

Industrial involvement in the program of nuclear conversion and development of the Korean Area



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3 technical lines of action:

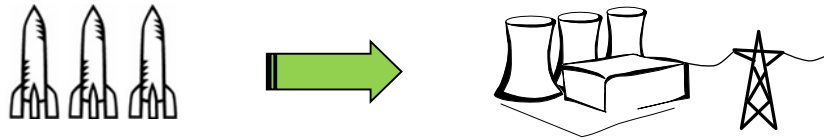
- i. to convert nuclear fissile material from North Korean warheads into fuel for civil NPPs;
- ii. to support the development of a complete electricity grid in North Korea with interconnections with neighboring countries:
 - 1. a submarine electricity interconnection between Japan and Korea;
 - 2. high voltage electricity interconnections of 2Koreas, China, Russia;
 - 3. a complete electricity grid in North Korea.
- iii. to decommission certain Korean nuclear installations and NPPs

In the framework of new international agreements & full compliance with IAEA safeguards requirements (by North Korea).

i. Convert nuclear fissile material from warheads into fuel for NPPs

“Megatons to Megawatts project” converted 20,000 nuclear warheads into fuel for US and Russian NPPs in 20 yrs ('93-'13).

New project proposed for the conversion of North Korean nuclear warheads into fuel for already existing NPPs mainly in South Korea.

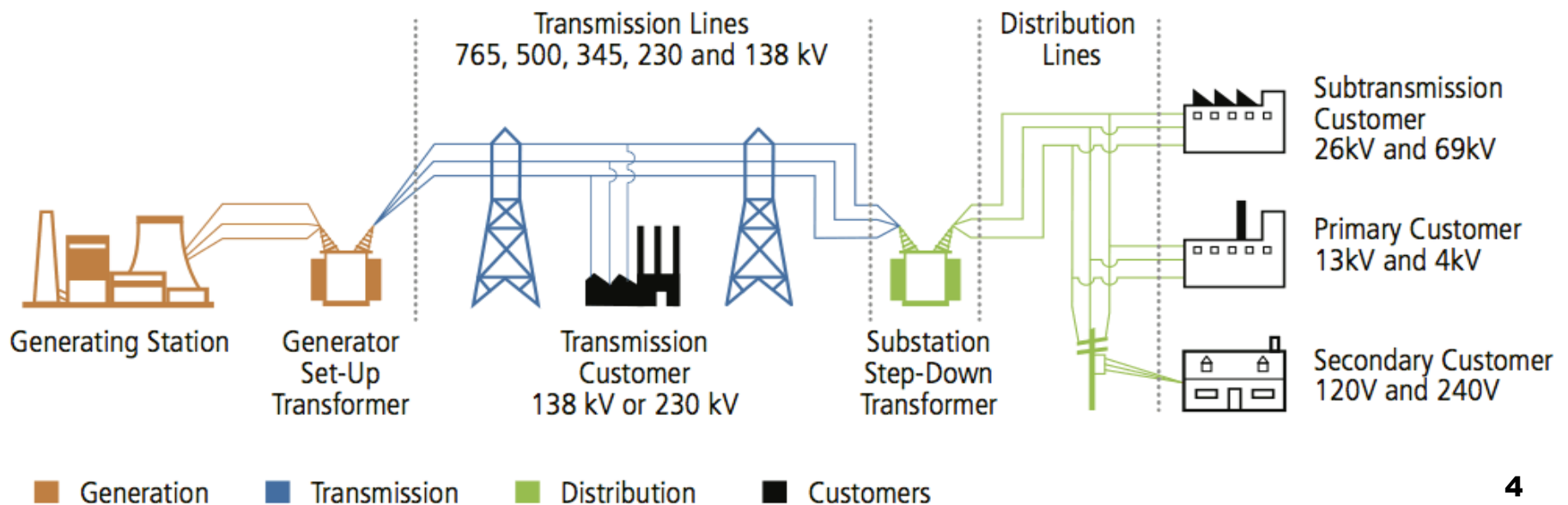


ANN has been supporting the “Comitato“, for many years, to technically evaluate solutions for the conversion of atomic arsenals.

ii. Build electricity lines between North Korea & neighboring countries

3 **main industrial contributions** related to the construction of:

1. a submarine electricity interconnection between Japan and Korea;
2. high voltage new electricity interconnections of the two Koreas, China and Russia;
3. a complete electricity grid in North Korea.



ii. Build electricity lines between North Korea & neighboring countries



Electrically interconnected countries are more willing to collaborate in peace.

