



**SASB  
STANDARDS**

Now part of IFRS Foundation

# Electric Utilities & Power Generators

## Sustainability Accounting Standard

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INFRASTRUCTURE SECTOR

**Sustainable Industry Classification System® (SICS®) IF-EU**

Under Stewardship of the International Sustainability Standards Board

**INDUSTRY STANDARD | VERSION 2023-12**



**IFRS®**  
Sustainability

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## About the SASB Standards

As of August 2022, the International Sustainability Standards Board (ISSB) of the IFRS Foundation assumed responsibility for the SASB Standards. The ISSB has committed to maintain, enhance and evolve the SASB Standards and encourages preparers and investors to continue to use the SASB Standards.

IFRS S1 *General Requirements for Disclosure of Sustainability-related Financial Information* (IFRS S1) requires entities to refer to and consider the applicability of disclosure topics in the SASB Standards when identifying sustainability-related risks and opportunities that could reasonably be expected to affect an entity's prospects. Similarly, IFRS S1 requires entities to refer to and consider the applicability of metrics in the SASB Standards when determining what information to disclose regarding sustainability-related risks and opportunities.

In June 2023, the ISSB amended climate-related topics and metrics in the SASB Standards to align them with the industry-based guidance accompanying IFRS S2 *Climate-related Disclosures*. In December 2023, the ISSB amended the non-climate-related topics and metrics in connection with the International Applicability of SASB Standards project.

### Effective Date

This version 2023-12 of the Standard is effective for all entities for annual periods beginning or after January 1, 2025. Early adoption is permitted for all entities.

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# INTRODUCTION

## Overview of SASB Standards

The SASB Standards are a set of 77 industry-specific sustainability accounting standards (“SASB Standards” or “Industry Standards”), categorised pursuant to the [Sustainable Industry Classification System<sup>®</sup> \(SICS<sup>®</sup>\)](#).

SASB Standards include:

1. **Industry descriptions** – which are intended to help entities identify applicable industry guidance by describing the business models, associated activities and other common features that characterise participation in the industry.
2. **Disclosure topics** – which describe specific sustainability-related risks or opportunities associated with the activities conducted by entities within a particular industry.
3. **Metrics** – which accompany disclosure topics and are designed to, either individually or as part of a set, provide useful information regarding an entity’s performance for a specific disclosure topic.
4. **Technical protocols** – which provide guidance on definitions, scope, implementation and presentation of associated metrics.
5. **Activity metrics** – which quantify the scale of specific activities or operations by an entity and are intended for use in conjunction with the metrics referred to in point 3 to normalise data and facilitate comparison.

Entities using the SASB Standards as part of their implementation of ISSB Standards should consider the relevant ISSB application guidance.

For entities using the SASB Standards independently from ISSB Standards, the [SASB Standards Application Guidance](#) establishes guidance applicable to the use of all Industry Standards and is considered part of the Standards. Unless otherwise specified in the technical protocols contained in the Industry Standards, the guidance in the SASB Standards Application Guidance applies to the definitions, scope, implementation, compilation and presentation of the metrics in the Industry Standards.

Historically, the [SASB Conceptual Framework](#) set out the basic concepts, principles, definitions and objectives that guided the SASB Standards Board in its approach to setting standards for sustainability accounting.

## Use of the Standards

SASB Standards are intended to aid entities in disclosing information about sustainability-related risks and opportunities that could reasonably be expected to affect the entity's cash flows, its access to finance or cost of capital over the short, medium or long term. An entity determines which Industry Standard(s) and which disclosure topics are relevant to its business, and which associated metrics to report. In general, an entity should use the SASB Standard specific to its primary industry as identified in [SICS<sup>®</sup>](#). However, companies with substantial business in multiple SICS<sup>®</sup> industries should refer to and consider the applicability of the disclosure topics and associated metrics in additional SASB Standards.

The disclosure topics and associated metrics contained in this Standard have been identified as those that are likely to be useful to investors. However, the responsibility for making materiality judgements and determinations rests with the reporting entity.

## Industry Description

Electric Utilities & Power Generators industry entities generate electricity; build, own and operate transmission and distribution (T&D) lines; and sell electricity. Utilities generate electricity from many different sources, commonly including coal, natural gas, nuclear energy, hydropower, solar, wind and other renewable and fossil fuel energy sources. The industry comprises entities operating in both regulated and unregulated business structures. Regulated utilities face comprehensive regulatory oversight of their pricing mechanisms and their allowed return on equity, among other types of regulation, to maintain their licence to operate as a monopoly. Unregulated entities or merchant power entities are often independent power producers (IPPs) that generate electricity to sell to the wholesale market, which includes regulated utility buyers and other end users. Furthermore, entities in the industry may operate across both regulated and deregulated power markets depending on their operational span. Regulated markets typically contain vertically integrated utilities that own and operate everything from the generation of power to its retail distribution. Deregulated markets commonly split generation from distribution to encourage wholesale power generation competition. Overall, the complex task of providing reliable, accessible, low-cost power while balancing the protection of human life and the environment remains a challenge.

Note: The Electric Utilities & Power Generators industry covers activities related only to electricity provision, not to natural gas provision. Some utilities may operate in both electricity and natural gas markets. Utilities undertaking activities related to natural gas sourcing and distribution also should consider the topics and metrics in the Gas Utilities & Distributors (IF-GU) industry.

# SUSTAINABILITY DISCLOSURE TOPICS & METRICS

**Table 1. Sustainability Disclosure Topics & Metrics**

TOPIC	METRIC	CATEGORY	UNIT OF MEASURE	CODE
Greenhouse Gas Emissions & Energy Resource Planning	(1) Gross global Scope 1 emissions, percentage covered under (2) emissions-limiting regulations and (3) emissions-reporting regulations	Quantitative	Metric tonnes (t) CO <sub>2</sub> -e, Percentage (%)	IF-EU-110a.1
	Greenhouse gas (GHG) emissions associated with power deliveries	Quantitative	Metric tonnes (t) CO <sub>2</sub> -e	IF-EU-110a.2
	Discussion of long- and short-term strategy or plan to manage Scope 1 emissions, emissions reduction targets, and an analysis of performance against those targets	Discussion and Analysis	n/a	IF-EU-110a.3
Air Quality	Air emissions of the following pollutants: (1) NO <sub>x</sub> (excluding N <sub>2</sub> O), (2) SO <sub>x</sub> , (3) particulate matter (PM <sub>10</sub> ), (4) lead (Pb), and (5) mercury (Hg); percentage of each in or near areas of dense population	Quantitative	Metric tonnes (t), Percentage (%)	IF-EU-120a.1
Water Management	(1) Total water withdrawn, (2) total water consumed; percentage of each in regions with High or Extremely High Baseline Water Stress	Quantitative	Thousand cubic metres (m <sup>3</sup> ), Percentage (%)	IF-EU-140a.1
	Number of incidents of non-compliance associated with water quality permits, standards and regulations	Quantitative	Number	IF-EU-140a.2
	Description of water management risks and discussion of strategies and practices to mitigate those risks	Discussion and Analysis	n/a	IF-EU-140a.3
Coal Ash Management	(1) Amount of coal combustion products (CCPs) generated, (2) percentage recycled	Quantitative	Metric tonnes (t), Percentage (%)	IF-EU-150a.1
	Description of coal combustion products (CCPs) management policies and procedures for active and inactive operations	Discussions and Analysis	n/a	IF-EU-150a.3

