Category: **Sustainable Project of the Year**

Project Nominated: **DEWA Solar Innovation Centre**

Status: **Detailed Design in Progress**

Client: **Dubai Electricity and Water Authority**

Lead Consultant: **Ted Jacob Engineering Group**

Certification: **LEED Platinum**

TJEG's appointment as lead consultant on the DEWA Solar Innovation Centre is testament to the company's sustainable and innovative design focus. The Centre forms the focal point for Dubai's solar technologies at Mohammed bin Rashid Solar Park. The facility will showcase the history, evolution and application of this abundant sustainable source of energy, by means of workshops, conferences and exhibitions for students, professionals and the public. TJEG's role as lead consultant and project managers for the design and construction phases has harnessed TJEG's global experience in green buildings. The project aims to be 'LEED Platinum' accredited on completion; hence all facets of the project and its life cycle must embody sustainability and reduce carbon emissions.

In order to achieve the LEED Platinum rating, numerous aspects of the design have been improved with consideration to their impact on energy and carbon usage in a holistic sense. Achievement of Leed Platinum is particularly difficult on projects in the Middle East due to the challenging environmental conditions. The first point of call on the project was to optimise the passive elements of the building such as the structural arrangement for air permeability throughout the internal spaces and then moving onto refinement of the building services systems. Some examples of the energy efficient modifications are the energy recovery unit (ERU) that recycles energy from the exhaust air to pre-cool the fresh air, use of water cooled chillers, variable air volume systems for large spaces, intelligent building controls and LED lighting.

Renewable technologies have also been utilised in the form of solar thermal systems to pre-heat the hot water system. Similarly, the addition of 1000m2 of photo voltaic surfaces generates the centre's own electricity. The original code based baseline model estimated an annual energy consumption of approximately 1,330,778 kWh, but after making the modifications the energy consumption has been reduced by 40% to 803,732 kWh, which earns an admirable 14 LEED points towards the platinum accreditation.

The energy savings extend further than building services systems to address the sourced location and embodied carbon of structural materials and architectural finishes employed. Similarly, the connectivity with public transportation networks, shading, landscaping, construction processes have also been modified to enable an iconic, innovative and sustainable building that embodies the Dubai Integrated Energy Strategy 2030.

