CHANGING WHAT'S POSSIBLE

Electrochemical Metals Production Breakout

What is the origin of the major energy losses associated with electrochemical metal extraction, and what opportunities are available to mitigate losses and/or recover heat?

Are there transformative routes to more efficient light metal (Al, Mg, Ti) extraction via electrochemistry, and have novel electrolytes been developed or are any under development that enable, high efficiency, reduced emissions, and/or heat recuperation? At what point in the process should heat be extracted for recuperation?

What are the major technical barriers and risks to implementing these routes, and what technologies are available today to enable success that may not have been available twenty years ago?

Are there promising approaches from past research efforts that were not adopted but may find success today?

CHANGING WHAT'S POSSIBLE

Heat Recuperation and Power Generation Breakout

What are the major barriers to waste heat recuperation in light metal (Al, Mg, Ti) extraction processes (electrochemical or thermochemical), and what transformative heat recuperation strategies can potentially overcome the barriers to waste heat capture in metal extraction processing?

What power generation cycles are feasible using waste heat capture from metal extraction processes, and are any of these economically viable?

For what temperature range should heat recuperation technologies be developed for metal extraction processes? What are the challenges and risks of operating at these temperatures?

Can efficient retrofit heat recuperation solutions be developed for existing smelters?

CHANGING WHAT'S POSSIBLE

Recycling and Other Innovative Metals Production Concepts Breakout

What are the major technical barriers to efficient and quality recycling of light metals (Al, Mg, Ti), and are there transformative solutions to enable efficient and high quality recycling?

How can alloyed metals be identified, separated, and recycled to meet ASTM specifications for aerospace or ground vehicle applications?

Why is a large fraction of U.S. scrap metal shipped overseas, and what technical innovations are required to enable U.S. scrap processing to be more competitive? Would heat recovery during the recycling process give a technological edge?

Can urban mining provide a recyclable product to meet ASTM specifications?

CHANGING WHAT'S POSSIBLE

Renewable Metals Production Breakout

Are there efficient renewable energy routes to light metal (Al, Mg, Ti) extraction, such as, a) solar thermochemical, b) hybrid solar thermochemical/electrochemical, c) wind/carbothermal or hydrothermal, and others?

Which routes make best use of available energy sources, and does using multiple renewable energy sources provide an advantage over using a single source (i.e. solar and wind or biomass and solar)?

Are any of these renewable energy metal extraction solutions cost competitive in the long term? In the near term, is there a path to market with any of these renewable energy routes?

What are the major technical barriers and risks to implementing these routes?

CHANGING WHAT'S POSSIBLE

Thermochemical Metals Production Breakout

Are there transformative carbothermic routes to more efficient light metal (Al, Mg, Ti) extraction via thermochemistry, and can methane be used effectively as a feedstock?

Is hydrogen based metal reforming a viable path to low emissions thermochemical metal extraction, and do the thermodynamics of hydrothermic light metal (Al, Mg, Ti) reforming compare favorably to carbothermic reforming?

Can heat recuperation be integrated with any of these transformative routes, and at what point in the process should the heat be extracted?

What are the major technical barriers and risks to implementing the transformative routes, and what technologies are available today to enable success that may not have been available twenty years ago?

Are there promising approaches from past research efforts that were not adopted but may find success today?