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The Rabbit in the Hat

One of the tricks practiced by a magician is to demonstrate that he has an empty hat and then a few minutes, later he reaches in and pulls out a rabbit. You have to wonder where that rabbit had been hiding all along. And, while most of us suspend our beliefs long enough to believe that a rabbit materialized out of thin air the reality is that that rabbit was there all along. We just couldn't see it.

In many ways fire protection has a lot of rabbits in the hat also. What I am referring to is fire problems that we don't know anything about yet, but that already exist. Or, fire problems that we think we know something about but we are not really adequately prepared to deal with in the long term.

What I am talking about specifically are two major issues that are going to face the fire service in a few more years. The first one is that of the growth and development of alternative fuel sources that will eventually begin to emerge as regulatory issues for fire departments. And the second is the growth and development to alternative building technologies that are replacing contemporary building methods.

Alternative to what? That is a legitimate question. Alternatives means that while we are busy dealing with reality today, there are people inventing an alternative tomorrow for us to deal with.

For example, in the case of alternative fuels the vast majority of our energy sources concurrently are packaged very neatly within the mindset of most human beings. Albeit expensive, they are traditional. We go to the gasoline station to fill our vehicle up with gasoline without a moment's thought. We turn on the heater or air conditioner of our house not really worrying too much about where the natural gas or the electrical energy comes from. These are conventional energy sources that we have long grown accustomed to and in general incorporated them into our fire station practices with a great deal of comfort.

The rabbit in the hat is the alternative sources that are going to start emerging over the next ten or fifteen years have been made viable, economical and available or widespread us. They will create an entire new environment for the fire and life safety business to deal with.

To drill down a little bit closer on this, what I am talking about is the use of electrical energy to drive vehicles, liquefied natural gas and hydrogen as a potential vehicle fuel source, solar energy and last but not least biomass energy.

In my opinion none of these are exactly on the front burner yet. They are buried inside that magician's hat waiting to be sprung upon us once they actually achieve some form of critical mass in society and become an energy source of choice. There has been some research conducted on these various forms of energy and they are actually being used out there in the real world today, although in an



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experimental stage. If you haven't already seen one there are several vehicles now that are powered by electrical energy. Some such as a Geo Prism are actually a combination of both fossil fuels and electrical energy.

In both cases the introduction of electrical energy to operate a vehicle begins to raise some very interesting long-term questions. Will fighting a fire in a vehicle charged by electrical energy be different? I think – yes! Years ago, the California State Fire Marshal's Office under the direction of Rodney Slaughter produced a series of training documents that deal with just this issue. Right now they are hardly on the radar screen of many fire organizations. It is conceivable that some organizations have not seen electrical vehicle fire nor have they done any training on it.

But it goes further than that. Imagine when the idea of having your vehicle plugged into your garage at night refilling its battery will replace the periodic visit to the gas pump. It will cause a redirection of energy costs and in many ways raise some other significant issues regarding electrical safety within the single family and multi-family dwellings.

Solar energy has been touted as being a potential alternative source that will free us from the limitations of fossil fuels. However, what is not as clearly understood is exactly how solar energy will interface with building construction and a transfer of that information into an electrical grid. Solar energy is not without its concerns especially when it comes to serving as an ignition source. Obviously if you are concentrating solar energy you are probably going to be achieving higher-level temperatures in certain sets of circumstances. The fire code will be unlikely to start thinking about this kind of an issue until problems begin to exist.

How about hydrogen? Hydrogen is a prolific chemical compound in our universe. It is also one of the most dangerous to try to contain and to harness effectively. It is one of the few gases, for example, that ignites upon expansion. And another of its unique characteristics is when it burns it is a transparent flame. All of which completely is obscured by the fact that there are methods of compressing hydrogen into a liquefied state and using it operate motor vehicles or for that matter stationary motors. What are the implications of liquid hydrogen when it is exposed to an external fire? What practices must be put into place to assure that when the refueling of these vehicles is being conducted that safety is provided for the vehicle owner?

