convergent lists of Market Needs, Opportunities, and Threats can be put into a larger framework – is there a way to organize some of these into a value-added offering?</li> <li>Prioritize the Market Needs, Opportunities and Threats</li> </ul>
4:00	Small group-1 & 2 map the opportunity space for Eaton in their areas <ul style="list-style-type: none"> <li>Describe the range of opportunities in the space</li> <li>Draw a boundary of what is in and out of scope for the areas</li> <li>List of possible experiments to help determine viability of the business</li> <li>List of pre-requisites for success in the area</li> <li>List of collaborators for success in the area</li> </ul>
4:45	Report-Out <ul style="list-style-type: none"> <li>4-minute sharing by each group to the whole room</li> <li>4-minutes for Pugh scoring, dialog and feedback</li> </ul>
5:15	Overall group mapping: <ul style="list-style-type: none"> <li>All groups are placed on a map to identify which opportunities will serve as “beach-head opportunities”, “scale and growth opportunities”, “evergreen opportunities”</li> </ul>
6:00	Next Steps <ul style="list-style-type: none"> <li>Sharing and next steps</li> </ul>
6:30	Adjourn

**Day3:                      Friday October 4<sup>th</sup>    Conference Room TBD: 14142 Denver West**

Start	Item
8:15	Breakfast – Participants check in at 14142 Denver West Pkwy Building
8:45	Report-Out <ul style="list-style-type: none"> <li>4-minute sharing by each group to the whole room</li> </ul> 4-minutes for Pugh scoring, dialog and feedback
9:15	Overall group mapping: All groups are placed on a map to identify which opportunities will serve as “beach-head opportunities”, “scale and growth opportunities”, “evergreen opportunities”
10:00	Next Steps Sharing and next steps

10:30	Travel to NREL for visit to ERL lab demos
12:30	Lunch at NREL
1:30	Continue lab tour at NREL
3:00	Adjourn