

TEPCO'S ATOMIC DELUSION:

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Kashiwazaki Kariwa nuclear plant (unit 5,6&7 site), Niigata, March 2017 Shaun Burnie/Greenpeace

More than seven years after the triple reactor meltdown at the Fukushima Daiichi nuclear plant, in mid June 2018 Tokyo Electric Power Company Holdings, Inc (TEPCO) finally bowed to the inevitable and announced it was considering the decommissioning of the four reactors at Fukushima Daini.² Facing hundreds of billions of yen in retrofit costs and united opposition to restart by all the communities in Fukushima prefecture it was the right decision for a company that remains deep in crisis. Given the time it took TEPCO to wake up to reality in Fukushima, there can be no expectation that any time soon the company will announce it is giving up on plans for operation of

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2 Power Magazine, "TEPCO Exec: Daini Plant Will Be Decommissioned", 14 June 2018, see <http://www.powermag.com/tepcO-exec-daini-plant-will-be-decommissioned/>

reactors at the world's largest nuclear plant at Kashiwazaki Kariwa in Niigata prefecture. However, the prospects for TEPCO at the site remain bleak.

The Niigata governor election of 10th June 2018 led to the appointment of Liberal Democratic Party (LDP) backed candidate Hideyo Hanazumi. However, this does not mean any early restart for TEPCO's Kashiwazaki Kariwa reactors. The newly elected governor conscious that 65 percent of the Niigata population remain opposed to restart of any reactors at the plant, stated, ***“As long as the people of Niigata remain unconvinced, (the reactors) won't be restarted.”***³

Unable to secure early operation of the Kashiwazaki Kariwa unit 6&7 reactors under the previous governor, TEPCO is still faced with further major challenges to restart. TEPCO has to date spent a total 700 billion yen (US\$6.38 billion) on Kashiwazaki 6&7 retrofits in an attempt to meet revised safety standards.⁴

TEPCO, hemorrhaging millions of customers, is confronted with Fukushima costs that are projected to run to tens of trillions of yen and with no prospects for operating the Kashiwazaki Kariwa nuclear reactors in the coming years. The survival strategy of TEPCO is based on the successful implementation of its new business plan revealed in May 2017 – the third since the Fukushima Daiichi nuclear accident of March 2011. The operation of the Kashiwazaki Kariwa reactors remains central to TEPCO's business prospects. This briefing summarizes some of the major obstacles to restart at Kashiwazaki Kariwa.

TEPCO's Financial Status Related To Nuclear Operations

In its latest financial report in April 2018,⁵ TEPCO reported that,

* Maintenance and construction work at the Kashiwazaki Kariwa and Fukushima Daini nuclear plants – a total of eleven reactors - cost TEPCO ¥59.6 billion (US\$510 million) in 2017, compared to ¥43.7 billion (US\$390 million) in 2016.

* The company recorded depreciation on its nuclear assets of ¥98.5 billion (US\$890 million), compared with ¥86.5 billion (US\$790 million) in 2016. TEPCO's ordinary back-end expenses (fuel reprocessing and decommissioning) were ¥47.4 billion (US\$430 million) compared to ¥49.0 billion (US\$450 million) in 2016.

* TEPCO costs in 2017 of ¥286.8 billion (US\$2.61 billion) related to the Fukushima Daiichi disaster, while it received ¥381.9 billion (US\$3.48 billion) from the Nuclear Damage Compensation and Decommissioning Facilitation Corporation in FY2017.

3 Eric Johnston, “If Niigata gubernatorial race was a litmus test, Abe and Nikai passed”, The Japan Times, 11 June 2018, see <https://www.japantimes.co.jp/news/2018/06/11/national/politics-diplomacy/niigata-gubernatorial-race-litmus-test-abe-nikai-passed/#.WzDaTxIzbOQ>

4 Yomiuri, “Japan's nuclear energy policy at crossroads”, 23 June 2018, see <http://the-japan-news.com/news/article/0004518947>

5 TEPCO, “FY2017 Financial Results (April 1, 2017 – March 31, 2018) Tokyo Electric Power Company Holdings, Inc.” 26 April 2018, see http://www.tepco.co.jp/en/corpinfo/ir/tool/presen/pdf/180426_1-e.pdf

* The total cost of the Fukushima Daiichi accident to TEPCO, paid for by grants from the NDF, as of FY2017 was ¥7,033.3 trillion (US\$64.21 billion) Government estimates are that total costs will be ¥21.5 trillion (US\$193 billion).

