

The barriers to achieving this scale of nuclear generation by 2030, even with all the financial incentives, market distortion, and central government support, look insurmountable. Therefore, there is no prospect that the SEP lays out the nuclear future for Japan during the next critical decade. Without a more ambitious expansion of renewable energy during the coming years, the shortfall in electricity supply due to the failure to meet nuclear targets, could be filled by fossil fuel. The 2021-SEP thus takes on even greater significance, if Japan is to begin to have any prospects of rapidly reducing its emissions by 45 percent by 2030, securing the necessary energy transition and to meet its 2050 goals of decarbonization and zero emissions.

SOUTH KOREA FOCUS



On the Korean Peninsula, South Korea (Republic of Korea) operates 23 reactors, plus one reactor in Long-Term Outage (LTO), and has four reactors under construction. One of two reactors which had been in LTO, Hanbit-3, resumed operation in November 2020. Both reactors had been shut for more than two and three years respectively, due to voids in concrete containment walls and corrosion on containment liner plates.

In December 2020, the Government of President Moon Jae-in announced its 9th Basic Plan for Long-term Electricity Supply and Demand which aims to significantly increase renewable energy, while reducing installed nuclear capacity and coal-fired plants in the period up to 2034. However, the possibility that current Korean energy policy will be overturned looms with the Presidential election scheduled for 2022.

South Korea's nuclear fleet, owned by Korea Hydro & Nuclear Power Company (KHNP), is located at the Hanbit, Hanul, Kori and Wolsong sites. Nuclear power provided 152.6 TWh in 2020, almost 10 percent more than the 138.8 TWh in 2019.

Construction

All four reactors under construction in South Korea are APR-1400 design. Construction of Shin-Hanul-1 and -2 has been nearly completed, but startup dates have been pushed back. Fuel loading for Unit 1 began on 14 July 2021 while Unit 2 is planned to be fueled one year later, on 1 July 2022.³⁵⁰ There is no date for grid connection, but KHNP has scheduled commercial operation for Unit 1 on 31 March 2022, and exactly one year later for Unit 2.

KHNP had also planned to construct two additional reactors at the site, Shin-Hanul-3 and -4. But they were ordered by the Moon government in 2017 to suspend their plans. The government's 2017-Basic Plan for Long-term Electricity Supply and Demand cancelled Shin-Hanul-3 and -4, as well as four other reactors Cheonji-1 and -2 (in Yeongdeok) and either Cheonji-3 and -4 or Daejin-1 and -2 (in Samcheok). While there is no immediate prospect of construction actually beginning under the current administration, in February 2021, the Ministry of Trade, Industry and Energy (MOTIE) extended the construction license permits for Shin-Hanul-3 and -4, which

350 - KHNP, "Nuclear Power Construction - Shin-Hanul #1,2", Korea Hydro & Nuclear Power Co., Updated 30 April 2021, see <https://cms.khnp.co.kr/eng/content/547/main.do?mnCd=EN03020303>, accessed 4 June 2021.

were due to expire, until end of 2023.³⁵¹ The suspension of construction could be terminated if the opposition party wins the upcoming 2022-Presidential elections.

The two other reactors, Shin Kori-5 and Shin Kori-6, have been under construction since April 2017 and September 2018 and were planned to be completed in March 2023 and June 2024 respectively.³⁵² However, in March 2021, KHNP applied for an extension of the construction license, with a completion schedule for Shin Kori-5 now extended one additional year until 31 March 2024, and for Shin Kori-6, nine months later to 31 March 2025.³⁵³

Typhoon Shutdowns

As a result of two typhoon systems hitting Korea in September 2020, a total of 5.3 GW of nuclear capacity was shut down. Six KHNP reactors suffered loss of off-site power caused by Typhoon Maysak on 3 September 2020 and Typhoon Haishen on 7 September 2020. Kori-3 and -4, and Shin Kori-1 and -2 had been operating on 3 September 2020 when they were tripped and emergency diesel generators began operation. Kori-1 and -2 had been offline undergoing refueling and maintenance at the time. On 7 September 2021, Wolsong-1 and -2 were tripped while the supply of off-site power was sustained and the reactors started to operate at 60 percent of reactor power, and then were shut down.

