

# FORD SITE ENERGY STUDY

## IDEA CAMPUS ENERGY 2015

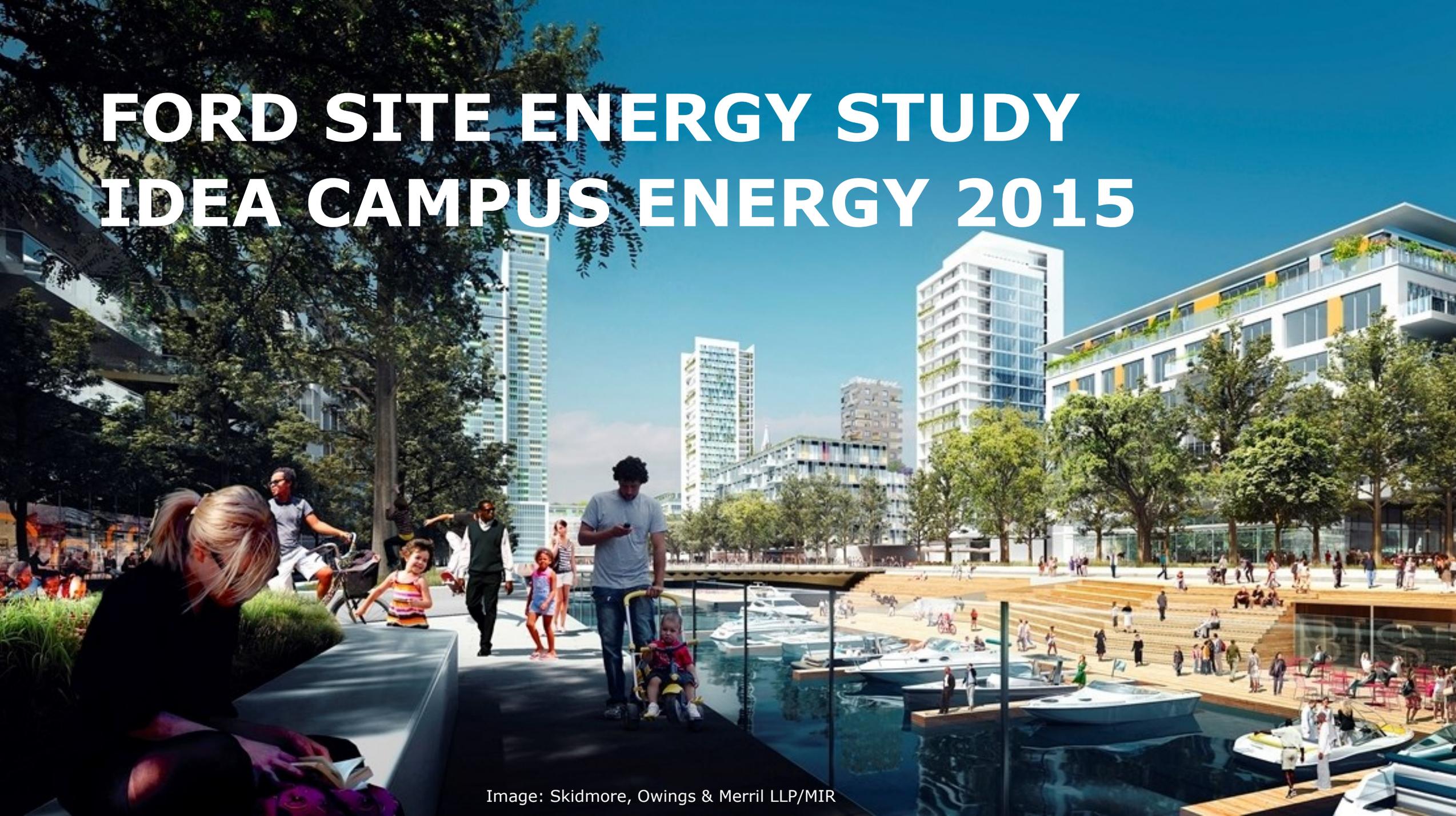


Image: Skidmore, Owings & Merrill LLP/MIR

# AGENDA

**THE HISTORY**

**THE CHALLENGE**

**THE APPROACH**

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**THE HISTORY**

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

