

**3.C. *Table of Needs Articulated on First Day***

TOPIC	STATIONARY	PORTABLE	VEHICULAR
Research/Testing/ Documentation	<ul style="list-style-type: none"> <li>▪ Basis for designation of a fuel cell as stationary, portable, or vehicular</li> <li>▪ I.D. of necessary safety concerns for each type of fuel cell and how to address them</li> <li>▪ Hydrogen piping and use in buildings</li> <li>▪ Basis for acceptance as an emergency power source</li> <li>▪ Standardization of data</li> <li>▪ Protocol for verifying compliance with building codes</li> <li>▪ <i>Consider matched sets of components to simplify approval</i></li> <li>▪ <i>Use testing agencies for pre-assessments on products to prevent problems</i></li> <li>▪ <i>Need standard acceptance tests for installations</i></li> <li>▪ <i>What is the impact of the fuel cell on the residential construction process? Specialty contractors?</i></li> <li>▪ <i>Testing labs can do site evaluations to help authorities having jurisdiction</i></li> <li>▪ <i>Manufacturers need to closely track feedback from the field</i></li> <li>▪ <i>During product development cycle the prototype may not be listable since the product is in flux – need opportunities to install prototypes without being listed</i></li> <li>▪ <i>Most code officials more concerned with fuel rather than fuel cell system</i></li> <li>▪ <i>NAHB RC working on PATH initiative and is looking at code issues relative to fuel cells</i></li> </ul>	<ul style="list-style-type: none"> <li>▪ Basis for designation of a fuel cell as stationary, portable, or vehicular</li> <li>▪ Safety related to hydrogen production</li> <li>▪ I.D. of necessary safety concerns for each type of fuel cell and how to address them</li> <li>▪ Fail safe controls</li> <li>▪ Standardization of data</li> <li>▪ Dealing with hydrogen leakage, especially with indoor applications</li> <li>▪ Basis for acceptance as an appliance in buildings</li> <li>▪ How much hydrogen can be stored where and in what for sale (work on the transport of the fuel supply for portable applications). The portable WG of the USFCC has commissioned a report from Rocky Mountain Environmental Strategies Inc. on this topic</li> </ul>	<ul style="list-style-type: none"> <li>▪ Basis for designation of a fuel cell as stationary, portable, or vehicular</li> <li>▪ Safety related to hydrogen production</li> <li>▪ I.D. of necessary safety concerns for each type of fuel cell and how to address them</li> <li>▪ Ventilation needs for all parking garages</li> <li>▪ How combustible liquids and flammable gases can co-exist in the same interior spaces or be stored on the same site</li> <li>▪ Standardization of data</li> <li>▪ Basis for the acceptability of fuel cell vehicle storage, fueling, and use within the current building infrastructure</li> <li>▪ <i>Need to address reforming on board or off site and issues associated with each</i></li> </ul>

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	<p data-bbox="513 228 784 285"><i>(collaboration with DOE efforts)</i></p> <ul style="list-style-type: none"> <li data-bbox="467 289 794 436">▪ <i>Consider using the spirit and intent provisions of codes to get permits (performance equivalency)</i></li> <li data-bbox="467 441 776 558">▪ <i>What about CE marking – may not be consistent response across various bodies in the CE</i></li> <li data-bbox="467 562 794 863">▪ <i>Reduce time between when fuel cell manufacturer decides what they want to build to the inclusion of criteria in the codes (code officials, utilities and test labs felt that there are no obstacles for stationary fuel cells)</i></li> <li data-bbox="467 867 794 924">▪ <i>Manufacturers see no obstacles other than time)</i></li> <li data-bbox="467 928 794 1075">▪ <i>What is the cycle time to be listed under Z21.83? One to six months unless components are not listed to standards in Z21.83</i></li> </ul>		

