FORD SITE ENERGY STUDY
TAG MEETING NOVEMBER 2014

AGENDA

1. Brief status (PMO)
2. Reuse of tunnels & steam plant building memo (PMO)
3. Car use memo (PMO)
4. Buildings Best Practise memo (FJK)
5. Energy Technologies and Systems (PMO)
6. Work programme – next visit (PMO)

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RAMBOLL

MEANS AND GOALS

GOALS

- Inspirational project
- Competitiveness
- Security of supply
- Sustainability
- Energy efficiency

POSSIBLE MEANS

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

ACTIVITY FOCUS

- **Complete**

- Activity 1.1: Conditions, constraints and opportunities
- Reuse of tunnels & steam plant buildings

- **In progress**

- Activity 1.2: Best practise in car use alternatives Security of supply (draft)
- Activity 1.3: Best practise building design to reduce energy demand (draft)
- Activity 1.4: Implementing sustainable site-wide energy system
- Activity 1.5: Energy technologies and district energy designs
- Activity 1.6: Energy mix, storage and pricing

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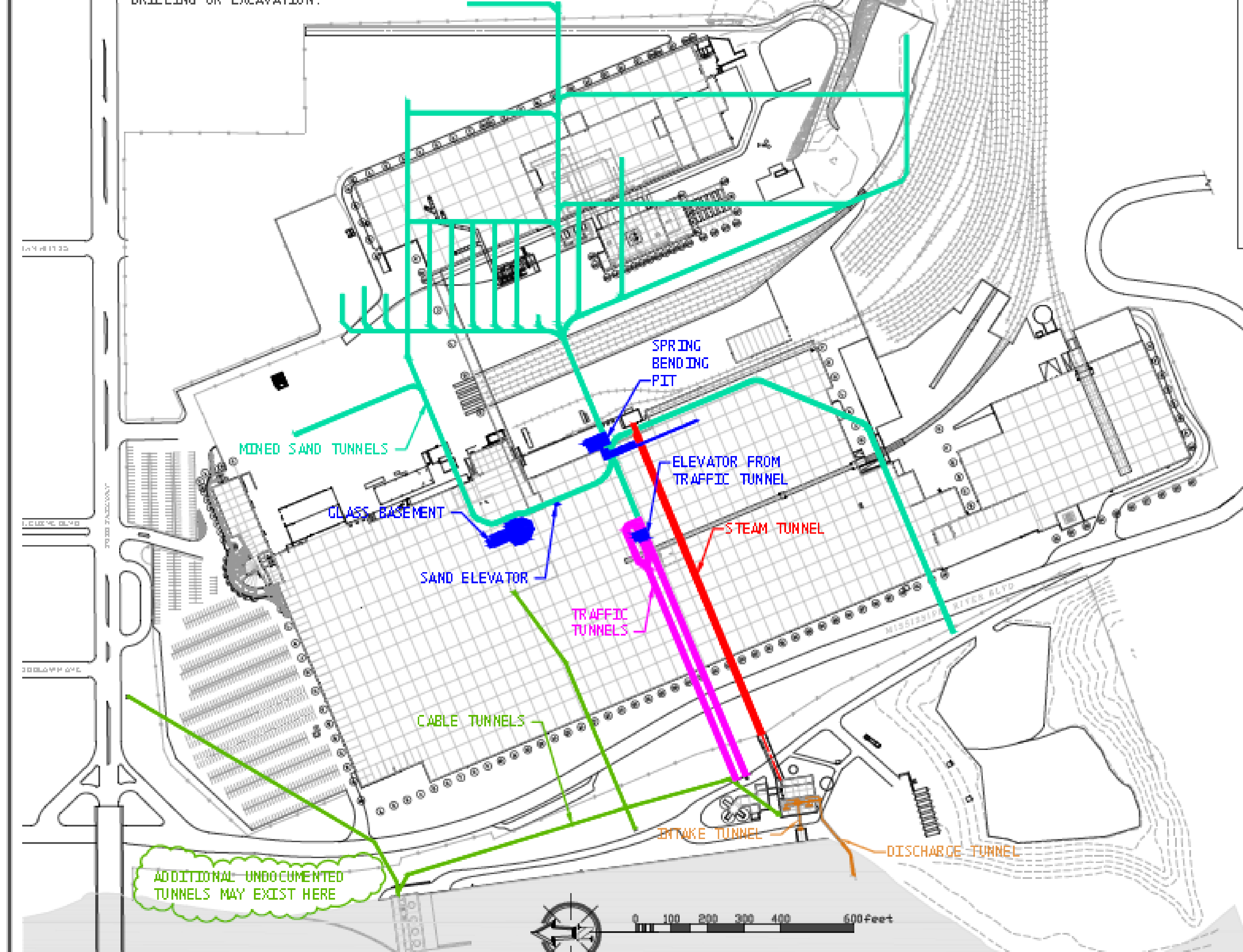
FEATURES MAY EXIST WHICH ARE NOT REFLECTED HERE. ALL UNDERGROUND TUNNELS, STRUCTURES AND EQUIPMENT MUST BE VERIFIED BEFORE DRILLING OR EXCAVATION.



