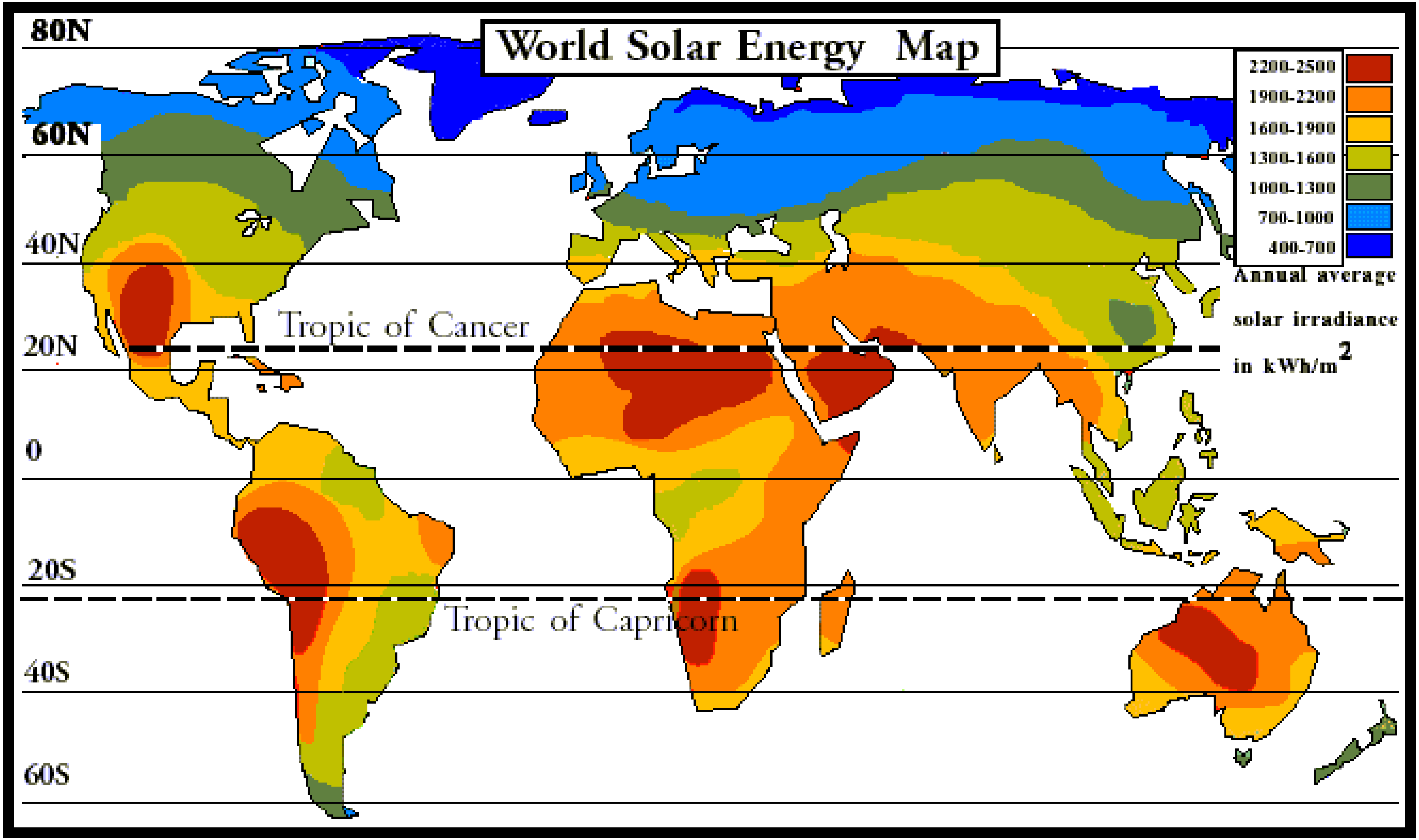
1B-SYMPOSIUM CITIES & LOW CARBON SOLUTIONS

Solar Thermal in US and Denmark

Solar Thermal & District Energy
A Proven Partnership

Kungalv, Sweden

Graz, Austria


World Solar Energy Map
80N
60N
40N
20N
0
20S
40S
60S
Tropic of Cancer
Tropic of Capricorn
2200-2500
1900-2200
1600-1900
1300-1600
1000-1300
700-1000
400-700
Annual average solar irradiance in kWh/m^2