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Education/Outreach and Service/Field Support	<ul style="list-style-type: none"> <li>▪ Presentations and videos for code officials on the technology and how to inspect and approve installations</li> <li>▪ Commentary on fuel cells to support existing educational efforts for code officials</li> <li>▪ Operational guidelines for building operators and consumers</li> <li>▪ Availability of one trained technician to do all related design, permitting, installation and commissioning functions in lieu of a number of different experts on individual steps in the process</li> <li>▪ <i>Need to address long term maintenance and the impact on continued code compliance</i></li> <li>▪ <i>Interchangeability with respect to future maintenance (inter-manufacturer parts, intra-manufacturer parts, and similar part in new technology) – may need to certify components and systems</i></li> <li>▪ <i>Design, installation and commissioning</i></li> <li>▪ <i>Get copies of Z21.83 soon in product development</i></li> <li>▪ <i>By code terminology fuel cells are appliances and location on property, site plans, certification, listings, supporting statements and documents need to be provided to the code official</i></li> <li>▪ <i>Need to deal with 2 bodies at the state level; code officials and utility commissions</i></li> <li>▪ <i>Need implementation of the code, not just the</i></li> </ul>	<ul style="list-style-type: none"> <li>▪ Operational guidelines for consumers</li> <li>▪ <i>Interchangeability with respect to future maintenance (inter-manufacturer parts, intra-manufacturer parts, and similar part in new technology) – may need to certify components and systems</i></li> <li>▪ <i>Fire codes are the most important codes for portable fuel cells</i></li> </ul>	<ul style="list-style-type: none"> <li>▪ Operational guidelines for consumers and distributors</li> <li>▪ How to address hydrogen safety</li> <li>▪ Servicing and maintenance protocols are being explored by SAE in cooperation with the Service Technicians Society (STS)</li> <li>▪ <i>Need to integrate fuel cell technology into airline support applications</i></li> <li>▪ <i>Need to compete against gearhead mentality regarding IC engine competition</i></li> <li>▪ <i>Need energy efficiency message to drive application of fuel cells</i></li> <li>▪ <i>EMTs need help dealing with increased issues associated with use of fuel cells and related fuels</i></li> <li>▪ <i>Service technicians need to be educated, in place and certified</i></li> <li>▪ <i>Aircraft in process inspectors need to be trained in fuel cell technology</i></li> <li>▪ <i>What do commercial insurance carriers need?</i></li> </ul>

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	<p><i>code</i></p> <ul style="list-style-type: none"> <li>▪ <i>Need to be aware of zoning and environmental requirements</i></li> <li>▪ <i>Be careful how we represent the fuel cell (new technology versus on site technology)</i></li> <li>▪ <i>Protect the one opportunity with residential construction to get it right</i></li> <li>▪ <i>Monitor standards making process relative to fuel cells and make sure you are represented</i></li> <li>▪ <i>Code writers need to know what to write code for and manufacturers need to know what codes to develop products for</i></li> <li>▪ <i>Fire marshals are the key officials right now</i></li> <li>▪ <i>Disparity between rural and urban code official</i></li> <li>▪ <i>Would builders and homeowners be willing to accept a fuel cell as a black box as the code officials do?</i></li> <li>▪ <i>Use community opinion to overcome some of the barriers to acceptance</i></li> <li>▪ <i>What about the qualification of the installers? Who is doing something about this? Can this issue be brought into codes?</i></li> <li>▪ <i>Manufacturers fearful that codes will drive the product development (some manufacturers using international standards)</i></li> <li>▪ <i>Safety is the most important issue for code officials to address</i></li> <li>▪ <i>The winner in residential construction will be the manufacturer who figures out how to make the use of fuel cells in buildings transparent</i></li> </ul>		

