



Fighting Fire with Fire II: Countering Film Propaganda with Video Podcasting

Melawan Kebakaran dengan Api II: Melawan Propaganda Film dengan Video Podcasting

Gary James Jason

INSTITUTION

Department of Philosophy
California State University, Fullerton
Fullerton, California (USA)

PHONE

9496065576

EMAIL

drgaryjjason@gmail.com

DOI

[https://www.doi.org/
10.37010/prop.v3i2.1364](https://www.doi.org/10.37010/prop.v3i2.1364)

PAPER PAGE

95-123

PROPAGANDA is a Journal of Communication Studies which is publish twice a year on January and July. PROPAGANDA is a scientific publication media in the form of conceptual paper and field research related to communication studies. It is hoped that PROPAGANDA can become a media for academics and researchers to publish their scientific work and become a reference source for the development of science and knowledge.

ABSTRACT

Dalam artikel sebelumnya di jurnal ini (Jason 2023), saya mengeksplorasi efektivitas penggunaan film untuk melawan propaganda dalam film. Dalam artikel ini, saya ingin mengeksplorasi penggunaan podcast video untuk melawan propaganda dalam film. Saya mulai dengan merangkum teori propaganda yang telah saya perkenalkan sebelumnya, yang menyatakan bahwa propaganda bisa masuk akal atau menipu dalam enam skala berbeda. Saya kemudian merangkum serial dokumenter Netflix Meltdown tahun 2022, tentang kecelakaan pembangkit listrik tenaga nuklir di *Three Mile Island* (di Central Pennsylvania). Kecelakaan ini (dan hingga hari ini) merupakan kegagalan tenaga nuklir terbesar dalam sejarah Amerika. Saya membahas bagaimana serial tersebut direview di media cetak. Saya kemudian melihat dua video yang membantah Meltdown, dan menunjukkan bagaimana kritik eksplisit dan implisit mereka terhadap serial Netflix sesuai dengan kriteria kami untuk menilai rasionalitas propaganda. Video pertama dibuat oleh Jesse Freeston, dan memiliki jumlah penonton terbatas. Yang lainnya dibuat oleh komunikator sains dan podcaster Kyle Hill yang diikuti secara luas. Saya menunjukkan bagaimana masing-masing secara efektif mengungkap pesan-pesan menipu yang disebarkan oleh serial Netflix. Saya menyelesaikan artikel ini dengan menyatakan bahwa podcast video memiliki kelebihan dalam membantah propaganda film yang tidak dimiliki oleh film kontra-propaganda: podcast video dapat dibuat jauh lebih cepat dan jauh lebih murah. Namun dalam hal memberikan informasi kepada masyarakat tentang biaya dan manfaat teknologi serumit tenaga nuklir, penggunaan film dan video sangatlah terbatas. Sayangnya, masyarakat biasanya mendapatkan informasi dengan cara seperti ini.

In a prior article for this journal (Jason 2023), I explored the effectiveness of using film to counter propaganda in film. In this piece, I want to explore the use of video podcasts to counter propaganda in film. I begin by summarizing the theory of propaganda I am introduced earlier, by which propaganda can be reasonable or deceptive on six different scales. I then summarize the 2022 Netflix documentary series Meltdown, about the accident at the nuclear power plant at Three Mile Island (in Central Pennsylvania). This accident was (and is to this day) the biggest nuclear power failure in American history. I discuss how the series was reviewed in the print media. I then turn to two videos that rebutted Meltdown, and show how their explicit and implicit criticisms of the Netflix series fit our criteria for assessing the rationality of propaganda. The first video was made by Jesse Freeston, and had limited viewership. The other was made by science communicator and widely followed podcaster Kyle Hill. I show how each effectively exposed deceptive messages propagated by Netflix series. I finish the article by suggesting that video podcasts have advantages in rebutting film propaganda that making counter propaganda films lack: video podcasts can be made much more quickly and much less expensively. But when it comes to informing the public about the costs and benefits of a technology as complex as nuclear power, films and videos are of limited use. Unfortunately, this is how citizens typically get their information.

KEYWORD

efektivitas film, video podcast, propaganda

effectiveness film, podcast video, propaganda

PROPAGANDA

INTRODUCTION

In a previous article for this journal (Jason 2023), I examined how effective film is as a medium for countering deceptive propaganda in film. In this article, I want to examine how video podcasting can be used to quickly counter sophisticated film propaganda. The accident explored in the Netflix documentary occurred in the early morning of March 28th, 1979, at the Unit 2 reactor at TMI (located in central Pennsylvania). The accident started when a pressure valve failed to close, which was made worse when control-room workers erroneously halted the emergency water cooling system. That led to the nuclear core heating to dangerous levels, resulting in a partial meltdown. It was and remains the worst accident in the history of American nuclear power. Together with an anti-nuclear-power Hollywood movie *The China Syndrome*, which was playing in theaters at the time, the reportage on this accident helped kill the growth of the American nuclear power industry, from that time to the present day.

METHOD

In my prior article, I laid out a simple theory of propaganda. The key idea of this theory is that despite the pejorative connotation that the term “propaganda” now commonly carries—by which the term is understood to be synonymous with deceptive or intentionally false messaging—propaganda need not be sophisticated. We should restore the original meaning of the term, which is simply that of rhetoric aimed at getting people to support a politician, political party, or ideology. Of course, it can be and very often is deceptive or sophisticated, but it need not be. In other words, what makes a message propaganda is not whether it is deceptive, but whether its purpose is to build support for a person, party, or ideology.

In this regard, propaganda is like marketing, which is rhetoric aimed at getting people to purchase specific products, or to be inclined to purchase in the future from a product line (a “brand”). What makes propaganda deceptive is when it violates any of six criteria. These are:

- First, the message should be evidence based. It should offer evidence for the message not merely repeat or assume it.
- Second, the message should be truthful. Spreading disinformation, telling lies, is one of the most common ways in which propaganda can be deceptive.
- Third, the message should be logical. The evidence offered should support the claims made in the message.
- Fourth, the message should not involve coercion or the threat of force.
- Fifth, the message should be targeted at mentally competent adults.
- Sixth, the message should be transparent, that is, it should be clear in the message that it is intended to persuade the audience to support a person or a cause, and crucial evidence should not be hidden.

On this view of propaganda, propaganda can range from the completely rational to the profoundly sophisticated, on six different scales. As I noted in the prior piece, these six criteria are useful in examining the irrationality in both marketing and propaganda. (See Jason 2022 Chapters 17 and 18). One last point of review from my prior article. I made the point that there that while film generally is a useful vehicle for propaganda, documentary film is especially useful, because the audience assumes that the film is informing them of the truth about some subject. Put another way, *the audience sees a film that is labelled “documentary” as an unbiased, objective documentation of reality*. This may lead them to lower their critical faculties.

I will use as my primary texts the 2022 Netflix four-part documentary on the accident at the Three Mile Island (hereafter simply “TMI”) nuclear power plant (Netflix 2022), along with two video podcast critiques of it. The first is by documentary filmmaker Jesse Freeston (Freeston 2022), and the second by the widely-followed science journalist and advisor Kyle Hill (Hill 2022).

I will begin by briefly reviewing the theory of propaganda I outlined in the prior article for this journal, which give us six criteria for judging the rationality of propaganda (on scales that range from the completely rational to the completely sophisticated). I will then review the series, and assess how successful it was. I will follow by reviewing Freeston’s and Smith’s critiques of the series, and show



how these critiques implicitly invoked those criteria. I will conclude by noting the limitations of film in informing the public about technical issues.

RESULTS AND DISCUSSION

Series Episode 1: *The Accident*

The Netflix series comprises four episodes: Episode 1, *The Accident* (42 minutes); Episode 2, *Women and Children First* (42 minutes); Episode 3, *The Whistleblower* (48 minutes); and Episode 4, *Fallout* (40 minutes). The series first aired on May 4th, 2022. It mixed recreations of past events using actors with contemporary interviews of participants and spectators of the events of the time (1979), along with archival film footage of the reportage of those events. Parenthetically, one problem the series has is that at times it is unclear whether we are seeing archival footage or present-day recreations, and if present-day recreations how accurate they are.

Episode 1 opens with the intertitle “March, 1979 Middletown, Pennsylvania.” We see a small girl, holding a doll, watching gravely as a warning appears on a TV set, telling residents to stay indoors with their windows and doors closed. We cut to see a little boy interviewed on TV. When the interviewer asks him, “Are you having dreams?” the boy (looking frightened) says yes “dreams about Three Mile Island.” An intertitle announces that this is a Netflix Documentary Series. Throughout the opening indeed, throughout the long four-part series—we hear unrelievedly ominous music.

We see a older man driving, and saying that he has thought about this disaster ever since it happened, and after 40 years, it still rears its ugly head. We cut back to 1979, with famous reporter Walter Cronkite announcing a breakdown at a nuclear power plant in Pennsylvania. We hear other reporters chiming in, one saying that the highways are crowded and the telephone lines jammed. A voice tells us that the accident was the worst American nuclear power plant malfunctions ever to have occurred. Another reporter announces that the plant officials say the accident wasn’t serious, but a man replies that the information given to the general public about the incident was intended “to cover stuff up.”

Cutting back to the reportage of the time, we see emergency vehicles racing through the streets, telling people to go to their homes. But the man’s voice returns, saying that “the world needs to know what happened at Three Mile Island.” We again see the little boy being interviewed, and when he is asked what happens to the nuclear power plant in his dreams, he purses his lips and says dramatically, “It blew up!”

The film cuts to scenes of the aftermath of Hiroshima, and of the Cold War “Duck and Cover” drills. [The viewer can only guess that the footage of Hiroshima and “duck-and-cover” drills shown here is intended to negatively associate nuclear power with nuclear weaponry in the eyes of the audience.] We then get the main intertitle showing the series name and the director. We see a picture of Middletown, where a resident of the time, Nicole Remsburg, tells us that she grew up seeing the TMI plant across from her childhood home. We meet one of the central characters of the series, Rick Parks, a nuclear power operator, telling us that the area was the perfect spot to build the plant, because the Susquehanna River right next to it supplied all the cooling water the plant needed. The plant had two Units (reactors), Unit 1 coming on line in 1974 and Unit 2 in 1978.

We see archival footage of the opening, and resident Joyce Corradi tells us that at the time the cooling towers represented progress. She says that at the time she and her family were happy she ran a daycare and her husband worked for the railroad. Paula Kinney, another resident of the town, tells us that at the time she had “no clue” what nuclear power was. The people were told that nuclear power was going to bring in cheaper energy with no downside, she adds, saying nobody worried about radiation. Another resident of the time, Eric Epstein, said that during the 1970s, when the coal and steel industries were collapsing, this new industry was welcomed. And, he adds as we see archival footage of the 1970s gas shortage nuclear power appeared to be the answer to our energy needs. We cut to an old (1950s) cartoon ad for nuclear power: “This is the power and the promise of the atom.” Parks notes that nuclear power plants appeared to be the promise of tomorrow, and that nobody could have been more pro-nuclear than he was. He points out that the reactor design seemed failsafe, and that a mindset

PROPAGANDA

developed in the nuclear power industry that major accidents were now impossible. But that belief, he says emotionally, was wrong.

An intertitle brings us to 4:00 am on March 28th, 1979. Parks says that early in the morning is a tough time to be working, because the worker struggles to stay awake. Here we see a recreation of the plant operators in the control room “sitting there, fat, dumb, and happy.” But then all the alarms on the control panels started going off simultaneously. For almost an hour, the operators were trying to figure out what the problem was by which time the temperature in the reactor was climbing rapidly, even though the water level gauge indicated that it had full water flow (which should have cooled the core). They shut down the water pump, which Parks noted should never have been done. Parks adds that the operating crew was scared because they had no idea what was going on. [It should be noted that while scenes like this suggests to the that Parks was a technician at TMI since its inception, in fact he only moved there in June 1980 more than a year *after* the accident to be part of the clean-up.

Next, Dick Dubiel, supervisor for radiation protection, is interviewed. He says that Unit 2 had shut down and he was ordered to enter the building. He walked in at about 5:30 am. Dubiel notes that there was no fresh cooling water flowing through the system, to which Parks adds that this meant that the existing water was heating rapidly. Finally, the shift supervisor realized the problem: the relief valve was stuck open, leaking coolant. Nuclear physicist Michio Kaku describes (over a picture of the mechanism) how, with the valve stuck open, water drains from around the core which presents the possibility of a core meltdown.

At 5:58 am, the staff shut the relief valve. But by this time, the core was superheated, and (as Parks tells us) the core began to melt, beginning a chain reaction of melting and heating further. As the film shows the control room apparently spinning around us, we hear that the reactor was in danger of a full melt-down.

We cut to one of the residents mentioned earlier, Remsburg, who says that she was 6 years old at the time. She heard an unusual noise from the plant (which was directly across from her house), but when she was asked about it, was just told to stay calm. Not surprisingly, she was extremely frightened. Back in the reactor control room, it is now 6:57 am. A radiation level alarm goes off, prompting supervisor Dubiel and two workers to go into the fuel handling building, only 200 feet from the reactor containment dome. They looked through the glass window into the room, and saw nothing out of the ordinary, but the radiation detector he carried showed that the unshielded sample line coming out from Unit 2 was dangerously radioactive, and he realized they had a major problem in the unit. We see a reenactment of the men running out of the room. One of the men ran into Unit 2 and had the workers leave the building. Dubiel ran to the office, and called in an emergency.

At 7:24 am, news reports were broadcasted that Unit 2 had had an accident and was shut down. The reports said nobody had been injured, there was no danger to the public, and that the situation was under control. Paul Critchlow, then-Governor Dick Thornburgh’s press secretary reports that that Thornburgh had called him with the news that there was an emergency at TMI. Critchlow said that Thornburgh’s administration had only been in power for about ten weeks, and so they had little awareness that such an accident could occur. The then-Lieutenant-Governor Bill Scranton adds that they had to call Metropolitan Edison to get an explanation of what was happening and what it meant. The administration was told that the situation was stable and this was not anything serious.