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TOPIC	METRIC	CATEGORY	UNIT OF MEASURE	CODE
Energy Affordability	Average retail electric rate for (1) residential, (2) commercial, and (3) industrial customers	Quantitative	Rate	IF-EU-240a.1
	(1) Number of residential customer electric disconnections for non-payment, (2) percentage reconnected within 30 days <sup>1</sup>	Quantitative	Number, Percentage (%)	IF-EU-240a.3
	Discussion of impact of external factors on customer affordability of electricity, including the economic conditions of the service territory	Discussion and Analysis	n/a	IF-EU-240a.4
Workforce Health & Safety	(1) Total recordable incident rate (TRIR), (2) fatality rate, and (3) near miss frequency rate (NMFR) for (a) direct employees and (b) contract employees	Quantitative	Rate	IF-EU-320a.1
End-Use Efficiency & Demand	Percentage of electric load served by smart grid technology <sup>2</sup>	Quantitative	Percentage (%) by megawatt hours (MWh)	IF-EU-420a.2
	Customer electricity savings from efficiency measures, by market <sup>3</sup>	Quantitative	Megawatt hours (MWh)	IF-EU-420a.3
Nuclear Safety & Emergency Management	Total number of nuclear power units, broken down by results of most recent independent safety review	Quantitative	Number	IF-EU-540a.1
	Description of efforts to manage nuclear safety and emergency preparedness	Discussion and Analysis	n/a	IF-EU-540a.2
Grid Resiliency	Number of incidents of non-compliance with physical or cybersecurity standards or regulations	Quantitative	Number	IF-EU-550a.1
	(1) System Average Interruption Duration Index (SAIDI), (2) System Average Interruption Frequency Index (SAIFI), and (3) Customer Average Interruption Duration Index (CAIDI), inclusive of major event days <sup>4</sup>	Quantitative	Minutes, Number	IF-EU-550a.2

<sup>1</sup> Note to **IF-EU-240a.3** – The entity shall discuss how policies, programmes and regulations impact the number and duration of residential customer disconnections.

<sup>2</sup> Note to **IF-EU-420a.2** – The entity shall discuss the opportunities and challenges associated with the development and operations of a smart grid.

<sup>3</sup> Note to **IF-EU-420a.3** – The entity shall discuss customer efficiency regulations relevant to each market in which it operates.

<sup>4</sup> Note to **IF-EU-550a.2** – The entity shall discuss notable service disruptions such as those that affected a significant number of customers or disruptions of extended duration.

**Table 2. Activity Metrics**

ACTIVITY METRIC	CATEGORY	UNIT OF MEASURE	CODE
Number of: (1) residential, (2) commercial, and (3) industrial customers served <sup>5</sup>	Quantitative	Number	IF-EU-000.A
Total electricity delivered to: (1) residential, (2) commercial, (3) industrial, (4) all other retail customers, and (5) wholesale customers	Quantitative	Megawatt hours (MWh)	IF-EU-000.B
Length of transmission and distribution lines <sup>6</sup>	Quantitative	Kilometres (km)	IF-EU-000.C
Total electricity generated, percentage by major energy source, percentage in regulated markets <sup>7</sup>	Quantitative	Megawatt hours (MWh), Percentage (%)	IF-EU-000.D
Total wholesale electricity purchased <sup>8</sup>	Quantitative	Megawatt hours (MWh)	IF-EU-000.E

<sup>5</sup> Note to **IF-EU-000.A** – The number of customers served for each category shall be the number of meters billed for residential, commercial and industrial customers.

<sup>6</sup> Note to **IF-EU-000.C** – The length of transmission and distribution lines shall be calculated on a circuit kilometre basis, where a circuit-kilometre is defined as the total length of circuits, regardless of conductors used per circuit.

<sup>7</sup> Note to **IF-EU-000.D** – Generation shall be disclosed for each of the following major energy sources: coal, natural gas, nuclear, petroleum, hydropower, solar, wind, other renewables and other gases. The scope of the disclosure includes owned or operated assets. The scope of the disclosure excludes electricity consumed at generating facilities.

<sup>8</sup> Note to **IF-EU-000.E** – The scope of the disclosure excludes electricity consumed at generating facilities.



# Greenhouse Gas Emissions & Energy Resource Planning

## Topic Summary

Electricity generation represents the largest source of greenhouse gas (GHG) emissions in the world. Mainly carbon dioxide, methane and nitrous oxide, these emissions are mostly by-products of fossil fuel combustion. The transmission or distribution (T&D) segments of the industry produce negligible emissions. Electric utility entities could face significant operating costs and capital expenditures for mitigating GHG emissions as environmental regulations become increasingly stringent. Although many of these costs may be passed to a utility's customers, some power generators, especially in deregulated markets, may be unable to recoup these costs. Entities may reduce GHG emissions from electricity generation through careful infrastructure investment planning by ensuring the delivery of an energy mix capable of meeting the emissions requirements set forth by regulations, and by implementing industry-leading technologies and processes. Being proactive in cost-effectively reducing GHG emissions may create a competitive advantage for entities and mitigate unanticipated regulatory compliance costs. Failure to properly estimate capital-expenditure needs and permitting costs, or other difficulties in reducing GHG emissions, may result in significant negative effects on returns in the form of asset write-downs, the costs to obtain carbon credits, or unexpected increases in operating and capital expenditures. Regulatory emphasis on this issue may increase in the coming decades, as exemplified by the international emissions-reduction agreement made at the 21st session of the United Nations Conference of the Parties in 2015.

## Metrics

### **IF-EU-110a.1. (1) Gross global Scope 1 emissions, percentage covered under (2) emissions-limiting regulations and (3) emissions-reporting regulations**

- 1 The entity shall disclose its (1) gross global Scope 1 greenhouse gas (GHG) emissions to the atmosphere of the seven GHGs covered under the Kyoto Protocol—carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF<sub>6</sub>), and nitrogen trifluoride (NF<sub>3</sub>).
  - 1.1 Emissions of all GHGs shall be consolidated and disclosed in metric tonnes of carbon dioxide equivalent (CO<sub>2</sub>-e) and calculated in accordance with published 100-year time horizon global warming potential (GWP) values. To date, the preferred source for GWP values is the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (2014).
  - 1.2 Gross emissions are GHGs emitted into the atmosphere before accounting for offsets, credits or other similar mechanisms that have reduced or compensated for emissions.
- 2 Scope 1 emissions are defined and shall be calculated according to the methodology contained in *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard* (GHG Protocol), Revised Edition, March 2004, published by the World Resources Institute and the World Business Council on Sustainable Development (WRI/WBCSD).
  - 2.1 These emissions include direct emissions of GHGs from stationary or mobile sources that include production facilities, office buildings and product transportation (marine, road and rail).

- 2.2 Acceptable calculation methodologies include those that conform to the GHG Protocol as the base reference, but provide additional guidance, such as industry- or region-specific guidance. Examples include:
- 2.2.1 *GHG Reporting Guidance for the Aerospace Industry* published by the International Aerospace Environmental Group (IAEG)
  - 2.2.2 *Greenhouse Gas Inventory Guidance: Direct Emissions from Stationary Combustion Sources* published by the U.S. Environmental Protection Agency (EPA)
  - 2.2.3 India GHG Inventory Program
  - 2.2.4 ISO 14064-1
  - 2.2.5 *Petroleum Industry Guidelines for reporting GHG emissions*, 2nd edition, 2011, published by Ipieca
  - 2.2.6 *Protocol for the quantification of greenhouse gas emissions from waste management activities* published by Entreprises pour l'Environnement (EpE)
- 2.3 GHG emissions data shall be consolidated and disclosed according to the approach with which the entity consolidates its financial reporting data, which generally is aligned with the 'financial control' approach defined by the GHG Protocol, and the approach published by the Climate Disclosure Standards Board (CDSB) that is described in REQ-07, 'Organisational boundary', of the *CDSB Framework for reporting environmental and social information*.
- 3 The entity shall disclose (2) the percentage of its gross global Scope 1 GHG emissions covered under an emissions-limiting regulation or programme intended to limit or reduce emissions directly, such as cap-and-trade schemes, carbon tax/fee systems, and other emissions control (for example, command-and-control approach) and permit-based mechanisms.
- 3.1 Examples of emissions-limiting regulations include:
    - 3.1.1 California Cap-and-Trade (California Global Warming Solutions Act)
    - 3.1.2 European Union Emissions Trading Scheme (EU ETS)
    - 3.1.3 Quebec Cap-and-Trade (Quebec Environment Quality Act)
  - 3.2 The percentage shall be calculated as the total amount of gross global Scope 1 GHG emissions (CO<sub>2</sub>-e) covered under emissions-limiting regulations divided by the total amount of gross global Scope 1 GHG emissions (CO<sub>2</sub>-e).
    - 3.2.1 For emissions subject to more than one emissions-limiting regulation, the entity shall not account for those emissions more than once.
  - 3.3 The scope of emissions-limiting regulations excludes emissions covered under voluntary emissions-limiting regulations (for example, voluntary trading systems), as well as reporting-based regulations.