However, the Japan Institute for Economic Research (JIER) in 2017 estimated that total costs for ‘decommissioning’, decontamination and compensation of the Fukushima could range between ¥50-70 trillion (US\$449-628 billion),⁶ and with enormous uncertainties. If confirmed over the coming years it will be the most expensive industrial accident in history, with even greater implications for the people and energy future of Japan.

* TEPCO’s projection for FY2018 are that its operating revenue will increase from ¥5,850.9 billion (US\$5.34 billion) in 2017 to ¥6,099 billion (US\$5.56 billion). At the same time analysts project declining profits through 2021.⁷ At the same time it projects that its electricity sales volume will decline from 240.3 billion kWh to 233.4 kWh.

* In FY2017 it lost 1.68 million customers, for a total loss of 3.5 million customers since the opening of the retail electricity market in April 2016.⁸

Future Operation of Kashiwazaki Kariwa Nuclear Plant

“We had to set a temporary timeline of when to restart reactors to make the business plan. But we cannot predict anything for sure,” TEPCO President Naomi Hirose, January 2014.⁹

As in 2014, the same holds true today when TEPCO management were predicting the future of the Kashiwazaki Kariwa reactors. As of 26th June 2018, the reactors at Kashiwazaki Kariwa had been shutdown for a total of 21,538 days (58.9 years).

When TEPCO submitted its first post Fukushima Daiichi accident business plan to the Japanese government in 2012 it predicted that restart of reactors at Kashiwazaki Kariwa would begin in FY2013;¹⁰ in its second business plan in January 2014 it planned for units 6&7 to restart in July 2014, and units 1&5 in late 2014.¹¹ These were never realistic. In its latest business plan in May 2017, TEPCO gave a restart date of units 6&7 in 2019, but also 2020 and 2021.¹² Of the other

6 Japan Center for Economic Research, “Accident Cleanup Costs May Rise to 50-70 Trillion Yen - It’s Time to Examine legal liquidation of TEPCO - Higher Transparency is Needed for the Reasons to Maintaining Nuclear Power”, Tatsuo Kobayashi, Principal Economist, Professor Tatsujiro Suzuki, Specially Appointed Fellow (Director of Nagasaki University Research Center for Nuclear Weapons Abolition), Kazumasa Iwata, JCER President, see <http://www.jcer.or.jp/eng/research/policy.html>

7 JP Morgan, “Tokyo Electric Power Company Holdings (9501)”, Asia Pacific Equity Research, 29 March 2018.

8 Joseph Jacobelli, “Tokyo Electric Power Research Primer”, Bloomberg Intelligence, 27 April 2018.

9 Japan Times, “Tepco business plan, including July reactor restart, gets official OK”, 15 January 2017, see <http://www.japantimes.co.jp/news/2014/01/15/national/tepcO-business-plan-including-july-reactor-restarts-gets-official-ok/#.WTT0pROGNE4>

10 TEPCO, “Comprehensive Special Business Plan (Outline): May 2012, see http://www.tepcO.co.jp/en/corpinfo/ir/tool/presen/pdf/120509_1-e.pdf

11 TEPCO, “New Comprehensive Special Business Plan”, 15 January 2014, see http://www.tepcO.co.jp/en/press/corp-com/release/betu14_e/images/140115e0206.pdf

12 Opcit, TEPCO, May 2017

Kashiwazaki Kariwa reactors, TEPCO is aiming for restart for units 1&5 from 2021, 2022 or 2023, and units 2, 3&4 from 2024, 2025 or 2026. In its worst-case scenario, TEPCO excludes any restart date for unit 2. The proposed restart schedule is not credible. Even on TEPCO's schedule, the 6&7 units will have been shutdown for nine and ten years respectively if they restarted in 2021. In the case of units 3&4 the situation is even worse at fourteen years shutdown.