At 10:55 am, Critchlow held a press briefing, announcing the accident, and telling the public that it was under control, that the air around the plant was being constantly monitored, and that no radiation had leaked into the surrounding environment. But when the reporters pressed for more information, Bill Dornsife, a nuclear engineer, told the reporters that technicians were sent outdoors to check for leakage, and they found small amounts of radioactive iodine on the ground.

Corradi is interviewed again, and she says that she only learned of the accident from her neighbor, who had a receiver tuned to the police frequency. Kinney adds that the townspeople were told that everything was under control. But, Corradi says, “That’s when we started seeing journalists coming into the community asking questions.” She became suspicious that the authorities are covering up.

Journalist Ira Rosen tells us that he was hired by *Rolling Stone* to report on the accident. He observes that at the time there was already a widespread fear of nuclear power because of the hit movie critical of the industry called *The China Syndrome*, which by incredible coincidence had been released only twelve days before the accident at TMI. We cut to scenes from the movie, one showing alarms going off in the control room of the fictional nuclear power plant, and another where one of the of the



characters explains what “China syndrome” means (a core meltdown so intense that it burns right through the Earth itself). Especially coincidental was a line from the movie that if the China syndrome occurred, it would send out such massive amounts of radioactive waste which would, “Render an area the size of Pennsylvania permanently uninhabitable.” Rosen observes that the fact that the TMI accident occurred precisely in Pennsylvania made people think that it wasn’t purely coincidental. Kaku adds that the movie *Chris Syndrome* was “prophetic” and made people instantly grasp of the concept of a core meltdown. Rosen claims that when the movie was released, the nuclear power industry said that the events portrayed in the film could never happen, “and within 12 days, people found out that it could.”

The film now cuts back to TMI at 1:50 pm, and as the personnel are doing their work, there is a large thud and an alarm starts sounding. At the same time, the narrator notes, there was a pressure spike in the containment building, which immediately dropped back down. The crew didn’t understand what was going on. They ran a check to see if any operating equipment inside the containment building had failed, but the check showed that everything was normal. So, they figured that they shouldn’t worry about it at that point, and returned to their other work.

Within the next hour, radioactive material was getting into the control room. Alarms went off again. Parks adds that the situation was deteriorating. Workers were putting gas masks on because of high airborne contamination. “It was a clusterfuck in the control room” he claims. Parks says that the workers were focused on the question whether the plant was releasing radioactive material to the general public. But they had no ideas. [How he could know that given that he wasn’t there at the time is not explained.

We cut to reportage from the time of the accident showing investigators check radiation levels around the plant, and found the levels elevated but not at harmful levels, except at the main gate. We see Jack Herbein, VP of Metropolitan Edison, asked by a reporter why there was such a delay in notifying the community about the problem at the plant. He denied there was a delay, but the reporter said it had happened at 4 am, yet they were only notified about it at 9 am. Herbein says that the public was not in danger at any point, that inspectors see no dangers at this point, and that company inspectors are using sensitive monitors to check the area’s radiation levels.

Thornburgh called the company’s officials into an urgent meeting, and was told that the plant was indeed releasing radioactive material. When Herbein was asked why he hadn’t told anybody, he said he had never been asked. This indicated to the Governor and his staff that the power company was not a reliable source of information.

At 4:54 pm, Scranton held a press conference, put out as update on the incident. He told the public that the situation was “more complex than the company first led us to believe.” A local reporter told the public that the power company said that this was not a serious accident, but admit that some radioactive materials were released. Middletown’s Mayor Reid told reporters that power company officials told him that there was nothing to be concerned about. But news reports concerning radioactive steam being vented caused alarm among the people, Remsburg and Corradi tell us.

Dubiel reports that in the control room, the technicians had to put their respirators on until the alarm cleared. At 8:00 pm, the radiation readings indicated that they could dispense with the respirators. The staff realized they needed to stabilize the situation, by getting at least one of the cooling pumps working again to cool the core. They tested one of the pumps, and it worked pressures returned to normal.

Throughout the night, crews checked air samples for radiation levels near the plant. We see Metropolitan Edison president Walter Creitz telling the reporters that the tests show low radiation levels and that the plant did not endanger anyone. And he makes the point that in the history of the nuclear power industry, with 72 plants [then] in operation, nobody yet had been hurt. No other technology has a record like that.

We move to day 2 of the incident. Ed Hauser, a supervisor, reports that he got to the plant on the morning of the accident, and was still there 30 hours later. He reports that the crew still didn’t know whether the core was uncovered or damaged. They needed a boron sample. At 8:30 am, they did a check to see if there was enough boron in the system to shut down the system completely.

Hauser and another technician volunteered to suit up and entered the fuel handling building. They silenced the radiation alarms that were sounding, and their radiation detectors indicated a worrisome level of radiation. They poured the sample and it boiled in the cup. They quickly exited, and Hauser showered for hours to get rid of the contaminants. But he had received nearly a hundred times

PROPAGANDA

the dose that was considered safe for a whole week, and he was still contaminated when he got home. He wouldn't touch his kids. At this point in his interview, he was moved to tears. Parks says that there is not telling how much radiation Hauser was exposed to, and (in a colossal understatement) he added that Hauser deserves "a big pat on the back."

The sample showed that the boron concentration was way too low. The plant was not yet in stable condition. The news reported that it was still hot in the plant: "One million more times more radioactive than normal." Corradi remembers that people were sobered by how dangerous it was, but were receiving conflicting information, and so she was convinced that the people were not being told the full truth. Rosen says that by the second day, "people realized the news conferences were bullshit." We cut to the Nuclear Regulatory Commission (NRC) in Washington. Lake Barrett, NRC analyst, tells us that agency's job to monitor the nuclear industry. Barrett says that they were indeed monitoring the situation at TMI, but the chain of information was very imperfect for the first two days. Congress called a quick hearing, with Joseph Hendrie [Chairman of the NRC] testifying. However, as Barrett observes, in the media frenzy, there was a "perfect storm of information being misunderstood and misused." People has all seen the movie *China Syndrome*, and asked how close we came to it which was not the reality here, Barrett notes but the nuclear industry faced getting a black eye from this incident.

At 10:00 pm, press secretary Critchlow tells us, he received a call from an NRC inspector who wanted to remain anonymous that he had been given "slightly misleading" information about what was happening in the plant. The NRC inspector said that, "Things are much worse than you have been led to believe." There was more serious core damage, which could have long term consequences. The inspector then hung up. The Governor's team began to doubt that the NRC was being truthful.

We move to day 3. A news report from the time says that the plant operators and the NRC inspectors were now reporting that the radiation in the plant was quite high, and that there was a continuing release of radioactive gases. NRC team in a van was continuously testing air, water and vegetation samples from the area for radioactivity levels. There was an increase in radiation escaping to the outside "it wasn't a lot, but enough to be concerned about," according to Barrett. Another news report quotes Pennsylvania officials that the radiation levels outside the plant are at the level of a single X-ray, which means that there was no need to evacuate the town. Barrett says that is was the NRC's job to determine if and when to evacuate the area around the plant. He calculated that a level of 1,200 millirem per hour outside the plant would indicate that the town should be evacuated.

At 8:01 am, a helicopter 130 feet above the stacks showed radiation readings as high as 1,200 millirem. The Governor and his staff started to consider evacuation, which (as the film rightly notes) is a dangerous thing to do people can die in accidents and looting can occur. People within ten miles of TMI were put on alert about a possible evacuation. The authorities gave out contradictory information, and confused the people around the plant. Thornburgh asked the NRC whether he should order an evacuation, but the agency was conflicted as well. Kaku says that all the authorities were playing Russian roulette with the people. The first episode ends here.

Series Episode 2: Women and Children First

Episode 2 opens with Governor Thornburgh ordering an evacuation, as we see "Day 3" on-screen. We see buses taking out people. Remsburg says again that she remembers being scared, as she looked out at jammed streets and seeing men in white suits (i.e., protective gear) all this with dramatic music in the background.

After an intertitle telling us that the this is *Meltdown* episode 2, we cut back to see people entering shelters, and people within a ten-mile radius being told to stay indoors indefinitely. Scranton says that Thornburgh made it clear that this preparation to evacuate was only precautionary, but it caused the very thing they were trying to avoid: panic. Corradi reports that she grabbed her kids and took them to her mother's house. She recalls wondering what to take with them she took her children's birth certificates, so that in case they were separated, she could prove that they were her children. She breaks out in tears as she describes her thoughts upon leaving them. Kinney says that when her kids came home, she didn't want to panic them, so she told them were going to their grandparent's home for a short vacation. But she wanted to get them away from this "monster." Again, we see scenes of crowded streets and honking horns.

In fact, half of the residents of Middletown left before any evacuation was ordered. The police imposed a curfew to curtail looting. A news report of the time says that it was obvious that the accident was far more serious than the public was led to believe. Remsburg says that she really didn't understand



what was going on when her parents decided to evacuate, only that she wondered if they would ever return. She also recalls seeing people in their vehicles and walking on the streets and realizing how afraid they were.

We cut to a news report saying that above the towers there was 3,000 times the level of radiation of a nuclear reactor in normal operation. Kinney tells us that a radioactive plume was headed in the same direction towards which they were all evacuating. She recalls feeling like a leper when they reached her parents' house and had to remove and wash their clothes, shower, and put on clean clothes to get rid of any contaminants. Reporter Walter Cronkite tells us that peoples' questions and confusions "clouded the atmosphere like atomic particles." Cronkite, Kinney says, shocked viewers by reporting that something like this could afflict their town.

Scranton observes that managing the flow of information was hard, with rumors flying and conflicting sources of information. The Pennsylvania state administration called upon President Carter to help. Jessica Mathews of the Office of Global Issues said that Carter felt the situation required one person to manage the situation on the ground. Carter had been a nuclear engineer in the Navy, and as Cronkite reported, he had led a team of technicians into the core of a reactor that had melted down, and spent a minute and a half dismantling that reactor. Carter felt comfortable with nuclear reactor technology. Thornburg announced that Carter was sending his personal representative, Harold Denton, Chief Operations Officer of the NRC, to work with the Governor's staff and that of Metropolitan Edison to monitor everything and keep the public informed. Parks says that Denton was considered in the NRC to be "one of the more knowledgeable people on site."

Denton announced publicly that he was concerned about the status of the reactor fuel and the presence of a bubble in the reactor vessel. Scranton tells us that Denton told the Governor's staff that this hydrogen bubble could explode if not dealt with. Scranton adds that for the first time since the beginning of the accident he became scared. We see Cronkite showing the public a picture of the reactor vessel with gas at the top. Kaku adds that this was a new and dangerous development, noting that this is what caused the explosion at Chernobyl. Kinney says that there was a great chance that the citizens were going to lose everything they ever worked for.

We watch a group of people watching a report on TV where a man telling them that the result of a massive meltdown would be "tens of thousands of deaths and hundreds of thousands of cancers." The people in the room are clearly deeply frightened, and we see some of them hold hands. The TV report has a reply by the eminent nuclear physicist Dr. Ralph Lapp to the man's claim Lapp being a strong proponent of nuclear power but the documentary amazingly and disappointingly cuts Lapp off so we never get to hear what he said. Instead, we see former resident Corradi tell us that she was extremely frightened because "There was no place in Central Pennsylvania that was safe." She adds that these chances of surviving even 40 miles away were at risk. The film thus presents Corradi's analysis even though she is no expert instead of Dr. Lapp's who was indeed an expert.] Parks adds that everybody was afraid of nuclear power when they heard about the hydrogen bubble blowing up the reactor. He states that the company and the NRC "blew it" when it came to communicating with the public, letting them "live in fear while they tried to decide what to do."

With ominous music in the background, an intertitle reads "Day 4." Scranton says that that day a Saturday the worry was whether the hydrogen would explode. They had to wait while the engineers tried to figure out what to do. Again, we hear news reports about a possible 45 thousand people killed and 250,000 injured. Barrett of the NRC said that there were conflicting stories about what to do. Critchlow recalls a news broadcast that said the hydrogen bubble was becoming dangerously explosive. NRC Chairman Hendrie said that it might be prudent to evacuate people from the area. Panic ensued. A call was put in to Carter to see if he was recommending a general evacuation. Carter decided to visit the plant himself to calm the public and the news media down.

"Day 5" opens with a protest offering a prayer for the safety of the community. Carter arrived with his wife with the clear aim of showing the public that there was nothing to fear, and (more broadly) that nuclear power was generally safe.

After Carter reviewed the site and left, Denton's staff went over their calculations again. Scranton tells us that they found a mistake in the math, and discovered that the bubble did not pose a major risk. Scranton was relieved that the immediate crisis was over. Carter wisely appointed an independent commission of experts to discover what caused this accident and how to improve the safety of nuclear energy going forward.

PROPAGANDA

But in the meantime, plant operators had to vent the hydrogen gas, releasing excess radiation into the environment. Now the public started to worry about how much cancer this would cause later on. The Governor pointed out that despite the anxiety over the prior seven days, at no time did the wide variety of tests being conducted showed no sign of dangerous levels of contamination.

Resident Eric Epstein says that the industry was in a rush to exonerate itself. But “our best measurement tool, unfortunately, are human beings.” He adds that some of the monitors were not capable of measuring the real amount of radiation released. [Epstein offers no evidence for or explanation of these claims.] Neurobiologist George Wald tells us that any amount of radiation, no matter how small, is harmful. Kaku adds that we just don’t have the data to say how much radiation was exposed to. We hear a reporter say that small doses of radioactive iodine were discovered in samples of milk. Waste water from the plant also contained amounts of radioactive iodine. Remsburg recalls going to the river to skip stones, and seeing massive numbers of dead fish suggesting to her that something toxic had been put into the water.