In biomass is run so far down the chain of thought in the fire service that it is unlikely that many people even regard it as an issue. Yet, biomass and its ability to generate electricity in local "micro generators" is an emerging technology. Right now nobody cares about it because it is not very economical and it is highly isolated. However, what would happen if all of the major facilities in a particular community had to use its emergency generators utilizing biomass to guard them?



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Fire prevention and operational aspects would increase significantly.

The reason that I am raising these issues is not to generate fear of their adaptation or utilization but rather to point out the role of the fire service in coping with it once they do pull it out of the hat.

The current discussion on the dependence of this country on foreign oil imports and the President "Freedom Car" initiative has brought the possibility of alternative fuels top the attention of the public. The topic has moved from the pages of Modern Science to the front page of the local newspaper. This has been increased also by the renewed emphasis on zero-emission fuels. Zero emission vehicles (ZEV's) may actually be mandated within the next 5 to 10 years.

If you go back and look at the history of fuel sources you will be able to observe that every time we have added chemistry to the scenario we have increased the need to have more adequate controls in place. For example, when crude oil was first pumped out of the ground and turned into gasoline we certainly didn't have anything in the way of engineering and design standards to make sure a gasoline did not endanger life and property. As a matter of fact there was a period of time during which a lot of people got hurt because they simply didn't understand the physical properties of gasoline.

Another alternative fuel source coming to the forefront is called liquefied natural gas. In a recent research project looking into liquefied natural gas I observed that a limited number of fire authorities were really concentrating their energies on understanding the phenomenon. Most of the information on LNG was focused on its production and its distribution with little emphasis on interaction with local government authorities. The nature of this column is to not sit here ringing hands over the fact that these alternative fuel sources will be coming to the forefront.

It is entirely appropriate that we start talking about the fire service's role in responding to these alternative sources. This involves three levels of concern. The first of these is having adequate fire codes in place. The second is to have a training program in place that clearly prevents a firefighter from becoming injured or killed in coping with the consequences of an alternative fuel source. The third element is to assure that there is modification to number one and number two over time as they become more sophisticated in understanding the product.

In 2003 there was a study conducted by Harvard that delineated these three obligations fairly clearly. What the study may not have focused on that we should be concerned about is the fire services role in assuring that those three things are done at the lowest possible level.

It is very unlikely that any of these alternative fuel sources would just suddenly spring up in the landscape of any of our local communities without some degree of warning. There will be federal support in some cases – or there could be state support in others. None of these alternative fuel



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sources will just emerge unannounced. If you recall the famous line from the Bullwinkle cartoon of the 60's – “Nothing up my sleeve” just prior to him pulling out the rabbit from the hat – there will be announcements that predict the arrival of these sources. The challenge is making sure that the fire service is sitting on the front row listening to these announcements rather than waiting for a catastrophic event to occur.

Right now these alternative sources are not invisible. To the contrary. There are several standards that have been recommended, such as NFPA 59A on liquefied natural gas and specific training programs have been created such as the California State Fire Marshal's project on alternative fuel vehicles. What we have to be concerned about is whether this is being paid attention to by fire service professionals in preparation for the next generation's challenges.

Our best defense mechanism against apathy in this area is one that I have mentioned in other columns – professional curiosity. The fire profession needs to be asking questions regarding all of these alternative fuel sources as they are being produced. What are the basic principles we need to understand? What are the necessary changes we have to make in tactics and strategy based on the attributes of these materials? What new codes ordinances and/or professional guidelines need to be laid down at different levels of government to assure an adequate response?

While curiosity may have killed a cat it is unlikely that curiosity will result in a fatal injury to a firefighter. Forewarned is forearmed. Looking at these potential energy sources long before they emerge from a magician's hat means that our survival and the safety of our community will be better assured.