

**Key Questions to address at
NIST/DOE Workshop on High-Megawatt Direct-Drive Motors and Front-End Power Electronics
(September 4, 2014)**

The previous April 2014 HMW workshop goal was to “identify the applications and approaches where advanced HMW machine technologies, front end power electronics, and their integration might provide substantial benefit” (see http://www.nist.gov/pml/high_megawatt/april-2014_workshop.cfm). The September 2014 workshop (detailed goals defined in a separate document) will focus on defining: 1) the cost/performance metrics that would quantify the benefits of an integrated direct-drive high-speed motor system solution (grid interface, high-speed MV drive, and gearless high-speed motor) versus today’s baseline solution; 2) key milestones for the required HMW power electronics/machine technology development needs; and 3) considerations for subsequent scaling of the integrated high-speed direct-drive motor solution to high manufacturing volume and higher MW levels (from initially ~1 MW to >30 MW).

Key Questions:

- 1) What are cost/performance metrics that would quantify the benefits of megawatt scale integrated direct-drive high-speed motor system solutions (grid interface, high-speed MV drive, and gearless high-speed motor, 10,000 -20,000 rpm) versus today’s baseline solution?
 - 1a) What are representative cost per megawatt metrics for each stage of today’s baseline solution, and what is expected total cost reduction for an integrated system and how would it be quantified in a proposed demonstration?
 - 1b) What are maintenance requirements and lifecycle cost issues for today’s baseline solution, and how might proposed integrated solutions quantify lifecycle cost benefits?
 - 1c) What are energy loss components of today’s baseline solution, and how might proposed integrated solutions quantify efficiency benefits?
 - 1d) What are footprint reduction metrics that would best quantify the benefits of the integrated solution?
 - 1e) What are factors that would need to be demonstrated to insure scalability of new solutions to high-volume low-cost manufacturing?
- 2) What are key milestones for the required HMW power electronics/machine technology development needs?
- 3) How will integrated direct-drive high-speed motor systems scale to high-megawatt (>30MW) and what are future markets (10 years) for these systems?
 - 3a) What are the applications for >10 MW motors (e.g., in oil and gas)?
 - 3b) What are system specifications and performance requirements for larger >10MW motors (e.g., application speed requirement might be 3,000-4,000 rpm versus 10,000-20,000 rpm for 1 MW applications)?
 - 3c) What are additional technology needs to ensure scalability to high MW (e.g., higher voltage semiconductors >15 kV, power electronics topologies, machine types, etc.)?