Optimizing Energy Performance

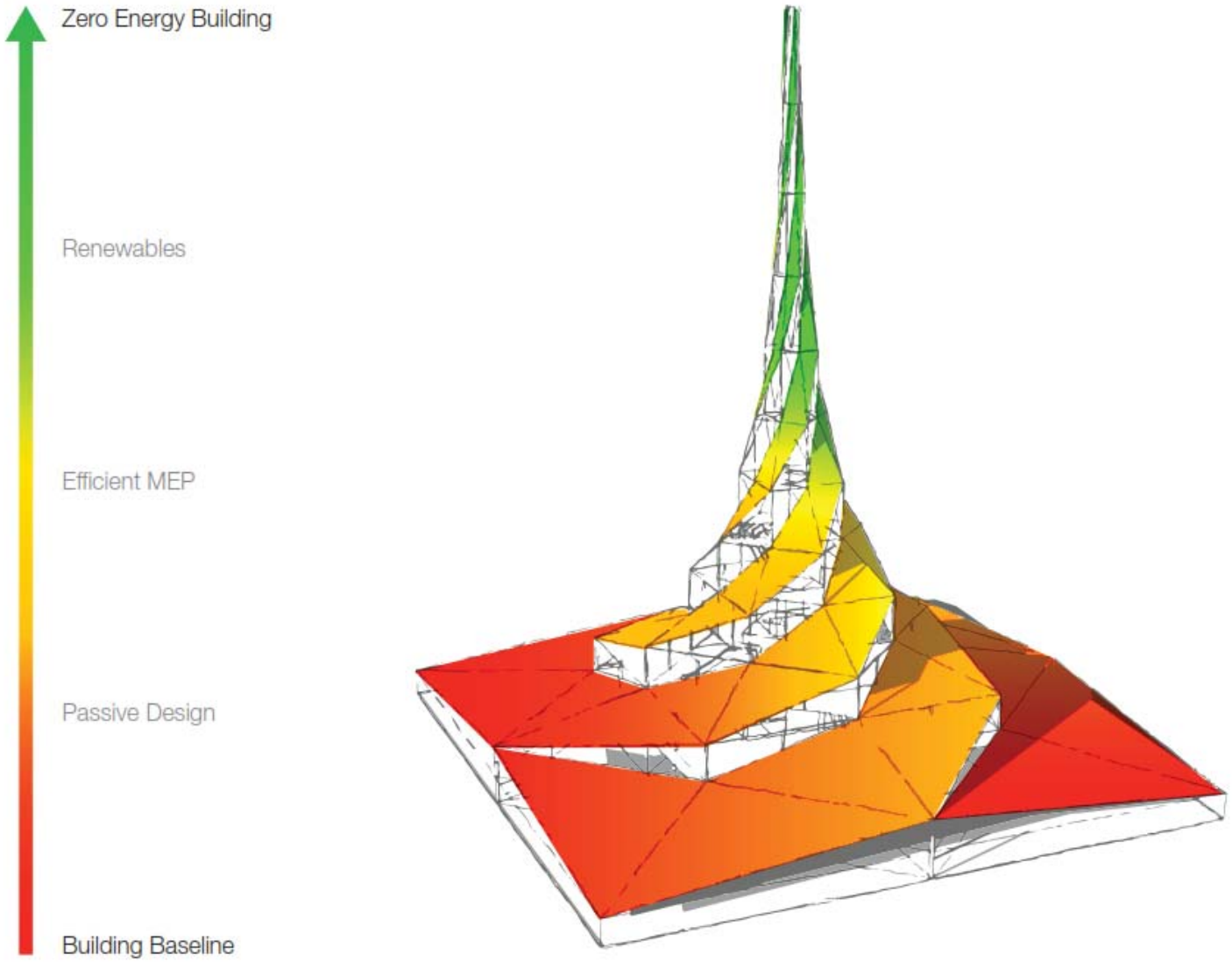
Due to high sustainable and LEED Platinum requirements, along with the clients requirements to have the building an 'Icon of Sustainability' for the region and the world, it is fundamental to the design of the building that optimizing the energy consumption of the Innovation centre is at the core of the design process we need to apply.

In order to achieve this it is proposed to follow the following design process to minimize the buildings reliance on the grid supplied energy:

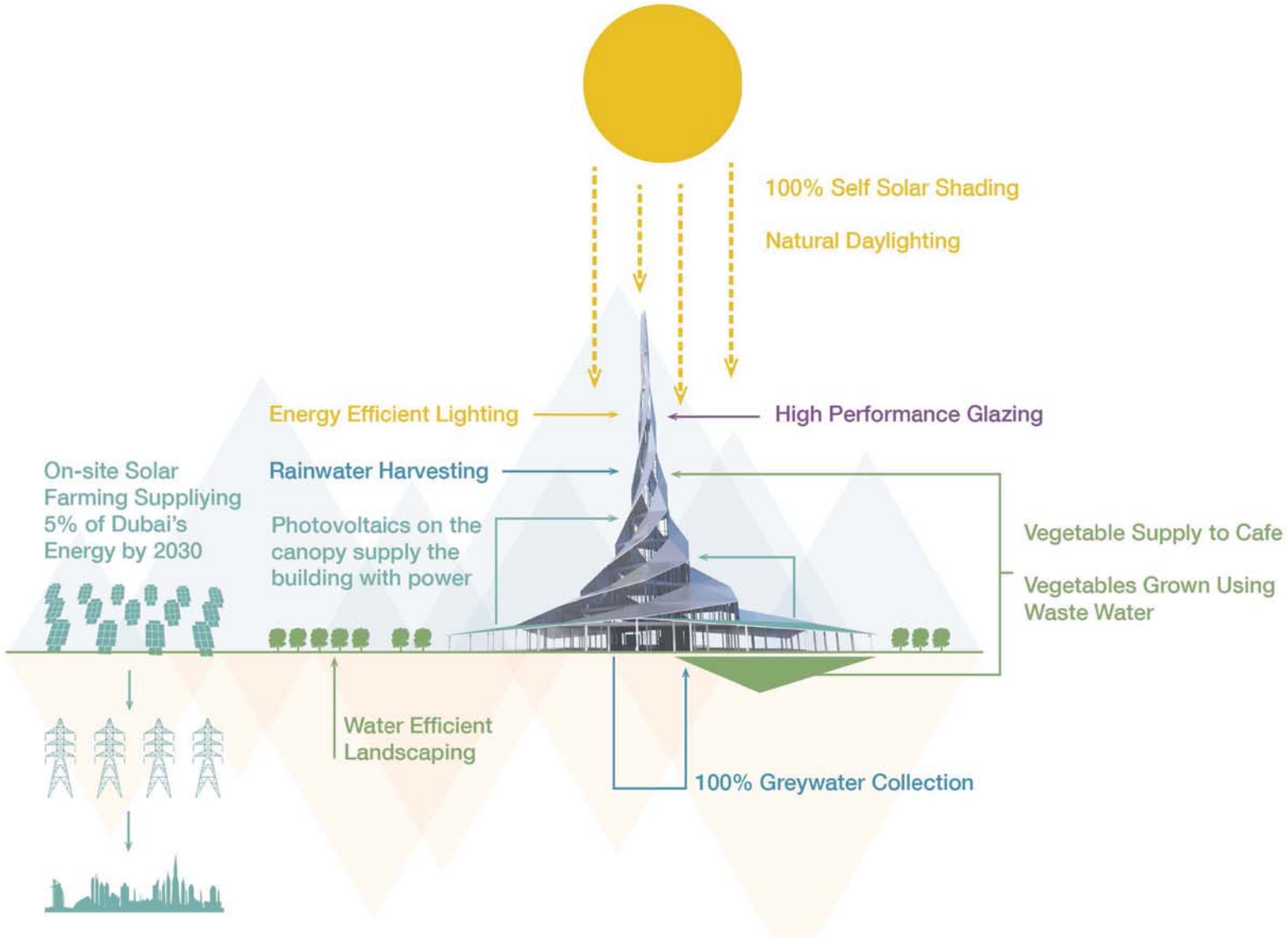
1. Create a baseline predicted energy consumption for the building, using ASHRAE 90.1 2007, as per LEED requirements.
2. Make improvements to the building envelope and incorporate passive design elements to the building structure
3. Apply efficient MEP systems to service the building
4. Apply on-site renewable technologies to reduce the remaining predicted grid supply energy consumption

By following this process it is felt that the building can meet the requirements of the project and largely contribute to the overall LEED Platinum rating.

This process can be represented as follows, in the same shape as the Solar Innovation Centre, and a similar graphical representation is proposed to be part of the exhibition once complete to show visitors how the design of the building was undertaken.



Application of Sustainable Technologies



LEED Assessment - MEP Credits

The project is subject to achieving a LEED Platinum accreditation. In order to achieve this a number of enhancements need to be made to the MEP systems where possible.

The following is a high level summary of how the optional MEP relevant credits will or will not be achieved.

Credit SS-6.1: Stormwater Design, Quantity Control (TARGETTED)

Calculations will be undertaken that determine the rates and quantities for pre and post development conditions for the required storm event. A storm water management plan will then be incorporated to manage these post development conditions.

Credit SS-6.2: Stormwater Design, Quality Control (TARGETTED)

It is currently proposed that 100% of Stormwater is collected and re-utilised via the grey water treatment system.

During periods of high Stormwater flow by pass in the collection system will be included that will discharge the excess Stormwater to a soakaway pit for attenuation and filtration.

Credit SS-8.0: Light Pollution Reduction (NOT TARGETTED)

Based on the current design and requirements it is felt that this credit is not achievable.

Credit WE-2.0: Innovative Waste Water Technologies (TARGETTED)

In order to achieve compliance with this credit we have allowed for 100% of grey water and sewage water to be treated and re-cycled within the building for non-potable water supplies, such as irrigation, cooling tower make up and sanitary flushing.

Credit EA-1.0: Optimising Energy Performance (TARGETTED)

LEED Credit EA1 is perhaps the most important Credit of the assessment and certainly the aspirational Platinum rating cannot be achieved without a Point score here towards the higher end of the 19 available. The initial stage pre-assessment has targeted 15 of the 19 points meaning a reduction over the ASHRAE 90.1 Appendix G baseline model of 40%.

