

FORD SITE ENERGY STUDY

IDEA CAMPUS ENERGY 2015

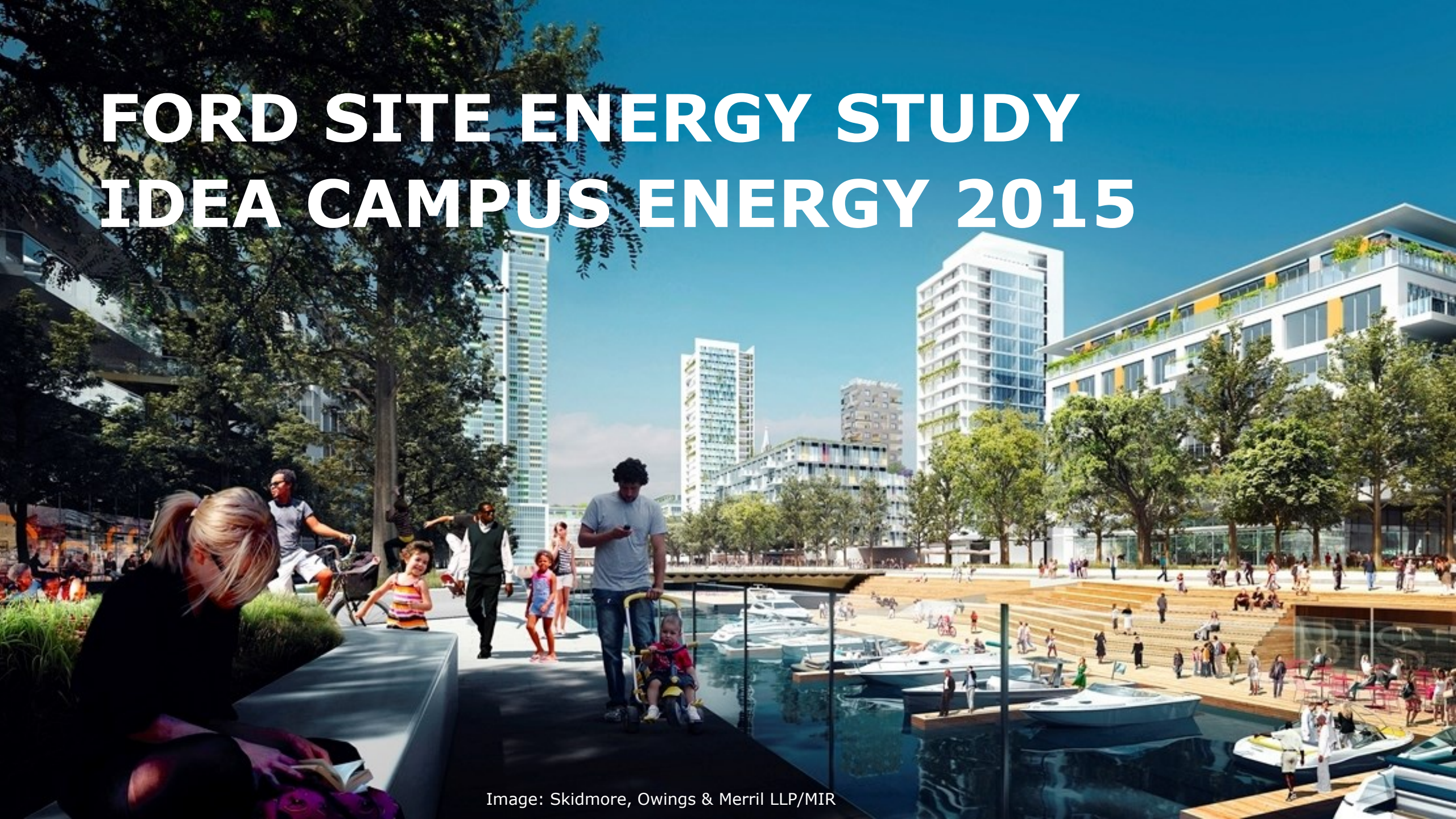


Image: Skidmore, Owings & Merrill LLP/MIR

AGENDA

THE HISTORY

THE CHALLENGE

THE APPROACH

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THE APPROACH

Government Dam and Ford Plant between St. Paul and Minneapolis, Minn.

