IDEA 105th annual Conference, Seattle
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Public Private Partnerships for Community Energy Systems in new, existing and sustainable City developments

- Public Private Partnerships
- Critical Key-Success Factors
- External Failure Factors

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Research Project
Context

- Requirement to reduce Carbon Dioxide Emissions;
- Allowing economic expansion and growth;
- Urbanization result in Air quality problems;
- Community Energy Systems is a capital intense key-infrastructure to provide Heating, Cooling & Electricity;
- Financing a major challenge;
- Government responsible for social, economic & environmental dimensions has to take the lead;
- Public Private Partnerships can be one solution;
- The main question is; what would be the best participation structure for PPPs, given the most important critical factors of success and failure?

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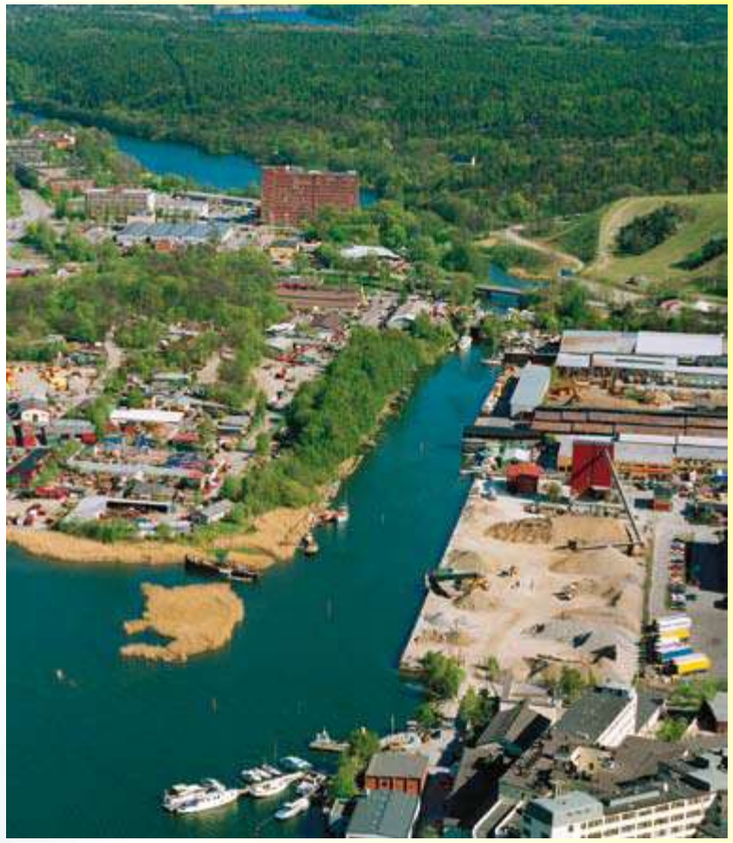
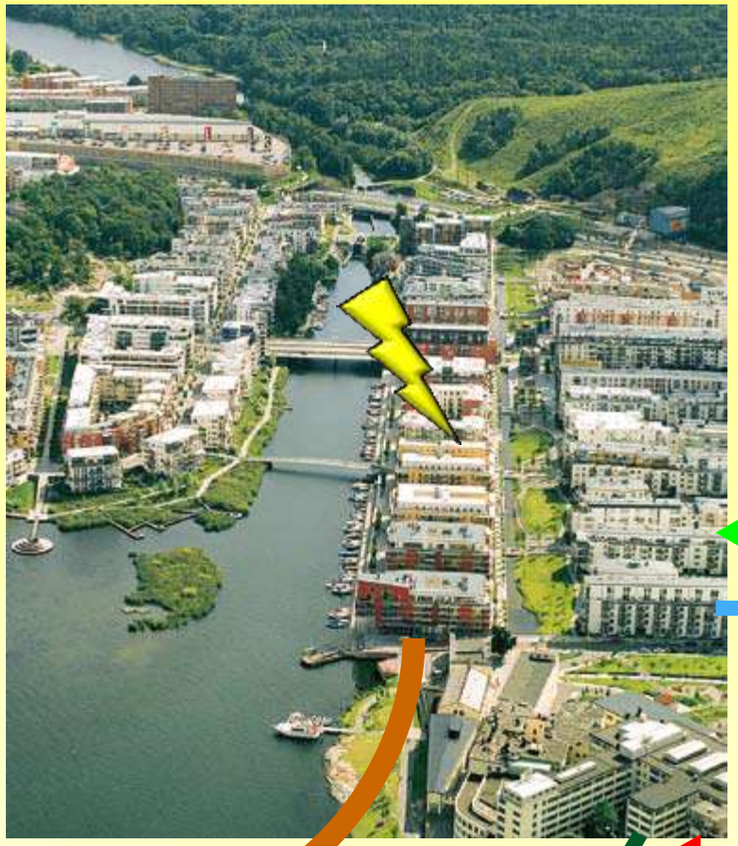
The energy scheme in a sustainable city utilize renewable, or limited amount of fossil fuels, as primary energy resource for power, heating and cooling generation to limit Carbon Dioxide emissions.





