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ENERGIZING THE FUTURE OF 'GEN Z'

PUBLIC ACCEPTANCE OF NUCLEAR ENERGY TRANSLATING TO INPUT FOR A COMMUNICATION STRATEGY

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Abstract

Objectives: On behalf of a stakeholder operating in the nuclear energy sector, this study examines to what extent future employees and policymakers (higher-educated 18 to 25 year olds) accept nuclear energy. This study seeks to find out which factors influence their opinion towards nuclear energy. The ultimate goal of this study is to come up with a communication strategy that aligns with the wants and needs of Generation Z, to engage them in discussions concerning nuclear energy.

Method: The study has been executed by means of two different methods. First, a general impression has been established by sending out a questionnaire, which measured the acceptance of nuclear energy. In total, 166 people participated in the questionnaire, of which 114 respondents fell in the target group of higher-educated 18 to 25 year olds. In total, 15 factors were expected to influence their opinion. Secondly, two focus groups were conducted to discuss the general findings of the survey (N=7). Additionally, six sorts of social media posts were shown to the participants, which they had to discuss. The discussions were used as input for a suitable communication strategy.

Results: The study found that acceptance of nuclear energy and trade-off between energy sources are significantly influenced by attitude. In that turn, only risks of nuclear energy and trust have a significant impact on attitude. Area of living significantly influences the acceptance, and age and technical education significantly affect trade-offs.

Conclusion: In the current study, it is found that knowledge of nuclear energy negatively affects the acceptance of nuclear energy. Furthermore, the knowledge of the risks of nuclear energy can be improved. Therefore, the communication strategy of companies that are operating in the nuclear energy sector should target this knowledge gap by enhancing their current social media posts by adding visual triggers which draw attention. To increase a company's credibility, they should add multiple sources to support their claims.

Key words: nuclear energy, acceptance, perception, communication strategy

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1. Introduction

1.1 Background of the topic

On June 23, 1988, the first article about climate change appeared on the front page of The New York Times. Ever since, society has been fed with articles about global warming, including consequences, such as loss of sea ice, longer, more intense heat waves, and an accelerated sea level. Moreover, if temperatures will continue to rise, there will be more periods of droughts, and hurricanes will become stronger and more intense (Jackson, n.d.). Not only policymakers and scientists are worried about climate change. Youngsters all over the world are concerned with their future and the future of their children. Greta Thunberg is the most prominent example. She is also the founder of Fridays For Future, which has been picked up by more than 14,000,000 youngsters all over the world (Fridays For Future, 2021). Other organizations that have been established by youth are ZeroHour, Alliance for Climate Education, and Earth Guardians. All have like-minded goals, namely acting on climate change (ZeroHour, n.d.; Alliance for Climate Education, n.d.; Earth Guardians, n.d.).

The supply of energy plays a central role in the discussion about the future of sustainability in our society. Studies have focused on how the general public is engaged in climate change, but they neglected the role children and adolescents play in these debates (Brügger, Gubler, Steentjes, & Capstick, 2020). Amnesty International (2019) questioned 10,000 people with an age ranging between 18 and 25-year-olds in 22 countries[1], and they indicated climate change as one of the most important issues facing the world (41%), followed by pollution (36%). Moreover, global warming was mentioned as the most important environmental issue facing the world (57%). One of the characteristics of this generation, known as 'Generation Z', is 'climate anxiety' (Walker, 2020). And, their concerns are not unfounded. During the last one million years, carbon dioxide levels have been shifted between 165 and 300 parts per million. At this moment, the level has risen to 410 parts per million (NASA, n.d.). To limit the long-term consequences of global warming, the world has to shift to a zero-carbon economy during the coming decades (Cristophers, 2019).

Even though many options will eventually lead to a generation with less climate anxiety, these are not implemented yet, but still in the consideration phase. One of the alternatives to face climate change is, as mentioned before, nuclear energy. In this thesis, facts and underlying concerns will be investigated to create an impression of the thoughts and feelings of 'Generation Z' regarding this topic.

[1] United Kingdom, United States of America, Argentina, Australia, Austria, Brazil, Canada, Germany, Hungary, India, Kenya, Mexico, Nigeria, Pakistan, South Africa, South Korea, Spain, Switzerland, Taiwan, Tunisia, and Ukraine

1.2 How history affected the public perception

To understand today's sentiment, it is important to know how history might have rooted in current perceptions. Three major disasters might be of influence on today's sentiment about nuclear energy: Three Mile Island (1979), Chernobyl (1986), and Fukushima (2011). Especially the middle one showed that nuclear accidents can have severe catastrophic consequences. According to Qi, Qi, and Ji (2020), the concerns that people have about nuclear energy and the impacts that the three nuclear accidents had resulted in less public acceptance of nuclear energy, and this hindered its development.

Due to these disasters, many governments changed their nuclear policies. Investments in nuclear energy have changed or nuclear power plants have been suspended (Ramana, 2011). Angela Merkel, chancellor of Germany, even decided that all nuclear power plants in Germany should be closed in 2022. The Paris Agreement aims to limit the average global temperature by 1.5 °C, requiring huge changes in every country (Brown, Alexander, Arneth, Holman, & Rounsevell, 2019). To make sure that the global temperature does not rise anymore, renewable and nuclear energy are sources that could be the solution to this problem (Menyah & Wolde-Rufael, 2010). One thing that should be emphasized is that all countries have the same goal – rapid decarbonization of the energy supplies that are currently used. As disadvantages can be found in nuclear energy, as well can they be found when weighing the pros and cons of wind- or solar energy. Besides being dependent on the weather for these two sources of energy, many other challenges are involved (Rippel et al., 2019; Fuchs, Kasten, & Vent, 2020; Stoltmann, 2020; Durao, Torres, Fernandes, & Marques Lameirinhas, 2020). This will be elaborated on in Chapter 2.

1.3 Research question

The purpose of this study is to find out how higher educated 18 to 25-year-olds, also referred to as 'Generation Z' (van Huet, 2017), perceive nuclear energy, and how their perception is shaped. This research aims to answer two questions, of which one is for a company which will not be referred to due to confidentiality reasons. The company is operating in the nuclear energy sector.

The first question has a general character, and focuses on how Generation Z perceives nuclear energy, and which factors influences their perception. A survey will be conducted to measure the current sentiment regarding nuclear energy. The factors by whom and by what this target group develops thoughts about the topic of nuclear energy will also be investigated. To get to this overview, a survey will be conducted to measure the overall sentiment of this target group and focus groups will be used, so participants can elaborate on statements in the survey, and they will be tested on how they perceive certain messages regarding nuclear energy.

In this study, the following research question will be answered:

"What influences the public acceptance of nuclear energy among higher educated 18 to 25 year olds ('Generation Z')?"

The second research question has a more consultative nature. The goal of this question is to deliver input for an external communication strategy, as an advice for companies that are operating in the nuclear energy sector. An answer to the following question will be found by the usage of focus groups.

"How does the public perception of Generation Z translate to an external communication strategy?"

1.4 Theoretical and practical relevance of the findings of the study

The outcome of the first research question will provide the company insights into how Generation Z thinks and feels about nuclear energy. No extensive research has been conducted on whether Generation Z accepts nuclear energy. It could be that some participants do not have any ideas about nuclear energy.

The answer to the second question will result in a clear overview of how Generation Z is influenced regarding their opinion towards nuclear energy. Furthermore, the acceptance of nuclear energy among adolescents has not been mapped out relating to social media. The outcome will result in a strategy that can be used to approach Generation Z. Additionally, an answer will be given on whether a stakeholder of nuclear energy should participate in the approach of 18 to 25-year-olds or whether an autonomous, independent company should participate in the discussion to make this generation more engaged. Moreover, the influence of social media on Generation Z will be considered in finding a suitable approach. So, by understanding the considerations that play a role in the lives of Generation Z, an approach can be created to enhance the needs of their generation. Moreover, the answers to these questions could be a suitable subject for further research.

1.5 Outline

To provide an answer to the research question, "What influences the public perception of higher educated 18 to 25-year-olds ('Generation Z') regarding nuclear energy?", a theoretical framework will be established to provide insight into the most relevant theories and elements regarding this research. Several concepts will be explained and hypotheses will be stated. Based on these insights, the methodological choices that are used in this study will be outlined. Afterward, results will be analysed and discussed. The conducted study will end with a discussion about the findings, including theoretical and practical implications, as well as directions for future research.

2. Theoretical framework

2.1 Public acceptance of nuclear energy

Public acceptance is a major determinant of the future of nuclear energy in our society. Acceptance can be defined as behaviour that has multiple attitudes, varying from passive agreement to active lobbying for the use of a technology (Sugiawan & Managi, 2019). Public acceptance can be defined as society's acceptance of a technology that impacts their lives (Roh & Kim, 2017b; Sugiawan & Managi, 2019). It focuses on deploying these technologies, for example, building nuclear power plants (Zhou & Dai, 2020). Whether someone does or does not accept nuclear energy can be seen as a behaviour. For this reason, it is interesting to see which models predict behaviour.

A well-known model that predicts behaviour is the theory of planned behaviour (TPB). According to this theory, one's behaviour is determined by one's intention to perform the behaviour, where the intention is influenced by subjective norms, the attitude, and the ability to perform a behaviour (Ajzen, 1991). Especially the latter factor cannot be translated to the current study since accepting nuclear energy is more of a mindset rather than acting (Liao, Zhang, & Shuang, 2018). However, the first two factors are considered necessary for the acceptance of nuclear energy. Thus, it is interesting to evaluate a model that includes attitude and external influences as well.

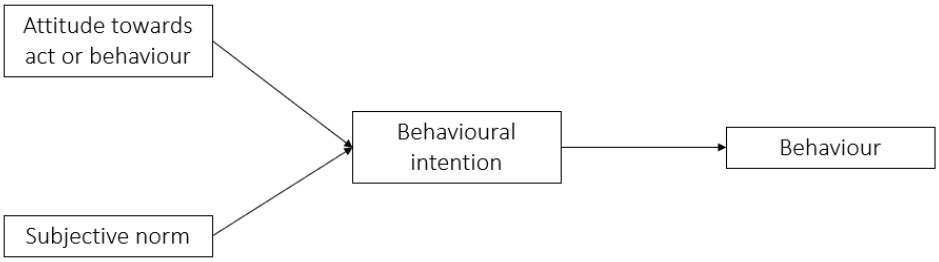
These factors were also found in the TAM model, which explains why one accepts or rejects a technology by evaluating the impact of technology on one's behaviour (Davis, Bagozzi, & Warshaw, 1989). Besides attitude and external variables, this model includes the perceived usefulness and the perceived use of technology. Once again, this model is about performing an action, i.e., using a certain technology, and this cannot be translated directly to the current study, because someone is not specifically using nuclear energy, but the energy in general, independently from the source. What these two models do have in common, is that the premise is derived from the theory of reasoned action (Revythi & Tselios, 2019). Therefore, it is interesting to see whether this model can be used to explain the acceptance of nuclear energy.

TRA is an often-used model to explain behaviour based on attitude and social factors (Kim, Lee, Yoon, 2015). Thus, it includes the two factors that are deemed most important when investigating the acceptance of nuclear energy: the attitude towards nuclear energy and subjective norms (Figure 1). The attitude of someone can be approached in different ways: whether one thinks positive or negative, or whether one is favouring or opposed to nuclear energy. The attitude of someone leads to behaviour, since it results in whether one accepts or rejects nuclear energy. However, the attitude towards something might not something that is established by the opinion of one individual, but also through the constitution of subjective norms. That is the social pressure of how an individual perceives what other people in their social networks will think about them implementing a certain behaviour, in this case accepting nuclear energy (Al-Suqri & Al-Kharusi, 2015). It is important to consider both the

attitude of an individual as well as the attitude of others because this results in engaging behaviour. (Laschinger & Goldberg, 1993). It was found that people with a favourable attitude and strong subjective norms towards a behaviour also show greater intentions to behave in that way (Kim, Lee, Yoon, 2015). Therefore, it is likely to assume that attitude has a positive effect on the acceptance of nuclear energy.

Figure 1

Model of the Theory of Reasoned Action (TRA)



This study aims to find an answer to the question of whether 18 to 25 year olds accept nuclear energy or whether they do not. This point of view focuses on the behavioural intention of accepting nuclear energy. The answer to this study is found by evaluating the antecedents that influence the behaviour to accept, namely attitudes towards nuclear energy and subjective norms. Those are not the only factors that contribute to the behaviour of acceptance. According to Zhou and Dai (2020), the level of knowledge, trust in the government or nuclear energy companies, and the perceived risks and benefits of nuclear energy should be included as well. Therefore, attitudes towards nuclear energy are discussed by evaluating how one perceives risk and benefits accompanying nuclear power, and by measuring trust. Additionally, by evaluating the subjective norms that are attended, such as family/friends and (social) media coverage, it can be measured to what extent social influence plays a part in accepting nuclear energy. All in all, the assumption is that both attitude and subjective norms have a positive effect on the acceptance of nuclear energy.

H1a: Attitude positively affects the acceptance of nuclear energy.

H2a: The injunctive attitude of family/friends towards nuclear energy negatively affects the acceptance of nuclear energy.

H3a: (social) Media coverage positively affect the acceptance of nuclear energy.

Besides measuring the acceptance of nuclear energy, this study also seeks to illustrate the trade-offs people make when they can choose between nuclear energy and another energy source. This is evaluating the acceptance of nuclear energy based on evaluating alternative choices, such as solar and wind energy. This is important to know because even though people might accept nuclear energy, they could still have a preference for another type of energy source which offers them more

advantages or fewer disadvantages. However, it is expected that both attitude and subjective norms have a positive effect on the trade-offs between energy sources.

H1b: Attitude positively affects the trade-offs between energy sources.

H2b: The injunctive attitude of family/friends towards nuclear energy negatively affects the trade-offs between energy sources.

H3b: (social) Media positively coverage affect the trade-offs between energy sources.

2.2 Attitude as a determinant for the acceptance of nuclear energy

One of the most important determinants of the theory of reasoned action is attitude. Attitude can be defined as "the mind's inclination or preference, manner, disposition, emotion, and stance towards a human or object" (Yuen, Chua, Wang, Ma, & Li, 2020). In the context of this study, it is about the attitude of an individual towards nuclear energy, which could be positive or negative. All in all, it is assumed that attitude positively affects the acceptance of nuclear energy and the trade-offs between energy sources.

Within the following sections, the three elements that are assumed to contribute to attitude are elaborated on. First, the risks of nuclear energy are discussed. Then, the potential benefits are explained. Finally, the feeling of trust that one has regarding nuclear energy is debated. It is important to consider these elements, because according to Siegrist's model (1999), risk perception, benefit perception, and trust are determinants of acceptance.

2.2.1. Risks of nuclear energy

Broadly, risks can be differentiated into two types. There is a subjective risk, which means how one thinks might be affected by fear, danger, or familiarity, and objective risk, which addresses the possibility and the chances of how likely it is that an event will occur (Siegrist & Cvetkovich, 2000). It is about how one perceives risk. Risk perception involves threats to the environment or public health (Zhou & Dai, 2020). It is not only about risk perception, but also how one expects to deal with a certain scenario. Especially in the case of nuclear energy, people have a high-risk perception. This is due to the potential of enduring damage caused by nuclear accidents and radioactive waste (Ho et al., 2018). Therefore, it can be assumed that there is a negative relationship between risk perception and acceptance of nuclear energy. The risks that are taken into account in this study are the environmental impact of nuclear energy, the risks of accidents, the risk of being exposed to radiation, and the high building costs of a new nuclear power plant.

Environmental impact

Due to multiple reasons, nuclear energy highly affects the environment. One of the reasons is that nuclear energy remnants end up in coastal waters through surface water and groundwater, which increases in organisms through the food chain (IAEA, n.d.). In other words, both animal and human

health are at risk, because animals consume each other and humans consume animals. It is important to consider the role of water in the nuclear energy process since it is also needed to cool the nuclear power plants. When the water is used to cool down, it returns 25 degrees warmer than the water originally was (Huang, Lin, & Zheng, 2019; Kivi, 2019). This temperature kills some of the fish and other species that are living in the water. Thus, water is affected in two ways during the nuclear process. Firstly, by cooling down nuclear power plants and returning this water to the water body again, and secondly, by killing fish and other species that are living in the water, and this might affect human health as well. The Daiichi reactor in Fukushima was built close to water, which resulted in an 80% nuclear fallout over the Pacific Ocean and a disastrous effect on marine life (Stohl et al., 2012).

Water is not the only factor that has an environmental impact. The process of mining and refining uranium is not clean either. Transporting nuclear fuel to and from nuclear plants also pollutes the environment. So, even though nuclear power plants do not release carbon dioxide, every step around it certainly does. Besides producing nuclear fuel, it also produces nuclear waste, and both need transportation to different locations (Xiang & Zhu, 2011). The transport of radioactive waste is dangerous and accidents during transport can cause disastrous accidents.

The examples given above show that nuclear energy might have severe consequences on the environment. Therefore, it can be assumed that the environmental impact of nuclear energy negatively affects the attitude towards it.

H1.1: The environmental impact of nuclear energy negatively affects the attitude towards nuclear energy.

Risk of accidents

One of the greatest concerns of nuclear energy is the risk of accidents. Even though the chance of happening is low, the consequences of an accident could be disastrous (Asselt, 2021). Therefore, it is important to consider the chance of nuclear accidents since it is an important element in forming a public view (Gupta et al., 2019). Accidents are not just about what happens at the nuclear power plant itself, it could also be about nuclear weapons or nuclear waste (Koerner, 2014). One major thing that scares people is the uncertainty that they have after an accident happens. These uncertainties include the trustworthiness of information, safety of family members, safety of food, and if the accident took place in a surrounding country, how the weather circumstances affect their own country (Hoti et al., 2021). The increased likeliness of nuclear attacks or accidents resulted in a greater focus by governments (Singh, Romaine, Newman, & Seed, 2016). Ever since the Chernobyl accident, governments have been working on plans that immediately go into action after the occurrence of a nuclear accident (Asselt, 2021). One of the preventive measurements of such a plan could be evacuating people from their homes, as happened after the Fukushima accident (World Nuclear

Association, 2021). However, most people are not aware of those measurements and remain scared. Therefore, it can be assumed that the chance of an accident happening negatively affects the attitude towards nuclear energy.

H1.2: The risk of accidents happening in the nuclear energy sector negatively affects the attitude towards nuclear energy.

Risk of radiation

In case of an accident, most people fear radiation (Uji, Prakash, & Song, 2021). This fear of ionising nuclear radiation is also called radiophobia (Ropeik, 2021). One of the models that increases fear of radiation is the "LNT" model, which states that any level of radiation higher than zero affects the human DNA (Undark Magazine, 2019; Energy Education, 2020). This increased amount of fear of radiation results in people avoiding nuclear energy. However, radiation is always surrounding people, as it comes from the Earth itself or the galaxy. In other words, people are always exposed to a small amount of radiation without any significant effects, meaning that our DNA is not affected right after a higher dose than zero. According to Luckey (2006), low levels of radiations does not affect the structure of DNA, but it does activate the immune system. Besides the dose of radiation, other factors that influence the seriousness of the injury are the distance from the source, the rate of exposure, and the quality of radiation (Singh, Romaine, Newman, & Seed, 2016). Agricultural production is one of the most important factors that influence the dose of radiation that is received by people (Alexahin & Geras'kin, 2011). Based on the previously mentioned literature, it can be concluded that radiation does not have any severe consequences as long as it is about a low dose. The Fukushima accident shows that even if accidents in nuclear power plants happen, it does not necessarily have deaths or cases of radiation sickness as a consequence (World Nuclear Association, 2021). This might be the decisive element that demonstrates that accidents at a nuclear power plant are not directly attended with radiation sickness or death.

Even though people are not likely to be exposed to dangerous amounts of radiation, the fear remains. Therefore, the assumption can be made that the risk of radiation harms the attitude towards nuclear energy.

H1.3: The risk of radiation negatively affects the attitude towards nuclear energy.

High building costs

The costs of building a nuclear power plant are immense. Moreover, other financial obstacles should be taken into account (Nuclear Energy Agency, 2009). First of all, it is technically very complex to build a nuclear power plant. This could result in high risks during the built itself, which might result in delay, or risks during operation, such as equipment failure. Secondly, it takes a relatively long period to re-earn the investments that were done during the construction of a nuclear power plant.

Currently, the estimated costs of building a new power plant are between $6 billion and $9 billion for each 1,100 MW plant (Schlissel & Biewald, 2008). According to the calculations of Kharitonov and Kosterin (2017), it is in the 41st year after constructing the nuclear power plant that it hits the payback point. To give some perspective: the average American nuclear power plant operates on average 40 years (Office of Nuclear Energy, 2020), whereas some American companies also claim that their plants can operate for 80 years (Voosen, 2009). On average, it can be concluded that a nuclear power plant operates for around 60 years, which means that there are only 19 profitable years left after the payback point. Large amounts of capital should be invested early on, while it takes years before investments flow back after the NPP starts operating.

Finally, the yet unclear solutions for radioactive waste and decommissioning, which are formulated by governments, make nuclear energy financially challenging. Interim storage of the fuel, as well as the final disposal of the fuel or related waste, are not always included in the costs for decommissioning, even though these costs are high, in particular for high-level waste (Nuclear Energy Agency, 2016). 3% of all nuclear waste is high-level waste, which is spent fuel containing 95% of the radioactivity in the nuclear waste (World Nuclear Organization, n.d.).

All in all, costs play an important role in the nuclear sector. It is assumed that the costs of building harm the attitude towards nuclear energy.

H1.4: The costs of building a new nuclear power plant negatively affect the attitude towards nuclear energy.

2.2.2. Benefits of nuclear energy

Benefits are an important aspect that influences the acceptance of nuclear energy. According to Lee (2020), no other technology offers such great benefits as nuclear energy. Benefit perception relates to how one perceives the positive consequences of nuclear energy (Ho et al., 2018; Wang, Gu, & Wu, 2020). Benefit perception is an important aspect of accepting nuclear energy (Hao, Guo, Tian, Shao, 2019). Benefit perception might increase one's acceptance level because it might reduce their risk perception or they have more faith in nuclear power companies or governments (Zhou & Dai, 2020). Lee (2020) found that income improvement and higher employment rates belong to the benefits accompanied by nuclear energy. Kim, Kim, and Kim (2014) added climate change mitigation to this list. The more benefits one experiences, the more likely one is to accept nuclear energy (Wang, Wang, Lin, & Li, 2020). Moreover, the benefits of nuclear energy are "shared by the whole society", whereas the risks mostly apply to people who live nearby a nuclear power plant (He et al., 2019). The benefits of nuclear energy that will be presented in this study are the low costs of nuclear energy as a energy source, zero carbon emissions, and the economic impact nuclear energy has.

Low costs of nuclear energy

One of the benefits of nuclear energy is that it produces very inexpensive electricity. A great advantage is that nuclear energy is not influenced by the fluctuation of oil and gas costs. In France, the price of one unit of electricity is the lowest in the world, since 75% of the electricity on the market is produced by nuclear fission (Brook et al., 2014). This example shows that adding nuclear energy to the energy mix of a country results in lower electricity prices.

One major setback of nuclear energy is the high investments that need to be done before generating energy. However, the costs can be reduced by providing private energy companies subsidies to build a nuclear power plant. If governmental institutions grant subsidies for the building of new nuclear power plants, energy companies can offer the energy even cheaper.

All in all, it can be concluded that nuclear energy is a cheap energy source. This will positively affect the wallets of Dutch households. Therefore, it can be assumed that low-cost energy has a positive effect on the attitude towards nuclear energy.

H1.5: The low costs of nuclear energy positively affects the attitude towards nuclear energy.

Zero carbon emissions of nuclear energy

The focus of climate policies for the coming years is on reducing carbon emissions. Nuclear energy is the answer to this question since it is providing the energy that society needs and it also mitigates emissions (Apergis, Payne, Menyah, & Wolde-Rufael, 2010). Many OECD countries acknowledged that greater usage of nuclear energy could reduce carbon dioxide emissions. Thus, many countries are seeking ways to embed nuclear energy in their energy mixes (Montel News, 2021; Deutsche Welle, 2021).

Nuclear power plants have already shown their value. Without nuclear power, the carbon dioxide emissions of OCED power plants would have been around one-third higher than they currently are (Menyah & Wolde-Rufael, 2010). The reduction of greenhouse gases plays an important role in climate change mitigation. In the UK, people reluctantly accept nuclear power stations, if it helps to temper climate change (Kim, Kim, & Kim, 2014). Thus, nuclear power cannot only be used to deliver electricity to households, but it could also contribute to decarbonising energy-intensive sectors, such as steel, aluminium, and cement. Therefore, the assumption can be made that this factor positively influences the attitude towards nuclear energy.

H1.6: Zero carbon emissions positively affect the attitude towards nuclear energy.

Economic impact

An advantage of a nuclear power plant is the economic impact it has on the local, regional, and national levels (Uji, Prakash, & Song, 2021). A nuclear power plant in the region brings numerous jobs and an increasing level of welfare. One study found that the entire nuclear programme in Poland

would generate over 12,000 new jobs (Zawalińska, Kinnunen, Gradziuk, & Celińska-Janowicz, 2020). This not only consists of jobs at the power plant itself but also jobs on constructing the power plant. It takes eight to ten years to build a nuclear reactor, which means that many people are ensured of an income in those years. Jobs at the nuclear power plant vary from engineers to security and chemists to HR, and other jobs that are included are maintenance employees or other firms operating in the process, such as mining, enrichment, transport, and the disposal of radioactive materials (Xiang & Zhu, 2011).

Furthermore, communities that already have a nuclear power plant nearby are more focused on the (economic) benefits that are seized with it (Parkhill et al., 2010). Other benefits that are related to a nuclear power plant can be found on a national level. Think of increased energy security, a lower unemployment rate due to the jobs that become available, and better development of human capital in the nuclear sector (Zawalińska, Kinnunen, Gradziuk, & Celińska-Janowicz, 2020). Moreover, nuclear energy consumption positively affected the real GDP in many European countries. A one percent rise in nuclear consumption has raised the economic growth, varying from 0.173% to 0.429% (Gokmenoglu & Kaakeh, 2017). The effect on the GDP can be explained by the fact that nuclear electricity is cheaper than other sources of energy and the fact that a lot of new employment is associated with the nuclear energy sector (Zawalińska, Kinnunen, Gradziuk, & Celińska-Janowicz, 2020). Additionally, energy is seen as a potential source of economic growth. An increase in energy consumption accounts for more productivity growth (Omri, Ben Mabrouk, & Sassi-Tmar, 2015). Since there are many economic benefits to nuclear energy, it is expected that this has a positive effect on the attitude towards nuclear energy.

H1.7: The economic impact of nuclear energy positively affects the attitude towards nuclear

2.2.3. The guarantees of nuclear energy

Trust is considered a vital determinant of public acceptance. It is a positive expectation about how others function in potentially risky situations (Xiao, Liu, & Feldman, 2017). Trust should not only be in government or nuclear power companies, but also about the overall nuclear policy, how information is provided, how the government would deal with sudden accidents, how nuclear power companies guarantee safety, and how they provide information about generating nuclear power (Zhou & Dai, 2020). However, trust in government and nuclear power companies is considered key to shaping public perception (Ho et al., 2018). This differs from the chance that a nuclear accident might happen. Trust is specifically about how governments and other institutions deal with potential consequences of an accident, and whether they are prepared to such situations.

One of the factors that influence the public perception of nuclear energy is knowledge about the technologies that are behind it (Stoutenborough, Sturgess, & Vedlitz, 2013). If people do not have

the correct knowledge about nuclear energy, they are not able to determine the risks and benefits that are associated with a certain technology. Therefore, they have to rely on experts who provide them with information (Siegrist & Cvetkovich, 2000). Information about nuclear energy and trust in the sources who provide this information affects the attitude towards it (Costa-Font, Rudisill, & Mossialos, 2008). Since many people do not possess knowledge related to nuclear energy, the conclusion can be drawn that they form opinions about nuclear energy based on the information that is provided by experts they trust. Moreover, trust positively influences the acceptance of nuclear energy (Sugiawan & Managi, 2019). If people can trust the aforementioned actors, trust can shift the public acceptance of nuclear energy from resistant to hesitantly accepted (Kim, Kim, & Kim, 2014). There is a positive relationship between trust and benefit perception of nuclear energy (Ho et al., 2018) since trust strengthens the benefit perception (Kim, Kim, & Kim, 2014). Based on the above-mentioned arguments, it can be assumed that trust plays a dominant role in the public acceptance of nuclear energy.