After ten days, Thornburgh allowed everyone to return, including pregnant women, and allowed the schools to reopen. But people were deeply suspicious. One man reported that on some days you could taste a metallic taste in your mouth. Another man said everyone suffered from sore throats. Corradi tells us that her son threw up some green-colored mucus. A woman reports seeing a girl who had ridden her bike develop skin lesions. Epstein claims that residents suffered all the side effects of radiation poisoning.

People started handing out literature on the long-term risks of radiation exposure. And some demonstrations broke out. Corradi says pressure grew to shut down TMI and even all nuclear power plants. She started going to community meetings. The NRC officials reported that the exposure to radiation the residents experienced was minor, but the residents didn’t believe it. Kinney says that the NRC kept giving contradictory answers to the same questions. She tells us emotionally that she concluded then that the NRC was either lying or they did not know what they were doing.

Stoking the fear, anger, and demonstrations was Jane Fonda, eager to blame it all on “utility executives whose main goal is to maximize profits.” She told the crowd at one demonstration that unless we shut down nuclear power, we will continue to see a rise in the epidemic of cancer in this country. Kinney said that all of this made her an activist, too. Dick Gregory, another celebrity/activist of the time, said that nuclear power was a bigger threat than war, hunger, or racism.

We move to October, 1979 six months after the accident when the special commission Carter had set up to investigate the accident issued its report. At the hearing called to review the report, all the men who were on the control room on the first day of the accident were asked to explain what they had done incorrectly, such as turning of the cooling pump to the core. Barrett notes that while we normally rely on operators to fix problems, in this case well-meaning operators had done things detrimental to the core. They were in a situation for which they had never trained, and “there were many cases of miscommunication and misunderstanding.” Denton adds that on of the six things that went wrong, four and a half were operator errors. One was an equipment malfunction, and one (perhaps) a design error.

Walter Cronkite reported that there had been cases before of pressure valve failures that should have warned of possible failures to come. NRC inspector Jim Cresswell said that there was a culture in the nuclear power industry that these plants were all safe, but he had not long earlier investigated a plant in Ohio that came close to suffering the same fate as TMI. He had reported early his concerns with safety valve issues at these plants (all built by Babcock & Wilson Company). Six days before the accident, he wrote a memo for the NRC about this sort of problem by the NRC responded that this sort of failure was not likely. The accident was preventable, but nobody listened.

Anti-nuclear activist Epstein, echoing Fonda, said there is no culture of safety at the NRC and in the industry, but only one of the “bottom line” (i.e., profit). [Parenthetically, neither Epstein nor Fonda explains how the far worse accident at Chernobyl which, unlike TMI, actually killed people could have occurred in a Marxist regime where profit was not pursued. Epstein concludes that the committee report was a “whitewash.”

Carter’s conclusion was different. The commission uncovered problems in the industry, which called for more regulation and inspection. But we as a nation needed this source of power. However, Corradi and other angry citizens were not to be placated. They were convinced that the problem of leaking radiation was still there.



We move forward to July 1982, three years after the accident. As Parks notes, up till then people did not know how damaged the core was. But the crew was now going to take a look at it. Parks says they sent in radiation monitoring equipment together with a camera into the core containment vessel to survey the damage. They discovered that there was more damage than people had thought the upper half of the core had just collapsed in on itself. Kaku says that “we came within maybe 30 minutes of catastrophe” namely, a steam explosion blowing the reactor apart. We cut to a completely distraught Kinney saying “Dear God.” The second episode ends with Parks saying that little did they know that there was a development “potentially more dangerous than the accident.”

Series Episode 3: *The Whistleblower*

The episode opens with Parks saying that he had never been so scared. We see him walking around his house with a gun in his hand. He was convinced that the TMI plant still formed a serious threat.

We see the title shown again. Then Parks appears again, saying that when he got his draft notice, the only program that he could get into was the Navy’s nuclear power program. Since he had never gone to college, he had to work intensely to complete the training. He speaks highly of Admiral Hyman Rickover, the “father” of the Navy’s nuclear power program. He put a premium on safety and his trainees were taught the motto: “Be Responsible.”

We cut back to the year after the accident. The fight was raging over nuclear power. But Parks tells us that he believed strongly in the promise of nuclear energy, so he volunteered to be part of the cleanup at TMI. He wanted to help make the future of nuclear power safe. Tragically, just three weeks before reporting for work at TMI, his wife died on an auto accident. In June of 1980, he moved with his two sons to TMI. Bechtel Company was selected to do the cleanup. It was the largest privately-owned construction company in the world, and had been involved in nuclear energy from the start. Parks adds that Bechtel was very politically well-connected. [He offers no evidence for this claim.] It fell to them to do the work. By then the Reagan Administration was in charge.

We meet Lake Barrett, an experienced nuclear engineer who the NRC put in charge of monitoring the clean-up. Barrett thus worked for the Federal government (the NRC), not Bechtel.

The first thing Bechtel had to do was vent off the hydrogen bubble. This led to the citizens becoming alarmed, fearing further exposure. Barrett says that he didn’t have the patience to deal with people’s emotional and irrational fears. He respected the people, but felt that they were being manipulated by scare stories in the news.

Parks tells us that the accident put the entire industry in jeopardy, so the push was on to get the repair job done quickly. He claims that Bechtel cut corners to do just that. The clean-up work dragged on, over-budget and behind schedule. Met-Ed set up a set of steps Bechtel had to reach before getting more money. A new man, Larry King, was brought in as director of the clean-up. King says that he did not hit it off with Bechtel.

Parks and King discovered that rather than put in a whole new crane to raise the core the “polar crane” to replace the existing one, Bechtel kept the old one, and “jury-rigged” fixes to it. They had not told Parks and King what they had done or who had inspected it. Parks explains that there was over a thousand pounds of highly radioactive materials in the reactor vessel, and if something went wrong lifting that vessel head, it could have been a disaster possibly a China syndrome. (We see a mock-up of such a crane failure on screen).

Meanwhile, the owners of TMI wanted to restart the undamaged reactor unit 1. This aroused instant anger in the people, even though no accident had occurred in unit 1 it had been shut down only as a precaution. Kinney says she opposed it because she didn’t want her children to be exposed to more contaminants. [She never explains why that would happen. Corradi says the same thing, crying emotionally as we watch close-ups of her face.

At about this time, Parks was dating Remsburg’s mother, and he came to view the townspeople as good people. [The film gives the impression that Remsburg’s mother Betty eventually married Parks, but in fact they never married they broke up shortly before he went public with his concerns.

When Bechtel decided to move ahead with using the old polar crane, Parks prepares a memorandum saying that the polar crane was unsafe. But Barrett, after hearing Parks concerns, felt that they had no real merit. He decided to allow Bechtel to move ahead i.e., to refurbish and reuse the polar crane. Parks tells us Barrett was saying he didn’t care about safety-rules. Barrett responds that he let Parks speak his piece, but Barrett analyzed what he had to say and rejected it: “I was satisfied that that

PROPAGANDA

crane was safe enough.” He adds that he was not saying that was zero risk of problems, but only acceptable risk.

Here the film descends into “he said, she said.” Parks alleges that Barrett deliberately told Bechtel that he had called the NRC, Barrett categorically denies it adding that TMI was a small place, and people’s actions would inevitably become common knowledge.

But we cut to Parks testifying that if the chief inspector the NRC is playing “patty-cake” with the utility and letting them engage in risky operations, how can you trust the NRC? King adds that having the NRC watch the nuclear power industry is like having the proverbial fox watch the henhouse. King refused to sign off on the use of the crane, so (he says) Bechtel fired him. Parks at the suggestion of King decided to “blow the whistle” by calling the NRC.

Parks days that the next day, he found that someone had placed a bag of marijuana in his toolbox in his van. He flushed it down the toilet and drove to work. On his way in, the security guards checked his car something they had never done before. [Parks doesn’t tell us whether the guards searched his toolbox, which they would have done if they were part of a plot to incriminate him.] Upon entering the work site, he found that Bechtel had removed him from all input on the polar crane issue.

We move to March 17, 1983, five days before the polar crane lift. We meet Billie Garde, of the “Government Accounting Project” (hereafter “GAP”). She recounts getting a call from someone who refused to identify himself. He said he had “issues” with a nuclear power plant which he refused to identify and he needed help. She told him that GAP was a “whistleblower advocacy” group, and she persuaded him that if there were major issues, she was willing to meet him that night. They agreed to meet at a bar. She showed up and sat next to the man of course, Parks who at first didn’t talk. Parks says meeting her was his first contact with the organization, and he was wary of giving what could be an anti-nuclear group information that would “slap the nuclear industry around.” Parks does not tell us how he first heard of the group and got their contact information.

But when he learned that she, too, had been a whistleblower, he felt respect for her, and he showed her diagrams of the TMI plant and told her what the issue was whether the polar crane, which was supposed to have been inspected, had survived years in a highly radioactive environment and would still function. Garde says that Parks showed her the “proof” that there was a major risk, that management knew all about it, but were going to proceed anyway. [The film does not tell us Garde’s background in nuclear engineering that enabled her to see what if anything the diagrams proved.] Looking at the diagrams he brought, she said that she thought that someone would surely go to prison for this apparently reckless disregard of safety. Parks says that he told her that “if we screw this up, we won’t have a second chance.” She says that the NRC commissioners were going to vote the next week on whether to allow the clean-up to go forward, and he needed to go public. Parks tells us he knew that this would make him enemies who would want revenge. She adds that half of all the nuclear power workers she talked to that they didn’t want to wind up like “Karen Silkwood.”

Here we cut to 1974, in Crescent, Oklahoma. We hear a news reporter tell us that Silkwood had worked as a lab technician at Kerr-McGee nuclear fuel facility there. Garde tells us that Silkwood had been reporting issues about the company’s failure to maintain a safe working environment. We go back to the news report about Silkwood’s death in a controversial car crash when she was on her way to talk to reporters about her concerns. Parks opines that Silkwood had had concerns about excess radiation, and when she was going to meet a reporter to document her allegations, she died in a “single-car wreck.”

We cut back to a 1974 report that Silkwood had traces of plutonium in her blood. The report raises the suspicion that the car was run off the road, and the documents supposedly proving her claims mysteriously disappeared. Parks says it makes one wonder. We cut back to a report from the time saying that whether Silkwood was murdered or not, her death was fuel for the controversy about the safety of nuclear power. Parks adds that many people have been intimidated by the nuclear power industry, and that “it can cost you your life.” Garde adds that the Silkwood case, still being litigated, created a “culture of fear.” Neither Parks nor Garde offer any evidence for these claims.

Parenthetically, as with the footage of atomic bombs and the “duck-and-cover” drills from the Cold War era, the viewer wonders why the material on the Silkwood case was dragged in to this quite separate case, other than to associate the two cases in the viewers emotions thus priming the audience to see nuclear power companies as being so profoundly evil that they willing to murder their employees if those employees pose a threat to the industry’s image. And, if the producers felt so strongly about the relevance of the Silkwood case, why did they need to give us such a tendentious account? For example,



the Netflix producers nowhere mention that both the Oklahoma State Police and the FBI ruled that the car crash was caused by Silkwood having fallen asleep, and that the autopsy indicated that Silkwood had taken a large dose of quaaludes (a sleep-inducing drug) before the drive.

We now move to March 18, 1983, four days before the polar crane lift. Parks was now willing to talk to Tom Devine, legal director at GAP. Devine appears, telling us that while GAP defended about 8,000 whistleblowers, this case was exceptional because the stakes were higher. Devine repeats the that if the polar crane malfunction, it could cause a meltdown that would completely destroy Philadelphia, New York City, and Washington, D.C. The East Coast might be rendered uninhabitable indefinitely. Parks and the legal staff at GAP prepare an affidavit to present to the NRC. Devine tells us that he wanted Parks to present this to the public, but Parks demurred, since it would be the death of the nuclear power industry which he still supported. And Devine adds that going public would permanently end Parks' career in the industry. Devine says that Bechtel and General Public Utilities would stop at nothing to silence him.

Parks says that his girlfriend Betty ("B") wanted him to stay silent and just quit. Remsburg, Betty's daughter, ruefully reports that this dispute put pressure on the family. Parks then reports returning with his sons to his apartment, and found that it had been broken into and his papers rifled through, though nothing of value was taken making it seem obvious to him that someone was after his documentation which he had left with Devine. He understood this to be an implicit threat on his sons' lives. Parks tells us that made "them" (apparently Bechtel and GPU) enemies for life, because threatening his children are "a step too far." With police sirens in the background, we see him walking through his apartment, pistol in hand, prepared to kill to protect his children. The episode ends with Parks saying that this all made him determined to go public.

Series Episode 4: *Fallout*

The episode opens with police cars outside of Parks' house March 20, 1983, two days before the polar crane lift. Parks tells us that he took the break-in to mean that Bechtel was telling him to back down or they were going after him. Devine says that he got a call from Parks telling him about the break-in, and Devine thought there would be a "credibility problem with the local police Parks wasn't sure he could trust them. So, Devine asked the FBI to come out. Garde says that GAP knows that whistleblowers from the nuclear industry are always in danger, but when Parks was bringing out his accusations about the polar crane, other information about "possible criminal misconduct" at TMI came out as well. She alleges that there was evidence that the whole TMI story going back to the accident was a "massive cover-up by the company and the NRC."

We see Parks talking to the FBI, and he says that when he asked them whether he should get his boys out of town, the agents told him that considering what he was going to say about the situation, he should move his children away. Parks said that this convinced him he was in danger. We now see the series title again onscreen.

