



Executive Summary

Environmental Best Practice Guide to Shutdown Coal Facilities in Chile

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During the next few years, a growing number of coal-fired generation facilities will begin a process of ceasing operations, closure and/or reconversion. The following was concluded based on the review of the environmental permits of coal-fired generation facilities and ash deposits:

- Seven units do not have a formal environmental permit associated with the original project.
- Six units were required to present a shutdown plan in their REA that should be started six months to a year prior before abandoning. Two units of *Nueva Tocopilla* committed to develop before shutting down.
- REAs of the remaining fifteen units state that the most probably outcome is that the units are reconditioned or reconverted with another generation technology. In the case that the site is abandoned, the following was committed: the disassembly and retirement of structures, superficial and marine equipment. However, the foundations are to be kept (they could be buried and covered with material from surroundings to mitigate the visual impact). The details of the plans presented varied.
- There are five REAs for the ash ponds, which were presented separately from those of the generation facilities had to be expanded or modified after their initial construction. The facilities are: *Barriles*, *Central Térmica Mejillones (CTM)*, *Puchuncaví*, *Bocamina* and *Santa María*. The details covered in the shutdown plan are primarily associated to the covering of the ash pond.

Based on the information reviewed, the shutdown processes for most sites are uncertain. An option for the site is to redevelop, for example, reconvert the plant to another electricity generation technology or to another industrial facility. Another option for the site is to retire the plant or abandon the facility. Considering the current social situation in Chile, abandoning the site is not considered a good practice and should be avoided. Currently, only some thermoelectric power plants have a defined closure plan which has been approved by the competent authority. The remaining units will have to define a closure plan and present it to the environmental authority.

The primary objective of the Environmental Best Practice Guide to Shutdown Coal Facilities in Chile is to provide guidelines to address the environmental and social challenges which are faced during the closure of coal-fired generation facilities. A 7-phase process is presented which must be materialized prior to the

reconversion or development of a new project on the existing site. In the process, it is important to involve the local community and the professionals in charge of the asset and government institutions. Agreements which reconcile the interests the relevant stakeholders must be sought out. Figure 1 illustrates the proposed closure process for coal generation facilities in Chile. The process includes



Source: Adapted from EPRI 2020

references to each of the chapters in this guide where the corresponding phase is addressed and described.

During the retirement process, the owner of the coal facility has different options for the generation asset and the site. It is important to consider the property surroundings, the existing environmental liabilities and the facts and perceptions of the stakeholders. High risk alternatives or options highly exposed to social opposition should be avoided. The competitive advantages of the site should be considered. Specifically, the site should be compared to other location options for a similar project. The presence of infrastructure which can be reused, the site's location and connectivity, among others should be weighed when comparing against other options.

Figure 4 / Options of the owner of a generation facility that will be retired

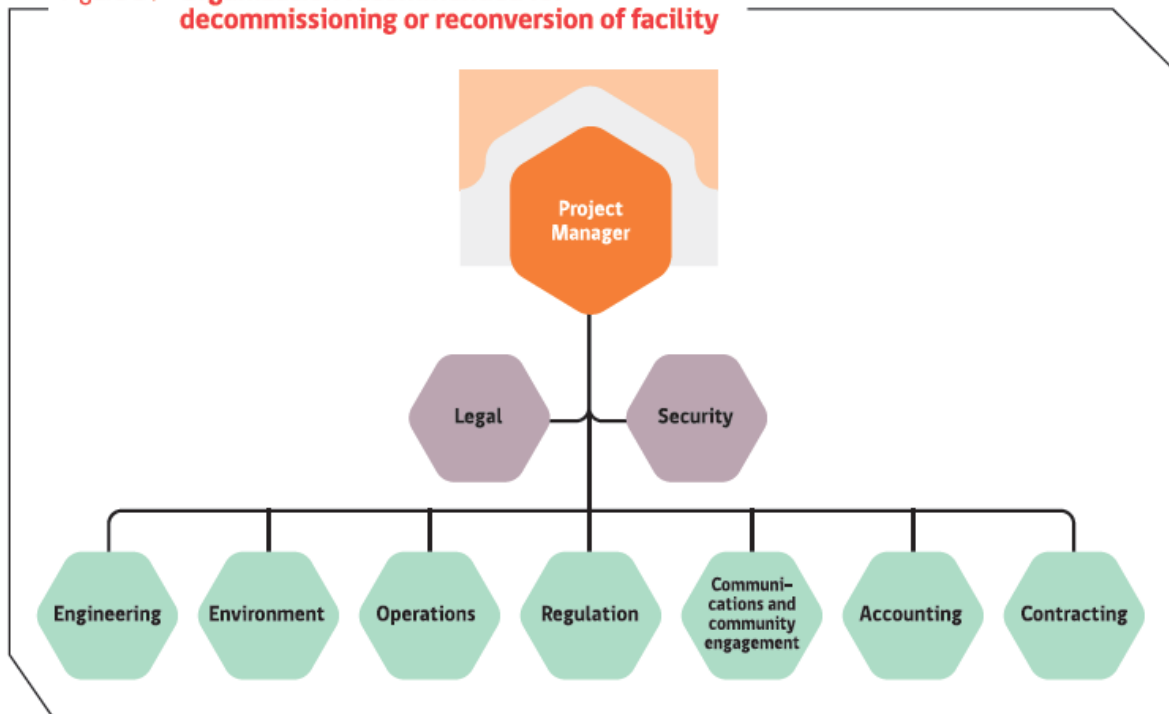


Note: Adapted from Raimi, 2017

The shutdown process will require effective coordination of multiple stakeholders from public institutions, private sector, and civil society. To establish a coherent process, the public sector will have to coordinate

