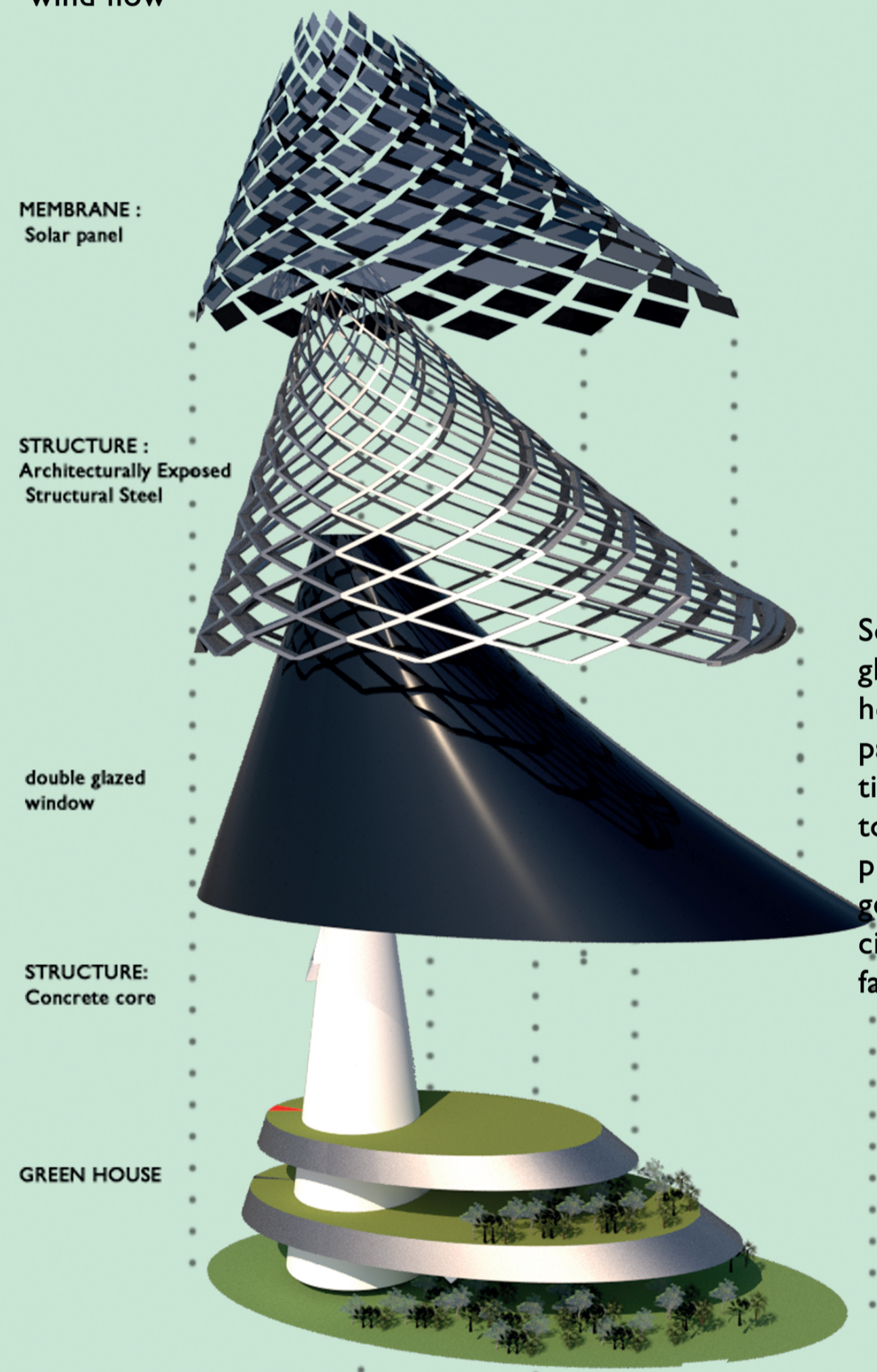


Green tower

Economy , Structure

A contextual design using two layers of the structure: a concrete core covering the facilities and turbine and an Architecturally Exposed steel system structure with double skin façade to cover the building. The concrete core includes two ducts for entrance wind that will go to the generator at the bottom of the building and another external duct to take out the wind. The solar panel placed on the Exposed steel system structure along the solar radiation path. The project designed on the study about sun orientation and wind flow.