We open with Parks telling us while that going public with his worries about the polar crane was difficult, he could never have lived with himself if he failed to speak out and there was an accident caused by the machinery. We see his girlfriend B (Remsburg's mother) packing to leave, because [he says] that she felt that if he went public with his accusations, they would all be murdered including her daughter and his two sons. Remsburg notes that her mother moved with her to another city. Parks adds that one has to live with the consequences of one's decisions, and he did.

We move to March 22, 1983 the day of the polar crane lift. Garde says she hand-delivered Parks' affidavit to the NRC before the vote. Simultaneously, Devine held a press conference with Parks, publicly charges Bechtel and GPU with harassed after he revealed "massive quality assurance violations." Devine says that Bechtel knew Parks would expose the chance of a "full meltdown that could take out the East Coast." [He offers no evidence for this claim. The companies held their own press conference to rebut Parks allegations. We see Parks again say he knew what he was revealing would be the "death knell" of the nuclear power industry, although in his press conference revealing his accusations, he again said that he supported nuclear power, but not the way TMI was being managed.

The NRC commission voted to not allow the polar crane to be used. Parks says he stopped them in their tracks. We see Parks interviewed after the NRC decision, saying again that he had gone to the NRC when he perceived a threat, and said Lake Barrett told him that they found nothing wrong with the polar crane. Barrett tells us he didn't listen to the news conference, and didn't know Parks was being a whistleblower. Barrett insists "we dealt with public health and safety to get that clean-up done."

PROPAGANDA

Parks tells us that after a Congressional investigation was ordered, he moved to an undisclosed location, because “management was pissed,” and laid off a number of workers, blaming it on his “bullshit allegations.” The clean-up was halted pending the outcome of the investigation. [Parks here insinuates that management was deliberately punishing innocent workers, but he does not explain why his allegations, which he proudly boasts halted the use of the polar crane and hence halted the clean-up, should *not* have led to the lay-offs of workers.

We move to April 1983, four years after the accident. We now hear from Joanne Doroshow, lead counsel for “TMI alert.” She says that the Congressional commission basically concluded that while TMI was the worst accident in the history of American nuclear power, that nobody died so “let’s move on.” She doesn’t explain why that conclusion of a Congressional hearing was in fact wrong. But Met-Ed was charged with a pattern of criminal conduct, including falsifying reports so that the reactor would not have to be shut down. Doroshow says that the company management was from the very beginning of the plant’s operation “falsifying critical leak data and destroyed documents” to keep the plant in operation, when it should have been shut down. We see a news report from the time saying that the damaged valve that started the accident was probably damaged by the leak which management hid from government regulators. The company’s cover-up “set the stage for disaster,” the news report concludes.

Barrett, back on screen, said he didn’t know much about that report, so he couldn’t comment. [The film doesn’t explain why Barrett *should* have known about the report, since he only moved to TMI *the year after* the accident, and he was with the NRC, i.e., was a federal regulator, not an employee of any of the companies involved. Moreover, this allegation about the company’s malfeasance at the start of the accident does not bear upon the issue of whether the polar crane was unsafe which was Parks’ dispute with Barrett.

We cut back to Doroshow, saying that the US Attorney bringing charges against the company also criticized the NRC itself. She adds that “nobody there made the slightest effort to get to the bottom of all this.” We hear a reporter say that the NRC is unable to deliver any assurance of safety in the industry. Parks tells us that the NRC allowed the companies “to get away with it.” He adds that a company shouldn’t destroy or alter documents, interpret the rules the it wants, and operate a nuclear plant in violation of the law. [Parks doesn’t tell us whether he thinks that the NRC knew about this company malfeasance at the time of the accident.

Doroshow claims that the worst malfeasance that put people in “extreme peril” was that the company intentionally hid on the first day of the accident. At 1:15 pm, he says, there was a loud thud that everyone heard and felt (we see this portrayed in the film). Barrett explains that the operators had let some hydrogen vent, and it ignited like when you light a match to your barbeque after turning on the gas. It was thus a burn, not an explosion. Parks says it was and explosion hydrogen explodes, he avers, and point to a slightly melted phone that was in the room. [But Parks doesn’t explain why that isn’t equally consistent with a vent burn such as suggested by Barrett.

Garde tells us that based upon what we now know, the control room knew about the hydrogen ignition the day it happened, and again tells us that we were close to a release of radioactive material that would have contaminated all of Central Pennsylvania. But she contends a lawyer for the company got the officials to change their story, and say that they didn’t know. [The film doesn’t name this lawyer, much less interview him.

Dubiel says that while they may have known about the hydrogen burn, he didn’t. Barrett says that some specialists including himself who later heard about what happened knew exactly what it was, but it didn’t get into the “analysis system” to the right people in the control room to understand it. Doroshow says that in the middle of the accident, the company insisted on downplaying it. We see clips from that time with Herbein (VP of Met-Ed) said that if there was a danger, the NRC would take action, and Hendrie (Chairman of the NRC) saying he doubted there was melting of the core. Doroshow says that “early on,” a lot of people testified to investigators that they knew what the hydrogen “explosion” meant: that the core was melting, and could release a major amount of radioactive material. But, she says, nobody told the Governor. “The danger was potentially lethal amounts of radiation the first day,” she claims, “while children were going to school and people were tending to their farms.” Their lives were in peril, but nobody told them. The authorities didn’t believe that the danger was great enough to justify evacuating Middletown, but they should have done so.



We move to July 24, 1984, the day of the polar crane lift. Parks tells us that by this time he'd been fired already. He says that when they tested the crane, it worked, but when they tried to lift the vessel, it "failed." Devine adds that the crane had frozen at several points, even though it had been refurbished along the way. But had it been tried a year earlier it could have been a disaster. [He does not explain why.] When it worked, Devine says he had a "cosmic sigh of relief."

Parks reappears and says "This is why you don't take shortcuts in the nuclear industry." [He doesn't make clear what "this" refers to—the crane, after all, did in fact work.] He adds that Bob Arnold resigned because of "questionable integrity of management," and that Barrett also resigned. However, Barrett tells us in no uncertain terms that he did *not* resign. He had asked to be reassigned so that his son could go to high school in Maryland, not because of any of these events. [The film doesn't interview Arnold.

We move to May 1985, six years after the accident. GPU was asking the NRC to allow the undamaged reactor, Unit 1, to restart generating power. The company had refurbished the piping in the plant, updated the monitoring equipment, and retrained the workers. Doroshov tells us in the background that even after the NRC were doing everything possible to restart the undamaged reactor, "out of fears this accident had killed the industry." We cut to a news report from that time that residents were objecting to reopening Unit 1. Kinney says in the background that "we" knew that the company lied and the danger they all faced, so the residents who opposed TMI would do everything they could to keep it closed. Corradi adds that "we" should have been assured that the company could not restart operations.

Epstein, chairman of "TMI Alert," an organization opposed to all nuclear power, said the push to reopen the plant was a historical turning point the restart of TMI would "signal the survival" of the American nuclear power industry. The industry "pulled out all the stops," bringing in Admiral Rickover [who created the "Nuclear Navy". Rickover said that TMI Unit 1 was safe to restart. Epstein says the opponents were confident that the evidence showed that nuclear power was unsafe, especially in the hands of "felons" like the operators at TMI. [Epstein doesn't identify who if anybody was ever convicted of a felony in this accident.

However, on May 29, 1985, the NRC commission voted almost unanimously to reopen Unit 1 (while some people in the audience shouted angrily that the commissioners were "Nazi murderers"). Barrett tells us that the Unit 2 accident had traumatized the local populace, so it was natural that they would be emotional about Unit 1 restarting. But there had been an expensive multi-year process to ensure that it would be safe to restart. Yet to Kinney and Corradi, it was an outrage. Corradi says it made the opponents of nuclear power felt like they didn't count. Epstein adds that Rickover's educational foundation received \$380,000 from GPU implying that his endorsement was bought and that Rickover was senile when he made the endorsement. Despite the opposition, Unit 1 went back on line in 1985.

As a sidebar, it is worth noting here that since Rickover died in 1986, he could not replay to these accusations. The film does not bother to present testimony from officials at GPU, such as its chairman William G. Kuhns. Nor does it present testimony from Joann P. DiGennaro, who was the administrator of Rickover's foundation at the time. In fact, both Kuhns and DiGennaro denied emphatically that Rickover was senile (Molotsky 1986).

The film now cuts to Parks driving in a pickup truck, saying that after he left TMI, he relocated far away, but he has never forgotten it, and it still troubles him. He claims that the NRC sold everyone out, and the residents are still dealing with the "fallout," an ambiguous word that can mean nuclear materials ejected from a site, or merely the effects of some event.

Arnie Gunderson, nuclear engineer, tells us that we will never know how much radiation was released—a lot of data was never subjected to proper scientific analysis. Parks asserts that most of the radiation was released during the first three days, but TMI had no high-level radiation detection equipment, so it was a "wild-ass guess" how much radiation was released. Kinney claims that the State had promised to do a follow-up health study of people living whether a 5-mile radius of the plant, but (now Corradi chimes in) as the study went on, "we" (presumably Kinney and Corradi) were never contacted. Kinney talked to an unnamed friend working with the study team, and this friend told Kinney that Kinney and Corradi were not within the 5-mile radius which Corradi claims is simply false. Corradi doesn't say why she and Kinney were excluded, but the viewer is left to conclude it was because they had become critics of nuclear power.

PROPAGANDA

Houser reappears, and reports that he was monitored for any adverse effects of the dose he received for a number of years, but he suffered no long-term effects. We see a news report from around 1985 by George Tokuhata of the Pennsylvania Department of Health that a study of residents within a 20-mile radius of TMI showed no abnormal growth in the incidence of cancer. But Epstein immediately dismisses that report, claiming that the Department of Health was just trying to “exonerate” the company and that no intelligent person would conclude there were no negative impacts of the accident so soon after it occurred (6 years). [Epstein gives no evidence that the Pennsylvania Department of Health or George Tokuhata were in collusion with the company in any way. He adds that there is a latency period for radiogenic cancer, and he says that he worries constantly about whether he will get cancer from the accident which occurred 43 years ago. [The film does not report any of the much later medical studies conducted.

Kinney reports that her husband was diagnosed with Hashimoto’s disease [an autoimmune disorder affecting the thyroid gland] after the accident, and his doctor asked if he had lived near TMI insinuating a causal link with radiation there. Kinney says that she thought her children were “doomed.” The film does not note that Hashimoto’s disease afflicts 14 million Americans, the vast majority of whom have not been exposed to abnormal amounts of radiation. She adds that her youngest daughter developed a fibroid cancer “recently” meaning presumably *four decades* after the accident. Corradi chimes in that she suffered from cancer herself, as did her granddaughter. [The film does not mention that over 600,000 Americans die from cancer every year, the vast majority of whom were not exposed to abnormal amounts of radiation.] Barrett says that he believes these are good people and sincerely believe their ailments are caused by the radiation released from the accident, but he doesn’t believe they are correct. The film doesn’t give his explanation for his belief.

Gunderson cites a study purporting to show higher rates of cancer around TMI where the radiation was supposed to be (i.e., in areas downwind from TMI) as opposed to where it wasn’t. Barrett observes that while you can find people who will attribute individual cases of cancer to TMI, it is scientifically worthless. But then Remsburg notes that she suffered from lymphoma, and Parks tells us with confidence that this was caused by the radiation she was exposed to as a child. [The film does not note that about 90,000 Americans are diagnosed with lymphoma every year in America, the vast majority of whom have not been exposed to abnormal amounts of radiation.] Parks also reports that he suffered from throat cancer, which he attributes to radiation exposure, but he admits he was a smoker, too. He tells us that this is why the NRC “gets away with everything.”

Gunderson appears again to tell us that TMI released an “enormous amount of radiation” too many people have experienced too many symptoms to ignore. The film doesn’t explain how he knows that TMI released an “enormous” amount of radiation, especially in the face of his prior assertion that the data here have never been subjected to proper scientific analysis.

We see an emotional scene of Parks embracing Remsburg, and saying he is sorry her mother had passed away. Remsburg tells us that his reaching out to her made her think that it was time to tell their story. He tells Remsburg that he and her mom broke up with her mom because she feared the consequences of his going public, and that he felt he had to speak out. He adds that his blowing the whistle destroyed his life. [He doesn’t explain how or why it did.

We then see images of the Fukushima disaster in 2011, and the message is again that nuclear power is not safe. [The film nowhere mentions that the Fukushima disaster, was not caused by a design flaw or operator error, or even by the massive earthquake that occurred measuring 9.0 on the Richter scale but by the tsunami that followed.

