International Organization for Standardization
Organisation internationale de normalisation
Международная организация по стандартизации

FORM 1:
PROPOSAL FOR A NEW FIELD OF TECHNICAL ACTIVITY

Circulation date: 2021-04-22 **Closing date for voting:** 2021-07-15	**Reference number:** (to be given by ISO Central Secretariat)
Proposer SAC	**ISO/TS/P** 299

A proposal for a new field of technical activity shall be submitted to the ISO Central Secretariat, which will assign it a reference number and process the proposal in accordance with the ISO/IEC Directives Part 1, Clause 1.5. The proposer may be a member body of ISO, a technical committee, subcommittee or project committee, the Technical Management Board or a General Assembly committee, the Secretary-General, a body responsible for managing a certification system operating under the auspices of ISO, or another international organization with national body membership. Guidelines for proposing and justifying a new field of technical activity are given in the ISO/IEC Directives Part 1, Annex C.

Proposal (to be completed by the proposer)

Title of the proposed new committee (The title shall indicate clearly yet concisely the new field of technical activity which the proposal is intended to cover).

District Energy System

Scope statement of the proposed new committee (The scope shall precisely define the limits of the field of activity. Scopes shall not repeat general aims and principles governing the work of the organization but shall indicate the specific area concerned).

Standardization of planning, operation, maintenance, optimization and application of the integrated district energy system with multiple energy carriers.
Excluding: specific energy (electricity or non-electricity) technologies, information technologies or control technologies within the scope of other ISO or IEC/TCs.

☒ **The proposer has checked whether the proposed scope of the new committee overlaps with the scope of any existing ISO committee**

☐ **If an overlap or the potential for overlap is identified, the affected committee has been informed and consultation has taken place between proposer and committee on**
- **i. modification/restriction of the scope of the proposal to eliminate the overlap,**
- **ii. potential modification/restriction of the scope of the existing committee to eliminate the overlap.**

☐ **If agreement with the existing committee has not been reached, arguments are presented in this proposal (under question 7) as to why it should be approved.**

Proposed initial programme of work. (The proposed programme of work shall correspond to and clearly reflect the aims of the standardization activities and shall, therefore, show the relationship between the subject proposed. Each item on the programme of work shall be defined by both the subject aspect(s) to be standardized (for products, for example, the items would be the types of products, characteristics, other requirements, data to be supplied, test methods, etc.). Supplementary justification may be combined with particular items in the programme of work. The proposed programme of work shall also suggest priorities and target dates.)

Modern district energy system (DES) creates synergies between the production and supply of heat, cooling, domestic hot water and electricity across multiple energy carriers and consumers, with the goal of optimizing energy efficiency and local resource use in line with the Paris Agreement and the UN's 2030 Agenda for Sustainable Development.

The work program will support the integrated DES in a holistic approach in planning, operation, maintenance, optimization and application to accelerate the development and modernization of district energy system.

As a priority and to lead the programme, a **Guidance on Planning District Energy System** will be developed to agree common terminology, and provide practical guidance on principles and practices that embed integrated and holistic consideration. It will provide examples of good practice, as well as implementation guidance on the different district energy systems using technologies and approaches such as combined cooling, heating and power (CCHP), heat pumps, energy storage and decentralized energy. The standard can support stakeholders including DES owners, constructors/contractors, operators, consumers and investors to improve their activities towards an efficient, affordable and decarbonised DES. The standard will bring a wider, more holistic umbrella for whole family of standards for DES. Importantly, it will draw upon existing and ongoing standardization effort (such as energy management system, digital technologies, renewable energy), and will serve as the basis of future international standardization in the field of DES.

The wider programme will also address:

1. Operation and maintenance of DES.
A series of standards will be developed to provide principles and good practices of the operation and maintenance of DES for flexible system operation characterized with efficient generation, consumption and storage among different energy carriers in integrated DES. Supporting tools such as calculation methods of the energy efficiency of integrated DES will be developed to understand the performance of the DES 'as a whole'.

