IEA Technology Collaboration Programme on District Heating & Cooling

Business models - the international perspective

Robin Wiltshire

UK Representative & Chair IEA-DHC

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What is the IEA District Heating & Cooling TCP (IEA-DHC)?

- IEA-DHC is a global research programme, established in 1983
- Research topics cover all aspects of DHC technology focusing on reducing cost and improving performance
- Reports are produced for all projects and are available at the website: www.iea-dhc.org
- Current members of IEA-DHC are: Austria, Canada, Denmark, Finland, France, Germany, Korea, Norway, Sweden, UK, USA
- Potential new members: China, Belgium.

Annex XI (2014 - 2017) Projects

- Transformation roadmap from high to low temperature district heating systems
- Plan 4DE: Reducing greenhouse gas emissions and energy consumption by optimising urban form for district energy
- Smart use as the missing link in district energy development
- Structured for success: governance models and strategic decision making processes for deploying thermal grids
- Future low temperature district heating design guidebook.

– *All project reports now available at www.iea-dhc.org*

Transformation roadmap from high to low temperature district heating system

- Case for reducing return temperatures incontrovertible.
- Even in Sweden: current average return temperature 47˚C; potential optimised return temperature 32˚C.
- Case for reducing supply temperatures when serving older existing buildings more contentious.
- So: reduce return temperature first; reduce supply temperature if/when appropriate.

Plan4DE: Reducing greenhouse gas emissions and energy consumption by optimising urban form for district energy

- Planning tool to help planners to consider the impacts of land-use plans on the feasibility of district energy.
- It calculates total heat demands and densities, and corresponding DH system costs.
- This enables planners to very quickly determine the implications of any built form for DH potential, and understand the impact of changing building or district densities.

Structured for success: Governance models and strategic decision making processes for deploying thermal grids

- A major barrier to DH system deployment remains complexity around identifying appropriate governance models.
- This project reviews a range of governance models and strategic decision making processes that have led to successful, financially viable district energy systems
- This research provides critical information and case study examples to align the governance and business models with their district energy project goals and objectives.

Critical Steps for Choosing Business Models

Objectives

Identify them & prioritise

Risk

Affects developers, investors/ lenders

Mitigation > Identify, understand and allocate to the right party

Money

Appropriate funding for stage of DE system lifecycle

Understanding Risk

Objectives Risk – Impacts Control

- Managed by the degree of control exercised through a governance structure

Design Risk – Impacts Capital Cost and System Performance

- Inappropriate selection of technologies, equipment size
- Incorrect design parameters - operating temperatures and pressures

Construction Risk – Impacts Schedule & Budget

- Delays in construction schedules due to unexpected project phasing changes
- Delays in equipment procurement
- Encountering unforeseen subterranean obstructions

Demand Risk – Impacts Revenue Projections

- For new developments
  - proposed buildings not built due to a downturn in the property market
  - customers do not sign connection agreements.
- For established systems
  - customers fail to pay for or consume the projected amounts of energy.

Understanding Risk

Operational Risk – Impacts Performance & Uptime

- Lack of or poor commissioning
- Insufficient system maintenance

Commercial Risk – Impacts Customers & Investors

- Challenge of balancing customer payments with the cost of service and return on investment

Capacity Risk – Impacts Project Delivery & System Performance

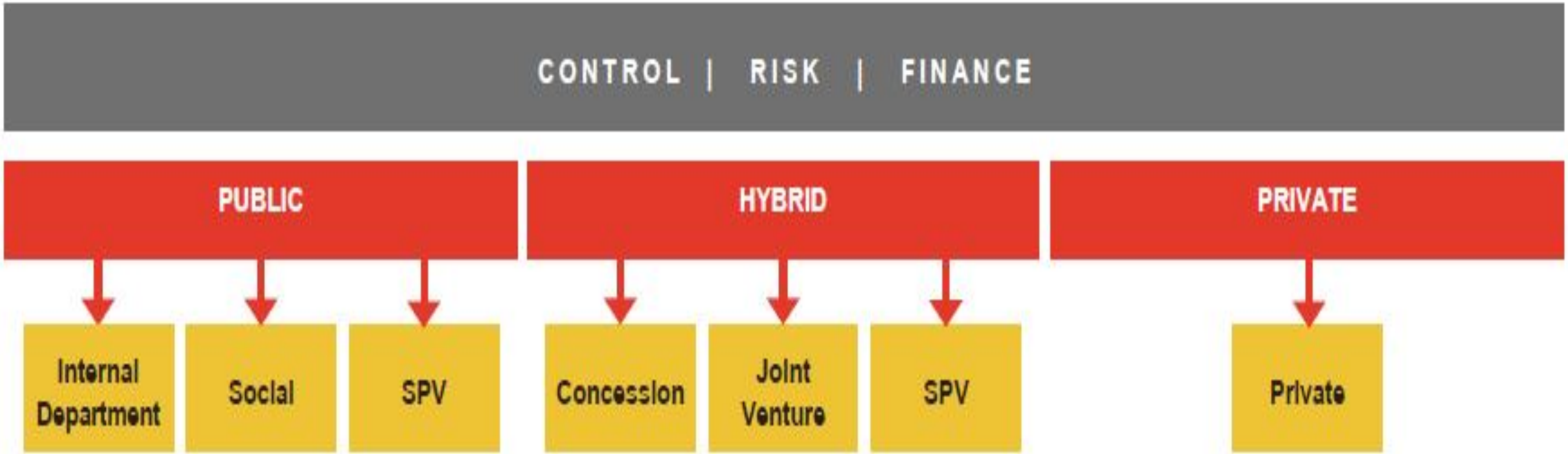
- Inadequate specific skills and competencies in-house