The Nuclear Safety and Security Commission (NSSC) and the Ministry of Trade, Industry and Energy (MOTIE) investigation into the event concluded that wind-carried salt had deposited on the transformer instruments, which measure electrical quantities generated from the reactors, which led to fire sparks or flashovers. It led to the opening of the breaker in the switchyard, which was the beginning of the event. KHNP said the typhoon was stronger than expected. However, Han Byeong-seop, director of the Korean Institute for Nuclear Safety (KINS) said that even if salinity was the cause, the real problem might be “poor-quality parts and slapdash construction,” *The Hankyoreh* newspaper reported.³⁵⁴ Countermeasures to be applied include replacing insulators with salt-resistant materials and minimizing parts exposed to the outside environment, including main transformers, standby transformers, and instrument transformers of the reactors by sealing the facilities.

As a consequence of the typhoons, combined with reactors offline due to refueling and maintenance during the off-peak autumn season, a total of 12 reactors with a combined capacity of 10.9 GW were offline in September 2020, or 47 percent of South Korea’s overall

351 - NucNet, “Ministry Extends Construction Licence For Delayed Shin-Hanul Units”, 23 February 2021, see <https://www.nucnet.org/news/ministry-extends-construction-licence-for-delayed-shin-hanul-units-2-2-2021>, accessed 9 June 2021.

352 - S&P Global, “S Korea’s 9 nuclear plants restarting Sep-Oct to pressure LNG demand”, 2 September 2020, see <https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/090220-s-koreas-9-nuclear-plants-restarting-sep-oct-to-pressure-lng-demand>, accessed 9 June 2021.

353 - Chosun Biz, “‘탈원전 기조 유지’ 문승욱...후쿠시마 사고로 원전 불안감 커져”[“Maintaining the post-nuclear power cycle... increased insecurity at the nuclear power plant due to the Fukushima accident - Seung-wook Moon”], 4 May 2021 (in Korean), see https://biz.chosun.com/policy/policy_sub/2021/05/04/ET6KS2F65JFEDEUGPER4U2M7CU/, accessed 9 June 2021.

354 - *The Hankyoreh*, “Six reactors shut down due to salinity during recent typhoons”, 11 September 2020, see https://english.hani.co.kr/arti/english_edition/e_national/961833.html, accessed 28 July 2021.

capacity of 23 GW across 24 nuclear reactors, KHNP reported on 28 September 2020.³⁵⁵ (See also [Nuclear Power and Climate Change Resilience](#)).

Permanent Closure

The NSSC formally passed the bill for the permanent closure of Wolsong-1 on 24 December 2019. The decision has met protests from the main opposition Liberal Democratic Party (LDP) and the labor union of KHNP, which have launched legal action against NSSC and its members. The controversy over the closure has escalated during the past year (see [below](#)).

Table 4 – Status of Nuclear Reactor Fleet in South Korea (with scheduled closure dates)

| Reactor | Type | MW | Grid connection | Expected Closure |
|----------------|------|-------|-----------------|------------------|
| Kori-2 | PWR | 640 | 1983 | 2023 |
| Kori-3 | PWR | 1 011 | 1985 | 2024 |
| Kori-4 | PWR | 1 012 | 1985 | 2025 |
| Hanbit-1 | PWR | 995 | 1986 | 2025 |
| Hanbit-2 | PWR | 988 | 1986 | 2026 |
| Wolsong-2 | PHWR | 606 | 1997 | 2026 |
| Wolsong-3 | PHWR | 630 | 1998 | 2027 |
| Hanul-1 | PWR | 966 | 1988 | 2027 |
| Hanul-2 | PWR | 967 | 1989 | 2028 |
| Wolsong-4 | PHWR | 609 | 1999 | 2029 |
| Hanbit-3 | PWR | 986 | 1994 | |
| Hanbit-4 | PWR | 970 | 1995 | |
| Hanbit-5 | PWR | 992 | 2001 | |
| Hanbit-6 | PWR | 993 | 2002 | |
| Hanul-3 | PWR | 997 | 1998 | |
| Hanul-4 | PWR | 999 | 1998 | |
| Hanul-5 | PWR | 998 | 2003 | |
| Hanul-6 | PWR | 997 | 2005 | |
| Shin-Kori-1 | PWR | 996 | 2010 | |
| Shin-Kori-2 | PWR | 996 | 2012 | |
| Shin-Kori-3 | PWR | 1 416 | 2016 | |
| Shin-Kori-4 | PWR | 1 418 | 2019 | |
| Shin-Wolsong-1 | PWR | 997 | 2012 | |
| Shin-Wolsong-2 | PWR | 993 | 2015 | |

