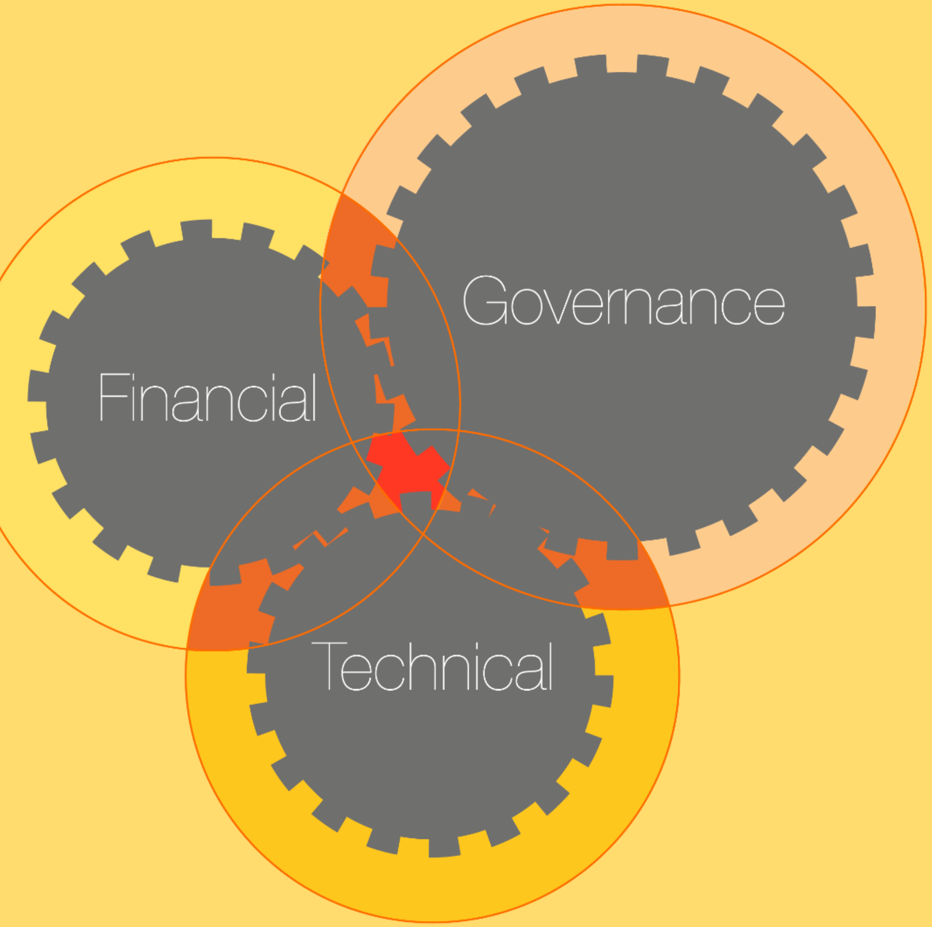
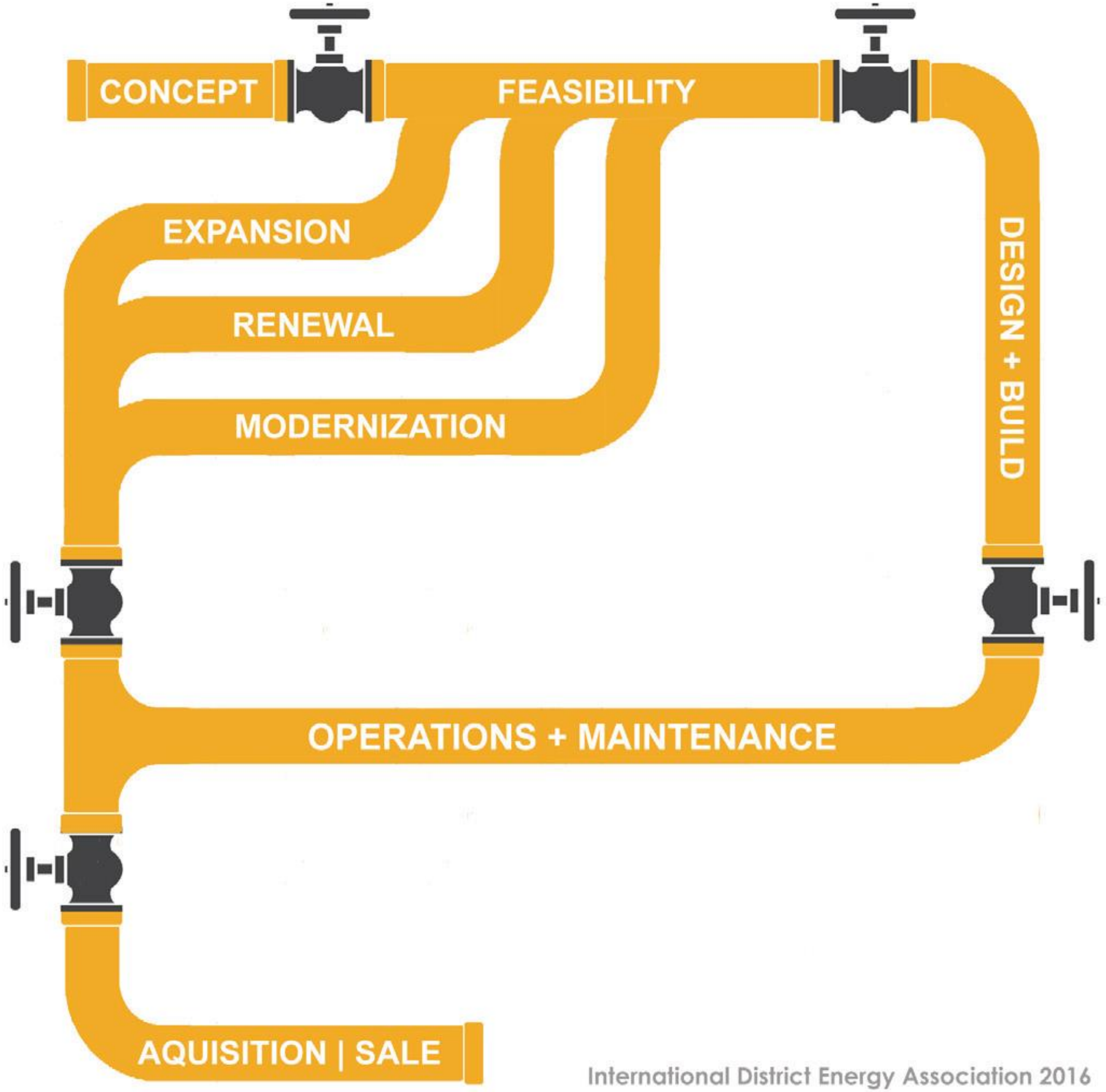
District Energy Life Cycle & Strategies for Success



