בניה אלטרנטיבית וחיסכון בצריכת חשמל באקו-קמפוס לוטן

Alternative building design and significant electricity savings on Lotan Eco-Campus

Center for Creative Ecology

www.KibbutzLotan.com

Research partially funded by the Lillian Scherzer Fund managed by JNF-KKL

קרן קימת לישראל
KEREN KAYEMETH LEISRAEL
JEWISH NATIONAL FUND

In cooperation with

EILAT EILOT Renewable Energy

Ben-Gurion University of the Negev
אוניברסיטת בן-גוריון בנגב

מכון הערבה
Arava Institute
معهد وادي عربة

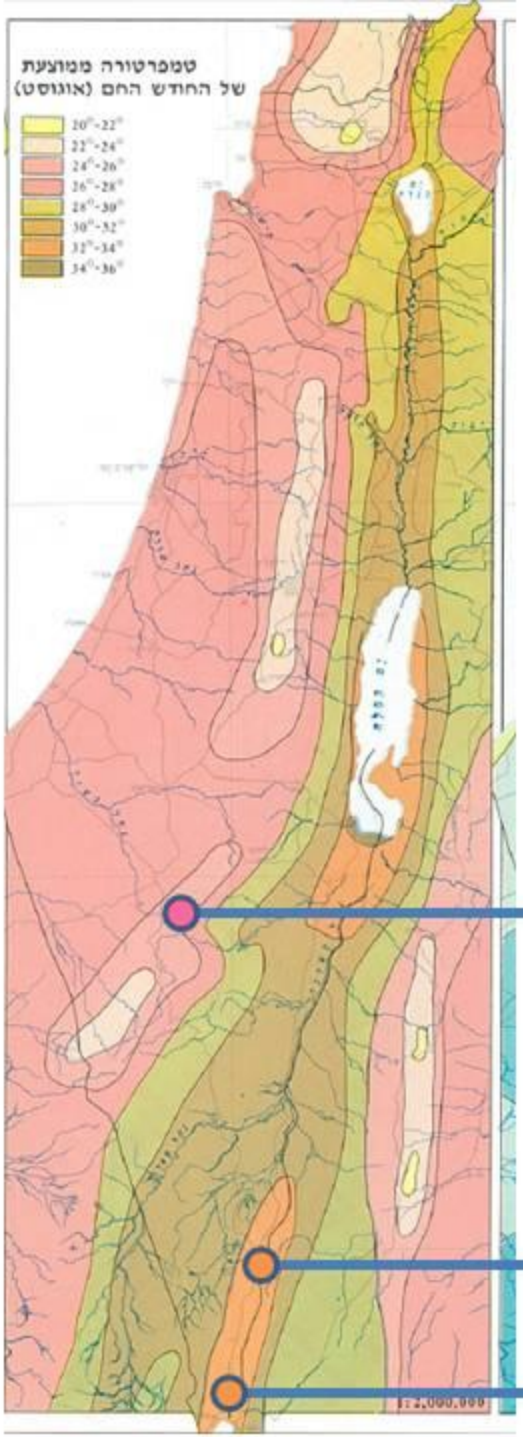
Center for Creative Ecology
www.KibbutzLotan.com