2. Optimization of DES.
Standards for optimization of DES will be developed to support the use of synergies, improvement in system integration, flexibility in demand, and short and longer-term energy storage solutions. Standards will also be developed to identify opportunities for continual improvement of DES to ensure efficient resource use and to realize their multiple benefits.

3. DES applications
The need to deploy efficient and modern DES could inform the development of guidance to provide good practices for applications of DES across the different economic sectors. Standards for applying DES in different scenarios such as industrial district or rural area will provide essential support in the development of customized energy services, green infrastructure and improvement of energy access and resilience.

Indication(s) of the preferred type or types of deliverable(s) to be produced under the proposal (This may be combined with the "Proposed initial programme of work" if more convenient). Under this proposed TC, new international standards will be developed and published as International Standards (ISs), Technical Specifications (TSs) or Technical Reports (TRs) in line with the technology revolution, market needs and target users.

A listing of relevant existing documents at the international, regional and national levels. (Any known relevant document (such as standards and regulations) shall be listed, regardless of their source and should be accompanied by an indication of their significance.)

There are no ISO international standards on the subject of integrated District Energy System (DES).

ISO/TC 205 and CEN/TC 228 have developed standards for calculation of system energy requirements and system efficiencies for cooling and heating system in buildings. CEN/TC 107 has developed standards for prefabricated insulated district heating and district cooling pipe systems. ISO/TC 268 has developed ISO 37160 Measurement methods for the quality of thermal power infrastructure and requirements for plant operations and management. The proposed TC will not develop standards for these specific technologies used in DES such as heating and cooling system, pipe systems or power plant.

ISO/TC 301 has developed standard ISO 50001 Energy management systems — Requirements with guidance for use. This document specifies requirements for establishing, implementing, maintaining and improving an energy management system (EnMS), and enables an organization to follow a systematic approach in achieving continual improvement of energy performance and the EnMS. The proposed TC will not develop standards for establishing or implementing EnMS in organizations. While the standardization activity in this proposed TC will align with the systematic approach to improve energy performance which is the core conception of the ISO 50001 series.

IEC/SyC Smart Energy developed deliverables in order to provide systems level standardization, coordination and guidance in the areas of Smart Grid and Smart Energy, including interaction in the areas of Heat and Gas. IEC/SyC Smart Cities made efforts to foster the development of standards in the field of electrotechnology to help with the integration, interoperability and effectiveness of city systems. The proposed TC will not develop standards for any smart grid, smart energy technologies or smart cities.

IEC/TC 8 and its SCs developed standards for overall system aspects of electricity supply systems. IEC/TC 57 develops standards for power system management and associated information exchange. IEC/TC 82/TC 88/JWG1 has developed standards for off grid systems, including decentralized rural electrification and hybrid systems. IEC/TC 120 has developed standards for electrical energy storage (EES) systems. The proposed TC will not develop standards for these specific electrical technologies potentially used in DES as well as their use cases.

Because the work program of the proposed TC will focus on the planning, operation, maintenance, optimization and application of the DES in a holistic approach integrating multiple technologies and energy carriers, above-mentioned standards can be harmoniously linked to the standards to be developed within the proposed TC.

Besides, China, Denmark and US have developed relevant national standards for district heating system or combined cooling, heating, and power (CCHP) system. Industry associations such as International District Energy Association (IDEA), American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) have published guide books for design, operation and maintenance for district cooling or district heating systems. The standardisation activity of the proposed TC will provide an international platform to increase the adoption of these proven technologies and best practices without duplications.