Following the optimising energy performance process discussed previously in this report improvements are made to the predicted energy baseline through passive design, efficient MEP and lastly application of renewable technologies.

Based on the schematic design information the baseline model has been simulated resulting in an annual energy consumption of approximately:

1,330,778.76 kWh

The proposed building design has an annual energy consumption of approximately:

803,732.43 kWh

This saving equates to 39.6% and earns 14 LEED Points.

Although this current calculation does not meet the target of 15 credits, the energy reduction is only 0.4% off the target. It is therefore felt that this can difference can be achieved through refinement of the design through the next stages of the design process.

Credit EA-2.0: On-Site Renewable Energy (TARGETTED)

Due to the relationship between the different stages of the optimising energy performance process, this credit is reliant on the model calculations undertaken in EA-1.0, and 7 credits have been targeted which equates to a 14% contribution.

For this credit, it is the percentage contribution of the renewable technologies, in this case photovoltaic and solar thermal system, of the predicted reduced energy consumption following incorporation of passive design and efficient MEP.

Based on the current calculations this equates to the following:

Renewable Technologies Contribution	=	215,793.68 kWH
Reduced Energy Consumption (Following improvements)	=	1,017,333.81 kWH
Percentage Contribution	=	21.2%

This equates to 7 credits as targeted.

Credit EA-3.0: Enhanced Commissioning (TARGETTED)

This credit will be led by EMS directly, with input as required from the MEP team over design duties.

Credit EA-4.0: Enhanced Refrigerant Management (TARGETTED)

The specified chillers will be using R-134a refrigerant, which complies with the credit requirements.

Credit EA-5.0: Measurement & Verification (TARGETTED)

This credit will be led by EMS directly, with input as required from the MEP team over design duties.

Credit EA-6.0: Green Power (TARGETTED)

The project owner is prepared to purchase green-e certified Renewable Energy Credits (RECs) for 100% of the project's energy needs for a two year period after occupancy.

Credit IAQ-1: Outdoor Air Delivery Monitoring (TARGETTED)

The project team will install an outdoor air delivery monitoring system to monitor the ventilation rates based on the ASHREA 62.1-2007 and trigger an alarm in case the ventilation rates varies than the set point by 10% or more.

Credit IAQ-2: Increased Ventilation (TARGETTED)

An additional 30% duty has been incorporated into the ventilation requirements, which are over and above the standard requirements of ASHARE 62.1-2007.

Credit IAQ-3.1: Construction IAQ Management Plan, During Occupancy (TARGETTED)

During construction, the project is required to meet, or even exceed SMACNA guidelines, as well as protect stored on-site materials from moisture damage. If the project is using permanent air handlers during construction, MERV 8 filters are recommended for usage, and are to be replaced before occupancy. In addition the credit requires the contractor store all materials in a clean and dry area, as well as protect them from weather and construction traffic.

The design team anticipates developing plan jointly with the contractor. The requirements of this credit will be part of the tendering documents.

Credit IAQ-3.2: Construction IAQ Management Plan, Before Occupancy (TARGETTED)

The project team anticipates developing plan jointly with the contractor. The requirements of this credit will be part of the tendering documents.

Credit IAQ-5.0: Indoor Chemical & Pollutant Source Control (TARGETTED)

Air filtration will be incorporated into the mechanical system that provides a minimum efficiency reporting value (MERV) of 13 or better.

Credit IAQ-6.1: Controllability of Systems, Lighting (TARGETTED)

Lighting controls are proposed in the project using motion sensors, daylight sensors, and time clock which complies with credit requirements.

Credit IAQ-6.2: Controllability of Systems, Thermal Comfort (TARGETTED)

The project will provide more than 50% of the occupants with individual thermal controls, and is therefore in credit compliance.

Credit IAQ-7.1: Thermal Comfort, Design (TARGETTED)

The set point temperature and humidity allowance meet ASHRAE 55.2007 requirements.

Data will be provided regarding the seasonal temperatures and humidity design criteria.