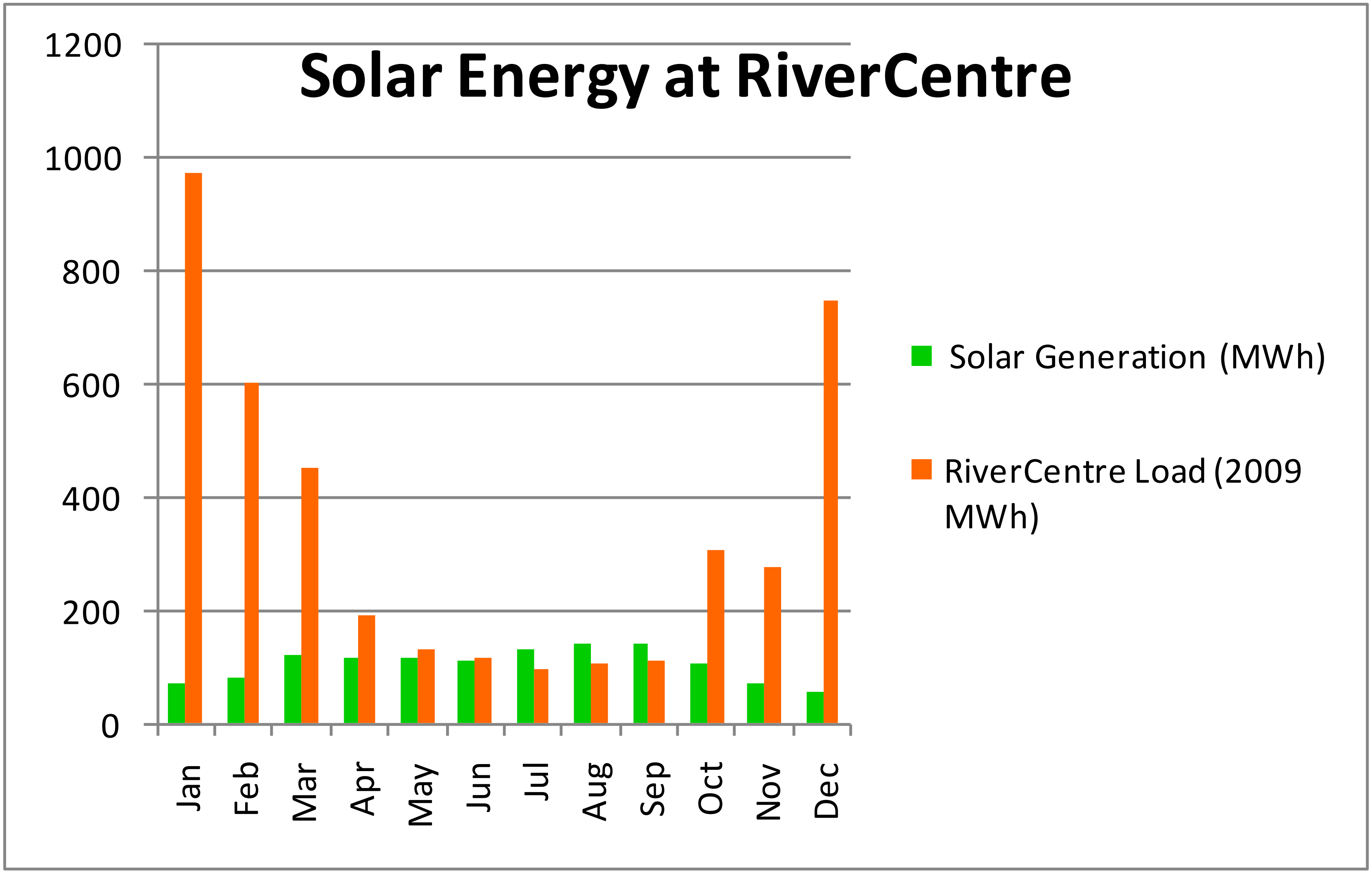
District Energy and Solar

- Solar thermal & district energy are a natural pair that can reach new sectors and new customers
- Solar thermal creates a visible component to promote district systems
- LEED credits or Renewable Energy Credits
- Can be utilized for college campuses, hospitals, hotels, and residential developments

Department of Energy Market Transformation Program

Opportunity

- Showcase large scale solar projects.
- Utilizing one site installation to serve the heating needs of multiple buildings (1st in the U.S.)
- New market for installing and manufacturing solar thermal goods
- Market opportunity for North American district energy systems


Solar Energy at RiverCentre
1200
1000
800
600
400
200
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Solar Generation (MWh)
RiverCentre Load (2009 MWh)