HISTORIC VIEW



1887

MODERN DAYS



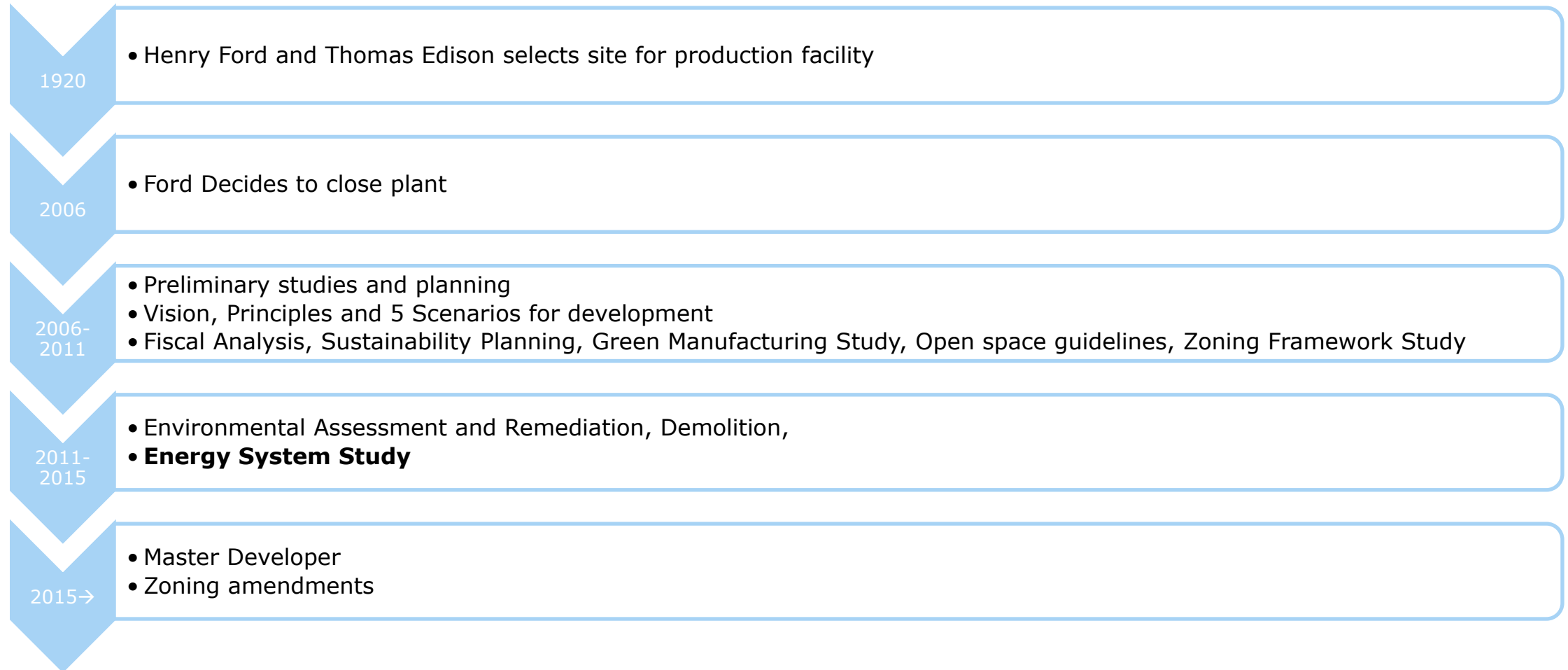
THE SITE



BROWNFIELD



TIMELINE



AGENDA

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MEANS AND GOALS

GOALS

- Inspirational project
- Competitive & Cost-effective
- Resilient energy supply
- Zero-carbon & Sustainable
- Energy efficient