The film then notes that in 2019, the TMI plant (meaning Unit 1, which had resumed operations in 1985) finally closed because other sources of power were cheaper [meaning natural gas produced by fracking]. But, the film adds, it will take decades for the “cleanup” to finish. Parks tells us that he still believes in the “promise” of nuclear power, but we must “take the profit motive out of it.” He concludes the film by saying that he would blow the whistle again, even if it totally destroyed the industry. The film notes that since the accident in 1979, only two new nuclear power plants have been licensed in the US, but neither have opened. The film’s producers asked Met-Ed and the NRC whether they wanted to comment on whether they wanted to comment on whether the company intentionally withheld information about the accident at the time it occurred. First Energy (the company that now owns Met-Ed) declined to comment. The NRC, remember, a Federal agency, not a for-profit company replied that



its comments at the time were based upon its own analysis of the best information then available. Here the film ends. We should note several disappointing and disquieting things about this episode:

- While Parks says he favors nuclear power if the profit motive can be taken out of it, he doesn't explain how the far more serious disaster at Chernobyl, where many people actually died unlike at TMI and even Fukushima, where nobody died happened, in a Marxist economy that rejected the profit motive.
- Concerning Parks, the film does a kind of bait-and-switch regarding his whistle-blowing. What led him to blow the whistle was his concern that the polar crane would fail when used, and that could lead to a complete meltdown that would render the East Coast uninhabitable. But after we learn that his affidavit succeeded in getting the NRC to temporarily halt the use of the crane, the film shifts its criticism to the company covering up radioactive leakage data to begin with (i.e., at the time of the accident), and its alleged violation of regulations that led to the accident. Only later does the film reveal that the crane was indeed eventually used with no accidents occurring. The East Coast is still habitable.
- Again, concerning Parks, he contends that the NRC official in charge Lake Barrett ignored his concerns about defects in the polar crane. Barrett contends that Parks gave no real reason to think that the polar crane would fail, only that the procedures that would be followed in the process of making the crane ready for use. Both Parks and Barrett were alive at the time of the filming of the series so why didn't the film put the two of them side-by-side to debate Park's allegations?
- The film doesn't note that TMI's Unit 1 first started operations in 1974, was shut down temporarily after the accident in 1979, and reopened in 1985. It kept producing power until late 2019. In 2018, the last full year of production, it produced 7,355 GWh of electricity, or about 4% of Pennsylvania's total electric power. Unit 1 thus operated for nearly *four decades*, with no accidents. It could have produced power for another 15 years, but the drop in natural gas prices brought by fracking operations made the cost of its continued operation not financially worthwhile.
- The film is correct that since the accident, no *new* nuclear power plants have opened. But the older plants still produce 18.2% of all American electricity generation, only slightly less than coal, which produces 19.5% of the total. (Natural-gas-powered plants produce 39.8%). Nuclear power *still* out-produces wind power, which accounts for only 10.2% of America's electricity. And nuclear power dwarfs into insignificance solar power, which produces only a meager 3.4% of America's electricity (EIA 2023). In other words, despite the massive state and federal subsidies of wind and solar power, our existing nuclear power plants produce *nearly double* what wind power produces, and *more than five times* what solar power generates.
- The film presents the views of those including Parks, King, Garde, Epstein, Devine, and Doroshov who accuse the nuclear power industry generally of malfeasance, indeed, even criminality on a scale of an organized crime syndicate willing to outright murder its critics. Actually, the nuclear power industry is portrayed as *worse than* organized crime, since mobsters kill their opponents, but generally leave wives and children alone, whereas the nuclear power companies are presented as willing to deliberately target the wives and young children of its critics. However, the film presents no evidence for these outlandish nay, paranoid claims. It doesn't bother to present *any* opposing voices neither from the companies criticized in the film (GPU, Met-Ed, First Energy, Kerr-McKee, and Bechtel), nor from any of the police, FBI agents, and regulators from the NRC other than Barrett, who is presented as villainous. Specifically, Parks alleges that an FBI agent told him that he should move his children to a safer community. Why doesn't the film identify this agent and interview him? And why doesn't it interrogate Parks, and ask him why he would think that moving his kids to Texas or anywhere else would keep them safe from contract killers hired by a nuclear power company? Hit men can go anywhere, no? Scant evidence is given for any of these conspiracy theory claims; instead, they are taken as Gospel in the film. This is hardly what one would expect from a "documentary."
- Arnie Gunderson is nowhere identified in the film as an anti-nuclear activist.

How was *Meltdown* Received?

The series director, Kief Davidson, has been making documentaries since 1994, and in 2013 was nominated for his film *Open Heart*. His 2005 film *The Devil's Miner* won the award for Best New Documentary Filmmaker at the Tribeca Film Festival. The series lead producer was Michael Shamberg,

PROPAGANDA

a major producer and an advisor to BuzzFeed Motion Pictures. He has been nominated for Best Picture Academy Awards four times (for his pictures *Django Unchained*, *Erin Brockovich*, *Pulp Fiction*, and *The Big Chill*).

However, despite the prestigious director and lead producer, the Netflix series won no major film awards, i.e., it won no Golden Globes, Emmys, or Academy Awards. Yet critics generally praised it. Adrian Horton of *The Guardian* said, “As the Netflix docuseries *Meltdown*...recounts, Unit 2 came less than half an hour from fully melting down a disaster scenario that would have sickened hundreds of thousands in the surrounding area” (Horton 2022 p. 2). Mollie Mitchell of *Newsweek* called the film a “spine-tingling new documentary series” (Mollie Mitchell 2022 p.2). James Moore of *The Independent* said of the series, “It could scarcely be timelier. Nuclear power is in the spotlight again as Western nations seek to find new sources of energy with a view to reducing their dependence on Russian gas, particularly in Britain where Boris Johnson has loudly trumpeted his support for a new generation of nuclear power plants” (Moore 2022, p.2).

Joel Keller of *Decider.com* praised the Netflix series: “Instead of a rehash of an event that could easily be researched, *Meltdown* takes a familiar event from the past half-century and fills in people’s gaps in information and debunks commonly held beliefs about the event” (Keller 2022 p.3). Daniel D’Addario of *Variety* said of the series that it “does an elegant job of bridging those truths—that Three Mile Island was a narrowly averted nightmare scenario and that it lives on in the public imagination as an argument against nuclear energy” (D’Addario 2022 p.2). Melissa Camacho of *Common-Sense Media* opined that, “The informative but disturbing...docu- series reveals how close the Three Mile Island came to becoming a horrific catastrophe” (Camacho 2022 p. 2). And Romey Norton of *Ready Steady Cut* called the series “gripping from the start” (Norton 2022 p. 1).

And the series spent one week on the Netflix US top ten list, two weeks on the Netflix Canada top ten list, one week on the Netflix New Zealand top ten list, and one week on the Netflix Slovakia top ten list.

However, not all reviewers of the Netflix series were favorably impressed. To frame our upcoming reviews of the two video podcasts rebutting *Meltdown*, let’s look at what John Fabian, writer for the American Nuclear Society’s official blog, *Nuclear News*, writes about the series (Fabian 2022). While his critical opinion is unsurprising, given that the American Nuclear Society is an organization of professionals who support nuclear power, his views deserve to be heard. Fabian’s overall view is:

The Three Mile Island accident in 1979 was the most-studied nuclear reactor event in the U.S. There is a plethora of research available to the general public, including the president appointed Kemeny Commission report and the Nuclear Regulatory Commission’s Rogovin inquiry report which are the two government-sponsored investigations into the accident. If the producers of *Meltdown: Three Mile Island* had read any of those documents instead of relying mostly on input from antinuclear activists, their “documentary” might have been presented with at least some sense of balance and credibility. Instead *Meltdown* focuses on drama instead of science (Fabian 2022).

Specifically, Fabian makes many major criticisms of the series. These include:

1. The only nuclear expert given the chance to rebut some of the claims made in the series was Lake Barrett, but while he was interviewed by the series’ producers for over three hours, only about five minutes of the interview made the film. (Barrett gives his account of the events, include his exchange with Parks and the producers, in (Barrett 2022)).
2. Moreover, Lake Barrett was “excoriated and vilified” in the film. In reality but totally unmentioned in the series Barrett is a very distinguished expert in the nuclear industry. He has BS and MS degrees in engineering, and in his 50-year career in nuclear power and materials management he has won many awards, including the President’s Meritorious Excellence Award, as well as the DOE and NRC Meritorious Awards. He is currently working on the clean-up of Fukushima.
3. The Netflix series repeatedly claims that nobody knows how much radiation was released, which is totally false.
4. The first episode says that one measurement showed 1,200 mrem/hour, but the film doesn’t note that that reading was taken directly above the exhaust vent in the auxiliary building, rather than anywhere on the perimeter of the site.



5. Actually, the NRC and the EPA had numerous testing sites around the plant, and they showed an average offsite radiation exposure dose of 1.4 millirem over the course of the accident—less than 1% of the *annual* dose a person receives from the Earth’s background radiation.
6. The highest offsite dose was less than 100 millirem, which is much less than that needed to cause harm to health.
7. The maximum radioactive activity detected in the air was only about one-fourth of the permissible concentration.
8. No radioactive iodine was detected in any of the nearly 150 soil samples nor the nearly 175 vegetation samples taken from around the plant.
9. The State of Pennsylvania conducted two studies of health effects of the accident. The first conducted six months after the accident in the area within a 10-mile radius of the plant showed no increase in fetal nor infant mortality. The second conducted four years later of cancer deaths within a 20-mile radius from 1974 to 1983 showed no increase in cancer rates after the accident.
10. A study conducted in 2000 by a team at the University of Pittsburgh of a sample of people within 5 miles of the plant between 1979 and 1998 again showed no impact of the accident on mortality.
11. Michio Kaku’s claim that the Chernobyl disaster was caused by a hydrogen explosion is wrong: it was caused by a “criticality event” (i.e., an accidental uncontrolled fission chain reaction) followed by steam explosion.
12. The hydrogen bubble never posed the risk the Netflix series hyped viz., that a hydrogen bubble in the pressure vessel would explode and blow massive amounts of radioactive materials all over Pennsylvania and even the whole East Coast. The NRC did initially worry about a hydrogen bubble mixing with oxygen, but soon realized that this wasn’t likely (hydrogen in the pressure vessel would suppress oxygen formation), and the operator were soon able to degas the system.
13. The slow release of Krypton gas from the containment building into the atmosphere was permitted by the NRC and never posed any serious risk to the public.
14. The claims made by “whistle blower” Parks in the film are different from the protests he filed at the time. There was little chance that the polar crane would fail it had been refurbished and even if it did, there was no way for it to cause the core to melt down and contaminate the countryside. The Netflix series doesn’t note that when the first missile shield was lifted by the polar crane, Barrett voluntarily stood in the containment room to monitor it which he would hardly have done if he had thought there was any risk in it failing in any way. He was, like Parks, a family man with his family living in town.
15. The series does not make it clear that Parks only started to work at TMI until three years after the accident, nor that he has no engineering degree.
16. The series mentions *none* of the many subsequent changes made to reactors and new regulations put in after the accident.
17. The series contains a number of cases of vivid scenes of people allegedly injured by released radioactive materials. We see a scene showing a pile of dead fish in the river next to the plant. We see one man telling us that some of the locals had a “metallic taste” in their mouths after the accident. We see a girl with burns or severe rashes on her legs. And one child was reported to have coughed up green mucus. But this anecdotal evidence proves nothing it is an exercise in *post hoc ergo propter hoc* reasoning. A metallic taste in a person’s mouth can be caused by many different things, such as indigestion or a sinus infection. Fish can die from any number of causes, such as a rapid temperature change in the water (which did happen at the time of the accident). Rashes and burns can be caused by things other than radiation, such as contact with poison ivy or a hot surface and nobody else developed burns at the same time. And green mucus can be produced by a flu or cold. More importantly, *the radiation levels were not high enough to cause harm to begin with*.
18. Finally, the reactor shut itself down by dropping the control rods within the *first five seconds* of the accident. Since the nuclear chain reaction was shut down the core was never at risk of returning to a critical state. As ANS past president Bill Burchill put it, “The core was not going to experience a self-sustaining nuclear reactor and it could not go off like a bomb and destroy thousands of square miles of land; that is one of the biggest falsehoods that is made in this documentary” (Fabian 2022, p. 11).

These are legitimate and penetrating criticisms of the Netflix series. In times of our six criteria mentioned earlier, points 6, 7, 8, 9, 10, 12, 14, 16 and 18 attack the series for lack of evidence on key

PROPAGANDA

claims. Points 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 and 18 attack the series for factual errors. Points 1, 2, 4, 5, 6, 7, 8, 9, 10, 13, 16 and 17 attack the series for illogical inferences. And points 1, 2, 15, 16, and 18. attacks the series for lack of transparency.

However, the influence of this critique among the general public was limited. To begin with, the source is a technical article from a scientific organization, so not likely to have been read by ordinary citizens.

Moreover, it is a basic point of logic that people should rely on an expert's opinion only if the expert is not biased. But here, the group of scientists is mainly composed of professionals working in the nuclear power industry, so may have a financial stake in the industry.

So let us now examine our two rebuttal video podcasts, which were produced by individuals who do not work in the industry, and who are talking primarily to lay people.

Freeston's Rebuttal Podcast

The term "podcast" was coined about 2004 by British journalist Ben Hammersley. It is a fusion of "iPod" and "Broadcast" and at first referred to sound recordings on files that could be downloaded and played on a variety of electronic devices, such as cell phones, laptops, and MP3 players. In time, it came to refer to podcasts that displayed pictures or texts ("slide-casts"), and then video podcasts (also called "video logs" or "vlogs"). Podcasts tend to be readily searchable on YouTube. With its incredible audience—more than 2.6 billion users around the world YouTube is the second-largest search engine next to Google. 95% of all people on the internet watch YouTube, with over 100 countries having localized versions of the channel.

Podcasting has grown rapidly. The number of podcasts downloaded worldwide has exploded from one and a half billion in 2012 to over three billion in 2016 (Herrick 2019 p.113). In just the U.S., the listener base for podcasts i.e., the number who listen to podcasts on a regular basis grew from about 45 million in 2017 to about 80 million in 2020. It is projected to hit 100 million in 2024 in a nation with a population of 330 million. Worldwide, it is set to pass 160 million in 2023 (Pawar 2022 p.19).

The U.S. listener demographics are interesting. About 66% of regular U.S. podcast listeners report having a bachelor's degree or higher, with an average income of \$75,000 considerably higher than the average American income (Pawar 2022 p. 19). They are typically younger, with 48% being aged 12-34 years, and 32% aged 35-54. And there is a rough gender balance: 51% are male, and 49% female.

The first video podcast criticisms of the Netflix series was made by Jesse Freeston. Freeston is a Canadian video journalist and documentary filmmaker. His focus is on investigating various social movements in North (and Central) America, as well as on global economic issues, the military-industrial complex, and undocumented immigration. His work has been shown or reprinted in such media outlets as *The Real News Network*, *the Huffington Post*, *Le monde diplomatique*, and *TeleSUR*. Freeston's critical review of the Netflix series (Freeston 2022) is a short (about 24 minutes) but fairly effective rebuttal of the series.