Sources: MOTIE, 2017

Following the closure of Wolsong-1, seven additional reactors are planned to be closed just prior to reaching their 40-year operating lifetime with a total 6.6 GW of capacity. The reactors are Kori-2 to be closed in 2023, Kori-3 in 2024, Kori-4 and Hanbit-1 in 2025, and Hanbit-2 in 2026, Hanul-1 in 2027 and Hanul-2 in 2028. Three reactors are scheduled to be closed as they

³⁵⁵ - Atsuko Kawasaki and Charles Lee, “Feature: South Korea bucks trend by turning to LSFO after typhoon-led nuclear shutdowns”, *S&P Global*, 28 September 2020, see <https://www.spglobal.com/platts/en/market-insights/latest-news/electric-power/092820-feature-south-korea-bucks-trend-by-turning-to-lsfo-after-typhoon-led-nuclear-shutdowns>, accessed 8 July 2021.

reach their 30-year lifetime: Wolsong-2 in 2026, Wolsong-3 in 2027 and Wolsong-4 in 2029 (see Table 4).³⁵⁶

Containment Liner Plate Corrosion

In recent years, there have been extended outages of South Korea's nuclear reactors. The principal reason has been that out of the 24 reactors South Korea operated (prior to startup of Shin-Kori-4 and closure of Wolsong-1 in 2019) 21 were found to have corrosion in the Containment Liner Plates (CLP) or voids in the concrete structure.³⁵⁷ Reactor containment-buildings in South Korea are insulated with a CLP of six millimeters in diameter, and then concrete 1.2 meters in diameter thick. As the U.S. Nuclear Regulatory Commission (U.S. NRC) noted in 1997: "Any corrosion (metal thinning) could change the failure threshold of the liner plate under a challenging environmental or accident condition. Thinning has the effect of changing the geometry of the liner plate, creating different transitions and strain concentration conditions. This may reduce the design margin of safety against postulated accident and environmental loads."³⁵⁸

Under nuclear regulation, evidence of structural deterioration that could affect the structural integrity or leak-tightness of metal and concrete containments must be corrected before the containment can be returned to service. Corrosion of a liner plate can occur at a number of places where the metal is exposed to moisture, or where moisture can condense (behind insulation) or accumulate. The corrosion repair has consisted of removal of the damaged liner section and embedded foreign material (e.g. wood), grouting the resulting void, and replacing the liner plate section.³⁵⁹ Root cause analysis of the causes of CLP corrosion reported by Korea Institute of Nuclear Safety (KINS) were predominately due to exposure to moisture (environment), as well as the presence of foreign debris.³⁶⁰ KHNP is required to submit its structural integrity assessment of the concrete voids found in the containment building of the reactors to the NSSC, which will then require a technical review by KINS, a technical support organization, and independent verification by the Korea Concrete Institute.³⁶¹ For details on KHNP reactors impacted by CLP see [WNISR2019](#) and [WNISR2020](#).

One of the reactors impacted with CLP remaining in LTO is Hanbit-4 though it is scheduled to resume operation in August 2021, while Hanbit-3, also with CLP problems, returned to operation at the end of 2020. On 7 July 2019, Korean broadcaster *MBC* reported that KHNP had confirmed 94 holes between the steel plate and concrete inside the reactor building of

³⁵⁶ - MOTIE, "The 8th Basic Plan for Long-term Electricity Supply and Demand (2017-2031)", Ministry of Trade, Industry and Energy, 2017, see <https://www.kpx.or.kr/www/downloadBbsFile.do?atchmnmfNo=30051>, accessed 9 June 2021.