POSSIBLE MEANS

- Design standards
- Micro grid
- Onsite production
- District energy
- Storage
- Electrification

DEVELOPMENT SCENARIO I



DEVELOPMENT SCENARIO II



AGENDA

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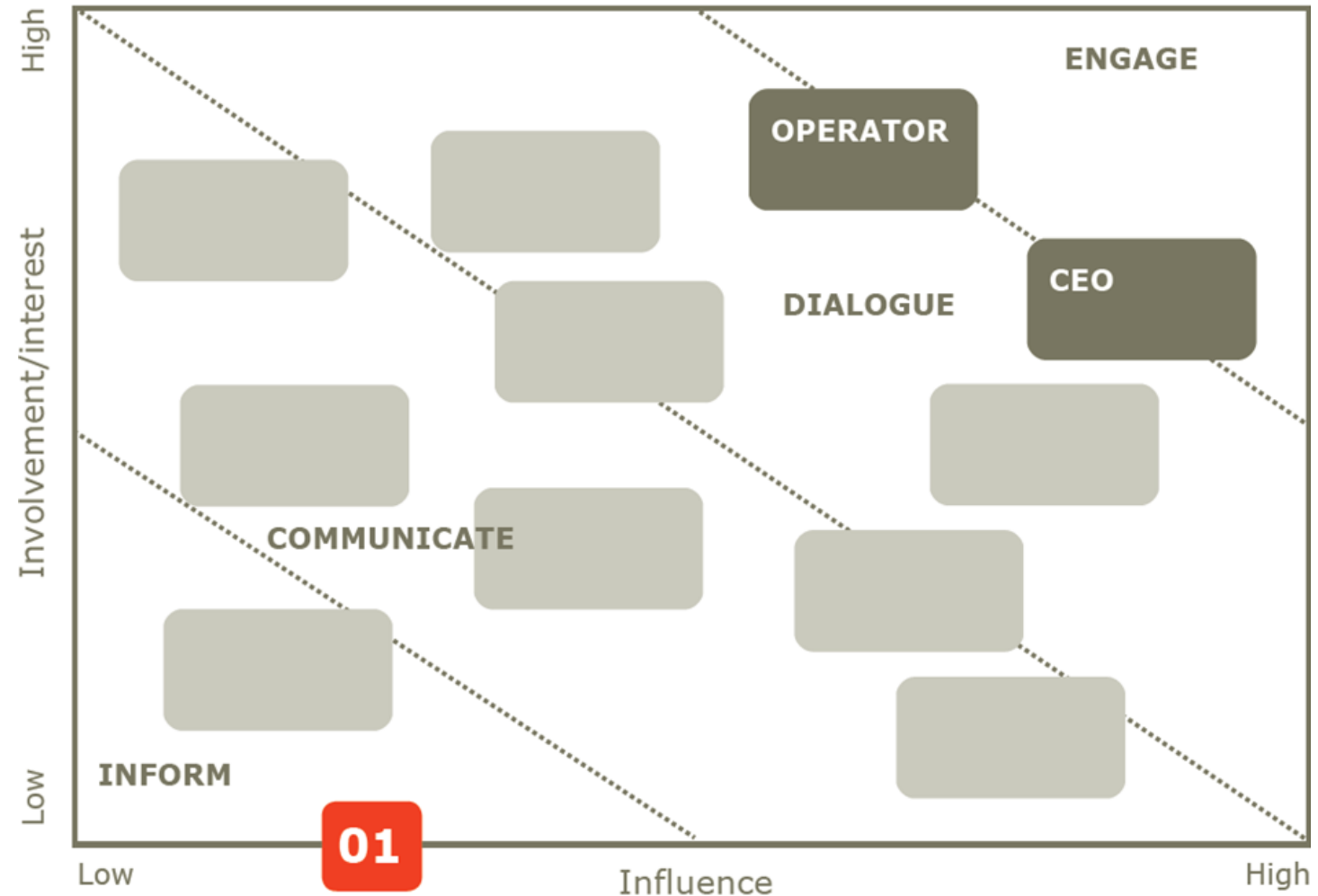
THE APPROACH

