

Concentrated Energy Towers

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SITUATION

Renewable energy is a key aspect in providing a safe source of energy for future generations. One of the main sources of renewable energy is solar energy. Solar energy is radiant light and heat from the Sun that is harnessed using a range of ever-evolving technologies.

One of the ways to acquire solar energy is through the use of concentrated energy towers (CET). These towers work by concentrating sunlight to heat up molten salt located inside the tower.

The heat gained is used to power a steam turbine power plant [1]. These towers are very effective in places where the sunlight is abundant, such as the area around Seville City in Spain.

Even though CET are expensive to build, to operate and maintain, solar power is still one of the best ways to harness and provide energy safely without affecting the environment.

Research question:

How can concentrated energy towers be enhanced so that they can operate efficiently through thermal and calibration methods?



Figure 1: Concentrated energy tower, California, USA [2]

PROBLEMS

1. Cost factors [3]
Tower construction Heliostat panels Operation/Maintenance Labor
2. Efficiency factors
3. Finding a suitable location (site) [3]
Load bearing soil Open space required.
4. Weather conditions
Low cloud coverage

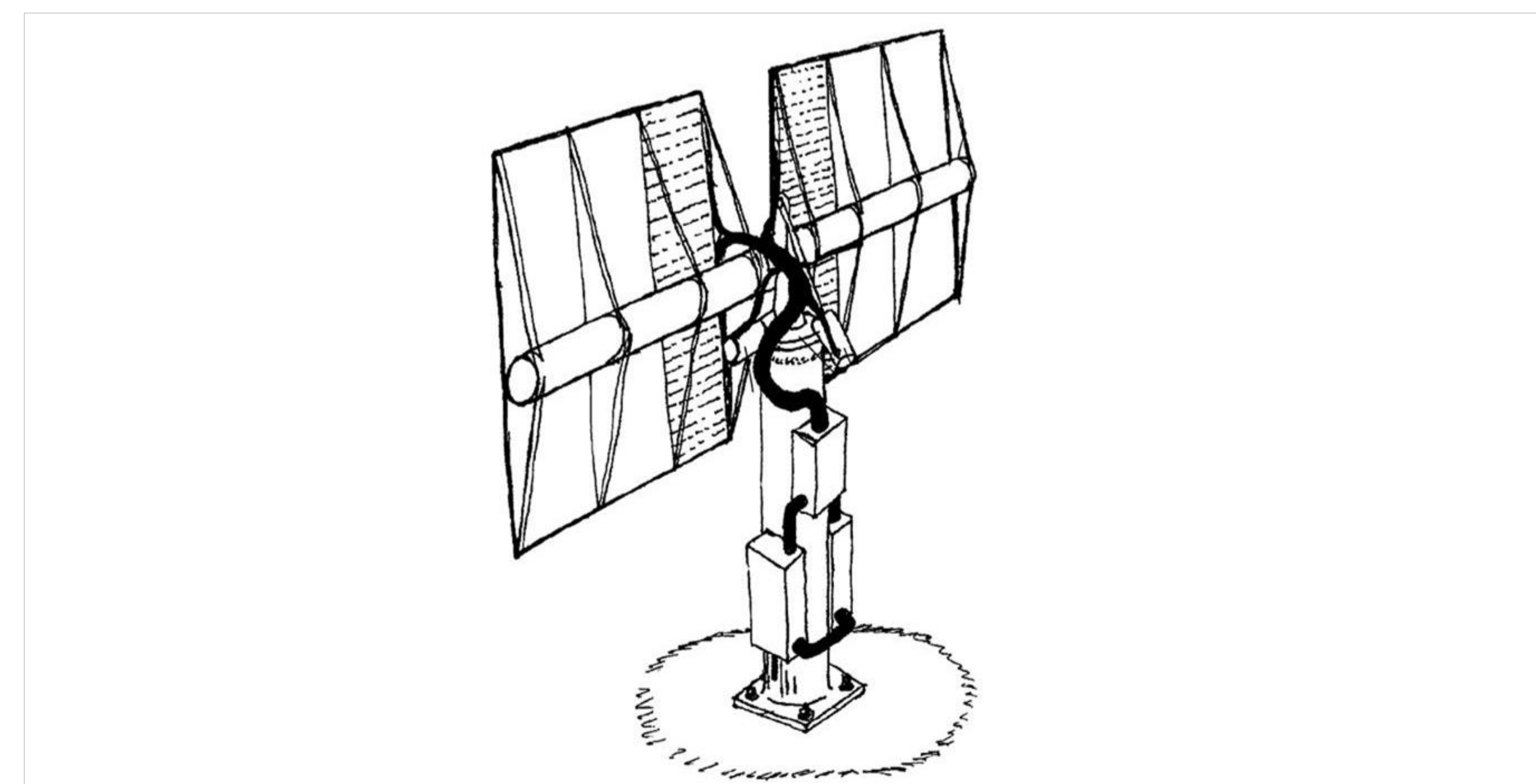


Figure 2: Heliostat panel [4]