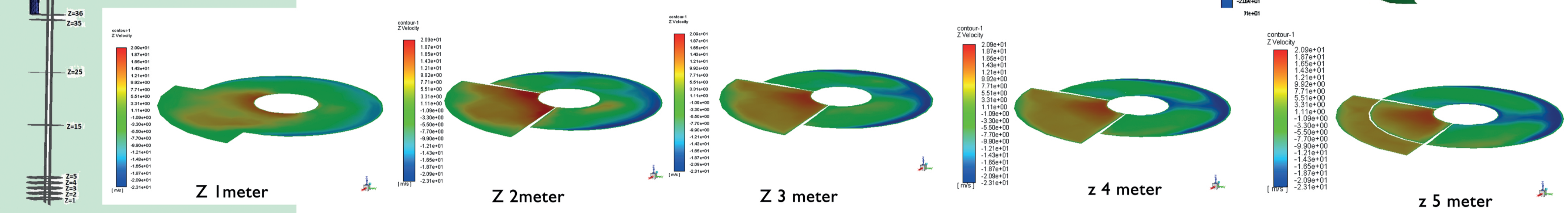
Solar panel and double glazed facade helps the hot air flow behind the panels and get hotter till the top of the tower so the negative pressure will be stronger and helps the air circulation comes out faster.

Wind tower height is 45 meter

Wind catcher model in Ansys fluent programm

We simulate the windtower to identify the best turbine position based on maximum speed of the wind in two conditions the first one at zero wind outside speed and based on the pressure that comes from the height of the tower, the Second one at 10 m/s outside (incoming) wind speed .

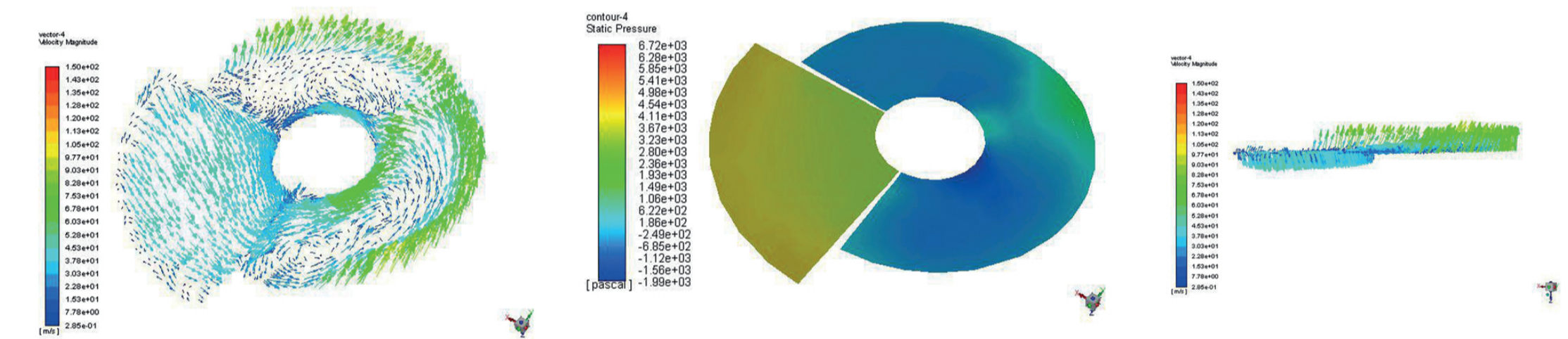
Wind catcher model based on five vertical position at zero wind speed