Status and Prospects

Kashiwazaki Kariwa Nuclear Power Plant

10 June 2018

Reactor	MWe	Start up/Age	Shutdown 1	NRA Application		Long Term Outage (LTO)	Status - Length of shutdowns as of 26 June 2018 ¹³	Earliest proposed start date – TEPCO plan May 2017	Length of shutdown at earliest TEPCO proposed start date (1st April of FY)	Prospects
				Submission	Approval					
Kashiwazaki-Kariwa Unit 1 BWR	1100	1985 – 30 years	06/08/11			Yes	2517 days	2021	3526 days	Decommission
Kashiwazaki Kariwa Unit 2 BWR	1100	1990 – 25 years	19/02/07			Yes	4146 days	2025	6617 days	Decommission
Kashiwazaki Kariwa Unit 3 BWR	1100	1993 – 23 years	16/07/07			Yes	3999 days	2024	6104 days	Decommission
Kashiwazaki Kariwa Unit 4 BWR	1100	1994 – 21 years	16/07/07			Yes	3999 days	2024	6104 days	Decommission
Kashiwazaki Kariwa Unit 5 ABWR	1100	1990 – 25 years	25/01/12			Yes	2275 days	2021	3354 days	Uncertain/ Decommission
Kashiwazaki Kariwa Unit 6 ABWR	1365	1996 – 19 years	23/06/12	27/09/13		Yes	2195 days	2019	2473 days	Not before 2022
Kashiwazaki Kariwa Unit 7 BWR	1365	1997 – 18 years	23/08/11	27/09/13		Yes	3000 days	2019	2778 days	Not before 2022
Totals	8230	Av. 27.1 years					21,631 days		30,956 days	

There remain multiple barriers to the restarting the KK 6&7 reactors, the only two TEPCO reactors under Nuclear Regulation Authority (NRA) review, with prospects for the other units even more uncertain.

¹³ Inclusive (shutdown date and 10 June 2018)



Kashiwazaki Kariwa nuclear plant, Niigata, July 2007, Greenpeace/Jeremy Sutton Hibbert

Seismic - The Kashiwazaki Kariwa site has a history of major seismic activity, and with repeated underestimates and non disclosures of the seismic risks by TEPCO and resultant cover ups.¹⁴ There are multiple seismic fault lines in the area of the Kashiwazaki Kariwa site, including through the site.¹⁵ There are large-scale submarine active faults offshore with four main ones, three of which run along either edge of the Sado Basin, a depression between Sado Island and mainland Kashiwazaki.¹⁶ Seismologists have long warned about the threat from major earthquakes leading to a severe nuclear accident at Kashiwazaki Kariwa.¹⁷

Opposition to plans to construct the Kashiwazaki Kariwa plant began as early as 1974, due in large part to seismic risks. Before construction began on unit 1 in 1980, it was known that the ground conditions of the Kashiwazaki Kariwa site was one of the worst among all of Japan's nuclear power plants. It was necessary to dig down about 40 meters to get to a stratum able to support a nuclear reactor.¹⁸ When the Chuetsu-oki earthquake struck Niigata in 2007,¹⁹ the reactor buildings were jolted by the 6.8 Japanese Seismic scale quake beyond their design basis. The Kashiwazaki Kariwa

14 In August 2002 it was announced that TEPCO had passed periodic inspections of its nuclear power plants by altering inspection data and concealing cracks. After the scandal was revealed, TEPCO nuclear reactors shut down for periodic inspections could not be restarted and in the spring of 2003 operation of all 17 TEPCO reactors was suspended. At the time of the licensing of the ABWR 6&7 reactors in 19991 TEPCO presented evidence to NISA that the nearby fault lines were not active. This was then proven to be incorrect, with TEPCO's own data showing that they were aware of active faults, including in 1980 though none of this was made public until after the 2007 quake – see http://www.cnic.jp/english/newsletter/nit123/nit123articles/kkearthquake.html#e*5