Commercial Panels

High Performance Thermal

8 ft high

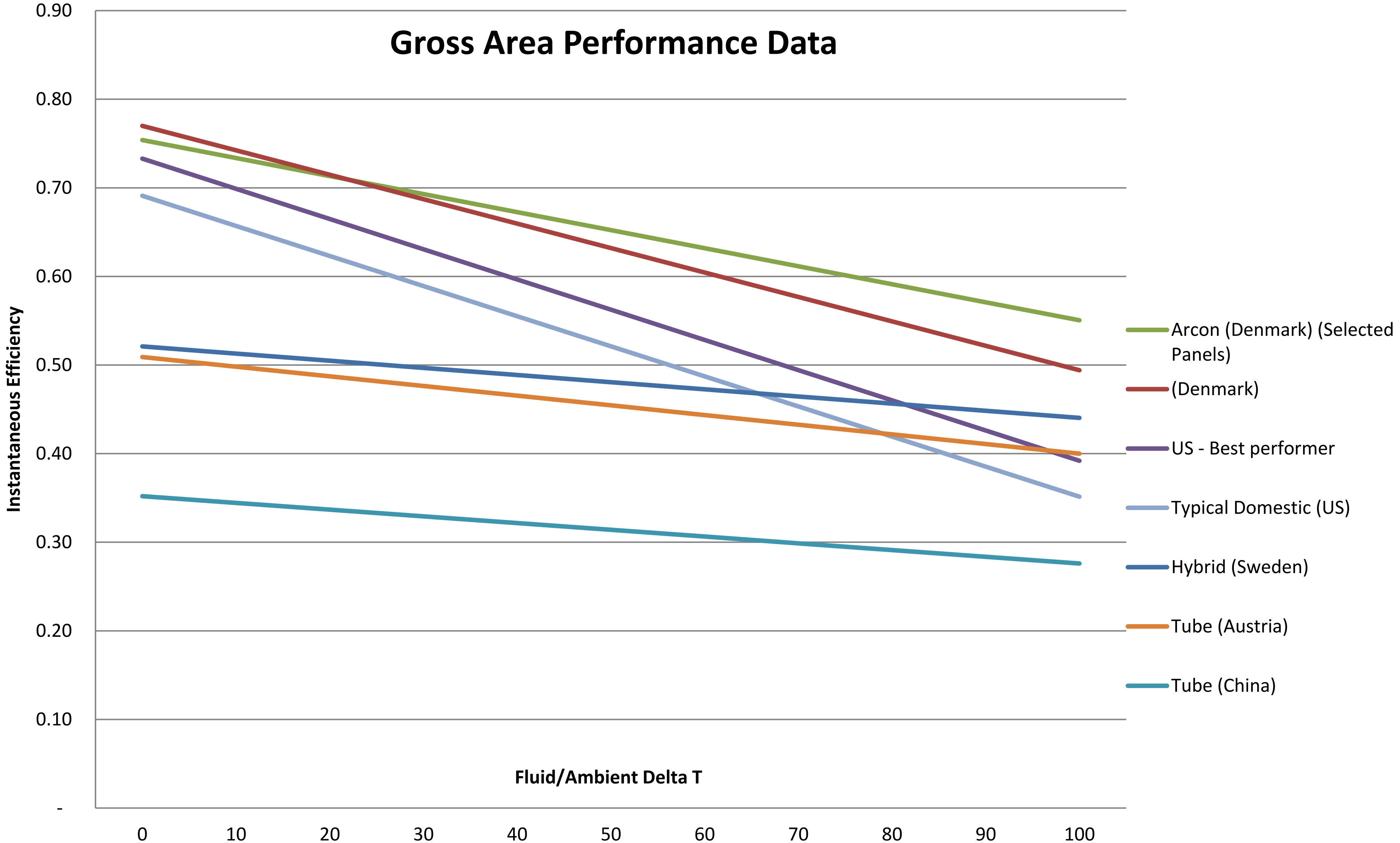
20 ft wide

Traditional Thermal

