

# THE FUKUSHIMA NUCLEAR DISASTER AND ITS EFFECTS ON MEDIA FRAMING OF FISSION AND FUSION ENERGY TECHNOLOGIES<sup>1</sup>

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## Introduction

The accident in the Japanese nuclear power plant of Fukushima Daiichi on March 11<sup>th</sup>, 2011, reawakened the public anxiety of nuclear catastrophes, compelling some countries to urgently revise their nuclear power plants security systems. The European Union underlined the importance of this procedures arguing that “*the safety of all EU nuclear plants should be reviewed, on the basis of a comprehensive and transparent risk and safety assessment (“stress tests”); the European Nuclear Safety Regulatory Group (ENSREG) and the Commission are invited to develop as soon as possible the scope and modalities of these tests in a coordinated framework in the light of lessons learned from the accident in Japan and with the full involvement of Member States...*” (Communication from the Commission to the Council and the European Parliament, Brussels, 2012: 2). Also in the USA, India, Russia, South Korea and several other countries, the need to conduct safety tests following the lessons learned from Fukushima scaled to the top of the political agendas, while institutional support to the continuance or even expansion of the nuclear industry remained undisputable.

In Europe, the accident in Japan had different repercussion at the national decision level. The German Federal Government announced their decision to completely phase out of nuclear energy until 2022, as a reaction to the chain of events started in Fukushima

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but also as a follow-up to the country's changing energy policy – the “Energiewende” or energy transition. By contrast, in France, the second largest nuclear power-producing country, the government reaffirmed their support to the nuclear energy, while stating their commitment to conduct the European Commission stress tests and increase the endorsement of renewable energy sources. In Spain, after a period of uncertainty, the government approved the extension of licenses to several nuclear facilities including the oldest ones, while in the United Kingdom, Finland, Sweden and Hungary, plans to maintain or even expand nuclear capacity were unshaken by the events in Japan (World Energy Council, 2012: 16-19).

As important it is to understand the political consequences of Fukushima, we cannot disregard the general public views about this landmark event in the history of nuclear technology – that represents the risk of modernity beyond comparison: “tremendous (...) potentially catastrophic, feared and serious (certainly fateful)” (Slovic et al 2007, 117). Indeed, we must bear in mind that nuclear technology, even when it is used for peaceful ends has been a major source of controversy, and that the general public looks at nuclear technology and nuclear accidents with different lenses from those of politicians and nuclear industry stakeholders.

For what concerns nuclear fusion the main question arising from Fukushima is whether the accident has contributed to shape with different contours the image of this technology, namely in comparison to nuclear fission. SERF studies have shown that unlike fission, nuclear fusion is still unknown by the general public: as shown in a Eurobarometer survey, 58% of European citizens have heard about nuclear fusion in the context of energy production, but only 9% have heard about ITER – the largest experimental programme on nuclear fusion – which indicates that the knowledge about this technology is to a great extent very imprecise (Eurobarometer, 2007). Much of the media attention given to it is driven either by scientific breakthroughs and technological developments (Borrelli, 2004) or by general expectations created around issues such as applications to host fusion research facilities on national territories, as it happened in the town of Vandellós, in Spain, at the time of the siting of the ITER research device (Prades et al., 2007). More importantly, these studies revealed that the general public frequently confuses fusion with fission and that this relationship has a negative impact on social acceptability of fusion energy (Schmidt et al., 2013b). Indeed, negative associations and imagery related to nuclear energy may contribute to stigmatize fusion technology, as the word/label nuclear may prompt an instantaneous emotional sense of fear (Horlick-Jones et al., 2010).

The main hypothesis of our research is that the accident in Fukushima impacted negatively in the public image of conventional nuclear power, while contributing to highlight the debate over fusion technology as an alternative route to nuclear energy production. It was also important to evaluate if representations of fission energy conveyed in the media after Fukushima had a negative effect in shaping the public image of fusion energy. Overall, this analysis provides a contribution to understand the social construction of nuclear power imagery in contemporary societies (Schmidt et al., 2013b).

This paper is based on a research project funded by the European Fusion Development Agreement (EFDA) which consisted in an international comparison of media

coverage of fusion and fission energy in three countries (Germany, Spain and Portugal) and in English language newspapers that address transnational elite. The awareness of the fact that a successful nuclear fusion programme depends largely on broad social acceptance besides scientific and technological breakthroughs, was the main reason behind the development of a series of studies on the subject of Socio-Economic Research on Fusion (SERF), founded by the Euratom back in 1997 and currently under the coordination of EFDA<sup>i</sup>. One important line of research in SERF studies is the confrontation between fusion and other energy technologies such as traditional nuclear or fission.