³⁵⁷ - Charles Lee, "South Korea completing safety checks on all reactor containment structures", *Nucleonics Week*, 9 May 2019.

³⁵⁸ - Office of Nuclear Reactor Regulation, "Information Notice No. 97-10: Liner Plate Corrosion in Concrete Containments", U.S.NRC, 13 March 1997, see <https://www.nrc.gov/reading-rm/doc-collections/gen-comm/info-notices/1997/in97010.html>, accessed 29 June 2021.

³⁵⁹ - Jason P. Petti, Dan Naus et al., "Nuclear Containment Steel Liner Corrosion Workshop: Final Summary and Recommendation Report", Sandia National Laboratories, operated for the U.S. Department of Energy, Report SAND2010-8718, July 2011, see <https://www.nrc.gov/docs/ML1121/ML112150012.pdf>, accessed 29 June 2021.

³⁶⁰ - Yonglak Paek, Sangyun Kim, Euisik Yoon and Hun Cha, "Introduction of Containment Liner Plate (CLP) Corrosion", Korea Institute of Nuclear Safety, Transactions of the "Korean Nuclear Society Spring Meeting", 17-18 May 2018, see https://www.kns.org/files/pre_paper/39/18S-189%EB%B1%EC%9A%A9%EB%9D%BD.pdf, accessed 29 June 2021.

³⁶¹ - NSSC, "Regarding Concrete Voids of Containment Buildings of Hanbit Unit 3 and 4, the NSSC Will Verify Structural Integrity Objectively and Transparently", 12 March 2020.

Hanbit-3 and 96 holes in Hanbit-4. KHNP, according to MBC, explained that the holes found are up to 90 cm in size, but there would be “no problem with the structural stability of the containment.”³⁶²

Hanbit-3 entered LTO status in July 2020. However, on 12 November 2020 and following repairs to the CLP damage, the NSSC approved criticality of Hanbit-3, which had been shut down on 11 May 2018.³⁶³ There were further delays to the restart plans for Hanbit-4, following shutdown in 2017 and originally scheduled for October 2020.³⁶⁴ As of 1 July 2021, Hanbit-4 remains in LTO status but is due to restart operations on 17 August 2021.³⁶⁵

Wolsong Debacle and Uncertainty Over Energy Policy

Highlighting the political and economic pressure against the Moon administration over its energy policy is the on-going controversy over the closure of Wolsong-1. The Pressurized Heavy Water Reactor (PHWR) was closed on 24 December 2019. The closure of the Wolsong-1 reactor has been used by those opposed to President Moon’s energy policy and is now set to continue in the runup to the 2022 Presidential election. The leading opposition candidate for President, Yoon Seok-youl, is the former Prosecutor General who ordered the investigation into the Wolsong case, and later resigned.³⁶⁶

The Wolsong-1 reactor was a CANDU-6 PHWR design, which was connected to the grid on 31 December 1982, and had originally been licensed for 30 years until 2012, but KHNP secured a license extension of 10 years to November 2022. KHNP spent 700 billion won (US\$616 million) during the period 2009–2011 on a first-of-its-kind complete retubing. All 380 zirconium calandria-tubes, which contain the reactor fuel channels and which allow heavy water coolant to circulate, were removed and replaced.³⁶⁷ KHNP stated that the work should enable the 679-MWe reactor to operate for a further 25 years.³⁶⁸ The reactor closed in November 2012, when its operating license expired, and restarted June 2015, after the NSSC voted in favor of lifetime extension.³⁶⁹ President Moon was elected in 2017 on a manifesto that included early

362 - MBC News, “한빛 3·4호기 격납건물서 구멍 190곳 발견” [“190 hatch holes in the containment building of Hanbit 3. 4”], 7 July 2019 (in Korean), see <https://n.news.naver.com/article/214/0000961974>, accessed 2019.

363 - NSSC, “NSSC Approved Criticality of Hanbit Unit 3 During Periodic Inspection and to Conduct Power Ascension and Other Remaining Tests”, 12 November 2020.