- 4 The entity shall disclose (3) the percentage of its gross global Scope 1 GHG emissions that are covered under emissions reporting-based regulations.
  - 4.1 Emissions reporting-based regulations are defined as regulations that demand the disclosure of GHG emissions data to regulators and/or the public, but for which there is no limit, cost, target, or controls on the amount of emissions generated.
  - 4.2 The percentage shall be calculated as the total amount of gross global Scope 1 GHG emissions (CO<sub>2</sub>-e) that are covered under emissions reporting-based regulations divided by the total amount of gross global Scope 1 GHG emissions (CO<sub>2</sub>-e).
    - 4.2.1 For emissions that are subject to more than one emissions reporting-based regulation, the entity shall not account for those emissions more than once.
  - 4.3 The scope of emissions reporting-based regulations does not exclude emissions covered under emissions-limiting regulations.
- 5 The entity may discuss any change in its emissions from the previous reporting period, including whether the change was because of emissions reductions, divestment, acquisition, mergers, changes in output or changes in calculation methodology.
- 6 In the case that current reporting of GHG emissions to the CDP or other entity (for example, a national regulatory disclosure programme) differs in terms of the scope and consolidation approach used, the entity may disclose those emissions. However, primary disclosure shall be according to the guidelines described above.
- 7 The entity may discuss the calculation methodology for its emissions disclosure, such as if data are from continuous emissions monitoring systems (CEMS), engineering calculations or mass balance calculations.

## **IF-EU-110a.2. Greenhouse gas (GHG) emissions associated with power deliveries**

- 1 The entity shall disclose gross global greenhouse gas (GHG) emissions associated with electric power delivered to retail customers, resulting from owned power generation and purchased power.
  - 1.1 GHG emissions are defined as emissions to the atmosphere of the seven GHGs covered under the Kyoto Protocol—carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF<sub>6</sub>), and nitrogen trifluoride (NF<sub>3</sub>).
    - 1.1.1 Emissions of all GHGs shall be consolidated and disclosed in metric tonnes of carbon dioxide equivalents (CO<sub>2</sub>-e), calculated in accordance with published 100-year time horizon global warming potential (GWP) values. To date, the preferred source for GWP factors is the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (2014).
    - 1.1.2 Gross emissions are GHGs emitted into the atmosphere before accounting for offsets or credits.

- 2 GHG emissions associated with electric power delivered to retail customers are defined by, and shall be calculated according to, the methodology established by the numerator in 'EPS Metric D-3: Retail Electric Deliveries', contained in the Electric Power Sector Protocol for the Voluntary Reporting Program, June 2009, Version 1.0, provided by The Climate Registry, including 2010 Updates and Clarifications (which clarified that 'EPS Metric D-3: Retail Electric Deliveries' was mislabelled as 'EPS Metric D-1' in Version 1.0).
  - 2.1 These emissions generally are calculated as the sum of emissions from power generation facilities owned by the entity, and those from power purchased from a third-party, subtracted by the emissions from power that was resold at the wholesale level.
  - 2.2 The scope of GHG emissions shall include all emissions associated with power delivered to retail customers, including emissions associated with power lost in transmission and distribution.
  - 2.3 Emissions factors for power purchased from third-parties are based on the most relevant and accurate method, which will depend on the type of power purchased. The Electric Power Sector Protocol for the Voluntary Reporting Program establishes potential methods.
- 3 Disclosure corresponds to the numerator in the metric contained in the Electric Power Research Institute's 2018 *Metrics to Benchmark Electric Power Company Sustainability Performance*, 'Total CO<sub>2</sub> emissions rate for power deliveries', except for the scope of emissions including all seven GHGs covered under the Kyoto Protocol.

**IF-EU-110a.3. Discussion of long- and short-term strategy or plan to manage Scope 1 emissions, emissions reduction targets, and an analysis of performance against those targets**

- 1 The entity shall discuss its long- and short-term strategy or plan to manage its Scope 1 greenhouse gas (GHG) emissions.
  - 1.1 Scope 1 emissions are defined and shall be calculated according to the methodology contained in *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard* (GHG Protocol), Revised Edition, March 2004, published by the World Resources Institute and the World Business Council on Sustainable Development (WRI/WBCSD).
  - 1.2 The scope of GHG emissions includes the seven GHGs covered under the Kyoto Protocol—carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF<sub>6</sub>) and nitrogen trifluoride (NF<sub>3</sub>).
- 2 The entity shall discuss its emission reduction target(s) and analyse its performance against the target(s), including, if relevant:
  - 2.1 The scope of the emission reduction target (for example, the percentage of total emissions to which the target is applicable);
  - 2.2 Whether the target is absolute or intensity-based, and the metric denominator if it is an intensity-based target;

- 2.3 The percentage reduction against the base year, with the base year representing the first year against which emissions are evaluated towards the achievement of the target;
  - 2.4 The time lines for the reduction activity, including the start year, the target year and the base year;
  - 2.5 The mechanism(s) for achieving the target; and
  - 2.6 Any circumstances in which the target or base year emissions have been, or may be, recalculated retrospectively or the target or base year has been reset.
- 3 The entity shall discuss its strategy to manage risks and opportunities associated with the GHG emissions regulatory environment, which may include:
- 3.1 Any changes it has made or plans to make to its business structure or model
  - 3.2 The development of new technologies or services
  - 3.3 Any changes it has made or plans to make to its operational process, control or organisational structures
  - 3.4 Influencing the regulatory or legislative process and outcomes, which may include interactions with regulators, regulatory agencies, utility commissions, legislators and policymakers
- 4 The entity may discuss its involvement in green power markets, including the number of customers served (by customer category) and the corresponding electricity generated.
- 4.1 Green power markets are defined as an optional utility service that allows customers the opportunity to support a greater level of utility entity investment in renewable energy technologies.
  - 4.2 The entity may disclose instances in which the provision of green power markets is required by state renewable portfolio standards.
- 5 The entity shall discuss the activities and investments required to achieve the plans or targets, and any risks or limiting factors that might affect achievement of the plans or targets.
- 6 The entity shall discuss the scope of its strategies, plans or reduction targets, such as whether they pertain differently to different business units, geographies or emissions sources.
- 7 The entity shall discuss whether its strategies, plans, or reduction targets are related to, or associated with, emissions limiting or emissions reporting-based programmes or regulations (for example, the EU Emissions Trading Scheme, Quebec Cap-and-Trade System, California Cap-and-Trade Program), including regional, national, international or sectoral programmes.
- 8 Disclosure of strategies, plans or reduction targets shall be limited to activities that were ongoing (active) or reached completion during the reporting period.

# Air Quality

## Topic Summary

Fuel combustion in electricity-generation operations generates hazardous air pollutants. These air pollutants can create significant and localised environmental and health risks. The most common and impactful are nitrogen oxides (excluding nitrous oxide), sulphur oxide, particulate matter (PM), lead and mercury. Emissions of these localised air pollutants often are strictly regulated, creating significant compliance risks for electricity generators. Regulatory and legal risks are higher for entities operating near large communities. Harmful operational air emissions may result in regulatory penalties, higher regulatory compliance costs and capital expenditures to install control technology. In some cases, such expenditures may be cost prohibitive to continued facility operations. Entities may manage air quality concerns by reducing emissions, as well as by working with regulators to establish priorities and manage short- and long-term capital planning risks.