The venue for Freeston's video on the Netflix series is DecoupleMedia.org, a podcast site that is broadly pro-nuclear power. It has traditional sound podcasts (such as interviews), as well as videocasts. The concept of "decoupling" behind this organization is the used of advanced technology (including nuclear power) to decouple the negative ecological effects of the free market economic system from the prosperity it brings. The group of researchers in Decouple Media include: its host, Dr. Chris Keefer; executive producer, Dylan Moon, energy journalist; and Jesse Freeston, video journalist, documentary filmmaker, and lead content creator for the site (DecoupleMedia.org/about 2023).

Freeston begins his video *Fact-Checking Netflix's Meltdown: Three Mile Island* by noting that the Netflix series focuses on three intense periods in the history of the accident. The first was the original accident (a coolant valve didn't close, while an indicator light indicated it had closed, leading to a series of bad decisions, ultimately resulting in the core overheating). Second, hours later, a hydrogen bubble was found in the reactor, which some feared would lead to an explosion. No such explosion happened. The third occurred a year later during the clean-up, when Bechtel (which had been tasked to do the clean-up) refused to run some costly tests on the polar crane which would be lifting the lid off the reactor so that the clean-up could take place. This is what led to Rick Parks blowing the whistle.

Freeston observes that the director of the series, Kief Davidson, said that he wanted to create a "ticking-time-bomb" atmosphere in the series; and to accomplish this, he used bizarre camera movements, ominous music, and the constant repetition by some of the residents about how scared they



were. Freeston tells us, “This relentless combination of stressful music and harrowing one-liners make *Meltdown* feel at times like a three-hour trailer.” And while Freeston himself a documentary filmmaker believe that while these techniques are fair tools in documentary film, the series commits the major sin of deceiving the viewers about the risks posed by the accident. To use my own language here, what Freeston is saying in effect is that while it is legitimate for a documentary to be propaganda, it should not be *deceptive* propaganda.

Freeston then enumerates the deceptions about TMI that the Netflix series presents. He starts with the biggest flaw: the series repeatedly equates the worst-case effect of a major nuclear power plant accident with the explosion of an atomic bomb. It does this by showing clips of atomic bombs exploding, children in the 1950s doing “duck-and-cover” drills, the young boy saying that he dreamed about TMI “blowing up,” and Corradi saying the residents were all afraid of an explosion. Freeston observes that this is pushing a lie: it is physically impossible for a nuclear power plant to explode like an atomic bomb. The worst risk is that of a total core meltdown, but American and West European reactors have always had heavy containment domes to stop the spread of nuclear material in the event of such an accident. The worst accident in the history of nuclear power one that actually killed people, unlike TMI was at Chernobyl. But Chernobyl like all Soviet reactors at the time *had no containment dome*.

Freeston gives more examples of the deceit, by showing the alarmist claims made in the series about this. We hear one person say that we were just minutes away from wiping out hundreds of thousands of people, and rendering all of Central Pennsylvania uninhabitable for millennia. We hear another say that TMI would have annihilated Washington, DC, Philadelphia, and New York City, and rendered the East Coast uninhabitable. Freeston tells us that these claims are “exponentially worse” than the worst-case scenarios put forward by genuine scientists; instead, they were all made by two anti-nuclear activist lawyers (Doroshov and Devine).

Freeston next makes the point that the Hollywood fictional film *The China Syndrome* had been released less than two weeks before the accident, and had quite a few scenarios eerily similar to what happened at TMI. Moreover, he notes that all of the malfunctions and mistakes that portrayed in the movie and that occurred at TMI had happened before in nuclear plants around the world around the world just not all at once and with the negative effects experienced at TMI. However, Freeston makes the point made by John Fabian but nowhere mentioned in the Netflix series that all the defects discovered at TMI were rapidly addressed and rectified at the other existing nuclear power facilities in the U.S. [He might have noted that also unstated in the series is the fact that in the 43 years between the accident at TMI and the making of the Netflix docuseries, no other major accidents have occurred.

Freeston then asks an important question: given the unprecedented climate of fear caused by the accident at TMI, the lack of reliable information available to the public at the time, and the amplifying effects of a fictional but influential movie, how does *Meltdown* reduce the hysterical fears about nuclear power, so that the public can rationally examine its potential in solving the world’s energy needs? The answer is, of course, that instead of trying to reduce the hysterical fears surrounding the subject, it is precisely the purpose of the makers of the series to recreate and intensify that hysteria *by any means necessary*. Freeston asks us to imagine what would have happened if the Netflix series had told the viewers, “After running more than 500 [nuclear] power plants in 30 countries over seven decades, we now know that nuclear power causes 99.9% less deaths per kilowatt hour than burning fossil fuels, and is comparable to wind and solar in terms of danger.” Freeston says this is a fact [although he cites no scientific sources that show this is true], but by omitting such facts, *Meltdown* fails as a documentary.

Freeston then introduces Dr. Spencer Weart, physicist and historian of physics. Asked what he thought of the Netflix docuseries, Freeston says his biggest problem with the series was the celebration at the end of the fact that since 1979, no new American nuclear power plants have opened. Specifically, Weart notes that the series does not mention that the cancellation of new nuclear plants resulted in the massive proliferation of coal-fired plants, which causes about 10,000 premature American deaths every year [presumably from the toxic pollution such plants produce. To this Freeston adds that coal power contributes greatly to global warming.

Parenthetically, the point that Freeston and Weart are making here to wit, that in halting the expansion of nuclear power because of the public panic over TMI and *The China Syndrome*, there was a dramatic expansion in coal power, with a huge loss of life due to its toxic pollution is entirely general.

PROPAGANDA

Cognitive psychologist Gerd Gigerenzer has researched how people miscalculate costs and benefits when it comes to what he calls “dread risks” (Gigerenzer 2004). A “dread risk” is an event that is very unlikely but has very frightening consequences. To use Gigerenzer’s example, a terrorist airplane hijacking is a dread risk. People can be so struck by the horrific consequences of a dread risk that they end up overestimating the chances of it happening, and thus be led to decisions that harm them. Gigerenzer calculates that more Americans died in the three months after the September 11, 2001 terrorist hijackings from avoiding flying than died in the actual hijackings. The reason for this is that there is a much higher chance per mile of dying from traveling in a car than in traveling by plane., so when people stopped flying after the well-publicized terrorist attack and turned to driving more, more of them died than would have died otherwise.

Freeston notes also that wind and solar power only produce electricity intermittently. Weart points out that the only solution to that problem: either nuclear power or batteries [to store energy from wind and solar power during the times of day when it is produced to then be supplied when it is most needed.] But while nuclear power is a proven technology, batteries aren’t.

Freeston then interviews Dr. Alex Wellerstein, another historian of science specifically, of nuclear technology. Wellerstein says that he agrees with some of the points made in the Netflix series, such as that we shouldn’t always trust what industry and government spokespeople tell us, and that there are real potential hazards in poorly designed, poorly run, or poorly regulated nuclear reactors. But fossil fuels don’t just potentially cause harm, they actually do cause harm harm to the environment, to the climate, and to people.

Freeston then makes a point that his own work in documentary filmmaking allows him to see. Unlike documentaries that rely on extensive narration or textual citation, the Netflix series uses character selection. And here there is another problem. The anti-nuclear side is represented by sympathetic characters. We see Corradi and Kinney, who start out by trusting government which Freeston notes is odd, given that their trust in government survived Watergate, the Vietnam War, the Pentagon Papers, and the Cuyahoga River repeatedly catching on fire but end up opposing the government because of TMI. Add Epstein, the anti-nuclear activist, Doroshov and Devine, the anti-nuclear legal team, Remsburg (allegedly the victim of radioactivity, and of course the putative hero Parks, who is presented as supporting nuclear power, but we are never told why he only disparages it in the film. Freeston omits other sympathetic anti-nuclear characters, such as Garde and Gunderson, not to mention the actor-activists Jane Fonda and Dick Gregory, and the ghost of Karen Silkwood.

By contrast, the only pro nuclear character is Barrett, who is portrayed as being a bureaucrat in the pocket of industry, indifferent to the safety of the public, and generally heartless. We should note that Admiral Rickover is also mentioned in the series, but dismissed as senile and corrupt. Not only does this do a disservice to Barrett, who is in fact a quite distinguished government worker one much more accurately described as a “public servant” than a “corrupt bureaucrat” but also (Wellerstein suggests) adds to the anti-expertise strain of contemporary political discourse. This view tells us not to listen to experts about nuclear power (or Covid or genetically modified foods or a million other things). Freeston acknowledges here that Kaku, who is shown a lot early in the series, is a physicist, and is cited as an expert. However, Kaku’s expertise is in theoretical physics, not nuclear power plant design, and has opposed nuclear power since he was a young man.

Freeston notes that the film deceives the viewer when it comes to radiation dosages it quotes instrument readings without explaining context. The government sets a level of radiation exposure of 100 millisieverts as the level at which radiation exposure becomes a health hazard. That means that if 100 people are each exposed to that level of radiation, one of them would likely develop a cancer he wouldn’t have developed otherwise. In the film, the man most subjected to radiation was almost surely the technician Ed Hauser, who went into the fuel handling building to check the boron level. He was exposed to 28 millisieverts. This is less than a third of the that would give a person a 1% greater chance of dying of cancer. Outside the compound, the highest registered dose was only 1 millisievert, which is less than what you would get from a routine CT scan.

But Freeston then shows us Kaku telling us that anyone who says they know how much radiation was released at TMI “is either lying, or a fool.” Now, Freeston observes, if Kaku is saying that there weren’t people with dosimeters or Geiger counters completely surrounding the plant for 24 hours a day, perhaps this is true. However—and here Freeston echoes a point made by Fabian in fact both the NRC and the EPA—both federal agencies, *not* for-profit companies had numerous testing sites



around the plant. The film only presents one expert making the point that despite all the things that went wrong at TMI, no one was exposed to the level of radiation that could cause harm.

Freeston then points out that the last episode is about how many of the characters we meet (Parks, Remsburg, and so on) later developed cancer. The only contrary voice was that of the “villain” Barrett, who puts the point that the fact some individuals developed cancer does not mean it was caused by radiation released at TMI in a seemingly heartless way. Here quotes Dr. Geraldine Thomas¹, that 40% of all Americans will be diagnosed with cancer at some point in their lives, so it is not an uncommon disease even among those not exposed to any abnormal amounts of radiation.

We cut to Wellerstein, who tells us that numerous longitudinal studies of the health effects of the accident at TMI have been done in the 1980s, the 1990s, and the 2000s, and the results consistently show that if there were any negative health effects from the accident, they were too small to measure. Freeston points out that none of these studies are cited in the Netflix series except one, presented as some kind of “gold standard” study—the one (conducted by Dr. Steven Wing) which studied cancer rates in an area right near the Susquehanna River. But first, Freeston notes that the series misstates that article’s results: the study only concluded that rates of *lung* cancer rates in that area were double the normal rate.

He then introduces Dr. Evelyn Talbot, a professor of epidemiology at the University of Pittsburgh, who has conducted the longest and largest study of the health effects of the accident. Her criticism of Wing’s study is that it doesn’t correct for risk factors in individuals, in this case, such as smoking. A person who smokes is 20 times more likely to develop lung cancer than a non-smoker. Her study followed 31,000 individuals over 20 years and she *did* correct for differences in life style. Her study a true gold standard one found no consistent evidence that the accident had any effect on overall mortality of the residents. (While her study did show an uptick in two types of cancer, other studies have argued against that finding).

Freeston observes here that in this third worst disaster in the history of nuclear power, despite numerous studies, little if any evidence shows any health impacts in the four decades since the accident. Freeston concludes by telling us that the Netflix series’ reenactments are well done, and it does a good job showing a whistle-blower “putting everything on the line.” [Freeston thus accepts Parks’ claims about his background, and criticism, and the dangers he faced as unquestionable.] However, he argues, the series over-hypes the dangers of nuclear power, without looking at the dangers of other sources of power. What if (he asks) he did a video focusing on men who have died installing solar panels on roofs? Would that be a fair documentary? Hardly.

Freeston’s criticisms of the Netflix series fall in line with the criteria listed earlier.

Evidence-based:

1. The Netflix series repeatedly claims that the TMI accident would lead to a nuclear explosion, but never gives evidence to back that up.
2. The series claims that the accident at TMI caused widespread illnesses without citing any studies but one, and misstating that study.

Truthful:

1. Not only is the claim that TMI was at risk of a nuclear explosion not supported by evidence, it is (Freeston holds) absolutely false.
2. The claim that a meltdown at TMI could have annihilated the major East Coast cities is (Freeston says) false.
3. The implicit message that nuclear power technology today is as flawed as it was at TMI is false the industry made improvements to rectify the problems that led to the accident.
4. The claim that nobody knew how much radiation was released is false the NRC and EPA conducted many measurements around the site.
5. The claim that the accident led to widespread illness isn’t just unproven, it is false.
6. No widespread radiation leakage actually occurred.

Logical:

1. The automatic attribution of later illnesses—including ones that occurred decades after the accident to radiation allegedly released by the accident is an exercise in *post hoc ergo propter hoc* thinking.
2. Virtually all the characters in the series are anti-nuclear power. The few pro-nuclear power advocates (mainly Barrett, and briefly Rickover) are disparaged. This is an exercise in special pleading or stacking the deck.

PROPAGANDA

Transparent:

1. The series does not say anything about improvements that were made subsequent to and due to the accident.
2. The series has almost no pro-nuclear power advocates to reply to all the assertions made by the anti-nuclear activists.

In sum, Freeston's rebuttal is a fair and balanced critique of the series. Its impact, however, was somewhat limited. His YouTube blog has only about 7,000 subscribers, and the podcast under discussion here only about 15,000 views. Let us turn next to a much more influential podcast.