Standards of relevance to the work of the proposed TC:
ISO
ISO 26000:2010 Guidance on social responsibility

ISO 31000:2018 Risk management — Guidelines
ISO 37160:2020 Smart community infrastructure - Electric power infrastructure - Measurement methods for the quality of thermal power infrastructure and requirements for plant operations and management
ISO 50001:2018 Energy management systems - Requirements with guidance for use
ISO 50007:2017 Energy services — Guidelines for the assessment and improvement of the energy service to users
ISO/DIS 52032 Energy performance of buildings - Method for calculation of system energy requirements and system efficiencies - Space distribution systems (DHW, heating and cooling), Module M3-6, M4-6, M8-6

IEC
IEC SRD 63199:2020 Top priority standards development status in the domain of smart energy
IEC SRD 63320 ED1 Systems reference deliverable (srd) - use case collection and analysis: smart urban planning for smart cities

China
GB/T 33757.1-2017 Energy saving ratio for distributed energy systems of combined cooling, heating and power - Part 1: Fossil energy driven systems
GB/T 36160.1-2018 Technical specification for distributed energy system of combined cooling, heating and power. Part 1: Refrigeration and heating subsystem
GB/T 36160.2-2018 Technical specification for distributed energy system of combined cooling, heating and power. Part 2: Power subsystem
GB/T 38680-2020 Technical guidelines for central heating system using low grade industrial surplus heat

Denmark
DS/CWA 16975:2015+AC:2016 Eco-Efficient Substations For District Heating

EN
EN 15316-4-5:2017 Energy Performance of Buildings - Method for Calculation of System Energy Requirements and System Efficiencies - Part 4-5: District Heating and Cooling, Module M3-8-5, M4-8-5, M8-8-5, M11-8-5

US
ANSI/ASHRAE 152-2014 Method of Test for Determining the Design and Seasonal Efficiencies of Residential Thermal Distribution Systems

ASHRAE
District cooling guide (second edition), 2019
District heating guide, 2013
Owner's guide for buildings served by district cooling, 2019

IDEA
Community Energy Development Guide, 2012
District Cooling Best Practice Guide, 2008
District Heating Handbook, Fourth Edition, 1983

A statement from the proposer as to how the proposed work may relate to or impact on existing work, especially existing ISO and IEC deliverables. (The proposer should explain how the work differs from apparently similar work, or explain how duplication and conflict will be minimized. If seemingly similar or related work is already in the scope of other committees of the organization or in other organizations, the proposed scope shall distinguish between the proposed work and the other work. The proposer shall indicate whether his or her proposal could be dealt with by widening the scope of an existing committee or by establishing a new committee.)

The proposed new field of technical activity on DES will complement and strengthen existing ISO activity and successful industry initiatives to clean energy transition in line with UN SDGs. The scope of the work program, in terms of its holistic approach to standardize DES, cannot be effectively dealt with by widening the scope, or changing the structure, of existing committees. The proposed TC will provide an opportunity to widely apply the relevant ISO standards in the form of integrated solution of DES.

As discussed above, the DES standards program falls outside the scope of relevant and existing ISO or IEC/TCs. The successful delivery of a holistic DES standardization program therefore requires a new committee, and dedicated committee support, which brings together all stakeholders. By establishing liaisons with relevant technical committees and its related SCs, any potential overlap or duplication could be managed and minimized. Engagement will be put in place to ensure effective collaboration among ISO and IEC technical committees and other interested members in moving related activities forward.

SAC has already reached international organizations including the UNEP and experts and the like, to procure their support in the delivery of international standards for DES, and would be looking to channel that support and knowledge into the new TC and into the collaboration mechanisms established between the proposed TC, and the aforementioned existing ISO TCs.

A listing of relevant countries where the subject of the proposal is important to their national commercial interests.

The subject area proposed here would have global implications and is of interest to a great number of countries.

IEA Technology Collaboration Program on District Heating and Cooling (DHC) was established in 1983 and now DHC TCP has 12 country members from Asia or Europe. The program conducts research and development as well as policy analysis and international co-operation to increase the market penetration of district heating and cooling systems with low environmental impact.