## Media and public understandings of nuclear energy technologies

Public acceptance of technologies has been considered a critical condition for its development and diffusion (Devine-Wright, 2007). A common assumption among policy makers and scientists is that informed citizens will be more likely to lend their support to new or controversial technologies. However, this assumption has been challenged by research showing that risk perception is a complex process involving multiple elements, and it is not clear that information leads to acceptance. In fact, public support of energy technologies is influenced by multiple factors, including pre-existing knowledge, attitudes, emotions, values, norms, beliefs, peer's opinions, trust and mass media information (Hobman and Asworth, 2013). Furthermore, a "new realism about the strengths and limitations of science" (Grove-White, 2005: 23) has emerged, resulting from the recognition of wide uncertainties related to the risks of technological innovation.

Nuclear energy production (fission) is an example of a highly stigmatised technology (Flynn, 2003) that at the beginning of its development was framed as a symbol of technological progress. As shown by Gamson and Modigliani (1989), until the 1970s there was no anti-nuclear discourse in the mass media, but this positive frame shifted into negative ones after the accidents with nuclear power plants in Three Mile Island and Chernobyl. Together with public anti-nuclear protests in Western Europe and the development of environmental movements, public responses to nuclear energy became often strongly negative (Flynn et al, 1998; Schmidt 2003), focusing on concerns over its risks (related to accidents, terrorism and weapons) and radioactive waste. The prior belief in the dominance of science over nature has been facing tensions and gaps among policy-makers, citizens, scientists and corporations' perceptions of technological innovation risks and perils, together with growing distrust of political authorities and scientific expertise (Jasanoff, 2005). In the struggles for shaping public views of nuclear energy, authorities have often been accused of "secrecy" or dissemination of "biased" information, instead of "objective" information about nuclear risks (Topçu, 2008).

Fusion energy, on the contrary, is still at a research and development stage, and thus seems to benefit from a media coverage that, as in the case of other emerging technologies, tend to be positive, emphasizing scientific progress and economic prospects (Nisbet and Lewenstein, 2002), as publicly promoted by the actors mainly interested in its development.

According to Jasanoff (2005), based on Goffman's concept of framing (1974), a sense of security towards disruptive events can be created by the construction in the policy arena of cognitive frames, stories told that help making sense of experience. The analysis of media framing can thus be used to understand the construction of public views about matters such as risk perception, social representations and valuations about nuclear energy and nuclear disasters.

## Method

The scope of our analysis on media coverage includes the number and evolution of articles published, thematic frames, actors and actors' positions, depth of information about each subject, degree of association with nuclear accidents, especially Fukushima, and image construction (perception and representations) both for fusion and fission between 2008 and 2012. The research carried out in Portuguese, Spanish and transnational print media contexts comprised the analysis of articles about fusion and fission energy. For German media analysis, only articles about fusion were considered. With regard to fusion, the analysis encompassed a collection of articles published by national-based print media and English language quality newspapers and magazines aimed at the transnational elite (which will be subsequently referred to as "transnational print media"), between the first quarter of 2008 and the third quarter of 2012. All types of newspapers and magazines were included in each study case: twenty newspapers or magazines in Germany, twenty in Spain, fifteen in Portugal and eight in the transnational print media. The titles selected for the transnational print media included *The Observer*, *Guardian*, *The Washington Post*, *International Herald Tribune* and *News Statement*; *Forbes*, *The Economist* and *The Wall Street Journal*. With regard to fission, the analysis covered a sample of national-based mainstream newspapers and English language quality newspapers, between the first quarter of 2010 and the third quarter of 2012, complying with the one year before/one year after Fukushima timeframe. The articles in Portugal were collected from eight newspapers, in Spain from three newspapers and in the transnational print media, from four main titles. The latter were: *The Economist*, *The Observer*, *International Herald Tribune* and *New Statesman*.

The study followed two different methods of analysis. In the first stage, the articles were submitted to quantitative analysis which was designed to measure the frequency of issues or topics, messages and events presented in several types of media communications (Macnamara, 2005). In the second stage, a qualitative content analysis was employed for a sub-sample of articles in order to provide an in-depth understanding of the public representations about fusion and fission energies as conveyed by social media. (Schmidt et.al., 2013b: 9-13).