בניה אלטרנטיבית וחיסכון בצריכת חשמל באקו-קמפוס לוטן

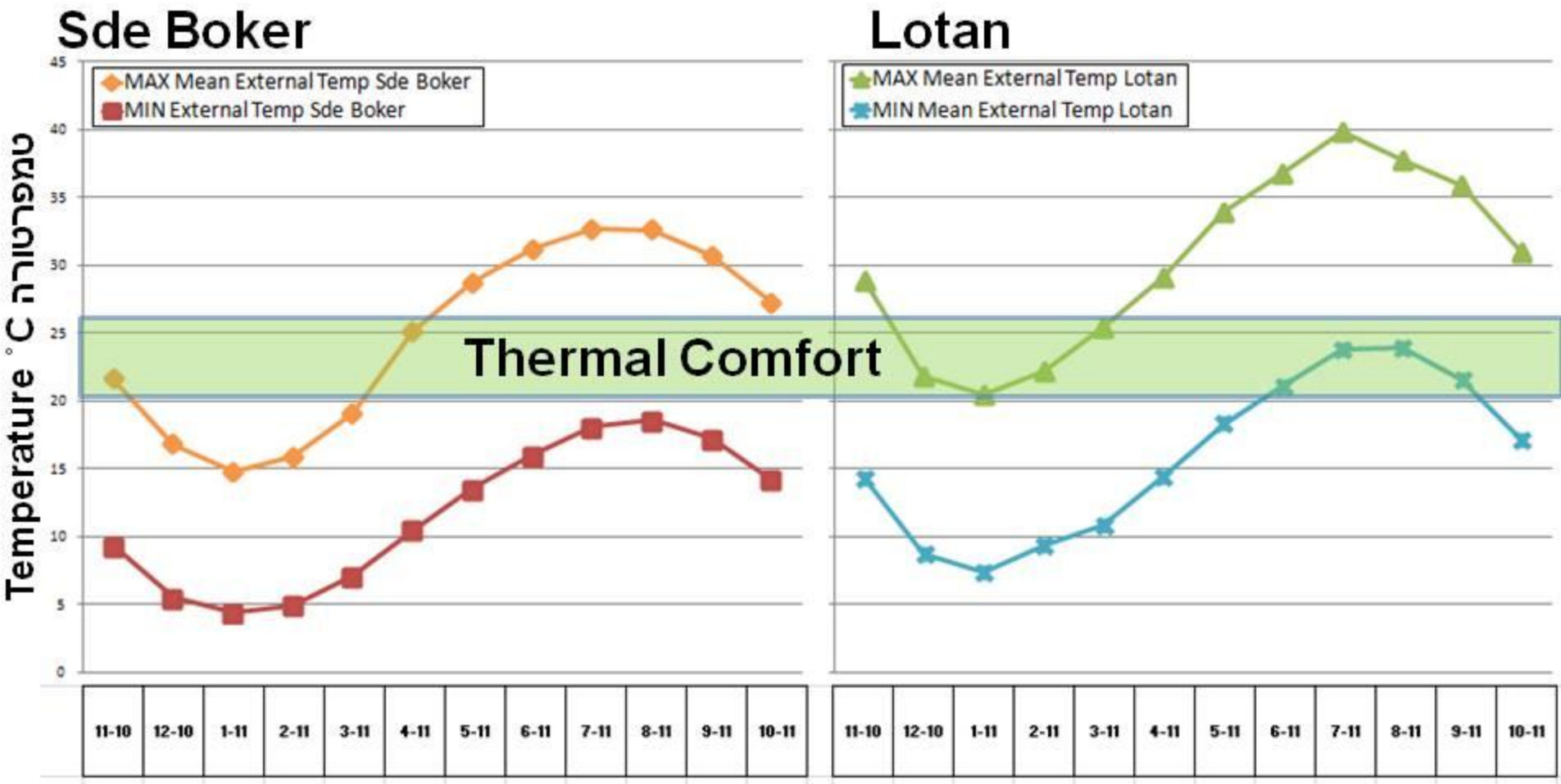
Alternative building design and significant electricity savings on Lotan Eco-Campus

1. CLIMATIC CHALLENGE OF THE SOUTHERN ARAVA
2. THE TEST FACILITIES
3. RESULTS
4. CONCLUSIONS

Mean Temperatures in August



טמפרטורה ממוצעת חיצונית יומית לפי חודשים – שדה בוקר וקיבוץ לוטן
Mean Daily Maximum and Minimum Temperatures
Sde Boker and Lotan