Reliability of nuclear energy

Since electricity plays a pivotal role in society, it is important that everyone can count on the energy mix chosen by the government. Even though many governments invest in renewable energy sources, one cannot fully depend on them. Annual figures of Energieopwek.nl show that the production of wind and solar energy is highly dependent on the weather. At times in 2020, the share in the total energy mix of solar and wind energy lay around 1.5%, whereas the percentage at other moments lay around 43,2% (Ministerie van Economische Zaken en Klimaat, 2020). One of the goals of renewable energy sources is reducing carbon dioxide emissions to zero. This objective could also be achieved by investing in nuclear energy since this also does not produce any carbon dioxide (U.S. Energy Information Administration, n.d.). Since nuclear energy is not dependent on weather conditions, it can run without climate-related disruptions. When there are periods without sun or wind, these periods need to be compensated. In nuclear energy, electricity is guaranteed, and therefore, the same low price can remain. Gupta et al., (2014) found that energy security has a positive effect on public support of nuclear energy.

Other reasons why governments invest in nuclear – and other sources of renewable – energy are to reduce the dependency on imported oil and other fuels, to reduce the price unpredictability's of this dependency, and to secure energy (Apergis, Payne, Menyah, & Wolde-Rufael, 2010). Moreover, uranium, which is used to start the chain reaction to produce nuclear energy, is not volatile in price as oil and natural gas are (Gogmenoglu & Kaakeh, 2017). Additionally, import independence and energy security were given as primary arguments by people who were in favour of nuclear energy (Teräväinen, Lehtonen, & Martiskainen, 2011).

All in all, nuclear energy delivers security that other energy sources cannot deliver. Therefore, it is assumed that reliability has a positive effect on the attitude towards nuclear energy.

H1.8: The reliability of nuclear energy positively affects the attitude towards nuclear energy.

Safety of nuclear energy

Nuclear accidents, such as Three Mile Island, Chernobyl, and Fukushima, increased the safety concerns people feel regarding nuclear energy (Gupta et al., 2019). In general, people perceive greater risks and fewer benefits ever since the Fukushima nuclear accident (Roh & Kim, 2017a). Therefore, governments must pay greater attention to the safety aspects of nuclear energy. According to Roh and Kim (2017b), governments should improve how people perceive safety rather than focusing on how necessary nuclear energy is. Not only the government plays an important role in convincing people on the safety aspects of nuclear energy. If there is trust in inspection authorities, this also leads to a greater acceptance of nuclear energy (Kim, Kim, & Kim, 2014). Since inspection authorities and governments are important to reduce safety concerns, nuclear power companies should collaborate closely and execute all safety measurements. This is not about the chance that an accident might happen, but how institutions and governments deal, if something actually happens. It is about whether one has trust in the government having a plan to protect people from the consequences of a nuclear accident.

So, it can be concluded that three important parties could reduce the safety concerns of people; nuclear power companies, governments, and inspection authorities. If they can guarantee safety measurements are taken and being controlled, it is logical to assume that this positively affects the attitude towards nuclear energy.

H1.9: The safety of nuclear energy positively affects the attitude towards nuclear energy.

2.3 Subjective norms

2.3.1. Opinions of family and friends towards nuclear energy

In the 1980s, scholars recognized that attitudes towards risk situations are influenced by friends, family, or co-workers (Groot, Schweiger, & Schubert, 2020). Therefore, it is important to take this factor into account to see whether it influences the acceptance of nuclear energy. According to the social network approach, what an individual should do or does is influenced by the perceptions or beliefs they have about what others, in this case, family or friends, think they should do (Kim, Lee, & Yoon, 2015). This does not only concern social norms, but also behaviours (Smith & Ruston, 2013). In other words, what a person does, in this case accepting or not accepting nuclear energy, is influenced by what the person thinks that their surroundings think they should do. Mehreen, Hui, and Ali (2019) found that relationships among individuals are important for the behaviour of an individual. Talking

with others about a risky subject, such as nuclear technologies, and improving your knowledge about the topic and how others perceive this topic, can play a determinant role in influencing how you perceive the topic (Groot, Schweiger, & Schubert, 2020). This perception is not just about risk and benefits, but also about acceptability. However, discussions within one's network are not protected from misinformation, since they are open to fake news, rumours, and hoaxes (Čábelková et al., 2021).

In short, it can be concluded that the surroundings of an individual play an important role when constituting an opinion. Therefore, it can be assumed that one's surroundings also play a role in forming a view on nuclear energy. The assumption is that one's circle has a positive effect on the acceptance of nuclear energy.

H2a: The injunctive attitude of family and friends towards nuclear energy positively affects the acceptance of nuclear energy.

H2b: The injunctive attitude of family/friends towards nuclear energy negatively affects the trade-offs between energy sources.

2.3.2. (Social) media impact on opinions towards nuclear energy

In the media, nuclear fusion is often presented as something that is technologically complicated and as a project that is expensive with an uncertain result (Čábelková et al., 2021). Often, it is also presented in a fragmented way, and only if something has happened that triggered to write about it (Harding, 2021). Examples are the number of reviews that appeared when it was ten years after the accident in Fukushima happened (The Guardian, 2021; Kurakawa & Meshkati, 2021). According to Čábelková et al. (2021), the news presented by mass media can be easily misinterpreted as they selectively highlight certain aspects (framing), whereas they trivialise others, and they are likely to be influenced by particular groups or financial trade-offs. Moreover, people often have negative associations when reading the word 'nuclear', since people connect it to the nuclear incidents in Chernobyl and Fukushima (Čábelková et al., 2021). Thus, if people rely solely on the information provided by mass media, they are likely to develop negative attitudes towards nuclear energy, since the media coverage is poor or negative (Odonker & Adams, 2020).

However, mass media is not the sole source of information that people rely on. Digital media, such as social media, Internet news sites, discussion platforms, and blogs, influence society nowadays (Dunas & Varatanov, 2020). Digital media tend to establish closed bubbles, where fake news or misinformation is easily spread and ideological polarization is supported (Čábelková et al., 2021).

Overall, it can be concluded that media plays a pivotal role in determining the acceptance of nuclear energy. Thus, to make it more acceptable, the media should highlight the benefits of nuclear energy rather than emphasizing the negative effects (Kim, Kim, & Kim, 2014). All in all, it can be assumed that people are negatively influenced by media coverage since nuclear energy is often displayed negatively.

H3a: (social) Media coverage of nuclear energy negatively affects the acceptance of nuclear energy.

H3b: (social) Media of nuclear energy negatively coverage affects the trade-offs between energy sources.

2.4 Socio-demographic factors' affection of opinions towards nuclear energy

The concept of nuclear energy is a technological concept, which might make it hard to understand. The decision of whether one does or does not accept nuclear energy depends on multiple socio-graphic factors (Čábelková et al., 2021). In the following section, the four most important factors – gender, age, education, and knowledge – will be discussed.

2.4.1. Gender

An important socio-demographic factor that might influence the acceptance of nuclear energy is gender. In general, women are more environmental-focused than men (Chung & Kim, 2018). Moreover, their risk perceptions are higher concerning energy technologies such as nuclear energy. A partial explanation for this could be that men, in general, are likely to know more about nuclear energy compared to women (Čábelková et al., 2021). Furthermore, their level of acceptance and approval of nuclear energy is higher than that of females (Ho et al., 2018). This results in stronger support towards nuclear power than women feel (Kim, Kim, & Kim, 2014). In other words, men have a higher acceptance of nuclear energy than women (Yu et al., 2020).

One of the reasons for this is that women have a more negative attitude towards nuclear power. Women show more concern and estimate the risk of nuclear power very high. There are multiple explanations for this. One of them is that males and females have different mental associations concerning nuclear energy (Kim, Kim, & Kim, 2014). Other reasons might be the result of "a gender-based biological factor such as maternity" or less understanding of technologies than men since fewer women are educated in the direction of engineering (Nguyen & Pim, 2018). In other words, men are more likely to accept nuclear energy than women, because women take the risks associated with nuclear energy into account, whereas men focus less on that. Therefore, it can be assumed that men are more likely to accept nuclear energy than women.

H4.1: Men are more likely to accept nuclear energy than women.

2.4.2. Age

The target group of this study is people with an age between 18 and 25. Therefore, literature research has been done to find out whether people with a respectively young age accept nuclear energy, or not. First of all, in a study by Čábelková et al. (2021), younger respondents were more likely to have an opinion on nuclear fusion in Europe than older respondents were. Younger people were also found to show more support for nuclear power plants than the older generation. This was also found in a study conducted in Switzerland (Siegrist, Sütterlin, & Keller, 2014). This is in line with the statement that the younger generation is more likely to accept nuclear power compared to older people (Chung & Kim, 2018). An Australian study found that younger Australians encourage renewable energy sources more than older Australians (Tranter, 2011).

Even though some doubt whether nuclear energy can be called renewable, the majority of people perceive it as renewable. Therefore, it can be concluded that younger Australians are also more supportive of nuclear energy than older ones. The fact that older people are less supportive is probably due to their sceptical attitude towards renewable sources than younger people (Karlstrøm & Ryhgaug, 2014). Based on the findings in the literature, the assumption can be made that younger people are more likely to accept nuclear technologies. However, no extensive research has been done about the differences within a small age group as will be done in this study. Therefore, this study will focus on whether different ages matter in the acceptance of nuclear energy.

RQ4.2: Do differences in age matter in the acceptance of nuclear energy?

2.4.3. Education

The participants of this study will be higher educated (HBO or WO) students or graduates. Thus, it is important to investigate what already has been written about the role of education and its connection to the acceptance of nuclear energy. This is important since education about energy sources has a chance of increasing public acceptance (Čábelková et al., 2021). This was also found by Nguyen and Yim (2018), who stated that education is a major determinant of an increased public understanding of nuclear electricity since education is a promotor of acceptance. A study in China found that the level of education and the level of knowledge of nuclear power are positively correlated (Yu et al., 2012). In other words, a higher level of education means a higher level of knowledge. This argument supports the outcome of a study conducted by Čábelková et al. (2021), who found that participants of the study with higher education were more likely to have (some) knowledge about nuclear energy and were more subjectively acquainted with nuclear fusion than lower levels of education. Within lower levels of education, the risk perception was also greater (Ho et al., 2018).

Furthermore, a relationship between age, acceptance, education, and awareness has been discovered by Odonker and Adams (2020). In their study, they found that younger participants with a high educational level had greater awareness of nuclear energy compared to the older participants as

well as those with a lower educational level. All in all, it can be concluded that education is an important factor to constitute public acceptance. The literature presented above already shows that a higher educational level is likely to affect public acceptance of nuclear energy. However, no research has been conducted yet on whether a technical study as a background matters in the acceptance of nuclear energy. Therefore, it is interesting to find this out.

RQ4.3: Does a technical education matter in the acceptance of nuclear energy?

2.4.4. Knowledge of nuclear technologies

Knowledge can be defined as "how much the public knows about nuclear power, nuclear technologies, and operation/inspection of nuclear facilities" (Kim, Kim, & Kim, 2014). It is important to consider the factor of knowledge in the scope of acceptance since it influences the amount of information and the accuracy of knowledge an individual has, which is a major rationale to determine one's values or attitude (Costa-Font, Rudisill, & Mossialos, 2008). For example, people with an acceptable level of knowledge were more likely to have a favourable opinion about nuclear energy, whereas people who were unfamiliar with technology and science were more likely to have risk-averse attitudes (Nguyen & Yim, 2018). This is in line with the findings of Odonker and Adams (2020), who found that people with high levels of knowledge were more likely to objectively evaluate the risks and benefits that are attended with nuclear energy.

In general, people with a higher level of knowledge about science tended more towards a positive approach to nuclear energy (Stoutenborough, Sturgess, & Vedlitz, 2013). The same people were also more likely to adopt renewable energy (Yu et al., 2012). It is important to consider the factor of knowledge, especially when approaching people. A study in China (Zhou & Dai, 2020) found that a national strategy (stimulating residents' patriotism) is the most powerful way of enhancing acceptance of nuclear energy, independent of knowledge. However, it was more effective for the inhabitants with a lower level of knowledge. Inhabitants with a higher level of knowledge were best approachable through scientific education (factsheets, exhibitions, and lectures), whereas people with a lower level of knowledge were reached using trust-building tools (scholarships to schools or providing free health check-ups).

Moreover, people with a higher level of knowledge are more likely to be aware of nuclear technologies other than energy. One of the most well-known examples is nuclear medicine. Here, it is applied in a variety of departments, such as oncology, cardiology, paediatrics, or neurology (Luckey, 2006; Radboud umc, n.d.). It is used for diagnostic techniques, such as scans, applying radiotherapy treatments, radiation from radioactive elements, or scans. Another example where nuclear technologies are used is in the food and agriculture sector. Radiation techniques result in insect control, increased food production, and a reduction of necessary fertilizers (Foro Nuclear, 2020). In

the manufacturer industry, radioisotopes can be used to detect leaks, gauge engine wear, and monitor fluid flow. It can also be used to inspect gauges, which are normally used to transport gases, liquids, and solids. Finally, isotope hydrology techniques can be used to measure underground water resources. By having this information, sustainable management of water resources can take place, in case of leakages through dams and irrigation channels for example (World Nuclear Association, 2020). If people have more knowledge, they are more likely to understand those technologies.

Thus, a higher level of knowledge of nuclear technologies makes it easier for people to estimate in which sectors nuclear energy can be applied. It is expected that people who have more knowledge of nuclear technologies are more likely to accept nuclear energy.

H4.4: A higher level of knowledge on nuclear technologies results in more acceptance of nuclear

2.4.5. Area of living

Even though the Netherlands is a small country, some people are more affected by a nuclear power plant than others. An often-heard argument is 'not in my backyard' (NIMBY), in which people acknowledge that something is necessary, however, they are against building the facility in the area they live in, which makes it hard to proceed (Eguchi, 2020). It is likely to assume that people who live further away from a nuclear power plant are less resistant to a nuclear power plant since they are not immediately affected if an accident happens. Due to the large amounts of water that is needed to cool down nuclear reactors, they are often built along the coast side. Therefore, a part of the Netherlands is not appropriate for the building of nuclear power plants. A distinction can be made between two regions: people who live next to a water source, and people who do not. Therefore, a distinction has been made between safety regions that are along the coast side, and those who are not: risk[2] and no risk[3]. If people live in a risk area, there is a potential chance that a nuclear power plant will be built in nearby. It is expected that people who live in the latter region are more in favour of nuclear energy because they are living further away from the potential building site of a nuclear power plant.

H4.5: The further people live away from a potential building site of a nuclear power plant, the more likely they are to accept one.

[2] Kennemerland, Amsterdam-Amstelland, Haaglanden, Zuid-Holland-Zuid, Hollands Midden, Noord-Holland-Noord, Friesland, Zeeland, Groningen, Drenthe, Gooi-Vechtstreek, Flevoland, Rotterdam-Rijnmond, Zaanstreek-Waterland, and Midden-West-Brabant.

[3] Noord-Oost Gelderland, Limburg-Noord, Twente, IJselland, Brabant-Noord, Brabant-Zuidoost, Zuid-Limburg, Utrecht, Gelderland-Midden, and Gelderland-Zuid.

2.5 Research model

This study seeks to find a relationship between the independent variables attitude, social influence, and socio-demographics, and the dependent variable acceptance of nuclear energy. In the aforementioned paragraphs, all the factors have been discussed extensively and their relevance to acceptance of nuclear energy has been underlined. A common theory that is used to explain behaviour, in this case accepting nuclear energy, is the theory of reasoned action (TRA). Therefore, the foundation of this study can be found within TRA. This theory demonstrates that attitudes and subjective norms are the primary elements to predict the implementation of behaviour (Espada, Griffin, Gonzálvez, & Orgilés, 2015).

In general, people who have favourable attitudes and stronger subjective norms regarding a specific behaviour are more likely to demonstrate intentions to implement that behaviour (Kim, See, & Yoon, 2015). Translating to this study, attitudes are subdivided into risks, benefits, and trust. Subjective norms can broadly be defined as the social influence, both from family/friends and (social) media. Multiple studies that have been conducted in the light of public acceptance of nuclear energy included the factors benefits, risks, and trust (Xiao, Liu, & Feldman, 2017; Sugiawan & Managi, 2019). Čábelková et al. (2021) also included the role of media in their study. Based on the literature discussed in the previous paragraphs, the following research model has been established to illustrate the relationships that are central to the present study (see Figure 2). The proposed relationships between the variables and the acceptance of nuclear energy and the trade-offs between energy sources are included as well.

Figure 2

Proposed Research Model including Hypotheses

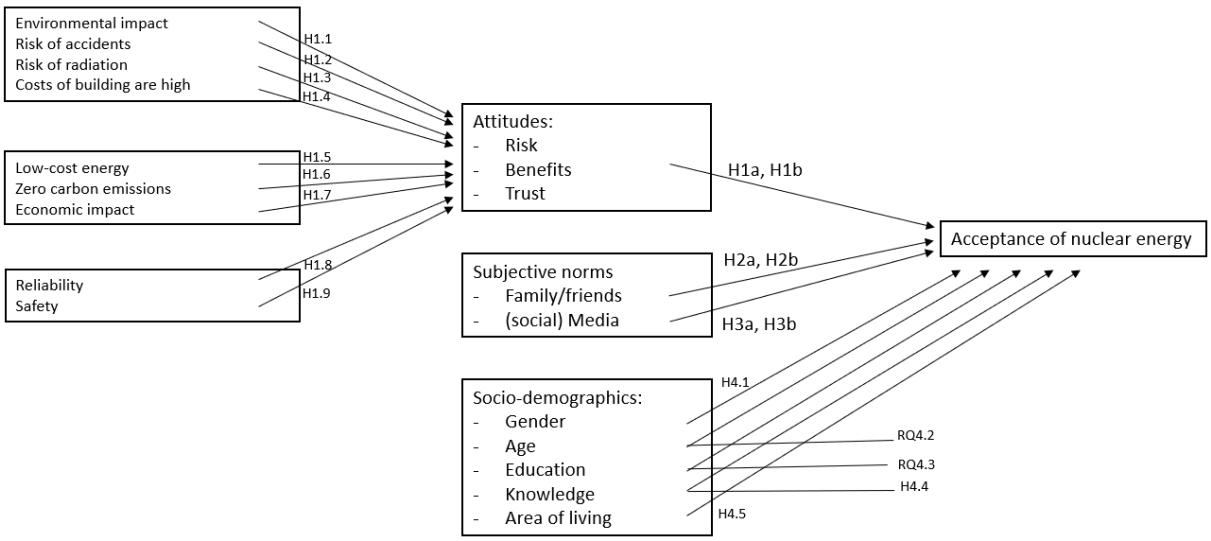


Table 1 shows a summary of the different hypotheses and research questions that will be tested in this research. Most importantly, this study is focused on finding the relationship between variables. It is expected that people with a positive attitude by, for example, having a low-risk perception, a high benefit perception, and a high trust level, have a higher willingness to accept nuclear energy.

Table 1.

Hypotheses and Research Questions of this Study.

Hypotheses
H1a: Attitude positively affects the acceptance of nuclear energy
H2a: The injunctive attitude of family/friends towards nuclear energy negatively affects the acceptance of nuclear energy
H3a: (social) Media coverage positively affect the acceptance of nuclear energy
H1b: Attitude positively affect the trade-offs between energy sources
H2b: The injunctive attitude of family/friends towards nuclear energy positively affects the trade-offs between energy sources
H3b: (social) Media coverage negatively affect the trade-offs between energy sources
H1.1: Environmental impact negatively affects the attitude towards nuclear energy
H1.2: Risk of accidents negatively affects the attitude towards nuclear energy
H1.3: Risk of radiation negatively affects the attitude towards nuclear energy
H1.4: Costs of building a new nuclear power plant negatively affect the attitude towards nuclear energy
H1.5: Low-cost energy positively affects the attitude towards nuclear energy
H1.7: Zero carbon emissions positively affect the attitude towards nuclear energy
H1.8: Economic impact of nuclear energy positively affects the attitude towards nuclear energy
H1.9: Reliability of nuclear energy positively affects the attitude towards nuclear energy
H1.10: Safety of nuclear energy positively the attitude towards nuclear energy
H4.1: Men are more likely to accept nuclear energy than women.
RQ4.2: Do differences in age matter in the acceptance of nuclear energy?
RQ4.3: Does a technical education matter in the acceptance of nuclear energy?
H4.4: A higher level of knowledge on nuclear technologies results in more acceptance of nuclear energy.
H4.5: The further people live away from a potential building site of a nuclear power plant, the more likely they are to accept one.

2.6 Communication strategy to enhance perceptions towards nuclear energy

Being online present has become an essential part of the marketing strategy of a company. This could be by promoting products via business accounts or by providing information on innovations (Sokolova & Kefi, 2020). This is also where communication comes around the corner since it focuses on interactively exchanging information and opinions among different individuals, groups, and institutions (Hyland-Wood, Gardner, Leask, & Ecker, 2021). The preferred form of communication depends on an individuals' social and cultural identity, age and gender, and access to resources (Hyland-Wood, Gardner, Leask, & Ecker, 2021). The goal of this study is to find a communication strategy that is suitable to the needs and wants of Generation Z. This generation is challenging since it is known for its short attention span of 8 seconds (Arthur, 2016). Moreover, they prefer communicating with images over communicating with text, as opposed to the generations before them (Djafarova & Bowes, 2021). Nowadays, Generation Z can barely be influenced by traditional media anymore, neither in an online nor in an offline environment (Kusá & Zákizová, 2016). Therefore, brands have to come up with a creative approach to draw attention towards them.

As mentioned previously, Generation Z is hardly affected by traditional media. Nowadays, they can be reached by using social networking sites (SNSs). Therefore, SNSs should become part of the communication strategy of a brand as they are mostly visited by Generations Y and Z (Kusá & Záziková, 2016). It is important to consider different SNSs since each network has its target audience and functions in its way. According to a study by Chen and Lee (2018), Twitter is the most popular among the ages 19 to 29. Women and people aged 35 or younger can be best reached via Instagram, and 45% of Snapchat users are between 18 and 24. A study conducted among 663 college students aged 18 – 25 found that men preferred Twitter and Facebook more than women, who, in turn, preferred Instagram (Shane-Simpson, Manago, Gaggi, & Gillespie-Lynch, 2018). The same study also indicated that Instagram and Twitter were preferred by younger people over Facebook.

One of the main reasons why some networks were preferred over others was visual imagery since it resulted in a more dynamic experience and people felt more intimate with others (Chen & Lee, 2018; Shane-Simpson, Manago, Gaggi, & Gillespie-Lynch, 2018). This generation should be engaged by using creativity, credibility, and a personalised approach (Kusá & Záziková, 2016). One major determinant to intrigue Generation Z is credibility (Smith, 2017; Sokolova & Kefi, 2020). Credibility is shown by expertise, honesty, empathy, and competence (Reynolds & Quinn, 2008). Credibility contributes to persuasive communication. Moreover, if the information is provided transparently, people are less vulnerable to misinformation (Jolley & Douglas, 2017). A study conducted by Smith (2017) among 176 Digital Natives (born from the mid-1990s to 2010) found that they want ads that entertain them, but also provide relevant information. Additionally, they prefer a 'real-life' scenario or information provided by a trusted source rather than a celebrity. Whereas entertaining ads are

preferred, interactive ads were not. Moreover, they like ads that express their values and they like to have the opportunity to 'swipe' for additional information. In other words, companies could use Instagram to visually entertain Generation Z and use Facebook to create social connections with them (Shane-Simpson, Manago, Gaggi & Gillespie-Lynch, 2018). One important thing is the usage of creativity in social media posts (Wolf, 2020).

Due to the short attention span of 18 to 25 year olds, it is essential to trigger them in an instant. In the literature, it was found that visuals and credibility were important determinants for a convincing social media post. Additionally, they want to have the opportunity to easily gather more information if they want to. Therefore, it is assumed that Generation Z should be targeted using convincing visual stimulation. In addition, companies are expected to create a credible image. Furthermore, it is expected that 18 to 25 year olds appreciate having the option to consult more information, e.g., by adding 'swipes' or links to websites.

3. Study 1: Survey method

Two different studies have been conducted to find an answer to both the research question and the consultancy question. Before developing a communication strategy, it is necessary to know how people perceive the product that the company wants to promote. Therefore, a questionnaire was established, which aims to answer the first research question: *"What influences the public acceptance of nuclear energy among higher educated 18 to 25 year olds ('Generation Z)?"*. The outcomes of this study will show which factors can be improved. The input for the communication strategy can then be adjusted to these improvements. The second research question: *"How does the public perception of Generation Z translate to an external communication strategy?"*, will be answered utilizing focus groups. The findings of the literature will be discussed, and the answers will be used to develop input for the communication strategy.

The report will continue as follows. First, the methods of the first study, the questionnaire to answer RQ1, will be provided. Following that, the results of the survey will be discussed as well. Then, the methods of the second study, the focus groups to answer RQ2, will be explained. Finally, the results of the focus groups will be examined. In the discussion section, the two questions will be discussed separately from each other. Then, in the conclusion, the answers to both questions will be combined and input for a communication strategy will be provided.

To answer the first research question: *"What influences the public acceptance of nuclear energy among higher educated 18 to 25 year olds ('Generation Z)?"*, a survey will be conducted among high educated 18 to 25 year olds living in the Netherlands. The development of the survey was based on factors that were identified in the theoretical framework, these were attitudes, social influence, and socio-demographic factors. All have their subfactors, which were used to create statements to find out what influences the acceptance of nuclear energy.

3.1 Research design

In the interest of eliciting information on what factors influence the acceptance of nuclear energy among higher educated 18 to 25 year olds, a quantitative research design has been chosen to find out how higher educated 18 to 25 year olds perceive nuclear energy. Since more research has been conducted on public acceptance (see Section 2), a quantitative, deductive approach was chosen, which uses a close-ended questionnaire to gather responses. This method of data collection was chosen based on the fact that surveys are the most prevalent way to easily, quickly, and efficiently measure public sentiment (Morgan, 1997; Berinsky, 2017). This study is descriptive since the aim is to discover relationships between the variables attitudes, social influence, socio-demographics, and the acceptance of nuclear energy, and to find out the characteristics of these relationships (Dulock, 1993).

For this survey, questions were developed per factor or subfactor based on the literature discussed in the theoretical framework. Together with a company that is operating in the nuclear

energy sector, all questions were reviewed. Per (sub)factor, multiple questions have been asked. Additionally, one open-ended question was asked where people could fill out factors that were not mentioned but did influence them.

3.2 Procedure

The questionnaire was built in the survey tool *Qualtrics.* The survey consisted of four parts and had a maximum of 46 questions. A non-probability convenience sampling was used by sending out requests via WhatsApp or personal social media accounts such as LinkedIn, Instagram, and Facebook. The goal of this study was to gather 150 respondents, whereas 80 – 100 respondents should have an age between 18 and 25 years old. Since the target group of this study is higher educated 18 to 25 year olds, they must be represented in the study to draw valid conclusions.

Before the questionnaire was officially published, a small pre-test was conducted to ensure that all statements were perceived in the way they should be. Three native Dutch people checked the questionnaire. They were asked to fill in the questionnaire and to spot any mistakes or misunderstandings (Appendix A). To ensure that the survey worked on all devices, the survey was filled in both on a laptop and a mobile device. After processing the feedback, the questionnaire had no mistakes anymore and was ready to send out.

The first part was to gather information about the assumed subfactors that constitute the attitude towards nuclear energy of the participants. The second part of the survey focused on collecting data about the social influence of respondents in their daily life. The third part consisted of questions concerning socio-demographics. The final part consisted of one open-ended question, where respondents could fill out any additional remarks about the study.

The respondents were invited to participate in an online study where they could give their opinion regarding energy sources. After clicking on the link, respondents were led to the questionnaire where they provided their consent. A short introduction was provided, where it was chosen to mention energy sources and not specifically nuclear energy, to ensure it was not too obvious what the survey would be about. In the first part of the study, the factors that contribute to the variable 'Attitude' were addressed. The second part of the questionnaire focused on the variable 'Social influence'. Two factors were assumed to influence participants, namely 'Family/friends' and '(social) Media'. The third part also had a general nature, since it focused on the socio-demographics of the respondents. General questions about gender, age, education, area of living, and knowledge of nuclear technologies were asked. The final part consisted of one open-ended question. The possibility was given to the respondent to enter factors that are relevant for him/her that were not asked in the questionnaire. An overview of the items and the corresponding factors and subfactors can be found in Appendix B.