ENERGY PLANNING AND LOCAL ENGAGEMENT

- **Local stakeholder engagement**
- **Best use of existing infrastructure**
- **Buildings Best Practise**
- **Inherent local resources**
- **Add Scandinavian experience**

STAKEHOLDER ENGAGEMENT

- **Ford Motor Company**
- **City Staff**
- **Politicians**
- **Technical Advisory Group**
- **Developers**
- **Neighbours**



THE STEAM PLANT BUILDING AND TUNNELS



Estimated Site Energy Utilization Intensity (EUI) for different new building types in climate zone 6A (St. Paul) using different energy codes or certification systems.

~ Current
MN
Energy
Code

COMPARATIVE SITE EUI

Building Type \ Code	Prototype Floor Area (sf)	kBTu/ft ² /yr										
		ASHRAE 90.1-2004	2012 IECC / ASHRAE 90.1-2010	2015 IECC / ASHRAE 90.1-2013	SB 2030 (2010) -60%	SB 2030 (2015) -70%	SB 2030 (2020) -80%	SB 2030 (2025) -90%	German Passive House System	Danish Building Code BR 2010	Danish Building Code Class 2015	Danish Building Code Class 2020
Small office	5,502	53.7	41.8	37.2	63.0	47.3	31.5	15.8	14.3	37.1	25.8	18.7
Medium office	53,628	62.2	46.2	42.8	62.0	46.5	31.0	15.5	14.3	36.1	25.2	18.7
Large office	498,588	99.7	84.8	83.5	60.0	45.0	30.0	15.0	14.3	36.1	25.1	18.7
Stand-alone retail	24,692	107.2	71.9	61.9	59.0	44.3	29.5	14.8	14.3	36.3	25.2	18.7
Strip mall retail	22,500	118.3	85.4	77.9	60.0	45.0	30.0	15.0	14.3	36.3	25.3	18.7
Supermarket	n/a	208.0	145.0	128.7	119.0	89.3	59.5	29.8	14.3	36.0	25.1	18.7
Primary school	73,959	100.1	75.1	67.8	70.0	52.5	35.0	17.5	14.3	36.1	25.1	18.7
Secondary school	210,887	98.4	64.7	56.2	60.0	45.0	30.0	15.0	14.3	36.1	25.1	18.7
Hospital	241,501	179.9	138.5	130.5	79.0	59.3	39.5	19.8	14.3	36.1	25.1	18.7
Outpatient health care	40,946	161.5	123.3	118.8	52.0	39.0	26.0	13.0	14.3	36.2	25.2	18.7
Full-service restaurant	5,502	570.2	470.9	450.8	90.0	67.5	45.0	22.5	14.3	37.1	25.8	18.7
Quick-service restaurant	2,501	781.9	723.0	689.6	98.0	73.5	49.0	24.5	14.3	38.3	26.6	18.7
Small hotel	43,202	87.4	75.8	71.5	50.0	37.5	25.0	12.5	14.3	28.5	19.6	15.0
Large hotel	122,120	151.8	119.1	109.4	63.0	47.3	31.5	15.8	14.3	28.5	19.5	15.0
Warehouse	52,045	35.3	25.2	23.6	42.0	31.5	21.0	10.5	14.3	36.2	25.2	18.7
Mid-rise apartment	33,741	68.0	60.4	57.3	82.0	61.5	41.0	20.5	14.3	28.6	19.6	15.0
High-rise apartment	84,360	72.1	65.8	61.2	88.0	66.0	44.0	22.0	14.3	28.5	19.5	15.0

