# **HyperSciences’ Project Needs and American Made Network Member Resources**

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| **Need** | A fast setting polymer concrete mixture that can be continuously extruded downhole. |
| **AMN Member** | Pacific Northwest National Laboratory (PNNL) |
| **Member Background and Resources** | PNNL has devoted an extensive amount of research to develop polymer concrete mixtures suitable for the harsh conditions imposed by geothermal wells. Their knowledge and consultation will be instrumental in selecting the appropriate concrete mixture that can be continuously extruded downhole. |

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| **Need** | Advanced nickel alloy 3d printing and design consultation. |
| **AMN Member** | MELD Manufacturing |
| **Member Background and Resources** | MELD Manufacturing has developed a new AM process that can print large nickel-based super alloy parts with 10 times the deposition rate of traditional fusion based additive processes. Their equipment could potentially be used to manufacture system components such as the waterjet coring tool and auger. |

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| **Need** | Engineering consultation, design, and prototyping of high-power downhole electric motor. |
| **AMN Member** | Windings Inc |
| **Member Background and Resources** | Windings has pioneered the development of high efficiency electric downhole motors for the Oil & Gas industry. They can engineer, develop, and prototype a downhole electric motor for the tool power train. |

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| **Need** | Engineering simulation and modeling of hypersonic impact and rock fracturing characterization. |
| **AMN Member** | Sandia National Laboratories |
| **Member Background and Resources** | Sandia National Laboratories is the creator of CTH, a multi-material, large deformation, strong shock wave solid mechanics code that HyperSciences currently uses for analyzing the performance of the HyperCoreTM engine. SNL can provide the analysis resources to further advance the HyperCore technology. |

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| **Need** | Materials science driven analytics and models of equipment in extreme temperature and pressure conditions. Consultation in developing bioplastics for hypersonic tunneling application. |
| **AMN Member** | Oak Ridge National Laboratory (ORNL) |
| **Member Background and Resources** | Oak Ridge National Laboratories has a world class materials science research and development program that has expertise in the modeling and analytics of materials under extreme conditions. This would be useful in understanding material interactions and behavior in hypersonic acceleration and impact.  The biomaterials research conducted at Oak Ridge National Laboratories could also provide valuable insight to pursue a goal of producing a bio-derived “green” projectile for hypersonic drilling and tunneling. |

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| **Need** | High speed impact testing and validation of rock breaking performance with various projectile designs, rock types, and exit velocities. |
| **AMN Member** | Lawrence Livermore National Laboratory (LLNL) |
| **Member Background and Resources** | Lawrence Livermore National Laboratory has a non-nuclear explosives test site including a Contained Firing Facility with robust data acquisition capabilities. Use of this test site would be instrumental in providing HyperSciences with independent validation of rock breaking performance. |