3.3 Measurements

A questionnaire was used to ask respondents about 15 constructs, based on the structure of TRA. First, respondents were shown statements related to the attitude towards nuclear energy, including risk perception, benefit perception, and trust. Then, items were shown regarding subjective norms, including the influence of family/friends and (social) media. Finally, items were shown related to the behaviour, namely the acceptance of nuclear energy and the trade-offs between energy sources. The items can be found in Appendix B. Some of the items have been adapted from existing literature; this also ensures its validity. Additionally, the procedure of translation and back-translation is used, to avoid any discrepancies between the Dutch and English versions.

The items were measured using a 5-point Likert scale, however, the definition of the scale sometimes differed. Therefore, the definition will be indicated at each construct. The choice for a Likert scale was made based on the fact that respondents could indicate a degree of agreement (e.g., from strongly agree to strongly disagree) with the presented statement (Joshi, Kale, Chandel & Pal, 2015). By using a Likert scale, respondents could easily indicate how they perceive the reliability of nuclear energy with 1 being 'not reliable at all', and 5 being 'very reliable'.

Attitude

As mentioned before, attitude is an important predictor in the model of the theory of reasoned action. It focuses on the thoughts and feelings one has towards, in this case, nuclear energy. This time, "bad" and "good" were placed on a five-point Likert scale. Other examples are "desirable" and "undesirable", and "dangerous" and "harmless" (Lee, 2020). All respondents had to indicate what they thought was the most suitable for their opinion on nuclear energy. In total, there were six items within this construct. This resulted in a Cronbach's Alpha of α=.935, which is highly reliable.

Risks

All risks have been measured on a 5-point Likert scale, with 1 being 'fully disagree' to 5 being 'fully agree'.

Environmental impact

This construct focuses on the consequences nuclear energy might have on the environment, e.g., dealing with climate change. Initially, the construct of environmental impact was presented with four statements, which resulted in a Cronbach's Alpha of α=.529. An example of a statement that was shown here is "I think it is impossible to achieve climate goals without nuclear energy for the Netherlands". This was deemed insufficient. Therefore, the statement "I think that the impact of an energy source on the climate is more important than energy security" was deleted. After removing this item, the Cronbach's Alpha increased to α=.723 (items = 3).

Risk of accidents

For this construct, statements regarding the estimation of accidents with nuclear energy happening were shown. For example, "I think that the chances of an accident happening in the Dutch nuclear energy sector are null". The Cronbach's Alpha was α=.811 (items = 5). This was considered a sufficiently reliable number.

Risk of radiation

This construct focuses on the chances that one will be exposed to radiation. Initially, this construct contained four items, resulting in a Cronbach's Alpha of α=.513. An example of a statement is "In case of an accident, I am afraid that I will be exposed to dangerous amounts of radiation". This number was presumed insufficiently. Therefore, one item was deleted. After doing so, Cronbach's Alpha increased to α=.818 (items = 3).

Costs of building and safely decommissioning are very high

Since the costs of building a nuclear power plant can be perceived as high, statements regarding this were provided. For example, the statement "I think that the costs are too high to build a nuclear power plant in the Netherlands" was presented. The Cronbach's Alpha was α=.805 (items = 4). After reconsideration, the statement "I think it takes too long to build a nuclear power plant in the Netherlands to contribute to achieving our climate goals" was deleted, because this was the only statement that took into consideration the time of building a nuclear power plant, rather than the costs. Deleting this statement resulted in a Cronbach's Alpha of α=.841 (items = 3).

Benefits

All of the constructs that were presented for the benefit perception were measured on a 5-point Likert scale (1 = fully disagree to 5 = fully disagree).

Low-cost energy

Nuclear energy produces inexpensive electricity. For example, the statement "I think that nuclear energy is a relatively cheap energy source for consumers" (Lee, 2020) was presented. Initially, this construct contained four items with a Cronbach's Alpha of α=.629. After deleting an item, the Cronbach's Alpha increased to α=.743 (items = 3).

Zero carbon emissions

Contrarily to fossil fuels, nuclear energy does not produce carbon emissions. An example of an item that was presented is "I think that the sole use of renewable energy sources does not bring the Netherlands the needed climate profits". Taking into account all four items resulted in a Cronbach's Alpha of α=.802 (items = 4). This is presumed as a sufficiently high number, and therefore, no items have been deleted.

Economic impact

Building a nuclear power plant results in employment opportunities. An item that was presented here is "I think that work opportunities in the Netherlands are stimulated by building a new nuclear power plant " (Lee, 2020). This construct contained four items, with a Cronbach's Alpha of α=.778. This number was deemed sufficiently, thus, no items were deleted.

Trust

All items of trust were measured on levels of agreement, where 1 means 'fully disagree' and 5 means 'fully agree'.

Reliability

Nuclear energy is considered a reliable energy source since a nuclear power plant never stops working, compared to solar and wind energy. A statement that was presented here is "I think that nuclear energy could be a reliable source of energy for the Netherlands". Three items were initially used in this construct, which resulted in a Cronbach's Alpha of α=.871. This number is considered sufficiently reliable. However, one of the statements, "Energy security in the Netherlands has my preference above renewable energy sources", was not in line with the other two statements. Therefore, it was decided to delete this item. This resulted in a Cronbach's Alpha of α=.910 (items = 2).

Safety

If an accident happens, it is important that people can trust governments and power companies to intervene. This construct is built up from four statements. A statement that was adapted from Hao, Guo, Tian, and Shao (2019) is "I trust that the Dutch government will ensure that the safety of a nuclear power plant is guaranteed". Another statement is "If an accident occurs at a Dutch nuclear power plant, I am confident that security services can intervene quickly and appropriately" (Xiao, Liu, & Feldman, 2017). Taking together these four items resulted in a Cronbach's Alpha of α=.897.

Sources

For this question, respondents had to indicate to which extent that they thought different information sources were reliable, for example, the government. Initially, this construct was divided into the variable of trust. After reconsidering, this variable has been used as a descriptive one in section 3.5. Participants. The main reason for this decision is the low reliability of the construct (α=.577, items = 8).

Social influence

Family/friends

This construct focuses on how the opinion on nuclear energy of family and/or friends influenced the opinion of the participants. A statement that was presented here is "I think that the people who are close to me see the advantages of nuclear energy over the disadvantages". It was

measured on a 5-point Likert scale (1 = fully disagree to 5 = fully agree). After deleting the two least reliable items, the Cronbach's Alpha increased to α=.882 (items = 3).

Media exposure

Contrarily to the other constructs, this variable was measured with a different five-point Likert scale. The scale of this construct varied from 1 being "Never" to 5 being "At least once a day". The Cronbach's Alpha of this construct was α=.639. This question focused on how often respondents used a media source, for example, TV or magazines (Čábelková et al., 2021) (items = 8). Eventually, this construct was also deleted from the model since it is more of a descriptive variable. Therefore, this construct is also used to describe the participants in section 3.5.

Social influence

This construct takes into account the (social) media coverage of nuclear energy. It consisted of four items, with a five-point Likert scale, with 1 being "Fully disagree" and 5 being "Fully agree". The Cronbach's Alpha of these four items together was α=.635 (items = 4). This is not a very high number, however, it is considered sufficiently reliable. An example of an item that was asked here is, "I think that the media that I often use objectively informs me about nuclear energy".

Acceptance of nuclear energy

The focus of this construct was on whether one did or did not accept nuclear energy. Examples of statements that were presented here are "I find the use of nuclear energy risky for society" (Finucane, Alhakami, Slovic, & Johnson, 2000 as cited in Groot, Schweiger, & Schubert, 2020), but also "I am in favour of including nuclear energy in the Dutch energy mix" (Xiao, Liu, & Feldman, 2017). The Cronbach's Alpha was α=.493. After deleting the item "I would demonstrate against the use of nuclear energy", the Cronbach's Alpha of this construct increased to α=.847. Even though this is already a high Cronbach's Alpha, it was decided to delete the statement "I think it is better to solely invest in renewable energy sources" because this statement is not necessarily about nuclear energy. This resulted in a Cronbach's Alpha of α=.943 (items = 5).

The trade-off of energy sources

This construct focused on which energy source participants would choose when they had free choice between nuclear energy and another energy source. Each time, nuclear energy was deceived against another type of energy, for example, wind energy. The energy sources were adapted from Chung and Kim (2018). Using a five-point Likert scale, respondents had to indicate which energy source they preferred. In total, nine energy sources were selected. This resulted in a Cronbach's Alpha of α=.880 (items = 9). This is considered a sufficiently reliable number.

Socio-demographic

Age

Age was measured to ensure that enough people of the target group were included in the study. It was measured as a numeric variable. The mean age of the respondents was 26,95.

Education

Another inclusion criterion of the target group is the education they fulfilled. Therefore, two questions regarding education have been asked. One question was about the highest achieved education level, and the other question was whether they did or did not follow a technical study.

Knowledge

To measure the knowledge on nuclear energy of respondents, five statements were presented. An example of a statement that was asked here is “I feel informed about nuclear energy” (Čábelková et al., 2021). After each statement, respondents could indicate to which extent they agreed with them. Including all five statements resulted in a Cronbach’s Alpha of α=.619.

Living area

The living area of respondents has been divided into two sections: a risk area and a no-risk area. It is less likely that a nuclear power plant will be built in a no-risk area. For this question, respondents had to select one out of 25 safety regions of the Netherlands.

3.4 Participants

The population of this study is higher-educated 18 to 25 year olds living in the Netherlands. Thus, the inclusion criteria of this study are age, nationality, and education level. A nonprobability convenience sampling was used to recruit respondents. The research sample of this study consisted of 256 Dutch-speaking respondents. Respondents of all ages were included, however, an amount of 80 – 100 participants should be between the age of the target group, which is 18 to 25 year olds. Respondents that did not complete the survey were excluded from the dataset. This exclusion led to a reduction of 90 respondents. Five other responses have been excluded since they were still in the dataset from the pre-study. This led to a final research sample of 166 respondents. A summary of the respondents can be found in Table 2. The research sample had a mean age of 26,95 (SD = 10,79). A small majority of the respondents identified as male (55,6%), whereas 42,8% identified as female. One respondent identified their selves as 'different' (0,6%). There were 103 full-time students (60,9%) involved in the study and 58 respondents that were full-time working (36,1%). Five respondents indicated that both options did not fit their occupation. Another reason that was given was that respondents were doing a full-time board year at an association (3,0%). Respondents were also asked in which region they lived the longest. The results can be found in Appendix C.

The sample of this study is higher-educated 18 to 25 year olds. Therefore, each of the demographic factors will be analysed to see whether the needed numbers to generalize the findings are achieved. The goal was to have 80 – 100 respondents that fit in the categories of the target group. In total, 114 respondents met the criterium of age (68%). More males than females respond, but this difference is not huge and therefore, not considered a problem. Next, respondents were asked to indicate their highest completed education. 121 respondents revealed that they completed HAVO, VWO/Gymnasium, or HBO/WO. Therefore, it can be concluded that this criterium is also met. Finally, the regions of the Netherlands were divided into two areas: risk and no risk. Even though a larger amount lives in a no-risk area, the dispersion is considered sufficient. All in all, it can be concluded that the sample size met the previously established requirements of the target group for this study.

Table 2

An Overview of the Demographics of the Respondents

Demographics		N	%
Age:			
	Under 18 years	4	2%
	18 thru 25 years	114	68,6%
	26 thru 30 years	17	10,2%
	31 thru 40 years	10	6,0%
	41 thru 50 years	7	4,2%
	51 thru 60 years	11	6,6%
	61 thru 70 years	2	1,2%
Gender:	Male	94	56,6%
	Female	71	42,8%
	Other	1	0,6%
Education:	Primary school	1	0,6%
	VMBO	1	0,6%
	HAVO	6	3,6%
	VWO/Gymnasium	27	16,3%
	MBO	10	6,0%
	HBO/WO propedeuse	24	14,5%
	HBO/WO bachelor	64	38,6%
	Other	3	1,8%
Area	No risk	106	63,9%
	Risk	60	36,1%

4. Study 1: Survey results

This section examines the results of the questionnaire. The data is analysed by using the statistics program SPSS. In this section, descriptive statistics, correlation coefficients between variables, and multiple regression analysis will be elaborated.

4.1 Descriptive statistics

Table 3 has been created to provide a broad overview of how participants answered the questions of the survey. The statements of the survey have been answered using a 5-point Likert scale, ranging from 1 being 'fully disagree' to 5 being 'fully agree'. The majority of the means of the variables vary between 3 and 4, or, between 'neutral' and 'agree'. There are also a few means that vary between 2 and 3, or, 'disagree' and 'neutral'. The highest mean is of the variable Safety (M=3,97, SD=0,87) and the lowest mean is of the variable Knowledge (M=2,51, SD=0,62).

Table 3

Means and Standard Deviations of the Different Variables

		N	Mean	SD
Measurement scales:				
	Mean Acceptance Nuclear Energy*	166	3,53	0,98
	Mean Trade-off Energy Sources**	166	3,25	0,84
Subjective norms	Mean Family/Friends	166	3,26	0,83
	Mean (social) Media	166	2,99	0,67
Attitude	Mean Attitude	166	3,61	0,94
	Mean Environmental Impact	166	2,66	0,93
	Mean Risk of Accidents	166	3,20	0,85
	Mean Risk of Radiation	166	3,13	1,03
	Mean Costs of Building and Decommissioning	166	3,64	0,84
	Mean Low-cost Energy	166	3,73	0,72
	Mean Zero Carbon Emissions	166	3,55	0,88
	Mean Economic Impact	166	3,79	0,67
	Mean Reliability	166	3,54	1,03
	Mean Safety	166	3,97	0,87
Demographic	Mean Knowledge	166	2,51	0,62
	Mean Area***	166	1,36	0,48

All scales are measured on a 5-point Likert scale (1=totally disagree / 5=totally agree)

* Measured on a 5-point Likert scale (1=negative aspect / 5=positive aspect)

** Measured on a 5-point Likert scale (1=nuclear energy / 5=other energy source)

*** Measured on a dummy scale (risk/no risk)

4.2 Correlation Coefficients

Before conducting the analyses to test the hypothesized effects, a correlation analysis was conducted. Pearson's Correlation is used to found the relationship between variables. Pearson's Correlation is always between -1 and 1. According to StatsTutor (n.d.), .00-.19 means a very weak correlation, .20-.39 means a weak correlation, .40-.59 means a moderate correlation, .60-.79 means a strong correlation, and finally, .80-.1.0 means a very strong relationship. The results of the Pearson's Correlation between measurement variables can be found in Table 4 and 5.

First, the correlations between the variables that are assumed to influence the acceptance of nuclear energy have been investigated (Table 4). Both trade-offs between energy sources and attitude show a strong positive correlation with acceptance of nuclear energy (*r*=.697; *r*=.795). Additionally, there is a very strong positive correlation between trade-offs between energy sources and attitude (*r*=.823) and between gender and attitude (*r*=.91). Finally, knowledge negatively correlates with all variables. This varies from a weak negative correlation to a strong negative correlation. The strongest negative correlation can be found between knowledge and attitude (*r*=.602).

Table 4

Correlations between Dependent Variables and Socio-demographics

Correlations

	1	2	3	4	5	6	7	8	9	10
Measures										
1 Gender	1									
2 Age	-.047	1								
3 Technical education	.087	.259**	1							
4 Area	-.055	.031	-.134	1						
5 Mean Knowledge of nuclear energy	-.015	-.106	.280**	.030	1					
6 Mean Family/friends	-.029	-.067	-.183*	.049	-.383**	1				
7 Mean (social) Media	-.040	.095	-.121	.024	-.324**	.252**	1			
8 Mean Attitude towards nuclear energy	.091	.098	-.210**	.009	-.602**	.397**	.217**	1		
9 Mean Acceptance of nuclear energy	.101	.119	-.062	.125	-.470**	.355**	.212**	.795**	1	
10 Mean Trade-off of energy sources	.106	-.005	-.114	.033	-.518**	.330**	.150	.823**	.697**	1

**Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Then, the correlations between the independent variables that are assumed to influence the predictor variable attitude were analysed (Table X). Moderately to very strong correlations can be found between the independent variables and attitude. Especially the risk of accidents (*r*=.846), reliability *(r*=.797), and safety (*r*=.761) have a strong positive correlation with attitude. Two variables negatively correlate with attitude, which are environmental impact (*r*=.783) and risk of radiation (*r*=.631).

Table 5

Correlations between Dependent Variable Attitude and Predictor Variables

Correlations

	1	2	3	4	5	6	7	8	9	10
Measures										
1 Mean Environmental impact	1									
2 Mean Risk of accidents	-.654**	1								
3 Mean Risk of radiation	.419**	-.696**	1							
4 Mean Costs of building and decommissioning	-.672**	.675**	-.483**	1						
5 Mean Low-cost energy	-.513**	.424**	-.245**	.5188**	1					
6 Mean Zero carbon emissions	-.766**	.621**	-.431**	.638**	.510**	1				
7 Mean Economic impact	-.534**	.418**	-.223**	.478**	.602**	.498**	1			
8 Mean Reliability energy source	-.806**	.696**	-.409**	.671**	.508**	.787**	.569**	1		
9 Mean Safety nuclear energy	-.602**	.695**	-.481**	.581**	.503**	.590**	.465**	.666**	1	
10 Mean Attitude	-.783**	.846**	-.631**	.735**	.507**	.737**	.501**	.797**	.761**	1

**Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

4.2.1. Multicollinearity

In the above-shown tables, the bivariate correlation between the variables is measured. It becomes visible that some of the predictor variables have very strong correlations with each other (above .8), rather than just with the independent variables. An example of this is the correlation between environmental impact and the reliability of energy sources (r=-.806). The rule of thumb indicates that you have multicollinearity if the correlation is above .8, but sometimes even above .7 (Grace-Martin, 2019). Therefore, the variables are tested on VIF (Variance Inflation Factor). First, the variables of Table 4 have been tested on VIF. All variables scored below 5, except for attitude. Values of VIF between 1 and 5 suggest that there is a correlation between the variables, but that no corrective measures have to be taken (Frost, n.d.). When the VIF-value is greater than 10, then, multicollinearity is present (Powers, 2021). From the variables of the first table, only attitude had a VIF fluctuating somewhat above five. All other VIF-values were at least below 3,348, but mostly below 3. Since multicollinearity is considered present when VIF is above 10, the few numbers that were a little above 5 were rejected, and therefore, no multicollinearity is considered present in the first table.

For the second correlation table (Table 5), no VIF was above five. The only variable that sometimes fluctuated, was the variable reliability (between 3.8 and 4.4). Therefore, multicollinearity is also not considered to be present in the second table.

4.3 Regression analyses

Multiple regression analyses have been conducted to investigate to which extent the independent variables influence the dependent variables. The first two analyses examine whether the independent variables attitude, family and friends, and (social) media affect the acceptance of nuclear energy and the trade-offs between energy sources. The third analysis investigates the impact of the predictor variables on the variable attitude towards nuclear energy. For each model, the model statistics are shown. Instead of R Squared, the Adjusted R Squared is used because the latter does correct for the variance of multiple explaining variables.

4.3.1. Multiple regression analysis for the acceptance of nuclear energy

Table 7 shows the effect of attitude and social influence from both family and friends, as well as (social) media on the acceptance of nuclear energy. In the first model, only demographics are included. The Adjusted R Squared is .237 (F=11,250, p <0.001) (Table 6). The first model shows that area of living (β=.311, p=.028) and knowledge of nuclear energy (β=-.769, p <.001) are significant. The second model adds the three predictor variables. The predictors explain an additional 41,3% of the variance of the model (Adj. R^2=.650). First, it is found that attitude has a significant effect on acceptance of nuclear energy (β=.820, p<.001), supporting H1.a. Secondly, the area of living remains significant (β=.271, p=.005). However, the results indicate that the nearer people live by a nuclear power plant, the more likely they are to accept it. This contradicts with H4.5, however, it does show that area of living affects the acceptance of nuclear energy. Additionally, the role of social influence is investigated. Both family/friends (β=.058, p=.351) and (social) media (β=.057, p=.416) show an insignificant effect. This means that hypothesis 2a, as well as hypothesis 3a, can be rejected. Gender, age, technical education, and knowledge of nuclear energy were found to be insignificant (p >.05), therefore, H.41 and H4.4 are rejected and RQ4.2 and RQ4.3 cannot be answered.

Table 6

Model Statistics of Acceptance on Nuclear Energy

Model statistics	*Adj. R^2*	*F-value*	*Sig.*
Model 1: Demographics	0,237	11,250	0,000
Model 2: Demographics + Predictors Acceptance on Nuclear Energy	0,650	39,262	0,000

Table 7. Regression coefficients of predictor variables on acceptance of nuclear energy.

Regression coefficients		*β*	*t-value*	*Sig.*
Model 1: Demographics (Δ Adj. R^2 = 0,264)				
	Gender	0,012	1,422	0,157
	Age	0,004	1,422	0,507
	Living area	0,311	2,219	0,028
	Technical education	0,145	0,982	0,328
	Knowledge of nuclear energy	-0,769	-6,742	0,000
Model 2: Demographics + Predictors of Acceptance on Nuclear Energy (Δ Adj. R^2 = 0,684)				
	Gender	0,004	0,591	0,555
	Age	0,000	0,085	0,933
	Living area	0,271	2,852	0,005
	Technical education	0,259	2,529	0,011
	Knowledge of nuclear energy	-0,007	-0,68	0,946
	Mean Attitude	0,820	13,144	0,000
	Mean Family/Friends	0,058	0,935	0,351
	Mean (social) Media	0,057	0,815	0,416

4.3.2. Multiple regression analysis for the trade-off between energy sources

In the following table, the statistics for the model of the trade-off between energy sources can be found (Table 8). The demographics already show significance, and the Adjusted R^2 is .264 (F = 12,846, *p* <.001). In the second model, the predictor variables of the trade-off between energy sources are added to the model, alongside the demographics. The Adjusted R^2 increased to .684, which means that an additional 42,0% is explained by the predictor variables. Similar to model 1, the second model is significant as well (F = 45,701, *p* <.001). Thus, it is interesting to find out whether all demographic and predictor variables are significant, or whether only a few are.

Table 8

Model Statistics of the Trade-off between Energy Sources

Model statistics	*Adj. R^2*	*F-value*	*Sig.*
Model 1: Demographics	0,264	12,846	0,000
Model 2: Demographics + Predictors Trade-off of Energy Sources	0,684	45,701	0,000

In Table 9, the two models can be found. The first model shows that only knowledge of nuclear energy has a significant effect on the trade-off of energy sources (β=-.736, *p* <.001). This effect is, however, negative. When adding the predictor variables, only the predictor variable attitude has a significant effect on the trade-off of energy sources (β=.732, *p* <.001). Thus, H1.b is accepted. The variable knowledge is no longer significant. Besides attitude, age (β=-.006, *p* =.290) and technical education (β=.190, *p* =.022) are found to have a significant effect on the trade-off of energy sources.

Table 9

Regression Coefficients of Predictor Variables on the Trade-off between Energy Sources

Regression coefficients		*β*	*t-value*	*Sig.*
Model 1: Demographics (Δ Adj. R² = 0,264)				
	Gender	0,010	1,370	0,173
	Age	-0,006	-1,062	0,290
	Living area	0,112	0,944	0,347
	Technical education	0,098	0,784	0,434
	Knowledge of nuclear energy	-0,736	-7,615	0,000
Model 2: Demographics + Predictors of Trade-Off of Energy Sources (Δ Adj. R² = 0,684)				
	Gender	0,002	0,350	0,727
	Age	-0,010	-2,584	0,011
	Living area	0,085	1,095	0,275
	Technical education	0,190	0,2314	0,022
	Knowledge of nuclear energy	-0,115	-1,447	0,150
	Mean Attitude	0,732	14,325	0,000
	Mean Family/Friends	-0,009	-0,181	0,856
	Mean (social) Media	-0,035	-0,559	0,550

4.3.3. Regression analysis for attitude towards nuclear energy

The dependent variable attitude consists of three predictor variables: risks, benefits, and trust. Table 10 shows that all predictor variables are significant. The Adjusted R^2 shows that risks already explain 82,0% of the variance of the model (F = 188,866, p <.001). After adding benefits (F = 112,762, p <.001) and trust (F = 103,684, p <.001), the predictor variables explain 84,9% of the model in total.

Table 10

Model Statistics for Attitude towards Nuclear Energy

Model statistics	*Adj. R^2*	*F-value*	*Sig.*
Model 1: Risks	0,820	188,866	0,000
Model 2: Risks + Benefits	0,826	112,762	0,000
Model 3: Risks + Benefits + Trust	0,849	103,684	0,000

In Table 11, the coefficient of the predictors of attitude can be found. In the first model, where only risk was added, all variables are significant: environmental impact (β=-.351, p <.001), risk of accidents (β=.490, p <.001), risk of radiation (β=-.093, p=.028), and costs of building and decommissioning (β=.171, p=.002). When the variables of benefits were added to the model as well, all risks remained significant (p <.05). From the added benefits, zero carbon emissions (β=.141, p=.015) and economic impact (β=.037, p =.002) were found to be significant. Finally, trust was added to the model as well. Environmental impact (β=-.197, p=.001), risk of accidents (β=.334, p <.001), risk of radiation (β=-.103, p <.001), and costs of building and decommissioning (β=.113, p=.035) remained significant. This means that H1.1 and H1.3 are supported. No benefits were found to be a predictor variable of the attitude towards nuclear energy. By adding trust, both the reliability of nuclear energy (β=.124, p=.034) and safety of nuclear energy (β=.207, p <.001) became significant, meaning that H1.8 and H1.9 are supported.

Table 11

Regression Coefficients for Attitude towards Nuclear Energy

Regression coefficients		*β*	*t-value*	*Sig.*
Model 1: Risks (Δ Adj. R^2 = 0,820)				
	Mean Environmental Impact	-0,351	-7,218	0,000
	Mean Risk of Accidents	0,490	7,620	0,000
	Mean Risk of Radiation	-0,093	-2,213	0,028
	Mean Costs of Building and Decommissioning	0,171	3,096	0,002
Model 2: Risks + Benefits (Δ Adj. R^2 = 0,826)				
	Mean Environmental Impact	0,258	-0,4468	0,000
	Mean Risk of Accidents	0,467	7,320	0,000
	Mean Risk of Radiation	-0,094	-2,252	0,026
	Mean Costs of Building and Decommissioning	0,131	2,320	0,022
	Mean Low-cost Energy	0,036	0,633	0,528
	Mean Zero Carbon Emissions	0,141	2,451	0,015
	Mean Economic Impact	0,037	3,178	0,002
Model 3: Risks + Benefits + Trust (Δ Adj. R^2 = 0,849)				
	Mean Environmental Impact	-0,197	-3,417	0,001
	Mean Risk of Accidents	0,334	5,121	0,000
	Mean Risk of Radiation	-0,103	-2,619	0,000
	Mean Costs of Building and Decommissioning	0,113	2,127	0,035
	Mean Low-cost Energy	0,002	0,040	0,968
	Mean Zero Carbon Emissions	0,072	1,243	0,216
	Mean Economic Impact	-0,007	-0,113	0,911
	Mean Reliability of Nuclear Energy	0,124	2,137	0,034
	Mean Safety of Nuclear Energy	0,207	4,129	0,000

4.4 Overview of the results of the tested hypotheses

Following the results, an overview of the tested hypotheses based on the statistical analyses performed is provided (Table 11).