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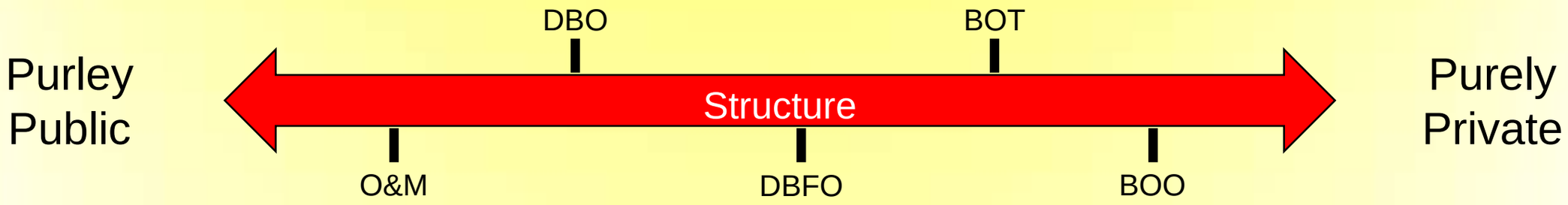
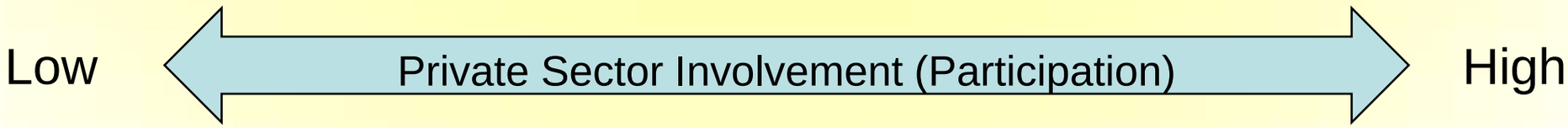
Types of PPPs





Source: Kwak et al. (2009)

- All variants, from minimum Private to maximum Private involvement, has been experienced in the District Energy industry!

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Public Private Partnerships

- Why do attempts to establish PPPs fail even though the most important CSFs are fulfilled?
- Most influential CSFs from other research that can be controlled by the PPP parties:
  - ✓ Management of Risk;
  - ✓ Economic Viability;
  - ✓ Sound Financial Package;
- Environmental Performance factor, new additional CSF:
  - ✓ Carbon Dioxide Emissions;
- External failure factors:
  - ✓ Factors that cannot be controlled by the Public & Private Parties;

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Public Private Partnerships in terms of participation structure at the moment of implementation in relation to CES in new, existing and sustainable City developments

- **Definition of PPP:** “a cooperative arrangement between the public and private sectors that involves the sharing of resources, risks, responsibilities, and rewards with others for the achievement of joint objectives” (Kwak et a. 2009);
- **Critical Success Factors:** “the limited number of areas, the result of which, if they are satisfactory, will ensure successful competitive performance for the organisation. They are the few key areas where things must go right for the business to flourish. ” (Kwak, Chih & Ibbs, 2009).
- **Management of Risk:** “management of the risk of being in businesses, construction risk, off take agreements, political, operation & maintenance and legal are allocated to the party that best can manage it ” (Zhang 2005);
- **Economic Viability:** “the businesses venture provides above 12% IRR calculated on net cash flow” (Zhang 2005);
- **Sound Financial Package:** “that sufficient amount of equity is provided to the PPP Company so that it can debt finance the remaining capital requirements. Closing of debt financing is the success factor” (Zhang 2005);
- **Carbon Dioxide Emissions:** “the development meet the requirements for maximum Carbon Dioxide Emissions to be regarded as a low carbon or carbon neutral scheme” (Särnholm et. al. 2009);
- **External Failure Factors:** “the external not controllable influence that prevents success” (Belassi 1996);