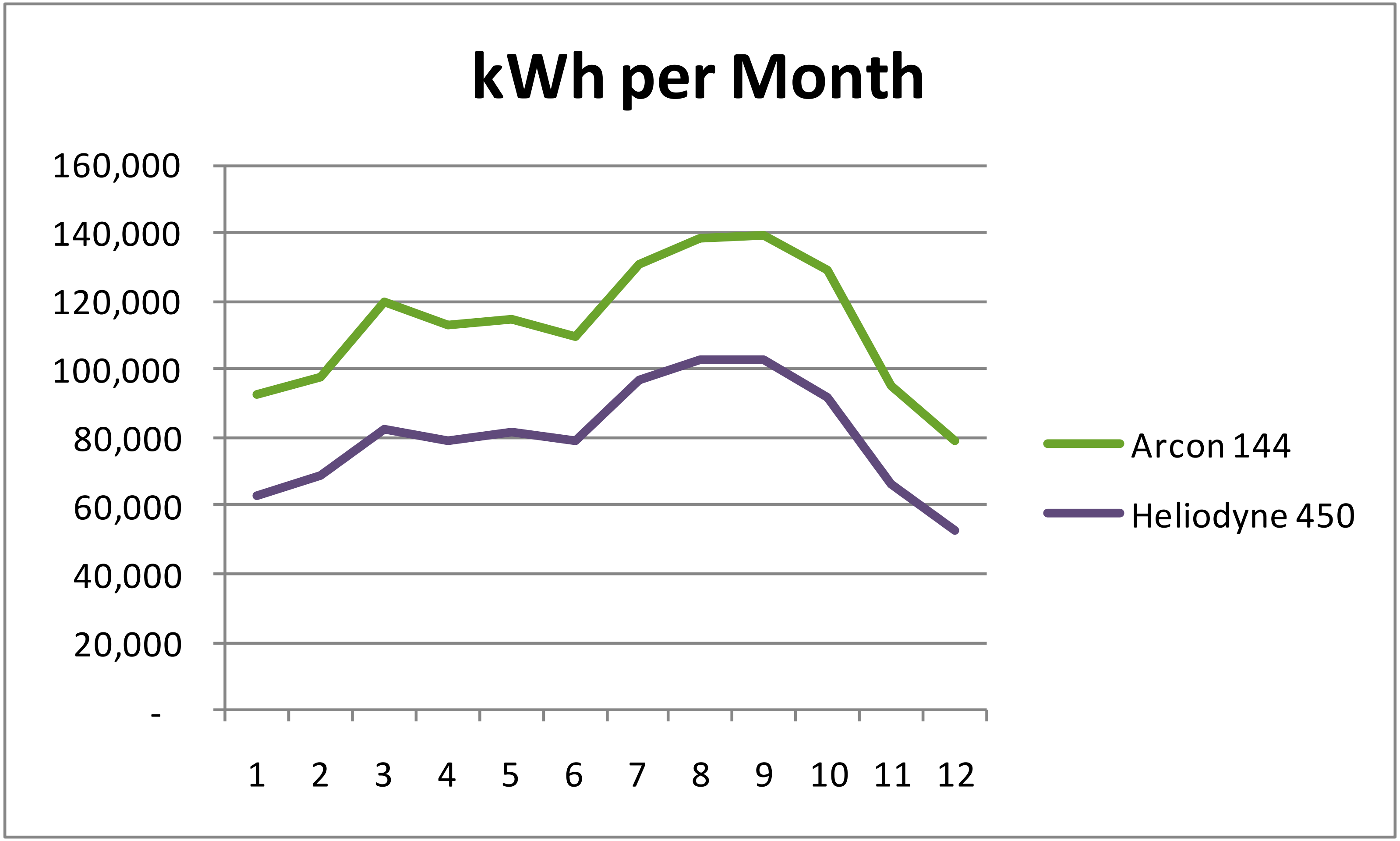
8 ft high

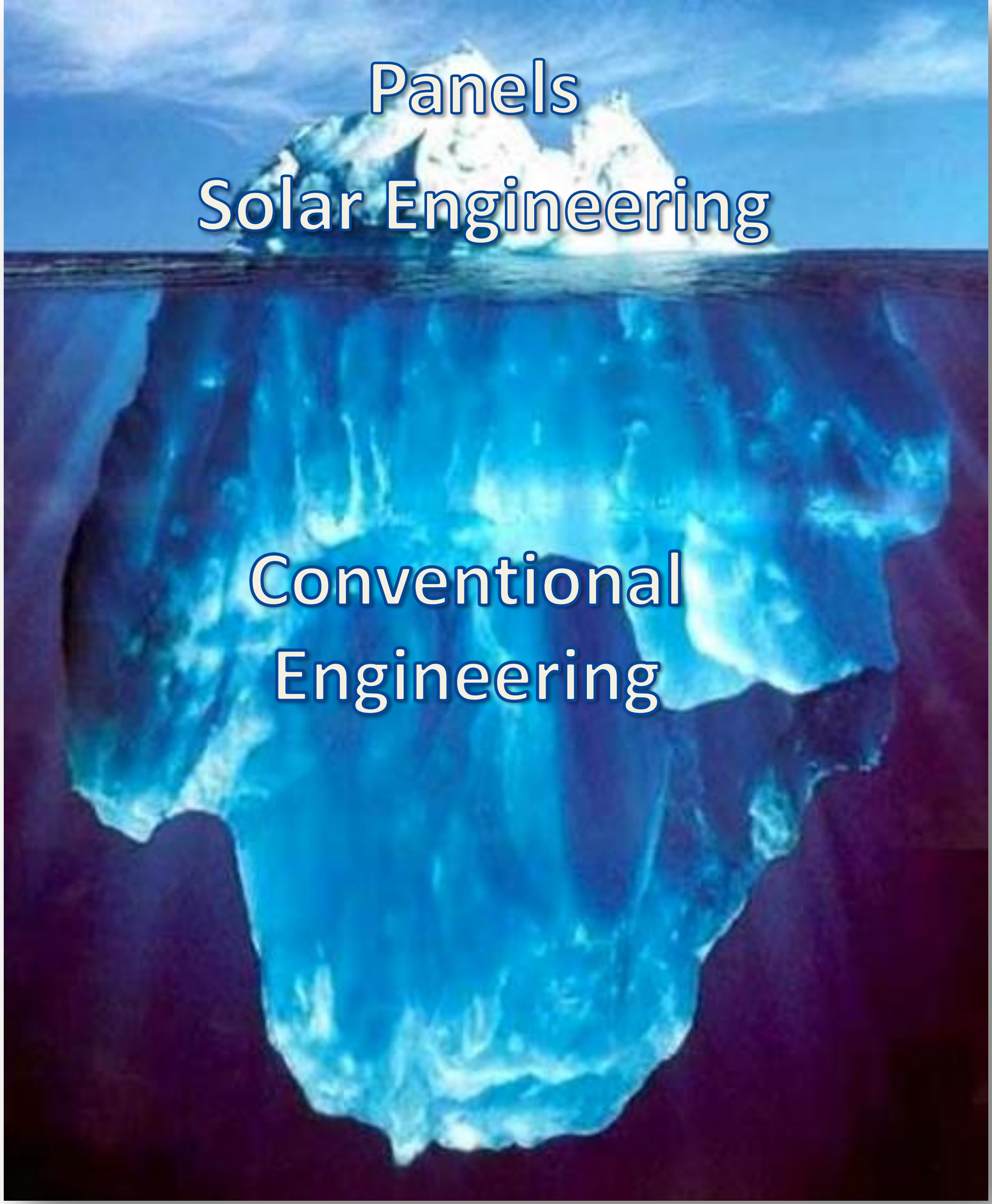
4 ft wide

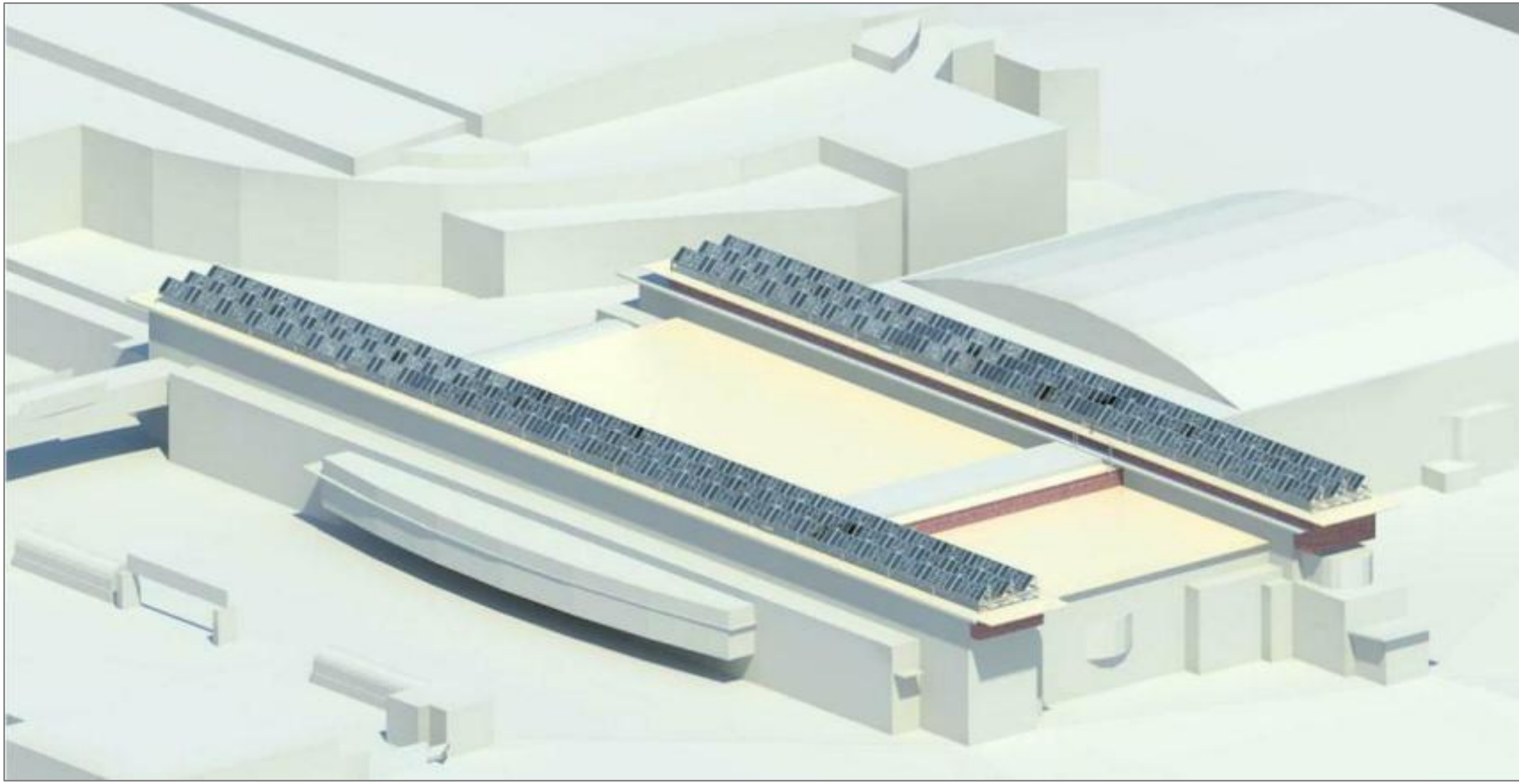