Table 11

Results of the Hypotheses of this Study

Hypotheses	*Results*
H1a: Attitude positively affects the acceptance of nuclear energy	Supported
H2a: Family/friends positively affect the acceptance of nuclear energy	Not supported
H3a: (social) Media positively affect the acceptance of nuclear energy	Not supported
H1b: Attitude positively affect the trade-offs between energy sources	Supported
H2b: Family/friends positively affect the trade-offs between energy sources	Not supported
H3b: (social) Media positively affect the trade-offs between energy sources	Not supported
H1.1: Environmental impact negatively affects the attitude towards nuclear energy	Supported
H1.2: Risk of accidents negatively affects the attitude towards nuclear energy	Supported
H1.3: Risk of radiation negatively affects the attitude towards nuclear energy	Supported
H1.4: Costs of building negatively affect the attitude towards nuclear energy	Supported
H1.5: Low-cost energy positively affects the attitude towards nuclear energy	Not supported
H1.6: Zero carbon emissions positively affect the attitude towards nuclear energy	Not supported
H1.7: Economic impact positively affects the attitude towards nuclear energy	Not supported
H1.8: Reliability of nuclear energy positively affects the attitude towards nuclear energy	Supported
H1.9: Safety of nuclear energy positively the attitude towards nuclear energy	Supported
H4.1: Men are more likely to accept nuclear energy than women.	Not supported
RQ4.2: Do differences in age matter in the acceptance of nuclear energy?	Partially supported**
RQ4.3: Does a technical education matter in the acceptance of nuclear energy?	Partially supported*
H4.4: A higher level of knowledge of nuclear energy results in more acceptance of it.	Partially supported**
H4.5: The further people live away from a nuclear power plant, the more likely they are to accept one.	Partially supported*

Note.

* Supported for the acceptance of nuclear energy

** Supported for the trade-offs between energy sources

The different results are incorporated in the previously established models. First, the models of acceptance of nuclear energy and trade-off between energy sources are shown (Figure 5; Figure 6). The models are separated from each other to ensure clearness. Then, the model is shown where the effects on attitude become visible (Figure 7).

Figure 5

Model for Acceptance of Nuclear Energy

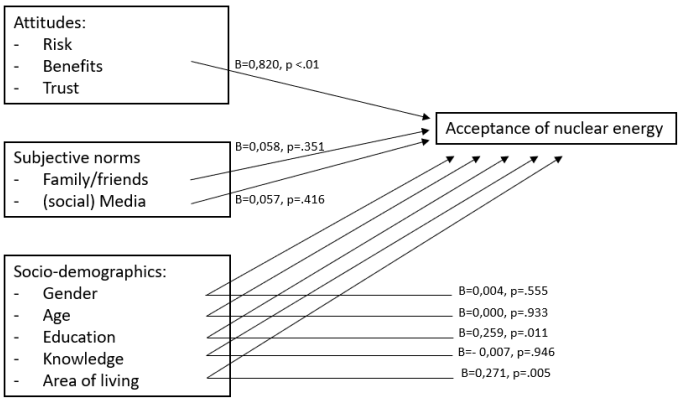


Figure 6

Model for Trade-offs between Energy Sources

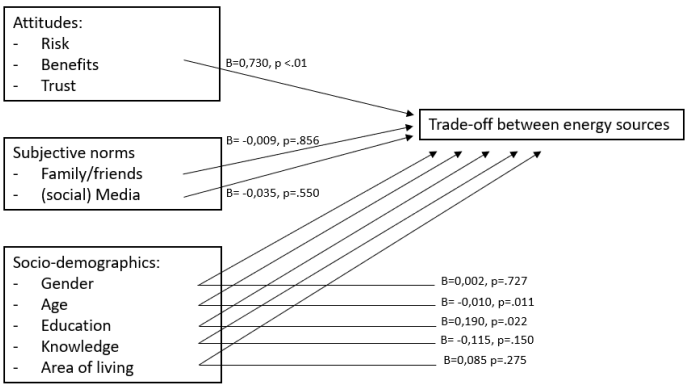
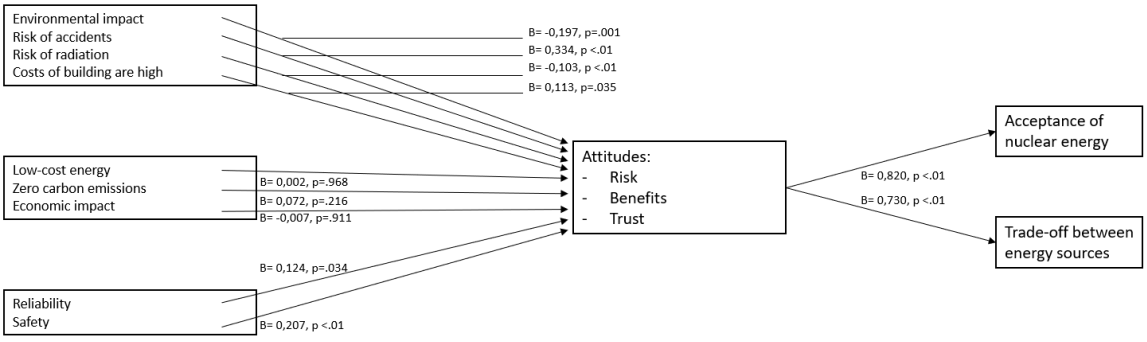


Figure 7

Model for attitude towards nuclear energy



5. Study 2: Focus group method

To answer the consultancy question for companies operating in the nuclear energy sector, and also the second research question: *"How does the public perception of Generation Z translate to an external communication strategy?"*, focus groups will be conducted among Dutch, higher educated 18 to 25 year olds. The goal of the focus groups is to discuss the outcomes of the previously held questionnaire, and, different social media posts will be evaluated. Especially the latter goal delivers input for an external communication strategy that could be used by companies that are operating in the nuclear energy sector to provide higher educated people of Generation Z with information about nuclear energy.

5.1 Research design

A survey has been conducted to answer the previous question to find out which factors influence the acceptance of nuclear energy. In the literature, no studies have been found by the researcher where the researchers of a study discussed the outcomes of a questionnaire with the participants. Therefore, this study can be seen as exploratory. The focus group is used to gain information about the participants' views of a certain topic (Stancanelli, 2014). In this study, participants will give their opinion on nuclear energy. The basic idea is that a small group of selected individuals hold an open, in-depth discussion about a subject of interest (Courtois & Turtle, 2008). An important characteristic of focus groups is that the researcher, or moderator, actively encourages participants to involve in group interaction (Barbour, 2005). Combining a survey with a focus group gives a great amount of data since the survey focuses on what participants think, and the focus group focuses on why the participants think the way they do (Morgan, 1996). A disadvantage of a focus group is that the data that is gathered cannot be generalized to an entire population since it is only about opinions expressed by a small number of participants (Courtois & Turtle, 2008).

For the focus group sessions, the results of the survey have been analysed at a certain point of time during data collection. This point has been reached when 80 participants had filled out the survey. Based on this, extraordinary outcomes of the statements that were asked in the questionnaire were selected. An example of an extraordinary situation that was discussed is the role of (social) media. Only 6% of the participants indicated (social) media as a reliable information source, however, 43% indicated that media is important for creating an image about a topic. This example shows some contradiction and was therefore discussed during the focus group. Secondly, based on the literature that was found, six categories were established, in which social media posts can be categorized. The discussion regarding these posts will provide input for an external communication strategy.

5.2 Procedure

To find an answer to the consultancy question, which is aimed at delivering input for the communication strategy of companies operating in the nuclear energy sector, a qualitative method is

used. A qualitative method was chosen to gather insights into the thoughts and opinions of participants. The qualitative method that has been selected to answer the second research question is focus groups. According to Krueger and Casey (2002), 6 – 8 persons per focus group are preferred. Due to COVID-19 circumstances, bringing that amount of people together in a small room does not feel responsible. Therefore, the decision has been made to decrease this amount by half. To guarantee that the same amount of information will be gathered, a second focus group will take place.

To gather participants for the focus groups, a question at the end of the survey was included where respondents could fill in their e-mail addresses if they wanted to participate. The reason for including this question at the end of the survey was because the results of the survey were subject to discussion during the focus group sessions. Therefore, the participants needed to know the questions and subjects that were asked. The minimum amount of focus groups that had to take place were two, where 3 to 4 persons participated in each group due to COVID-19 measurements.

In total, seven people from the target group participated in a focus group. Due to time restrictions, it is not a high number of people that have been consulted. Therefore, not all findings should be automatically generalized over the total population. The focus groups that have been conducted serve as a starting point for an external communication strategy. The seven participants were divided into two focus groups. Five participants were male and the other two were female. Their ages vary from 18 to 25. Six out of seven participants were students and one participant had a gap year. All participants lived in the region of Enschede. They were personally approached after they filled in their email dress in the survey.

During the focus group, participants were allowed to elaborate on the answers they had given in the survey. A focus group can be used to support the data that has been found in the survey (Gundumogula, 2020). Moreover, their opinions and thoughts regarding different social media posts were asked. The social media posts of a wide range of companies were selected (Appendix D). To test different sides of posts, not only companies that are operating in the nuclear energy sector have been selected. Other companies or organizations that were selected were companies operating in other energy sectors, or activism organizations. However, the goal was to have a larger amount of companies of the nuclear energy industry being present in the posts, to see whether the way of explaining things was appealing to the participants. This is considered important since the ultimate goal is to deliver input for companies that operate in the nuclear energy sector, and not for companies that are operating in the energy sector in general. The social media posts have been based on the existing theory that was found regarding the constructs of visual/textual stimulation and credibility (Boeije, 2009).

According to Gundumogula (2020), the preparation and the outline of the focus group play a determinant role when conducting the focus group. Two constructs were aimed to be measured

during the focus group: visual/textual stimulation and the use of sources. Therefore, the outline of the focus group has been discussed with a company that operates in the nuclear energy sector. This functioned as a sort of pre-test, to ensure that the outline of the focus group would be clear, and to ensure that no things were forgotten to be asked. Additionally, the selected social media posts were shown to ensure that the division between nuclear energy companies, energy companies, and activism organizations was sufficient, and no other external organizations of importance were forgotten.

The outline of the focus group was as follows. Firstly, the moderator welcomed the participants. They gave their informed consent regarding the recording of the group interview. Following, the rules of the focus group were introduced (Appendix E), and after that, the goal of the interview was explained. Then, highlights or extraordinary outcomes of the survey were discussed (Appendix F). One at a time, a statement was presented and a discussion was started. The first thing that was presented was the answers to the statement "A career in the nuclear sector would be appealing to me". In total, five slides with outcomes to statements were presented. Other statements were asked in the following order: "I consider the electricity costs for the consumer when forming an opinion on nuclear energy", "Nuclear innovations are important for the future of nuclear energy", "I think that scientists/ companies with an own stake/(social) media are reliable", and the trade-offs between nuclear energy and wind energy at sea and hydro energy. Each time, participants were asked to explain the outcomes, and participants could elaborate on their choices or could think of reasons why other participants choose a certain answer. The statements of the survey that are the topic of discussion during the focus groups have been selected based on the outcomes of the statement. A few statements were selected based on their extraordinary outcomes.

Subsequently, different posts of SNS's were presented (Appendix D). The posts that have been selected are all from companies or organizations operating in the (nuclear) energy sector, or from activism organizations. The posts have been discussed with one company that operates in the nuclear energy sector, to see if a representative selection was made.

The SNS's that were selected were Instagram, Facebook, LinkedIn, and Twitter. Six sub-categories were established, varying from visual stimulation to textual stimulation. Vacancies have been included as well. The posts have been selected based on stimuli that were found in the literature. One post from each stimulus was presented to gather their opinions. The posts were chosen based on randomization and the order of sections was also in a randomized order. Finally, participants were asked to give feedback on two posts about vacancies. One vacancy had included a personal approach, whereas the other one did not. The goal was to find out whether the participants liked to see a personal approach in a vacancy.

6. Study 2: Focus group results

6.1 Coding reliability

After collecting the data, all interviews were transcribed and anonymized to ensure confidentiality (Appendix G). Subsequently, the transcripts were uploaded to ATLAS.ti, a tool that helped to code the conversations. A deductive approach was used, where knowledge that was gathered in the theoretical framework helped to establish codes (Boeije, 2009). Then, the transcripts of the discussions were carefully read to establish sub-categories of the codes. After doing so, a coding schema was created and sent out to the second coder.

The coding scheme and the reliability of the coding were tested by calculating the intercoder reliability. A second coder coded one transcript of a focus group. SPSS was used to calculate Cohen's Kappa. The first coding round resulted in substantial agreement. For this status, Cohen's Kappa has to be between 0.61 and 0.80. Cohen's Kappa was namely 0.727. This means that the codebook is sufficiently reliable. The final codebook can be found in Appendix H, and the table that shows the Cohen's Kappa can be found in Appendix I.

6.2 Discussion of the outcomes of the survey

During the focus group, some results of the questionnaire were discussed (N = 120). An important descriptive factor that should be used to develop a communication strategy is the media exposure of the participants. In the following table (Table 12), this data will be provided.

Table 12

Summary of Media Exposure of Different Sources

Source	*Mean*	*Std. Deviation*
TV	3,51	1,306
Newspapers	3,44	1,416
Magazines	2,01	1,094
Radio	3,14	1,392
National news via Internet	3,14	1,392
National news blogs	2,21	1,288
National news via social media	3,78	1,446
National news via discussions	3,09	1,157

All scales are measured on a 5-point Likert scale (1=Never / 5=At least once a day)

6.2.1. Career in the nuclear sector

The focus group started with a discussion of the results of the survey. The first point of discussion was about the number of respondents that indicated that they do not want to pursue a career in the nuclear sector (52%). The participants of the focus group were asked to come up with reasons for this percentage. Some participants perceived the number of respondents that did want to pursue a career in the nuclear sector as quite high (24%). The reason that was given for the high number of people that did not want to pursue a career in the nuclear sector was that the question might have been misunderstood. Participant 4 interpreted the question as: *"I guess the question was*

this job, do you want it, yes or no?". On the other hand, participant 5 interpreted the question as *"If it were offered to you, whether you would pass or…*". Other explanations for the number were that people associated it with the engineering side or that they do not want this type of job. One other reason that might play an important role is that people do not have an idea what a job in the nuclear sector contains. The final reason that was given was the lack of interest in the nuclear sector.

Based on the discussions that the participants had, it can be concluded that there are three explanations for the number of participants that do not want a career in the nuclear sector. It might have been the case that respondents misunderstood the question since it could have been interpreted in multiple ways. The other explanation that participants together agreed on was that they have no idea about jobs in the nuclear sector and that they have already pictured another career for themselves.

6.2.2. Electricity costs

Another outstanding thing was the fact that respondents did not care much about electricity costs, namely 44% does not care about electricity costs. Together, participants of the focus group came up with multiple explanations, but the primary reason that was given was the large number of students that participated in the questionnaire. Participant 5 explained, *"I think it is also dangerous to talk about this because a big part of the study are students now and lots of students are living in their student places and they're not really paying directly for their own electricity"*. All in all, they reached a consensus the explanation that respondents do not know anything about electricity costs, and, therefore, indicated that they do not care about it.

6.2.3. Nuclear innovations

The following point that concerned nuclear innovations. 71% of the respondents indicated that nuclear innovations are important for the future. When the participants were asked about nuclear innovations, two sides appeared. One side did know about nuclear innovations. Both participant 2 and participant 6 stated that they know about nuclear fusion. Participant 2 added this *"I would think of the development of molten salt reactors or thorium reactors. Those are much safer than conventional nuclear reactors"*. Both participants 1 and 3 agreed to this answer and did not add anything else. The other side indicated that they do not know nuclear innovations, as participant 7 said *"Yeah, I don't know any nuclear innovations at all"*. All participants agreed that *"innovations, in general, are always good"* (participant 5). So, no consensus was reached on this statement. Even though all participants agreed on that innovations in general are good, they did not reached consensus on specifical nuclear innovations.

6.2.4. Reliability of information sources

The next point from the questionnaire that was discussed during the focus group addressed the reliability of information sources. The statement was positively phrased, e.g., "I think that the

government is a reliable information source". Then, participants had to indicate on a five-point Likert scale to what extent they agreed with the statement. The results can be found in Table 13.

Table 13

Summary of the Results of Reliability of Information Sources

Source	*Mean*	*Std. Deviation*
Government	3,61	0,983
Journalists	3,04	0,968
Politicians	2,42	0,968
Scientists	4,51	0,620
Companies with an own share	2,08	0,812
NGO's	3,07	0,727
Friends/family	2,46	0,899
Social media	1,92	0,824

Scientists were the most reliable information source (97%), whereas social media (6%) and companies with an own stake (4%) were the least reliable. Furthermore, 43% of the respondents indicated that they used media to create an image of nuclear energy. Participants were asked to give their opinion on these numbers. Participant 7 explained, *"I think 97% of scientists, I would say it's still quite high, I think not every scientist is reliable because if you investigate something, you can get the result you want, most of the time"*. Participant 3 added *"I think that scientists are over-reliable. Scientists, in general, do the right thing, but I think that when we look at data from, from example, social sciences, a lot of the papers have been proven incorrect, even though they were peer-reviewed"*. Participant 6 came up with another explanation and said *"Scientists themselves are pretty reliable, but the companies or institutions who hire them to do research influence the* scientists". Participant 5 added, *"they are pretty much reliable, they still vary and there are still a lot of different and different opinions among scientists"*.

About the low number of trust in companies with an own stake, participant 3 said *"I think that number is too low really. It shouldn't be at the scientist level, but I think it should at least be 40% or something like that"*. Another point that was discussed was a company with an own stake that shares a scientific article. Participant 7 explained *"Well, I think if a company posts a scientific article, it is true, but, it's one-sided like the other side isn't shown in the article, so they are reliable, but they are keeping a bit of the truth away"*. Participant 2 agreed on the reliability of the post, *"I trust that, because articles have to be peer-reviewed before it is accepted. So, if a paper is accepted, it is approved"*. On the other hand, some participants indicated that they would not be interested to see a scientific article on social media.

Concerning media, only 6% think that they are reliable. As participant 6 stated, *"The most social media is sort of biased. They want to present a certain image*". The concern of participant 5 is that people live in their own bubble, and, thus, only see that information rather than unbiased

information. About unbiased reporting, participant 2 added *"If you look at the accidents of nuclear energy, they are all zoomed in. In the coal industry, a lot more accidents happen but there it has become normal so they don't report about it that often anymore. It is neglectable what happens in the coal industry. In that sense, it is harmful"*. About using media to form an opinion, all participants agreed that people are affected by what media write, even though they do not want to be affected by that information.

All in all, the participants reached a consensus that most respondents rely on scientists. The participants of the focus groups had some doubts about the reliability of scientists when they get paid by a company or an institution. The reason that was reached consensus on by the participants for the low trust in companies with an own stake, is that their foremost goal is to remain profitable. The participants argued that companies only share things that are in their interest. If companies share a scientific article, the participants of the focus group do trust the article but keep in their heads that it is one-sided. All participants together agreed that media are biased, but that they are consciously or unconsciously used to form an opinion on almost everything, including nuclear energy.

6.2.5. Preference of energy sources

The final point of the questionnaire that was discussed during the focus groups was about the preferences of energy sources. Two results were outstanding, the preference for hydro energy (60%) and the preference for wind energy at sea (56%) compared to nuclear energy. Participant 3 gave for these preferences the explanation that *"the latter options are considered risk-averse"*. In both focus groups, the lack of knowledge about hydro energy came forward. Participant 2 indicated that *"consequences of wind and hydro could be even more severe than nuclear accidents"*. Participant 6 agreed, and stated that *"they [Asia] are messing up the whole system with the rivers that they're like causing floods and they just haven't got enough water. So I think the top one is for the people not knowing hydro energy"*. During the discussion, it came forward that the level of knowledge about wind energy differed between the participants. Some could mention risks or disadvantages about the energy sources, whereas others learned new arguments during the discussion. Participant 4 said *"I'm not really in that world, so I cannot list it and I cannot say this one is better or this"* and participant 5 added to that *"because now you just talk about how much noise they make. And I actually haven't even thought about that".*

One of the main explanations that the participants reached a consensus on was the likeliness of a lack of knowledge of the respondents of the questionnaire about energy sources. The participants of the focus group assumed that respondents did not know about the risks and disadvantages of hydro- and wind energy, and therefore, unjustified thought they were risk-free. The level of knowledge about the energy sources also differed between the participants. Therefore, no real

consensus was found here. However, after one of the participants gave information about advantages and disadvantages, the other participants could make a better consideration about their preference.

6.3 Discussion of social media posts

Besides gathering the opinion of participants on the outcomes of the questionnaire, they were asked to give their opinion on existing social media posts of companies and organizations that are active in the energy sector.

6.3.1. Visual stimulation with funny posts

The first slide showed funny posts on social media. Thus, the stimulation was visual. The first picture concerned a meme. Participant 2 said, *"it is pretty cringy. Like somebody was told to make a meme but that never works out. It's trying to be hi but it misses the mark. Quite far"*. Another participant said, *"they put the effort in it to create a meme, but it doesn't make it more understandable what you mean. I can't relate"*. None of the participants understood what this post was about. About memes in general, one focus group indicated that it could be useful to target the younger audience, whereas the other focus group said that memes should always avoid.

About the strawberry post, participant 2 said *"it has a nice message but it is pretty hard to decipher in that way"*. Participant 6 said that it was not engaging enough, whereas participant 4 said "*it's an informative post and it's understandable. The content is nice, but maybe the engagement not so*". Participant 7, who did not like the post, saw room for improvement and said *"I would have preferred a time-lapse that shows how the mould grows on it"*.

Another post that was perceived differently by the focus groups was the post from Greenpeace. Participants in one focus group said that *"it was not engaging and a bit stupid"* (participant 7) and it was *"badly photoshopped"* (participant 6). Moreover, they agreed on the fact that it was easy scoring and *"conformed to the opinion of Greenpeace followers already have"* (participant 4). The other group appreciated the Greenpeace post more since it is "*very clear and nicely presented"* (participant 2).

Based on the first slide, the participants reached a consensus that memes are not considered a good option to target this group. Their reason was that it might gain their attention, but it might also be hard to understand what is meant with the meme. Another thing that came forward is that the use of a time-lapse would be appreciated. One thing that should be taken into account is that when things are photoshopped, they should look clean.

6.3.2. Visual stimulation with a video

The movie that was shown was about nuclear energy. All participants liked the movie. As participant 2 said, *"the film is pretty good"*. Participant 7 indicated that *"it's engaging"* and also participant 6 *"liked it"*. However, they did have some remarks. Participant 3 questioned the use of missiles in the movie. Another thing that was questioned was the use of a rocket because the

participants of this focus group thought it was about warfare. Participant 6 questioned the mention of nuclear health care since this was not further explained and remains unclear. Participant 7 says that *"it's engaging, it's yeah, it's really positive, maybe it should also be some disadvantages in the video, but I really like the overall confidence style"*.

The fact that the disadvantages were not mentioned in the video was something that would have improved the video. This was not only to give an unbiased image but also because *"you can counter them and so you can stripe them down to make it even more powerful"* (participant 7). There was one remark about the style of the movie, and that was the use of colour. According to participant 1, *"the black dots in the screen made it look a little old"*. All participants would be interested to see the entire movie. If there would be a shortcut to the movie on Instagram, they would click on the movie to entirely watch it.

The participants reached a consensus on the usage of movies since it was highly appreciated to convey a message. With regards to this specific movie, all participants agreed that they liked the way the message was brought to them. However, according to them, it could have been even stronger by adding disadvantages, which could also have been refuted afterward. All participants together agreed that movies are a great way of explaining a topic and visualizing information.

6.3.3. Visual stimulation by using infographics

Three different infographics were presented to the participants. On a general level, the use of infographics is not highly appreciated. Participant 7 said, *"I'm actually quite sceptic about infographics. There's always some statistic that is going to support your opinion and then you make infographics and then it looks nice*". Participant 2 said, "*if you use an infographic very effectively and it's very cleanly and very clear, then it can be very effective"*. None of the participants liked the infographics that were presented to them. Moreover, the content of the infographic remained unclear. The only reason why some participants understood it was "*because we are discussing it now, we get something. But it was not clear"* (participant 6). They also indicated that they barely see any infographics on social media.

The presence of a source at a post did add some worth. It increased the reliability of the information that is presented. One focus group indicated that the use of colours is incorrect. Participant 3 said, "*no one cares about energy. It's boring. But if you make interesting graphs or interesting infographics, you're going to get people hooked regardless*".

All in all, infographics is not something that is often used on social media. Therefore, some of the participants had a hard time estimating whether they would scroll or would stick to read it. In general, participants together agreed that they thought infographics would give a biased image of the thing being presented, and it would also give an unclear image. Adding sources was given as an idea to make an infographic trustworthy. The participants reached a consensus on using sources to increase the credibility of a post.

6.3.4. Textual stimulation – long text

The posts that were presented to the participants contained a longer story, and eventually, a link to the full article. The first thing that was indicated as important was the picture that accompanied the text. As participant 2 said, *"it's a very effective use of that picture. Although I would say that the picture in the middle one is also interesting. The one on the left is very… that does not really stand out"*. The second thing that people did was reading the title. After that, the text became important. The opinions on the text differed between the participants. Participant 5 said "*it's a bit much, but if you split it into three parts, like paragraphs, that would be better*". Participant 7 indicated that it *"would prefer to just read the article instead of the caption"*. This argument was also given in the other focus group, where all participants agreed that they first look at the picture, then the title, and then click on the article. As participant 2 said, *"I would not even read the text above*".

Based on the discussion that took place, it came forward that most participants of the focus group do not even look at the text that is placed above the picture. They agreed that their attention is drawn to a post by the picture that is accompanying the text. So, even if a company wants to make a point with the information that they are providing, they should first choose an engaging picture, that serves as a trigger to the post. Moreover, the text should not be posted as one long story, but rather as small paragraphs.

6.3.5 Textual stimulation – short text with a click-through

The next slide that was presented to the participants contained short texts, with a focus on click-through links. Once again, participants focused on the picture that accompanied the post. The decision to scroll or to stop and read the post was made on the attractiveness of the accompanying picture. One post completely missed the mark. The statement that was made – nuclear energy is a logical step – contradicted the picture that was used. According to the participants, this emphasized the accidents that happened with nuclear energy, rather than focusing on the positive points that are attended with nuclear energy. So, even if there is not a long text posted, the participants reached consensus on that they still made their decision to stop scrolling based on the picture.

6.3.6. Vacancies

To answer the question of Company X on how to engage future employees and policymakers, two different vacancies were presented to the participants. Whereas one of the vacancies included a personal approach, the other one did not. One of the participants noticed the joke that one of the vacancies used. After explaining it to the other participants, everyone thought that this gave a nice touch. Participant 3 said that "*it would not be bad to combine the personal approach of the left vacancy with the vacancy that was presented on the right*". The personal approach was a bit appreciated, but participants felt that a different way would have been better. The personal story was perceived as biased since it only emphasized the positive side of the employer. As participant 6 stated,

"*this feels like propaganda"*. Some participants indicated that they would rather talk to an own-chosen employee from the company rather than a person that is presented to them on social media. A solution for this was given by participant 5, who said "*you could put a link to the website where you provide more information, there's a blog of an employee doing this and this. So you can still have those insights, but making it less subjective"*. Participant 2 emphasized the use of pictures of the right vacancy, *"what I like about the right one is that they actually have the person in the field they are working in. Dennis is standing against a green screen or something"*.

One of the things that stand out is once again the usage of pictures. One of the companies used a picture that was not engaging, whereas the other company decided to use a picture of an employee in their working environment. The participants reached a consensus on a personal approach since it shows where a future employee is likely to work as well. A personal story of how the employee experiences their job is not necessarily preferred since it often only shows the good sides of the company. The presence of such a story on the website of the company would be more appreciated by the participants.

6.3.7. Additional remarks

At the end of the focus group, participants were asked whether they had any additional remarks about the discussions that took place. Participant 3 said "*try to make it sexy. Nuclear energy is not something that is likeable, it's not exciting to see a nuclear reactor. And then you see those fusion reactors you know, they are really cool! That makes you excited because it looks cool and it's tacky"*. Participant 2 added, *"When you can see things from the inside, that's really cool. It's often very clinical and they don't make it exciting"*. Participant 6 suggested *"to look at NOSop3 videos, how they explain things, and how they clearly convey a message*". Participant 7 added that *"not one source should be used but as many sources as possible"* and *"not only the good side, but also state the bad side or whatever is considered as the bad side"*.

7. Discussion and implications

Energy transitions are on their way to tackle climate change. An energy source that is proposed as a (partial) solution to do so, is nuclear energy. This study aims to provide insight into how Generation Z experiences nuclear energy, and how their experiences translate to input for a communication strategy to inform this group. Therefore, two sub-questions were identified. The first sub-question refers to what factors influence the acceptance of nuclear energy of Generation Z, with a specific focus on higher-educated 18 to 25 year olds: *"What influences the public acceptance of nuclear energy among higher educated 18 to 25 year olds ('Generation Z')?*

In the first study, the fundamental elements that people need to create an image of nuclear energy were identified and placed in context. Through a questionnaire, it came forward that attitude towards nuclear energy, the trade-off between energy sources, and the acceptance of nuclear energy all tend to be positive. Especially attitude towards nuclear energy played a determinant role for both acceptance and trade-offs. Within attitude, risks of nuclear energy and the trust that people have in nuclear energy were found to be significant.