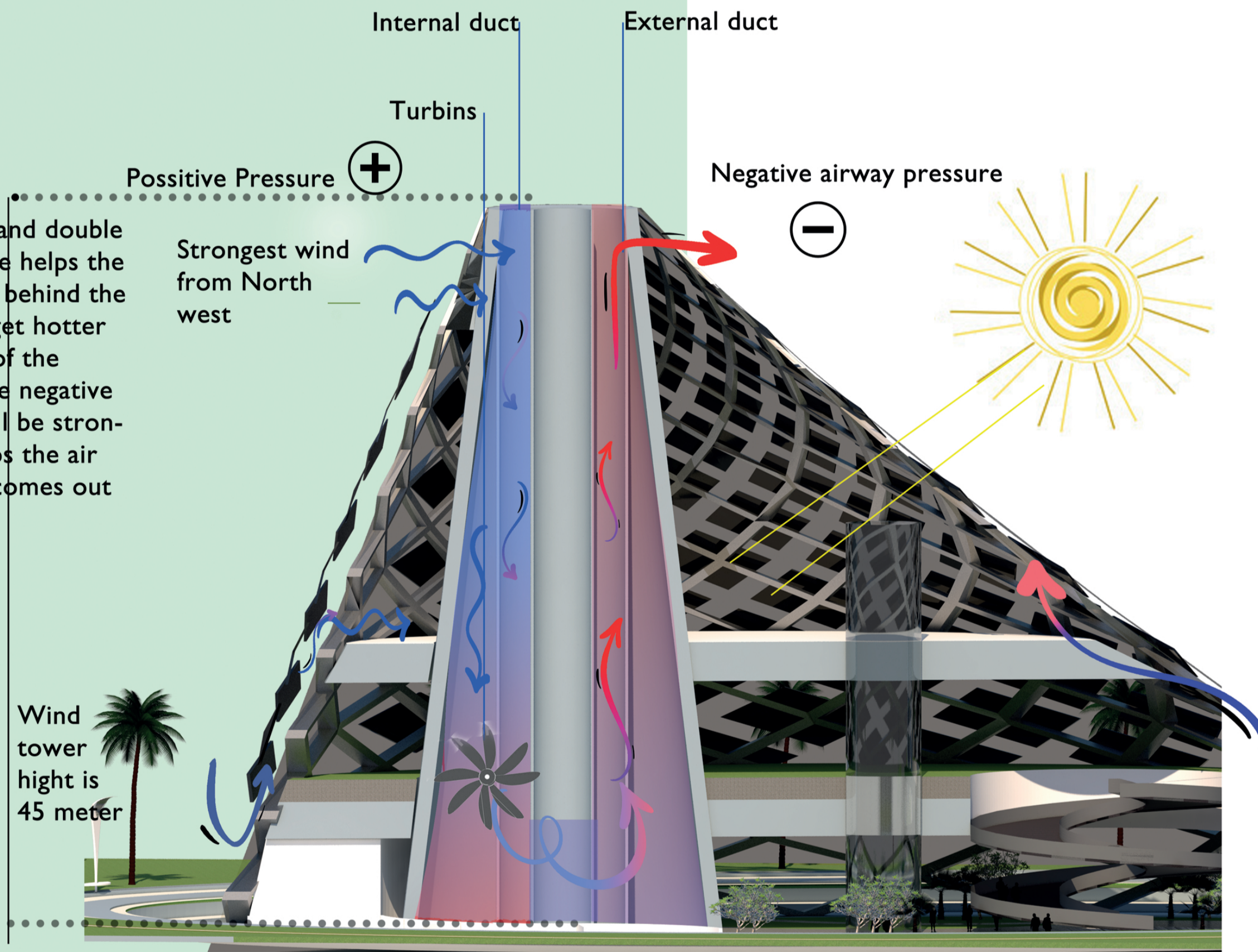
Simulation result shows that the best position for the turbines is three meter from bottom. Average speed 3 meters from the bottom: 17.5 meters per second

Transmission energy from this section if a turbine with a diameter of one meter is at this point
 $E = 1/2 \times \rho \times V^3 \times A \times t$
 If the entire turbine section is covered and turbine efficiency is 50%, the turbine output will be 10 kW.

Wind catcher Simulation at 3 meter high position with 10 m/s outside wind speed



The second simulation result shows that by having a minimum outside wind speed (at 45 meter high ,10 m/s wind speed ,in abudhabi), the speed in ducts increases Strongly to 40m/s



Economic justification of the project

Green house electricity kw/h year: 7142
 Solar pannel electricity kw/h year: 623330
 Total Kwh year: 616188

revenue from electricity (AED): 123237.6
 revenue from electricity (USD): 33550

| | Revenue (USD) |
|--------------|----------------|
| Tomato | 144,670 |
| lettuce | 11,907 |
| cucumber | 18773.5 |
| pepper | 42100 |
| strawberry | 117880 |
| Total | 335,331 |

| Time (year) | Sum of total Revenue (USD) | Fixed cost |
|-------------|----------------------------|----------------|
| 1 \$ | 368,880.50 | \$1,660,215.00 |
| 5 \$ | 1,844,402.50 | \$1,660,215.00 |
| 10 \$ | 3,688,805.00 | \$1,660,215.00 |
| 15 \$ | 5,533,207.50 | \$1,660,215.00 |
| 20 \$ | 7,377,610.00 | \$1,660,215.00 |
| 25 \$ | 9,222,012.50 | \$1,660,215.00 |

Total cost of Concrete (AED): 1216080
 Total cost of Steel building: 444135