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Research Project,
Methods

- The target is to understand how to best establish the Participation Structure;
- Interviews will be conducted based on pre-structured questions and open discussions;
- Parties Reflections; Public --- Private
- Interviewees will be divided into three categories which result in three options for analysis:
  - ✓ “Insiders”
  - ✓ “Outsiders”
  - ✓ “Industry Professionals”
- Four countries Sweden, USA, Canada & China;

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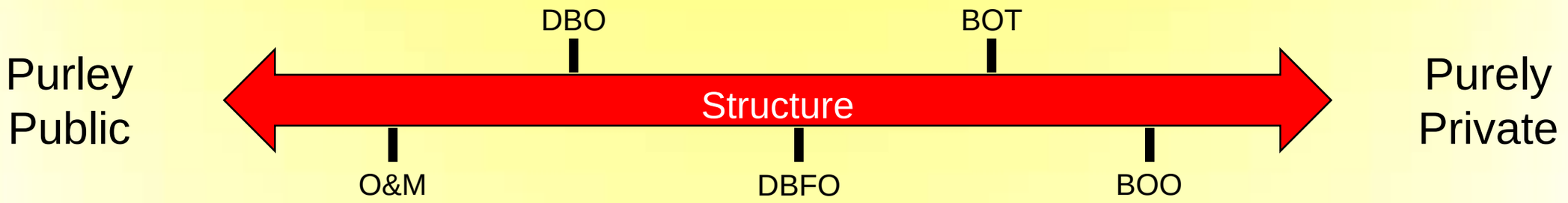
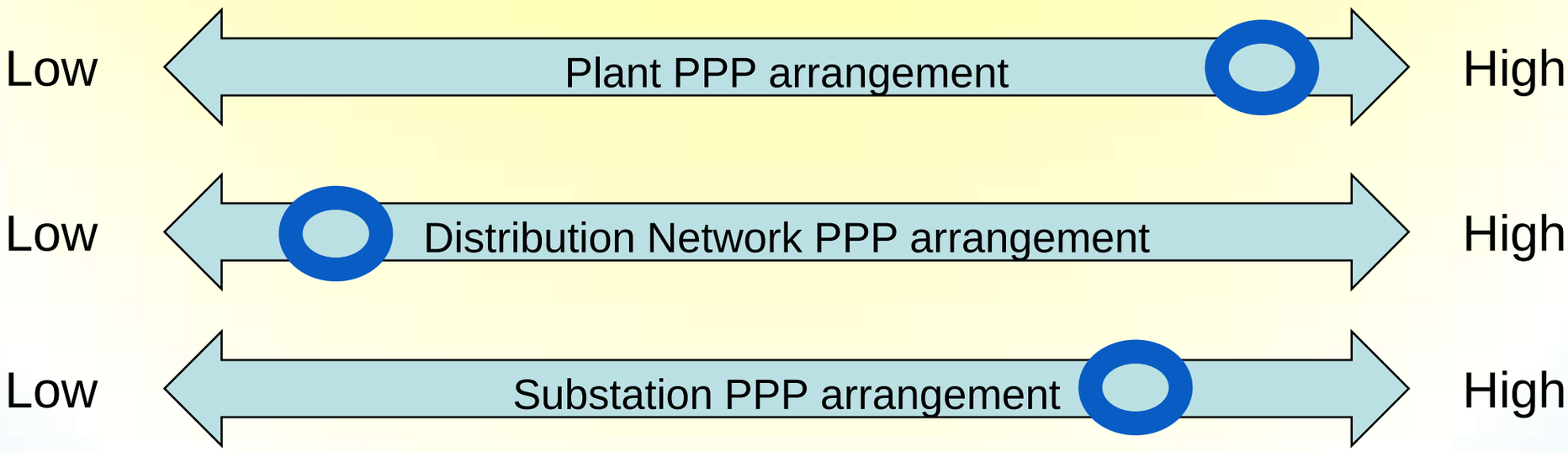
Types of PPPs





- What is the experience with regard to best participation structure for different parts of a DE scheme?