364 - S&P Global, “S Korea’s 9 nuclear plants restarting Sep-Oct to pressure LNG demand”, 2 September 2020, see <https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/090220-s-koreas-9-nuclear-plants-restarting-sep-oct-to-pressure-lng-demand>, accessed 29 June 2020.

365 - Argus, “Nuclear disruption to support South Korea coal burn”, 22 March 2021, see <https://www.argusmedia.com/en/news/2198274-nuclear-disruption-to-support-south-korea-coal-burn>, accessed 29 June 2021.

366 - Ser Myo-ja “Yoon incinerates Moon’s anti-nuclear energy policy”, *The Korea JoongAng Daily*, 6 July 2021, see <https://koreajoongangdaily.joins.com/2021/07/06/national/politics/Yoon-Seokyoul-nuclear-phaseout-Wolsong1/20210706183300295.html>, accessed 6 July 2021.

367 - AECL, “AECL achieves milestone in Korean CANDU Refurbishment Project”, Atomic Energy of Canada Limited, 1 December 2010, see <https://www.newswire.ca/news-releases/aecl-achieves-milestone-in-korean-candu-refurbishment-project-546964022.html>, accessed 5 June 2021.

368 - WNN, “Korean Candu restarts after refurbishment”, 29 July 2011, see https://www.world-nuclear-news.org/C_Korean_Candu_restarts_after_refurbishment_2907114.html, accessed 5 June 2021.

369 - NSSC, “The Commissioners Decided to Approve Continued Operation of Wolsong Unit 1 in the 35th Meeting”, Press Release, 27 February 2015, see http://www.nssc.go.kr/nssc/english/release/list.jsp?mode=view&article_no=17977&pager.offset=10&board_no=501, accessed 10 July 2017.

closure of Wolsong-1. In June 2018, the commercial operation of Wolsong-1 was “terminated”,³⁷⁰ and the NSSC on 24 December 2019 formally passed the bill for its closure.³⁷¹

The opposition to the closure decision (and Moon’s overall nuclear and energy policy) was given a boost in October 2020 when the Korean Board of Audit and Inspection (BAI), concluded that, “The economic effectiveness of continuing operation of the reactor was unreasonably devalued,” as result of a “faulty assessment that unfairly underestimated the economic advantage of keeping it operating”.³⁷² The investigation was launched at the request of the Korean National Assembly in September 2019. The BAI avoided ruling on the validity of the state-run corporation’s decision. The BAI found that an accounting firm had submitted a report that undervalued the economic advantage of continuing the operation of the reactor to KHNP in June 2018.

The Ministry of Trade, Industry and Energy (MOTIE), as part of the Moon administration’s energy policy, had already decided to close the reactor prior to the report being completed. Paek Woon-kyu, President Moon Jae-in’s first MOTIE minister decided on 4 April 2018 that the reactor would be closed earlier than the scheduled closure in 2022. KHNP, according to BAI, was prevented from considering any other options and this influenced the company’s economic efficiency assessment.

The BAI report did make clear that the audit looked only at the economic factors, not wider safety issues, stating that, “Safety and region-based elements were excluded from the scope of the audit,” and that,

The decision to close the reactor was a result of a range of factors such as safety and regional acceptance, in addition to economic viability. As the inspection was not about determining the validity of the policy decision, it is not appropriate to view the results of this inspection as a comprehensive assessment on the closure of Wolsong-1 reactor.³⁷³

The BAI did conclude that Minister Paek deserved to be punished for having violated the State Public Officials Act, but no reprimand was recommended at that time because he had retired from the government in September 2018. The BAI recommended the government issue a strong warning to the president of KHNP and punish public servants who obstructed its audit.

Defending the decision to close the reactor, Rep. Youn Kun-young of the ruling Democratic Party warned that, “Shutting down the Wolsong-1 reactor was Moon’s presidential campaign pledge, and it was a policy endorsed by the people through the election. Auditing or investigating the policy to shut down the reactor is a direct challenge to democracy”.³⁷⁴

370 - KHNP, “Nuclear Power Operation - Plant Status”, 31 December 2018, see <http://cms.khnp.co.kr/eng/content/529/main.do?mnCd=EN03020101>, accessed 29 June 2021.