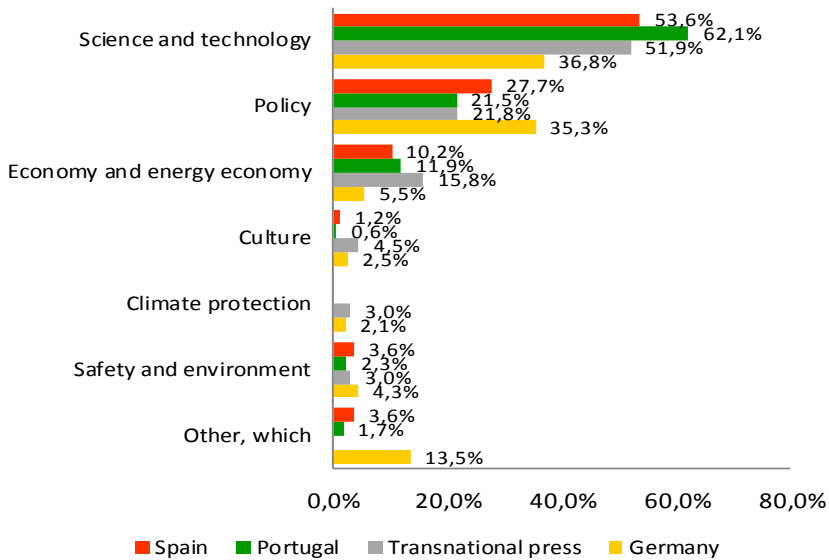
## Media coverage and thematic framing of fusion and fission

Media coverage of nuclear fusion (Figure 1) was very irregular and provided a low number of articles throughout the whole period of analysis in all study areas, except in Germany where a considerable amount of news was published in almost every quarter,

mainly in the second quarter of 2011, right after the nuclear accident in Fukushima.

Fusion is framed firstly as a science and technology topic: text news about research projects and results of fusion science are the core issues of media coverage of fusion energy, a trend that has been stressed by previous studies on public perceptions of nuclear fusion (Borrelli, 2004). At a second level, fusion is linked to political subjects, mainly in Germany, but clearly dissociated from safety, environmental and climate change related themes (Figure 1).

Figure 1. Thematic areas covered in articles with fusion energy related content



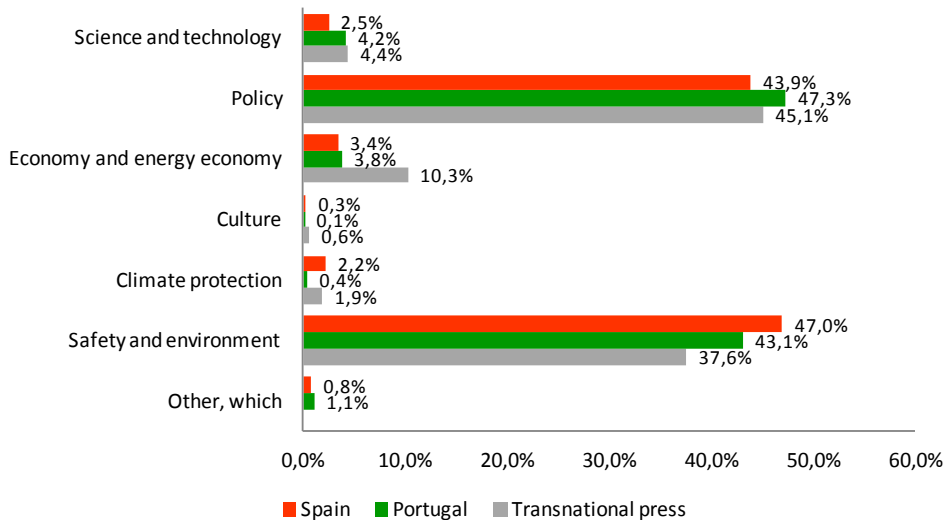
N Germany=318; N transnational print media=133; N Portugal=177; N Spain=168.

Source: Schmidt et al, 2013b.

The publication of articles about conventional nuclear (or fission) energy was very regular at a low degree throughout 2010, increasing considerably in the first and second quarters of 2011 as a result of the accident in Fukushima and its aftermath. From the second quarter of 2011 onward, there is a continuous decrease in the number of articles published, as media focus on the accident gradually diminished.

Policy related content is the main source of interest in media coverage of nuclear energy (Figure 2), immediately followed by safety and environmental themes which are more commonly presented in Spanish print media. Themes related to science and technology, along with economy and energy economy, do have some relevance, especially in the transnational print media, while themes related to climate protection are almost disregarded, although after the last decade nuclear energy has been promoted as an instrument of mitigation of climate change, both by scientists (Sailor et al 2005) and politicians (Bang 2010).

Figure 2. Thematic areas covered in articles with nuclear energy related content



N transnational print media=937; N Portugal=1393 ; N Spain=640.

Source: Schmidt et al, 2013b.