Attitude towards nuclear energy

The attitude towards nuclear energy was found to be a significant factor for both the acceptance of nuclear energy and the trade-offs people make when they have a free choice. For both variables, it had a positive effect. In other words, when people have a positive attitude towards nuclear energy, they are more likely to accept nuclear energy, and they also prefer to choose nuclear energy over another type of energy when they have the choice. Park (2020) also found that a positive attitude towards nuclear energy leads to more acceptance of nuclear energy.

The attitude towards nuclear energy was found to be significant for the acceptance of nuclear energy as well as for the trade-off between energy sources. Thus, it is interesting to see which factors influence the positive attitude.

Risks

Against expectations, the risks of nuclear energy already explained 82,0% of the attitude. It was also found by Wang, Wang, Lin, and Li (2020) that risks are positively associated with the acceptance of nuclear energy. In line with other expectations, the environmental impact of nuclear energy negatively influences the attitude towards nuclear energy. Other energy sources might be considered more environmentally friendly because uranium needs to be mined and transported from the source to an enrichment company to a nuclear power plant. Additionally, nuclear energy uses a tremendous amount of water to cool down the reactors. Secondly, the risk of accidents positively influences the attitude towards nuclear energy. This contradicts the assumption, but a possible explanation for this could be that people estimate the risk of an accident happening as zero. Additionally, the sample of this study is relatively young, and they did not experience the severe

accidents that happened last century. The risk of radiation negatively affects the attitude towards nuclear energy. A logical reason for this is that people fear that they are exposed to dangerous amounts of radiation, as happened in Chernobyl. Moreover, people might have the feeling that no institutions or governments could protect them from radiation. Finally, costs of building and decommissioning have a positive effect on attitude. This was not expected, but people may think that the time and investments that are needed to build a nuclear power plant are justified to achieve climate goals.

Benefits

It was expected that all three benefits would have a positive effect on the attitude towards nuclear energy. However, this was not the case, because the economic impact had a negative impact. Additionally, the results did not demonstrate a significant effect of benefits. This is not in line with what was expected before the study. It also contradicts the findings of Groot, Schweiger, and Schubert (2020), who found that benefits are the most important determinants of acceptability. The findings of this study are also not in line with the findings by Wang, Wang, Li, and Lin (2020), who stated that benefits significantly affect the acceptance of nuclear energy, however, the benefit perception is low. An explanation for the lack of significance for benefits could be that people do not know how to correctly estimate the benefits.

The guarantees of nuclear energy

Two other significant determinants of attitude were found to be the reliability and the safety of nuclear energy. An explanation could be that people think that other energy sources are less reliable, due to weather conditions (e.g., solar and wind energy). The fact that the risk of accidents positively influences the attitude towards nuclear energy might be in line with the fact that the safety of nuclear energy also positively influences the attitude. In this study, people have confidence in the government and companies operating in the nuclear sector taking appropriate measurements to protect citizens. This result is consistent with data obtained in a study of Wang, Gu, and Wu (2020), who found that trust in government was positively related to the acceptance of nuclear energy.

Subjective norms

Family/friends

This study found that family and friends do not significantly contribute to the acceptance of nuclear energy nor do the trade-offs they make. For the acceptance of nuclear energy, family and friends had a small positive effect, where it had a small, negative effect for the trade-offs between energy sources. This could be explained by the relatively young sample of this study. Often, energy is included in their rental price, and they are not aware of that. Additionally, they often do not have the choice for making solar panels on their rooftops. Since it is not part of the decisions they make, they likely dwell upon those things.

(social) Media

The (social) media coverage of nuclear energy was not found to have a significant contribution to either the acceptance of nuclear energy, or the trade-offs people make. Again, (social) media coverage had a slightly positive effect on acceptance, whereas it had a slightly negative effect on the trade-offs people make. An explanation for this could be that other energy sources get greater positive media coverage contrarily to nuclear energy.

Socio-demographics

Gender

Against expectations, gender had a very small, insignificant effect on the acceptance of nuclear energy and the trade-offs between energy sources. It was expected that men would be more in favour of nuclear energy than women, but this was not the case. An explanation for this could be that the majority of the participants study at a technical university, and therefore, are more open to technicalities, such as nuclear energy.

Age

Age did significantly affect the trade-off between energy sources but did not affect the acceptance of nuclear energy at all. Thus, when people are younger, they are less likely to choose nuclear energy over other energy sources. A possible explanation for this could be that solar and wind energy are promoted more often, and have higher visibility in society. Compared to other studies that have been done on acceptance, this study had a relatively young sample (Odonker & Adams, 2020; Čábelková et al., 2021). Even though nuclear energy is suggested as a solution for nuclear energy, it could be that the target group of this study is more focused on other options to tackle climate change rather than nuclear energy.

Education

It was found that when people were technically educated, they were slightly more likely to choose nuclear energy over other energy sources. A reason for this might be that people with a technical background take a more rational approach to nuclear energy, rather than an emotional approach. Also, when they see numbers that explain reasons, they can interpret those and place them in context. This might be harder for people that do not have a technical background.

Knowledge of nuclear energy

Against all expectations, knowledge negatively affects the acceptance of nuclear energy and the trade-offs between energy sources. Thus, when people have more knowledge about nuclear energy, they are less likely to choose nuclear energy when they also have the option of choosing another source of energy. This given could be clarified by knowledge about the disadvantages of nuclear energy negatively impacting the feeling people have about this type of energy. Additionally, it could be that the disadvantages of nuclear energy are exaggerated rather than put in perspective.

Living area

The living area of respondents had a significant effect on the acceptance of nuclear energy. An explanation for this might be that people who live in or live close to an area where a nuclear power plant could potentially build are more aware of the advantages of a nuclear power plant. A similar result was stated in a study by Uji, Prakash, and Song (2021), who found that people who lived near a nuclear power plant showed higher support for re-operating one after they heard of the benefits of nuclear energy than people who lived further away from nuclear power plants.

A remarkable point is that area of living is significant for the acceptance of nuclear energy, but not for trade-offs between energy sources. A reason could be that even more people are directly affected by other energy sources, such as wind turbines or solar parks. Since the area of living has a slightly positive effect on trade-offs, it is likely to assume that people prefer nuclear power plants since they can be built in fewer regions and take less space, and therefore, most people are less affected by those decisions.

7.1 Practical implications

The second study aimed to deliver input for a communication strategy, that fits the needs and wants of higher educated 18 to 25 year olds that live in the Netherlands. To answer the question *"How does the public perception of Generation Z translate to an external communication strategy?"*, questions from the questionnaire were used, as well as focus group sessions where social media posts were discussed.

First, the survey was used to provide insights into the exposure of different media to participants, and to what extent they think certain sources provide reliable information. Scientists were perceived as the most reliable, whereas companies with their own share and social media were perceived as the least reliable. Since everyone can post information on social media, the information is likely to be inconsistent or incorrect (Lewoniewski, Wecel, Abramowicz, 2020). The extremely high number of people that fully rely on scientists (97%) could be problematic. Examples of factors that threaten the reliability of scientists are false-positive results and publication bias (Munafò & Flint, 2010). Participants indicated that they thought that some of the trade-offs between energy sources were made based on risk perception and lack of knowledge.

Although some of the answers varied between the focus groups – it highly depends on one's personal preferences – some trends can be discovered. In line with the expectations, participants like the use of visuals when a message is trying to be conveyed. However, they also indicated that it sometimes is hard to understand what a picture is about, or that the message and the picture are contradicting. Not only pictures are appreciated, but videos as well. Visualizing information in the form of an infographic was not recommended for two reasons: unclarity and bias.

The image that is accompanying the post is the most important thing for Generation Z. The first thing that draws their attention is the picture. If they do not like the picture, they will not read the text above, even if the text is not long. This is in line with the expectations since this generation has a very short attention span.

It was further hypothesized that it is important that companies present a credible image. One way of doing so is by adding a source to a social media post. According to participants, this would ensure credibility. Companies that are involved in the nuclear energy sector could therefore consider using more than one source. Additionally, they could consider mentioning both the advantages as well as the disadvantages to create a completer image. Notifying of disadvantages also allows the company to counter them with sources that prove the opposite.

7.2 Limitations

Some words should be dedicated to the limitations of this study. A common method to measure what the public knows and thinks is using a survey. Two serious problems that are concerned with a questionnaire are that it differs how respondents infer the content of the questions, and how some of the questions might have been framed, which both can lead to different responses (Morgan, 1997). This was also indicated by the respondents of the study. Multiple respondents gave feedback that they had a hard time with some of the statements because they did not know what they were about. Even though the explained variance of the model was quite high, not all influential factors have been included in the questionnaire. According to some respondents, nuclear waste and terrorism were important for their image regarding nuclear energy, but those were not included. Additionally, it would have been a good idea to ask in the questionnaire at which SNSs respondents were active since this could have been used as input for both the focus group and to answer the second sub-question.

Another limitation is that the questionnaire is distributed via non-probability convenience sampling. The survey could not be found on the Internet by all people. The sample size of the survey is relatively small. Moreover, especially persons living in the east of the Netherlands have filled out the survey. Additionally, it should be noted that the University of Twente is a technical university. This means that the findings not automatically can be generalized over the entire population (Wang, Gu, & Wu, 2020).

A third limitation of this study is that only a Cronbach's Alpha has been used to measure the constructs' internal consistency. Thus, no factor analysis has been performed. This could be due to the statements that were used. For example, there was a thin line between the statements that were previously indicated as belonging to risks and the statements that were indicated to belong to trust. However, combining them with all other statements that were supposedly belonging to a latent variable would not make sense. Therefore, it was decided to use Cronbach's Alpha to measure the

reliability of the constructs. Thus, the relationships between the constructs have not been thoroughly tested as they would have been with factor analysis.

7.3 Academic implications

From the findings of this study, a few interesting directions for further research can be formulated. Future studies could, for example, investigate whether other parties have the perception of nuclear energy among adolescents on their agenda. This could be independent parties, but also other institutions or companies that do or do not play a part in the nuclear energy sector.

Since no significant effects of benefits have been found in this study, future research could investigate what benefits do significantly influence the attitude of people towards nuclear energy.

The goal of this study was to find out how higher-educated 18 to 25 year olds perceive nuclear energy, however, it might also be interesting to focus on 15 to 18 year olds, and give more education on nuclear energy. Additionally, to create more support, it could be investigated how Generation Z, in general, perceives this energy source, and not necessarily higher educated people. Additionally, the current research findings could be further validated in a larger population, so the findings are more likely to be generalized.

8. Conclusion

In light of the debates about energy transitions that currently take place in society, this study aims to gather insights into the perception of nuclear energy of higher-educated 18 to 25 year olds. By using data obtained from a questionnaire that was launched in the region Twente, the Netherlands, this study tried to explore the factors that eventually lead to the acceptance of nuclear energy. A model, derived from the theory of reasoned action (TRA), was composed and a theoretical framework was established to examine previous studies and identify the factors that are likely to affect the acceptance. The model elaborated on underlying factors, such as risk, benefits, and trust for attitude, and family/friends and (social) media for subjective norms.

Hypotheses related to acceptance of nuclear energy, trade-offs between energy sources, attitude towards nuclear energy, and socio-demographics have been verified, and the relationships between these variables have been discussed. This study shows that the environmental impact of nuclear energy, the risk of accidents, the risk of radiation, the costs of building, the reliability of nuclear energy, and the safety of nuclear energy have significant effects on the attitude of people towards nuclear energy. Area of living plays a significant role in the acceptance of nuclear energy; age and technical education in the trade-offs between energy sources.

Further, input for a communication strategy has been provided, which aims for a greater understanding of both the advantages and disadvantages of nuclear energy. Existing literature is confirmed by the current study, meaning that visual stimulation plays the greatest deal in targeting higher-educated 18 to 25 year olds. Additionally, companies could enhance its credibility by adding reliable sources, e.g., scientific articles, to its social media posts. This also means that it is not necessary to engage an independent company in the discussion to create a credible image.

Currently, knowledge of nuclear energy negatively influences the acceptance of nuclear energy. Therefore, companies operating in the nuclear energy sector should aim to improve the knowledge on nuclear energy, so higher-educated 18 to 25 year olds can create a well-established opinion on nuclear energy. Underexposed areas where knowledge could be improved are the risks that are accompanied by nuclear energy.

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Appendices

Appendix A: Feedback pre-test

One of the points that came back was that multiple questions were not asked with the right scale and had to be changed into a 5-point bipolar scale. Additionally, a numeric validation had to be added to the question where people were asked to fill in their age, instead of a text box. Another point that came back is that the randomization of some questions was incorrect. One of the questions referred to media "as indicated in the question before". However, there was no question about media asked in this random order before this question. Therefore, this changed by deleting "as indicated in the question before". Feedback about the formulation of some questions was given as well. "Ik voel me geïnformeerd over kernenergie" was changed into "Ik heb het gevoel dat ik voldoende geïnformeerd ben over kernenergie". The statement "Ik ben een voorstander om kernenergie op te nemen in de Nederlandse energiemix" was changed into "Ik ben een voorstander van het opnemen van kernenergie in de Nederlandse energiemix". Finally, some minor spelling mistakes were found, which were easily changed.

Appendix B: Statements that were asked in the questionnaire

Variable	Factor	Sub factor	Questions
Attitudes			
	Risk		
		Environmental impact	I think renewable energy sources are a better way to face climate change than nuclear power plants. I think it is impossible to achieve climate goals without nuclear energy for the Netherlands. I think that nuclear power plants are a suitable option for the Netherlands, because they take less space compared to renewable energy sources. I think that the impact of energy source on the environment is more important than energy security.
		Risk of accidents	I think that the chances of accidents in de Dutch nuclear sector is null. I think that the chances of accidents during transportation of nuclear waste is null. Due to risks, I would not want to live in area where a nuclear power plant is located. I think that accidents in the Dutch nuclear sector can have severe consequences.

		The chances of accidents is an important consideration regarding my opinion on nuclear energy.
	Risk of radiation	How I feel about the risks of radiation influences my opinion on nuclear energy. In case of an accident, I am afraid that I will be exposed to dangerous amounts of radiation. I think that radiation is a concerning aspect of nuclear energy. I trust the government to take measurements that protect me from radiation in case of an accident in the Dutch nuclear sector.
	Costs of building and safely decommissioning are high	I think that it takes too long to build a nuclear power plant in the Netherlands that it will help to achieve the climate goals of 2030. I think that the costs are too high to build a nuclear power plant in the Netherlands. I think that a nuclear power plant in the Netherlands is only allowed to build without subsidies. I think it is fair that no subsidies are allocated to the building of new nuclear power plants.
Benefits		
	Low-cost energy	I think that nuclear energy is a relatively cheap energy source for consumers (Lee, 2020). I think that nuclear energy is less subject to price fluctuations. I think that the high costs of building a nuclear power plant positively outweigh the low energy costs for consumers. Electricity costs for the consumer are an important consideration for me when forming an opinion on nuclear energy.
	Zero carbon emissions	I believe that a nuclear power plant in the Netherlands can make a major contribution to making the Netherlands climate neutral. I think that the sole use of renewable energy sources in the Netherlands does not yield enough climate benefits. I think that the addition of nuclear energy to the Dutch energy mix is an

		important solution for drastically reducing CO2 in the short term. To achieve climate goals, I believe that nuclear energy should become the primary energy source.
	Economic impact	I think that the construction of a nuclear power plant in the Netherlands will stimulate employment (Lee, 2020). I think that the low costs of raw materials to generate nuclear energy is an advantage of the application of nuclear energy in the Netherlands. I think that the dependence on expensive energy from abroad is reduced by the application of nuclear energy in the Netherlands. I think that a nuclear power plant can be a financial/economic boost for a region.
Trust		
	Reliability	I think that nuclear energy could be a reliable source of energy for the Netherlands. The energy security of nuclear energy in the Netherlands is my preference over renewable sources. I think it is a good idea to add nuclear energy to the Dutch energy mix to guarantee energy security.
	Safety	I think that a nuclear power plant in the Netherlands can operate safely. I trust that the Dutch government will ensure that the safety of a nuclear power plant is guaranteed (Hao, Guo, Tian, & Shao, 2019). If an accident occurs at a Dutch nuclear power plant, I am confident that security services can intervene quickly and appropriately (Xiao, Lui, & Feldman, 2017). I think that the supervision of the operation of a Dutch nuclear power plant can be sufficiently guaranteed to make me feel safe.
	General questions regarding trust	Through various channels is communicated about nuclear energy and its application. Please indicate the extent you consider the reliability of the information sources below: - Government, journalists, politicians, scientists,

		companies with an own stake, NGOs, family/friends, social media.
Social influence		
	Family/friends	The opinion of people in my direct environment about nuclear energy is important to me. I think that people in my direct environment have a positive opinion about nuclear energy. I think that people who are close to me see the advantages of nuclear energy over the disadvantages. I think that people in my environment see nuclear energy as an important factor in achieving climate goals. I think that people in my direct environment are concerned about the safety of nuclear energy in the Netherlands.
	(social) Media	How often do you follow the news through the following channels (Čábelková et al., 2021): - TV, newspapers, magazines, radio, news pages, discussions on internet forums/blogs, social media and discussion outside the Internet The media that I often use (as indicated in the previous question) are important for my perception of nuclear energy. I think the media I often use (as indicated in the previous question) inform me objectively about nuclear energy. In the media that I often use (as indicated in the previous question) I actively seek information about nuclear energy. I am interested in information about nuclear energy that I come across in the media that I use often (as indicated in the previous question).
Acceptance of nuclear energy		I am in favour of including nuclear energy in the Dutch energy mix (Xiao, Liu, & Feldman, 2017). I would demonstrate against the use of nuclear energy. The position of a party on nuclear energy played an important role for

		me during the Tweede Kamerverkiezingen in 2021. At the moment I am in favour of building a new nuclear power plant in the Netherlands. I think it is better to invest exclusively in renewable energy sources. I find the use of nuclear energy risky for society (Finucane, Alhakami, Slovic, & Johnson, 2000 as cited in Groot, Schweiger, & Schubert, 2020).
Trade-off of energy sources		If you have a free choice in energy sources, which source do you prefer? (energy sources adapted from Chung & Kim, 2018) - Nuclear power vs. Solar energy, onshore wind energy, offshore wind energy, hydropower, coal-fired power, biomass energy, geothermal energy, natural gas and shale gas
Attitude towards nuclear energy		What do you think about nuclear energy? - Good or bad? - Desirable or undesirable (Lee, 2020)? - Harmless or harmful? - Necessary or unnecessary - Dangerous or harmless (Lee, 2020)? - Positive or negative?
Socio-demographic factors		
	Gender	What is your gender?
	Age	How old are you?
	Education	What is your full-time occupation? What is your highest level of education attained? Are you following a technical education or have you followed a technical education? A career in the nuclear industry might appeal to me.
	Place of birth	Click on the region where you have lived most of your life.
	Knowledge	I feel that I am sufficiently informed about nuclear energy. I believe that nuclear technologies are separate from nuclear energy. Nuclear innovations are important for nuclear energy in the future.

I think it is good that radioactive radiation is used in nuclear medicine.
I believe that the profits from nuclear energy should be invested in nuclear science.
Do you know what nuclear fusion is (Čábelková et al., 2021)?
Has your knowledge about nuclear energy increased by completing this questionnaire?
Were there other factors not discussed that you think are important to form an opinion about nuclear energy?

Appendix C: Division of living area of the participants

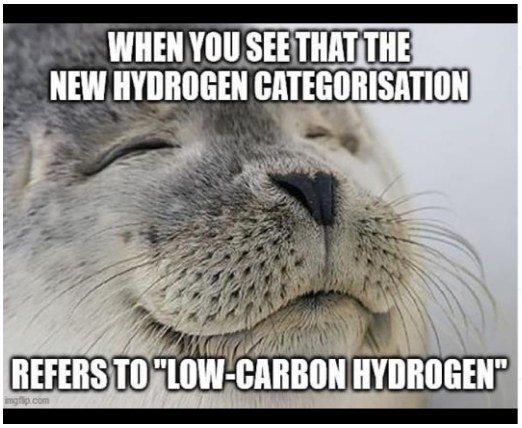
Region	Number of participants that lived here
Twente	64
Noord- en Oost-Gelderland	12
Utrecht	12
Friesland	11
Gelderland-Midden	11
IJsselland	8
Drenthe	6
Gelderland-Zuid	5
Kennemerland	5
Haaglanden	5
Groningen	4
Amsterdam-Amstelland	4
Rotterdam-Rijnmond	4
Midden- en West-Brabant	3
Brabant-Noord	3
Hollands Midden	2
Noord-Holland-Noord	2
Flevoland	2
Brabant-Zuidoost	2
Zuid-Holland-Zuid	1
Zuid-Limburg	
Zaanstreek-Waterland	

Gooi- en Vechtstreek

Limburg-Noord

Zeeland

Appendix D: Social media posts that were shown to the participants



foratom_org • Volgen
Brussels, Belgium

foratom_org #didyouknow that nuclear can produce large quantities of low-carbon hydrogen and help other sectors to decarbonise?
We discuss this aspect of #nuclear in our latest press release about the new EU #hydrogen and #sectorintegration strategies.
Go check it out (link in the bio)!

42 w.

10 vind-ik-leuks

9 JULI 2020

Een opmerking toevoegen... Plaatsen

greenpeace • Volgen

greenpeace Big brands like @cocacola @nestle and @pepsico want you to believe they are taking effective steps to cut down plastic pollution.

But they are not only polluting our planet with their single-use plastic packaging but also working hand in hand with the fossil fuel industry to keep plastic production afloat.

If big brands like these don't ditch their throwaway plastics then plastic production could double in the next 10-15 years and triple by 2050 😫

Tell them to stop fueling climate change and #breakfreefromplastic once and for all.

154.959 vind-ik-leuks

11 APRIL

Een opmerking toevoegen... Plaatsen

Urenco Nederland
17 oktober 2019 ·

In de categorie wist je dat...

Bepaalde voedingsmiddelen bestraald worden, waardoor ze minder snel bederven?

Deze radioactieve doorstraling (irradiatie of ionisatie) doodt bacteriën en vermindert de kans op voedselvergiftiging, zonder invloed te hebben op smaak, geur, textuur of uitzicht.

En natuurlijk blijft er niets van de radioactiviteit aan de voeding hangen - het is volkomen veilig!

Bron: Nucleair Forum

25 1 opmerking 6 keer gedeeld

Leuk Opmerking plaatsen Delen

Urenco USA
7.808 volgers
1 mnd ·

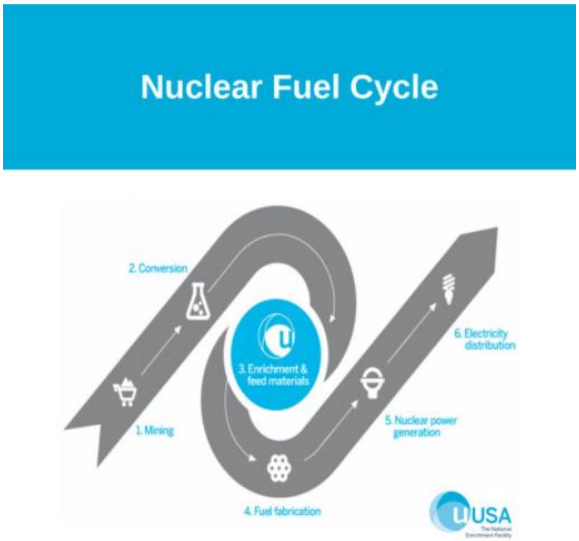
+ Volgen

The nuclear fuel supply chain enables the generation of reliable, low carbon electricity for consumers worldwide, and UUSA plays a key role in the cycle.

After uranium ore (U3O8) is extracted and chemically converted into uranium hexafluoride (UF6) our enrichment process begins. By separating UF6 gas into U235 and U238, we are able to play our part in the nuclear fuel cycle.

Visit our website to learn more about how the enrichment process works: https://lnkd.in/gCscQQB

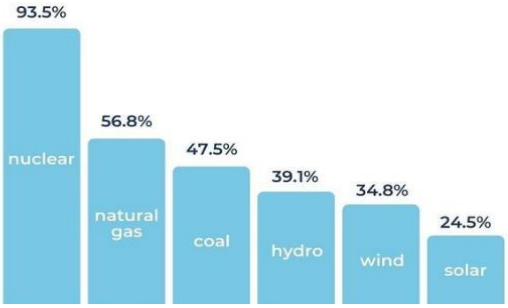
Vertaling weergeven



UUSA

Nuclear energy has the highest capacity factor of any other energy source.

SOURCE: U.S. ENERGY INFORMATION ADMINISTRATION



urencousa • Volgen

urencousa Nuclear power plants are capable of producing maximum power for over 90% of the year.

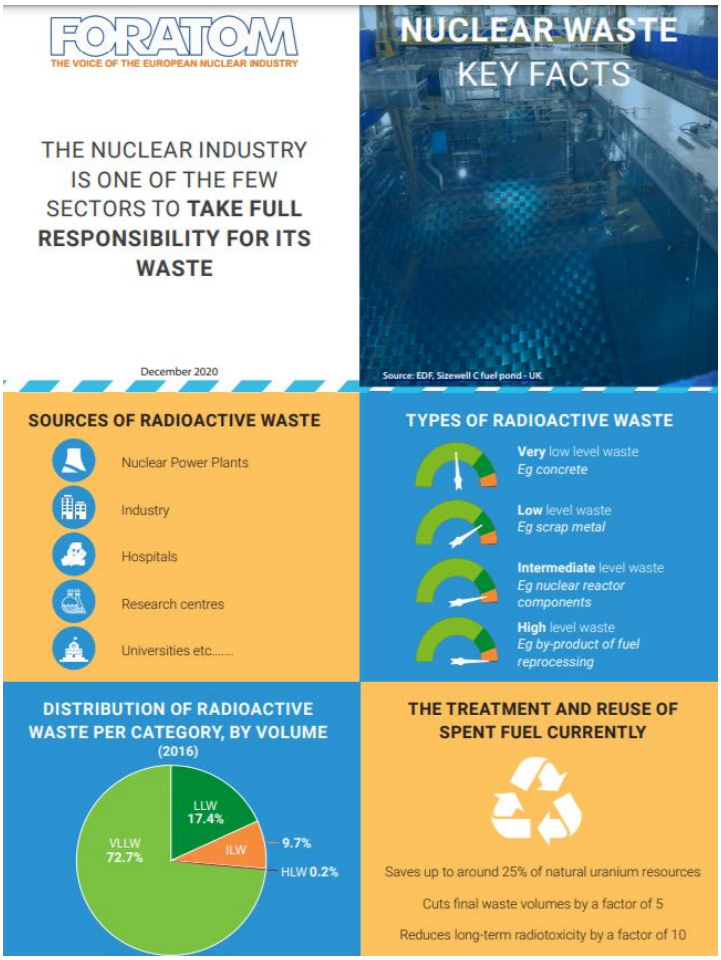
This means that one nuclear plant can generate the same amount of electricity onto a grid as three to four renewable plants.

4 w.