15 Kashiwazaki Kariwa Nuclear Power Fault Study Group, “Kashiwazaki Kariwa Nuclear Power Station site and its surroundings - Proposal for strict scientific judgment on stratigraphy of middle and upper Pleistocene”, 22 May 2017, (in Japanese) see <http://masatate.blog.fc2.com/blog-entry-55.html>

16 Katsuhiko Ishibashi and Mitsuhsa Watanabe, “Earthquakes and Ground Condition Just how safe is the Kashiwazaki-Kariwa Nuclear Power Plant?”, CNIC, March/April 2008 Nuke Info Tokyo No. 123, see <http://www.cnic.jp/english/newsletter/pdf/nit123.pdf>

17 Professor Ishibashi Katsuhiko, “Why Worry? Japan's Nuclear Plants at Grave Risk From Quake Damage,” Japan Focus, 1 August, 2007 Volume 5 | Issue 8, see <http://apjjf.org/-Ishibashi-Katsuhiko/2495/article.html>

18 Consisting largely of sand deposits of the Arahama Dune Bed.

unit 3 turbine building experienced east-west movement 2.5 times above the design basis acceleration.²⁰ The epicenter of the 2007 seismic sub-seabed event was 15km northwest from the plant and the ground motion far exceeded Kashiwazaki Kariwa basic S1 and S2 earthquake ground motions assumed when the plant was designed.²¹ Unit 1 was only designed to withstand a M6.9 earthquake arising from the Kihinomiya Fault, and the other units were also built to the pre-2006 seismic guidelines. TEPCO chose during the construction phase, including for the newer 6&7 units, not investigate the possibility of active offshore faults. Even when it did become aware of these, in advance of construction of units 6&7 in 1992/93, it chose not to disclose them.²² TEPCO's original calculations indicated that a M6.9 earthquake arising from the Kihinomiya Fault would only cause a ground motion of 222 Gal (S1), while a M6.5 earthquake directly beneath the plant would only cause a ground motion of 274 Gal (S2). However, to be on the 'safe side', design basis ground motion S1 was set at 300 Gal, while design basis ground motion S2 was set at 450 Gal. In the event, these figures turned out to be gross underestimates.²³ During the 2007 Chuetsu-Oki earthquake the ground motion at the 'free surface of the base stratum' for KK Unit 1 was calculated to be 1,699 Gal.²⁴ All operating units were shut down, unit 7 was restarted in 2009;²⁵ units 1, 5 and 6 restarted in 2010, however units 2, 3 and 4 have not operated since 2007.²⁶