## Metrics

### **IF-EU-120a.1. Air emissions of the following pollutants: (1) NO<sub>x</sub> (excluding N<sub>2</sub>O), (2) SO<sub>x</sub>, (3) particulate matter (PM<sub>10</sub>), (4) lead (Pb), and (5) mercury (Hg); percentage of each in or near areas of dense population**

- 1 The entity shall disclose its emissions of air pollutants, in metric tonnes per pollutant, released into the atmosphere.
  - 1.1 The scope of the disclosure includes air pollutants associated with the entity's direct air emissions resulting from all the entity's activities and sources of emissions, which may include stationary or mobile sources, production facilities, office buildings and transportation fleets.
- 2 The entity shall disclose its emissions of (1) oxides of nitrogen (NO<sub>x</sub>), reported as NO<sub>x</sub>.
  - 2.1 The scope of NO<sub>x</sub> includes NO and NO<sub>2</sub> but excludes N<sub>2</sub>O.
- 3 The entity shall disclose its emissions of (2) oxides of sulphur (SO<sub>x</sub>), reported as SO<sub>x</sub>.
  - 3.1 The scope of SO<sub>x</sub> includes SO<sub>2</sub> and SO<sub>3</sub>.
- 4 The entity shall disclose its emissions of (3) particulate matter 10 micrometres or less in diameter (PM<sub>10</sub>), reported as PM<sub>10</sub>.
  - 4.1 PM<sub>10</sub> is defined as any airborne finely divided solid or liquid material with an aerodynamic diameter less than or equal to a nominal 10 micrometres.
- 5 The entity shall disclose its emissions of (4) lead and lead compounds, reported as Pb.

- 6 The entity shall disclose its emissions of (5) mercury and mercury compounds, reported as Hg.
- 7 The entity shall disclose the percentage of its NO<sub>x</sub>, SO<sub>x</sub>, PM<sub>10</sub>, Pb, and Hg emissions from its facilities located in or near areas defined as urbanised areas in the local jurisdiction.
  - 7.1 Generically, urbanised areas include densely developed residential, commercial and other non-residential areas with a population greater than 50,000. The entity may reference the United Nations Statistics Division list of the various national definitions for the word 'urban' in its *Demographic Yearbook 2005*, Table 6.
  - 7.2 The scope of the disclosure includes facilities located in an urbanised area or those with boundaries within 49 kilometres of an urbanised area, which constitutes an exposed population that is likely to come into contact with air emissions.
  - 7.3 In the absence of available or accurate census data, the entity may use global population density data available from the NASA Socioeconomic Data and Applications Centre's (SEDAC) *Gridded Population of the World* (GPW).
- 8 The entity may discuss the calculation method for its emissions disclosure, such as whether data is from continuous emissions monitoring systems (CEMS), engineering calculations or mass balance calculations.

# Water Management

## Topic Summary

Electricity generation is one of the most water-intensive industries in the world in terms of water withdrawals. Thermoelectric power plants—typically coal, nuclear and natural gas—use large quantities of water for cooling purposes. The industry is facing increasing water-related supply and regulatory risks, potentially requiring capital investment in technology or even creating stranded assets. As water supplies tighten in many regions—and electricity generation, agriculture and community use compete for water supplies—power plants increasingly may be unable to operate at full capacity, or at all, because of region-specific water constraints. The availability of water is an important factor to consider when calculating the future value of many electricity-generating assets and for evaluating proposals for new generation sources. Increased water scarcity—because of factors such as increasing consumption and reduced supplies resulting from climate change, which could result in more frequent or intense droughts—could prompt regulatory authorities to limit entities' ability to withdraw necessary amounts of water, especially in regions with high baseline water stress. Furthermore, entities must manage the growing number of regulations related to the significant biodiversity impacts that such large withdrawals may cause. To mitigate these risks, entities can invest both in more efficient water-usage systems for plants, and place strategic priority on assessing long-term water availability, as well as water-related biodiversity risks, when siting new power plants.

## Metrics

### **IF-EU-140a.1. (1) Total water withdrawn, (2) total water consumed; percentage of each in regions with High or Extremely High Baseline Water Stress**

- 1 The entity shall disclose the amount of water, in thousands of cubic metres, withdrawn from all sources.
  - 1.1 Water sources include surface water (including water from wetlands, rivers, lakes and oceans), groundwater, rainwater collected directly and stored by the entity, and water and wastewater obtained from municipal water supplies, water utilities or other entities.
- 2 The entity may disclose portions of its supply by source if, for example, significant portions of withdrawals are from non-freshwater sources.
  - 2.1 Fresh water may be defined according to the local laws and regulations where the entity operates. If no legal definition exists, fresh water shall be considered to be water that has less than 1,000 parts per million of dissolved solids.
  - 2.2 Water obtained from a water utility in compliance with jurisdictional drinking water regulations can be assumed to meet the definition of fresh water.
- 3 The entity shall disclose the amount of water, in thousands of cubic metres, consumed in its operations.
  - 3.1 Water consumption is defined as:
    - 3.1.1 Water that evaporates during withdrawal, use and discharge



3.1.2 Water that is directly or indirectly incorporated into the entity's product or service

3.1.3 Water that does not otherwise return to the same catchment area from which it was withdrawn, such as water returned to another catchment area or the sea

- 4 The entity shall analyse all its operations for water risks and identify activities that withdraw and consume water in locations with High (40–80%) or Extremely High (>80%) Baseline Water Stress as classified by the World Resources Institute's (WRI) Water Risk Atlas tool, Aqueduct.
- 5 The entity shall disclose water withdrawn in locations with High or Extremely High Baseline Water Stress as a percentage of the total water withdrawn.
- 6 The entity shall disclose water consumed in locations with High or Extremely High Baseline Water Stress as a percentage of the total water consumed.

### **IF-EU-140a.2. Number of incidents of non-compliance associated with water quality permits, standards and regulations**

- 1 The entity shall disclose the total number of incidents of non-compliance, including violations of a technology-based standard and exceedances of quantity or quality-based standards.
- 2 The scope of disclosure includes incidents governed by applicable jurisdictional statutory permits and regulations, which include the discharge of a hazardous substance, violation of pre-treatment requirements or total maximum daily load (TMDL) exceedances.
- 3 The scope of disclosure shall only include incidents of non-compliance that resulted in a formal enforcement action(s).
  - 3.1 Formal enforcement actions are defined as governmental recognised actions that address a violation or threatened violation of water quantity or quality laws, regulations, policies or orders, and can result in administrative penalty orders, administrative orders and judicial actions, among others.
- 4 Violations shall be disclosed, regardless of their measurement methodology or frequency. These include violations for:
  - 4.1 Continuous discharges, limitations, standards and prohibitions that are generally expressed as maximum daily, weekly and monthly averages; and
  - 4.2 Non-continuous discharges, limitations that are generally expressed in terms of frequency, total mass, maximum rate of discharge and mass or concentration of specified pollutants.

### **IF-EU-140a.3. Description of water management risks and discussion of strategies and practices to mitigate those risks**

- 1 The entity shall describe its water management risks associated with water withdrawals, water consumption and discharge of water or wastewater.