From late 2013 to early 2015, interviews, surveys and consultations were undertaken by the UNEP[1] from 65 cities around the world in order to gather expert and local stakeholder perspectives on the necessary parameters to ensure successful design, implementation and operations of modern district energy systems. According to the report, the 45 champion cities from 31 countries collectively have installed more than 36 gigawatts (GW) of district heating capacity (equivalent to approximately 3.6 million households), 6 GW of district cooling capacity (equivalent to approximately 600,000 households) and 12,000 kilometres of district energy networks.

In 2016, G20 members adopted the G20 Energy Efficiency Leading Programme (EELP) and identified the District Energy System (DES) as a key area of work on energy efficiency with the objective to encourage district cooling/district heating deployment. The task group of G20 EELP/DES is co-led by Kingdom of Saudi Arabia, China and Russia with close support of Singapore.

The proposed standards program has good geographic representative from Africa, Asia, Europe and North America with diverse economic and climatic situations. For most of the developing countries, DES is playing an increasingly important role in providing the quickly-deployed, stable, sustainable and affordable energy supply, and the customized energy services, particularly considering the weak energy infrastructure and rich renewable energy resources in many developing countries. A holistic standards program for DES at the ISO level will help to support the global efforts on clean energy transition in line with sustainable development goals, thereby delivering significant benefits, including:

- deploying innovative, efficient and clean energy solution through standardized DES technology;
- supporting green growth by establishing or improving DES infrastructure;
- providing affordable DES service to consumers by use of efficient and local resources;
- improving energy system resilience and energy access in developed or developing countries by disseminating good practices of DES

.

[1] UNEP etc. (2015), District energy in cities, unlocking the potential of energy efficiency and renewable energy, https://www.unep.org/resources/report/district-energy-cities-unlocking-potential-energy-efficiency-and-renewable-energy

A listing of relevant external international organizations or internal parties (other ISO and/or IEC committees) to be engaged as liaisons in the development of the deliverable(s). (In order to avoid conflict with, or duplication of efforts of, other bodies, it is important to indicate all points of possible conflict or overlap. The result of any communication with other interested bodies shall also be included.)

Internal Parties
ISO/TC 28/SC 7 Liquid biofuels
ISO/TC 86 Refrigeration and air-conditioning
ISO/TC 163 Thermal performance and energy use in the built environment
ISO/TC 180 Solar energy
ISO/TC 205 Building environment design
ISO/TC 238 Solid biofuels
ISO/TC 255 Biogas
ISO/TC 262 Risk management
ISO/TC 268 Sustainable cities and communities
ISO/TC 301 Energy management and energy savings
IEC/SyC Smart Energy
IEC/SyC Smart Cities
IEC/TC 8 System aspects of electrical energy supply
IEC/SC 8B Decentralized electrical energy systems
IEC/SC 8C Network management
IEC/TC 57 Power systems management and associated information exchange
IEC/TC 82/TC 88/JWG1 Solar photovoltaic energy systems/Wind energy generation systems/Photovoltaic off grid systems, including decentralized rural electrification and hybrid systems
IEC/TC 120 Electrical Energy Storage (EES) Systems

External International Organizations
G20 EELP DES task group
International District Energy Association (IDEA)
International Energy Agency (IEA)
UNEP DES initiative

A simple and concise statement identifying and describing relevant affected stakeholder categories (including small and medium sized enterprises) and how they will each benefit from or be impacted by the proposed deliverable(s).

This proposed work program would be designed to meet the needs of different stakeholders including energy planners, energy regulators, utilities, energy companies, infrastructure companies, energy service companies (ESCos), and consumers for standardized terminology, technology and supporting tools of DES.

The standardization of DES would also enhance ongoing international effort by the international organizations and national governments to accelerate clean energy transition aligning with sustainable development goals.

More specifically, the proposal will support local governments in supplying modern, clean and affordable energy as a priority in their agenda of economic and social development.