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- 19 For an overview of the Chuetsu-oki earthquake see, http://www98.griffith.edu.au/dspace/bitstream/handle/10072/42174/71142_1.pdf;jsessionid=7BDA0FCBF0003D1DDFE6F39FC56BFC17?sequence=1
- 20 TEPCO, "Impact of the Chuets-oki Earthquake on the Tokyo Electric Power Company (TEPCO) Kashiwazaki Kariwa Nuclear Power Station and Countermeasures", September 2007, see <http://www.tepco.co.jp/en/news/presen/pdf-1/0709-e.pdf>.
- 21 The Kashiwazaki-Kariwa nuclear power plant was designed for basic horizontal earthquake ground motions of 300 Gal (S1) and 450 Gal (S2). Gal is a unit of acceleration. Gravitational acceleration at the earth's surface is 980 Gal. These figures apply to a hypothetical surface called "free surface of the base stratum", where S1 is an earthquake ground motion that could actually occur, while S2 is an almost inconceivable hypothetical earthquake ground motion. Tertiary layers, or earlier bedrock that has not been eroded are generally referred to as "ground". Hypothesizing that above this ground there are no layers or structures, the surface spreading out horizontally is called the "free surface of the base stratum".
- 22 CNIC, "Kashiwazaki-Kariwa Nuclear Power Plant Seismic Design of the Kashiwazaki-Kariwa Nuclear Power Plant: a Historical Perspective", Nuke Info Tokyo No. 130, 10 May 2009, see <http://www.cnic.jp/english/?p=1988#note5>.
- 23 Martin Fackler, "Japan's Quake-Prone Atomic Plant Prompts Wider Worry", New York Times, 25 July 2007, see <http://www.nytimes.com/2007/07/25/world/asia/25japan.html>
- 24 This figure was derived from a peak east-west ground motion of 680 Gal recorded by a monitor in the fifth floor basement of Unit 1, see CNIC, "Kashiwazaki-Kariwa Nuclear Power Plant Seismic Design of the Kashiwazaki-Kariwa Nuclear Power Plant: a Historical Perspective", Nuke Info Tokyo No. 130, 10 May 2009, see <http://www.cnic.jp/english/?p=1988#note5>
- 25 On the same days as restart TEPCO had problems in unit 7 when problems occurred in the main steam line - (steam leakage from the turbine driven reactor feed water pump – see <http://www.tepco.co.jp/en/press/corp-com/release/09060801-e.html>; reactor operation continued and then on May 11th a further problem occurred with the reactor core isolation cooling system (RCIC), when the water level of the suppression pool went beyond the normal level..."[T]he RCIC could not be shut down by normal procedure and had to be shut down manually at the site." The problems led to a departure from the "Limiting Condition for Operation" stipulated in the Technical Specification. The reactor was subsequently restarted and operated through the remainder of 2009, through to 2011 – see, <http://www.cnic.jp/english/newsletter/pdf/files/nit130.pdf>
- 26 IAEA Power Reactor Information System, PRIS, Japan, see, <https://www.iaea.org/PRIS/CountryStatistics/CountryDetails.aspx?current=JP>

Despite TEPCO²⁷ and the IAEA²⁸ concluding that Kashiwazaki Kariwa shutdown was successful and with no serious damage, it is known that this major seismic event impacted safety functions at the site. Damage of one form or another has been confirmed at more than 3000 locations at the plant. Warnings of the failure of nuclear regulation and TEPCO to conduct effective seismic assessments were made immediately after the 2007 event.²⁹

Following the March 2011 Fukushima Daiichi accident, the revised NRA guidelines, while they did not revise the seismic guidelines of 2006, did require more extensive assessments of the seismic risks at nuclear plants, including a longer historical record requirement to determine if a fault was active or not. The NRA now defines an active fault as one that has moved any time within the last 400,000 years (in contrast to the previous 120,000- 130,000 years. It's worth emphasizing that seismologists have warned that a strong earthquake of up to about 7.3 magnitude could directly hit an area where even perfect seismic research could not discover an active fault line,³⁰ underscoring that while identifying active faults is important, the presence of inactive faults does not preclude a future major event. The seismic formula used by the NRA has been widely criticized as flawed in multiple submissions to court cases during the last three years, including those for the Sendai, Takahama, Ikata, and Hamaoka and reactors, as well as a for the Kashiwazaki Kariwa plant. Specifically, the so-called Irikura/Miyake method used by the NRA underestimates deformation when using estimated fault area values.³¹ The result of this is that actual seismic measurements at a site could be several times higher.

This was the view of former NRA deputy chair Kunihiro Shimazaki when he testified in April 2016 in a court case against the Ohi nuclear plant in Fukui prefecture. Shimazaki, an emeritus professor of seismology at Tokyo University and the only seismologist to have been an NRA commissioner during his period in office from 2012-2014, has challenged the formulas used by the regulator in computing the scale of earthquakes, which he believes underestimates potential seismic impact by factor of 3.5.³² In 2016, he warned that,

“I see lack of clarity and responsibility in committees of experts organized by the state...In the world of science, we can together look for facts and can reach agreement to a certain extent.