Credit IAQ-7.2: Thermal Comfort, Verification (TARGETTED)

The following survey will have to be carried out post occupancy of the buildings on the site:

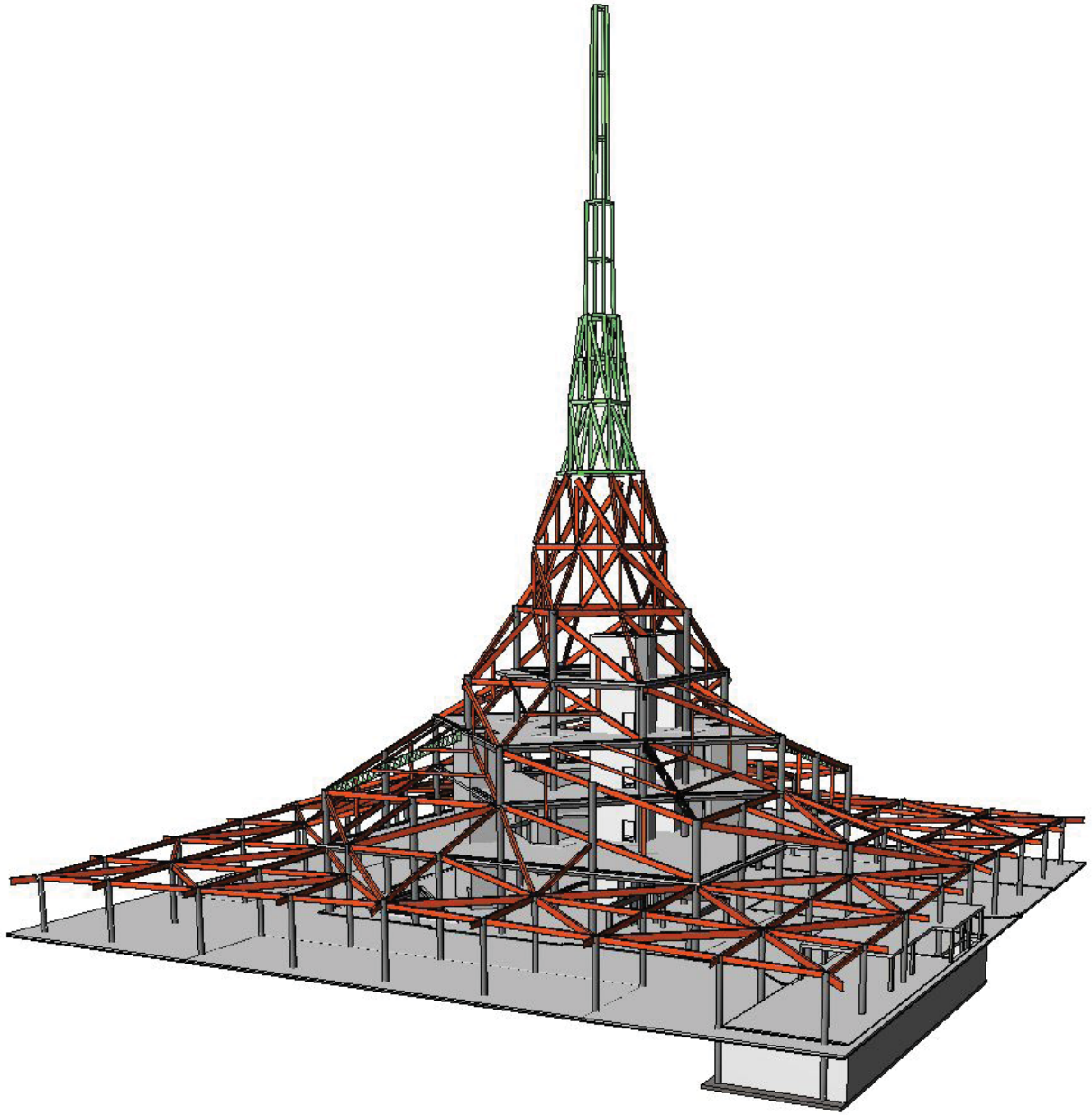
- Agree to implement a thermal comfort survey of building occupants within a period of six to 18 months after occupancy.
- This survey should collect anonymous responses about thermal comfort in the building including an assessment of overall satisfaction with thermal performance and identification of thermal comfort-related problems.

In addition, it is necessary to agree to develop a plan for corrective action if the survey results indicate that more than 20% of occupants are dissatisfied with thermal comfort in the building. This plan will include measurement of relevant environmental variables in problem areas in accordance with ASHRAE Standard 55.