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Research Project
Expected Outcome

- One or two PPP structures to be most viable and least sensitive to “External Failure Factors;
- Different structure for the different parts of a CES scheme i.e. plants, networks and substations;
- Higher interest by the Public Party to participate with increased reduction of Carbon Dioxide;
- Research could lead to the definition of a new Business Model for the whole or a part of PPPs for Community Energy Systems in new, existing and sustainable City developments;

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Statements made in earlier research

- **Risk:** “There is considerable evidence indicating that risks have not been managed and/or risk allocation strategies have not been enforced properly” (Kwak, Chih & Ibbs, 2009);
- **Sustainable development:** “Requires joint movement and collaborative action of several actors from different sectors and social spheres to be realised” (Malmborg, 2003);
- **Benefits:** “Companies look for commercial pay-off, while public actors look for social pay-off” (Malmborg, 2003). To that should be added: “Public actors also look for environmental benefits and economic development” (Muiznieks);
- **Relations:** “Networks, partnerships and alliances depend on cooperation and inter-dependency. Leading, ideally, to mutual interest, shared goals and shared norms (Klijn et al. 2000);
- **Dependency:** “Reduced transaction costs because of mutual dependency” (Parker et al. 2003);

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Conceptual Model

Critical Key-Success Factors

- *Management of Risk*
- *Economic Viability*
- *Sound Financial Package*
- *Carbon Dioxide Emissions*

External Failure Factors

"External Deal Killer"

Public Private Partnerships in terms of structure & participation at the moment of implementation in relation to CES in new-, existing- and sustainable- City developments

- *Public Privat Partnerships*
  - *Participaton Structure*

Main Hypotheses

The main hypotheses has been derived based on existing literature of which some are: (Aziz 2007), (Belassi 1996), (Chan 2010; Chan et al. 2010), (Ke, et al. 2010), (Kwak 2002; Kwak et al. 2009), (Särnholm et al. 2009), (Zhang 2005; Zhang 2005; Zhang 2005; Zhang 2006)

- (A1) If the level of Management of Risk is high, the participation structure of a PPP will more likely be a BOT or BOO Structure.
- (A2) If the level of Management of Risk is low, the participation structure of a PPP will more likely be a DBO or DBFO Structure.

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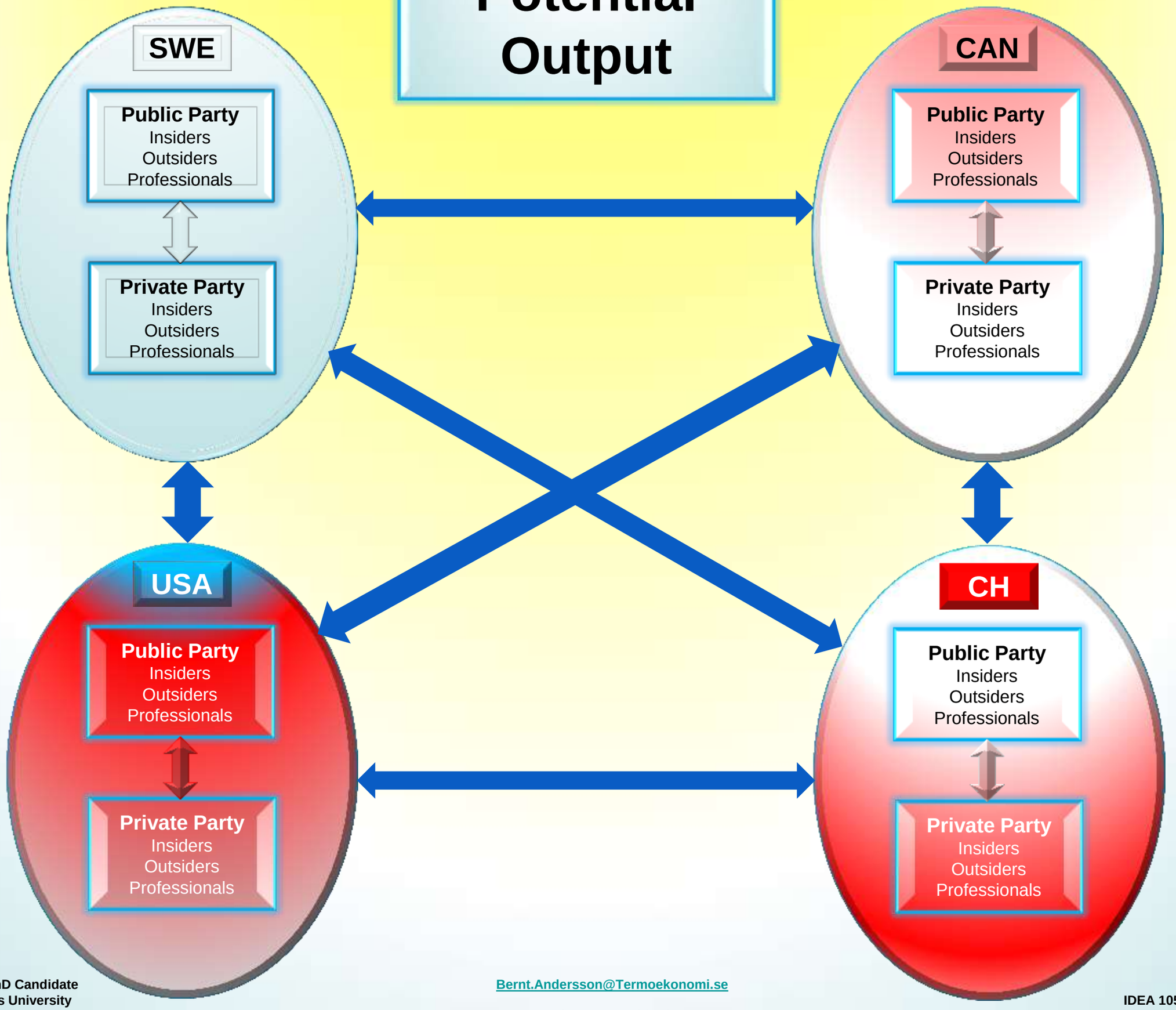
Potential Output