27 Nucnet, “No Damage To Kashiwazaki Kariwa Fuel, Tepco Confirms”, 26 July 2007, see, <http://www.nucnet.org/all-the-news/2007/07/26/no-damage-to-kashiwazaki-kariwa-fuel-tepco-confirms/print>

28 The IAEA produced three reports on Kashiwazaki-kariwa between 2007 and 2009 – see <http://www.iaea.org/newscenter/news/2009/kashiwazaki290109.html>

29 Letter to the IAEA Concerning Earthquake Damage at the Kashiwazaki-Kariwa Nuclear Power Station”, Citizens’ Nuclear Information Center (Tokyo, Japan), Greenpeace Japan (Tokyo), Green Action (Kyoto), 6th August 2007, see <http://greenaction-japan.org/en/2007/08/letter-to-the-iaea-concerning-earthquake-damage-at-the-kashiwazaki-kariwa-nuclear-power-station/>

30 Ishibashi Katsuhiko is a professor at the Research Center for Urban Safety and Security of Kobe University, International Herald Tribune/Asahi Shinbun on August 11, 2007.

31 Mainichi, “NRA to scrap recalculated quake ground motion data for Oi nuclear plant”, 21 July 2016, see <http://mainichi.jp/english/articles/20160721/p2a/00m/0na/013000c>

32 Shimazaki, “‘Maximum-class’ Japan Sea tsunami scenarios are less than maximum-class — An error, left uncorrected, is a recipe for another ‘unforeseeable’ disaster, Kagaku (Science Journal), Vol. 86, No. 7, July 2016, see https://www.iwanami.co.jp/kagaku/eKagaku_201611_Shimazaki.pdf

That is not the case when the state is involved, and mistakes will be repeated if we are not aware of the difference.³³

In July 2016, the NRA dismissed Professor Shimazeki's evidence.

Further critical analysis of the NRA's flawed approach to seismic analysis includes the failure to adequately apply uniform hazard spectrum in probabilistic analysis, and at a level less than that applied for example by the U.S. Nuclear Regulatory Commission (NRC),³⁴ with the NRA failing to provide sufficient explanation as to the process used to construct the uniform hazard spectra. The result of this is that the NRA is adopting an approach that undermines its own efforts to determine the specific seismic hazard at any given site, including at Kashiwazaki Kariwa.

“When comparing the process of determining the design-basis-earthquake in Japan to other examples in the U.S. and other countries, there are many unclear elements in the Japanese process, as it is not worked out comprehensively. It is unacceptable to promote this process as the highest standard in the world.” Satoshi Sato, former General Electric engineer, 2015.³⁵

TEPCO until recently also failed to disclose the risks of liquefaction at the site. In February 2018, TEPCO revealed that it had confirmed that the site under the emergency hydrogen ventilation buildings at units 5,6&7 were vulnerable to liquefaction. This came two months after the NRA had approved the reactors basic safety assessment.³⁶ TEPCO is now under pressure to explain the scale of liquefaction at the site, prove that it does not extend to the reactor buildings and how it was that the NRA was not informed prior to granting approval. Equally, the NRA has to explain how it failed to identify liquefaction as a problem for a site prior to granting basic safety approval in December 2017.

There are multiple seismic fault lines in the area of the Kashiwazaki Kariwa site, including large-scale submarine active faults, with four main ones, three of which run along either edge of the Sado Basin, a depression between Sado Island and mainland Kashiwazaki.³⁷ The enormous seismic risks at the Kashiwazaki Kariwa site remain unresolved and are certain to dominate the debate about the safety of any reactor restart, including in ongoing legal challenges.

33 Japan Times, “State ignored predictions 10 years before 3/11 tsunami, says seismologist”, 23 March 2016, see <http://www.japantimes.co.jp/news/2016/03/23/national/state-ignored-predictions-10-years-311-tsunami-says-seismologist/#.WTk44xN95E4>

34 Sato-Satoshi, “Technical Issues of Japanese Seismic Evaluations from the Point of Global Standards”, 28 April 2015, commissioned by Greenpeace Japan, see <http://www.greenpeace.org/japan/global/japan/pdf/20150428-seismic-evaluation-en.pdf>

35 Ibid.

36 JAIF, “Kashiwazaki Kariwa 6 & 7 Clear Safety Examinations, First BWRs”, 27 December 2017, see <http://www.jaif.or.jp/en/kashiwazaki-kariwa-6-7-clear-safety-examinations-first-bwrs/>