Kibbutz Lotan EcoCampus

אקו-קמפוס קיבוץ לוטן

Floor space of 10 Dome Housing Units

שטח רצפה 10 יחידות דיור

200 sqm

Standard Unit

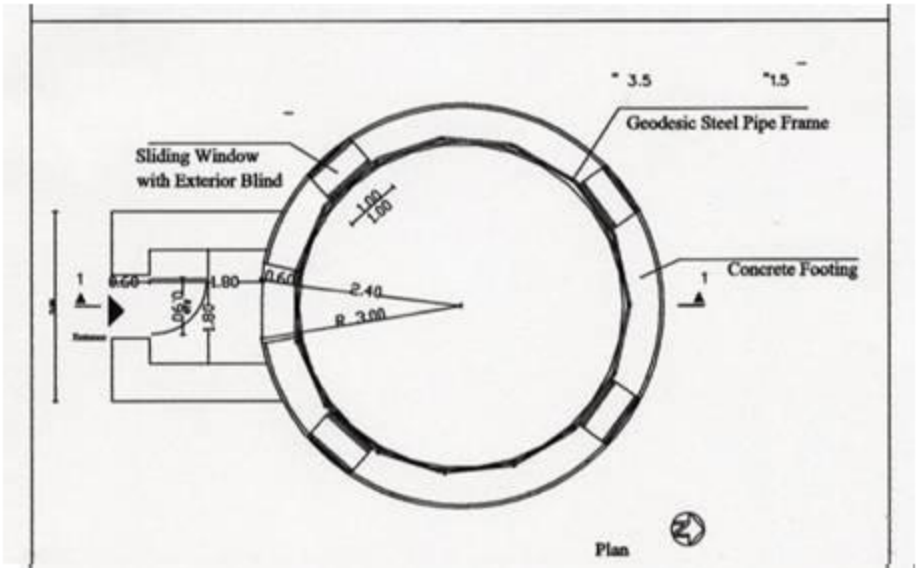
20cm Concrete

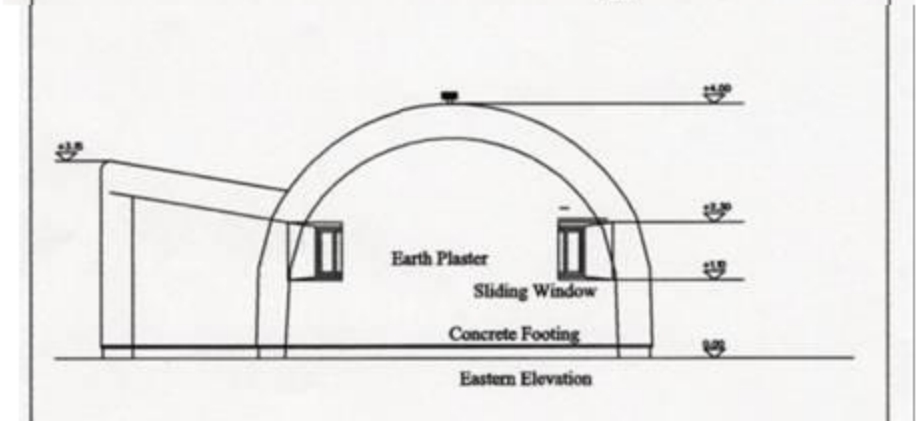
Dome Unit

5cm Earth Plaster

50cm Straw Bale

5cm Earth Plaster





5cm Internal Thermal Mass 50cm External Insulation
South Facing Insulated Windows

Center for Creative Ecology
www.KibbutzLotan.com

Comparison of Electricity Use for Cooling

Under Controlled (Uninhabited) Conditions

Golding, J.Y. (2010).
Ben-Gurion University of the Negev.