INHERENT LOCAL RESOURCES



MISSISSIPPI RIVER

HYDRO PLANT

**STEAM PLANT
BUILDING**

CONTAMINATED LAND



MOST LIKELY ENERGY CONCEPTS

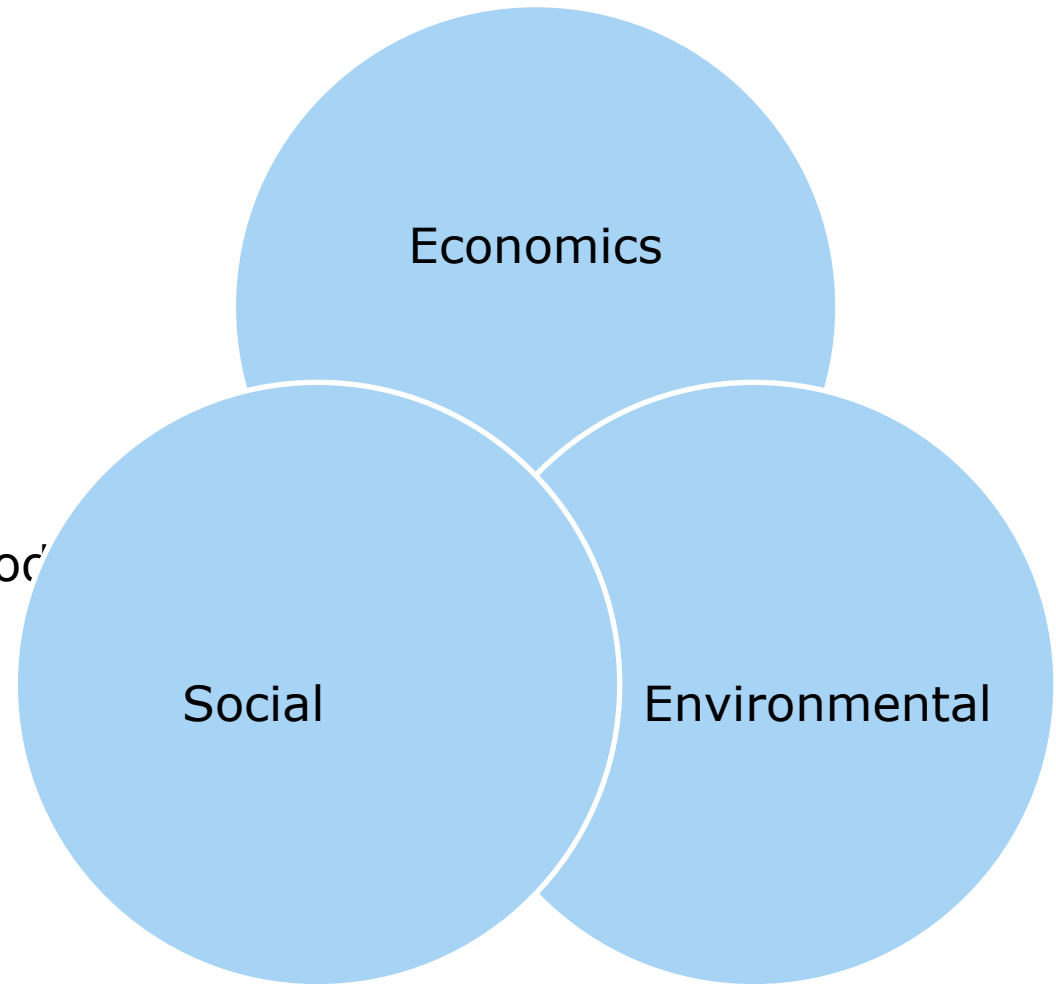
	Baseline	District Energy	Individual Energy
Power	Grid electricity	Hydro-plant	Solar PV
Heat	Gas	Solar thermal Heat pump - River Gas boiler (back-up)	Solar thermal Heat Pump
Cooling	Individual A/C	Heat Pump – River	Heat pump
Storage		Thermal Storage (seasonal / daily)	Hot water storage
Additional		Deep Geothermal	Ground source heat pump

THE HEADACHE – THE STRONG BUSINESS AS USUAL CASE

- **Economy**
 - **Cheap electricity and gas**
 - **Relatively small scale**
- **Net zero (carbon)**
 - **Electricity 50% carbon free**
- **Energy efficiency**
 - **Large scale energy production as benchmark**