1. [illegible]	[illegible]	[illegible]
2. STEAM PLANT INTAKE & DISCHARGE	STONE & WEBSTER 4100 TOLTZ, KING & DAY	V98485, V98437 ALL
3. CABLE TUNNELS	STONE & WEBSTER 4066	GEN. PLAN OF PROPERTY
4. GLASS BASEMENT	VARIOUS SOURCES	VARIOUS
5. SPRING BENDING PIT	STONE & WEBSTER 3928	V94949, V94951
6. ELEVATOR FROM TRAFFIC TUNNELS	STONE & WEBSTER 4066	F94135
7. SAND ELEVATOR	PLANT ENGINEERING	1952 PLANT LAYOUT
8. TRAFFIC TUNNELS	STONE & WEBSTER 4066	F89832
9. MINED SAND TUNNELS	PLANT ENGINEERING	DWG NOT NUMBERED

NOTES:

STEAM PLANT DISCHARGE TUNNEL CLOSED DURING 1952 FLOOD PROTECTION PROJECT. SEE TOLTZ, KING & DAY COMM. 3842. SUMP NOW DISCHARGES THRU UNDERGROUND PIPE AND EXITS NEAR SOUTH END OF SCREEN WELL HOUSE.

CABLE TUNNEL LOCATIONS ARE APPROXIMATE AND ADDITIONAL UNDOCUMENTED TUNNELS ARE SUSPECTED IN AREA NORTH OF HYDROELECTRIC PLANT.

GLASS BASEMENT ORIGINALLY CAPPED AT TIME OF 1958 GLASS PLANT DECOMMISSION. SPACE IS CURRENTLY USED FOR STORAGE.

INTERIOR PART OF SPRING BENDING PIT SEALED OFF OR FILLED WITHOUT RECORD AT UNKNOWN TIME. EXTERIOR PART, aka "SPENCE'S CAVE" FILLED IN 2008 AT TIME OF FIRELINE REPAIR.

ELEVATOR FROM TRAFFIC TUNNELS CAPPED WITHOUT RECORD.

SAND ELEVATOR SHAFT CAPPED AT TIME OF 1958 GLASS PLANT DECOMMISSION. ADDITIONAL UNDOCUMENTED SHAFT RUMORED IN VICINITY.

TRAFFIC TUNNEL PORTALS CAPPED IN 1952 FLOOD PROTECTION PROJECT.

LOCATION OF MINED SAND TUNNELS ARE LARGELY UNKNOWN. OUTLINE SHOWN HERE IS BASED ON AN UNTITLED DRAWING FOUND IN THE PLANT ENGINEERING OFFICE AND SHOULD NOT BE VIEWED AS ANYTHING MORE THAN A CRUDE REPRESENTATION OF EXISTING CONDITIONS.