Electricity consumed to cool 20 sqm housing units to 26°C in mid-summer

Concrete standard unit - 24.6 kWh

Straw bale dome unit - 13.5 kWh

Center for Creative Ecology
www.KibbutzLotan.com

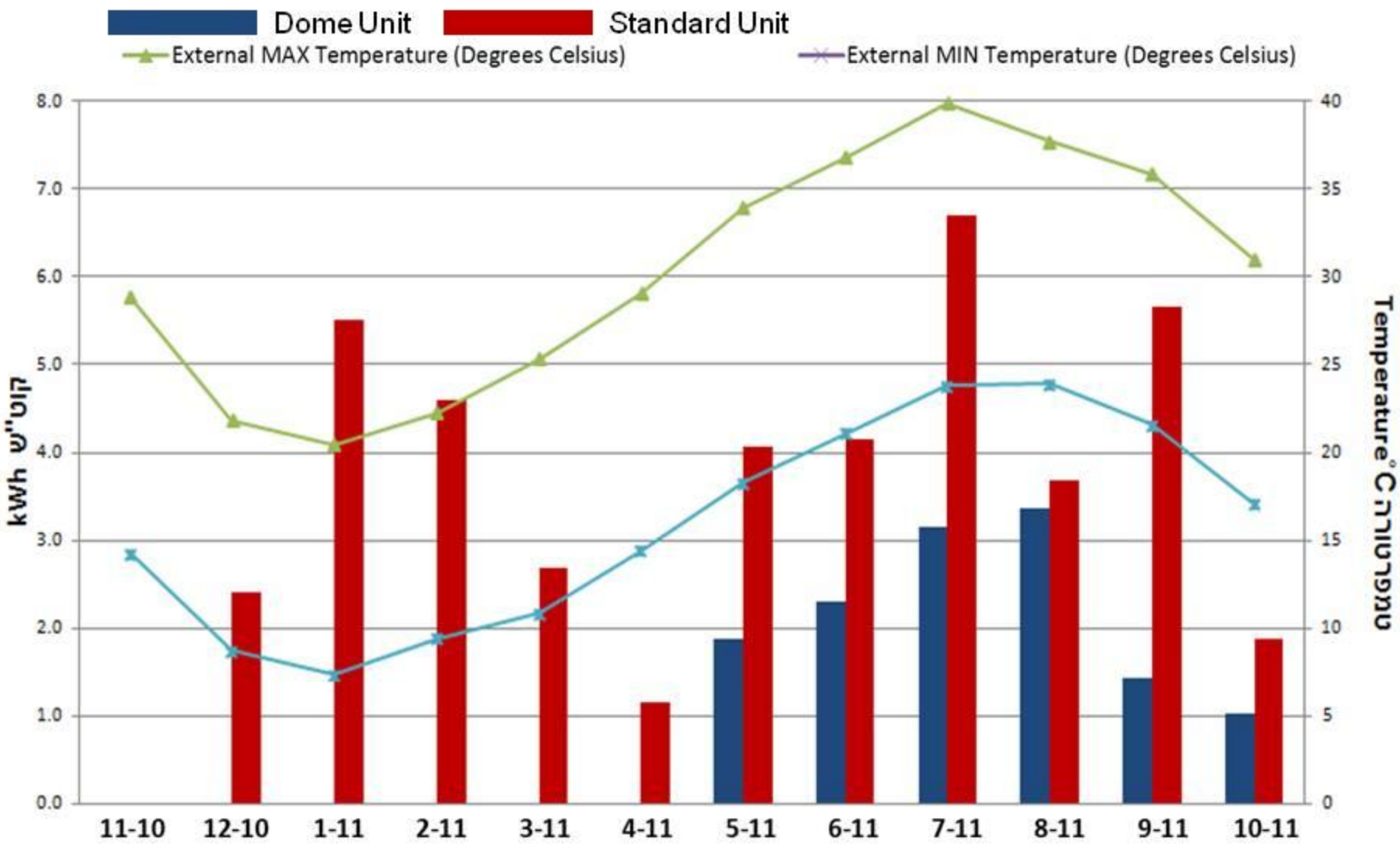
קרן קימת לישראל
KEREN KAYEMETH LEISRAEL
JEWISH NATIONAL FUND

Yearlong Energy Monitoring
Aims

- Monitor electricity consumption for heating and cooling in EcoCampus
- Compare EcoCampus with Standard buildings and evaluate energy savings

צריכת חשמל לקירור וחימום - יחידות דיור באקו-קמפוס ודירות סטנדרטיים

Electricity Consumption for Heating and Cooling per EcoCampus Unit and Standard Unit (kWh/day)



Daily Electricity Consumption for Heating and Cooling (kWh/Unit)

Period	EcoCampus Unit	Standard Unit	Relative Savings
6 months Nov - April	0	16.3	100%

Daily Electricity Consumption for Heating and Cooling (kWh/Unit)

Period	EcoCampus Unit	Standard Unit	Relative Savings
6 months Nov - April	0	16.3	100%
6 months May - Oct	14.1	26.1	46%

Daily Electricity Consumption for Heating and Cooling (kWh/Unit)

Period	EcoCampus Unit	Standard Unit	Relative Savings
6 months Nov - April	0	16.3	100%
6 months May - Oct	14.1	26.1	46%
12 months Nov - Oct	14.1	42.5	67%