## Confrontation between fusion and fission in the media

### *Actors and actors' positions*

Scientists are the actors more often mentioned or quoted when fusion energy is the subject of the articles in German (47,7%), Portuguese (54,9%) and transnational print media (54,3%). It is only in Spain that the main focus is given to representatives of industry (35,6%) rather than to scientists (33,1%), who in this case are secondary players when talking about fusion. In Germany, political actors are much more relevant (38,2%) than in any other study area. Other actors play a minor role in news about fusion: officials for instance are either absent or almost disregarded (except for Portugal, where they represent 6,6% of actors mentioned). Environmental groups and activists, who nowadays are very important players in social change, are shadowed by other actors when addressing fusion energy (Schmidt et al, 2013b).

Most actors state their support to fusion energy, especially in Spanish (65,6%) and transnational print media (60,8%). Neutral or ambivalent positions are mainly found in German and Portuguese print media (39,2% and 31,3%), while actors that oppose fusion are very few (10,2% in Spain, 9,6% in transnational press and 3,5% in Germany). Supporters of both fusion and fission are found in every study area (with a higher proportion of records in Spanish and Portuguese print media); the very few opponents of both technologies are found only in articles published in Germany and in the transnational print

media. Records of supporters of fusion but not fission or, otherwise, supporters of fission but not fusion are residual, which indicates that the majority of actors clearly dissociate both technologies (Schmidt et al, 2013b).

Let us now turn attention to fission. Politicians are the main actors involved in media discourse about nuclear energy in all study areas (53,6% in Spain, 49,1% in Portugal and 40,3% in transnational press). Other actors either play a minor role in the discursive construction of nuclear energy or are simply overlooked. In the Spanish press, environmental groups and activists stand with a relatively significant role (14,3%), especially when measured against other study areas. Representatives of industry also have some significance both in the transnational print media. Officials, who are often associated with political decision making, play a relevant part in Portuguese and in transnational public discourse on nuclear energy. It should be underlined that scientists have little relevance in the media discourse about nuclear fission energy, although with some exceptions as far as the transnational media are concerned (Schmidt et al, 2013b).

Supporters of fission prevail in all study areas, especially in Portugal where they represent almost half of actors (48,4%) that take a specific position over nuclear energy (where there are no nuclear power plants but numerous attempts to implement at least one). Opponents of fission are found mainly in the Spanish press (43,3%). In fact, it is only in Spain that we identify polarized positions towards fission and that opponents are dominant in comparison to supporters. Neutral or ambivalent positions can be found in every media context but prevail in the transnational (42,3%; while in Portugal they represent 38,9% and in Spain 17,6%). We may say that the predominant characteristic of actors' attitudes towards fission is signaled by the balance between positive and neutral attitudes in the transnational and Portuguese press contexts, whereas in the Spanish there is a divide between supporting and opposing attitudes, making it more radicalized. Supporters of fusion and fission as well as opponents to both technologies are a minority in print media news about nuclear energy. The same can be stated with respect to supporters of fusion but not fission or, otherwise, supporters of fission but not fusion. This seems to be an important characteristic of media discourse regarding nuclear fission, since it indicates that fusion and fission are in any case strongly dissociated (Schmidt et al, 2013b).

### *The quest for fusion energy – between hope and disbelieve*

Positive statements on fusion prevail in all study areas, especially in Portugal (71,7%), Spain (61,8%) and in transnational print media (60,3%) and less in Germany (48,4%), where it is possible to find a considerable yet not predominant number of records (33,6%) that portray nuclear fusion in a negative way.

Qualitative analysis provided a more clear insight on the image construction of fusion energy. In the current stage of research, fusion is presented as a great challenge for scientists but not as much for politicians and stakeholders. Ambiguous insights are particularly disclosed in the transnational print media where fusion is, on one hand, compared to outstanding collective enterprises such as medieval cathedrals, the Apollo Program and the Manhattan Project and, on the other hand, compared to desperate