C:\DOCUMENTS AND SETTINGS\MHEISTER\LOCAL SETTINGS\TEMP\TEMPORARY DIRECTORY 1 FOR 2007APRILTUNNELS3 - STANDARD.ZIP\2007

PLOTTED TUE, JUL/09/13 10:43AM BY MHEISTER

SHEET NO. 1 OF 1 — DRAWING NUMBER: NONE

UNDERGROUND STRUCTURES/TUNNELS

LAYOUT OF KNOWN SUBTERRANEAN FEATURES
UTILITIES NOT INCLUDED

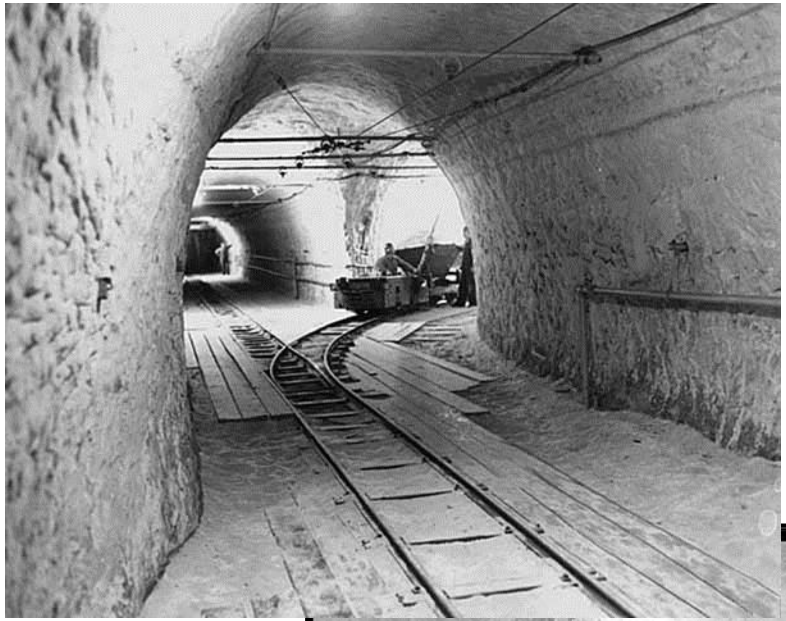
DRN. BY: MKH

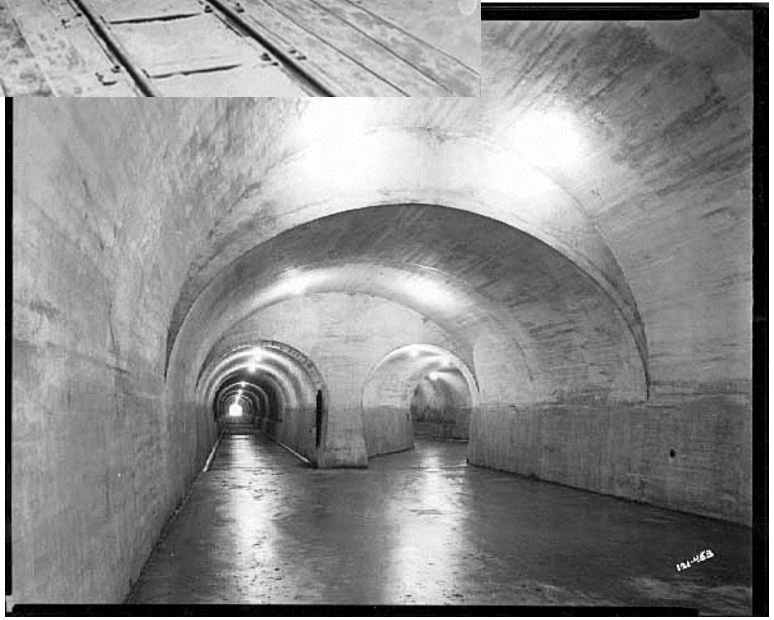
FORD MOTOR COMPANY
PLANT ENGINEERING

THE STEAM DUCT

RAMBOLL

SAND TUNNELS





THE STEAM PLANT

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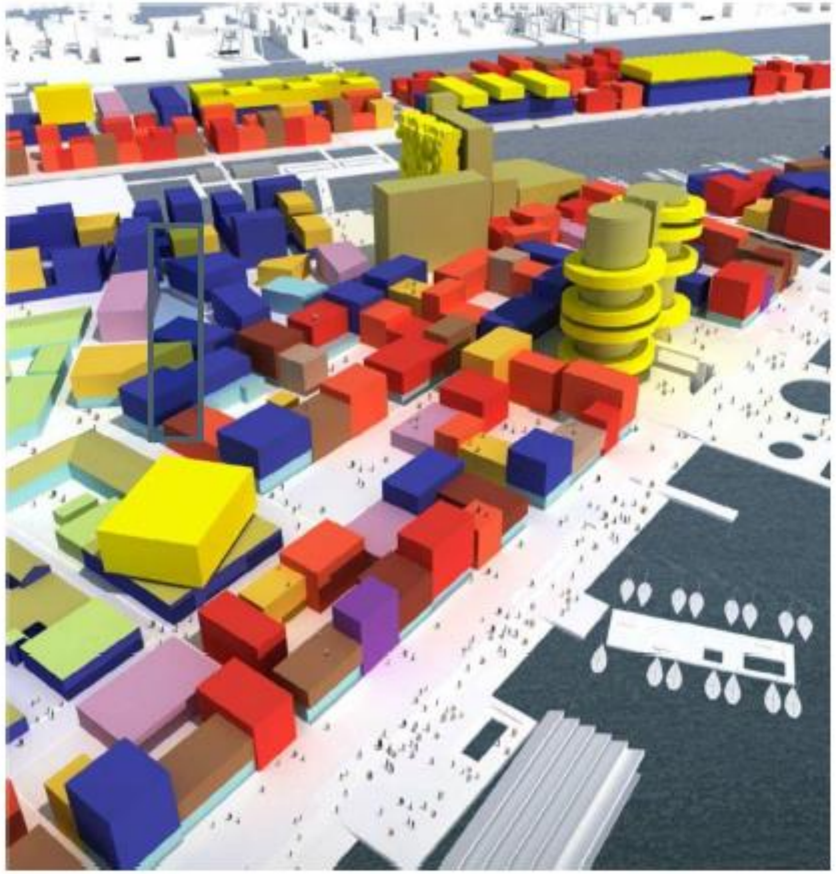
SMART PLANNING MEASURES

1. Holistic infrastructure concept
2. Land use based on principles of mixed use
3. Balanced physical planning measures - matching density to the transit capacity
4. Increased density around transit nodes
5. Compact community with short commutes
6. Walkability – neighborhoods that promotes walking
7. Cyclable city – direct, safe and fast cycle routes with high connectivity
8. High quality transit supply – BRT and/or LRT
9. Mode shift facilities – regulation of parking, P&R incentives
10. Strategic infrastructure design
11. Strategic parking policy
12. Branding and communication measures
13. Economic incentive planning



HIGHLIGHTS

- Studies of cities and community developments that have succeeded in achieving a low car owner ship and low private car transportation share are cities that have taken a holistic view on the whole infrastructure system and not only focused on singular solutions within the sectors.