Laxmi Rao, IDEA

DE System Life Cycle Stages & Success Factors



International District Energy Association 2016

KEY FACTOR	BRIEF DESCRIPTION
RISK	Identifying, allocating and managing risk
INFORMATION	Gathering and disseminating information needed for decision-making
MONEY	Managing funds to align with the system lifecycle stage needs
PEOPLE	Including appropriate people and experts in decision-making
TOOLS	Using available tools to improve decision-making

Concept

- Municipalities, cities, towns, campuses, businesses and industry set objectives
  - environmental/sustainability, economic/urban development, social/fuel poverty

- Planning staff, neighborhood groups, developers and experts develop climate action plans, transportation studies, energy maps and campus utility master plans

- The development of new greenfield districts or the rejuvenation of brownfield sites offer early-stage opportunities to explore DE as a possible solution

- Information is preliminary in nature

- Objectives may not be well defined and may compete

- Anchor loads may not be identified or immediately available

- The project is not well understood

- Funds are inadequate

Feasibility

- The potential district is identified and the objectives are defined
- The project scope, scale, and phasing of the development timeline are outlined
- Options appraisal is initiated with a technical and economic study of various options to determine viability of project scope and economics

- Development risk from misaligned project phasing and buildout timelines
- Demand risk from customer connection delays
- Technical risk of poor equipment performance
- Lack of ability to raise needed funds

Design + Build

- In-depth attention is paid to the technical aspects of the system
- The selected option is designed and engineered
- Systems components are procured
- District Energy system is built, installed and commissioned
- Poor design that negatively impacts system performance
- Over-sizing of capacity, ties up capital and yielding poor system performance at partial loads
- Changes in phasing of development resulting in construction delays with budget impact
- Design and planning approval delays
- Financing approval glitches
- Procurement practices related delays
- Right-of-way issues

Operations + Maintenance

- This stage can span decades.
- It requires knowledge of the system and how best to operate and maintain it for reliable operations and optimal technical and economic performance.