quests such as El Dorado or the Holy Grail (Sojak, Afeltowicz, Stankiewicz, 2013). An eloquent example of such views about nuclear fusion research is given by an article published by the International Herald Tribune – “A crusade to achieve what had eluded thousands of other scientists” (International Herald Tribune, 2010) (Sojak, Afeltowicz, Stankiewicz, 2013: 44). The Sun metaphor (artificial replication of fusion energy that occurs within the Sun) is a common and powerful symbolic reference, which contributes to associate fusion technology with a clean, safe and unlimited source of energy. Technological feasibility of fusion is the subject more vividly discussed in the articles. Arguments presented are rather very optimistic – “The promise is virtually unlimited amounts of energy from abundantly available sources (International Herald Tribune, 2009) (Sojak, Afeltowicz, Stankiewicz, 2013: 46); cautiously positive - “Ignition may eventually be possible. But there’s still much to learn.” (International Herald Tribune, 2009) (Sojak, Afeltowicz, Stankiewicz, 2013: 47); or conveyed with irony and ridicule – “The old joke has it, fusion is the power of the future— and always will be” (The Economist, 2011); or “The Decades – old mantra – fusion is only 20 (or 30 or 50) years away – remains wishful thinking at its best” (IHT, 2010) or even “NAIF – National Almost Ignition Facility” (Sojak, Afeltowicz, Stankiewicz, 2013: 47). Some scientists of the field responded to this saying that mankind’s great projects are always hard to achieve, pointing as an example the “Cathedral Church of Saint John the Divine”, in Manhattan, that “was still under construction after more than a century...” (IHT 2009). Cleanliness and safety are not so much discussed in the International media; however, the ideas that fusion might be an unlimited and abundant energy source, as well as a way to solve the nuclear waste problem, have been diffused. Economic costs of fusion for such a long term result are the main reasons for criticism. These refer to costs associated with the funding of ITER in national media contexts (Germany, Portugal and Spain) or with other fusion large experiment facilities such as NIF (transnational print media), a situation that is aggravated at a time of increasing scarcity of funds for scientific research.

### *Evaluation of nuclear fission*

Nuclear fission is negatively evaluated in more than a half of the cases both in the Portuguese (57,4%) and Spanish print media (53,6%). In the transnational print media negative valuations (47,3%) are attenuated by a slight percentage of positive (30,4%) and neutral statements (22,3%).

This negative association is linked to a great variety of features, most of all to safety, cleanliness, costs of research and of power plants as well as possible military use or proliferation risks of nuclear technology. In contrast, fission is positively associated when compared to fossil fuels or whenever some of its main characteristics such as the warranty of supplying great amounts of energy, climate neutrality, energy abundance and, to a lower degree, its cost competitiveness are debated in the articles.

Climate neutrality and warranty of supply are somehow appraised both in Spanish and transnational newspapers, while energy source limits and fission properties in comparison to fossil fuels are the most highly evaluated items in Portuguese titles.



Although fission is more positively evaluated when confronted with fossil fuels in all study areas, it is negatively or neutrally evaluated with regard to renewable sources, which means that nuclear energy may be considered a good alternative to fossil fuels (particularly when the subject of discussion is climate change) and conversely, a less acceptable alternative when renewables are also addressed as such. With Fukushima, these trends have changed.

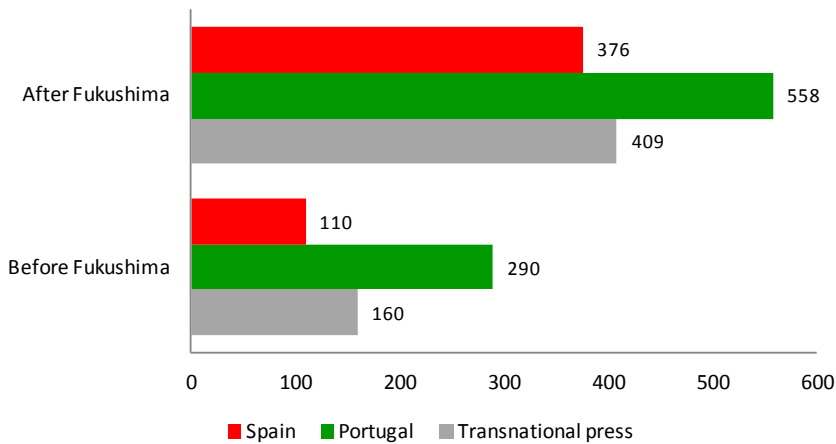
### The 'Fukushima Effect' - Media coverage of fusion and nuclear fission with relation to Fukushima

The Fukushima accident overall is not associated with fusion energy. The highest proportion of articles that mention Fukushima is found in the Spanish press (31,5%), followed by the German (24,4%). In Portugal Fukushima is mentioned in 20,0% of articles about fusion and in the transnational press that occurs in 15,0% of cases. The majority of articles that mention Fukushima in Spain are news in brief and opinion columns, published by nationwide quality newspapers where fusion is addressed in the context of nuclear energy or fission and evaluated in a positive way. These articles explore energy policy related themes and argue about possible alternatives to fission. In Germany, most of the articles are opinion columns also published by nationwide quality newspapers, where fusion is addressed in the context of fission and particularly with regard to the country's energy policy. Here again, fusion is positively evaluated especially as an alternative to fission. In Portugal, the accident is mentioned mainly in interviews published by nationwide quality newspapers where fusion is positively addressed in the context of energy scenarios including the future of nuclear technology. As for the transnational print media, Fukushima is primarily referred to in reportages published by titles such as *The Washington Post* and *The International Herald Tribune*; research projects and results of fusion technology are the main subject of such articles where fusion is addressed with a positive stance, which reinforces the idea that virtually there was no negative impact of the accident on the image of nuclear fusion.