The design team will compile a draft thermal comfort survey and provided a written statement of compliance, in addition to a notation on the MEP drawings indicating credit specifications.

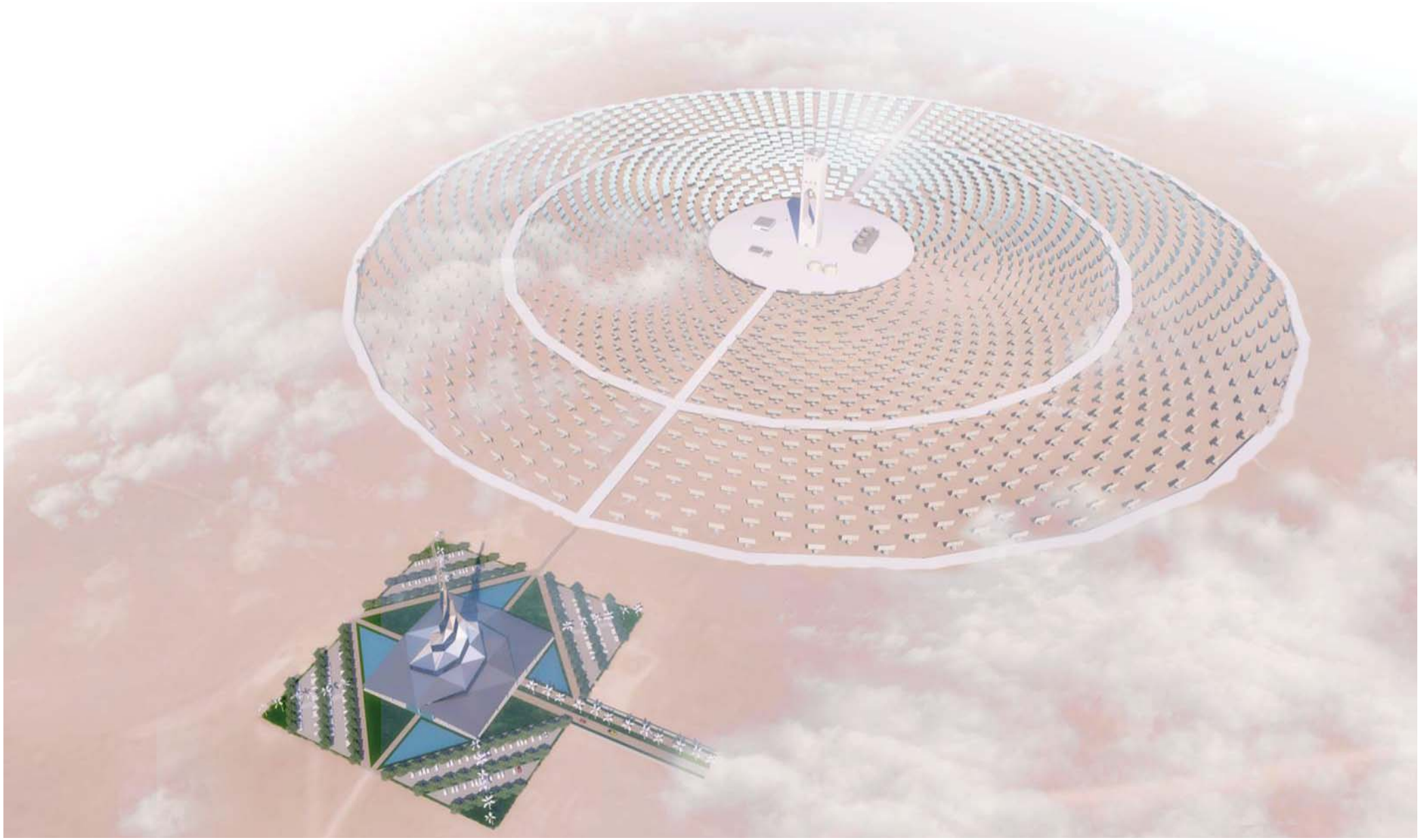
Day and Night Views

Revit Model - Whole Building



Location of the Solar Innovation Centre within the Mohammed bin Rashid Solar Park

TED JACOB ENGINEERING GROUP



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