Hill's Rebuttal Podcast

Kyle Hill is a science communicator based in Los Angeles, California. He graduated Marquette University in 2011 with BS degrees in environmental and civil engineering, and in 2013 with an MA in science communication. His writings on science have been regularly published in *The Boston Globe*, *Discover Magazine*, *Popular Science*, *Scientific American*, *Slate*, and *Wired*. Hill has appeared on *Al Jazeera America*, *BBC World Service*, *Fox News*, and *Huffington Post Live*. He has been a host on regular expert on *How to Build Everything*, *MythBusters*, *The Search*, and *TechKnow*. He is a former host of the YouTube science program *Because Science* and is the Science Editor of *Nerdist*. His YouTube program has 1.47 million subscribers. The podcast I will examine is one of his series on nuclear energy, "Half-Life Histories". It had a viewership of 1.58 million.

Kyle Hill's first response to the *Meltdown* series was quite negative: he tweeted "Holy shit... Netflix's *Meltdown: Three Mile Island* is **wildly** conspiratorial, alarmist, and apparently blind to simple facts." Shortly thereafter he tweeted that he was working on his own mini-documentary on the subject (Twitter 2022).

Hill's video, *Three Mile Island—What Really Happened*, is a slightly longer (at 36 minutes) critique of the Netflix series than Freeston's video (at 24 minutes). It opens with Hill describing the start of the accident at 4:00:35 am, when some feed water pumps stopped. Two seconds later, the system shut down the steam turbine and generator—as it was designed to do. 7,164 seconds later, two-thirds of Unit 2's core was without coolant, and got half as hot as the surface of the sun.

This was how the accident started, an accident that was rated a 5 out of 7 on the international nuclear scale—an "accident with serious consequences," just below a "serious accident." It left a deep stain on the American public's view of nuclear power to this day. But Hill holds that the truth was so poorly reported to the public "that today history remembers Three Mile Island as an unmitigated disaster, not what it really was: an inevitable series of human errors that resulted in a harmless failure." This video is the 13th in Hill's series of Half-Life Histories, and it aims to tell the true story of the accident.

Hill begins by describing the basic design of a nuclear power plant. The core contains enough nuclear material to sustain fission, which produces heat that turns water into actually generates the electricity. The steam is cooled in large towers and turned back into water that is used again. This is all controlled by a series of systems, valves, and pressurizers keep the plant running. The nuclear reaction in the core is controlled by rods that soak up the neutrons that drive the reaction—lowering those rods stops the reaction completely. But if the cooling water in the reactor boils off, the core can be damaged or even (if all the water is gone) melt down into a puddle of "corium"—the most dangerous material on Earth.

For this reason, virtually all advanced reactors are put inside very thick reinforced concrete containment structures. TMI had a core containment vessel of forty feet of eight-inch steel, inside two concrete shields with a total thickness of nine feet, all housed in a containment building nearly 200 feet high, with reinforced concrete walls four feet thick. This amount of steel and concrete makes these buildings extremely robust—here, Hill shows actual footage of the 2022 Russian artillery fire directed at the Zaporizhzhia power plant, which causes little damage. This robustness of containment structures is what made the TMI incident an accident rather than a disaster.

Hill then gives a second-by-second review of the accident. He notes something that Fabian pointed out but was missed by the Netflix producers, viz., that within seconds of the feedwater pump stopping, the control rods dropped automatically and the fission halted. At this point, the relief valve should have closed to return pressure to the system. But it was stuck open, and there was no indication of this on the instrument panel in the control room. By one minute into the accident, the operators noticed that the water feed pumps had turned on, but failed to notice warning lights indicating that no



water was flowing through the core. When the automatic emergency cooling system turned on to compensate, the operators thinking that there was water already flowing through the core turned off the emergency system. And even though the indicator light in the control room showed that a signal was sent to close it, it did not show that it was closed. This resulted in 32,000 gallons of water leaving the core, which then started to overheat. Had the operators not turned off the emergency cooling system, or had the relief valve shut properly, the Presidential Commission report says, “The accident would have remained little more than a minor inconvenience.”

Here Hill takes up the question whether TMI was a “normal accident,” using the terminology developed by sociologist Charles Perron [in Perron 1984.] Perron theorized that in a highly complex technological system (such as a nuclear power plant), because failures can happen in so many different ways, they are unpredictable and unavoidable. Perron held that the TMI accident was “normal,” meaning “unexpected, incomprehensible, uncontrollable, and unavoidable.” Normal accidents occur in complex technologies because even trivial, random events can cause the system to crash. Hill says that Perron’s book revolutionized the study of risk, bringing in insights of chaos theory.

But Hill points out that in the case of TMI, the incident was in fact entirely predictable “we should have seen it coming.” The Presidential Commission report on the accident noted that the relief valve had failed on *eleven* previous occasions, something that Babcock & Wilcox, the company that produced these reactors, never disclosed to its customers. Hill notes that the David-Besse nuclear plant in Ohio had an identical problem thirteen months earlier than TMI, but the operators there discovered and corrected the problem before sooner than those at TMI. An engineer working at the Ohio plant wrote a company internal memo explaining the problem and noting that had the plant been operating at full capacity it was only running at 9% of capacity at the time it probably would have damaged the core. But Babcock & Wilcox issued no new instructions based upon the memo.

Hill then informs us that the TMI control room was poorly designed and maintained. There were warning tags covering warning lights, and an emergency would often cause dozens of alarms to go off simultaneously, making it virtually impossible for operators to figure out which were the crucial ones. And the valves that failed were poorly maintained, with heavy mineral build-up on them. So, the accident was hardly unavoidable or unforeseeable. [Hill might have added an additional reply to Perron’s theory. In his 1984 book, Perron predicted that many more TMI-type accidents in American nuclear power plants would occur. But in the four decades since TMI, there have been no serious accidents at any of the American facilities.]

We move to 6:00 am on March 28th, 1979. A low-level radiation alarm sounded. By 6:15 there was no around the core to cool it. The core was uncovered for as long as 38 minutes. At 6:22 am, the valve was shut, but the malfunction continued. For unknown reasons, it took until 6:54 am to finally start pumping the cooling water again. By this time the core was at 4,000 degrees Fahrenheit, causing major damage to the core. Several areas of the plant now showed high levels of radiation, and at 7:00 am, a site emergency was declared. There was a threat of an uncontrollable release of radiation. At 7:15 am, rising radioactivity caused the evacuation of the workers in the auxiliary building. At 7:20 am, a radiation detector at the top of the containment building registered 8 rems/hour, but since it was shielded by lead, the figure was really about 800 rems hour which would exceed the maximum yearly dose limit for an average person I about half a second.

At this time, the cooling pumps were turned on, flooding the core with 1,000 gallons of water per minute. But the operators mistakenly shut it off again 18 minutes later. At 7:29 am, TMI declared a general emergency meaning there was a major chance of radiation affecting the general public.

At 8:00 am, a reporter for a local music radio station was scanning the policy frequency and heard that the Middletown fire department was preparing for action. The station’s news director managed to call the TMI control room, where a plant manager told him, “I can’t talk right now. We’ve got a problem.” By 8:25 am, the public found out what was going on not, as Hill wryly observes, from the city emergency authorities, or power company’s public relations department, or an regulator agencies, but from a Top 40 Rock station. This started a media frenzy, making TMI probably the most widely reported story of the decade, and certainly one of the worst PR failures of all time what Hill nicely describes as a “communications meltdown.”

The President’s Commission report reveals that Babcock & Wilson deliberately chose not to comment on the situation, even though it knew that a lot of misinformation was being disseminated. At a news conference, the officials seemed unprepared or ignorant about the accident, and often

PROPAGANDA

contradicted each other. Because not many true experts were at these news conferences, reporters had a lot of problems determining exactly what had happened and what the chances of harm were. There was little transparency here Hill gives the example of the small discharge of slightly radioactive waste into the river on March 29th. While the discharge was harmless, not notifying the downstream water supply districts was unconscionable.

March 30th was an even worse case of communication breakdown. A supervisor made the decision to allow xenon and krypton gases to be transferred from one containment structure to another, knowing that some of the gas would leak into the atmosphere. Again, this was harmless in and of itself, but he did not bother to notify either the power company or other officials. A helicopter flying above registered 1,200 millirem/hour, which was reported *before* the supervisor told anyone what he had done. This massive lack of communication between plant operators, company officials, regulatory agencies, and public officials, and the public “was a meltdown of a different sort.” When the spokesman for Met-Ed was asked at a news conference about the reading of 1,200 millirem, he said he never heard that number, and told the assembled reporters he didn’t see why the company had to explain everything it did. That reduced the credibility of the company to zero in the eyes of the reporters—and the public.

Worse yet was the handling of the hydrogen bubble several days after the accident. President Carter sent Harold Denton of the NRC to take charge of the situation. Denton immediately learned that hydrogen was building up in and around the core, and he informed the Governor. The next day, scientists around the country were trying to calculate how much hydrogen there was, and whether there was enough oxygen present to cause an explosion. The scientists initially reached no definitive conclusion. Actually, the containment structure was built strong enough to have withstood such an explosion, but the public and government officials didn’t know this. Denton and Governor Thornburgh told the public that they didn’t know whether the bubble could explode, but later that night, Denton told the press that there wasn’t a “combustible mixture” in the reactor vessel, and that there was no danger. But again, the press was hearing reports that there was disagreement among scientists about what Denton claimed.

The next day, President Carter arrived to tour the plant. While scientists were still debating the issue, by 4 pm, on-site engineers (with the help of scientists around the country) had proven that the hydrogen bubble around the core would automatically combine with any oxygen, so “the processes within the reactor were still violent but not explosively so.” A few hours later, readings showed that in fact, the bubble was shrinking. However, Hill tells us, the information meltdown continued. Again, quoting from the Presidential Commission’ report,

By late Sunday afternoon, the NRC which was responsible for the concern that the bubble might explode knew there was no danger of a blast and that the bubble appeared to be diminishing. It was good news, but good news unshared with the public. Throughout Sunday, the NRC made no announcement that it had erred in the calculations or that no threat of an explosion existed. Governor Thornburgh was not told either. Nor did the NRC reveal that the bubble was disappearing that day Hill ironically adds that this foolish NRC error occurred on April 1st (April Fools’ Day).

Hill next turns to a quick review of the concept of statistical randomness. He shows the viewer side-by-side pictures of dots, and points out that truly random patterns have some apparent clustering, though clustering that is not repeated. This is important in epidemiology, where the random distribution of a disease like cancer can anecdotally appear like true clustering resulting from some local causal agent. But correlation cannot be equated with causation.

Hill observes that the radiation released at TMI was from planned, approved and controlled release of krypton and xenon gases, the total radiation released was later calculated to be 2.5 million Curies. This is less than 1% of what was released by the Chernobyl disaster. More importantly, these gases are not absorbed by the human body, and they decay away quickly krypton has a half-life of 10.5 years, and xenon a mere 5.3 years. Anyone exposed to this release downwind from TMI would have gotten a total radiation exposure from that release roughly equivalent to one year of natural exposure from the ordinary environment. But, Hill notes ruefully, “this fact has been lost to history, and improper correlation has become conspiracy.”

According to virtually all reputable studies, Hill reports, including the comprehensive Presidential Commission final report, the total radiation released at TMI (mostly from the controlled release of krypton and xenon) amounted to an average exposure (to people living within 10 miles of the plant) of roughly 8 millirem about the amount a person gets from a chest x-ray.



And of all the many studies of the health effects of TMI, Hill tells us, none of the peer-reviewed, statistical studies showed any measurable harm. The allegations of cancer (say) caused by the accident are purely anecdotal, and are often put forward by people who are not epidemiologists but who make a living from pursuing the claims in court [presumably trial lawyers. Out of the 2 million people living within 50 miles of TMI, we can expect roughly 325,000 eventual cancer deaths from normal causes. The radiation released by TMI is estimated to have caused less than *one extra case* (0.7 extra cases total) essentially, zero effect.

The accident at TMI did have one real negative health impact, Hill tells us: stress. Think of the stress caused by being told that the power plant near you may explode like a nuclear bomb and wipe out the East Coast, or being pregnant and told that you and your fetus have been exposed to high-level radiation, or being a parent and having to stay with your children in a shelter for an indefinite amount of time. This stress caused more damage to people's health, Hill avers, than the low level of radiation released at TMI.

Hill turns next to the cleanup phase of TMI noting the immense amount of work that had to be done, and the enormous cost. With the tsunami of negative publicity, fanned by activists, actors, and singers, the tide of public sentiment turned against nuclear power. Met Ed was repeatedly sued by various agencies and businesses, and forced to pay millions in damages. But Hill notes that 2,000 separate lawsuits from individuals alleging that their various illnesses were caused by radiation released at TMI were all summarily dismissed for lack of scientific evidence by Judge Sylvia Rambo of the Federal District Court.

Then Hill turns to the effects of the TMI accident on the power industry as a whole. After TMI, the number of new nuclear power plants dropped essentially to zero. What took the places of those projected nuclear-powered plants? Mainly coal-powered plants. Echoing the point made by both Fabian and Freeston, the number of deaths caused by the pollution from these new fossil fuel plants dwarfs into insignificance all the deaths from all nuclear power plants.

Hill ends by saying that all the defects of equipment, of software, the poor training of technicians, and the mismanagement of informing the public led to sweeping reforms in the industry, but these reforms did not affect public opinion because the public was ignorant of them. And the final nail in the coffin of the public perception of nuclear power came with Chernobyl.

Hill's video is superbly well done, as you would expect from his background in science communication. Despite being less than ¼ the length of the Netflix series, it manages several major accomplishments. First, in about 15 minutes, Hill's video gives the viewer a very clear picture of exactly how the accident occurred. It does a much better job of this than does the Netflix series. It does this primarily by utilizing the canonical, exhaustive account given by the Presidential Commission's final report.