Not surprisingly, the accident in Fukushima is paramount in articles about nuclear energy (fission) in Spanish, Portuguese and transnational print media (74,2%, 68,6% and 66,5%, respectively), accounting for over than half of the sampled articles in each case study. In Spain and Portugal, these articles are mainly news in brief published by nationwide quality and popular newspapers, where fission is the core subject of discussion. The accident is essentially related to questions such as risk management and safety practices which in the case of Fukushima have failed, placing fission technology under strong criticism as it is frequently addressed in a negative way. In the transnational print media, Fukushima is primarily mentioned in reportages and opinion columns where fission technology is the core subject, the majority of which published by *The New York Times*, *The Economist* and *The Guardian*. These articles address fission technology mainly in a negative way (although there is a considerable number of articles where it is neutrally debated), and focus on the relationship between the accident and the guidelines of present and future energy policies and energy development scenarios of several countries.

Figure 3 illustrates the linkage between Fukushima and media coverage of nuclear fission. Nuclear energy was covered to a larger extent after the accident in Fukushima in all study areas. We can therefore state that the accident had a homogeneous impact in media coverage of nuclear energy (Schmidt et al., 2013b: 35).

**Figure 3. Number of articles with nuclear energy (fission) related content published before and after Fukushima accident**



N transnational print media = 569; N Portugal = 848; N Spain = 486.

Source: Schmidt et al., 2013b.

After the accident in Fukushima negative valuations of nuclear energy increased in Portugal and Spain, while positive valuations decreased. Neutral valuations did not change much. In transnational media context both positive and negative evaluations increased, which indicates a polarization of judgments about nuclear energy (Table 1). Overall, we may say that nuclear energy was already negatively portrayed by the media before the nuclear accident in Fukushima, a fact that became more visible afterwards (Schmidt et.al., 2013b). Regarding transnational press the proportion of articles with a negative stance increased after the accident, mainly those related to cleanliness and safety. The number of neutral articles increased as well, indicating a general higher interest over these subjects.

For a more comprehensive insight about the effect of Fukushima on media evaluation of nuclear or fission energy, it is important to differentiate what were the specific features (benefits and costs) of fission that underwent significant changes within this period (Schmidt et.al., 2013b).

Table 2 presents the averages of evaluation attributed to various benefits and costs of fission that decreased after the accident in Fukushima in each study area. In transnational print media the most significant changes that can be observed after Fukushima relate to the accentuation of negative averages of evaluation (average score under 3 on a 1 to 5 scale), of items such as safety, the possibility of military use of nuclear energy, costs of power plants

Table 1. Image of nuclear energy based on various fission-related costs/benefits before and after Fukushima

|                 | Transnational print media |       | Portugal |       | Spain  |       |
|-----------------|---------------------------|-------|----------|-------|--------|-------|
|                 | Before                    | After | Before   | After | Before | After |
| <b>Positive</b> | 38,4%                     | 41,2% | 25,6%    | 13,8% | 47,5%  | 24,6% |
| <b>Neutral</b>  | 28,3%                     | 20,4% | 28,5%    | 25,4% | 16,1%  | 17,6% |
| <b>Negative</b> | 33,3%                     | 38,4% | 45,9%    | 60,8% | 36,3%  | 57,7% |

Source: Schmidt et al, 2013b.

and fission properties in comparison to renewable energy. One could obviously expect a more vivid debate about safety of nuclear power plants after the accident in Fukushima, which was indeed the case in all scenarios including the transnational media, but the same does not apply to cleanliness (another issue that is directly linked to nuclear risks and accidents). More attention was given to the collapse of safety mechanisms in Fukushima and to the possibility of occurring other disasters of the sort in other countries, than to the discussions about contamination potential vs. cleanliness of nuclear materials and nuclear technology even after a nuclear accident. Climate neutrality of nuclear power and its continuity as an energy option in future scenarios (Long-term option) remained positively evaluated in transnational newspapers (scores above 3), although there was a decrease in positive trends regarding these topics after the accident in Fukushima.

Persistent positive evaluations of climate neutrality and long-term-option as well as neutral evaluations of cost competitiveness might reveal a fall-down in media attention rather than structured opinions with regard to these topics, since they were almost set aside by other topics more extensively and profoundly debated in the aftermath of Fukushima, such as risks associated with nuclear fission (Sojak, Afeltowicz, Stankiewicz, 2013).