- 1.1 Risks associated with water withdrawals and water consumption include risks to the availability of adequate, clean water resources, which include:
  - 1.1.1 Environmental constraints—such as operating in water-stressed regions, drought, concerns of aquatic impingement or entrainment, interannual or seasonal variability, and risks from the impact of climate change
  - 1.1.2 Regulatory and financial constraints—such as volatility in water costs, stakeholder perceptions and concerns related to water withdrawals (for example, those from local communities, non-governmental organisations and regulatory agencies), direct competition with and impact from the actions of other users (for example, commercial and municipal users), restrictions to withdrawals because of regulations, and constraints on the entity's ability to obtain and retain water rights or permits
- 1.2 Risks associated with the discharge of water or wastewater include the ability to obtain rights or permits related to discharges, regulatory compliance related to discharges, restrictions to discharges, the ability to maintain control over the temperature of water discharges, liabilities, reputational risks and increased operating costs because of regulation, stakeholder perceptions and concerns related to water discharges (for example, those from local communities, non-governmental organisations and regulatory agencies).
- 2 The entity may describe water management risks in the context of:
  - 2.1 How risks may vary by withdrawal source, including surface water (including water from wetlands, rivers, lakes and oceans), groundwater, rainwater collected directly and stored by the entity, and water and wastewater obtained from municipal water supplies, water utilities or other entities; and
  - 2.2 How risks may vary by discharge destinations, including surface water, groundwater or wastewater utilities.
- 3 The entity may discuss the potential effects that water management risks may have on its operations and the time line over which such risks are expected to manifest.
  - 3.1 Effects include those associated with costs, revenue, liabilities, continuity of operations and reputation.
- 4 The entity shall discuss its short- and long-term strategies or plans to mitigate water management risks, which include:
  - 4.1 The scope of its strategy, plans, goals or targets, such as how they relate to various business units, geographies or water-consuming operational processes.
  - 4.2 Any water management goals or targets it has prioritised, and an analysis of performance against those goals or targets.
    - 4.2.1 Goals and targets include those associated with reducing water withdrawals, reducing water consumption, reducing water discharges, reducing aquatic impingements, improving the quality of water discharges and regulatory compliance.

- 4.3 The activities and investments required to achieve the plans, goals or targets, and any risks or limiting factors that might affect achievement of the plans or targets.
- 4.4 Disclosure of strategies, plans, goals or targets shall be limited to activities that were ongoing (active) or reached completion during the reporting period.
- 5 For water management targets, the entity shall additionally disclose:
  - 5.1 Whether the target is absolute or intensity-based, and the metric denominator if it is an intensity-based target.
  - 5.2 The time lines for the water management activities, including the start year, the target year and the base year.
  - 5.3 The mechanism(s) for achieving the target, including:
    - 5.3.1 Efficiency efforts, such as the use of water recycling or closed-loop systems;
    - 5.3.2 Product innovations, such as redesigning products or services to require less water;
    - 5.3.3 Process and equipment innovations, such as those that enable the reduction of aquatic impingements or entrainments;
    - 5.3.4 Use of tools and technologies (for example, the World Wildlife Fund Water Risk Filter, the Global Water Tool and Water Footprint Network Footprint Assessment Tool) to analyse water use, risks and opportunities; and
    - 5.3.5 Collaborations or programmes in place with the community or other organisations.
  - 5.4 The percentage reduction or improvement from the base year, in which the base year is the first year against which water management targets are evaluated towards the achievement of the target.
- 6 The entity shall discuss whether its water management practices result in any additional lifecycle impacts or trade-offs in its organisation, including trade-offs in land use, energy production and greenhouse gas (GHG) emissions, and why the entity chose these practices despite lifecycle trade-offs.

# Coal Ash Management

## Topic Summary

Electricity generators must safely discard the hazardous by-products of their operations. Coal-fired electricity generation is a major source of hazardous waste because of coal ash. Coal ash can have a significant effect on entity value in the power-generation segment of the industry. This issue will affect entities differently, depending on the extent to which they generate electricity from coal. Coal ash is one of the largest industrial waste streams in the world. It contains heavy metal contaminants associated with cancer and other serious diseases, especially when they leach into groundwater. Coal ash can have beneficial uses when recycled or reused, such as in the creation of fly ash concrete or wallboard, creating revenue opportunities for electric utilities. Safe handling of coal ash, locating coal ash impoundments to minimise potential harm to human life or the environment, effective monitoring and containment of coal ash, and the sale of coal ash for beneficial uses are important strategies to reduce regulatory compliance costs as well as penalties for non-compliance. Coal ash leaching into the surrounding environment can result in significant litigation and remediation costs.

## Metrics

### **IF-EU-150a.1. (1) Amount of coal combustion products (CCPs) generated, (2) percentage recycled**

- 1 The entity shall disclose (1) the weight, in metric tonnes, of coal combustion products (CCPs) generated from its operations.
  - 1.1 CCPs include fly ash, bottom ash, boiler slag, fluidised-bed combustion ash or flue gas desulphurisation material resulting predominantly from the combustion of coal.<sup>9</sup>
- 2 The entity shall disclose (2) the percentage of CCPs recycled, by weight.
  - 2.1 The entity shall define recycled CCPs based on the applicable jurisdictional definition.
  - 2.2 CCPs generally are considered recycled if they are converted into new materials and objects. Recycling includes selling CCPs to a third-party for re-use or other circularity measures to prevent waste.
  - 2.3 The percentage shall be calculated as the weight of CCPs reused or reclaimed, plus the weight recycled (through treatment or processing) by the entity, plus the weight sent externally for further recycling, divided by the total weight of CCPs generated from operations.
  - 2.4 The entity shall disclose the applicable jurisdictional laws or regulations used to define recycled CCPs.

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<sup>9</sup> Adapted from the World Wide Coal Combustion Products Network's definition of coal combustion products.

### **IF-EU-150a.3. Description of coal combustion products (CCPs) management policies and procedures for active and inactive operations**

- 1 The entity shall describe the policies and procedures set forth by its coal combustion products (CCPs) management strategy.
  - 1.1 The scope of the disclosure shall include policies and procedures for the entity's active and inactive operations.
  - 1.2 CCPs include fly ash, bottom ash, boiler slag, fluidised-bed combustion ash or flue gas desulphurisation material resulting predominantly from the combustion of coal.<sup>10</sup>
- 2 The entity shall describe how its policies and procedures compare with those required by local jurisdictions that apply to the entity.
  - 2.1 The entity shall discuss whether and how its policies and procedures exceed the requirements of local jurisdictions.
  - 2.2 The entity shall discuss how its policies and procedures vary by region.
- 3 The entity shall describe its approach to CCPs management during the entire product lifecycle.
  - 3.1 The scope of the disclosure shall include a discussion of the entity's:
    - 3.1.1 approach to assessment of potential environmental impacts associated with CCPs;
    - 3.1.2 policies and procedures related to CCP waste avoidance;
    - 3.1.3 approach to identification, assessment and application of recycling, reuse and repurposing of CCPs as management strategy;
    - 3.1.4 policies and procedures related to CCP disposal;
    - 3.1.5 policies and procedures related to remediation of environmental or social impacts of incidents associated with the mishandling of CCPs; and
    - 3.1.6 approach to decommissioning CCP disposal facilities.
- 4 The entity shall include a description of how CCP management efforts are coordinated among business partners (for example, contractors and subcontractors).
- 5 The entity shall describe how it ensures compliance and conformance with its CCP management policies and procedures.

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<sup>10</sup> Adapted from the World Wide Coal Combustion Products Network's definition of coal combustion products.

# Energy Affordability

## Topic Summary

An objective of regulated electric utilities is to provide reliable, affordable and sustainable electricity. Entities in the industry manage these potentially competing priorities to maintain favourable relations with customers and regulators—and ultimately to earn appropriate returns for shareholders. The affordability of energy is particularly challenging for entities to balance because it often conflicts with other core objectives. Utility energy bills generally are perceived to be increasingly unaffordable for low-income customers (affordability is determined by both the net cost of energy bills and the underlying customer economics). Ensuring that utility bills are affordable is crucial for utilities working to build trust (intangible asset value) with regulators and customers. Regulatory relations are an important value driver for utilities and one of the issues analysed closely by investment analysts. The willingness of regulators to grant rate requests, rate structure modifications, cost recovery and allowed returns determines financial performance and investment risk. Effectively managing affordability may enable utilities to invest more capital, favourably revise rate structures and increase allowed returns. Furthermore, utilities that ineffectively manage affordability increasingly are exposed to customers defecting from the grid (or reducing reliance on the grid) by implementing distributed energy resources or pursuing other alternative energy sources (for example, industrial customers' use of combined heat and power). Managing affordability involves operating an efficient business with a comprehensive, long-term strategy, as well as working closely with regulators and public policymakers on rate structures and, potentially, bill-assistance programmes. Although a utility's business model and rate structure largely determine the precise nature of the financial effects, affordability is a critical business issue for utilities managing, maintaining and growing customer bases, building intangible asset value, creating investment and return opportunities, and ultimately delivering shareholder returns.