37 Katsuhiko Ishibashi and Mitsuhsa Watanabe, “Earthquakes and Ground Condition Just how safe is the Kashiwazaki-Kariwa Nuclear Power Plant?”, CNIC, March/April 2008 Nuke Info Tokyo No. 123, see <http://www.cnic.jp/english/newsletter/pdf/nit123.pdf>

Niigata Fukushima Investigative Committees

The previous Governor of Niigata appointed a panel of experts to review the causes and impacts of the Fukushima Daiichi accident and to review emergency planning in Niigata in the event of a severe accident at the Kashiwazaki Kariwa plant.³⁸ The conclusion of the work of the committees was linked to the then Governor determination of approval or not for the restart of the units 6&7. They were expected not conclude their investigations until mid 2020 at the earliest. The committees work is on going, and the new Governor has stated since his election that he will await the conclusion of their investigations, while also suggesting that a further election could be held specifically on whether to restart the reactors.³⁹

Legal Challenges

As with elsewhere in Japan, the prospects of multiple legal challenges, including injunction requests, loom over the restart of Kashiwazaki Kariwa units 6&7, with the potential delay and stop restart.⁴⁰ An administrative lawsuit against the Kashiwazaki Kariwa reactors, with a particular focus on seismic risks at the plant, was filed in 2012, and is on-going.

In parallel to the lawsuit in Niigata, criminal court proceedings continue in Tokyo against three former TEPCO executives over the Fukushima Daiichi accident.⁴¹ The prospects are for a ruling in 2019. While TEPCO is not formally in court and not a defendant, a judgement that ruled the executives willfully ignored evidence of tsunami risks to the Fukushima nuclear plant, and failed to take preventative measures that could have prevented the triple reactor meltdown, would be a decisive blow against TEPCO plans for any reactor restart at Kashiwazaki Kariwa.

Conclusion

TEPCO's ability to meet its financial obligations remains in deep crisis. Projections on TEPCO's earnings, and therefore their ability to cover dramatically rising Fukushima costs, were, to a significant degree, based on the false premise of an early restart of Kashiwazaki Kariwa reactors. TEPCO's 2017 business plan includes the ambition to cover their share of Fukushima costs of currently at 16 trillion yen (US\$150 billion) to be paid at rate of 500 billion (US\$4.56 billion) each year. This far exceeds TEPCO's projected profits over the coming years.

Greenpeace analysis concludes that given the technical challenges at the Kashiwazaki Kariwa site and the political context in Niigata, restart of units 6&7, if it takes place, will not be before 2022. The Niigata election has not resolved the underlying challenges facing TEPCO. The end result is that the Government will likely seek to increase the share of costs to be borne by the taxpayer and

38 Kentaro Hamada and Osamu Tsukimori, "Niigata governor's plans may upend TEPCO's nuclear restarts, restructuring", Reuters, 9 June 2017, see <http://www.euronews.com/2017/06/09/niigata-governors-plans-may-upend-tepcos-nuclear-restarts-restructuring>

39 Asahi Shimbun, "LDP-backed candidate wins governor's race in Niigata" 11 June 2018, see <http://www.asahi.com/ajw/articles/AJ201806110049.html>

40 AFP, "Group files injunction to stop restart of Kashiwazaki-Kariwa reactors", 24 April 2012, see <https://japantoday.com/category/national/group-files-injunction-to-stop-restart-of-kashiwazaki-kariwa-reactors>

41 Justin McCurry, "Fukushima nuclear disaster: former Tepco executives go on trial", The Guardian, 30 June 2017, see <https://www.theguardian.com/environment/2017/jun/30/fukushima-nuclear-crisis-tepco-criminal-trial-japan>

other power companies, which will only grow further as the actual costs of the Fukushima disaster rise potentially to between 50-70 trillion yen.⁴²

TEPCO under its previous management failed to adapt to the main challenges of the energy market following the 2011 Fukushima Daiichi disaster – including a new wave of market deregulation, the devaluation of nuclear assets, and breakthroughs in renewable deployment.⁴³ The new TEPCO President Tomoaki Kobayakawa has recently referred to TEPCO’s future as “Utility 3.0 is coming,” and that he wants renewables to become a major pillar of his company on a par with thermal power generation.⁴⁴ The aim of TEPCO to develop renewable business is to be welcomed and is a major shift in thinking.⁴⁵ Though we have heard this before from TEPCO in 2010,⁴⁶ it is correct to view this shift as of strategic importance, **“The current situation...would have been unthinkable before the Fukushima disaster. That indicates TEPCO has entered a transitional stage,”**⁴⁷ a TEPCO official stated in May 2018.