# HISTORIC VIEW



# MODERN DAYS



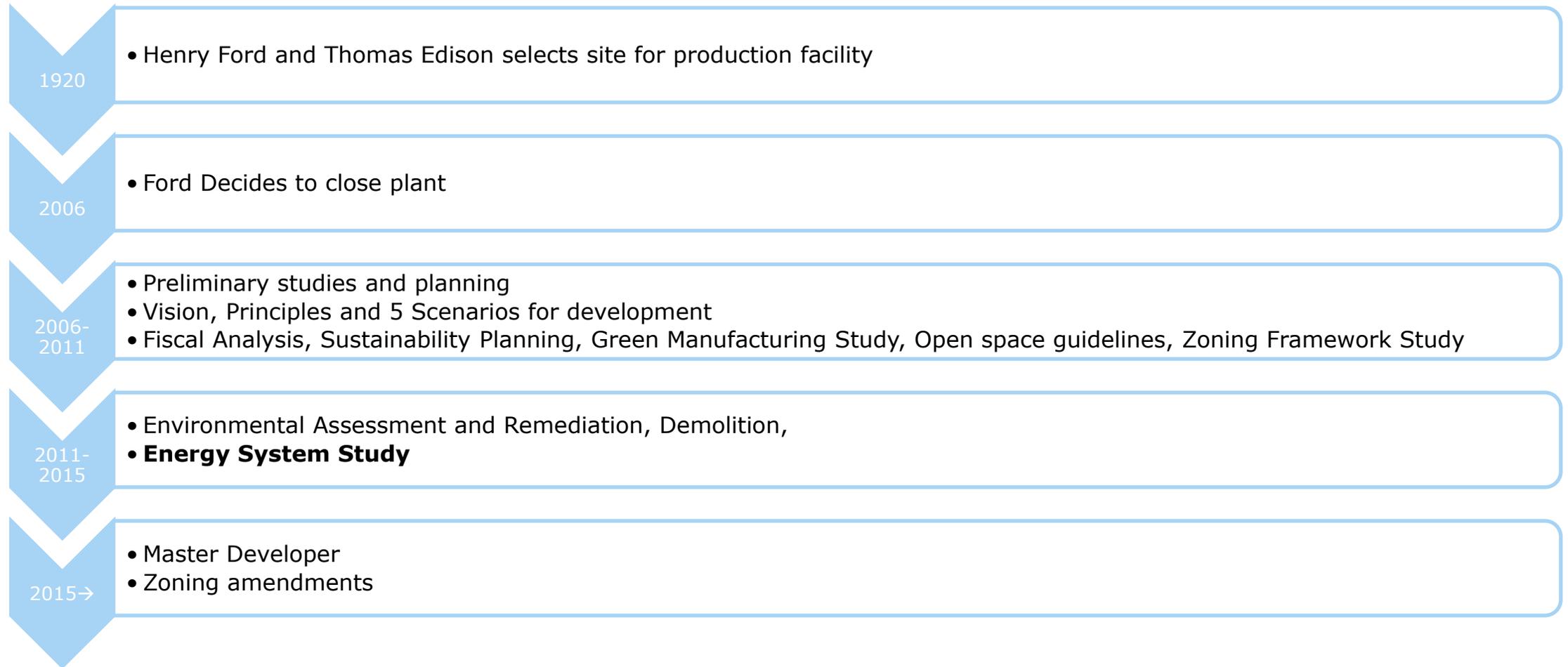
# THE SITE



## BROWNFIELD



# TIMELINE



# AGENDA

THE HISTORY

THE CHALLENGE

THE APPROACH

# 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

THE HISTORY

THE CHALLENGE

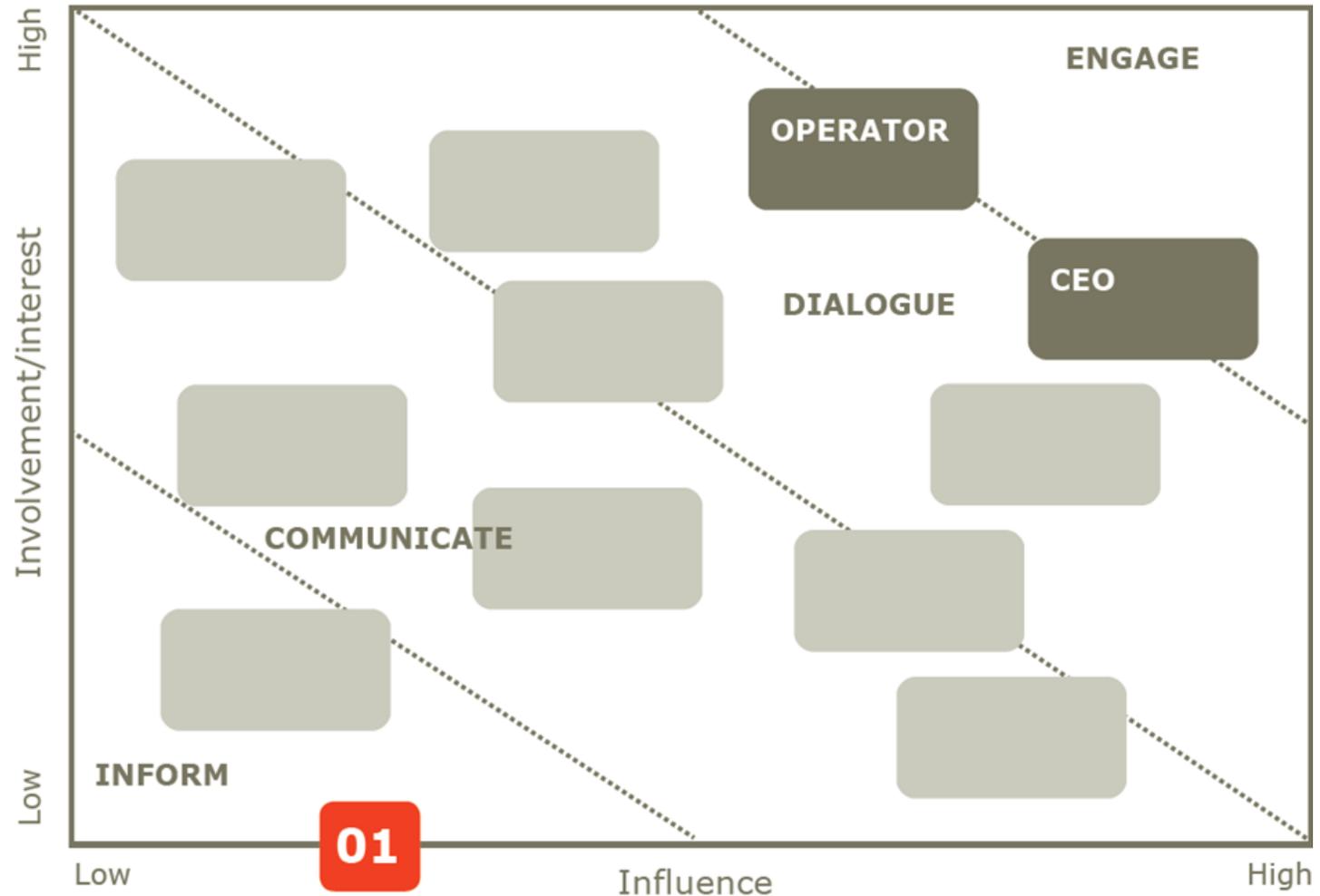
THE APPROACH

# 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



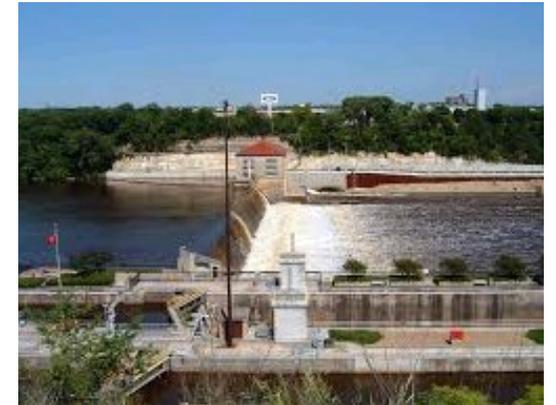
Estimated Site Energy Utilization Intensity (EUI) for different new building types in climate zone 6A (St. Paul) using different energy codes or certification systems.