## Metrics

### IF-EU-240a.1. Average retail electric rate for (1) residential, (2) commercial, and (3) industrial customers

- 1 The entity shall disclose its average retail electric rate per kilowatt hour (kWh) of electricity delivered to retail customers.
  - 1.1 The entity shall calculate its average retail electric rate as the total revenue directly resulting from electricity delivered to retail customers divided by the corresponding amount of electricity delivered (in kWh).
- 2 The entity shall disclose its average retail electric rate separately for each type of customer, classified as (1) residential, (2) commercial, and (3) industrial.
  - 2.1 The scope of each customer type shall be consistent with the entity's financial reporting.
  - 2.2 Each customer type shall be disclosed as an aggregate for all customers within that respective customer type.
    - 2.2.1 If the entity's financial reporting combines commercial and industrial customers into one category, then the entity may combine the commercial and industrial customer types.

2.2.2 The entity may disclose sub-classifications of customer types. For example, in addition to the average retail electric rate for commercial customers, the entity may provide further disclosures by small commercial customers and large commercial customers.

- 3 The entity may disclose additional customer types if such customer types exist outside the scope of the customer types described above. For example, the entity may additionally disclose the average electric rate for agricultural customers or public street lighting.

### **IF-EU-240a.3. (1) Number of residential customer electric disconnections for non-payment, (2) percentage reconnected within 30 days**

- 1 The entity shall disclose (1) the total number of electricity disconnections among residential customers during the reporting period that resulted from non-payment.

1.1 A disconnection is defined as the entity, or its service provider, intentionally terminating a customer's access to electricity.

1.2 Disconnections occurring for more than one reason shall be included if non-payment (or under-payment) is a contributing cause of the disconnection.

- 2 The entity shall disclose (2) the percentage of disconnections that are reconnected within 30 days.

2.1 The percentage shall be calculated as the number of residential customers previously disconnected, which were reconnected within 30 days of the date of the disconnection, divided by the total number of residential customers disconnected during the reporting period as a result of non-payment.

2.2 A reconnection is defined as the entity, or its service provider, intentionally reinstating a customer's access to electricity, which was previously disconnected.

2.2.1 Reconections may occur for reasons including bill payment, the establishment of a bill payment plan or the use of a bill-assistance programme.

2.3 The scope of the disclosure may include reconections that occur after the end of the reporting period; but the entity shall not double-count reconections for more than one discrete reporting period.

#### **Note to IF-EU-240a.3**

- 1 The entity shall discuss how policies, programmes and regulations affect the number and duration of residential customer disconnections.

1.1 Policies include entity-level policies that govern the conditions under which the entity may (or may not) disconnect residential customers.

1.2 Programmes include those administered by jurisdictions, utility commissions or entities designed to improve the affordability of electricity among residential customers or reduce the number or duration of residential customer disconnections.

- 1.3 Regulations include those enforced by jurisdictions, utility commissions or entities designed to improve the affordability of electricity among residential customers or reduce the number or duration of residential customer disconnections.

#### **IF-EU-240a.4. Discussion of impact of external factors on customer affordability of electricity, including the economic conditions of the service territory**

- 1 The entity shall describe the external factors that cause, or are reasonably likely to cause, a significant change in the affordability of electricity among the entity's retail customers.
  - 1.1 External factors are defined as influences outside the entity's direct control.
  - 1.2 The scope of external factors includes factors that directly affect current or future electricity rates, or factors that affect customers' current or future ability to pay electricity bills (with no direct effect on electricity rates).
  - 1.3 External factors may include geography, climate, weather, regulations, public policy and public purpose programmes, regardless of whether such factors directly relate to affordability.
  - 1.4 At a minimum, external factors shall include the prevailing economic conditions in the service territory.
    - 1.4.1 The entity may disclose the median household income, poverty rates, employment rates, or other quantitative or qualitative data describing the economic conditions of the service territory.
- 2 For each external factor, in addition to a description of the factor, the entity shall briefly describe:
  - 2.1 the frequency and magnitude with which the factor affects electricity affordability for the entity's customers; and
  - 2.2 the trend in how the factor affects electricity affordability for the entity's customers.
- 3 The entity shall describe the risks and opportunities that may arise from external factors.
  - 3.1 Risks may include customer non-payment of electricity bills, cost recovery uncertainty, reputational value, and regulations, public policy or public purpose programmes that may generate adverse financial consequences.
  - 3.2 Opportunities may include customer growth, capital investment opportunities, reputational value, and regulations, public policy or public purpose programmes that may generate positive financial effects.
- 4 The scope of the disclosure includes the affordability of electricity for all retail customers within the entity's service territory, which may include residential, commercial, industrial and agricultural customers.
  - 4.1 The entity may prioritise low-income residential customers in its disclosures.
- 5 The entity may describe how its average rates, average bills or customer disconnections compare to other utilities in the industry.



# Workforce Health & Safety

## Topic Summary

Employees of entities in the Electric Utilities & Power Generators industry face numerous hazards in the construction and maintenance of electric transmission and distribution lines, as well as with the various means of electricity generation. Many of these employees work for extended periods at great heights, operate heavy machinery and face electrocution risks. Although the industry has made significant strides in safety improvements, significant risks remain, along with opportunities for further improvements. The nature of the industry—as a necessity of modern life and economies, as well as commonly a legally granted monopoly—means that entity actions receive significant public and regulatory scrutiny. Entities must maintain a culture of safety to ensure adequate working conditions for their workers, strong operational productivity, and to uphold positive views from the perspective of regulators and manage potential risks of regulatory penalties.

## Metrics

### **IF-EU-320a.1. (1) Total recordable incident rate (TRIR), (2) fatality rate, and (3) near miss frequency rate (NMFR) for (a) direct employees and (b) contract employees**

- 1 The entity shall disclose (1) its total recordable incident rate (TRIR) for work-related injuries and illnesses.
  - 1.1 An injury or illness is considered a recordable incident if it results in death, days away from work, restricted work or transfer to another job, medical treatment beyond first aid, or loss of consciousness. Additionally, a significant injury or illness diagnosed by a physician or other licensed health care professional is considered a recordable incident, even if it does not result in death, days away from work, restricted work or job transfer, medical treatment beyond first aid, or loss of consciousness.
    - 1.1.1 First aid is defined as emergency care or treatment for an ill or injured person before regular medical aid can be provided.
    - 1.1.2 The entity may use applicable jurisdictional criteria for definitions of a recordable incident and a non-recordable incident such as first aid. The entity shall disclose the legal, regulatory or industry framework used as the source for these criteria and definitions.
- 2 The entity shall disclose (2) its fatality rate for work-related fatalities.
- 3 The entity shall disclose (3) its near miss frequency rate (NMFR) for work-related near misses.
  - 3.1 A near miss is defined as an unplanned or uncontrolled event or chain of events that has not resulted in a recordable injury, illness, physical damage, or environmental damage, but had the potential to do so in other circumstances.
  - 3.2 The entity may disclose its process for classifying, identifying and reporting near misses.
- 4 All disclosed rates shall be calculated as:  $(\text{statistic count} \times 200,000) / \text{total number of hours worked by all employees in the year reported}$ .

