

Terms of Reference: Development of five rapid assessments including project pre-feasibility studies in Chile

Overview

The Copenhagen Centre for Energy Efficiency (C2E2) is seeking proposals from qualified and experienced consultants to prepare city-wide district energy rapid assessments for the cities of Santiago, Recoleta, Independencia, Renca and Coyhaique in Chile. The district energy rapid assessments will contribute to the ongoing support of the UN Environment-led District Energy in Cities Initiative to the government of Chile. C2E2 is a lead partner of this global Initiative.

Building owners and tenants in Chile mostly heat their buildings using individual inefficient wood stoves using a variety of fuels, in particular wood, paraffin, electricity and gas. Just some buildings (usually public buildings or commercial buildings) have installed hydronic central heating systems and no centralised heating systems are developed and installed in these cities. One district heating network already exists in Santiago, however no expansion to this network has been considered since its construction during the 1960s. Heating in many cities is linked significantly to local air pollution, for example, 30% of air pollution in Santiago caused by firewood leading to regulations limiting use of wood burning heaters during air pollution peaks and to phase out the most polluting heaters.

In the South of Chile winters are very cold and heating is a necessity. The use of wood in inefficient wood stoves leads to significant air pollution in the heating season and the government of Chile has launched several programmes to tackle this pollution, focused on the heating sector. A small pilot district heating system exists in Temuco, demonstrating the technology and business model and district heating pre-feasibility studies of the city have been undertaken in the past.

In many cities in Chile, simple boiler fed district heating is unlikely to provide cheaper heat than existing solutions, particularly given the limited extent of central heating in buildings. Innovative business models, cogeneration and alternative fuels, regulations on polluting technologies, local and national financial incentives, connection policies and supportive local planning policies all need to be assessed in the context of Chile's liberalised energy market.

Objectives

- Develop five city-wide rapid assessment reports for the cities of Santiago, Recoleta, Independencia, Renca and Coyhaique, analysing district energy(heating and cooling) potential, main technological solutions to develop district energy and decrease air pollution to allowed limits, economical analysis, benefits, barriers, policy and regulatory requirements, business models and next steps (short term 2-5 years perspective, middle term (5-20) and long term 20-30 years perspective), identify a potential area to develop district energy and undertake a pre-feasibility study of a potential project in each city.
- Drawing on the results of the city-wide rapid assessments and the project pre-feasibilities, provide recommendation on policy, regulatory and financial instruments to overcome barriers to district energy and create a district energy market in Chile.

Scope of work

- Review and input to UN Environment District Energy Rapid Assessment methodology;
- Collect all required information and data for the work:
 - Desk based gathering of preliminary data and information from city stakeholders, including but not limited to: city plans, energy/pollution plans/strategies, regulatory framework, relevant studies (e.g. district energy feasibility studies, biomass sustainability reports, geothermal mapping, national roadmaps etc.), spatial information including GIS data;
 - City visits with stakeholder consultations and surveys to collect data and information relevant to the assessments.
- Develop five city-wide rapid assessments for the cities of Santiago, Recoleta, Independencia, Renca and Coyhaique including the following analysis:
 - Current and projected impact of heating and cooling demand locally;
 - Identification and prioritization of potential sites/districts in each city that are technically and economically viable for district energy including simple cost-benefit analysis and assessing a range of consumer groups;
 - Identification and prioritization of potential sites/districts in each city that technically are viable but economically are not viable for district energy including simple cost-benefit analysis and assessing a range of consumer groups.
 - Make a city level analysis and potential solutions for all economically viable and non viable sites/districts to suppress air pollution level. If the additional subsidies are required, indicate what level and per what period of time in long term perspective;
 - Evaluation of long-term district energy growth potential;
 - Evaluation of long-term benefits of district energy to each city with particular focus on air pollution (PM_{2.5}, PM₁₀, NO_x, SO_x) and CO₂ reduction (other benefits to include: cost savings, refrigerants, reduced fossil fuel imports/expenditures, increased local electricity production, reduced deforestation, increase in local renewable energy);
 - Provide commentary on social impacts such as health implications and energy poverty.
 - Identification of renewable sources and waste heat sources, including the potential of developing waste to energy plants, that could be connected to district energy networks;
 - Stakeholder analysis, description of the political structure in the City and decision making procedures related to the DH operations.
 - Local barrier analysis (including: financial, taxation policy on a District Heating services (influence of applied VAT taxes for the final customer expenses and taxation policy to tackle that), political, local government capacity, regulatory, planning and stakeholder coordination, energy poverty) which may impact development and implementation of district energy;
 - Identification of potential business models and tariffs for development of district energy in each city accounting for current levels of energy market liberalisation and stakeholders in identified sites/districts;