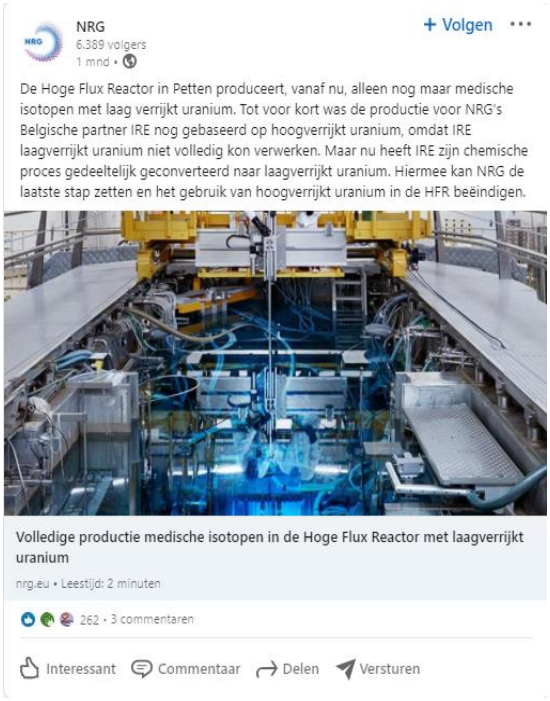
12 vind-ik-leuks

6 APRIL

Een opmerking toevoegen... Plaatsen


FORATOM
THE VOICE OF THE EUROPEAN NUCLEAR INDUSTRY
THE NUCLEAR INDUSTRY IS ONE OF THE FEW SECTORS TO TAKE FULL RESPONSIBILITY FOR ITS WASTE
December 2020
NUCLEAR WASTE
KEY FACTS
Source: EDF, Sizewell C fuel pond - UK
SOURCES OF RADIOACTIVE WASTE
Nuclear Power Plants
Industry
Hospitals
Research centres
Universities etc.....
TYPES OF RADIOACTIVE WASTE
Very low level waste
Eg concrete
Low level waste
Eg scrap metal
Intermediate level waste
Eg nuclear reactor components
High level waste
Eg by-product of fuel reprocessing
DISTRIBUTION OF RADIOACTIVE WASTE PER CATEGORY, BY VOLUME
(2016)
LLW 17.4%
ILW 9.7%
HLW 0.2%
VLLW 72.7%
THE TREATMENT AND REUSE OF SPENT FUEL CURRENTLY
Saves up to around 25% of natural uranium resources
Cuts final waste volumes by a factor of 5
Reduces long-term radiotoxicity by a factor of 10


Nucleair Nederland
31 maart ·
Mirjam Vossen, researcher, journalist en framing expert, schreef een opiniestuk over de obsessie van kranten met de veiligheid van kernenergie. Ze keek hiervoor kritisch naar de verschenen artikelen en nam de berichtgeving over tien jaar Fukushima onder de loep.
Het stuk verscheen gisteren in het Brabants Dagblad. Haar conclusie: het wordt de hoogste tijd om de risico's van kernenergie in perspectief te zien. De technologie is net zo veilig als wind- en zonne-energie. Dat zijn de feiten. Laten we deze vooropstellen, om vervolgens te discussiëren over het nut en de haalbaarheid van een kerncentrale in Brabant.
https://www.bd.nl/.../vertel-eerst-dat-kernenergie.../
BD.NL
Vertel eerst dat kernenergie veilig is
Blijf altijd op de hoogte van het laatste nieuws via de snelste en leu...
8
6 keer gedeeld
Leuk
Opmerking plaatsen
Delen


NRG
6.389 volgers
1 mnd ·
+ Volgen
De Hoge Flux Reactor in Petten produceert, vanaf nu, alleen nog maar medische isotopen met laag verrijkt uranium. Tot voor kort was de productie voor NRG's Belgische partner IRE nog gebaseerd op hoogverrijkt uranium, omdat IRE laagverrijkt uranium niet volledig kon verwerken. Maar nu heeft IRE zijn chemische proces gedeeltelijk geconverteerd naar laagverrijkt uranium. Hiermee kan NRG de laatste stap zetten en het gebruik van hoogverrijkt uranium in de HFR beëindigen.
Volledige productie medische isotopen in de Hoge Flux Reactor met laagverrijkt uranium
nrg.eu • Leestijd: 2 minuten
262 · 3 commentaren
Interessant
Commentaar
Delen
Versturen


Vattenfall
129.590 volgers
1 mnd ·
+ Volgen
De voorbereidingen voor Vattenfalls Windpark Hollandse Kust Zuid zijn in volle gang. Het eerste subsidievrije en het grootste windpark op zee ter wereld maakt als eerste gebruik van een nieuwe serie windturbines: de Siemens Gamesa Direct Drive 11 MW. Hiermee krijgt Hollandse Kust Zuid ook de grootste turbines die ooit op deze schaal zijn geïnstalleerd. Door het grotere rotoroppervlak leveren de 140 turbines meer groene stroom, zelfs bij lagere windsnelheden. Op dit moment is producent Siemens Gamesa Digital Ventures Lab volop bezig met het testen van een prototype.
Lees meer over de ontwikkeling van deze windturbines voor het grootste windpark op zee ter wereld: https://bit.ly/3slKxwb
#Fossielvrijleven #HollandseKustZuid #Vattenfall #Windenergie
618 · 12 commentaren
Interessant
Commentaar
Delen
Versturen

Greenpeace NL @GreenpeaceNL · 30 apr.

Gletsjers smelten steeds sneller, maar het is moeilijk te zien hoezeer ze daardoor veranderen. Deze visualisaties laten zien hoe groot deze verandering werkelijk is:

Visualised: glaciers then and now

Explore an interactive database that reveals how the climate crisis is reshaping glaciers around the world

theguardian.com

2 6 6

Atoom Alliantie
50 volgers
6 mnd •

+ Volgen

Mooi nieuws uit Engeland. De Britse overheid verwacht een investering van 180 miljoen pond te gaan doen in nucleaire innovatie. https://lnkd.in/dr_ASfK

Fuelling nuclear innovation in the UK

powerengineeringint.com • Leestijd: 5 minuten

2

Urenco Nederland
29 januari ·

Yessss! We hebben weer 2 kansen om je wereld te verrijken bij ons

Is mechanisch onderhoud van installaties en gebouwen jouw vakgebied en ben je toe aan nieuwe energie? Bekijk dan de vacature voor Technician in het team van Maintenance Mechanical.

Of heb je een VAPRO B/MBO 3 in technische richting achtergrond en zie jij jezelf wel bijdragen aan het chemisch reinigen van compressoren en kleine vacuümdelen.

#datgeeftenergie #vacatures #technician #maintenance #operator #techniek #almelo #twente

Vacature Technician MM

Operator D&O

19 35 keer gedeeld

Leuk Opmerking plaatsen Delen

Eneco
43.273 volgers
3 w •

+ Volgen

Collega Dennis Spelt is Monteur Service en Onderhoud. Na 20 jaar Eneco zit hij nog steeds op de juiste plek. Het allerleukste aan zijn baan vindt hij de veelzijdigheid en het klantencontact. Benieuwd naar het hele verhaal van Dennis? Bekijk zijn blog.

Wil jij ook werken aan een duurzame toekomst en tegelijkertijd een afwisselende baan? Dan is dit dé baan voor jou. Dennis zoekt collega Service en Onderhoud Monteurs in regio Utrecht en Den Haag: https://bit.ly/3dRFjlK

#werkenbijeneco #onzeverhalen #werkenindetechiek #serviceenonderhoud #vacature

Dennis: Een baan waarbij iedere dag iets nieuws met zich meebrengt

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33

Interessant Commentaar Delen Versturen

Appendix E: Rules of the focus group

- Participation is voluntary;
- If you do not feel comfortable about a topic, it's all right to abstain;
- There are not right or wrong answers;
- Please respect other opinions;
- Try to stay on the topic;
- Do not discuss the content of discussion outside the group.

Appendix F: Outcomes of survey that were discussed during the focus group

Een carrière in de nucleaire industrie zou mij kunnen aanspreken.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Ja	26	21,7	22,2	22,2
	Neutraal	29	24,2	24,8	47,0
	Nee	62	51,7	53,0	100,0
	Total	117	97,5	100,0	
Missing	System	3	2,5		
Total		120	100,0		

Geef aan in hoeverre jij het eens bent met de volgende stellingen. - De elektriciteitskosten voor de consument zijn voor mij een belangrijke afweging bij het vormen van een mening over kernenergie.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Helemaal mee eens	7	5,8	6,0	6,0
	Eens	30	25,0	25,6	31,6
	Neutraal	27	22,5	23,1	54,7
	Oneens	46	38,3	39,3	94,0
	Helemaal oneens	7	5,8	6,0	100,0
	Total	117	97,5	100,0	
Missing	System	3	2,5		
Total		120	100,0		

Geef aan in hoeverre jij het eens bent met de volgende stellingen. - Nucleaire innovaties zijn belangrijk voor kernenergie in de toekomst.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Helemaal mee eens	39	32,5	33,3	33,3
	Eens	44	36,7	37,6	70,9
	Neutraal	29	24,2	24,8	95,7
	Oneens	5	4,2	4,3	100,0
	Total	117	97,5	100,0	
Missing	System	3	2,5		
Total		120	100,0		

Via diverse kanalen wordt er gecommuniceerd over kernenergie en de toepassing daarvan. Geef bij onderstaande informatiebronnen aan in hoeverre jij de informatie die zij geven betrouwbaar vindt. - Wetenschappers zijn een betrouwbare informatiebron omtrent kernenergie.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Helemaal mee eens	67	55,8	57,3	57,3
	Eens	46	38,3	39,3	96,6
	Neutraal	4	3,3	3,4	100,0
	Total	117	97,5	100,0	
Missing	System	3	2,5		
Total		120	100,0		

Via diverse kanalen wordt er gecommuniceerd over kernenergie en de toepassing daarvan. Geef bij onderstaande informatiebronnen aan in hoeverre jij de informatie die zij geven betrouwbaar vindt. - Bedrijven die een eigenbelang hebben zijn een betrouwbare informatiebron omtrent kernenergie.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Helemaal mee eens	1	,8	,9	,9
	Eens	4	3,3	3,4	4,3
	Neutraal	19	15,8	16,2	20,5
	Oneens	64	53,3	54,7	75,2
	Helemaal oneens	29	24,2	24,8	100,0
	Total	117	97,5	100,0	
Missing	System	3	2,5		
Total		120	100,0		

Via diverse kanalen wordt er gecommuniceerd over kernenergie en de toepassing daarvan. Geef bij onderstaande informatiebronnen aan in hoeverre jij de informatie die zij geven betrouwbaar vindt. - Sociale media zijn een betrouwbare informatiebron omtrent kernenergie.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Eens	7	5,8	6,0	6,0
	Neutraal	23	19,2	19,7	25,6
	Oneens	43	35,8	36,8	62,4
	Helemaal oneens	44	36,7	37,6	100,0
	Total	117	97,5	100,0	
Missing	System	3	2,5		
Total		120	100,0		

Als je een vrije keuze hebt in energiebronnen, geef dan aan hoe je staat in de afweging tussen onderstaande energiebronnen. - Kernenergie:Windenergie op zee

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	8	6,7	7,0	7,0
	2	19	15,8	16,7	23,7
	3	20	16,7	17,5	41,2
	4	24	20,0	21,1	62,3
	5	43	35,8	37,7	100,0
	Total	114	95,0	100,0	
Missing	System	6	5,0		
Total		120	100,0		

Als je een vrije keuze hebt in energiebronnen, geef dan aan hoe je staat in de afweging tussen onderstaande energiebronnen. - Kernenergie:Windenergie op zee

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	8	6,7	7,0	7,0
	2	19	15,8	16,7	23,7
	3	20	16,7	17,5	41,2
	4	24	20,0	21,1	62,3
	5	43	35,8	37,7	100,0
	Total	114	95,0	100,0	
Missing	System	6	5,0		
Total		120	100,0		

Appendix G: Transcription of the focus groups

Focus group 1

Participant 1: Participant 1
Participant 2: Participant 2
Participant 3: Participant 3
Moderator: We are going to start with some general information about the survey. I analysed the data of 148 participants. 52% were male, 48% were female. 93 participants were between 18 and 25 years old and that is also the target group of this study. 56% is a student and 67% is higher educated.
The first thing that was outstanding was that only 24% wants a career in the nuclear sector. 22% was neutral about this, but 52% did not want to pursue a career in the nuclear industry at all. That is the majority. What are your thoughts about that? What could be a reason that someone does not want to work in the nuclear sector?
Participant 2: This could also be because people might associate it with the engineering side and there are not many engineers.
Participant 3: Yeah. That would be my explanation as well. Maybe 5% of the population is an engineer…
Participant 2: Yeah
Participant 3: So, 24% is maybe even quite high. In my opinion. I said that I did not want to work in this sector, because I do not want to do this type of work, so I think a lot of other people agreed with that as well.
Moderator: participant 1, do you have any thoughts on this?
Participant 1: Yeah, I agree with them. They said what I wanted to say.
Moderator: So it is not just because it is about nuclear?
Participant 3: no, not necessarily.
Moderator: Okay, and if you think about something like the nuclear medicine sector?
Participant 2: I do not think that that is something that people will immediately associate with this question. I think most people just think about nuclear power plants.
Participant 3: Yeah.
Participant 1: And in the medical sector, you also have very different… you can do things with cancer but you can also do things with… making pictures. I don't know what it is called in English. There are different sectors.
Moderator: So, it is more about how the question is presented and that there are not a lot of engineers.
Participant 3: Yeah. Something like that. I just think that there are not a lot of people with a degree that can do this work.
Moderator: Okay. The next thing that was outstanding for me was that 44% do not care about electricity costs. They don't consider it at all. Only 42% does. What could a possible explanation for this be?
Participant 1: Maybe it is more important for them to have green energy.
Participant 2: So you would exclude nuclear energy from green energy?
Participant 1: No…
Participant 3: No, […] means that people care more about green energy than costs. Right?
Participant 1: Yeah.
Participant 2: Okay, yeah.
Participant 3: I think this is also because of your audience. Because 18 to 25 years old, they don't pay for electricity bills. In my last house, I had to care about it and I really made sure we got the best deal that there was and we were really tight about the electricity costs because it is expensive. So, I think this shows that your audience is relatively incorrect.
Participant 1: Yeah, I also think because the audience is very young, they want green energy. I think that is also important.
Participant 2: They choose presence over whatever the costs are.

Participant 1: Yeah. We want to live on the earth, no matter what the costs are.
Participant 3: I think that a lot of other people think that as well.
Moderator: Okay. Another question is that 71% thinks that nuclear innovations are important for the nuclear future. But do you think that they specifically agreed on nuclear innovations or just innovations in general? And do you have any ideas about nuclear innovations?
Participant 2: I would think of the development of molten salt reactors or thorium reactors. Those are more safer than conventional nuclear reactors. I don't know if you intended to include nuclear fusion as well.
Moderator: Yes, that is also included in this question.
Participant 2: I think that there could be a fair amount of interest in any innovation is a good innovation.
Moderator: What do you think?
Participant 1: Yes, I agree.
Participant 3: Yeah, I fully agree as well. This was going to be my answer. In general, any innovation, by its definition, is a good one. It's progress. If you don't think it is important, than it is kind of weird in my eyes. Innovation is always good.
Moderator: There was also a question about the reliability of different energy sources. 97% thinks that scientists are reliable. 4% thinks that companies with an own stake are reliable and 6% thinks that (social) media is a reliable source. But, 43% also indicates that media is very important for them to create an image about nuclear energy. So, what do you think about these numbers?
Participant 2: Well, people trust scientists.
Moderator: Yes, that for sure. But the other numbers are very low. What are possible explanations for that?
Participant 2: It does not surprise me. I'm not surprised that people don't trust companies because …. If companies show the bad side, it is bad for them and their profits.
Moderator: And what if a company with an own stake shares a message, e.g., a scientific paper? What do you think about that? Do you trust that information?
Participant 2: I trust that, because articles have to be peer-reviewed before it is accepted. So, if a paper is accepted, it is approved. You can do marketing through scientific papers in that sense. I think then it depends from which channel the information comes from.
Participant 3: I think that scientists are over-reliable. It's very dangerous. Scientists in general do the right thing, but I think that when we look at the data from, for example, social sciences, a lot of the papers have been proven to be incorrect, even though they were peer-reviewed. I think it is really dangerous that people trust scientists that much. I think that the systems are good, but this number is not really representative. The same with companies. If a company has a stake in something, they are going to do their best at least in sense, because otherwise you'll lose your profits. If you don't do good business you're going to crash. I think that that number is too low really. It shouldn't be the scientist level, but I think it should at least be 40% or something like that.
Participant 2: That is a good point.
Participant 3: And I agree with the social media aspect. I'm not sure about the rest really.
Participant 2: With media probably also if you look at the impact of what … has, because even unbiased reporting could be more damaging in some sense. If you look at the accidents of nuclear energy, they are all zoomed in. In the coal industry, a lot more accidents happen but there it has become normal so they don't report about it that often anymore. It is neglectable what happens in the coal industry. In that sense, it is harmful.
Participant 3: I agree with that as well. It penders to be on the emotional side instead of the logical side. Basically what you said.
Participant 2: Yeah.
Moderator: Okay. And what do you think about that most people don't trust media but still use it to form an image? What are your thoughts about that?

Participant 1: Media is about a lot of things. And they do a lot of like, creating an image about things. And I think that people are still affected by what the media says, even if they don't want to be affected and are still critical. But in the end, they still see it so it affects their opinion on nuclear energy.
Moderator: Do you have something to add?
Participant 3: I think that is quite right yeah. I think that everyone has fallen in the trap once of looking at a Facebook article and thinking it's real and then it's not.
Moderator: Okay. So, there was also a question where you could give your preference for different energy sources. Two things were outstanding: hydro energy (60%) and wind energy at sea (56%). What are your thoughts about that?
Participant 3: I think the latter options are considered risk-averse. And I think that that exactly shows that people are afraid of nuclear energy. Because if you look at hydro energy or at wind energy, the chances that something goes wrong drastically at all of a sudden, is very low. But it also shows the perception of how much energy you can create from a nuclear power plant in comparison to wind energy especially, shows that maybe it's not realistic to see: hey we go all in for wind.
Participant 2: It might also show that people think that nuclear has more risks, but the consequences of wind and hydro could be even more severe than nuclear accidents. If you look at China, there are a few dams that are just right upstream cities with more than two million living in it, so if the dam breaks, which is very possible, then you have a huge disaster. And the other thing is what you said (participant 3), how people perceive the risk. I'm actually surprised that hydro has such a high percentage because it is obviously not without risks.
Participant 1: But there are also risks with wind. For example, birds flying in the wind blades.
Participant 2: Yeah that is true.
Participant 3: And hydro is also more efficient and less dependent than wind. Maybe some people know that, but I don't know.
Moderator: And did you perceive this question as actually choosing between the options or as combining it together for a total energy mix? So that people might have read this question as: okay, I want nuclear energy but I also want hydro energy.
Participant 2: I think the question was posed as where you had to choose between them. As I read it, you have to choose. I interpreted as making a decision between the two of them.
Moderator: Okay. Do you have anything to add about the outcomes of the data?
Participant 3: Yeah, this just surprises me. That's the only thing.

Moderator: Then we move on to the next part and that's about communication. I selected some social media posts and I like you to evaluate them on these points: content, style, engagement, what do you like, what don't you like, and what are the thoughts about the medium that is used. So, these are the first messages. You don't have to evaluate each message separately, but more in general.
Participant 3: All right.
Moderator: So, what do you think about the types of messages that are used here?
Participant 1: Do we have to read the captions as well?
Moderator: Yes, because it is about the content.
Participant 2: I like the one from Greenpeace.
Participant 3: I like that one as well.
Participant 2: I think it is an effective way of making a point. The top one is euh… it is pretty cringy.
Participant 3: Yeah!!
Participant 2: Like somebody was told to make a meme but that never works out. So I think that they just should have left that behind and post something else. It's trying to be hip but it misses the mark. Quite far.
Participant 3: Memes are something which you should always avoid.
Moderator: So, no usage of memes?
Participant 3: Exactly. Never.
Participant 2: And the right one.
Moderator: Can you read it from there?

Participant 1: The right one is about… radiating the food?
Moderator: Yes.
Participant 2: OOH…! They are showing that there is mould growing on it after a while. Ah, I see.
Participant 3: I kinda like it.
Participant 2: I like the message, but I think the way it is presented is not as clean as the Greenpeace one. Clean in style. The Greenpeace one is very clear and nicely presented. This one has a nice message but it is pretty hard to decipher in that way. You want to be able to just glimpse at it and know what it is about. Especially if it is at a social media platform like this. Because I guess this is Facebook, right?
Participant 1: Yes.
Moderator: Based on this, do you think that the message should become clear from the picture, and then if you want some more information that you can read it?
Participant 3: Yes.
Moderator: Is that what you need?
Participant 2: Well that's what you have to deal with if you present it on these platforms. If you are on Instagram, people focus on the images.
Participant 1: Yeah. On Facebook I think you can have more text.
Participant 2: But a message from the image is still necessary.
Moderator: So, for example, if you're scrolling on Facebook, and then you see the message from Greenpeace, would you then stop and read it or would you skip it?
Participant 2: I would stop to look at it.
Moderator: So then you think it is attractive. I assume that you would skip the meme?
Participant 3: NO, NO!
Participant 2: Sometimes I wouldn't, just because it's so bad.
Participant 3: Yeah exactly!!
Participant 2: I would be reading the captions to see if anyone is roasting them.
Participant 3: But it wouldn't to them any good. It would be just funny.
Moderator: And if you look at the posts with the strawberries, what would you do then?
Participant 1: Well, I'm never on Facebook, but if I would be on Facebook… I don't know. I think I would stop, because you know, I see strawberries.
Moderator: With mould.
Participant 1: Yeah, haha!
Participant 2: I think that it needs something gripping in that. What they could do is that they present a very short message there and add a link to their website where the whole message is visible. So that you're willing to click on it.
Moderator: Okay. Then we move on to the next slide. That's a short movie.
Participant 3: Oh. Popcorn time.
movie plays
Moderator: Okay, what are your thoughts about a movie like this?
Participant 3: The film is pretty good.
Participant 2: Yeah.
Participant 1: Yeah.
Participant 3: There is one thing that I really didn't like and that is that they used a missile.
Participant 2: Yeah, hahaha!
Participant 3: That's not very smart to add a missile in your video when you're talking about nuclear energy.
Participant 2: *keeps laughing*
Participant 3: I was like: oh… I thought they were going to talk about the bad side of nuclear energy, because there are bad sides but they didn't. At that point, with the rocket, I thought they were going to talk about warfare or something.
Participant 2: Or maybe they want warfare, hahaha.
Participant 3: Oh yeah, maybe.. haha!

Moderator: If you would see this movie on, for example, Instagram, would you then keep watching it? Because you only have 10 seconds or you have the Reels you know
Participant 2: I think I would stay and watch it. Because the film is good.
Moderator: And the style, what do you think about the graphics?
Participant 1: I liked it, but I only did not like the black dots in the screen.
Participant 3: *nods agreeingly*
Participant 1: It makes it look a little old. And I don't think the video is that old. But, I think it is a very nice video.
Participant 3: I think that there could have been more thinking on the design. I think that if you're doing this you need to go more modern. Because as you said, it really gives you the feeling of the eighties. And then you also think back of the really bad nuclear reactors where things went wrong. It should be more cleaner and more modern. I think that is a good point actually.
Participant 2: I liked the information and the way it was presented.
Participant 1 and participant 3: Yes, that was good.
Participant 1: It was short and understandable and pleasant to hear.
Moderator: Do you often watch videos on social media?
All: Yes.
Moderator: Okay. So, the next one are more about the use of infographics as you can see. I don't know if you can read the captions. What do you think about the use of infographics? How would you evaluate that? Would you read them, would you skip them?
Participant 1: Well, I actually always look at things with nuclear fuel in it, because I think that is interesting. So I always stop already about things that has that in it. I don't think my answer is for all people.
Moderator: And in general, if you see infographics about other topics? How do you handle that?
Participant 1: Not nuclear things? I mostly skip them.
Moderator: Okay, that is also a good answer. And you?
Participant 2: Depends on how clear it is presented. If you use an infographic very effectively and it's very cleanly and very clear, then it can be very effective. The one on the left.. maybe it's because I'm sitting far away but…
Participant 3: no, that's not it haha!
Participant 2: it's not immediately clear what it shows. If you use a bar chart (middle one), it's pretty much always clear what it is about.
Participant 1: When I think about it, I don't see a lot of graphs when I scroll through my social media. So, actually I don't know if I would skip them. I don't see them often.
Moderator: Would you like to see them more often?
Participant 1: About certain topics, yeah. But maybe I don't follow the informational groups that post such things.
Participant 3: I don't see them either. I think the use of colours is really bad. If you want to grip people with a chart, then you need much more work to make it visually interesting for people. For example, the histogram.. it's boring. No one is going to look at that. What you need to do is that… you could even be a bit mean to the coal and gas sectors. Make those black. Make the nuclear one… well, green is not the right colour, but make it stand out and really interesting. Because if you look at these things, it almost makes me fall asleep. It looks like a boring presentation that I get at 9 in the morning.
Participant 1: And the right one is with colours, but I don't think these are the right colours.
Participant 3: Yeah you're right, they need to be… different, haha.
Participant 1: This is just not great.
Participant 3: Start looking at companies who do it really well, such as Greenpeace, clearly. Or Coca Cola, they really sell their selves. No one cares about energy. It's boring. But if you make interesting graphs or interesting infographics, you're going to get people hooked regardless.
Moderator: Okay, do you have anything to add?
Participant 2: No, I agree with them.

Moderator: Okay, then we are going to move on to the next part. What you see are again textual pictures, but now with longer texts.
Participant 1: This is Facebook again, right?
Moderator: Euh, yeah..
Participant 3: Yes, it is Facebook
Moderator: The left one is Facebook, the other two are LinkedIn.
all participants nod
Participant 2: Well, the right one immediately grasps my attention because of the size of it (wind blade).
Participant 3: Yeah, that's cool man.
Participant 2: It's a very effective use of that picture. Although I would say that the picture in the middle one is also interesting. With the glow and all of the machinery. That's also very good. The one on the left is very… that does not really stand out.
Participant 1: Yeah I think it looks like just a factory of coal or something. It isn't, but it looks like it.
Moderator: And how likely are you going to click on those links?
Participant 3: I would click on the right one, I think it looks very cool. And maybe the middle one.
Participant 2: I would click on all of them, haha.
Moderator: So that there is more text above does not make any difference to you?
Participant 1: No, I first look at the picture.
Participant 2: Especially if it is formatted like this, in an article. Then I look at the picture first, then the title and then… I would most likely click on the article. I would not even read the text above.
Participant 1: Yeah, that is also true. That's what I would do as well.
Moderator: You as well?
Participant 3: Yeah, I think so yeah. And I would read a tiny bit of text quickly just to see what it's really about and… that's it. Just two sentences.
Participant 2: I'm already interested in nuclear energy production so if I see an article I almost always read the article.
Participant 3: Makes sense, yeah.
Moderator: You already kind of answered it, but the next slide is about articles with a short text above.
Participant 2: The one on the right is very vague. Very hard to see what it is about. The one on the left is very clever. I think that it is an interesting picture, haha. And the one in the middle…
Participant 1: Yeah, it says like "Chernobyl" and all the yellow and black colours. you think it is about how bad nuclear energy is, but then it says "kernenergie is een logische stap" (nuclear energy is a logical step).
Participant 3: hahahaha
Participant 2: hahaha, oh yeah, did not even see the text beneath it.
Participant 1: I'm confused by that.
Participant 2: That is a terrible picture.
Participant 1: Yeah!!
Participant 2: This is so stupid.. the choice is really interesting…
Participant 2: It's like someone wanted to say: Nuclear energy is great, do you remember that disaster?
all laughing
Moderator: Okay, on which links would you click then?
Participant 1: I think I would click on the middle one, since it is so … tegenstrijdig.
Moderator: paradoxical.
Participant 1: Yeah. And… I don't really care about the U.K., so I would not click on that one. Maybe on the right… I don't know. The picture is not that appealing.
Participant 2: The glaciers are visualized, that looks interesting. But only after I've read the title. The picture is so unclear. It might have been trees.
Participant 3: I felt that was what it was at first. I would click on the left one and the right one. The right one only out of curiosity and the left one… well I like the U.K. haha.