- High-rises have the tendency to keep life inside the building, while low to mid-rises to a much larger extent generates city life on the streets outside the building complex

- Given a high standard public transport system and a compact development, restrictions can be put on the parking norms to reduce the number of parking spaces and to increase the parking fees. Even the locations can be moderated and put in a number of specific multi-story car parks.

REGULATION VS SHARED SPACE

- The most ordinary design standard is the total regulation of the traffic.

- A streetscape in urban areas can be designed with a use of materials and geometric design that signals low speed, frequent pedestrian crossings etc.

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Krifcon Engineering

TECHNICAL ADVISORY GROUP PRESENTATION

RAMBOLL

BEST PRACTICES IN BUILDING DESIGN

CURRENT MINNESOTA ENERGY CODES

Current Energy Codes / Standards	Commercial, civic, institutional incl. multi-residential	One and two-family houses and multi-residential 3 stories or less
Privately funded projects	ASHRAE 90.1-2004 incl. Amendments	2006 IRC incl. Amendments
State Bonded projects	SB 2030	N.A.
Federal projects	ASHRAE 90.1-2010	2009 IECC (and 30% better if cost-effective)

- In 2013 the U.S. Department of Energy has asked MN to determine if more recent versions of standard 90.1 should be implemented as code.
- As recent as Sep 26, 2014 the DoE issued a Determination Notice asking States to certify that they have evaluated and as necessary updated energy codes to 90.1-2013.

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

Krifcon
Sustainable Consulting

COMPARATIVE SITE EUI

kBtu/ft²/yr

Building Type \ Code	Prototype Floor Area (sf)	ASHRAE 90.1-2004 (~ Current MN Energy Code)	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

BUILDING ENERGY GOALS AND DISTRICT ENERGY

- To illustrate the range of total energy load for the Ford site depending on chosen building energy requirement

REDEVELOPMENT SCENARIOS	Total site energy MBtu/yr (Million Btu)	Total site energy MWh/yr (Million Watt-hour)	Demand load 2,300 hrs/yr
2- Light Industrial/ Flex Tech			
2012 IECC / ASHRAE 90.1-2010	166,140	48,691	21.2 MW
SB 2030 (2025 requirement)	36,848	10,799	4.7 MW
5 - Mixed Use: Transit Village			
2012 IECC / ASHRAE 90.1-2010	140,037	41,041	17.8 MW
SB 2030 (2025 requirement)	42,839	12,555	5.5 MW

Optimal DES solution and technologies are different for a 5 MW system than for a 21 MW system.

FORD SITE BUILDING ENERGY DESIGN GOAL

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- Successful systems work with, and are embraced by, the local design and construction industry.
- Often better to focus on a well-known and tried system and improve goals.

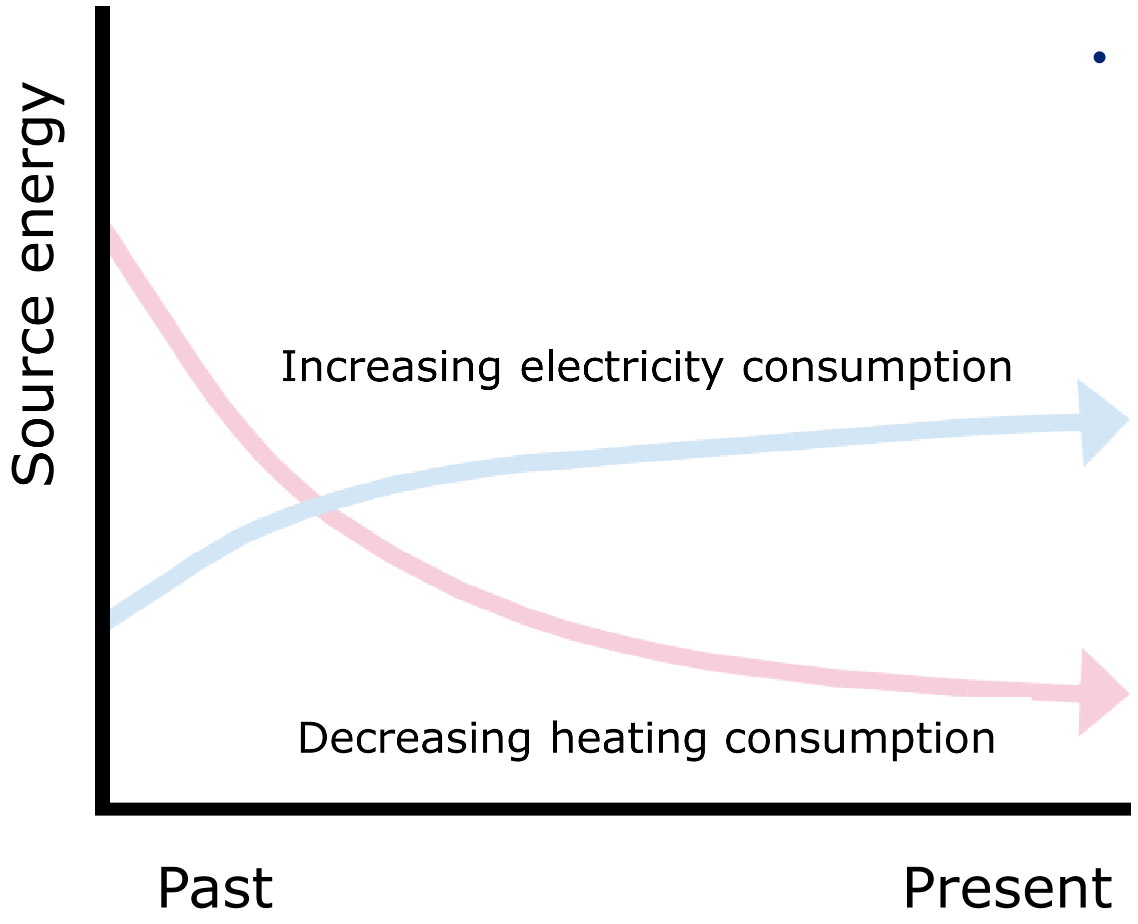
Possible Ford site Building energy design goal:

- X% better than the ASHRAE 90.1 standard current at the time of design.
- SB 2030's 2020 requirement.
- Minimum x% better than the baseline requirement listed in LEED credit EAc2 'Optimize Energy Performance' in the LEED BD+C rating system current at the time of design.
- LEED Platinum certification (or able to obtain such) using the LEED BD+C rating system current at the time of design.
- A fixed maximum site EUI in kBtu/ft^2/yr for types of buildings.
- A fixed maximum site EUI in kBtu/ft^2/yr for all buildings.

RAMBOLL

PLUG LOADS

- When reducing heating and cooling demand in buildings, we tend to forget the plug loads.



- How to control and reduce plug loads?
  - Energy Star requirement
  - Plug load controls above standard

IMPLEMENTATION

- How to ensure implementation of Ford site energy aspirations when Developer takes over?

  - Zoning
  - Requirements as part of developer RFP
  - Requirements tied to financing

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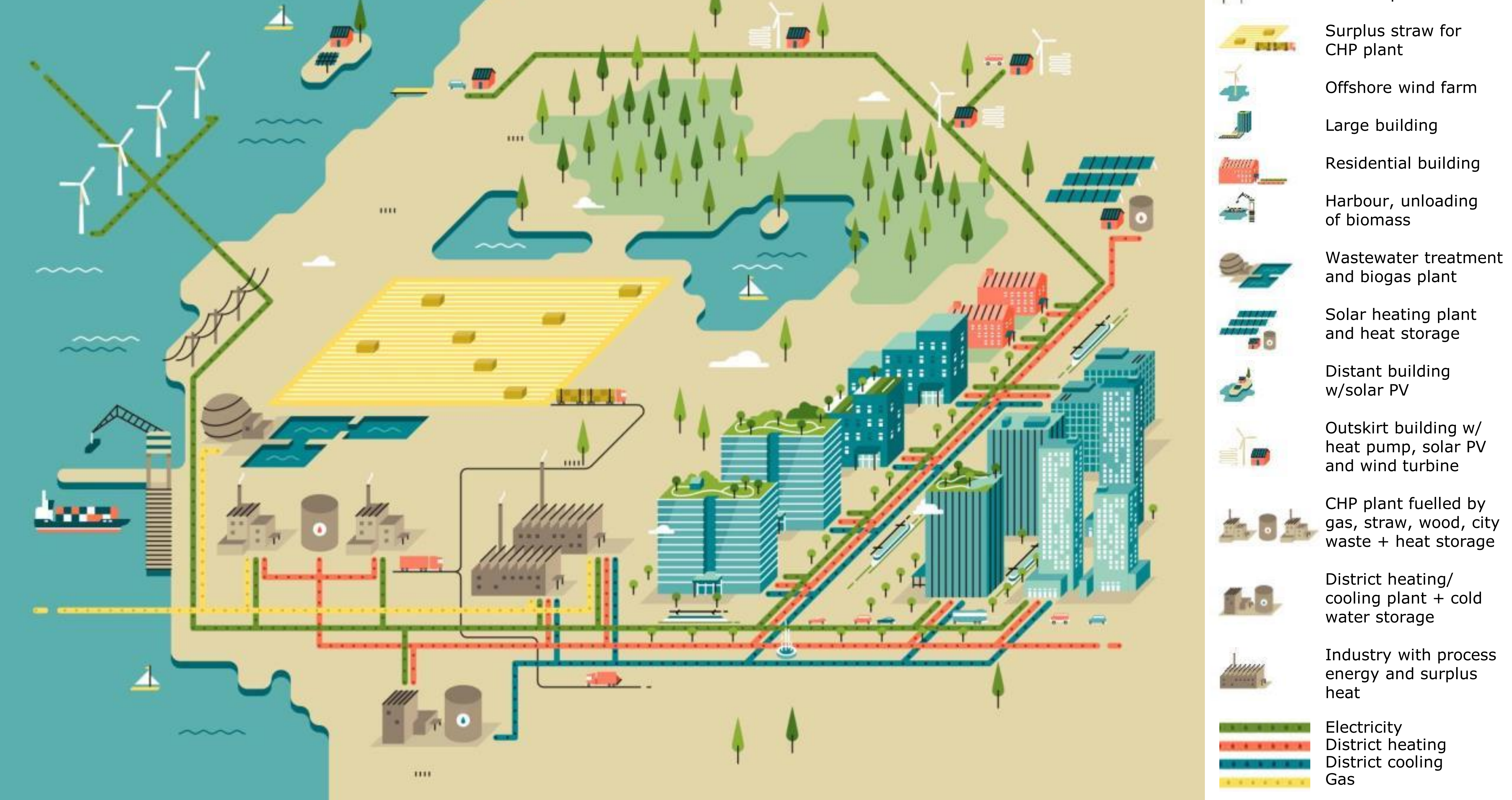
SMART ENERGY SYSTEM