- Analyse the policy and regulatory framework in each city and formulate a summary of policy and regulatory recommendations needed to establish the business case for district energy projects and to ensure long-term expansion;
 - Analysis of current data collection and accessibility related to the heating and cooling sector;
 - Analyse the potential of a future interconnection of networks between the different communes of Metropolitan Santiago previously analysed (only for Santiago and communes).
 - In coordination with the District Energy in Cities Initiative Secretariat, select a potential district heating/cooling project in each city to proceed with a pre-feasibility study.
- Undertake one project Pre-feasibility study per city including the following:
 - A technical analysis of the chosen site including: preliminary project designs, heating/cooling load/production/consumption curves, analysis of connections, rapid environmental and social impact assessment. These items includes also a geographical positioning and presentation of the sites on a city map.
 - Description of energy needs, total primary energy, primary energy for heating, primary energy for hot water, primary energy for electricity, energy losses in production chain (for heat and for electricity), energy losses in distribution chain (for heat and for electricity) and energy losses in consumption chain (for heat and for electricity). Sankey diagram for energy flows from Primary energy to the final consumer level in today situation, in short and long term perspectives.
 - Collection, compilation and analysis of heat production (and energy use), distribution and consumption pattern with respect to, daily, weekly, and seasonal load variations, and based on that preparation of annual load duration curve as well as provide information on any differences in the distribution of load compared to what is considered standard for DH. Description, analysis and visualization of base load and all other loads.
 - Tables and/or graphs showing daily and annual use profiles for each form of energy (e.g., electric/steam/hot water/chilled water).
Review of recent and projected fuel composition, description of all used fuel types (from energetic parameters to the price), structure and bills, heat energy and electricity prices, description of the current and planned DH tariffs, subsidies, including price methodologies and regulatory national/local bodies.
 - A financial analysis of the chosen sites including: development of Base Case Financial Models (BCFM), CAPEX and OPEX evaluation, structuring of heating/cooling and hot water tariffs, payback periods, simple sensitivity and risk analysis, assessment of finance sources and site-specific business models.
 - A regulatory/risk assessment analysis of the chosen sites including: project specific regulatory risks, risks and responsibilities of stakeholders, structuring analysis, potential business model designs and procurement options.
 - Analysis and assessment of Legislative, Regulatory and Institutional environment.
 - Data collection, assessment and pre-design phase:

- Applying verified data to identify optimal district heating/cooling network, system configuration and sizing, location, preliminary design drawings, preliminary equipment specifications, appropriate application, economic operating strategy.
- Technical solution equipment selection and rationale for equipment selection.
- Thermal output, capacity, emissions, site constraints, other.
- Seasonal performance, maintenance requirements, viability/reliability,
- Technological system description, efficiency, schematic of system, controls and monitoring, operating hours per year, recommended operating profile

Deliverables

- Five reports, one per city, including a city-wide rapid assessment and the project pre-feasibility on a separate section. An electronic version of the report should be presented in a MS Word format. Collected data and performed calculations should be presented in MS Excel and if required other open source format.
- All reports should be written in English.
- Power point presentation of the project selected in each city in English
- A fact sheet including main figures of each project.

Timeline

Deliverables	Delivery date
Site visits	April and May 2018
Outline of rapid assessments and pre-feasibility studies	1 May 2018
Projects identified in Santiago, Renca, Independencia and Recoleta (power point with preliminary project characteristics for the Nordic Energy week, 22-25 May in Copenhagen)	15 May 2018
Initial results of rapid assessments of Santiago, Renca, Independencia and Recoleta	June 2018
First drafts rapid assessments of Santiago, Renca, Independencia and Recoleta, including pre-feasibility studies	August 2018
Final report rapid assessments of Santiago, Renca, Independencia and Recoleta, including pre-feasibility studies	September 2018
First draft rapid assessment and pre-feasibility study of Coyhaique	October 2018
Final report rapid assessment and pre-feasibility study of Coyhaique	November 2018
Fact sheets including main figures of each project.	December 2018