Moderator: Okay. Then I have the final slide. This is about vacancies. You have to read them carefully and then I'd like to have your opinion on them.
Participant 2: I think the one on the left is good. They involve employees at the company as well, make it a bit more personal.
Moderator: Yeah, that's exactly the point that I want you to get from this. Whether you like the personal approach or not.
Participant 2: The one on the left looks like everyone can work for this company and the one on the right, they ask specifically for a type of person. The one on the left could also be something more general. Any person that is interested in working at Eneco. If someone is interested they could read and see what they do.
Moderator: And if a company uses a personal approach like Eneco at a vacancy, do you prefer that approach?
Participant 2: Don't know, because if you're looking for a specific someone for a specific job then the post of Urenco is already very clear. The one on the left is more like "hey I did not think about this job" and the one on the right is probably better when you're specifically looking for someone.
Participant 3: The right one immediately turned me off, because I'm not MBO 3 and technical whatever. That's not me so I'm not interested anymore. Like you say.
Moderator: Okay, but forget about the MBO 3. Imagine they are asking for someone like you. Or would you combine them? So, the personal story of Eneco together with the message of Urenco?
Participant 3: I don't think that that could be bad. What do you guys think?
Participant 2: You could very easily combine them.
Moderator: And would you like that?
Participant 2: Yeah, I would like that. Because then you can rephrase it to "would you like to work with, Dennis" in this case. Most of the time you're not going to post someone who hates their job.
Participant 3: yeah, hahaha!
Participant 2: Someone might think: Dennis looks like a nice guy, nice to work with. He describes a good environment, I'm interested. I think it would be very good to add that.
Moderator: Okay, and what do you think of the pictures that are used?
Participant 1: I don't think this is the most charming picture of Dennis. I don't know how you guys feel about that?
Participant 2: He looks very annoyed and forced to be on the picture.
Participant 1: Yeah, like "I'll smile, but…"
Participant 3: What I like about the right one is that they actually have the person in the field where they are working in. Dennis is standing against a green screen or something. I'd rather have him sitting by one of those Eneco boxes. Makes it more real. This could have been some random guy they picked up of the street.
Participant 1: Yeah, exactly.
Moderator: Okay. That was it. Do you have any additional remarks or things that you want to say about this research? Or comments about the things that we saw.
Participant 3: Yeah, I have one thing. Try to make it sexy. Nuclear energy is not something that is likeable, it's not exciting to see a nuclear reactor. And then you see those fusion reactors, you know, those donut things, they are really cool! That makes you excited because it looks cool and it's tacky. Focus more on that I would say. 20% less accidents or something is less interesting I think.
Participant 2: when you can see things from the inside, that's really cool!
Participant 3: Yeah, exactly.
Participant 2: It's often very clinical and they don't make it exciting.
Moderator: So more visual stimulation I think? Pictures of how things look like instead of texts describing it.
Participant 3: Yeah, exactly.
Participant 2: Yeah, because if you're that interested in it, then you will find a text and the information that you want. But you need the excitement, a trigger, first.

Focus group 2

Focus group 1:

Participant 1: Participant 1
Participant 2: Participant 2
Participant 3: Participant 3
Moderator: We are going to start with some general information about the survey. I analysed the data of 148 participants. 52% were male, 48% were female. 93 participants were between 18 and 25 years old and that is also the target group of this study. 56% is a student and 67% is higher educated.
The first thing that was outstanding was that only 24% wants a career in the nuclear sector. 22% was neutral about this, but 52% did not want to pursue a career in the nuclear industry at all. That is the majority. What are your thoughts about that? What could be a reason that someone does not want to work in the nuclear sector?
Participant 2: This could also be because people might associate it with the engineering side and there are not many engineers.
Participant 3: Yeah. That would be my explanation as well. Maybe 5% of the population is an engineer…
Participant 2: Yeah
Participant 3: So, 24% is maybe even quite high. In my opinion. I said that I did not want to work in this sector, because I do not want to do this type of work, so I think a lot of other people agreed with that as well.
Moderator: participant 1, do you have any thoughts on this?
Participant 1: Yeah, I agree with them. They said what I wanted to say.
Moderator: So it is not just because it is about nuclear?
Participant 3: no, not necessarily.
Moderator: Okay, and if you think about something like the nuclear medicine sector?
Participant 2: I do not think that that is something that people will immediately associate with this question. I think most people just think about nuclear power plants.
Participant 3: Yeah.
Participant 1: And in the medical sector, you also have very different… you can do things with cancer but you can also do things with… making pictures. I don't know what it is called in English. There are different sectors.
Moderator: So, it is more about how the question is presented and that there are not a lot of engineers.
Participant 3: Yeah. Something like that. I just think that there are not a lot of people with a degree that can do this work.
Moderator: Okay. The next thing that was outstanding for me was that 44% do not care about electricity costs. They don't consider it at all. Only 42% does. What could a possible explanation for this be?
Participant 1: Maybe it is more important for them to have green energy.
Participant 2: So you would exclude nuclear energy from green energy?
Participant 1: No…
Participant 3: No, […] means that people care more about green energy than costs. Right?
Participant 1: Yeah.
Participant 2: Okay, yeah.
Participant 3: I think this is also because of your audience. Because 18 to 25 years old, they don't pay for electricity bills. In my last house, I had to care about it and I really made sure we got the best deal that there was and we were really tight about the electricity costs because it is expensive. So, I think this shows that your audience is relatively incorrect.
Participant 1: Yeah, I also think because the audience is very young, they want green energy. I think that is also important.

Participant 2: They choose presence over whatever the costs are.
Participant 1: Yeah. We want to live on the earth, no matter what the costs are.
Participant 3: I think that a lot of other people think that as well.
Moderator: Okay. Another question is that 71% thinks that nuclear innovations are important for the nuclear future. But do you think that they specifically agreed on nuclear innovations or just innovations in general? And do you have any ideas about nuclear innovations?
Participant 2: I would think of the development of molten salt reactors or thorium reactors. Those are more safer than conventional nuclear reactors. I don't know if you intended to include nuclear fusion as well.
Moderator: Yes, that is also included in this question.
Participant 2: I think that there could be a fair amount of interest in any innovation is a good innovation.
Moderator: What do you think?
Participant 1: Yes, I agree.
Participant 3: Yeah, I fully agree as well. This was going to be my answer. In general, any innovation, by its definition, is a good one. It's progress. If you don't think it is important, than it is kind of weird in my eyes. Innovation is always good.
Moderator: There was also a question about the reliability of different energy sources. 97% thinks that scientists are reliable. 4% thinks that companies with an own stake are reliable and 6% thinks that (social) media is a reliable source. But, 43% also indicates that media is very important for them to create an image about nuclear energy. So, what do you think about these numbers?
Participant 2: Well, people trust scientists.
Moderator: Yes, that for sure. But the other numbers are very low. What are possible explanations for that?
Participant 2: It does not surprise me. I'm not surprised that people don't trust companies because …. If companies show the bad side, it is bad for them and their profits.
Moderator: And what if a company with an own stake shares a message, e.g., a scientific paper? What do you think about that? Do you trust that information?
Participant 2: I trust that, because articles have to be peer-reviewed before it is accepted. So, if a paper is accepted, it is approved. You can do marketing through scientific papers in that sense. I think then it depends from which channel the information comes from.
Participant 3: I think that scientists are over-reliable. It's very dangerous. Scientists in general do the right thing, but I think that when we look at the data from, for example, social sciences, a lot of the papers have been proven to be incorrect, even though they were peer-reviewed. I think it is really dangerous that people trust scientists that much. I think that the systems are good, but this number is not really representative. The same with companies. If a company has a stake in something, they are going to do their best at least in sense, because otherwise you'll lose your profits. If you don't do good business you're going to crash. I think that that number is too low really. It shouldn't be the scientist level, but I think it should at least be 40% or something like that.
Participant 2: That is a good point.
Participant 3: And I agree with the social media aspect. I'm not sure about the rest really.
Participant 2: With media probably also if you look at the impact of what … has, because even unbiased reporting could be more damaging in some sense. If you look at the accidents of nuclear energy, they are all zoomed in. In the coal industry, a lot more accidents happen but there it has become normal so they don't report about it that often anymore. It is neglectable what happens in the coal industry. In that sense, it is harmful.
Participant 3: I agree with that as well. It penders to be on the emotional side instead of the logical side. Basically what you said.
Participant 2: Yeah.
Moderator: Okay. And what do you think about that most people don't trust media but still use it to form an image? What are your thoughts about that?

Participant 1: Media is about a lot of things. And they do a lot of like, creating an image about things. And I think that people are still affected by what the media says, even if they don't want to be affected and are still critical. But in the end, they still see it so it affects their opinion on nuclear energy.
Moderator: Do you have something to add?
Participant 3: I think that is quite right yeah. I think that everyone has fallen in the trap once of looking at a Facebook article and thinking it's real and then it's not.
Moderator: Okay. So, there was also a question where you could give your preference for different energy sources. Two things were outstanding: hydro energy (60%) and wind energy at sea (56%). What are your thoughts about that?
Participant 3: I think the latter options are considered risk-averse. And I think that that exactly shows that people are afraid of nuclear energy. Because if you look at hydro energy or at wind energy, the chances that something goes wrong drastically at all of a sudden, is very low. But it also shows the perception of how much energy you can create from a nuclear power plant in comparison to wind energy especially, shows that maybe it's not realistic to see: hey we go all in for wind.
Participant 2: It might also show that people think that nuclear has more risks, but the consequences of wind and hydro could be even more severe than nuclear accidents. If you look at China, there are a few dams that are just right upstream cities with more than two million living in it, so if the dam breaks, which is very possible, then you have a huge disaster. And the other thing is what you said (participant 3), how people perceive the risk. I'm actually surprised that hydro has such a high percentage because it is obviously not without risks.
Participant 1: But there are also risks with wind. For example, birds flying in the wind blades.
Participant 2: Yeah that is true.
Participant 3: And hydro is also more efficient and less dependent than wind. Maybe some people know that, but I don't know.
Moderator: And did you perceive this question as actually choosing between the options or as combining it together for a total energy mix? So that people might have read this question as: okay, I want nuclear energy but I also want hydro energy.
Participant 2: I think the question was posed as where you had to choose between them. As I read it, you have to choose. I interpreted as making a decision between the two of them.
Moderator: Okay. Do you have anything to add about the outcomes of the data?
Participant 3: Yeah, this just surprises me. That's the only thing.

Moderator: Then we move on to the next part and that's about communication. I selected some social media posts and I like you to evaluate them on these points: content, style, engagement, what do you like, what don't you like, and what are the thoughts about the medium that is used. So, these are the first messages. You don't have to evaluate each message separately, but more in general.
Participant 3: All right.
Moderator: So, what do you think about the types of messages that are used here?
Participant 1: Do we have to read the captions as well?
Moderator: Yes, because it is about the content.
Participant 2: I like the one from Greenpeace.
Participant 3: I like that one as well.
Participant 2: I think it is an effective way of making a point. The top one is euh… it is pretty cringy.
Participant 3: Yeah!!
Participant 2: Like somebody was told to make a meme but that never works out. So I think that they just should have left that behind and post something else. It's trying to be hip but it misses the mark. Quite far.
Participant 3: Memes are something which you should always avoid.
Moderator: So, no usage of memes?
Participant 3: Exactly. Never.
Participant 2: And the right one.
Moderator: Can you read it from there?

Participant 1: The right one is about… radiating the food?
Moderator: Yes.
Participant 2: OOH…! They are showing that there is mould growing on it after a while. Ah, I see.
Participant 3: I kinda like it.
Participant 2: I like the message, but I think the way it is presented is not as clean as the Greenpeace one. Clean in style. The Greenpeace one is very clear and nicely presented. This one has a nice message but it is pretty hard to decipher in that way. You want to be able to just glimpse at it and know what it is about. Especially if it is at a social media platform like this. Because I guess this is Facebook, right?
Participant 1: Yes.
Moderator: Based on this, do you think that the message should become clear from the picture, and then if you want some more information that you can read it?
Participant 3: Yes.
Moderator: Is that what you need?
Participant 2: Well that's what you have to deal with if you present it on these platforms. If you are on Instagram, people focus on the images.
Participant 1: Yeah. On Facebook I think you can have more text.
Participant 2: But a message from the image is still necessary.
Moderator: So, for example, if you're scrolling on Facebook, and then you see the message from Greenpeace, would you then stop and read it or would you skip it?
Participant 2: I would stop to look at it.
Moderator: So then you think it is attractive. I assume that you would skip the meme?
Participant 3: NO, NO!
Participant 2: Sometimes I wouldn't, just because it's so bad.
Participant 3: Yeah exactly!!
Participant 2: I would be reading the captions to see if anyone is roasting them.
Participant 3: But it wouldn't to them any good. It would be just funny.
Moderator: And if you look at the posts with the strawberries, what would you do then?
Participant 1: Well, I'm never on Facebook, but if I would be on Facebook… I don't know. I think I would stop, because you know, I see strawberries.
Moderator: With mould.
Participant 1: Yeah, haha!
Participant 2: I think that it needs something gripping in that. What they could do is that they present a very short message there and add a link to their website where the whole message is visible. So that you're willing to click on it.
Moderator: Okay. Then we move on to the next slide. That's a short movie.
Participant 3: Oh. Popcorn time.
movie plays
Moderator: Okay, what are your thoughts about a movie like this?
Participant 3: The film is pretty good.
Participant 2: Yeah.
Participant 1: Yeah.
Participant 3: There is one thing that I really didn't like and that is that they used a missile.
Participant 2: Yeah, hahaha!
Participant 3: That's not very smart to add a missile in your video when you're talking about nuclear energy.
Participant 2: *keeps laughing*
Participant 3: I was like: oh… I thought they were going to talk about the bad side of nuclear energy, because there are bad sides but they didn't. At that point, with the rocket, I thought they were going to talk about warfare or something.
Participant 2: Or maybe they want warfare, hahaha.
Participant 3: Oh yeah, maybe.. haha!

Moderator: If you would see this movie on, for example, Instagram, would you then keep watching it? Because you only have 10 seconds or you have the Reels you know
Participant 2: I think I would stay and watch it. Because the film is good.
Moderator: And the style, what do you think about the graphics?
Participant 1: I liked it, but I only did not like the black dots in the screen.
Participant 3: *nods agreeingly*
Participant 1: It makes it look a little old. And I don't think the video is that old. But, I think it is a very nice video.
Participant 3: I think that there could have been more thinking on the design. I think that if you're doing this you need to go more modern. Because as you said, it really gives you the feeling of the eighties. And then you also think back of the really bad nuclear reactors where things went wrong. It should be more cleaner and more modern. I think that is a good point actually.
Participant 2: I liked the information and the way it was presented.
Participant 1 and participant 3: Yes, that was good.
Participant 1: It was short and understandable and pleasant to hear.
Moderator: Do you often watch videos on social media?
All: Yes.
Moderator: Okay. So, the next one are more about the use of infographics as you can see. I don't know if you can read the captions. What do you think about the use of infographics? How would you evaluate that? Would you read them, would you skip them?
Participant 1: Well, I actually always look at things with nuclear fuel in it, because I think that is interesting. So I always stop already about things that has that in it. I don't think my answer is for all people.
Moderator: And in general, if you see infographics about other topics? How do you handle that?
Participant 1: Not nuclear things? I mostly skip them.
Moderator: Okay, that is also a good answer. And you?
Participant 2: Depends on how clear it is presented. If you use an infographic very effectively and it's very cleanly and very clear, then it can be very effective. The one on the left.. maybe it's because I'm sitting far away but…
Participant 3: no, that's not it haha!
Participant 2: it's not immediately clear what it shows. If you use a bar chart (middle one), it's pretty much always clear what it is about.
Participant 1: When I think about it, I don't see a lot of graphs when I scroll through my social media. So, actually I don't know if I would skip them. I don't see them often.
Moderator: Would you like to see them more often?
Participant 1: About certain topics, yeah. But maybe I don't follow the informational groups that post such things.
Participant 3: I don't see them either. I think the use of colours is really bad. If you want to grip people with a chart, then you need much more work to make it visually interesting for people. For example, the histogram.. it's boring. No one is going to look at that. What you need to do is that… you could even be a bit mean to the coal and gas sectors. Make those black. Make the nuclear one… well, green is not the right colour, but make it stand out and really interesting. Because if you look at these things, it almost makes me fall asleep. It looks like a boring presentation that I get at 9 in the morning.
Participant 1: And the right one is with colours, but I don't think these are the right colours.
Participant 3: Yeah you're right, they need to be… different, haha.
Participant 1: This is just not great.
Participant 3: Start looking at companies who do it really well, such as Greenpeace, clearly. Or Coca Cola, they really sell their selves. No one cares about energy. It's boring. But if you make interesting graphs or interesting infographics, you're going to get people hooked regardless.
Moderator: Okay, do you have anything to add?
Participant 2: No, I agree with them.

Moderator: Okay, then we are going to move on to the next part. What you see are again textual pictures, but now with longer texts.
Participant 1: This is Facebook again, right?
Moderator: Euh, yeah..
Participant 3: Yes, it is Facebook
Moderator: The left one is Facebook, the other two are LinkedIn.
all participants nod
Participant 2: Well, the right one immediately grasps my attention because of the size of it (wind blade).
Participant 3: Yeah, that's cool man.
Participant 2: It's a very effective use of that picture. Although I would say that the picture in the middle one is also interesting. With the glow and all of the machinery. That's also very good. The one on the left is very… that does not really stand out.
Participant 1: Yeah I think it looks like just a factory of coal or something. It isn't, but it looks like it.
Moderator: And how likely are you going to click on those links?
Participant 3: I would click on the right one, I think it looks very cool. And maybe the middle one.
Participant 2: I would click on all of them, haha.
Moderator: So that there is more text above does not make any difference to you?
Participant 1: No, I first look at the picture.
Participant 2: Especially if it is formatted like this, in an article. Then I look at the picture first, then the title and then… I would most likely click on the article. I would not even read the text above.
Participant 1: Yeah, that is also true. That's what I would do as well.
Moderator: You as well?
Participant 3: Yeah, I think so yeah. And I would read a tiny bit of text quickly just to see what it's really about and… that's it. Just two sentences.
Participant 2: I'm already interested in nuclear energy production so if I see an article I almost always read the article.
Participant 3: Makes sense, yeah.
Moderator: You already kind of answered it, but the next slide is about articles with a short text above.
Participant 2: The one on the right is very vague. Very hard to see what it is about. The one on the left is very clever. I think that it is an interesting picture, haha. And the one in the middle…
Participant 1: Yeah, it says like "Chernobyl" and all the yellow and black colours. you think it is about how bad nuclear energy is, but then it says "kernenergie is een logische stap" (nuclear energy is a logical step).
Participant 3: hahahaha
Participant 2: hahaha, oh yeah, did not even see the text beneath it.
Participant 1: I'm confused by that.
Participant 2: That is a terrible picture.
Participant 1: Yeah!!
Participant 2: This is so stupid.. the choice is really interesting…
Participant 2: It's like someone wanted to say: Nuclear energy is great, do you remember that disaster?
all laughing
Moderator: Okay, on which links would you click then?
Participant 1: I think I would click on the middle one, since it is so … tegenstrijdig.
Moderator: paradoxical.
Participant 1: Yeah. And… I don't really care about the U.K., so I would not click on that one. Maybe on the right… I don't know. The picture is not that appealing.
Participant 2: The glaciers are visualized, that looks interesting. But only after I've read the title. The picture is so unclear. It might have been trees.
Participant 3: I felt that was what it was at first. I would click on the left one and the right one. The right one only out of curiosity and the left one… well I like the U.K. haha.

Moderator: Okay. Then I have the final slide. This is about vacancies. You have to read them carefully and then I'd like to have your opinion on them.
Participant 2: I think the one on the left is good. They involve employees at the company as well, make it a bit more personal.
Moderator: Yeah, that's exactly the point that I want you to get from this. Whether you like the personal approach or not.
Participant 2: The one on the left looks like everyone can work for this company and the one on the right, they ask specifically for a type of person. The one on the left could also be something more general. Any person that is interested in working at Eneco. If someone is interested they could read and see what they do.
Moderator: And if a company uses a personal approach like Eneco at a vacancy, do you prefer that approach?
Participant 2: Don't know, because if you're looking for a specific someone for a specific job then the post of Urenco is already very clear. The one on the left is more like "hey I did not think about this job" and the one on the right is probably better when you're specifically looking for someone.
Participant 3: The right one immediately turned me off, because I'm not MBO 3 and technical whatever. That's not me so I'm not interested anymore. Like you say.
Moderator: Okay, but forget about the MBO 3. Imagine they are asking for someone like you. Or would you combine them? So, the personal story of Eneco together with the message of Urenco?
Participant 3: I don't think that that could be bad. What do you guys think?
Participant 2: You could very easily combine them.
Moderator: And would you like that?
Participant 2: Yeah, I would like that. Because then you can rephrase it to "would you like to work with, Dennis" in this case. Most of the time you're not going to post someone who hates their job.
Participant 3: yeah, hahaha!
Participant 2: Someone might think: Dennis looks like a nice guy, nice to work with. He describes a good environment, I'm interested. I think it would be very good to add that.
Moderator: Okay, and what do you think of the pictures that are used?
Participant 1: I don't think this is the most charming picture of Dennis. I don't know how you guys feel about that?
Participant 2: He looks very annoyed and forced to be on the picture.
Participant 1: Yeah, like "I'll smile, but…"
Participant 3: What I like about the right one is that they actually have the person in the field where they are working in. Dennis is standing against a green screen or something. I'd rather have him sitting by one of those Eneco boxes. Makes it more real. This could have been some random guy they picked up of the street.
Participant 1: Yeah, exactly.
Moderator: Okay. That was it. Do you have any additional remarks or things that you want to say about this research? Or comments about the things that we saw.
Participant 3: Yeah, I have one thing. Try to make it sexy. Nuclear energy is not something that is likeable, it's not exciting to see a nuclear reactor. And then you see those fusion reactors, you know, those donut things, they are really cool! That makes you excited because it looks cool and it's tacky. Focus more on that I would say. 20% less accidents or something is less interesting I think.
Participant 2: when you can see things from the inside, that's really cool!
Participant 3: Yeah, exactly.
Participant 2: It's often very clinical and they don't make it exciting.
Moderator: So more visual stimulation I think? Pictures of how things look like instead of texts describing it.
Participant 3: Yeah, exactly.
Participant 2: Yeah, because if you're that interested in it, then you will find a text and the information that you want. But you need the excitement, a trigger, first.

Focus group 2:

Participant 4: Participant four,
Participant 5: participant five,
Participant 6: Participant six
Participant 7: participant seven
Moderator: So I'll start with some general information of the survey, I analyzed the data of 148 participants . 52% of them were male, 46 % were female. 93 participants were aged between 18 and 25. And that's also the target group of this study. 56% were students and 67% is higher educated. And the target group of my study also focuses on higher educated people.
Participant 6: Yeah. What is the difference between students and higher educated?
Moderator: I'm sorry, what did you ask?
Participant 6: What is the difference between students and higher educated?
Moderator: Well, the other percentage is that of people that are working.
Participant 6: OK.
Moderator: So that's the difference here, because people have to indicate whether they are working or whether they are a student. The first thing that was outstanding for me is that 52% said that they do not want a career in nuclear sector and 24% does. What are your thoughts about that? So you can discuss now. Do you have any explanations for this?
Participant 6: Well, I get the neutral part, but I'm surprised by the amount of people who actually want a career in the nuclear sector. 24% is a lot.
Participant 7: You think it's a lot, it's only a quarter, right?
Participant 6: But still, if you look at how much jobs and types are available and then 24% desires to jump in the nuclear sector, I think that's a lot of people. So one in four.
Participant 4: I guess the question was this job, do you want it, yes or no? It's not like this, 24 percent is to actively pursue a career in this sector.
Participant 5: I think that if it were offered to you, whether you would pass or...
Participant 4: Yeah, I'm actually surprised by the 52 percent who do not want a career in the nuclear sector. and. Well, do you think it's because the name nuclear sector is the name and, of course, a job in nuclear sector? There's all this and the nuclear sector sounds dangerous, so no thank you, but...
Participant 7: I would say I don't have a clue what a job in the nuclear sector contains. I wouldn't have a clue what it is.
Participant 5: Same for me actually.
Participant 6: Yeah, I can imagine people and physicists are kind of what am I supposed to do with the nuclear sector? I think there might be a lot more jobs than just being a physicist. Yeah, I agree with Participant 7.
Moderator: There are also other jobs in the nuclear sector that you can think of. For example, at the communications department or at security. It's more broad than physicists and engineers.
Participant 5: I was also thinking about that. But then I still don't know. Yeah, well, it doesn't interest me that much, so I think it would still pass because I guess even if you're working at the communication department, you should still be interested in the whole company or organization, whatever you're working for.
Participant 6: Yeah.
Moderator: OK, then we move on to the next thing. 44% of the participants do not care about electricity costs, so they don't consider it at all. Only 30%. What are your thoughts about that? Do you have an explanation for this?
Participant 7: I think it's stupid to not care about costs, because if you have to pay them yourselves, I think you will care. So to say I do not care, it's bit stupid I would say. I
Participant 4: It's an important consideration for forming an opinion, and while they do care about energy costs, of course, but they may find the cost less important than the fact that nuclear energy is the thing that you pay for.
Participant 7: The thing is that if you have , for instance, to pay 100 euros more per month if you start

a household. I'm sure you will care
Participant 4: Yeah.
Participant 6: It really depends on the margin. How much percentage is higher than other.
Participant 5: I think it is also dangerous to talk about this because a big part of the study are students now and lots of students are living in their students places and they're not really paying directly for your own electricity. .
Participant 6: I would not know how much the electricity costs are per month. I have no clue. I have no reference point for estimating if it's much or not.
Moderator: OK. Next one. And yes. 51% think that nuclear innovations are important for the future, and do you think that they say that nuclear innovations are good or innovations in general? And can you think of any nuclear innovations?
Participant 6: Nuclear fusion. Which is a lot safer than getting them apart, you know nuclear fission. Yeah, I think it's important to investigate it further. And also, nuclear power reactors are quite safe if they are maintained correctly.
Participant 7: Yeah, I don't know any nuclear innovations at all.
Moderator: And if you think about innovations in general. What are your thoughts about that?
Participant 7: Innovations are always important, right? They make things better.
Participant 5: Well, I think you have a point, I just totally agree with you. I guess I have no idea about nuclear innovations and also about the second thing innovations are always good, it's always good to keep on improving.
Participant 4: Yeah, totally, totally agree with that, um, I wonder the 29% who doesn't think nuclear innovations are good for nuclear energy in the future? Are they stating with that nuclear energy is safe as it is, and it doesn't need innovations or do they just don't care about nuclear energy.
Moderator: I have a small remark about that, because a quarter said that they were neutral about this. Only 4% said that they disagreed with this statement.
Participant 4: Ah, OK. Yes.
Moderator: Maybe that changes your view on this.
Participant 4: Uh. Yeah, I think so. But it's a good thing. Yeah, but the innovations are in patient and nothing is perfect as it is, especially in nuclear energy.
Moderator: OK. And then there was also a question about the reliability of information sources, 97% thinks that scientists are reliable, 4% thinks that companies with an own stake are reliable, and 6% thinks that (social) media are reliable. 43% indicates that social media is important for creating an image about nuclear energy. What do you think about these numbers?
Participant 4: Four percent for the companies with an own stake?
Participant 6: Yeah, that's really low.
Participant 7: But I agree with it. Well, yeah, I think 97% of scientists, I would say it's still quite high, I think not every scientist is reliable because if you investigate something, you can get a result you want, most of the time.
Participant 5: I think it's high, but it doesn't mean that they're a hundred percent reliable. Of course, it means that like 97 percent of the participants said that they see them as reliable. And I think. I think I at least would also I don't know what I answered in the survey, but I think I would right now also go for that. So I can imagine that lots of people actually said, yes,
Participant 6: Scientists theirselves are pretty reliable, but the institutions or companies who hire them to do research influence the scientists, so scientists can't be fully objective anymore. If they are independent, I think very reliable. But depending on the organization for who they research, they might be influenced
Participant 7: But are they still reliable then?
Participant 5: I think.
Participant 6: Yeah.
Participant 4: I guess if you make the choice to be a scientist. And if this, this thing that you... I guess that there is this unspoken rule of I want to discover things genuinely, not because I get paid, but because of science. All right. So there might be a couple of scientists that get influenced by the money