- 4.1 The 200,000 in the rate calculation represents the total number of hours 100 full-time workers working 40 hours per week for 50 weeks per year can provide annually.
- 5 The scope of the disclosure includes work-related incidents only.
- 5.1 Work-related incidents are injuries and illnesses resulting from events or exposures in the work environment.
- 5.2 The work environment is the establishment and other locations where one or more employees are working or are present as a condition of their employment.
- 5.3 The work environment includes not only physical locations, but also the equipment or materials used by the employee during the course of work.
- 5.4 Incidents that occur while an employee is travelling are work-related if, at the time of the injury or illness, the employee was engaged in work activities in the interest of the employer.
- 5.5 A work-related incident must be a new case, not a previously recorded injury or illness being updated.
- 6 The entity shall disclose the rates for each of these categories of employee:
- 6.1 direct employees, defined as individuals on the entity's payroll, whether they are full-time, short service, part-time, executive, labour, salary, seasonal, migrant or hourly employees.
- 6.2 contract employees, defined as individuals who are not on the entity's payroll, but whom the entity supervises or manages, including independent contractors and those employed by third parties (for example, temp agencies and labour brokers).
- 7 The scope of the disclosure includes all employees regardless of employee location or type of employment.

# End-Use Efficiency & Demand

## Topic Summary

Energy efficiency is a low-lifecycle-cost method to reduce greenhouse gas (GHG) emissions, because less electricity needs to be generated to provide the same end-use energy services. Utilities can promote energy efficiency and conservation among their customers. Such strategies may include offering rebates for energy-efficient appliances, weatherising customers' homes, educating customers on energy-saving methods, offering incentives to customers to curb electricity use during times of peak demand ('demand response'), or investing in technology such as smart meters, which allow customers to track their energy use. While saving consumers money, these efforts also may reduce operating costs for electric utilities by decreasing peak demand. Furthermore, depending on the utility regulatory framework, local jurisdictions may mandate that entities develop energy efficiency plans before permitting new builds. Companies with effective strategies to reduce the downside risks from demand fluctuations, may gain adequate and timely returns on needed investments. Furthermore, reducing costs through efficiency initiatives may earn higher, long-term risk-adjusted returns.

## Metrics

### IF-EU-420a.2. Percentage of electric load served by smart grid technology

- 1 The entity shall disclose the percentage of its electric load, in megawatt hours, served by smart grid technology.
  - 1.1 The electric load served by smart grid technology is defined as the amount of electricity delivered to the entity's customers that incorporates the use of smart grid technologies to meet the electricity demand of the consumer.
  - 1.2 A smart grid is defined, consistent with the International Energy Agency (IEA), as an electricity network that uses digital and other advanced technologies to monitor and manage the transport of electricity from all generation sources to meet the varying electricity demands of end users. Smart grids coordinate the needs and capabilities of all generators, grid operators, end users and electricity market stakeholders to operate all parts of the system as efficiently as possible, minimising costs and environmental impacts while maximising system reliability, resilience and stability.
  - 1.3 An electric load is considered to be served by smart grid technology when the technology enables one or more of the distinguishing characteristics defined by the IEA:
    - 1.3.1 Enables informed participation by customers
    - 1.3.2 Accommodates all generation and storage options
    - 1.3.3 Enables new products, services and markets
    - 1.3.4 Provides the power quality for the range of needs
    - 1.3.5 Optimises asset utilisation and operation efficiency

#### 1.3.6 Provides resiliency to disturbances, attacks and natural disasters

- 1.4 Examples of smart grid technologies may include wide-area monitoring and control, information and communication technology integration, renewable and distributed generation integration, transmission enhancement, distribution grid management, advanced metering infrastructure, electric vehicle charging infrastructure, and customer-side systems.
- 2 The percentage of load served by smart grid technology shall be calculated as the total amount of energy load, in megawatt hours, served by smart grid technology divided by the total amount of energy load, in megawatt hours.
- 3 The entity may discuss the type of smart grid technology through which its electric load is served, the customer types using the technology (for example, residential, commercial or industrial), whether technologies are owned by the utility or the customer, and any plans for further integration of smart grid capabilities.

#### Note to IF-EU-420a.2

- 1 The entity shall discuss the opportunities and challenges associated with the development and operation of a smart grid, including, if relevant:
  - 1.1 Demand-response and end-user efficiency opportunities (for example, smoothing of the demand curve, increased cost-effective electric generation, improved incorporation of distributed generation, and increased generation and transmission efficiency)
  - 1.2 Political and deployment challenges (for example, opposition to smart grid development, disparate degrees of technology deployment and economic disincentives)

### **IF-EU-420a.3. Customer electricity savings from efficiency measures, by market**

- 1 The entity shall disclose the total amount of electricity savings delivered to customers, in megawatt hours, from energy efficiency measures during the reporting period, for each of its markets.
  - 1.1 Markets are defined as those operations subject to distinct public utility regulatory oversight.
  - 1.2 Electricity savings are defined according to the gross savings approach as the changes in energy consumption or demand that result from programme-related actions taken by participants in an efficiency programme, regardless of why they participated.
    - 1.2.1 The entity may list those markets where it reports electricity savings on a net electricity savings basis, and thus, may be different from the figures disclosed here. Net electricity savings are defined as changes in consumption specifically attributable to an energy efficiency programme, and that would not have occurred in the absence of the programme.
- 2 Electricity savings shall be calculated on a gross basis but consistent with the methodology set forth in applicable jurisdictional evaluation, measurement and verification (EM&V) regulations where such savings occur.
- 3 The scope of electricity savings from efficiency measures includes savings delivered directly by the entity and, where regulations provide, savings substantiated through purchases of efficiency savings credits.

- 3.1 For any savings from efficiency measures delivered directly by the entity, any efficiency savings credits shall be retained (not sold) and retired or cancelled on behalf of the entity for the entity to claim them as delivered electricity savings.
- 3.2 For efficiency savings credits purchased, the agreement shall explicitly include and convey that credits be retained and retired on behalf of the entity for the entity to claim them.

**Note to IF-EU-420a.3**

- 1 The entity shall discuss regulations related to customer efficiency measures for each of its relevant markets, including:
  - 1.1 The amount or percentage of electricity savings from efficiency measures required by regulations for each market.
  - 1.2 Instances of non-compliance with electricity savings obligations.
  - 1.3 In such instances, the entity shall disclose the difference between the energy savings delivered and the amount required by the regulation.
  - 1.4 Electricity savings delivered that exceed those required by regulations and that resulted in the entity receiving energy efficiency performance incentives, including the value of any such incentives.
- 2 The entity shall discuss the forms of policy, by each market, that allow for, or incentivise, energy efficiency, including a discussion of the benefits, challenges and financial effects associated with such regulations.
- 3 Relevant policy mechanisms to discuss may include:
  - 3.1 Deferral decoupling
  - 3.2 Current period decoupling
  - 3.3 Single fixed variable rates
  - 3.4 Lost revenue adjustments
  - 3.5 Energy efficiency feebates
- 4 For markets lacking regulations that allow for, or incentivise, energy efficiency, the entity shall discuss its stance on and efforts to manage risks and opportunities relating to such regulation.
- 5 The entity may discuss any efforts to meet regulations through incentives it has developed for its customers that promote end-use efficiency, including dynamic pricing, energy efficiency rebates and other measures to subsidise customer energy efficiency.

# Nuclear Safety & Emergency Management

## Topic Summary

Although rare, nuclear accidents can have significant human health and environmental consequences because of their severity. Owners of nuclear power plants in many regions have operated for decades without any major public safety incidents, but the occurrence of infrequent but large-magnitude incidents anywhere in the world can have major effects on the entire nuclear power industry. Entities that own and operate nuclear plants may lose their licence to operate, as well as face many other financial consequences in the event of an accident—though entities carry insurance and may have legal protections from some liabilities. Failure to comply with the safety regulations can be expensive to nuclear power operators; in extreme circumstances it may make the continued operation of the plant uneconomical. Facing potentially significant financial repercussions, both from ongoing safety compliance as well as tail risk incidents, entities that own or operate nuclear plants must be vigilant in the safety compliance, best practices and upgrades of their facilities. They also must maintain robust emergency preparedness training for their staff and a strong safety culture. These measures can reduce the probability that accidents will occur and enable an entity to effectively detect and respond to such incidents.

