Changes and Developments in Hydrogen Energy as Seen in TV Programs

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1. INTRODUCTION

Hydrogen energy, which has attracted attention in recent years, has the following two major advantages. Hydrogen as a fuel has multiple production methods and does not depend on petroleum. Only water is produced during combustion, and carbon dioxide is not emitted. For these reasons, hydrogen energy is considered as a new energy for the next generation especially in Japan, and both companies and governments are rapidly putting effort into dissemination. However, hydrogen used as a fuel is a flammable gas essentially. Hydrogen also ignites when energy such as static electricity is applied in a state of being mixed with oxygen at a constant concentration. In addition, hydrogen is often marketed and distributed as high-pressure gas in order to reduce its volume. Therefore, when the gas container is heated, the volume of hydrogen contained therein suddenly increases and the container withstands internal pressure. There is a possibility of explosion without breaking. In fact, according to The High Pressure Gas Safety Institute of Japan, 69 accidents have happened involving high pressure hydrogen gas in 2011-2014 [1]. Thus, in order to spread hydrogen energy, it is indispensable to prepare means and regulations for safely handling hydrogen.

Herein, changes and developments in hydrogen energy as seen in TV programs about hydrogen energy and fuel cells have been investigated by not only browsing NHK (Nihon Hoso Kyokai)'s program archives but also other database or materials. In addition, by comparing with other TV programs about a famous fire accident in Japan, characteristics of TV programs as will be discussed.

2. METHODS

The following TV programs by NHK were searched and hit by keywords of “hydrogen energy”, “fuel cell”, and “Fire accident”. Among them, 1-4 could be watched actually, while 5-8 (lost programs) could be found from the archives. Only 4 (featuring fire alarms) is associated with “Fire accident”. It should be noted the historical order (year or date) when they were broadcasted.

1. Science ZERO “Save the Earth with New Energy” (Broadcast on April 21th, 2007, E(Educational)-TV)
2. Biz + Sunday (August 4th, 2013, E-TV)
3. Weekly news profound reading “First year of hydrogen society: Can Japan win the world?” (February 14th, 2015, E-TV)
4. Science document “Can you trust? Smoke and fire alarm” (March 16th, 1982, E-TV)
5. Sunday Forum “Towards a Low-Carbon Society: Living and Local Issues” (November 22th, 2009, E-TV)
6. TV Symposium “To reduce CO₂ emissions by 80%” (December 11th, 2010, E-TV)
7. NEWS WEB (November 25th, 2014, G-(General) TV)
8. TV symposium “The era of hydrogen energy has begun” (January 31th, 2015, E-TV)

3. RESULTS

3.1 Programs about Hydrogen Energy

For 1: Bio-ethanol, solar, wind, biomass, geothermal, water, snow and ice, as well as other natural energies, solar power generation, and fuel cells were introduced to overcome the issue of “saving the earth with new energy”. At this point, hydrogen energy is one of the many new energies. Fuel cells were introduced as a part of special topic on wheelchairs powered by a fuel cell, which was manufactured by a machine maker in Osaka, Japan. The advantage of wheelchairs is downsizing by air-cooling system and easily replenished hydrogen cylinders.

For 2: Fuel cell vehicles running on hydrogen energy were focused as well as residential power sources using hydrogen energy. At this time, 2015 was referred to as the first year of the hydrogen society by Japanese government. However, it was aware that technical advantage might not lead to economic success similar to electric products by Japan. Moreover, regulations for hydrogen station were compared between Japan (strict law needs expensive equipment) and Germany (as a top-runner but not strict), which may be weak point of Japanese industry. For example, 6 m distance and 12 cm thickness wall required for safety separation in Japanese hydrogen stations.

For 3: Program 3 (in 2015, said as the first year of the hydrogen society in Japan) focused on economic and industrial aspects such as “Can Japan win the world (global market)?” with the aid of fuel cell units. Beside general discussion of hydrogen society (such as principles of batteries or generation of fuel hydrogen, hydrogen stations, and marketing strategy), the safety against hydrogen explosions was also mentioned a little only by one commentator.

3.2 Program about Fire Accident

For 4: Program 4 mentioned fire alarms (e.g. comparison with popular ionization type and photoelectric type sensitive to smoke) predominantly triggered by a famous fire accident in Hotel New Japan on February 8th, 1982, happened in the same year, due
to the lack of sprinklers by the owner’s violation. According to Tokyo fire department’s investigation, a sprinkler could extinguish 74 out of 75 cases of fire except for an explosive fire. Contrary to USA, however, Japanese fire alarms made deliberately lowered the sensitivity to prevent malfunctions, which were considered serious issue at this time in Japan.

4. DISCUSSION

4.1 Changes in the Position of Hydrogen Energy in the Programs

Changes in the position of hydrogen energy in the programs 1-3 could be found according to broadcast years. As summarized in Table 1, the importance of hydrogen energy increased mainly due to political supports. The progress of government and corporate efforts one after another was a tailwind, and the TV industry produced and broadcasted programs related to hydrogen in order to popularize it.