the requirements imposed by the Ministry of Energy, Ministry of the Environment, Ministry of Health, Ministry of Housing and Urban Planning, Governorships and Municipalities. On the other hand, companies will have to involve multidisciplinary teams which include professionals from multiple areas within the organization. In each of the coal generation facility locations, different stakeholders, needs and social and environmental situations inherited by the history of various industrial activities will have to be considered.

Figure 5 / Organization recommended for decommissioning or reconversion of facility



Source: EPRI 2020

Multiple early decisions were identified that are relevant to the closure and/or reconversion process of coal-fired power plants. The definition and application of corrective actions are conditioned by the definition of public policy requirements that are critical to the risk management process. Corrective actions should be defined based on risk analysis. The following are regulatory requirements that must be established to carry out a risk analysis: the reference values for water and soil remediation; the data quality objectives; the objective risk levels; the appropriate statistics and amount of data required to determine the levels of exposure to concentration of contaminants; the selection of exposure scenarios; the procedure to reach consensus or define the acceptability of decisions; the land use limitations; the definition of the effectiveness of remediation measures; the assessment of cost-effective measures; among others. The owner of the plant should not be required to prescribe reference values or risk levels for concentration of contaminants.

Once the applied risk reduction standard is implemented, it must provide adequate protection for human health and the environment. A corrective action will be completed when the site of interest has met one or a combination of risk reduction standards. Although there is currently no regulation in Chile that defines remediation objectives, it is desirable to address the following requirements through a *voluntary environmental commitment*, when applicable:

- The soil should not contain hazardous waste as defined in Title II of DS 148 of the Ministry of Health.
- In any stage of the handling hazardous substances, mixing dangerous waste with other types of waste, materials or substances is strictly prohibited. Especially when mixing substances has the objective of diluting or reducing the concentration (DS 148, Article 7).
- The corrective action must protect the bodies of water. The discharge could have a negative impact and lead to exceeding the criteria in the applicable water qualities standards, then the concentration level of contaminant in the discharge could generate acute toxicity for hydrobiological organisms should be defined according to the competing authority.
- The greater of the following two values should be met in order to comply with applicable risk reduction standard:
 - The minimum level of detection for a concentration level of a regulated substance, or
 - the natural concentration level of a substance.

The scope associated with dismantling a generation unit and the environmental remediation of a site will depend on the final use that will be given to the site after the generation unit is shutdown. Therefore, the means to reuse the existing structures and the remediation methods can be chosen according to the standards which are required for the specific use which will be given to the site, hence minimizing the costs of remediation and dismantling.

When developing a dismantling plan, best efforts should be made to transform waste into valuable materials and sustainably manage the waste generated (Ministry of Housing and Urban Development, 2019). Hence, the reuse of existing buildings, structures, and materials should be prioritized in order to avoid the use of new resources and avoid the local environmental impact of the demolition process. First all materials that can be reused should be. Otherwise, waste should be recycled. However, if it is not possible to recycle, their energy content should be valued. Finally, as a last resource the waste should be disposed of in an adequate location. The previously described process is known as a hierarchical use of waste (Ministry of Housing and Urban Development, 2019).

When shutting down a coal storage yard, if possible, all the stored coal should be used to generate electricity at the coal facility. However, another option is to send the remaining coal to another coal facility or sell it. If contaminants which pose a health risk are detected in the coal yard area, the layer of coal waste which has mixed with the soil should be removed and transported to the ash pond. After removing

the coal residue and soil mix at the coal yard site, the removed material should be replaced with clean soil (EPRI, 2006). Otherwise, the contamination should be remediated considering the final use which is planned for the site.

On the other hand, waste from coal combustion (CCR) is classified as non-hazardous waste and includes all solid waste produced during coal combustion. To keep the waste from coal combustion in the deposit and to be able to install a cover, the closure must, if possible, control, minimize or eliminate liquid infiltrations into the coal combustion waste. Additionally, the release of CCR to the subsoil, surface waters or the atmosphere must be limited. The accumulation of water, sediment, or mud on the surface of the deposit must also be prevented. The physical stability of the slopes and coating of the deposit must be ensured. The maintenance needs must be minimized as well.

Finally, to materialize the closing process in the most harmonious way possible, the process should follow the steps and actions which are being in this guide described. In the future, it will be important to focus on building the capabilities to execute various processes and establishing a mechanism to share lessons learned in the different facility closures being materialized.

It is suggested to use this guide in tandem with the "Coal-fired power plant decommissioning: recommendations and best practices for stakeholder engagement", developed by Gestion Social and commissioned by the GIZ.

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