- Suboptimal technology training of operations staff
- Inadequate investment in maintenance impacting system performance
- Some customer contracts not delivering expected revenue due to poor demand forecast

Expansion

- DE Systems have long – lived with many performing over several decades
- During the long life of DE systems, especially in campus, hospital and research sectors, it is necessary to expand the capacity of the system to meet the added loads from growth
- Getting the sizing right
- Integration of new assets into existing system
- System interruptions, both planned and unplanned
- Ability to secure financing

Renewal

- District energy systems have long useful lives
- Mature and aging systems require infusion of capital for replacing end-of-life assets
- Renewal is a stage where aging assets are reviewed for needed replacement.

- Aging system with losses related to poor or deferred maintenance
- Increased failures and reduction in overall system reliability
- Reduced service quality to specific customers with compromised equipment or components

Modernization

- Over time technology offerings evolve and systems mature
- Opportunities to modernize and improve the design offer benefits of increased efficiency, reliability and use of renewable resources
- Examples of modernization:
  - converting from steam to hot water systems
  - changing to biomass fuels
  - adding CHP and solar thermal
  - adding thermal energy storage and District Cooling
  - integrating renewable resources
- Technical challenges of integrating new technologies into existing resource mix
- Lack of availability of new required skills sets
- Finding needed capital

Acquisition | Sale

- Systems that are established and in operation can change ownership
- Systems that are struggling to operate may need new management
- Sale may be between two private parties, from public to private, private to public, or private to private

- Loss of ownership that results in changing objectives
- Market will not support expected sales price
- Potential impact on customers

TABLE 5.1: SUMMARY OF ACTIVITIES USEFUL FOR MANAGING THE PROJECT/SYSTEM LIFECYCLE

ACTIVITY	DATA NEEDS AND CONSIDERATIONS	LEAD	SUPPORT
Preliminary planning City/district plan/ master plan Climate action plan	• Location and demands of new development • Existing energy demands • Existing energy installations • Resource assessment • Emissions reduction	• Planners • Economic development officers • Government officials • Project developer	• Engineering, planning or sustainability consultants • Community members, stakeholders and interest groups • Planning bodies, project developers
Objectives setting	• Economics and cost-effectiveness • Environmental benefits and emissions reductions • Energy security	• Government officials • Planners • Economic development officers • Project developer	• Planning bodies, project developers
Data gathering	• Development density • Demand loads • Mix of uses • Age of buildings • Anchor loads • Barriers and opportunities • Energy mapping	• Project developer	• Engineering, planning, master planning consultants • Building owners, managers
Project definition	• Prioritize clusters with maximum density, diversity and anchors, and identify key buildings to be connected	• Project developer	• Engineering, planning, master planning consultants
Options appraisal	• Detailed analysis of options	• Project developer	• Engineering, planning, master

Feasibility study	• Detailed analysis of data • Technical feasibility • Financial viability • Phasing	• Project developer	• Engineering consultants
Financial modeling	• Detailed financial viability assessment • Capital cost • Operational cost • Revenue	• Project developer	• Consultants • Financial advisors
Business modeling	• Project type • Attitude to risk • Desire for long-term control • Regulation • Access to finance and the desired internal rate of return	• Project developer • Government officials	• Consultants • Legal advisers • Tax and/or bond counsel
Marketing and business development	• Target audience • Likely customer base	• Project developer	• Consultants • Architectural and business community • Other project developers
Project procurement and delivery	• Level of public/private sector involvement • Overall project viability	• Project developer	• Engineering consultants • Procurement officers • Legal advisers

District Energy Life Cycle and Strategies for Success
Panel Discussion

Ken Smith, President & CEO, Ever-Green Energy

Suresh Jambunathan, Director, Business Development
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Jim Lodge, Vice President, Strategy and Business Development,
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