Modeling & Panel Selection



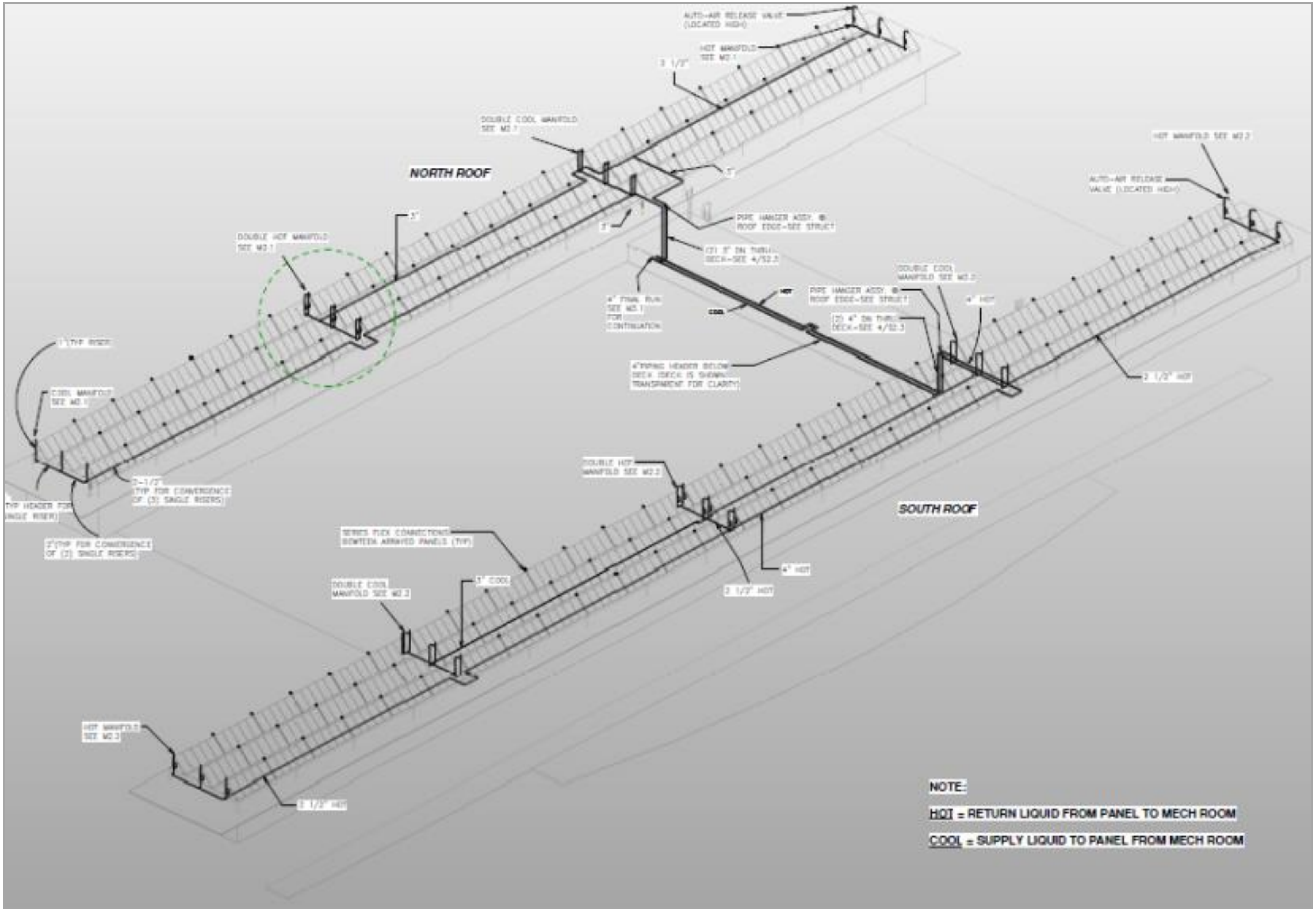
30% higher energy production than leading US solar thermal technology