It is also interesting to notice that after the accident there was a slight increase in positive evaluations about fission properties or characteristics in comparison to fossil fuels, and a rather significant increase of negative evaluations of fission properties in comparison to renewables. This trends indicate that after Fukushima nuclear fission maintained a better status in comparison to fossil fuels, but lost support when compared to renewable energy sources, mostly as a result of safety problems associated with nuclear technologies and, conversely, to a more positive appreciation of safety mechanisms associated with renewables.

In Portugal, there was a shift from positive to negative evaluations regarding the long term use, competitiveness and supplying warranty of nuclear energy. Also there was a slight decrease in average concerning climate neutrality, but it only corresponded to a shift from positive to neutral perspectives (from 3.2 to 3). On one hand nuclear energy

Table 2. Changing trends in average evaluation of costs/benefits of fission energy after the accident in Fukushima.

|   | Transnational print media |       | Portugal |       | Spain  |       |
|---|---------------------------|-------|----------|-------|--------|-------|
|   | Before                    | After | Before   | After | Before | After |
| <b>Energy source cleanliness</b>  | 2,6                       | 2,6   | 2,3      | 2,2   | 2,6    | 2,3   |
| <b>Energy source safety</b>   | 2,8                       | 2,4   | 2,3      | 2,1   | 3,2    | 2,3   |
| <b>Energy source limits</b>   | 3,3                       | 3,5   | 3,7      | 3,6   | 3,1    | 2,9   |
| <b>Warranty of supply</b>   | 3,9                       | 3,9   | 4,1      | 2,8   | 3,7    | 3,6   |
| <b>Climate neutrality of fission energy</b>                                   | 4,1                       | 3,9   | 3,2      | 3     | 3,8    | 3,6   |
| <b>Proliferation/military use</b>   | 2,3                       | 2,2   | 2,4      | 2,2   | 2,7    | 2,3   |
| <b>Long term option</b>   | 3,5                       | 3,2   | 3,1      | 2,7   | 3,0    | 2,3   |
| <b>Costs of fission power plants</b>  | 2,7                       | 2,3   | 2,7      | 2,0   | 3,0    | 2,0   |
| <b>Cost competitive</b>   | 2,4                       | 3     | 3,1      | 2,9   | 3,7    | 2,8   |
| <b>Expensiveness of fission research compared with fostering of renewable</b> | 1,2                       | 2,4   | 2,7      | 2,5   | 2,0    | 3,0   |
| <b>Fission properties in comparison to Renewables</b>                         | 2,8                       | 2,4   | 2,5      | 2,3   | 2,7    | 2,2   |
| <b>Fission properties in comparison to fossil fuels</b>                       | 3,1                       | 3,3   | 3,7      | 3,4   | 3,5    | 3,2   |

Scale: (1-very negative; 5-very positive)

Source: Schmidt et al, 2013b.

remained positively associated with alternatives to fossil fuels and energy limits, on the other hand, it remained negatively associated with safety, cleanliness, military use, costs of power plants and costs of research compared to fostering of renewable sources (Schmidt et al, 2013a).

In Spain, there was a clear fall in averages of evaluation attributed to safety, limits, continuity and costs of nuclear energy after the accident in Fukushima, corresponding to shifts from positive or neutral to negative judgments. These items are more closely associated with declining credibility of nuclear energy in the context of nuclear accidents, especially safety and long-term use of nuclear power. They are also crucial in Spanish public opinion (therefore in Spanish media), since the country has nuclear power plants. Cleanliness, military use and fission properties compared to renewables remained negatively evaluated after Fukushima as they were before. Only climate neutrality, supplying

warranty and fission properties compared to fossil fuels remained positively (although to a lesser degree) associated with nuclear energy. Judgments about costs of fission research compared with fostering of renewable energies also changed but in this case from negative to neutral, probably reflecting a change in media attention (less articles referring this subject) more than a consistent change of public opinion towards it (Oltra and Prades, 2013).

## Conclusion

There was no evidence that the accident in Fukushima had a specific effect on media coverage of fusion energy. The number of published articles with fusion related content evolved independently from public attention given to the accident in Japan. In fact, the analysis indicates that the public discourse on fusion is constructed mainly around research challenges, clamorous events and scientific and technological achievements, rather than energy policy debate, climate protection or future economic compensations of fusion research. However, there are some differences when comparing the various media contexts. We found that German press published more articles than Portuguese, Spanish and transnational print media in the period between one year before and one year after Fukushima, not as a result of the accident itself, but rather as a consequence of a more lively and continuing public debate about fusion in Germany, where the decision to terminate fission propelled the idea of fusion as an alternative, which also became a matter of concern regarding the future of European research financing in this sector (Schmidt et al, 2013b).