INITIAL GROSS LIST AND SCREENING

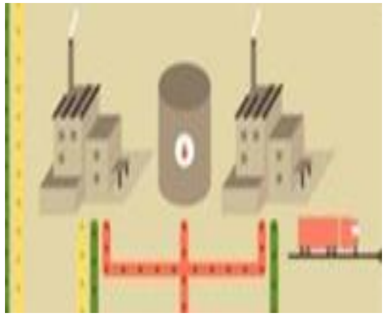
- a total 33 technologies were identified

An initial screening ruled out three technologies for various reasons:

- Wind turbines: It's unlikely to receive permits and public acceptance for setting up wind turbines in close proximity of the site

- Waste incineration plant: The size of plant required to achieve a viable business case is not compatible with the site dimensions and the stress on the traffic system for supplying the waste is deemed unacceptable.

- Deep-geothermal: The potential and risks associated with such a project cannot be rightly evaluated through this general study.



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SCREENING

<u>Net Zero:</u> Net Zero concerns the CO2 emissions and primary energy use of the technology. The highest score have been given to 100% renewable technologies. Other GHG emissions have also been taken into account.

<u>Resilience:</u> Resilience is understood as the security for energy supply that the technology delivers, in particular in case of power grid failures. On site power production has been given high rankings, but fuel diversification and -independence has also been considered.

<u>Legacy/Innovation:</u> Developing technologies with high potential have scored high, whereas traditional concepts with no innovation are evaluated poorly.

<u>Energy efficiency:</u> Energy efficiency is evaluated on the conversion efficiencies and energy losses for the technologies. Renewable energy has not been given preference as is often the case due to a 0 primary energy factor by definition.

<u>Cost effectiveness:</u> The technologies are evaluated primarily on the expected leveled cost of energy (LCOE) over the technical lifetime. The levels of economic risk related to the technology have been considered. There is uncertainty towards the relative value of power vs heat, which may lead to changes in evaluation later on.

I - Technologies		III - Initial Viability			IV - Performance & Scoring matrix								
					Accessment								
Technology	Critical Factors	Go/No-	Jus	TOTAL SCORE	Net Zero		Resilience		Innovative		Energy Efficiency		Cost effective
Anerobic digestion	availability of waste, quality sorting	GO		15	100% renewable energy	5	Additional energy supply, to some extent add to resilience	2	Emerging technology	4		2	
Biomass boiler	Availability of biomass and transportation	GO		16	Yes, if sustainable biomass.upsteam emissions influences	5	If supply of biomass is secure	4	No	2	Relatively low efficiency, when not CHP	2	Dependent on biomass prices
Biomass CHP	Availability of biomass and transportation. Scale (economics)	GO		18	Yes, if sustainable biomass.upsteam emissions influences	5	If supply of biomass is secure	5	Many tech developments within CHPs	3	High efficiency in CHP, but hard in smaller scale	3	Higher capex, economy depends on value of elec and evt. subsidies
Cooling storage in existing tunnels	Ability to seal of areas. Stratification	GO		18	No emissions related, small energy loss	4	Add hugely to resilience	4	New application if tunnels are used, well-known technology	3	Energy loss in storage, but higher efficiency of production	3	Good positive impact on operating economics of production
Cooling Tower w River water		GO		14	No emissions related, small energy loss	4	Does not affect resilience	3	Common solution	2	Relative low efficient compared to alternatives	2	Cheap
Free cooling, river	Water intake permit	GO		21	100% renewable energy	5	Not available in warmer periods	3	Average	3	Very efficient	5	Free
Frying/vegetarian oil boiler	Availability of fuel/bio oil, emissions and smokestack	GO		20	Bio oil, 100% renewable	5	High, with steady supply	5	New fuel, old technology	3	Efficient use of waste fuel, no power production though	4	Depends on accessability

RAMBOLL

OVERALL CHALLENGE

		Energy use	Demand load
Scenario 2	BAU	48,7 MWh/yr	21,2 MW
	Ambitious	10,8 MWh/yr	4,7 MW
Scenario 5	BAU	41 MWh/yr	17,8 MW
	Ambitious	12,5 MWh/yr	5,5 MW

Load	Main Pipe out of EC
20 MW	DN300
10 MW	DN250
5 MW	DN200

(ΔT=40 K and max. pressure loss of100 Pa/m pipe) are:

RES & CONVENTIONAL PRODUCTION TECHNOLOGIES

I - Technologies	II - Definition		III - Initial Viability			IV - Performance & Scoring matrix	
						Accessment	
Technology	**Definition**	**Critical Factors**	**Go/No-Gc**	**Justifi**	**TOTAL SCORE**	**Net Zero**	
Anerobic digestion	Production of biogas through AD from household waste	availability of waste, quality sorting	GO		**15**	100% renewable energy	**5**
Biomass boiler	Combustion of sustainable biomass in boiler. Heat production, Mounted flue gas condensation	Availability of biomass and transportation	GO		**16**	Yes, if sustainable biomass.upsteam emissions influences	**5**
Biomass CHP	Biomass boiler + steam turbine. Power and heat production. Mounted flue gas condensation	Availability of biomass and transportation. Scale (economics)	GO		**18**	Yes, if sustainable biomass.upsteam emissions influences	**5**
Cooling storage in existing tunnels	Using the sand tunnels as cooling storage	Abitlity to seal of areas. Stratification	GO		**18**	No emissions related, small energy loss	**4**
Cooling Tower w River water	Alternative to river cooling, not suitable for DC alone		GO		**14**	No emissions related, small energy loss	**4**
Free cooling, river	Cooling extracted from river used directly in system	Water intake permit	GO		**21**	100% renewable energy	**5**
Frying/vegetarian oil boiler	Boiler running on liquid waste products	Availability of fuel/biooil, emissions and smokestack	GO		**20**	Bio oil, 100% renewable	**5**
Fuel cells	Fuel cell plant fueled by natural gas or hydrogen	Price, duration and efficiency of installation. Access of hydrogen.	GO		**0**		
Heat accumulators	Tanks for short term storage of hot water	Fluctuating power prices, disconnected heat, cooling and power demand	GO		**19**	No emissions related, small energy loss	**4**
Electric heat pumps	Large heat pumps on river water or similar	Electricity price, temeprature sets, water 'cleanness' and icing	GO		**23**	Low power consumption per energy unit produced	**5**
Industrial surplus heat	Recovery of waste heat from industrial processes or malls	Proximity of industry, acceptance of industries, temperature sets and recovery conditions	GO		**18**	Waste heat, 100% but depends on need for upgrade to use	**4**
Natural gas boiler	Boiler running on natural gas providing heat	Acces to natural gas	GO		**16**	Fossil fuel, but gas are better than coal and oil	**2**
Natural gas CHP	CHP driven by natural gas	Acces to natural gas	GO		**18**	Fossil fuel, but gas are better than coal and oil. Very high efficiency	**3**
Photovoltaic, central	PV on ground in central location	Sun conditions	GO		**19**	100% renewable energy	**5**
Photovoltaic, decentral	Roof mounted PV on larger buildings	Sun conditions	GO		**18**	100% renewable energy	**5**
Sewage water Heat pump	heat extraction from cleaned site sewage water	Access and proximity to sewage plant	GO		**19**	Good coefficient of performance, but power needed	**4**
Shallow Geothermal	Utilization of solar radiation on soil. Tubes with flow of liquid in drillings/land (horizontal or vertical)	Available areas/soil conditions	GO		**18**	Good coefficient of performance, but power needed	**4**

COMBUSTION TECHNOLOGIES

Technology	TOTAL SCORE	Net Zero		Resilience		Innovative		Energy Efficiency		Cost effective	
Frying/vegetarian oil boiler	20	Bio oil, 100% renewable	5	High, with steady supply	5	New fuel, old technology	3	Efficient use of waste fuel, no power production though	4	Depends on accesability of fuel	3
Biomass CHP	18	Yes, if sustainable biomass.upsteam emissions influences	5	If supply of biomass is secure	5	Many tech developments within CHPs	3	High efficiency in CHP, but hard in smaller scale	3	Higher capex, economy depends on value of electricity and psbl subsidies	2
Natural gas CHP	18	Fossil fuel, but gas are better than coal and oil. Very high efficiency	3	High, depends on gas supply	4	No	2	Very high efficiency in CHP	5	Relatively cheap plant, good operational economics	4
Industrial waste boiler	18	Energy from waste products	5	Depends on supply chain	3	OK	3	Use of waste products	4	Depends on "fuel" costs	3
Biomass boiler	16	Yes, if sustainable biomass.upsteam emissions influences	5	If supply of biomass is secure	4	No	2	Relatively low efficiency, when not CHP	2	Dependent on biomass markets prices	3
Natural gas boiler	16	Fossil fuel, but gas are better than coal and oil	2	High, depends on gas supply	4	No	1	Efficient use of gas	4	Cheap installations	5