Panels
Solar Engineering
Conventional
Engineering



Design and Engineering Partners: TKDA and Ramboll

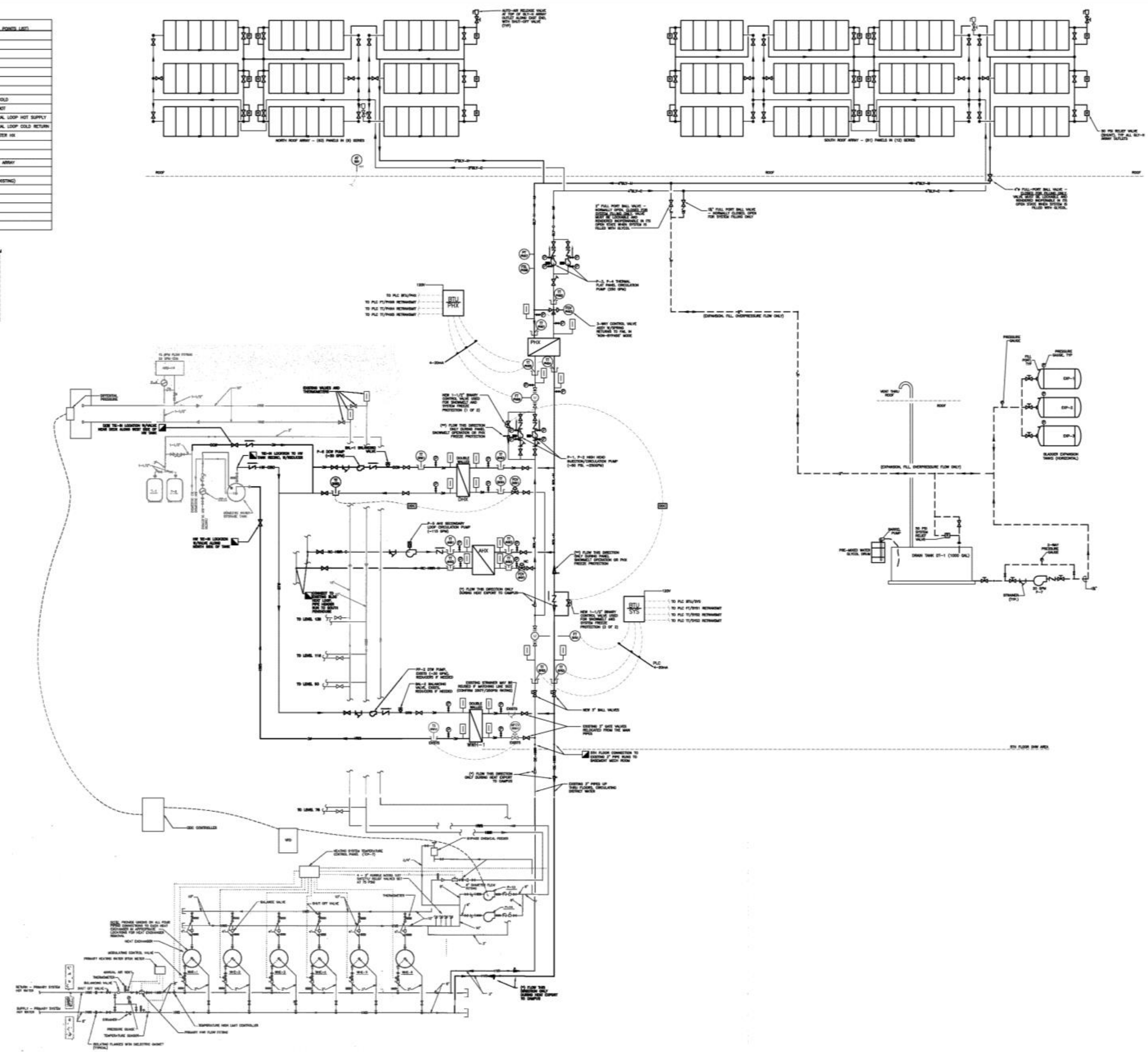

NORTH ROOF
SOUTH ROOF
HOT
COOL
NOTE:
HOT = RETURN LIQUID FROM PANEL TO MECH ROOM
COOL = SUPPLY LIQUID TO PANEL FROM MECH ROOM

EQUIPMENT & PIPING LEGEND (SEE M6.2 FOR CONTROL POINTS LIST)	
DE-HWS	DISTRICT ENERGY HOT WATER SUPPLY
DE-HWR	DISTRICT ENERGY HOT WATER RETURN
GLY-C	SOLAR GLYCOL COLD (RETURN)
GLY-H	SOLAR GLYCOL HOT (SUPPLY)
DCW	DOMESTIC COLD WATER
DTW	DOMESTIC TEMPERED WATER
HWS	HOT WATER SUPPLY (TO TANK)
RC-HWR-C	RIVERCENTRE HOT WATER RETURN – COLD
RC-HWR-H	RIVERCENTRE HOT WATER RETURN – HOT
SOL-H	SOLAR HEATED DISTRICT WATER – LOCAL LOOP HOT SUPPLY
SOL-C	SOLAR HEATED DISTRICT WATER – LOCAL LOOP COLD RETURN
WWH-1	HIGH EFF. REPLACEMENT DOMESTIC WATER HX
DHX	DOMESTIC HOT WATER PREHEAT HX
AHX	5TH FLOOR AIR HANDLER HX
PHX	PRIMARY (DISTRICT) HX – FLAT PANEL ARRAY
FCV	AUTOMATIC FLUID CONTROL VALVE
MFCV	MECHANICAL FLUID CONTROL VALVE (EXISTING)
BTU	BTU METER/COMPUTER
EXP	DIAPHRAGM EXPANSION TANK
DT	DRAIN TANK (NON PRESSURE)
TT	TEMPERATURE TRANSMITTER
FT	FLOW TRANSMITTER