371 - NSSC, “The 112th Meeting of the Commission Was Held”, 24 December 2019.

372 - Ser Myo-ja, “BAI slams Wolsong I nuclear plant shutdown process”, *The Korea JoongAng Daily*, 20 October 2020, see <https://koreajoongangdaily.joins.com/2020/10/20/national/politics/Board-of-Audit-and-Inspection-BAI-Wolsong/20201020191600377.html>, accessed 5 June 2021.

373 - *Asia Today*, “BAI: Wolsong-1 reactor’s economic viability unreasonably undervalued”, 21 October 2020, see <http://en.asiatoday.co.kr/view.php?key=20201020002137344>, accessed 8 July 2021.

374 - *The Korea JoongAng Daily*, “BAI head refutes ruling party, stands by Wolsong probe”, 23 February 2021, see <https://koreajoongangdaily.joins.com/2021/02/23/national/politics/BAI-Choe-Jaehyeong-Wolsong/20210223172300387.html>, accessed 29 June 2021.

The main opposition People Power Party (PPP) demanded a criminal investigation into the government's decision to close the reactor and public servants' attempts to hinder the audit. In December 2020, Daejeon District Prosecutors Office sought arrest warrants for three officials from MOTIE suspected of deleting documents related to the closure of Wolsong-1 charging them with disturbing the state auditors' examination and alleging that they had destroyed 444 materials and files about the decision.

On 1 July 2021, the Prosecutors' Office charged former Minister of Trade, Industry and Energy Paik Un-gyu and former presidential secretary for industrial policy Chae Hee-bong with abuse of power and obstructing the business of KHNP. Chung Jae-hoon, president of the KHNP, was indicted on charges of breach of trust and obstruction of business.³⁷⁵

Moon Administration's Energy Policy Under Threat

Despite the mounting pressure on the administration of President Moon from the main opposition party, industry and much of the media, the government confirmed a more ambitious renewables energy policy, the "9th Long-Term Basic Blueprint for Power Supply over 2020–2034", which was announced on 20 December 2020.

Details of the plan, as reported in [WNISR2020](#), were confirmed in the final version. The Government plan is to reduce dependence on nuclear and fossil fuel from the 46.3 percent in 2020 to 24.8 percent by 2034. Renewable energy is to be expanded from 20 GW in 2020 to 77.8 GW, supplying 40 percent of the country's electricity by 2034, compared with the current 15.1 percent.³⁷⁶

The number of reactor units would peak at 26 in 2024, and by 2034 there would be 17 reactors operating with a total of 19.4 GW installed nuclear capacity generating 10.4 percent of South Korea's electricity.³⁷⁷ This compares with 24 reactors (including the one in LTO) in 2020 and 23.3 GW and 19.2 percent of the nation's electricity. A total of 5.6 GW of new nuclear capacity—Shin-Hanul-1 and -2, and Shin-Kori-5 and -6 are now scheduled to begin commercial operation between 2022–2024.

The uncertainty going forward was highlighted by the announcement of the lead opposition Presidential candidate, Yoon Seok-youl, who stated on 29 June 2021 that, "The nuclear phase-out policy was a poorly and hastily crafted one, and it must be revised...the Wolsong nuclear reactor probe is directly related to my resignation (as prosecutor in March 2021)...As soon as I ordered the Daejeon District Prosecutors' Office to conduct raids to investigate the suspicion that the reactor was shut down earlier than scheduled due to an assessment that deliberately underestimated the economic advantages of keeping it going, a disciplinary process against me started. There were also enormous pressures on how we handled the case."³⁷⁸

³⁷⁵ - *The Korea JoongAng Daily*, "Former energy minister charged with abuse of power", 1 July 2021, see <https://koreajoongangdaily.joins.com/2021/07/01/national/socialAffairs/Paik-Ungyu-Chae-Heebong-Wolsong1/20210701154800369.html>, accessed 6 July 2021.