# COMPARATIVE SITE EUI

kBtu/ft <sup>2</sup> /yr		~ Current MN Energy Code											
Code	Prototype Floor Area (sf)	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	
Building Type													
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

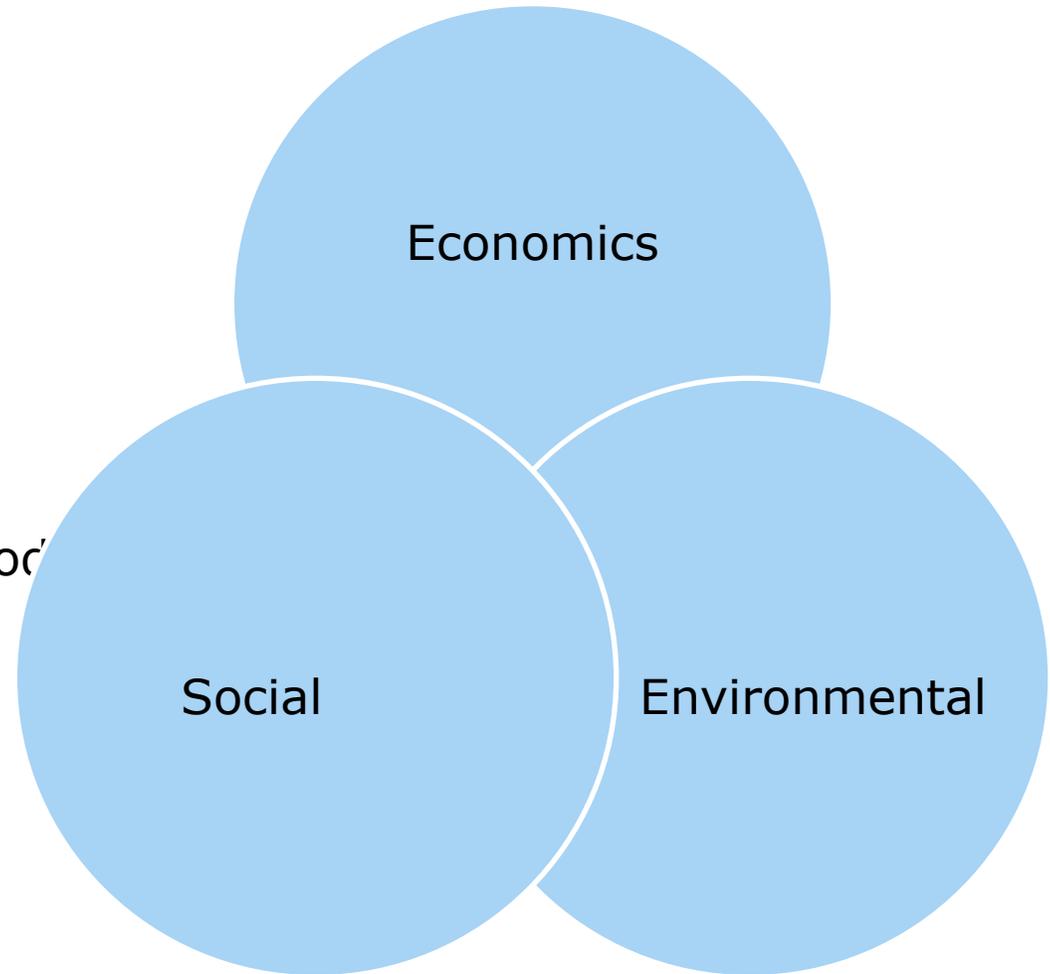
	Baseline	District Energy	Individual Energy
Power	Grid electricity	Hydro-plant	Solar PV
Heat	Gas	Solar thermal Heat pump - River Gas boiler (back-up)	Solar thermal Heat Pump
Cooling	Individual A/C	Heat Pump – River	Heat pump
Storage		Thermal Storage (seasonal / daily)	Hot water storage
Additional		Deep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