ELECTRICITY/HEAT PUMP TECHNOLOGIES

Technology	TOTAL SCORE	Net Zero		Resilience		Innovative		Energy Efficiency		Cost effective	
Ice/Snow cooling/storage	20	Almost no additional energy use from conventional snow cleaning	5	Only works when snow	3	Only few existing plants	5	High	5	Storage could be expensive, operation not proven	2
Electric heat pumps	23	Low power consumption per energy unit produced	5	Dependent on power supply	3	Innovative	5	Very efficient	5	Very cost effective with river water and cheap power	5
Free cooling, river	21	100% renewable energy	5	Not available in warmer periods	3	Average	3	Very efficient	5	Free	5
Cooling Tower w River water	14	No emissions related, small energy loss	4	Does not affect resilience	3	Common solution	2	Relative low efficient compared to alternatives	2	Cheap	3
Electrical heater/boiler	13	Dependent on power from grid	3	Dependent on power from grid, runs on excess power primarily	2	No	2	Low	2	Depends on power price fluctuations	4
Compressor cooling	12	Low	2	Dependent on power	3	NO	2			off the shelt product	5
Shallow Geothermal	18	Good coefficient of performance, but power needed	4	Supply in vinter?	4	Simple technology	4	Good use of energy	4		2
Gas driven heat pump	15	Fossil fuel, but gas are better than coal and oil	3	High, depends on gas supply	4	No	2	Efficient use of gas	4	Rather expensive setup	2
Absorption cooling	10	Depends on heat source		Needs cheap available heat		Yes	5	Medium	3	Medium/low	2

RAMBOLL

SOLAR, WASTE HEAT, STORAGE

Technology		TOTAL SCORE	Net Zero		Resilience		Innovative		Energy Efficiency		Cost effective
Solar heating, central	20	100% renewable energy	5	Good in summer, low in winter	3	Yes	4	High	5	Almost no cost of operation	3
Photovoltaic, central	19	100% renewable energy	5	Good in summer, low in winter	3	Yes	4	No energy input	5	Depends on value of power	2
Solar heating, decentral	19	100% renewable energy	5	Good in summer, low in winter	3	Yes	4	High	5	Almost no cost of operation	2
Photovoltaic, decentralize	18	100% renewable energy	5	Good in summer, low in winter	3	Yes	4	No energy input	5	Depends on value of power	1
Heat accumulators	19	No emissions related, small energy loss	4	Add to resilience	3	Proven and wellknown solution	3	Allows for efficient production	5	Good positive impact on operating economics of production	4
Cooling storage in existing tunnels	18	No emissions related, small energy loss	4	Add hugely to resilience	4	New application if tunnels are used, well-known technology	3	Energy loss in storage, but higher efficiency of production	3	Good positive impact on operating economics of production	4
Sewage water Heat pump	19	Good coefficient of performance, but power needed	4	Constant supply, reliant on power	4	Yes	5	Good use of energy	4	Expensive setup	2
Industrial surplus heat	18	Waste heat, 100% but depends on need for upgrade to use	4	Depends on industry and number of suppliers	2	Not very common, but also not that innovative	3	Increases total efficiency	5	Likely with high investment but low operational costs	4

ALTERNATIVE TECHNOLOGIES

Technology	TOTAL SCORE	Net Zero		Resilience		Innovative		Energy Efficiency		Cost effective	
Off-site PV or Wind electricity	20	High	5	None	2	Ok	3	RES	5	Low cost	5
Nat gas Fuel cell CHP	17	Dependent on origin of fuel, natural gas assumed, no polutants	3	Only dependent on natural gas	4	Very innovative	5	High efficiency	4	High Capex and short technical lifetime	1
Syn gas CHP	16	Yes, if sustainable biomass.upsteam emissions influences	5	Risky as demo project	2	Innovative	5	High efficiency in CHP, but hard in smaller scale	3	Higher capex, economy depends on value of electricity and psbl subsidies	1

SYSTEM COMBINATIONS

#	Name	Notes	Base 1	Base 2	Peak	Additional 1	Additional 2	Storage 1	Storage 2
1	ALL-GAS	Storage only depends on power markets, if power prices fluctuate, storage may be feasible The site will be heavily dependent on gas supply	Gas CHP	Compressor cooling River water	Gas boiler	Free cooling			
2	BiomassCHP-Gas	Investment in CHP is high - means it needs many hours of operation, therefore intermittent renewables not compatible More diversified supply than #1.	Biomass CHP	Compressor cooling River water	Gas boiler	Free cooling			
3	Biomass-solar-storage	All renewable, but less energy efficient due to boiler as baseload, very high resilience with storage	Biomass boiler	Solar thermal		Cooling: Heat pump on thermal storage		Seasonal Thermal storage	
4	Biomass gasification	Very inovative and renewable with gasification of biomass producing heat and power. Coupled with heat pump on gas and snow cooling with storage. Risky	Syngas CHP		Gas driven Heat pump	Biomass gasification, 700+ degrees	Ice/Snow cooling	Cooling storage	
	AD and biomass	Anerobic digestion to produce gas for CHP,			biomass	Anerobic			

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AGENDA

1. Brief status (PMO)
2. Reuse of tunnels & steam plant building memo (PMO)
3. Car use memo (PMO)
4. Buildings Best Practise memo (FJK)
5. Energy Technologies and Systems (PMO)
6. **Work programme – next visit (PMO)**

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WORK PROGRAM

WORK PROGRAM

	2014						2015		
Item	July	August	September	October	November	December	January	February	March
Project reviews									
Status meetings									
TAG meetings									
Public meeting									
Developer and builders' panel meeting									
Final report									
Final presentation									