Before the milestone year 2015, as seen in the program 1, several candidates of new energy were mentioned, while after 2015, hydrogen energy or fuel cell were focused and topics have been changed from technical ones to industrial ones. Economic or political considerations of the new energy were prosperous when the program 2 was broadcasted. In the program 3, the development of fuel cell vehicles, which has been tackled so far, is predicated on the challenges that have arisen in the future spread as the major theme of the first year of the hydrogen society (2015). Residential power supplies and fuel cell vehicles should be selected as a major means for realizing a hydrogen society in the future.

Table 1 Social movements concerning hydrogen energy [3]

| Date            | Events                                                                 | Contents                                                                                                                                 |
|-----------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| April 2014      | “Energy Basic Plan” is decided by the Cabinet.                         | This plan includes “acceleration of efforts to realize Hydrogen society”. It is written “For full-scale utilization of hydrogen, it is necessary to develop a large-scale system that involves changes in the social structure that is equivalent to the current power supply system and petroleum product supply system.” |
| June 2014       | Based on the “Basic Energy Plan”, the Ministry of Economy, Trade and Industry compiled the “Hydrogen / Fuel Cell Strategy Roadmap”. | In addition to the use of hydrogen, the objectives at each stage of production, transportation, and storage, and the efforts of industry, academia, and governments to realize them are specified. |
| November 28, 2014 | The 4th Tokyo Metropolitan Assembly Regular Meeting was held.         | The Governor of Tokyo at the time announced that it would realize a hydrogen society for the Tokyo Olympics and Paralympics in 2020 when the governor announced. |
| December 15, 2014 | Toyota Motor commenced officially sales of the fuel cell vehicle “MIRAI”. | MIRAI is the world’s first mass-produced fuel cell vehicle. |
4.2 The Reason or Motivation to Broadcast “Safety Topics” by the Program

Although safety issues of hydrogen will be serious in future, few information on fire accidents of hydrogen stations were found since these programs have been made actually. Consequently, only the merits of hydrogen energy were emphasized in the programs. According to Table 2 [4], only 74 high-pressure gas accidents including hydrogen stations have occurred in Japan between 2005 and 2016. Among accidents at hydrogen stations that are indispensable for the spread of hydrogen energy and fuel cell vehicles, most of them are caused by leaking out of hydrogen. For example, hydrogen station demonstration test facility installed on Kyushu University had an explosion accident in 2005 [5].

Table 2 High-pressure gas accidents related to hydrogen stations that occurred between 2005 and 2016 (74 cases in total)

| Occurring events     | Number of occurrences (cases) | Number of casualties and serious injuries (persons) | Number of mild cases (persons) |
|----------------------|-------------------------------|----------------------------------------------------|-------------------------------|
| Burst damages        | 1                             | 0                                                  | 0                             |
| Explosions           | 2                             | 0                                                  | 0                             |
| Leakages             | 61                            | 0                                                  | 1                             |
| Leakage, etc.        | 10                            | 0                                                  | 0                             |

The broadcast day of the program 4 was about a month after the Hotel New Japan’s fire and 4 mentioned especially the problems with fire alarms and various initial fire extinguishing in which sprinklers (unequipped in the hotel), fire alarms, or fire doors play an important role. By using the fire that actually occurred and its problems for introduction of 4, it had a strong impact on viewers, presented fire prevention measures at that time and issues for future spread.

5. CONCLUSION

In this study, we could know how hydrogen energy has been reported in TV programs According to the times such as technology and social situation. In this context, the first year of hydrogen (2015) was an important turning point in Japan. Because there are few operation results of hydrogen stations and the number of fuel cell vehicles is limited, “fire accidents caused by fuel cell vehicles” have not yet been reported as some data exhibited. However, at the present time, almost no negative aspects of fuel cell vehicles and fire hazards are reported on television, including the actual hydrogen station accidents that have continued. This is because, as you can see from the report format of the program 4, many “documentary” programs are configured to report on countermeasures from all directions “only after” a tragic accident or incident occurs.

Indeed, (Japanese) New Energy and Industrial Technology Development Organization (NEDO) has been referred to as “Development of Fundamental Technologies for Safe Use of Hydrogen” in 2003-2007 launching a business. In this
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project, the study of scenarios and the development of necessary technologies for the realization of a hydrogen society were undertaken targeting hydrogen as fuel for fuel cell vehicles [6]. In addition, Japanese government has also incorporated technical standards that can investigate and analyze hydrogen station accidents that occurred in Japan and USA, and take measures against the cause of the accident [7].

If each direction puts effort into the spread of hydrogen energy and the number of fuel cell vehicles spread along with the hydrogen station dramatically increases, it will be an accident that cannot be avoided in the near future. How to communicate the negative aspects and the dangers of a fire before actual tragic accident occurs? It will be a new issue common to the TV industry with industry, academia and government specializing in fire prediction and disaster prevention science.

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