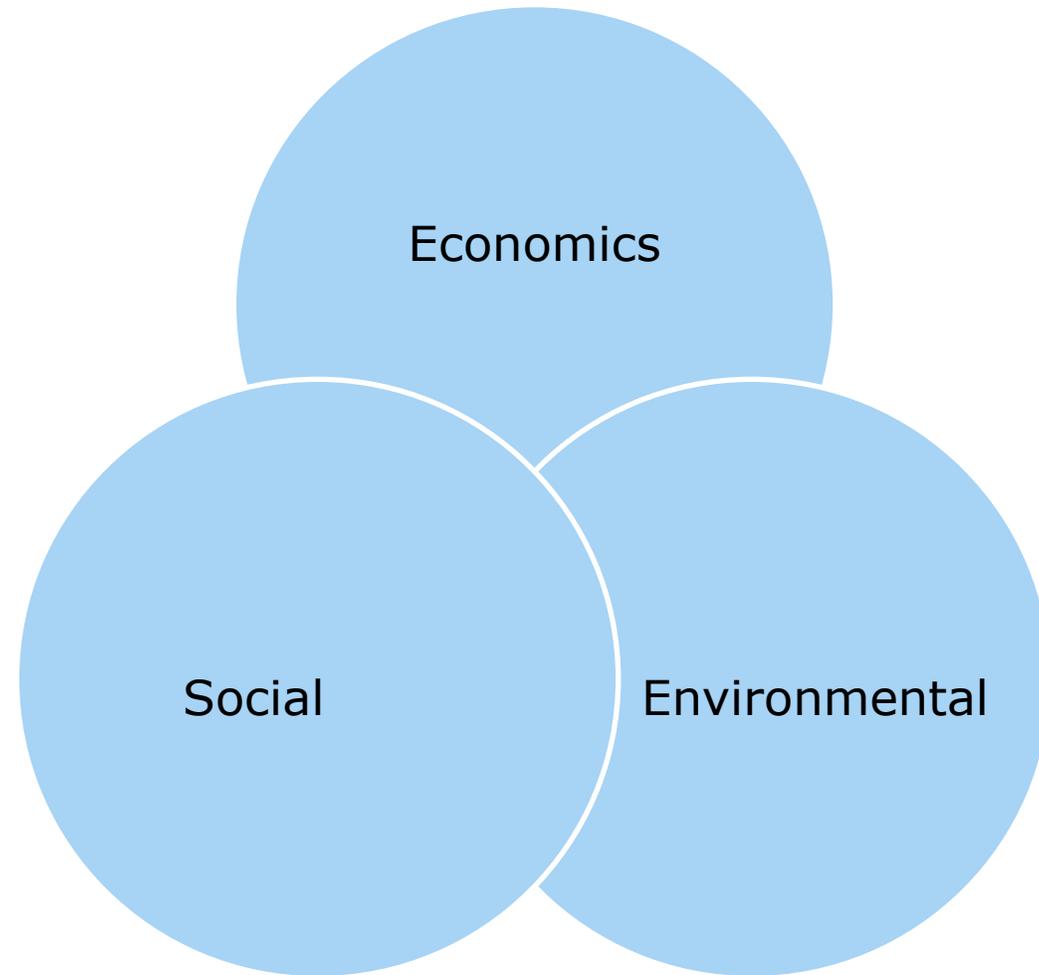
# DISTRICT ENERGY SOLUTION – TRIPLE SUSTAINABILITY

- 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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FORD SITE ENERGY STUDY – CAMPUS ENERGY PRESENTATION  
WEDNESDAY, FEBRUARY 11, 2015

**RAMBOLL**