It will also provide assurance to global stakeholders, particularly the energy service providers and consumers of the credibility of DES technologies.

An expression of commitment from the proposer to provide the committee secretariat if the proposal succeeds.

China will provide secretariat for this new TC if the proposal is successful.

Purpose and justification for the proposal. (The purpose and justification for the creation of a new technical committee shall be made clear and the need for standardization in this fieldshall be justified. Clause C.4.13.3 of Annex C of the ISO/IEC Directives, Part 1 contains a menu of suggestions or ideas for possible documentation to support and purpose and justification of proposals. Proposers should consider these suggestions, but they are not limited to them, nor are they required to comply strictly with them. What is most important is that proposers develop and provide purpose and justification information that is most relevant to their proposals and that makes a substantial business case for the market relevance and the need for their proposals. Thorough, well-developed and robust purpose and justification documentation will lead to more informed consideration of proposals and ultimately their possible success in the ISO IEC system.)

Accelerating the uptake of energy efficiency and renewable energy in the global energy mix is the single biggest contribution to keep global temperature rise under 2 degrees Celsius (°C) and to reap the multiple benefits of an inclusive green economy. The development of modern and affordable district energy systems is one of the least-cost and most-efficient solutions for reducing greenhouse gas emissions and primary energy demand. A transition to such systems, combined with energy efficiency measures, could contribute as much as 58 per cent of the carbon dioxide (CO2) emission reductions required in the energy sector by 2050.

The traditional district energy system was first commercially introduced in cities in US in the 1870s and 1880s. The ability of modern district energy systems to combine energy efficiency improvements with renewable energy integration allows for a transition away from fossil fuel use and can result in a 30–50 percent reduction in primary energy consumption. For example, Denmark has seen a 20 percent reduction in national CO2 emissions since 1990 due to district heating. Now 61 countries had either a regulatory policy, a financial incentive or both to improve energy efficiency or increase renewable energy in district energy system.[1] Yet the full potential of modern district energy systems remains largely untapped. Significant opportunities exist for growth, refurbishment and new development. The European share of district energy system in the heating sector should increase from 12% (current values) to 50% by 2050 and is supplied mostly by decarbonised energy sources.[2] The 45 champion cities – including Dubai, London, Munich and Paris – with many cities attracting over US$150 million of investment in their respective district energy systems between 2009 and 2013. District energy systems can contribute to the transition to a green economy through different ways. In Toronto, Canada, the extraction of lake water for district cooling reduces electricity use for cooling by 90%, and the city earned US$89 million from selling a 43% share in its district energy systems. Port Louis in Mauritius has developed Sea Water Air Condition (SWAC) at an estimated cost of MUR4 billion (US$130 million) financed mainly through private funding from local banks and international financial institutions. The city of Cyberjaya in Malaysia implemented district cooling in 1998. Total project investment between 1998 and 2012 was around US$50 million. Oslo, Norway's, employment benefits from district energy are estimated at 1,375 full-time jobs. [3]

Therefore, the creation of a new technical committee is necessary to deliver a successful programme of standards. The proposed TC will bring forward a holistic approach of standardization using "systems thinking" to overcome the silos among existing TCs of technologies or sectors related to DES. Standardization of integrated DES will allow different networks to function and interact with one another in a reliable and user-friendly manner. For example, linking the heat and electricity sectors through district energy infrastructure and utilizing low-grade energy sources, such as waste heat from industry or free cooling, can greatly improve the operational efficiency. This requires big efforts on standardization of physical and organisational elements for different energy resources and demand response. The lack of standards can also be a barrier to the effective use of new technologies in the existing DES and could slow down innovation and technology deployment. Standardisation can also ensure that consumers retain a wide market choice for affordable and clean energy service. Standardization

of DES will dramatically facilitate the use of synergies, improvement in system integration, flexibility in demand, and both short- and long-term energy storage solutions across different economic sectors. It is also anticipated the standards will provide fundamental technologies for policy or regulation to deploy modern DES infrastructures and customized energy services.