EXISTING BUILDING AUTOMATION SYSTEM

OUTSIDE AIR TEMPERATURE

BLDG HEATING SUPPLY TEMPERATURE (RESET)



DISTRICT ENERGY ST. PAUL™

Hans O. Nyman Energy Center
76 Kellogg Boulevard West
St. Paul, MN 55102-1611

RIVERCENTRE SOLAR THERMAL SYSTEM DESIGN

ALL CONTRACTORS AND SUBCONTRACTORS SHALL VERIFY ALL DIMENSIONS BY MEASUREMENT AT THE BUILDING AND/OR SITE

NO.	DATE	ISSUE RECORD
B	1/18/11	ADDL. DEVICES/CONFIG
A	11/3/10	CONTR. MARKUP COPY
	8/24/10	ISSUED FOR BID

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

SIGNATURE:

PRINTED NAME: Lucas T. Davis

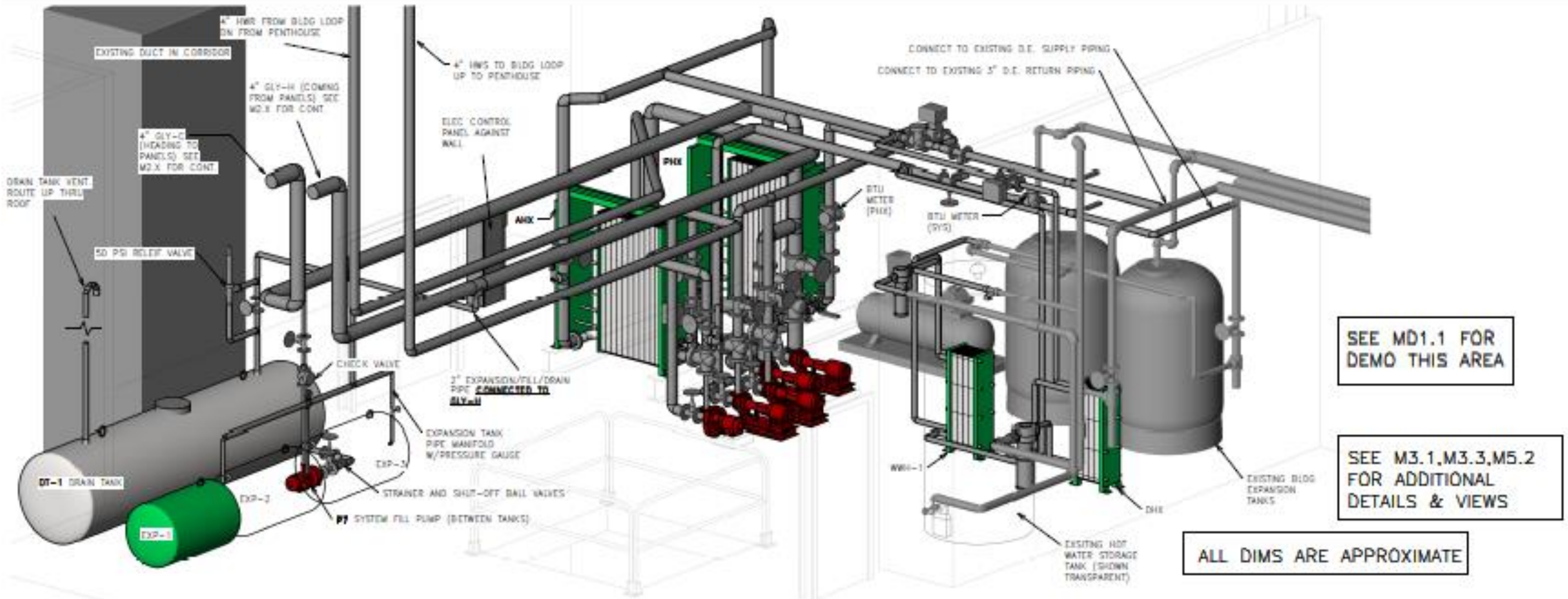
LIC. NO.: 47057 *DATE:* 8/24/10

TKDA
ENGINEERING • ARCHITECTURE • PLANNING

DESIGNED	DRAWN	CHECKED
L.D./L.F./F.U.	LTD	LWF

PIPING & INSTRUMENTATION DIAGRAM, LEGEND

M6.1



1 5TH FLOOR MECH AREA - LOOKING NORTHWEST

5TH FLOOR MECHANICAL NOTES:

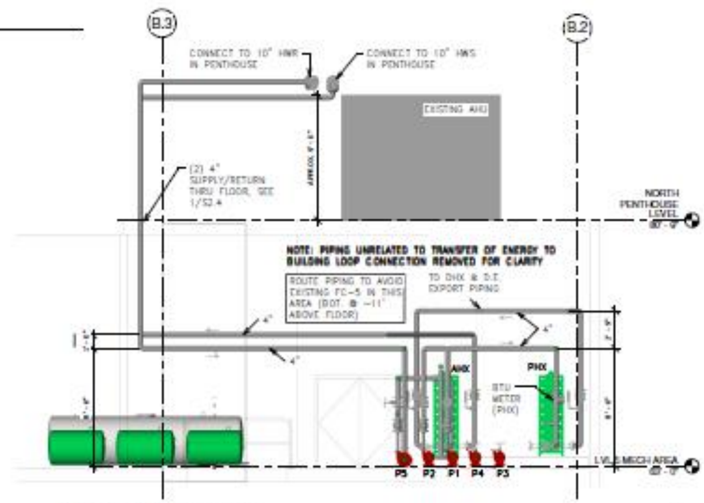
1: REFER TO M6.1, M6.2 FOR ADDITIONAL PIPE SIZES, DEVICE & EQUIPMENT ARRANGEMENT DETAILS.