that they get from some company. I think the majority of it does it for being a scientist.
Participant 7: Yeah, could be. I would be more neutral about it.
Participant 5: I think you have a point, though, because you think about the... I don't know the word... There are also a lot of scientists that actually say, climate change does not exist, or this is happening or it's not happening because people are... Well, I actually think, like most most of these scientists say it is. So, of course, even though we would now say, oh, they're pretty much reliable, they still vary and there are still a lot of different and different opinions among scientists. So I do understand what you mean.
Moderator: And what do you think about companies that share a scientific article?
Participant 4: Uh. Well, the article is, of course, in line with what the company thinks, otherwise they wouldn't share, I think.
Participant 6: It also depends on what it's about, if it's research about a device or something, it's different than something about environmental impact.
Moderator: And how do you perceive the difference between those articles?
Participant 6: Hm... I mostly take such results with a grain of salt.
Participant 7: Well, I think if a company posts a scientific article, it is true, but, it's one sided like the other side isn't shown in the article, so they are reliable, but they are keeping a bit of the truth away. Y
Participant 4: Yeah, sure.
Participant 7: But, yeah, I think this isn't a really fair way. It's for their own company, so I understand it.
Participant 5: I think lots of people actually say, oh, yeah, it's a scientific article, so it's true. Well, it might as be too old or that research experiment was maybe not pretty valid or whatever. And a lot of people don't know. Probably I would also not really dive into it, whatever I would not look to see what they did to actually come to an answer.
Participant 7: Yeah.
Participant 4: And if they post a scientific article on social media, I don't think I would actually take the time to read it on social media. I look at pictures.
Participant 7: And also only reading the headline.
Participant 4: Yeah, exactly.
Participant 7: OK, I'm going to next point. Only 6% thinks that social media is a reliable source, however, 43% indicates that they use social media to create an image about nuclear energy. What are your thoughts about that?
Participant 6: The most social media is sort of biased. They want to present a certain image like yours is the good side and there is the bad side and the good side promotes it and the bad side tries to fight it. I don't think there's a completely anonymous...
Participant 5: You're also in your own bubble, so people are also looking for nuclear energy or something, you will see something else going on. So creating an image only based, solely based on social media is probably bad.
Participant 7: But if you use it as a part of creating an image, I think everybody does that. Say, I don't do it at all. I think that's not true.
Participant 5: No, no, definitely not. I think I still... maybe not on purpose, but I think it definitely happens to me.
Moderator: Do you have anything to add?
Participant 4: No, I think that's really important if you at 43 percent, so... can we say that, 57% doesn't think that it's important for creating an image and because of enough on social media, everything you see and everything you, you read influence influences your... yeah, you're thinking no matter what you what you think, you can really... you can disagree with what you see, but it does influence you.
Participant 7: Of course.
Participant 4: And I think that's the point you make, of course, it influences you.
Participant 5: Yeah, it's pretty funny, actually. Six percent says it's reliable, 43 percent say they're.
Participant 4: Yeah, yeah.
Participant 5: ...It's actually important for creating an image.
Participant 6: It could also be that it supports them in creating an image, not the correct image, but at

least something.
Participant 7: Yeah, that's true. But if I find something on social media, maybe it's not true. I always also search on the Internet for something similar so you can use it, but you investigate a little bit more I think.
Participant 6: Like a step up.
Participant 4: That's a nice, nice starter. LIke, it gets you hooked on some some something and then you do your own research and call it.
Moderator: OK, yeah. Let me move on to the next slide. You also had to give your preferred choice for a type of energy source. 18% prefers nuclear energy, whereas 60% would choose hydro energy. 23% prefers nuclear energy, whereas 56% prefers wind energy at sea. What are your thoughts about this?
Participant 6: Well, I don't know how much people know about hydro energy, but then Asia and stuff with hydro dams, they fucking up the whole system with the rivers that they're like causing floods and they just haven't got enough water. So I think the top one is for the people not knowing hydro energy and just not knowing that it exists.
Participant 7: I don't have a clue about hydro energy.
Moderator: Can you give a general explanation?
Participant 6: Well, there are lots of different techniques, though, on hydro dams, they mostly use between two... a higher point and a lower point of water, and it flows through a turbine and turbines then make energy, but it kind of blocks of water and also disrupts rivers from continuous flow, which can influence lower parts, but also high parts before and after the dam. But also something they're investigating is using the tides near seas for using.. creating energy. And I don't know how good or bad that is. That might be something that...
Participant 4: this is actually something that came to me before that, the hydrodams. Yeah. I thought hydro energy and I probably heard something like this. Getijden, I don't know the English word..
Participant 6: Yeah, tides.
Participant 4: That thing and I thought that's hydro energy.
Participant 6: Yeah. But I'm surprised that there's no geothermal energy.
Moderator: Oh, it's not listed here. I can show you those numbers afterwards if you want. What do you think of windenergy?
Participant 7: Well, I think it sucks. It isn't effective and then you are going to place all those windmills in the sea, for instance, in the Waddenzee, which is a protected nature area, to get some green energy. What's green about it, I don't know.
Participant 5: I think wind energy, at its core, might not be that bad if you just keep on improving it. So I think I don't remember my choice, but I think for now, I would still go for wind energy and still have in my mind that I can keep on improving it, maybe find a better place or something. But then I think at its core, it might be better than nuclear energy.
Participant 6: I'm not sure about wind energy, but they make a lot of noise, the wind turbines, that's for sure. And as far as I know, sea life is very sensitive in hearing and they get scared away from the wind energy. So I cannot fully back it up, but as far as I know, it isn't as great for sealife as you think, even though it's above the water.
Participant 5: OK!
Moderator: Do you have an opinion about this?
Participant 4: Well, hydro energy as well as wind energy, I think it's it's found... oh it's green energy! I think that's the that's the pull so many people have to favoring these before nuclear energy. But... Well, there are, of course, many disadvantages about either hydro and wind energy I'm not really in that world, so I cannot list it and I cannot say this this one is better or this, but I think this is all the reason why people are so many people prefer these.
Moderator: Can you also come up with an explanation why not many people know the advantages or disadvantages of these sources?
Participant 7: Yes.
Participant 6: Yeah, I agree. Yeah, exactly.
Participant 5: Yeah. Because now you just talk about how much noise they make. And I actually I

haven't even thought about that.
Participant 6: Yeah.
Participant 4: Yeah, when we see them from distance, they don't make noise.
Participant 5: And they actually doesn't look that bad.
Participant 6: Yeah.
Participant 4: And then when it's when you're standing close...
Moderator: OK. Do you have any additional remarks about things that we just discussed about the survey?
Participant 7: Not really, actually.
Moderator: OK, because then we move on to the next part, and that is about... communication. And so I selected multiple social media posts from different mediums. And I'd like you to read them and evaluate them on their style, on their content, whether they they engage you or not, what do you like about the post, what don't you like and what do you think of the medium that is used. And then you can discuss this together.
Participant 5: Is there a target group that you want to reach?
Moderator: Yeah, the target group is people from our age. So, here is the first slide. Can you read it in the back?
Participant 7: Yeah, yeah, yeah.
Moderator: Okay, so you don't have to read them thoroughly, but just a little bit.
Participant 7: I'm really blind. I can't read those two in the middle. From Greenpeace and the one above it.
Participant 4: Greenpeace refers to the picture next to it.
Moderator: Yeah exactly. That one is about the use of plastic. And the upper one is about what's written in the picture.
Participant 7: Oh, it's you should only look at the pictures?
Moderator: No, but it's not like any more important information is given in the text.
Participant 7: Oh, okay.
Participant 4: The first post is about Foratom.
Participant 7: Foratom is the European trade association of nuclear energy companies.
Participant 4: For atom, AH, I see! Foratom, I didn't get it.
Participant 7: I'm not really sure what the upper left one is supposed to mean.
Participant 5: Same!
Participant 7: I'm not sure what it is supposed to do.
Participant 4: They put effort in it to create a meme, but it doesn't make it more understandable what you mean with it. I can't relate.
Moderator: What do you think of the usage of memes in general? If companies do that?
Participant 7: I think for the younger audience could be quite useful.
Participant 4: Yeah, I
Participant 7: I think Foratom has its marketing...
Participant 6: It's one of the best strategies. Holy shit.
Participant 5: Yeah, that's true. But this is a pretty difficult message they're trying to convey.
Participant 7: Maybe it's also a bit too serious for memes this.
Participant 4: Yes.
Participant 6: Like it should be not your standard market strategy of like once in a while. It's fine, but it's a sensitive topic. So I would be really careful.
Participant 5: It's such a difficult message to put in ameme actually makes me feel confused myself, instead of making it clear to me.
Participant 7: Keeping humor in it is also important. I wouldn't make it too serious.
Participant 4: so we can see a cute picture of a baby seal. At this point, we are actually engaged in this post, so we are complied to read it and maybe even read the thing next to it. But afterwards, we don't know.
Participant 6: I have to say, because I don't fully understand the post I was more into reading the

caption below it.
Moderator: If you're scrolling on your Instagram, would you stop this or would you swipe further?
Participant 6: Yeah, I would.
Participant 7: I would stop because I just don't understand it. And I want to read the caption and some comments. Maybe someone explain it to you.
Participant 5: I think I would simply stop because it looks like a meme. Yes. Then, when you read it, I think, oh I don't understand. I probably skipped because I'm on Instagram or social media, you just not get information about this kind of thing that stands out, which reads like a news app or whatever.
Participant 4: Like scrolling. Read this. Don't understand anything from the meme. OK. The algorithm thinks I'm smarter than I'm, again. I agree with you guys. At social media, this is not the content I'm looking for, I think.
Moderator: OK, and what about the other two?
Participant 6: On the lower left. I mean, I get the companies they're targeting. It doesn't appeal to me to read into what it is. Maybe if I have time, I will, because I mostly read comments in almost any post because they're mostly funnier than the post itself. But this one, I don't know. I think it might skip.
Participant 7: I don't find it engaging. Also a bit like, yeah, bit stupid I would say.
Participant 6: Also badly photoshopped.
Participant 4: Yeah. I think it really conforms to the opinion Greenpeace followers have already and it doesn't add anything Greenpeace followers already think that these companies are objectively, objectively evil. So we make a post about them and that there's nobody new from outside the Greenpeace community, you know, to see this post. And yes...
Participant 7: It's really easy scoring.
Participant 6: Yeah, it's like feeding your followers.
Participant 4: Yeah, exactly. Exactly.
Participant 6: Keep them satisfied.
Participant 4: Which is OK, I think. But well, if that is your idea of posting stuff on social media.
Participant 6: I'm not on Facebook and I hate the post with you have to comment, like the three emoji is in front of each statement or something.
Participant 7: I think this is this post is made for like this 50 year old ladies.
Participant 4: Yeah. This is a Facebook post. So it's probably like...
Participant 6: But I like that they state the source. It's something.
Moderator: What do you think of the picture? So if you would to see this post on Instagram, with the picture? Would you then stop and read the caption?
Participant 6: Nah, the photo itself... yeah, it screams boomer sort of.
Participant 7: yeah, that's really true, too much boomer to handle I would say. I
Participant 4: Haha, OK. But I see a picture of strawberries.
Participant 6: It's not engaging to me.
Participant 4: But I think it's a it's it's an informative post and it's better than the last two. And it's understandable. It's relevant for your life because, because many people eat strawberries I think. I eat strawberries.
Participant 6: You are many people, hahaha.
Participant 4: And they state the source. So I think that I would... OK, the content is nice, but maybe engagement not so.
Participant 7: I would have preferred it if it was a timelapse and you could see the mould grow on it.
Participant 6: The photo, it feels like it's already 20 years old. I don't know why, but it feels like it had been taken in 2000 or something, I think.
Participant 5: I don't find the picture that bad actually. The thing that I don't like is the text.
Participant 4: Why not?
Participant 5: But now, because I'm a big skeptic, it's just says that it's totally safe. Well, of course there's a source mentioned, but maybe then given maybe give a short explanation of it.
Participant 6: Of why, of how it works.
Participant 5: Yeah, and for me, it's like that looks like a... what is it? A win action. I mean, actually,

when. I don't know, it looks cheap.
Participant 7: Like it's almost propaganda with no real facts.
Participant 5: Yeah, yeah.
Moderator: OK. So we can also conclude that you do not like Facebook, but we like Instagram.
Participant 7: Yeah, that's for sure.
Participant 6: That is the story with the.
Participant 6: That has to do with the target group I think.
Participant 7: I also don't have Facebook.
Participant 6: Me neither.
Participant 4: What is Facebook? Haha
Participant 6: Who is Facebook? Haha
Moderator: Then we move on to the next one. This is a short movie. OK, so what are your thoughts about this movie? So it's not onsocial media now, but if it would be on social media.
Participant 6: Yeah, I really like it, but I like it. But a general tip, I think it's the they mentioned nuclear health care, but it would be best if they stated some examples of where it's used, because now it's just nuclear health care. I don't know nuclear health care, so I have nothing to compare it with.
Participant 4: X-ray photos.
Participant 6: Yeah. But it could be even more. That would be best to give some examples. So we know, OK, so a more kind of more clear image of to what it's compared. But I really like the style. I was just going to mention I want to mention the last part that they should take a look at the NOSop3 videos because they have a really smart way of conveying a message, which really difficult to understand. And almost everyone can watch this and clearly understand what's going on. So I like the way they bring it.
Moderator: OK. Someone else?
Participant 7: I would say it's engaging, it's yeah, it's really positive, maybe it should also be some disadvantages in the video, but I really like the overall confidence style.
Participant 4: Yeah, exactly. Because in the style of the video, you want to, um, you want to attract as much as many viewers as you can. And viewers who want their positive opinion about nuclear energy confirmed because it's free. It's free awesome points. So not but also people who are on the fence are really against it. And when you put some disadvantages in there, and do it's really early, some people will see it. OK, well, they actually have a reasonable message. But also, I can do something... do something with or understand.
Participant 7: And yeah, if you put in some disadvantages you maybe can also counter them so you can stripe them down and make it even more powerful I would say. I
Participant 6: Yeah, I'm also curious to what the target platform is that they are going to use for this. Because if it's on Youtube, then I don't care if the five seconds are passed, I'm going to get there.
Participant 4: Yeah.
Moderator: It's not on social media yet.
Participant 6: Because on most social media. I just skip all the ads.
Participant 4: Yeah, it it says 'sponsered' in the top.
Participant 6: For television or something. I mean, it's a nice ad to watch.
Moderator: It's not for television. It is used to target 18 to 25 year olds. As a company, you can post it on your own account and then it's not sponsered. You then only see the first ten seconds and then click on the link and you can watch it entirely. You can also post it on LinkedIn and then you can click on that and watch it. So it's not sponsered. It's going to be posted from the company account. Would you then keep watching? Would you click on it or would you skip it?
Participant 7: I found it interesting so I would watch the whole movie again.
Participant 4: What's your opinion about the movie?
Participant 5: I actually liked it, and I completely agree with you, they should maybe mention some negative points or some disadvantages that could be countered then to as well, because that was actually what I was waiting for, the whole movie. I was just waiting for like the whole movie. The 'but...'. But it didn't happen and I guess it could make it indeed a bit stronger. But I really like to go for

a solid
Participant 6: Yeah, to make it feel less propogandish.
Participant 7: Yes. Right now it feels like why isn't the whole world using nuclear energy yet, it's only positive.
Participant 5: And then it also seems more reliable, because, you know.
Moderator: OK. The next slide is about the use of infographics. They might be a bit small to read back in the room. Can you see the pictures?
Participant 7: Yeah, I can see them. I'm actually quite skeptic about infographics, because what you show the results you like, there's always one infographic you can use and you can post it. I would say, there's always some statistic that is going to support your opinion and then you make an infographics and then it looks nice and. Yeah. I'm not really a fan of infographics.
Participant 6: And I feel like the right one, those things belong together, right?
Moderator: Yeah.
Participant 6: And I suppose they're slides from Instagram or some you go through or is it just one image?
Moderator: It's not on social media yet, but how would you perceive it if it would be?
Participant 6: I like infographics, but not those ones, and also I don't feel like they belong together. They're sort of random images put together and they tried to make them match with the color, but. Yeah.
Moderator: They used sources on the right ones. Does that add anything for you?
Participant 6: Which one are supposed to be together and which ones are not?
Moderator: No, they are all seperate posts. But, for example, this one has a source. This is one infographic. And this one, is also one infographic, and it also has a source. But this one does not. Does that add anything for you?
Participant 7: That makes it more reliable to me. If it doesn't have a source, then the source would be 'trust me bro', that would be really bad.
Participant 6: Like the neighbor child told you something. OK. Yeah. This seems spectral.
Participant 7: Yeah that's right. So a source would always add a bit of reliability.
Participant 6: It doesn't mean I fully trust it, but I trust it more than... other....
Participant 7: Unless the source is like, de Speld
Participant 6: Haha, that's completely valid.
Moderator: And what do you think about the messages they want to convey?
Participant 6: The middle one, I don't know what it's trying to say. Capacity factor?
Participant 4: Capacity on a energy source..?
Participant 7: So I would say, the space they take and how much energy they can get out of it. I think that would be it. Like one square meter of nuclear would gain you way more energy than solar. I think that's the image they try to show. But maybe it's more detailed in the caption, but I don't know.
Participant 6: Yes, I like the first statement. I would like a little backup slides on how they would get to this point. Like, what do they include? What don't they include? It's kind of attractive. It makes me curious, but I would like more information about what they're stating. So what is it? What am I looking at?
Participant 4: What post are you talking about?
Participant 6: The middle one.
Participant 6: Yeah. Like, I'm curious what capacity factors that would explain it in further slides and also explain how they got to these numbers. Then yeah.
Participant 7: Would you prefer the investigation methods first or the percentages of the slides first?
Participant 6: The percentages. So I kind of see that something is comparedly better than something else. But why? Or is it better? What are you trying to say?
Moderator: So, then the message of this picture does not convey you.
Participant 6: No.
Participant 4: OK, but we are discussing it right now.
Participant 6: Yeah. Because we are discussing it now, we get something. But it was not clear.

Moderator: Okay, and the left one?
Participant 6: I kind of like the left one one, but it's some kind of timeline what happened?
Participant 7: No, I'm not really sure what it is, maybe because it's too small for.
Participant 6: That's a I think I sort of road with what happens from suppose... Yeah then dumping the waste.
Moderator: No, not the waste.
Participant 4: Haha, dump it in Brabant.
Participant 6: Or the ocean.
Participant 7: I would quickly read it.
Moderator: All in all, an infographic is risky to choose. But if you choose one, you should add a source.
Participant 6: Yeah. And make sure they match they line up. Don't be like the right one to throw stuff together and make try to make it match.
Moderator: Okay, then we move on to the next slide. This is more text. You don't have to read it extensively, but more in general. What are good elements? What do you think of the amount of text?
Participant 7: Well, if the text does include a nice story with some detailed content, I would say it does add something. But I'm not able to read it.
Participant 5: It's a bit much, but if you just split it into three parts, like paragraphs, that would be better.
Participant 7: Isn't that much right?
Participant 5: I guess for Facebook, I don't know.
Participant 6: Yeah, you're probably have really low attention.
Participant 7: Yeah, that's true.
Moderator: The left one is on Facebook and the other two are on LinkedIn.
Participant 6: OK, because I like... I would definitely skip the first part, looked at the title of the post below, like the reference to and then check it out, like OK, does it feel like it's important? If so, I'm going to go back to the top and read it.
Participant 5: I think for LinkedIn you should always have like three lines max, and than some space and then another two or three lines.
Participant 6: I would skip the right one, the right post. I can't clearly see immediately what it's about, so it takes too much time to read through it.
Participant 4: But I think that the picture of Vattenfall is the nicest picture. I think for me it is though.
Participant 6: I like the middle one.
Participant 4: Yeah, but maybe when I see the middle one and I read the title, then I don't get it. And then, I will scroll.
Moderator: The left one, what do you think of the left one?
Participant 6: I like the title of the post below. "Vertel eerst dat kernenergie veilig is".
Participant 7: I think I would prefer..., it stated an article, right? I think I would prefer to just read the article instead of the caption. That's what I mostly do.
Moderator: So what do you think of the usage of pictures in general here?
Participant 6: It attracts attention, so, yes, do it, but make use of some nice picture.
Participant 4: Yes.
Participant 6: The left one, I don't know what I'm seeing or looking at. And the right one... I know it's a part of a windmill. And the middle one, it scores.
Moderator: Does anyone have anything to add about this?
Participant 7: No.
Participant 4: I think the left one, I think it's it's nice. It's... it's... I think it should convey a story that you can say. But in the title it's like, oh, we are not sure. I maybe read this first and then... so it really attracts the attention of as many people as possible.
Moderator: Yeah, OK. The next one is about a short piece of text and then a link.
Participant 6: So I don't understand Greenpeace, I don't know the thing that someone said about they're trying to appeal their audience already and that's mostly what happens with Greenpeace, I don't feel like they're stating new information or trying to involve new people.

Participant 7: But of course, they are skeptic and they should be always skeptic about it, probably.
Participant 6: Yeah.
Participant 7: So I get what they're doing with it isn't engaging for me.
Participant 6: Me neither.
Participant 7: I mean, I wouldn't say it's also engaging for more neutral people. As in neutral about the topic, I wouldn't go to Greenpeace.
Moderator: Okay, and the other two? What do you think?
Participant 5: Um, yeah, the middle one used a citation, but I would definitely use use the source first or like that person who said that. And maybe some sort of explanation or so, like what is the article about or what... what I... what is it referring to? So it's not giving enough information, I guess. I like to picture though, um, and yeah, the right one, I don't know, it's just stating a fact for at least I guess it's I'm not sure if I see a souce, oh, they are the source, but I don't really get the image. I know what it should visualize, but for me, it's not clear enough. I still don't know what I exactly see. So could be better as well.
Participant 4: Well, I think one piece of these companies, these organizations that Atoom Alliantie and Greenpeace, they found an article in some newspapers. The article was the same as their opinion, so let's share the article. The middle one is de Telegraaf, and de Telegraaf of course, don't take it too seriously and the the right one is stating um, I think, a fact, which is a nice piece of news for someone who speaks for someone who is interested in the nuclear sector, I think.
Participant 6: I like the middle one, especially the statement, I just have watched a lot of documentaries and read about nuclear fusion and the nuclear reactors. I agree to this.
Participant 7: But it states like "nuclear energy is a logical step", but I think the picture is quite negative.
Participant 4: Yeah, exactly!!
Participant 6: I'm associating it with some negative. I think it's the wrong picture to this message.
Participant 5: Yeah.
Participant 4: At least the colours are nice. Put any other name than Chernobyl in there and then it's fine.
Participant 6: But people only know the mistakes. Like no one, almost no one knows an active, good working nuclear reactor because it is not interesting. Only the failures are interesting.
Participant 7: And think on your audience, because nobody knows good things, so you shouldn't use Chernobyl, because that's already a bad thing.
Participant 6: I agree.
Moderator: Okay, then the final one. It is about vacancies.
Participant 6: Name for a job. Dennis.
Participant 7: Dennis, Dennis is a nice looking guy.
Participant 4: It's fine, I think.
Moderator: Both of them?
Participant 4: Yes.
Moderator: Is there anything you like more about one post than the other one?
Participant 6: Well. The right one, Urenco. I know what they do, and that's why I don't know for sure if the first line is a joke, the "verrijken", but I really like it. Since they...
Moderator: Urenco is a company that enriches uranium.
Participant 6: So that's why I like the word.
Participant 4: O my god. That completely went pheeeuw
Participant 6: That's yeah, if you know what they are talking about, I really like it. So I enjoy that one.
Participant 4: OK, nice!
Participant 6: And on the left, it seems like every other, yeah, every other vacancy.
Participant 4: What do you think of the personal approach they used in the left one? To add a story of an employee. Would you read something like that if you were looking for a job?
Participant 7: If I would be interested, I would. But that isn't... I'm not really engaged by this Eneco thing.

Participant 6: I feel like those things of a person, it's always going to be like one of the better sides because they're not going to post something or someone who doesn't like the job there. I would like to talk to them in person that would give me a lot more information. I don't trust these ones
Participant 7: Yeah, but I would also like speak to a person that you already know and works there. Yeah, because then you get a more honest story.
Participant 6: You know, this is going to be sort of... this this feels like propaganda.
Participant 7: Yeah.
Participant 6: If I can pick someone myself from the company, to speak to yes, but if I get someone presented, no.
Participant 5: You could still sort of take a personal approach, nobody displaying his face or talk like Dennis, but put the link ot the website there and say hey, if you want more information, there's a blog of an employee doing this and this and this. So you can still read that story, so you can still have those insights of working directly or someone's opinion about their to do's basically, um, well, not really making too much of a subjective.So you can say it's more like if you want more information, you can read this blog or do this and this instead of just putting the blog there and read it.
Participant 4: A blog or I feel like anything regarding a person doing his job and telling, most importantly, a future colleagues, what job he is doing and how much fun it is. It's... it's inherently biased, I think. I don't really add something for me. Yeah, I don't think so, but a personal approach, it sounds... it sounds nice, I guess. I don't know. I would do the personal approach then.
Participant 7: But both of these I don't really find engaging.
Participant 6: I agree.
Participant 4: Well, it's engaging enough if you're looking for a job. I think.
Participant 7: Yeah, yeah, haha.
Participant 6: Yeah, haha that's of big importance.
Participant 4: Okay, okay. But if I have a job and I scroll through Linkedin. Would I give up my job, my current job to work for one of these companies? I don't really think so.But if I'm already already looking at Eneco and I see this message of Urenco, I really think I would switch in the other way around.
Moderator: OK. Do you have any additional remarks?
Participant 6: And I would still suggest to look at NOS videos and stuff, like how to explain this, that they can really clearly convey a message. Like a hard topic.
Participant 7: The most important thing I would say is to not use one source butget as many sources as possible and form your own opinion. Not to take the opinion of NOSop3 or anything else.
Participant 6: Yeah, but they are not the convincing style, but how they inform.
Participant 7: Yeah, I agree. I agree.
Moderator: And also don't just state the good side, but also state the bad sides or whatever you consider the bad side.

Appendix H: Coding scheme with examples

Category	Code	Sub code	Sub code	Example
1. Sentiment	1.1 Negative 1.2 Neutral 1.3 Positive	-	-	“It was short and understandable and pleasant to hear.”
2. Reliability	2.1 Unreliable 2.2 Reliable	-	-	“Articles have to be peer-reviewed before it is accepted. So, if a paper is accepted, it is

					approved."
3.	Financial	3.1 Costs 3.2 Profit	-	-	"We were really tight about the electricity costs because it is expensive."
4.	Energy sectors	4.1 Nuclear 4.2 Hydro 4.3 Coal 4.4 Wind	-	-	"People think that nuclear has more risks."
5.	Attitude towards risk	5.1 Risky 5.2 Risk-free	-	-	"Those are more safer than conventional nuclear reactors."
6.	Media	6.1 Biased 6.2 Unbiased	-	-	"It's neglectable what happens in the coal industry."
7.	Stimuli of messages	7.1 Textual	7.1.i. Length	7.1.i.a. Short 7.1.i.b. Long	"I think for LinkedIn you should always have like three lines max, and then some space and then another two or three lines."
			7.1.ii. Sort	7.1.ii.a. Caption 7.1.ii.b. Article	"I would not even read the text above."
		7.2 Visual	7.2.i. Photo	7.2.i.a. Appealing 7.2.i.b. Not appealing	"The one on the left is very clever."
			7.2.ii. Infographic	7.2.ii.a. Appealing 7.2.ii.b. Not appealing	"Because if you look at these things, it almost makes me fall asleep. It looks like a boring presentation that I get at 9 in the morning."
			7.2.iii. Video	7.2.iii.a. Appealing 7.2.iii.b. Not appealing	"I think I would stay and watch it. Because the film is good."
8.	Style	8.1. Graphics	8.1.i. Positive 8.1.ii. Neutral		"The Greenpeace one

			8.1.iii. Negative		is very clear and nicely presented."
		8.2. Content	8.2.i. Too much info 8.2.ii. Clear message 8.2.iii. Unclear message		"It's not immediately clear what it shows."
		8.3. Presentation	8.3.i. Clean 8.3.ii. Effective 8.3.iii. Clear 8.3.iv. Entertaining 8.3.v. Ineffective 8.3.vi. Unclear 8.3.vii. Not entertaining		"It's a very effective use of that picture."
		8.4. Colour	8.4.i. Correct use of colour 8.4.iii. Incorrect use of colour		"I think the use of colours is really bad."
9.	Engagement	9.1. Stop and read 9.2. Swipe further	-	-	"I would stop to look at it."
10.	Attitude towards media post	10.1. Likeable 10.2. Not likeable 10.3. Appealing 10.4. Not appealing	-	-	"I think the left one is good. They involve employees at the company as well, make it a bit more personal."
11.	Point of message	11.1. Hits the mark 11.2. Misses the point	-	-	"It's trying to be hip but it misses the mark. Quite far."

Appendix I: Cohen's Kappa of intercoder reliability

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	,727	,046	36,724	,000
N of Valid Cases		95			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.