Center for Creative Ecology
www.KibbutzLotan.com

Yearlong Energy Evaluation
Conclusions

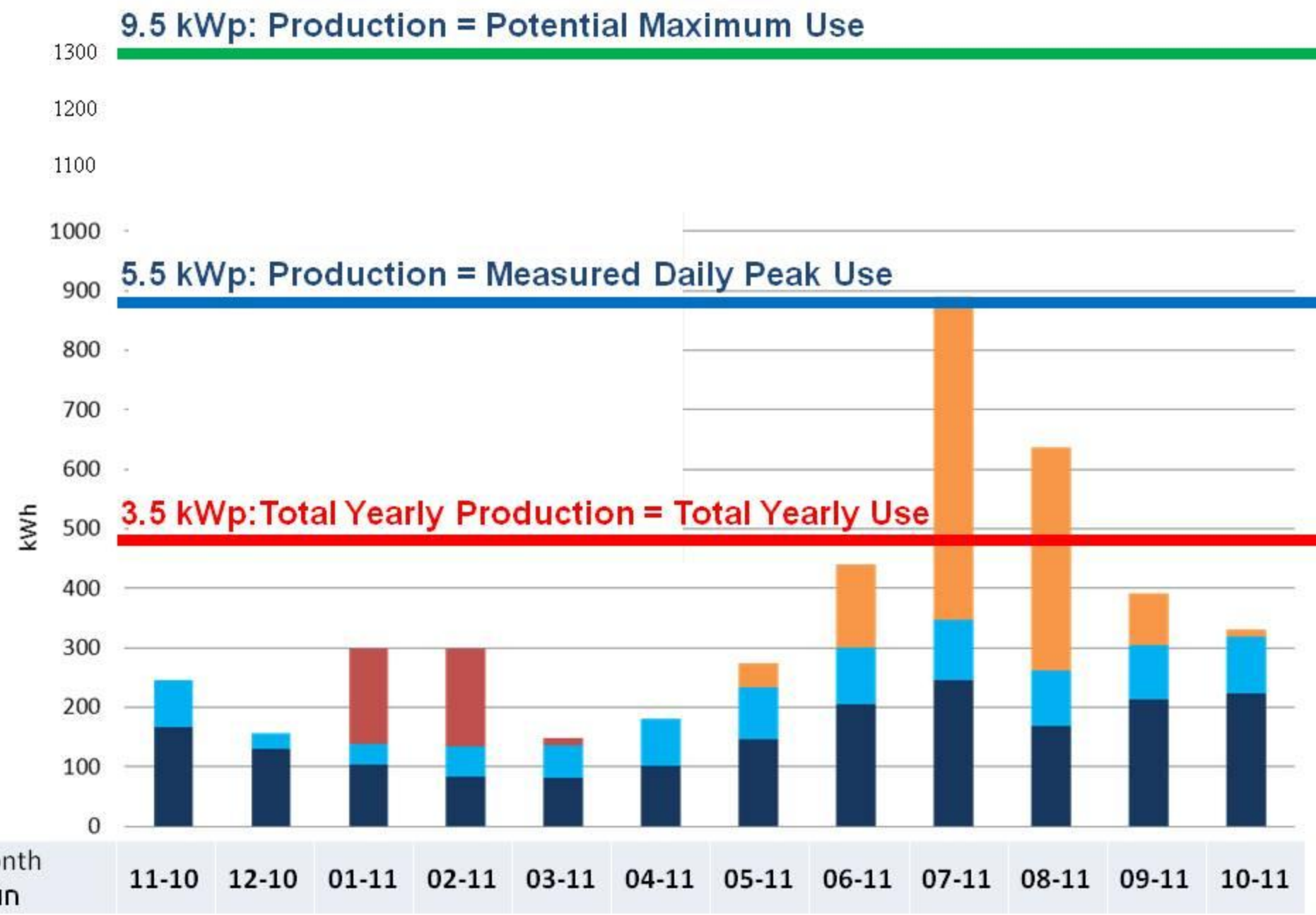
- Evaluate efficiency of passive solar heating in winter > INSULATION + WINDOW PLACEMENT
- Compare Air Conditioning energy savings in summer >

Center for Creative Ecology
www.KibbutzLotan.com

Yearlong Energy Evaluation
Conclusions

- Evaluate efficiency of passive solar heating in winter > INSULATION + WINDOW PLACEMENT
- Compare Air Conditioning energy savings in summer > INSULATION + WINDOW OPERATION

Sizing the PV System Based on EcoCampus Energy Use



Center for Creative Ecology
www.KibbutzLotan.com

Yearlong Energy Evaluation
Conclusions

- Evaluate efficiency of passive solar heating in winter > INSULATION + WINDOW PLACEMENT
- Compare Air Conditioning energy savings in summer > INSULATION ABOVE CURRENT CODES
- Determine size of PV system to power neighborhood > [3.5 to 9.5 kWp] EFFICIENT BUILDINGS = SMALLER PV SYSTEMS

Thank You

Center for Creative Ecology

www.KibbutzLotan.com