2: WWH-1/DHX LOCATIONS SHOWN CORRECT. PIPING PHYSICAL ARRANGEMENT SUBJECT TO CHANGE DEPENDING ON FIELD CONDITIONS AFTER DEMO.

3: KEEP EXISTING DHW RECIRC PIPING, EQUIPMENT & DEVICES INTACT AND OPERATIONAL FOR NEW SYSTEM.

4: FLOOR LIVE LOAD RATING IN THIS AREA IS 150 POUNDS PER SQ.FT. NOWHERE CAN THE LIVE LOAD EXCEED THIS LIMIT. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE THAT ANY CHANGES TO EQUIPMENT LOCATION DOES NOT RESULT IN THIS LIMIT BEING EXCEEDED.

5: SUPPORT ALL NEW PIPING SIMILARLY TO EXISTING PIPING. USE APPROVED METHODS AND MATERIALS FOR SUPPORTS.



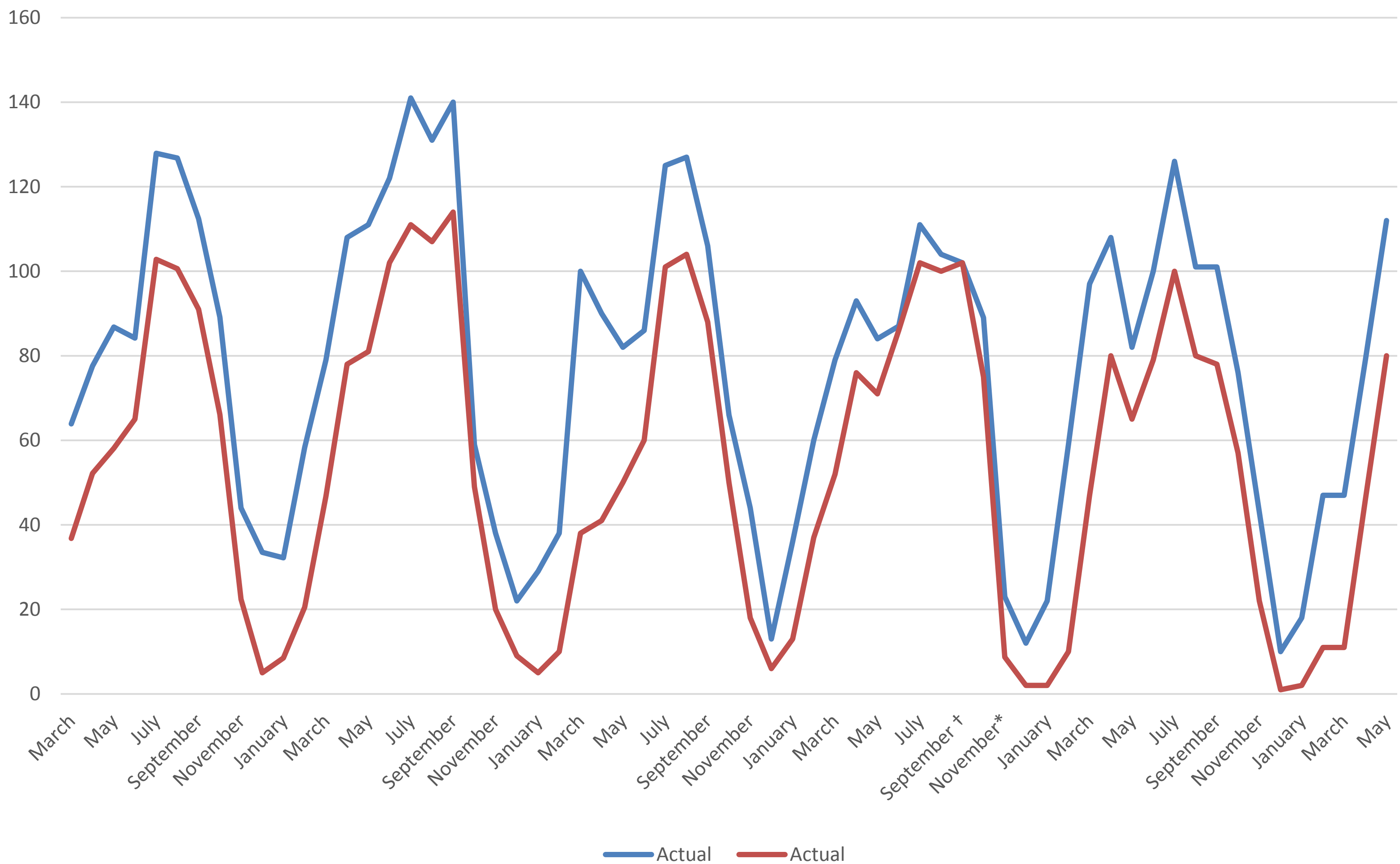
2 AHX TO BLDG HEAT LOOP CONNECTION
1/4" = 1'-0"


GROVE


GROVE
12/08/2010 14:13

DISTRICT ENERGY
ST. PAUL™

Solar Production Data 2011-2016



Questions?