# Talking points for discussion sessions

## Opportunities to Enhance/Accelerate Conductor Development

### Moderator: Luca Bottura

1. Which LTS and HTS conductor R&D directions are most important for high field accelerator magnets? Do they together provide the most effective means to advance conductors?
2. What consistent/coherent message(s) are we providing (or should we provide) to industry in terms of High Energy Physics conductor needs?
3. Are there mechanisms that should be explored to strengthen industry? What are the primary issues with industrial scale-up from R&D to commercial levels, and are there opportunities for our programs to streamline/support that transition?
4. Is there a role for lab R&D or small-business prototyping, and how do such developments translate most effectively into real magnet conductors?

## Roadmap Discussion

### Moderator: Steve Gourlay

This session is meant to discuss international efforts in high-field accelerator magnet development, and in particular how the US MDP fits into the international context.

1. Are there areas of strong overlap of R&D focus? Are there “gaps” that need to be addressed?
2. Are there opportunities to leverage overlap to accelerate development?
   1. (Identify and prioritize for the afternoon discussion session on *Opportunities to Enhance/Accelerate Magnet Development)*
3. What are the biggest obstacles to progress?
   * 1. (Identify and prioritize for the afternoon discussion session on I*ssues that Limit Progress*)
4. Given that the time frame for a next hadron collider may be long, should we revisit the program goals and priorities?
   1. Training vs high field?
   2. Cost vs performance?
   3. Focus on robust, cost-effective two-layer design? (Integrates the two preceding bullets)
5. Is incremental progress on Nb3Sn acceptable? Should we bifurcate the program and take HTS to high field, and work on value engineering of Nb3Sn magnets? If not, where is the branch point for Nb3Sn?
6. Is this an opportunity to increase risk/reward ratio, i.e. more emphasis on HTS?

## Facilities for Conductor and Magnet R&D

### Moderator: Sasha Zlobin

* 1. What and how many R&D conductors, coils and magnets per year are planned to be tested during the next 5-10 years? What major test capabilities need to be provided to support that throughput?
  2. What are the major facilities for conductor / cable / magnet qualification and testing that are available for our programs? What are their capabilities and limitations with respect to our needs?
  3. Is there an important role for solenoid test facilities and not just dipole facilities?
  4. Do we understand and agree on what could be tested using single wires and what requires testing cables and coils?
  5. Are the available conductor (strand, cable) testing capabilities adequate for the planned magnet R&D? Are there conductor development facilities at laboratories/universities that should be enhanced to accelerate conductor development?
  6. What facility capabilities of benefit to high field accelerator magnet technology development are missing, or are marginal (I.e. limited in number and/or capability)?
  7. Are there opportunities for further coordination of test techniques / protocols / diagnostics / etc?
  8. What are the most efficient approaches to share test data and/or collaborate more closely on testing? What issue are there and how can we resolve them?

## Issues that Limit Progress

### Moderator: Kathleen Amm

1. Can we identify leading technical questions/hurdles that impede progress on LTS magnets?
2. What are the leading technical questions/hurdles for HTS: REBCO? Bi2212?
   1. Are these issues captured by the roadmaps?
3. What are the primary “operational” limitations to progress in magnet development? (e.g. funding? Management structures? Access to appropriate expertise? Access to appropriate facilities?)
4. Are there other approaches to high-field accelerator magnet design/fabrication that should/would be considered if resources were not limited? How would they be prioritized?
5. Building on the roadmap discussion - what areas have been identified from the morning discussion?
6. Possible push out in timescale for a future hadron collider - longer time frame for development – have areas leveraging this been fully identified in the roadmap discussion?
7. Can we identify leading technical questions/hurdles that impede progress on LTS magnets? E.g. is incremental progress enough on Nb3Sn? Are there coil configurations that simplify magnet design with Nb3Sn?
8. Lessons learned during HiLumi and LARP - can we really industrialize Nb3Sn magnets for use in the next hadron collider?
9. What are the leading technical questions/hurdles for HTS: REBCO? Bi2212? e.g.
   1. How can you even make a cable with REBCO that is magnet ready?
   2. Can we address coil materials challenges with BI2212 even beyond what we have with Nb3Sn during heat treatment?
   3. What lessons-learned from LTS can we apply to HTS? What is unique to HTS?
   4. What are the additional technical questions/hurdles for HTS/LTS hybrid magnets? Are there particular magnet designs that lend themselves best to hybrid designs?

## Opportunities to Enhance/Accelerate Magnet Development

### Moderator: David Larbalestier

* 1. Can we identify actions we can take now to accelerate conductor and magnet developments?
  2. Can the programs for high energy physics be strengthened by coordinating/teaming with other areas that have synergistic needs, such as fusion? What are the best mechanisms for such coordination?
  3. Do we see opportunities to strengthen career opportunities through enhanced collaborations and staff exchanges?
  4. Since the magnet brings all key problems together in one place (conductor uniformity, conductor stability and margin, response to stress, cost, quench protection, etc.) and rapid turnaround is highly valuable, can we usefully use solenoid testing as an important part of our road map?

## Summary Discussions

### Moderator: Soren Prestemon

* 1. What are the key take-aways from each discussion session?
  2. What are the key take-aways from the overall meeting?
  3. What are the next steps, and how do we make the meeting outcomes “stick”?