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Stockholm, Sweden

- **2010 awarded the first <u>European Green Capital.</u>**

- “DH & DC are our energy heroes”, Swedish minister for trade;
- 31 boilers @ 25 production sites;
- 16 pump stations;
- 2 000 km DH main pipes;
- 10 000 ETS’s (substations);
- District Cooling network, 200 km;
- Large-scale Heat Pumps in operation since 1984;
- Use of renewable heat sources and CHP.

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Stockholm, Public – Private Partnerships

- The DH in Stockholm started on an initiative by the City in the late 1950's and was operated as a City department;
- The City took the responsibility both for the expansion of the piping network as well as for installation of Plants;
- In 1998 Fortum became a Partner in the venture i.e. a Public Private Partnership was formed to jointly take the responsibility for the energy system;
- In 2001 the City decided to exit and Fortum became the sole owner of the operation;
- In summary the DE scheme has gone from fully Public to fully Privately owned;

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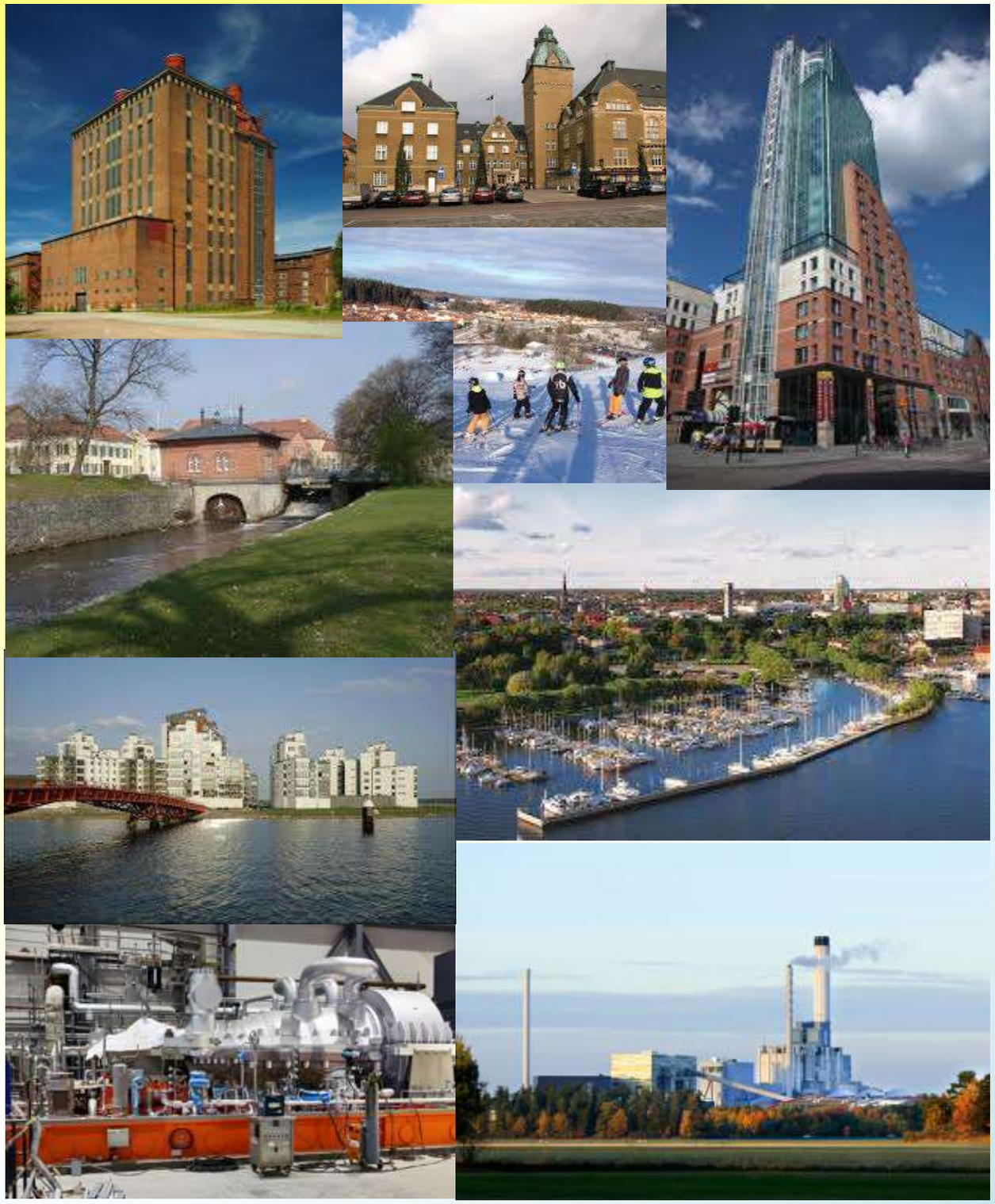
Västerås, Sweden

- In Västerås, DH started in 1954 and in 1963's a CHP plant was added;
- The Västerås system is today integrated with other smaller communities;
- DH network ~800 km, with a distance from one end to the other of approximately 70 km;
- Originally burning coal and heavy fuel oil, part of the CHP plant has been converted to Peat and a Biomass Boiler was added in 1999;
- The first District Cooling scheme in Sweden;
- Large-scale Heat Pumps in operation since 1984 that now also produce cooling;



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Västerås, Public – Private Partnerships

- The Municipality took on the responsibility to build the district heating piping network in mid -50's, at the time the population were 30 000 people, today over 130 000 people live in the City;
- Heat was purchased from Vattenfalls CHP plant located in the Västerås harbour i.e. Public Private Partnership;
- Early 60's a disagreement between the parties resulted in that the Municipality arranged another Public Private Partnerships with 4 other Partners that together built their own CHP plant;
- In 2000 the Municipality took over the CHP plant and became the sole owner of the District Heating Network and the CHP plants;
- In summary the DE scheme has gone from partly Public to fully Public, the Distribution network has the whole time been Public;

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Summary

- The objective of my project is to research Public Private Partnerships' in terms of participation structure at the moment of implementation in relation to Community Energy Systems (CES) in new, existing and sustainable City developments.
- The project will aim to formulate recommendations on participation structure for the benefit of public leaders and private companies' CEOs.
- A variation of different types of Public Private Partnerships have and are being used in the District Energy Industry and I believe the utilization of PPPs will have to increase over the next number of years;
- I hope to be able to document what has been done before, both successes an failures;
- I hope that my research will contribute to expanding the knowledge base in the DE industry and possibly it will contribute with ideas to establish new business models/arrangements;

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Thank You for Your Patience

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