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Future codes and standards	<ul style="list-style-type: none"> <li>▪ Secure adoption by reference of NFPA 853 in the model building codes</li> <li>▪ Develop standards for verifying or testing as-installed performance, which may be required for interconnection to the utility. The requirements for verifying as-installed performance can vary depending on the capacity of the unit, interconnection voltage, line PQ etc. Having some sort of as-installed test standard that recognizes these needs could avoid unnecessary testing or simplify testing of as-installed equipment</li> <li>▪ Need for scope revision of NFPA 853 to cover equipment &lt; 50 Kw.</li> <li>▪ <i>Issue of separation of reformer and fuel cell (2 or 3 black boxes versus 1 big black box</i></li> <li>▪ <i>May need separate reformer standard</i></li> <li>▪ <i>Producing and storage of hydrogen on site may change the building categorization to a hazardous production facility-need to review use group issues</i></li> <li>▪ <i>Need hydrogen generation standard-CSA needs to complete work started</i></li> <li>▪ <i>May change zoning if serving multifamily building and fuel cell is used to generate income from sale of power</i></li> <li>▪ <i>Need to address natural hazard survivability both for automatic shutdown and lifeline support</i></li> <li>▪ <i>Need to work on different requirements for small and large units – yes CSA is doing this</i></li> </ul>	<ul style="list-style-type: none"> <li>▪ This product will be asked to perform under a variety of environmental conditions and applications since conditions can vary significantly depending on the application. Standardized testing will be needed so the performance for a given range of conditions (e.g. temperature, humidity, etc.) can be stated or the recommended operating range of conditions can be identified and verified.</li> <li>▪ CSA Requirements No. 3.01, Portable Fuel Cell Appliances (Draft)</li> <li>▪ <i>Producing and storage of hydrogen on site may change the building categorization to a hazardous production facility-need to review use group issue</i></li> <li>▪ <i>Who addresses fuel storage devices carried on aircraft – USFCC is working on this and need to change DOT regulations and IATA regulations</i></li> <li>▪ <i>CSA writing FC3 and should be ready this year</i></li> <li>▪ <i>Transportable fuel supplies</i></li> <li>▪ <i>Storage of fuel supply at the destination</i></li> <li>▪ <i>ICC has defined portable fuel cells and exempted them from permitting(Gray area is where portable connected to hard piping at residence)</i></li> <li>▪ <i>Household use may trigger monitoring from consumer Product Safety Commission</i></li> <li>▪ <i>Codes for portable fuel cells should impose similar requirements to portable gas generators</i></li> </ul>	<ul style="list-style-type: none"> <li>▪ SAE has started a dialogue with the Performance Review Institute (PRI) for potential mobile unit certification</li> <li>▪ <i>Producing and storage of hydrogen on site may change the building categorization to a hazardous production facility-need to review use group issues</i></li> <li>▪ <i>SAE has relationship with transit standards consortium for standards for bus applications</i></li> <li>▪ <i>Federal transit authority – bus standards on safety, but also performance</i></li> <li>▪ <i>Refueling stations may be a big issue (OEMS considering getting involved in distribution of fuel)</i></li> <li>▪ <i>SAE is doing a lot in codes and standards</i></li> <li>▪ <i>Need hydrogen infrastructure</i></li> <li>▪ <i>Need to address parking garages?</i></li> <li>▪ <i>What about tunnels? (DOT and NITSA need to address this)</i></li> <li>▪ <i>Will state vehicle inspectors need to inspect fuel cell related components?</i></li> <li>▪ <i>What about passive ventilation of enclosed spaces for hydrogen safety?</i></li> </ul>

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	<ul style="list-style-type: none"> <li>▪ <i>Fuel cell may have residual combustible gases on shutdown</i></li> <li>▪ <i>Treatment of breach of separators and air bleeds – NFPA 853 covers this</i></li> <li>▪ <i>What about catalytic technologies when Z 21.83 refers to open flames</i></li> <li>▪ <i>What about reverse power controls backfeeding the grid?</i></li> <li>▪ <i>Need to address deodorized gas</i></li> <li>▪ <i>Criteria for fabrication of sulphur traps</i></li> <li>▪ <i>Get NFPA 853 adopted into the model codes</i></li> <li>▪ <i>Keep standards and codes moving and out of draft stages</i></li> <li>▪ <i>Look at issues like use of equipment for standby use versus non-emergency use and fuel storage</i></li> <li>▪ <i>Design systems so that standard connections can be made to minimize installation problems</i></li> <li>▪ <i>European CE markings define safety requirements but don't limit designs – this makes it tough to know what need to be done or what directive apply (performance versus prescriptive)</i></li> <li>▪ <i>Do we need a standard for annual ratings of fuel cells for consumer labeling (consider ASHRAE standard for seasonal ratings)</i></li> <li>▪ <i>What about combination fuel cells and microturbines? (UL 2200 is used to test microturbines)</i></li> </ul>	<ul style="list-style-type: none"> <li>▪ <i>Indoor use issues may be important</i></li> </ul>	