However, the timeframe of 2050, when TEPCO predicts renewables will beat nuclear power, reveals that the company has still not woken up to the reality of today, when renewables globally are already cheaper than new nuclear plants. New European wind power costs per kWh are already less than Japan’s existing reactor operating costs.⁴⁸ TEPCO has a long way to go, with renewable energy generation of only 0.07 billion kWh in 2017⁴⁹ (still more than any nuclear generation in the past year), but a fraction of Japan’s potential. By comparison, German utilities generated 100 TWh

42 Opcit. Japan Center for Economic Research, 2017.

43 Gyorgy Dallos, “Beyond Nuclear: The Triple Challenge Facing Japanese Utilities” Greenpeace International, February 2013, see <http://www.greenpeace.org/international/Global/international/publications/nuclear/2013/BeyondNuclear.pdf>

44 Asahi Shimbun, “In cautious shift, TEPCO promotes renewables as business ‘pillar’” 23 May 2018.

45 Greentech Media, “Could Tepco’s New Strategy Spur Offshore Wind in Japan? Investments are likely as the Japanese energy giant looks to diversify”, 23 March 2018, see <https://www.greentechmedia.com/articles/read/could-tepcos-new-strategy-spur-offshore-wind-in-japan#gs.Tp2UmQo>

46 Reuters, “TEPCO to boost renewable energy, expand overseas”, 13 September 2010, see <https://www.reuters.com/article/us-tepc/tepc-to-boost-renewable-energy-expand-overseas-idUSTRE68C2HY20100913>

47 Opcit. Asahi Shimbun, May 2018.

48 A recent assessment reported that solar PV costs dropped 73 percent in the period 2010-2017 – and its only going to get cheaper, see GT, “IRENA: Global Renewable Energy Prices Will Be Competitive With Fossil Fuels by 2020 - The International Renewable Energy Agency calls it “a significant shift in the energy paradigm.”, 16 January 2018, see <https://www.greentechmedia.com/articles/read/irena-renewable-energy-competitive-fossil-fuels-2020#gs.u9O9Ano> Current prices for new offshore wind in the North Sea are in the range of euro 49.9/MWh, see C4 offshore, “North Sea wind power to multiply around 10 fold”, 24 May 2018, see <https://www.4coffshore.com/news/north-sea-wind-power-to-multiply-around-10-fold-nid7890.html> This compares with the costs given by the IEEJ for existing nuclear power in Japan of 6.9 yen /kwh in the 2016/17 period, which is euro 53.8 / MWh, see IEEJ, “Economic and Energy Outlook of Japan through 2017”, 26 July 2016, see <https://eneken.ieej.or.jp/data/6852.pdf>

49 Opcit. TEPCO, April 2018.

of wind power electricity in 2017,⁵⁰ five times more than the combined 17.43 TWh generation at Kashiwazaki Kariwa 6&7 generated in their last full year of operation in 2011 and 2012.⁵¹

There clearly is great uncertainty inside TEPCO over its future business direction. The inevitable further delays in any restart at Kashiwazaki Kariwa should concentrate minds inside the company as it struggles to come to terms with the global rise of renewable energy, and the threat it poses to its outdated business model based as it is on nuclear and coal generation.

50 Craig Morris, “German wind overtakes coal and nuclear”, Wind Power Monthly, 5 April 2018, see <https://www.windpowermonthly.com/article/1461284/german-wind-overtakes-coal-nuclear>

51 IAEA, Japan” PRIS, see <https://www.iaea.org/PRIS/CountryStatistics/CountryDetails.aspx?current=JP>