Second, while the Netflix series focuses on how threatened and frightened the residents of Middletown *felt*, Hill's video focuses on the threats the accident *actually posed*. His view is that while it was a level 5 accident on a 7-point scale (one with "serious consequences," but not categorizable as "serious"), it killed nobody and did not threaten the East Coast or even Central Pennsylvania with a nuclear explosion or a China Syndrome. In his words, the citizens were threatened by a communication meltdown more than a nuclear one. For this, Hill faults everyone from the NRC and the company spokesmen to local and state officials, to President Carter himself. Hill points out that Carter, himself trained in nuclear power and who told his cabinet after visiting TMI that the accident was minor, he never conveyed this to the press or public, not wanting to contradict the anti-nuclear environmentalists in his own party.

Third, Hill does a thorough job of explaining the difference between meaningless anecdotal reports of harems and proper statistical epidemiological studies of diseases that prove causal linkages. And he reviews the studies that have been done, showing that there is no compelling evidence of widespread harm done to the citizens around TMI.

In sum, Hill's criticisms of the series mirror a number of those raised earlier by Fabian or Freeston. However, it is fair to say that Hill focusses more on issues pertinent to TMI that the series does not mention.

Evidence-based:

1. While the series presents images that prime the viewer to believe that TMI could have resulted in a nuclear explosion, it offers no evidence that it could have.

PROPAGANDA

2. The series says that the hydrogen bubble was at risk of exploding, but gives no evidence that it could have.

Truthful:

1. At no point did TMI risk causing a nuclear explosion.
2. While the core partially melted, when the cooling water turned off, because of extensive containment shielding, the East Coast was not in danger of massive contamination.
3. It is not true that any people were sickened by radiation released by TMI, much less killed by it.
4. The implicit message that nuclear power technology today is as unreliable as it was at TMI in 1979 is false: the industry made numerous changes to correct the issues that arose in 1979.
5. The claim that nobody knows how much radiation was released at TMI is false.
6. The claim that there was widespread leakage of radioactive materials from TMI is false.

Logical:

1. Anecdotal claims about illness being caused by radiation leaked by TMI are not logical proof correlation does not mean causation.

Transparent:

1. The Netflix series doesn't reveal that the core of Unit 2 was shut down automatically within seconds of the operation.
2. The series does not reveal that TMI led to sweeping improvements in the American nuclear power industry.
3. The series doesn't describe the extensive containment structures surrounding the core structures not present at Chernobyl that likely would have stopped the spread of contaminants had a core meltdown occurred.
4. The series doesn't mention that the halt in opening new nuclear plants led to the opening of many new coal-fired plants, and the resultant pollution actually *does* kill people.
5. The series doesn't mention that the accident at TMI was foreseeable and avoidable.
6. The series didn't reveal that what little radioactive materials that were released were krypton and xenon, both of which have short half-lives.
7. The series reveal that 2,000 lawsuits alleging that some illness was caused by radiation released by TMI were summarily dismissed in Federal Court for lack of evidence.

CONCLUSION

My conclusion in this article is similar to my conclusion in my previous piece. Start with how persuasive were these video podcasts in refuting the Netflix series. Again, if one means by this how many people were turned against nuclear power by watching the Netflix series but were turned back in favor of nuclear power by the rebuttal video podcasts, it is hard to say. Certainly, the Netflix general viewership is huge. Globally, Netflix has a paid subscriber base of 209 million families, with about 579 million viewers as of 2021. The American viewership is about 175 million (Kats 2022, p.2 and p.4). And while there appears to be no figures available for exactly how many people actually watched *Meltdown*, the fact that it was in the Netflix top-10 most watched shows in the US for a week, in Canada for two weeks, and in Slovakia and New Zealand for one week would make it likely that the viewership was in the millions. Of course, this would dwarf the number for Freeston's video podcast. But Kyle Hill's podcast, which logged a viewership of 1.58 million people, at least would be likely in the same order of magnitude as the Netflix series itself.

However, again, both video podcasts make probing criticisms of the series, with both podcasters frankly characterizing the series as deceptive propaganda. And both Freeston's and Hill's criticisms track those of Fabian, focusing on the lack of evidence for key claims, the illogicality of key points, the opacity of various points, and the outright falsehood of others.

As in my previous article, I want to note that in this article I have not taken a position on the issue of whether nuclear power is a good alternative to fossil fuels, and whether it is a better solution to the problem of anthropogenic global warming than the other alternatives to fossil fuels such as hydroelectric, wind turbine, geothermal, or other sources of power. Taking a position on nuclear power would require even more research than that it would to decide whether fracking is harmful to the environment. There are two reasons why this is so.



First, in the roughly 70 years since nuclear power plants were first constructed, a number of different basic designs have emerged. Nuclear power currently provides about 10% of the world's electric power—roughly equal to that of solar and wind power combined. The current types of reactor designs in use are: the pressurized water reactor, with 309 in use (in China, France, Japan, Russia, South Korea, and the USA); the boiling water reactor, with 60 in use (in Japan, Sweden, and the USA); the pressurized heavy water reactor, with 47 in use (in Canada and India); the light water graphite reactor, with 11 in use (in Russia); the advanced gas-cooled reactor, with 8 in use (in the UK); the fast neutron reactor, with 2 in use (in Russia); and the high temperature gas-cooled reactor, with 1 in use (in China) (World Nuclear Association 2023).

Each of these designs has its advantages and disadvantages. For example, the reactors most often used in the USA pressurized water reactors are fueled by enriched U235. U235 constitutes less than 1% of all uranium, therefore the ore is expensive, as is the enrichment. In contrast, in a pressurized heavy water reactor, such as the Canadian CANDU reactor, the fuel can be U238, which is 99% of all uranium. Thus, the fuel is cheaper, but the moderator is heavy water (D₂O), which is made by enriching ordinary water, so the moderator is more expensive. There are thus design trade-offs here.

Second, any serious citizen evaluating any source of power will consider its strengths and weaknesses on three quite different dimensions, viz., the environmental, the economic, and the geopolitical. The environmental dimension involves considerations of what toxic wastes (including greenhouse gases) are generated in the production of the power, including the mining of minerals for the power supply, the construction of the machinery and the plant, the running of the plant, and its eventual shut-down. All forms of energy production *including solar and wind power* produce toxic wastes. The question is what types of waste are produced, and in what quantities.

The economic dimension involves the total costs of producing the energy, including the cost of mining the requisite materials for building the equipment (such as rare Earth metals used to make solar panels and wind turbines), the cost of constructing the plant, the costs of running the plant, the costs of disposal waste materials, and the costs of decommissioning the plant. A significant portion of the expenses will be the cost of labor. Insert on the cost should be measured consistently in either money or to life.

Finally, the geopolitical dimension involves the total impact of the type of power production on national security. The U.S., for example, has achieved energy independence in fossil fuel from its now extensive use of fracking over its vast shale fields. It has extensive reserves of uranium deposits. But it is dependent on China for the rare Earth metals that are used in solar panels and wind turbines, and China has started to restrict exports of those minerals. As a consequence, the International Energy Agency estimates that China now makes 80% of all solar panels. It also is the major maker of large lithium batteries for storing power. Moving to “renewable” energy likely will make the U.S. more and more energy dependent on China, with its obvious geopolitical risks.

An even more current example of the geopolitical risks associated with energy production is the countries of the European Union, which became dependent upon Russia for their natural gas supplies. The geopolitical cost of this became apparent with Russia invaded Ukraine in 2022.

In fine, the issues surrounding nuclear power are complex and multi-varied. But how many citizens will base their opinions based on extensive and open-minded research? And how many will decide after only watching a deceptive documentary? However, on a more positive note, many citizens are now looking at video podcasts that are able to provide some balance. The advantage of such a medium over (say) making a counter-propaganda documentary is that the response time is much quicker and less expensive with a video podcast. These are decisive advantages.

BIBLIOGRAPHY

- Barrett, Lake (2022). What Really Happened at Three Mile Island?. *ANS.org webinar*.
<https://www.ans.org/webinars/view-tmi2022/>
- Camacho, Melissa. (2022). TV Review of Meltdown: Three Mile Island. *Common Sense Media*.
<https://www.common Sense Media.org/tv-reviews/meltdown-three-mile-island>

PROPAGANDA

- D'Addario, Daniel. (2022). *Meltdown: Three Mile Island is a Methodical Look at an American Disaster*. <https://variety.com/2022/tv/reviews/meltdown-three-mile-island-netflix-1235256986/>.
- Decouple Media.org. (2023). *About the Team*. <https://www.decouplemedia.org/about>.
- EIA (U. S. Energy Information Administration). (2023). *What is U.S. Electricity by Energy Source?*. Link: <https://www.eia.gov/tools/faqs/faq.php?id=427&t=3>.
- Fabian, John. (2022). Meltdown: Drama Disguised as a Documentary” in. *Nuclear News*. <https://www.ans.org/news/article-4016/meltdown-drama-disguised-as-a-documentary/>
- Freeston, Jess. (2022). *Fact-Checking Netflix's Meltdown: Three Mile Island, Decouple Media podcast*. <https://www.ans.org/news/article-4016/meltdown-drama-disguised-as-a-documentary/>
- Gigerenzer, Gerd. (2004). Dread Risk, September 11, and Fatal Traffic Accidents,” *Psychological Science*, Vol. 15, No. 4, pp. 286-287.
- Herrick, James. (2019). *Argumentation: Understanding and Shaping Arguments (7th ed.)*, State College, PA: Strata Publishing, Inc.
- Hill, Kyle. (2022). Three Mile Island What Really Happened, *YouTube*. <https://www.youtube.com/watch?v=cL9PsCLJpAA>.
- (2022). Twitter feed. https://twitter.com/Sci_Phile/status/1531379846672023552?lang=en.
- History.com Editors. (2009). Karen Silkwood Dies in Mysterious One Car Crash. *History.com*. <https://www.history.com/this-day-in-history/karen-silkwood-dies-in-mysterious-one-car-crash>.
- Horton, Adrian. (2022). Dodged a Bullet’: How Whistleblowing Averted a Second US Nuclear Disaster. <https://www.theguardian.com/tv-and-radio/2022/may/05/meltdown-three-mile-island-netflix-us-nuclear-accident>.
- Jason, Gary J. (2023). Fighting Fire with Fire I: Using Film to Counter Film Propaganda. *Propaganda: Journal of Communication Studies*, Vol. 3, No. 1: 49-67. <https://journal.neolectura.com/index.php/propaganda/article/view/1132/961>.
- Jason, Gary J. (2022). *The Critical Thinking Book*. Ontario, Canada: Broadview Press.
- Kats, Rimma. (2022). Netflix Statistics: How many Subscribers does Netflix Have?. *Insider Intelligence*. <https://www.insiderintelligence.com/insights/netflix-subscribers/>.
- Keller, Joel. (2022). Meltdown: Three Mile Island,” *Decider.com*. <https://decider.com/2022/05/04/meltdown-three-mile-island-netflix-review/>.
- Meltdown: Three Mile Island* Director: Kief Davidson; Production studios: Moxie Pictures & MAS; executive directors: Carla Santos and Michael Shamberg; 4 episodes, 2 hours, 52 minutes (2022). <https://www.youtube.com/watch?v=nAOIH8HRdDo>.
- Mitchell, Alex. (2022). The Nuclear Nightmare that Almost Took out the East Coast. *New York Post*. <https://nypost.com/2022/05/04/how-a-brave-engineer-saved-the-us-from-nuclear-catastrophe-new-doc/>.
- Mitchell, Molli. (2022). Do People Still Work at and Live Near Three Mile Island? *Newsweek.com*. <https://www.newsweek.com/do-people-still-work-three-mile-island-live-middle-town-pennsylvania-netflix-1704265>.
- Molotsky, Irvin. (1986). Rickover’s Son Says His Father was Exploited,” *The New York Times*. <https://www.nytimes.com/1986/07/11/us/rickover-s-son-says-his-father-was-exploited.html>.
- Moore, James (2022). Netflix’s Three Mile Island documentary highlights the real issue with nuclear power: people,” in *The Independent*. <https://www.independent.co.uk/voices/three-mile-island-netflix-documentary-nuclear-power-b2078962.html>.
- Norton, Romey. (2022). Review: *Meltdown: Three Island* Netflix Series,” *Ready Steady Cut*. <https://readysteadycut.com/2022/05/02/review-meltdown-three-mile-island-netflix-series/>.
- Owen, Rob. (2022). V Talk: *Meltdown* Revisits Three Mile Island,” *Pittsburgh Tribune-Review*. <https://triblive.com/aande/movies-tv/tv-talk-meltdown-revisits-three-mile-island-star-trek-strange-new-worlds-premieres/>.
- Pawar, Pramod. (2022). Podcast Statistics 2022 Future, Demographics and Advertising Trends, *EnterpriseAppsToday*. <https://www.enterpriseappstoday.com/stats/podcast-statistics.html>.
- Perron, Charles. (1984). *Normal Accidents: Living With High Risk Technology* Princeton, NJ: Princeton University Press.



- Todd, Andrew. (2019). How The China Syndrome Brought Down the Nuclear Power Industry. in *BirthMoviesDeath.com*. <https://birthmoviesdeath.com/2019/06/28/how-the-china-syndrome-brought-down-the-nuclear-power-industry>.
- Weart, Spencer R. (2012). *The Rise of Nuclear Fear*, Cambridge, MA: Harvard University Press.
- Wikipedia. Three Mile Island Accident, [en.wikipedia.org](https://en.wikipedia.org/wiki/Three_Mile_Island_accident).
https://en.wikipedia.org/wiki/Three_Mile_Island_accident.
- World Nuclear Association. (2023). Nuclear Power Reactors. <https://world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-power-reactors/nuclear-power-reactors.aspx>.