The Fukushima accident had otherwise a significant impact on media coverage of nuclear fission. The number of articles published in Portugal, Spain and transnational print media (let us remind that Germany was not analyzed) scaled up after the accident, but only for a limited period of time (first and second quarters of 2011). From the third quarter of 2011 onwards, previous trends in the amount of news about fission published in all print media contexts were re-established.

The major effect of Fukushima in thematic framing of nuclear energy was a shift in focus from routine issues concerning nuclear energy (such as military use, waste, energy policy, etc.), to accidents and emergencies, security, risk management or environmental risks associated with nuclear disasters.

Before Fukushima, the public discourse conveyed by key actors about fission was much more positive and/or neutral compared to after the accident, when its negative accent grew up. In general, fission is portrayed as a hazardous source of energy, expensive when compared to research costs of renewables, hardly a long-term energy option, susceptible to contribute to the proliferation of nuclear weapons or rogue military use; after the Fukushima accident the image of nuclear fission conveyed by the media deteriorated substantially.

The “shock wave” that spread across the world after Fukushima threw some shadows over the future of nuclear technology. Nuclear fusion is considered an important alternative to traditional nuclear energy - safe and unlimited -, but too costly and postponed (too

far-off) for the current urgencies; almost a fiction: a ‘Holy Grail’ as some transnational newspapers conveyed with irony. Nuclear fission was directly and profoundly affected by the accident in Fukushima, and aside from political options for the future regarding the support of the nuclear industry, a more negative and pessimistic view of nuclear energy emerged after Fukushima.

## Note

i EFDA during FP7 – Reinforced coordination of physics and technology in EU laboratories Part 7, retrieved from EFDA: <http://www.efda.org/newsletter/efda-during-fp7-%E2%80%93-reinforced-coordination-of-physics-and-technology-in-eu-laboratories-part-7-2/>

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# THE FUKUSHIMA NUCLEAR DISASTER AND ITS EFFECTS ON MEDIA FRAMING OF FISSION AND FUSION ENERGY TECHNOLOGIES

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**Abstract:** The Fukushima nuclear disaster was a reminder of previous nuclear disasters such as Three Miles Island and Chernobyl, bringing back to the public sphere the discussion around nuclear power plants safety problems. However, while risk associated to traditional nuclear energy (fission) was amplified in the media, a new nuclear energy technology under research (fusion) went unharmed. A comparison of media coverage of fusion and fission energy technologies in three countries (Germany, Spain and Portugal) and in the English language international print media addressing transnational elite, from 2008 to 2012, showed that the Fukushima disaster did not have significant impact on media framing of nuclear fusion in the major part of print media under investigation. This paper intends to explain what lead to this situation.

**Resumo:** O desastre nuclear de Fukushima veio relembrar anteriores desastres nucleares tais como os de Three Miles Island e Chernobyl, trazendo de volta à esfera pública o debate em torno dos problemas de segurança das centrais nucleares. No entanto, enquanto o risco associado à energia nuclear tradicional (fissão) foi amplificado pelos media, uma nova tecnologia de energia nuclear em investigação (fusão) não foi afetada. Uma comparação entre a cobertura mediática das tecnologias de fusão e fissão nuclear em três países (Alemanha, Espanha e Portugal), bem como na imprensa internacional de língua inglesa dirigida à elite transnacional, de 2008 a 2012, mostrou que o desastre de Fukushima não teve um impacto significativo no enquadramento mediático da fusão nuclear na maior parte dos jornais analisados. Neste artigo procura-se explicar o que conduziu a esta situação.

**Resumen:** El desastre nuclear de Fukushima ha sido un recordatorio de desastres nucleares anteriores, como la Isla de Tres Milas y el Chernobil, devolviendo a la esfera pública la discusión alrededor de problemas de seguridad de centrales nucleares. Sin embargo, mientras el riesgo asociado a la energía nuclear tradicional (la fisión) fue amplificado en los medios de comunicación, una nueva tecnología de energía nuclear en investigación (la fusión) quedó ilesa. Una comparación de la cobertura de fusión y fisión por los medios de comunicación en

três países (Alemania, España y Portugal), así como en la prensa internacional de lengua inglesa dirigida a la élite transnacional, a partir de 2008 hasta 2012 muestra que el desastre de Fukushima no ha tenido un impacto significativo sobre los relatos mediáticos de fusión nuclear. Este trabajo tiene la intención de explicar porqué esto ocurrió.

**Palavras-chave:** Desastre nuclear, fusão, fissão, energia, comparação transnacional

**Keywords:** Nuclear disaster, fusion, fission, energy, cross-national comparison

**Palabras clave:** Desastre nuclear, fusión, fisión, energía, comparación transnacional

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