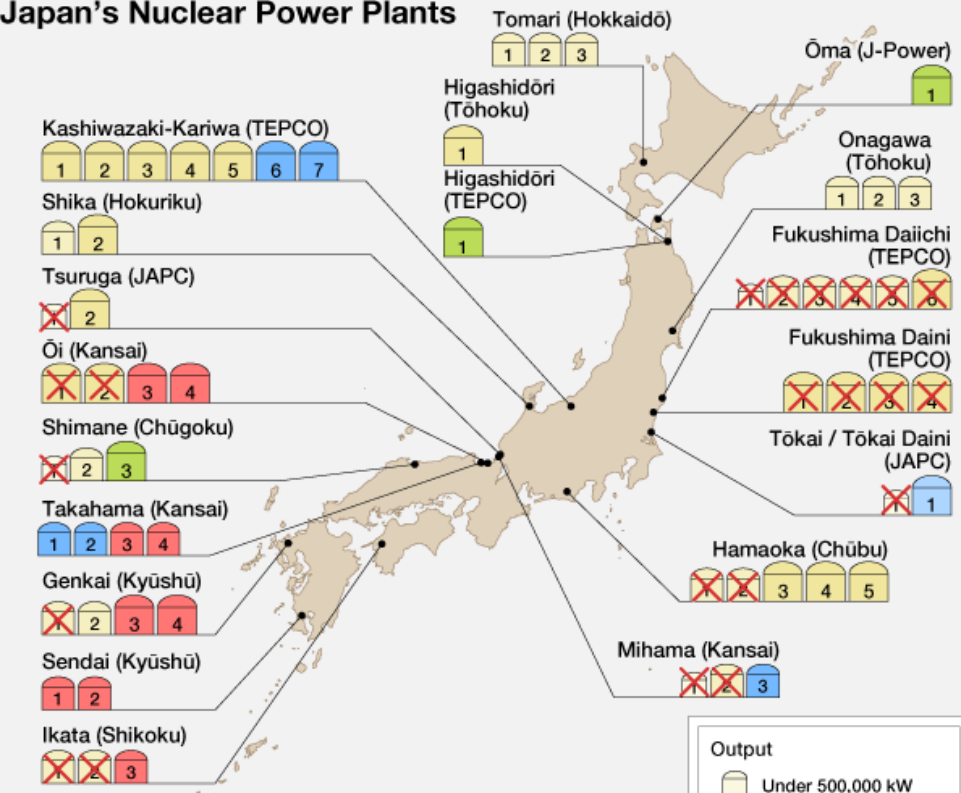
Italian industrial contribution for electricity interconnections with experienced companies (e.g. Terna, SAIPEM).

ii.1 NPPs in Japan

- Now 1,7% electricity from NPPs (expected to increase to 20% by 2030 with 30 NPPs)
- NPPs as July 2018: 9 restarted, 17 restart approval process, 19 to be decommissioned.
- Needs to import most of its energy requirements
- Before 2011, 30% electricity from 54 NPPs (expected increase to at least 40% by 2017)
- From Fukushima nuclear accident (March 2011), public sentiment shifted calling for nuclear power to be abandoned. Balance with continuation of reliable and affordable electricity supplies.

ii.1 9 NPPs in operation in Japan

Japan's Nuclear Power Plants



Compiled by *Nippon.com* based on reference materials released by each power company.
 * Tōkai Nuclear Power Plant and reactors 1 and 2 of Hamaoka Nuclear Power Plant, which were all set to be decommissioned prior to the 2011 Great East Japan Earthquake, are included in the map.
 * On July 4, the review report draft for Tōkai Daini nuclear power plant (Tōkai, Ibaraki Prefecture) was judged by the Nuclear Regulation Authority as complying with the new regulatory standards. Although not officially approved yet, it has effectively passed.

Output

- Under 500,000 kW
- Under 1 million kW
- Over 1 million kW

Status

- In operation
- Meets new standards
- Under construction
- To be decommissioned

ii.2 Electricity lines between North Korea & neighboring countries

South Korea:

- Nuclear energy past strategic priority
- new president elected in 2017 is aiming to nuclear phase out
- now 24NPPs for a total of 23 GWe of installed capacity
- about 1/3 of electricity from NPPs
- among the most prominent nuclear energy countries (also for export)

Nuclear Power Plants in South Korea



Source: World Nuclear Association

ii.2 Electricity lines between North Korea & neighboring countries

China:

- Mainland China with 45 NPPs in operation + 15 under construction + more about to start construction.
- The impetus for nuclear power in China is increasingly due to air pollution from coal-fired plants.
- China has become largely self-sufficient in reactor design and construction, as well as other aspects of the fuel cycle
- Policy of exporting nuclear technology including heavy components

ii. Build electricity lines between North Korea & neighboring countries

Russia:

- 35 NPPs in operation totaling 26,9 GWe.
- Expanded role of nuclear energy, including development of new reactor technology.
- Exports of nuclear goods and services are a major Russian policy and economic objective. Over 20 NPPs are confirmed or planned for export construction.
- Russia is a world leader in fast neutron reactor technology.
- Plans to build seven or eight floating nuclear power plants

ii.2 35 NPPs in Russia

Nuclear Power Plants in Russia



ii.2 Floating NPPs in Russia

Plans for Floating Nuclear Power Plants



* Initial choice, later changed to Saint Petersburg

iii. Close several Korean nuclear installations & NPPs

Shut down and decommissioning in:

North Korea: nuclear installations (internationally agreed/verified)

South Korea: 1 + 6 + more NPPs

- Kori 1 (PWR of 576 MWe net, oldest reactor) closed in June 2017 after 40 years of service, having had a 10yrs licence extension.
- Wolsong 1 (Candu 6 PHWR of 997 MWe net) in June 2018 announced to be permanently shut down due to the "uncertain economic viability".
- Kori 2,3,4 and Wolsong 2 now planned to be closed before 2026.
- Other Korean reactors may add to this list since they are licensed for 40 years initially and life extension may not be requested.

Italian industrial contribution is worldwide recognized for decommissioning domestic and international projects.

Conclusions:

The program of nuclear conversion and development of the Korean Area must be supported by International Agreements

The 3 technical lines of action proposed can have an important support from European and Italian Industrial experience

The projects that are related to the program would allow North Korea to work peacefully in close relation with neighboring countries and other international partners (including EU and Italy in particular)

Electrical interconnections with neighboring countries are important examples of mutual and international agreements useful to keep Peace