There is strong evidence to support the need for the proposed work programme – from industry, European Commission and international organizations including G20 EELP, IEA and UNEP.

In the EU Strategy for Energy System Integration, it is suggested to facilitate the reuse of waste heat from industrial sites and accelerate investment in smart, highly-efficient, renewables-based district heating and cooling networks. It is also emphasized energy system integration will also strengthen the competitiveness of the European economy by promoting more sustainable and efficient technologies and solutions including district heating system across industrial ecosystems related to the energy transition, their standardisation and market uptake.[4] System planning, considering jointly the development of different types of networks and vectors (electricity, heating & cooling, gas, water, transport), and synergies and mutual efficiency enhancements is identified as a key are for establishing holistic energy system architectures. Standardization of flexibility would be helpful to support planning methods considering cost-effective flexibility means along the value chain (demand response, energy storage, generation, transmission, cross-carrier) as well as resilience under high uncertainties (variable generation) and against natural and human-related threats (single and multiple contingencies). [5]

G20 DES task group has discussed the needs of technical specification for district cooling system. [6] IEA presents that the fourth generation district heating (4GDH) requires new infrastructure in heat production, distribution and consumption. Low-temperature heat and increased integration with other energy sectors offer interesting opportunities, and policy makers should take a systems-based approach when supporting the clean energy transition. [7] It was also found that standards that prioritize building-level efficiencies over full energy-system efficiency can stand as a barrier to using not-in-kind alternatives.[8] In UNEP's report, needs of standardization of DES include: technical standards to integrate multiple networks; many existing energy standards or certification schemes currently do not reflect all of the efficiency benefits of district energy; interconnection standards that enable district energy; and standardized guidance for developers, network designers and energy producers on the delivery and operation of district energy projects.

[1] IRENA, IEA and REN21, Renewable Energy Policies in a Time of Transition Heating and Cooling, November 2020, https://www.irena.org/publications/2020/Nov/Renewable-Energy-Policies-in-a-Time-of-Transition-Heating-and-Cooling.

[2] Heat Pump Centre, Heat Pumps in District Heating and Cooling Systems Final Report, 2019, https://heatpumpingtechnologies.org/publications/heat-pumps-in-district-heating-and-cooling-systems-final-report.

[3] UNEP etc. (2015), District energy in cities, unlocking the potential of energy efficiency and renewable energy, https://www.unep.org/resources/report/district-energy-cities-unlocking-potential-energy-efficiency-and-renewable-energy

[4] European Commission (2020), Powering a climate-neutral economy: An EU Strategy for Energy System Integration, https://ec.europa.eu/energy/sites/ener/files/energy_system_integration_strategy_.pdf

[5] ETIP SNET (2020), ETIP SNEP R&I Roadmap 2020-2030, https://www.etip-snet.eu/wp-content/uploads/2020/02/Roadmap-2020-2030_June-UPDT.pdf

[6] G20 Energy Efficiency Leading Programme (2016), https://ec.europa.eu/energy/sites/ener/files/documents/G20%20Energy%20Efficiency%20Leading%20Programme.pdf

[7] IEA (2019), District heating needs flexibility to navigate the energy transition, https://www.iea.org/commentaries/district-heating-needs-flexibility-to-navigate-the-energy-transition

[8] IEA and UNEP (2020), Cooling emissions and policy synthesis report: benefits of cooling efficiency and the Kigali Amendment, https://webstore.iea.org/cooling-emissions-and-policy-synthesis-report

Signature of the proposer
Dr. LI Yubing
Deputy Director General, Department of Standards Innovative Management, SAMR;
Secretary General of Chinese Member Body of ISO, SAC

Further information to assist with understanding the requirements for the items above can be found in the Directives, Part 1, Annex C.