Financial Risk – Impacts Investors

- Ability to deliver return on investment relative to the sources of capital available.

Business Models - Spectrum

FIGURE 4.2: OVERVIEW OF BUSINESS MODEL SPECTRUM



Public - Private Partner Roles with Risk Allocation

	OPTION	DESCRIPTION	RISK ALLOCATION	MUNICIPAL/COUNCIL
Public	1	Entirely public sector led, funded, developed, operated and owned	Public sector retains all risk	Public sector procures contracts for equipment purchase only. Procurement could be direct, or via a publicly owned arm's-length entity
	2	Public sector led: entirely publicly funded, greater use of private sector contractors	Private sector assumes design & construction risk, and possibly operational risk	Public sector procures turnkey asset delivery contract(s), possibly with maintenance and/or operation options
	3	Public sector led, private sector invests/takes risk in some elements of the project	Private sector takes risks for discrete elements (e.g., generation assets)	As 2, with increased private sector operational risk, and payment or investment at risk
	4	Joint venture: public sector & private sector partners take equity stakes in a special purpose vehicle	Risks shared through joint participation in JV vehicle / regulated by shareholders' agreement	Joint venture: both parties investing and taking risk
	5	Public funding to incentivize private sector activity	Public sector support only to economically unviable elements	Public sector makes capital contribution and/ or offers heat/power off-take contracts
	6	Private sector ownership with public sector providing a guarantee for parts of project	Public sector underpins key project risks	Public sector guarantees demand or takes credit risk
	7	Private sector ownership with public sector facilitating by granting land interests	Private sector takes all risk beyond early development stages	Public sector makes site available and grants lease/license/wayleaves
Private	8	Total private sector owned project	Private sector carries all risks	No or minimal public sector role (e.g., planning policy / stakeholder engagement

Business Models: Public

Internal Department

- DE system project is developed within a department of a governmental body
- Governmental body acts as the local authority with full system ownership
- Project is funded from the public balance sheet of the local authority

Social

- Municipality establishes DE system as a community-owned not-for-profit cooperative
- Heat customers become cooperative members & own system
- Vote for representatives who select board members who control the company

Special Purpose Vehicle (SPV)

- Wholly owned subsidiary independent from the local authority
- Created with the purpose of owning, operating and maintaining a DE system
- One or more public sector entities may own shares in the SPV
- Established as a company limited by guarantee based on shares owned by the participating organisations.

Business Models: Hybrid

Concession

- Public sector initiates & develops project, development and continues to own assets
- Contracts with private operator as concessionaire for a specified term, with renewal option
- Public partner typically guarantee long term heat loads

Joint Venture

- Company limited by guarantee with partners ownership shares based on equity invested
- Public partner - land & access to lower-cost debt capital
- Private partner – skills/expertise, shorter procurement process & access to external capital

Special Purpose Vehicle (SPV)

- Wholly owned subsidiary created for owning, operating and maintaining a DE system
- Ownership is split between public & private entities.

Business Models: Private

- Private sector fully owns, operates and controls the DE project
- Financing is through private debt and/or equity
- Financing costs higher than those for public sector sources
- Results in higher expectation on the rate of return on investments.

