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Technical guidelines for the development of small hydropower plants —

Part 3: Design principles and requirements

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

International Workshop Agreement IWA 33 was approved at a workshop hosted by the Standardization Administration of China (SAC) and Austrian Standards International (ASI), in association with the International Center on Small Hydro Power (ICSHP), held virtually from 19th to 23rd October, 2020.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

A list of all parts in the IWA 33 series can be found on the ISO website.

Introduction

Small hydropower (SHP) is well recognized as an important renewable energy solution to the challenge of increasing access to electricity in remote rural areas. However, while most countries in Europe, North and South America, China and India have high degrees of installed capacity, the potential of SHP in many developing countries remains untapped and is hindered by a number of factors, including the lack of best practices or standards for SHP development.

The technical guidelines for the development of small hydropower plants contained in this document address the current limitations of the regulations applied to technical guidelines for SHP plants by applying the expertise and best practices that exist across the globe. It is intended for countries to utilize this document to support their current policy, technology and legislation. Countries that have limited institutional and technical capacities will be able to enhance their knowledge base in developing SHP plants on rivers/streams and existing water resource structures outlets such as dams, barrages, navigation lock, canal falls, outfalls and flowing water (kinetic flow), including renovating/upgrading the old SHP plants, thereby attracting more investment in SHP projects, encouraging favourable policies and subsequently assisting in economic development at a national level. This document will be valuable for all countries, but also allow for the sharing of experience and best practices between countries.

This document is the result of a collaborative effort between the United Nations Industrial Development Organization (UNIDO) and the International Network on Small Hydro Power (INSHP). About 80 international experts and 40 international agencies were involved in this document's preparation and peer review. This document can be used as the principles and basis for the planning, design, construction and management of SHP plants up to 30 MWe.

Technical guidelines for the development of small hydropower plants —

Part 3: Design principles and requirements

1 Scope

This document specifies the general principles and basic requirements of design for small hydropower (SHP) projects up to 30 MWe, mainly including hydrology, geology, energy calculations, project layout, hydraulics, electromechanical equipment selection, construction planning, project cost estimates, economic appraisal, social and environmental assessments.

Application of this document is intended to be site specific, with the principles and requirements of design applied in accordance with the needs of proposed hydropower plant.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IWA 33-1, *Technical guidelines for the development of small hydropower plants — Part 1: Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IWA 33-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Hydrology

4.1 Basic data

4.1.1 The basic data include hydrometeorological data, river basin physiographic characteristics data, information about the human activities impact, hydrological computation results of the basin and nearby areas and the other relevant data. The changes in water resources management that occur upstream of a hydropower plant during its long lifespan will alter the runoff regime. Thus, the present and foreseeable needs of the population living on both sides of the river shall be taken into account for water supply, irrigation, industrial, ecology and recreation purposes.

4.1.2 The data series upon which hydrological computation is based shall be checked for reliability, consistency and representativeness.

4.1.3 The investigation of historical floods and dry seasons shall be carried out for the regions with insufficient or no data; if the conditions permit, observation and survey of water level, flow and sediment