## Metrics

### **IF-EU-540a.1. Total number of nuclear power units, broken down by results of most recent independent safety review**

- 1 The entity shall disclose the total number of nuclear power units that it owns or operates, where:
  - 1.1 A nuclear power unit is defined as a nuclear reactor and associated equipment necessary for electric power generation, including those structures, systems and components required to provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public.
- 2 The entity shall provide a breakdown of nuclear power units that it owns or operates by results of the most recent independent safety review.
  - 2.1 A review is considered independent when conducted by third parties who are not and have not been directly involved with the design or operation of the nuclear power unit.
  - 2.2 For applicable jurisdictions, the entity shall disclose the results of the most recent independent safety review for both regulatory and peer reviews.
  - 2.3 The entity shall disclose the applicable jurisdictional regulation, guideline or standard under which the safety review was conducted.

### **IF-EU-540a.2. Description of efforts to manage nuclear safety and emergency preparedness**

- 1 The entity shall describe its efforts to manage nuclear safety and emergency preparedness, including its efforts to identify, report and assess initiating events and event sequences relating to nuclear safety and emergency preparedness.

- 1.1 Initiating events are defined as natural or human-induced events that cause an event sequence.
- 1.2 An event sequence is defined as a series of actions or occurrences within the natural and engineered components of a geologic repository operations area that potentially could lead to exposure of individuals to radiation. An event sequence includes one or more initiating events and associated combinations of repository system component failures, including those produced by the action or inaction of operating staff.
- 1.3 Disclosure may focus broadly on nuclear safety and emergency management systems, but it specifically shall address the systems in place to avoid and manage initiating events, accidents, emergencies and incidents that could have catastrophic impacts on human health, the local community and the environment.
- 2 The entity shall discuss how it manages nuclear safety and emergency preparedness, such as through training, rules and guidelines (and their enforcement), implementation of emergency plans and use of technology.
- 3 The entity shall discuss its efforts to create and maintain a culture of nuclear safety and emergency preparedness, including efforts to institute the traits of a positive safety culture, where the traits of a positive safety culture include:
  - 3.1 Leadership safety values and actions
  - 3.2 Problem identification and resolution
  - 3.3 Personal accountability
  - 3.4 Work process
  - 3.5 Continuous learning
  - 3.6 Environment for raising concerns
  - 3.7 Effective safety communications
  - 3.8 Respectful work environment
  - 3.9 Questioning attitude
- 4 The entity may discuss implementation of the Institute of Nuclear Power Operations' (INPO) Principles for a Strong Nuclear Safety Culture or the International Atomic Energy Agency's (IAEA) Best Practices in the Utilization and Dissemination of Operating Experience at Nuclear Power Plants.

# Grid Resiliency

## Topic Summary

Electricity is critical for the continued function of most elements of modern life, from medicine to finance, creating a societal reliance on continuous service. Major disruptions to electricity infrastructure may result in potentially high societal costs. Disruptions can be caused by extreme weather events, natural disasters and cyberattacks. As the frequency and severity of extreme weather events associated with climate change continues to increase, all segments of electric utilities entities—and especially major transmission and distribution (T&D) operations—will face increasing physical threats to their infrastructure. Extreme weather events could result in frequent or significant service disruptions, outages and require upgrade or repair of damaged or compromised equipment, all of which may add substantial costs and damage brand reputation among regulators and customers. The increased use of smart grid technology has several benefits, including strengthening the resiliency of the grid to extreme weather events. However, this technology may make the grid more vulnerable to cyberattacks, because it provides hackers more entryways into infrastructure systems. Entities must implement strategies that minimise the probability and magnitude of impacts from extreme weather events and cyberattacks. To remain competitive in the face of increasing external competition, entities must improve the reliability, resilience and quality of their infrastructure.

## Metrics

### IF-EU-550a.1. Number of incidents of non-compliance with physical or cybersecurity standards or regulations

- 1 The entity shall disclose the total number of instances of non-compliance with physical or cybersecurity standards or regulations applicable to electricity infrastructure owned or operated by the entity.
  - 1.1 The scope of physical or cybersecurity standards or regulations includes mandatory, enforceable standards and regulations intended to mitigate physical or cybersecurity risks related to the reliability or resiliency of electricity infrastructure, including the electricity grid.
    - 1.1.1 The entity may disclose instances of non-compliance with voluntary physical or cybersecurity standards or regulations.

### IF-EU-550a.2. (1) System Average Interruption Duration Index (SAIDI), (2) System Average Interruption Frequency Index (SAIFI), and (3) Customer Average Interruption Duration Index (CAIDI), inclusive of major event days

- 1 The entity shall disclose its (1) System Average Interruption Duration Index (SAIDI), in minutes.
  - 1.1 The SAIDI is defined as the total duration of an interruption for the average customer during the period under reporting.
  - 1.2 The entity shall calculate its SAIDI as the total number of customers interrupted multiplied by the duration of interruptions (restoration time) divided by the total number of customers served, written as  $\sum(r_i \times N_i) / N_T$ 
    - 1.2.1  $\sum$  = Summation function



1.2.2  $r_i$  = Restoration time, in minutes

1.2.3  $N_i$  = Total number of customers interrupted

1.2.4  $N_T$  = Total number of customers served

2 The entity shall disclose its (2) System Average Interruption Frequency Index (SAIFI).

2.1 SAIFI is defined as the average number of times that a system customer experiences an outage during the period under reporting.

2.2 The entity shall calculate its SAIFI as the total number of customers interrupted divided by the total number of customers served, written as  $\sum(N_i) / N_T$

2.2.1  $\sum$  = Summation function

2.2.2  $N_i$  = Total number of customers interrupted

2.2.3  $N_T$  = Total number of customers served

3 The entity shall disclose its (3) Customer Average Interruption Duration Index (CAIDI).

3.1 The CAIDI is defined as the average amount of time required to restore service once an outage has occurred.

3.2 The entity shall calculate its CAIDI as the total number of customers interrupted multiplied by the duration of interruptions (restoration time in minutes) divided by the sum of the number of customers interrupted, written as  $\sum(N_i \times r_i) / \sum(N_i)$

3.2.1  $\sum$  = Summation function

3.2.2  $r_i$  = Restoration time, in minutes

3.2.3  $N_i$  = Total number of customers interrupted

4 The entity shall disclose its SAIDI, SAIFI and CAIDI inclusive of major event days, where:

4.1 Major event days are defined, according to IEEE Std 1366, as days in which the daily SAIDI exceeds a threshold value,  $T_{MED}$ , where  $T_{MED}$  is calculated as follows:

4.1.1 The entity should collect values of daily SAIDI for five sequential years, ending on the last day of the last complete reporting period. If fewer than five years of historical data are available, use all the available historical data.

- 4.1.2 If any day in the data set has a value of zero for SAIDI, replace it with the lowest non-zero SAIDI value in the data set—this permits taking the logarithm of every day.
- 4.1.3 Take the natural logarithm ( $\ln$ ) of each daily SAIDI value in the data set.
- 4.1.4 Find  $\alpha$  (Alpha), the average of the logarithms (also known as the logaverage) of the data set.
- 4.1.5 Find  $\beta$  (Beta), the standard deviation of the logarithms (also known as the log-average) of the data set.
- 4.1.6 Compute the major event day threshold,  $T_{MED}$ , using the equation:  $T_{MED} = e^{(\alpha+\beta)}$ .
- 4.1.7 Any day with daily SAIDI greater than the threshold value  $T_{MED}$  that occurs during the subsequent reporting period is a major event day.

**Note to IF-EU-550a.2**

- 1 The entity shall discuss notable service disruptions such as those that affected a significant number of customers, or disruptions of extended duration.
- 2 For such disruptions, the entity should provide:
  - 2.1 Description and cause of the service disruption
  - 2.2 The total generation or transmission capacity, in megawatts, and population affected by the disruption
  - 2.3 The costs associated with the service disruption
  - 2.4 Actions taken to mitigate the potential for future service interruptions
  - 2.5 Any other significant outcomes (for example, legal proceedings or related fatalities).



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