SOLUTIONS

1. Isolated or coastal areas
2. Heat transfer fluid
3. Control schemes for calibration
Sensor based Computer based
4. Steam turbine power cycles

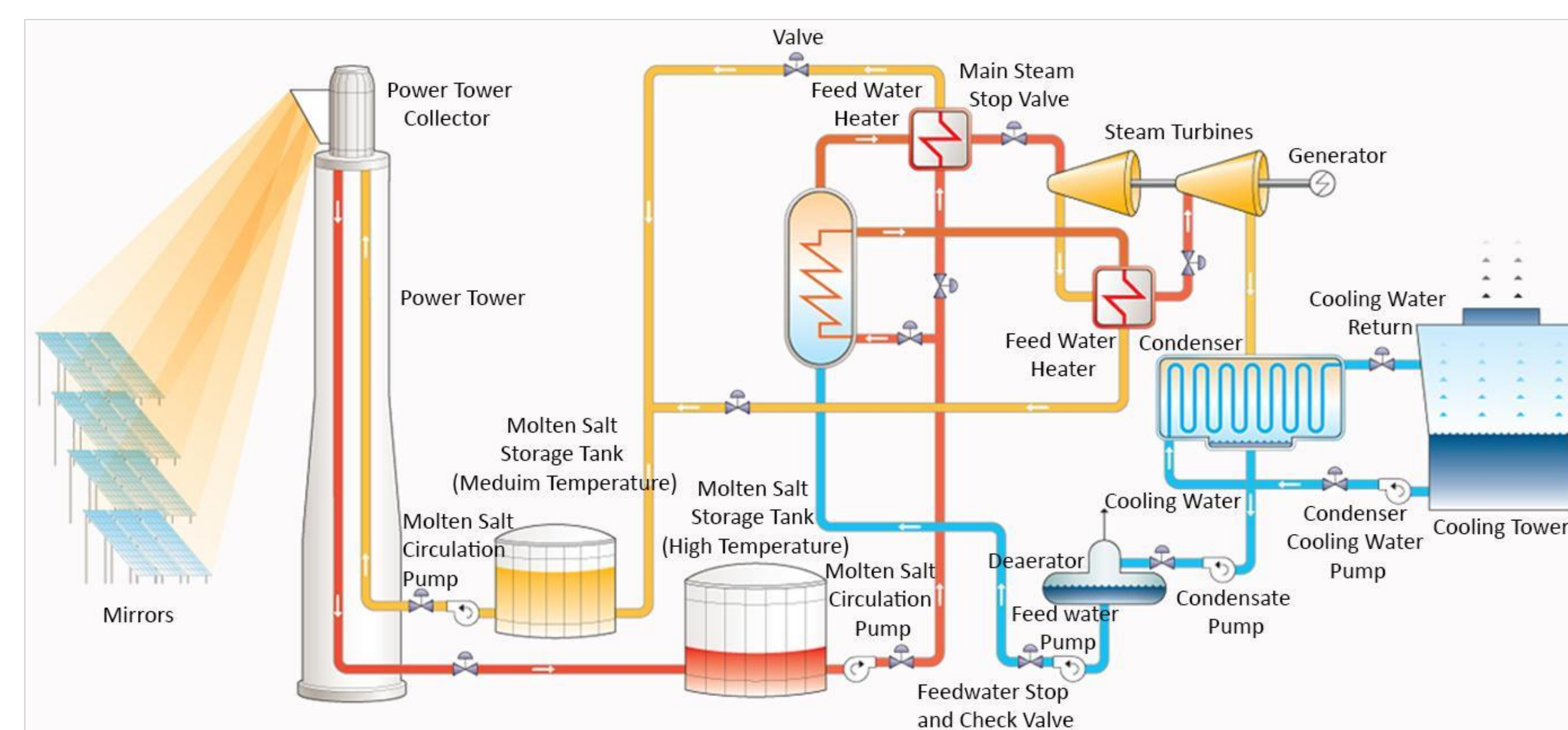


Figure 3: Power tower process diagram [5]

EVALUATION

1. Concentrated energy towers need to be optimized so that they can produce energy at a cheaper cost and be as effective as energy generators.

2. Computer based methods are more accurate than sensor based methods, however they require a higher computational capacity.

3. Heliostat calibration methods constitute one of the largest costs (time and money). A sensor based control system can contain project costs and provide an efficient output.

4. Due to the fact that concentrated energy towers are heavy, it is important to ensure that the tower is built on soil that is capable of sustaining the overall load.







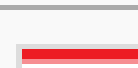
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 United States	1,634	+752
 India	225	+175
 United Arab Emirates	100	0
 Algeria	25	0
 Egypt	20	0
 Morocco	20	0
 Australia	12	0
 China	10	0
 Thailand	5	0

Figure 4: National CET Capacities in 2014, compared to the year 2015 [6]

REFERENCES

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