³⁷⁶ - *The Korea Herald*, "Korea sets 42% renewable energy target by 2034", 16 December 2020, see <https://ieefa.org/korea-sets-42-renewable-energy-target-by-2034/>, accessed 29 June 2021.

³⁷⁷ - Kyeongho Lee, "South Korea's 9th Basic Plan for electricity – a step closer to carbon neutrality?", Woods Mackenzie, 8 March 2021, see <https://www.woodmac.com/our-expertise/focus/Power--Renewables/south-koreas-9th-basic-plan-for-electricity--a-step-closer-to-carbon-neutrality/>, accessed 29 June 2021.

³⁷⁸ - *The Korea JoongGang Daily*, "Yoon incinerates Moon's anti-nuclear energy policy", 6 July 2021, op. cit.

It appears clear that the future of South Korean energy policy for the coming years, including the planned closure of 10 reactors, will be determined by the outcome of the 2022 Presidential elections.

TAIWAN FOCUS



Taiwan has three operating reactors at Kuosheng (Guosheng) and Maanshan, all owned by the Taiwan Power Company (Taipower), the state-owned utility monopoly. This is one less reactor than previously due to closure of the Kuosheng Unit 1 (Guosheng) BWR on 1 July 2021.³⁷⁹ The Kuosheng Unit 1 closure is the third Taiwanese reactor to be closed under President Tsai Ing-wen government's nuclear phase out plan and another milestone in the island's energy transition including the end of nuclear generation by 2025.

In 2020, nuclear generation was almost stable at 30.3 TWh, compared to 31.1 TWh in 2019, equal to 12.7 percent of Taiwan's electricity compared to 13.4 percent in 2019. Nuclear generation reached its maximum share of 41 percent in 1988.

As a consequence of the January 2020 re-election of President Tsai Ing-wen of the Democratic Progressive Party (DPP) the nuclear phase out and energy transition enacted in the first term, remains official policy.³⁸⁰ The rival Chinese Nationalist Party (KMT) continues to strongly oppose President Tsai's energy policy, calling for a life extension of existing reactors and the construction of new plants.³⁸¹

Reactor Closures

As reported in WNISR2020, Taipower announced the closure of Chinshan Unit 1 on 5 December 2018, while Chinshan-2, which remained shut down from June 2017, was officially closed on 15 July 2019, when its 40-year operating license expired.

On 1 July 2021, Taipower announced that due to lack of spent fuel storage capacity, Kuosheng Unit 1 had been permanently shut down, which was six months earlier than planned.³⁸² The closure of Kuosheng Unit 1 was originally scheduled for 27 December 2021 when its operating license expired. Nuclear fuel was loaded into the reactor during the refueling and maintenance outage in 2020, but in February 2021 Taipower reduced the reactor power level to 80 percent to allow it to extend operations until June.³⁸³

379 - Taipower, “核 1 號機燃料池滿今提前停機” [“The fuel pool of Nuclear No. 2 Unit 1 was shut down ahead of schedule today”], 1 July 2021 (in Chinese), see https://www.taipower.com.tw/tc/news_info.aspx?id=4741&chk=75ddf691-44f7-406a-922c-ebf676c2fbd8&mid=17, accessed 5 July 2021.

380 - Yang Chun-hui, Shih Hsiao-kuang and Lin Liang-sheng, “2020 Elections: Tsai wins by a landslide”, *Taipei Times*, 12 January 2020, see <https://www.taipeitimes.com/News/front/archives/2020/01/12/2003729107>, accessed 7 July 2021.

381 - Pan Han-shen, “Han, nuclear fans lie about wind”, *Taipei Times*, 5 January 2020, see <https://www.taipeitimes.com/News/editorials/archives/2020/01/05/2003728728>, accessed 7 July 2021; and *Nucleonics Week*, “Taiwan election returns anti-nuclear president to office”, 6 February 2020.

382 - Taipower, “核 1 號機燃料池滿今提前停機”, 1 July 2021, op. cit.

383 - WNN, “Early shutdown for Taiwanese reactor”, 1 July 2021, see <https://www.world-nuclear-news.org/Articles/Early-shutdown-for-Taiwanese-reactor>, accessed 7 July 2021.