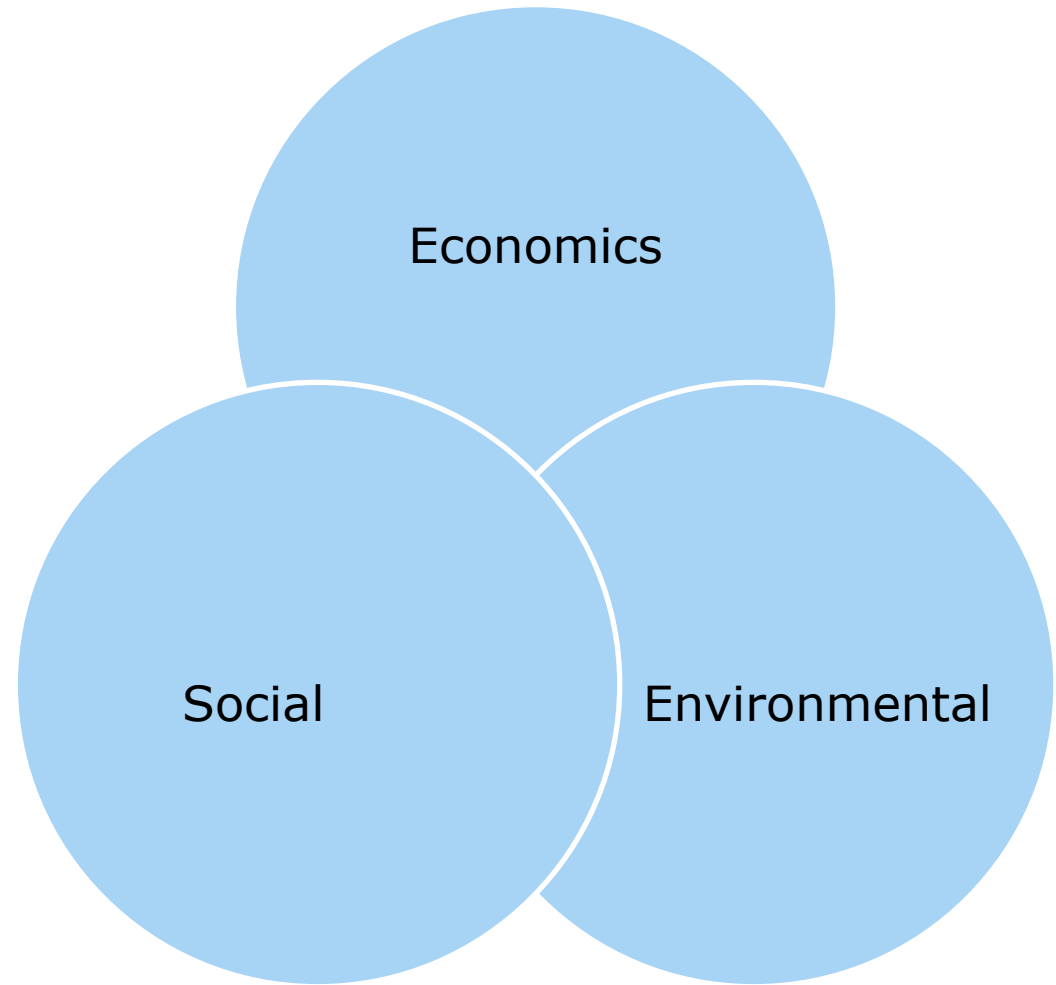
DISTRICT ENERGY SOLUTION – TRIPLE SUSTAINABILITY

- Economy
 - Security from fluctuations in energy prices
 - Utilizes & stores excess power
- Social
 - Keep the money in the neighbourhood
 - Local job creation
- Environmental
 - 100% renewable energy
 - Resource Efficiency



FINAL REMARKS

- **Local involvement is paramount**
- **Dare to dream**
- **Learn from others**
- **Long term planning**
- **Integrated Livability Concept**



THANK YOU

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