Strengths & Weaknesses

TABLE 4.1: STRENGTHS AND WEAKNESSES OF VARIOUS BUSINESS MODELS

PUBLIC SECTOR MODELS		
	STRENGTHS	WEAKNESSES
INTERNAL DEPARTMENT	• Access to lower-cost public sector financing • Generate revenue for municipality • Deliver aggregate demand and provide public sector anchor loads and reduce demand risk • Better control on flexible development and network growth • Internal oversight and regulation • Greater control on objectives such as carbon savings and affordable tariffs	• May have limited ability to raise public debt • Lack of ring-fenced budget can create risk on internal department municipal budgets • Need to develop internal skills and build capacity • Must comply with longer public sector procurement process
SOCIAL	• Not-for-profit approach allows lower tariffs • Better control on flexible development and network growth • Greater control on objectives such as carbon savings and affordable tariffs	• Cannot rely on credit rating of public organization • Cannot exit to other owners – owned in perpetuity by members and cannot access equity funding.
SPV	• Can secure lower-cost public finance via its public sector parent, particularly if the heat customers are public entities • Parent outsources technical risk to SPV • Separate SPV business plan and budget insulate parent organization • Greater control over objectives such as carbon sav-ings and affordable tariffs	• Must provide financing • Must carry commercial risk • Must comply with longer public sector procurement process

Strengths & Weaknesses

PUBLIC-PRIVATE HYBRID MODELS	STRENGTHS	WEAKNESSES
CONCESSION	• Leverage third-party financing • Technical and commercial risk transferred to concession operator • Concessionaire provides necessary skills • Shorter private sector procurement process • Ability to align with the social and environmental objectives of the public sector	• Reduced control for public partner • Loss of flexibility – concessionaire may decline to accept heat from sources not under its control or connect customers where cost of connection exceeds higher hurdle rate • Liabilities are consolidated into public sector accounts • Customers see public partner guarantor of last resort in conflict situations • Need to provide higher private sector rates of return may result in higher tariffs
JOINT VENTURE	• Can draw on public and private sector financing to achieve a blended rate • Medium degree of control allows flexible development • Risk shared between partners • Separate business plan • Can choose private sector procurement route • Risk shared between partners	• Possible early exit by a partner may compromise strategic objectives and constrain flexibility • Return on capital requirements will determine tariff rates • Longer procurement process required by public partner
SPV	• Outsource technical risk to SPV • Separate SPV business plan and budget insulate parent organization	• Must provide financing • Must carry commercial risk

Strengths & Weaknesses

PRIVATE MODEL		
	STRENGTHS	WEAKNESSES
	• Access to capital • Ability to leverage expertise in technology and best practices • Shorter project development time due to proven track record and project management skills	• Higher rate of return expected • Tariffs higher compared to public model • Cannot access low-cost infrastructure funding available to public sector • Customers are tied into a private company and tariffs

Business Models Summary

Case	Migration path	PUBLIC			HYBRID			PRIVATE
		Internal Department	Social	SPV	Concession	Joint Venture	SPV	Private Utility
Aberdeen, UK:	Arm's-length not-for-profit		●					
Aarhus, Denmark:	Municipally owned & run	●						
Birmingham, UK:	Run as a concession				●			
Norman, USA:	Initially owned and operated by the university. Currently owned by university with private concessionaire for operations and maintenance				●			
Paris, France:	City owned system with Engie as Concessionaire				●			
Phoenix, USA:	Private DE Utility							●
Rotterdam, Netherlands:	Joint venture					●		
Sangam, South Korea:	KDHC is an SPV owned by public entities Korea Electric Power Company, Seoul Metropolitan City government, Korea Energy Management Corporation			●				
Stockholm, Sweden:	Fortum Varme AB is a JV formed by Finnish energy company Fortum, and the City of Stockholm					●		
Toronto, Canada:	For major investments operated as SPV with two public shareholders;			●				
	Now run as a private DE utility							●
Vancouver, Canada:	Run as municipal utility subject to public oversight board	●						
Wick, UK:	Started as public social;		●					
	Moved to public SPV;			●				
	Currently private							●

New initiatives in preparation

Practical realisation of low temperature district heating systems

Led by Halmstad University

kristina.lygnerud@hh.se

Kick-off meeting 9/10 April, Graz.

Hybrid Networks – District heating and cooling networks in an integrated energy system.

Led by AIT

Ralf-Roman.Schmidt@ait.ac.at

Development meeting tbc, probably 25/26 April.

Further information

For more about the IEA-DHC, contact:

Robin Wiltshire (Chairand UK Representative)

Robin.Wiltshire@bre.co.uk

Andrej Jentsch, AGFW (Operating Agent)

IEA-DHC@agfw.de