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Harvesting Energy From Footsteps

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Harvesting Energy From Footsteps

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Situation

- The UAE is currently undergoing industrialization which increases demand for energy and thus increases the usage of fossil fuels to cover this increasing demand for energy [1].
- Fossil fuels are limited and gradually depleting, so it is not considered a reliable source of energy [2].

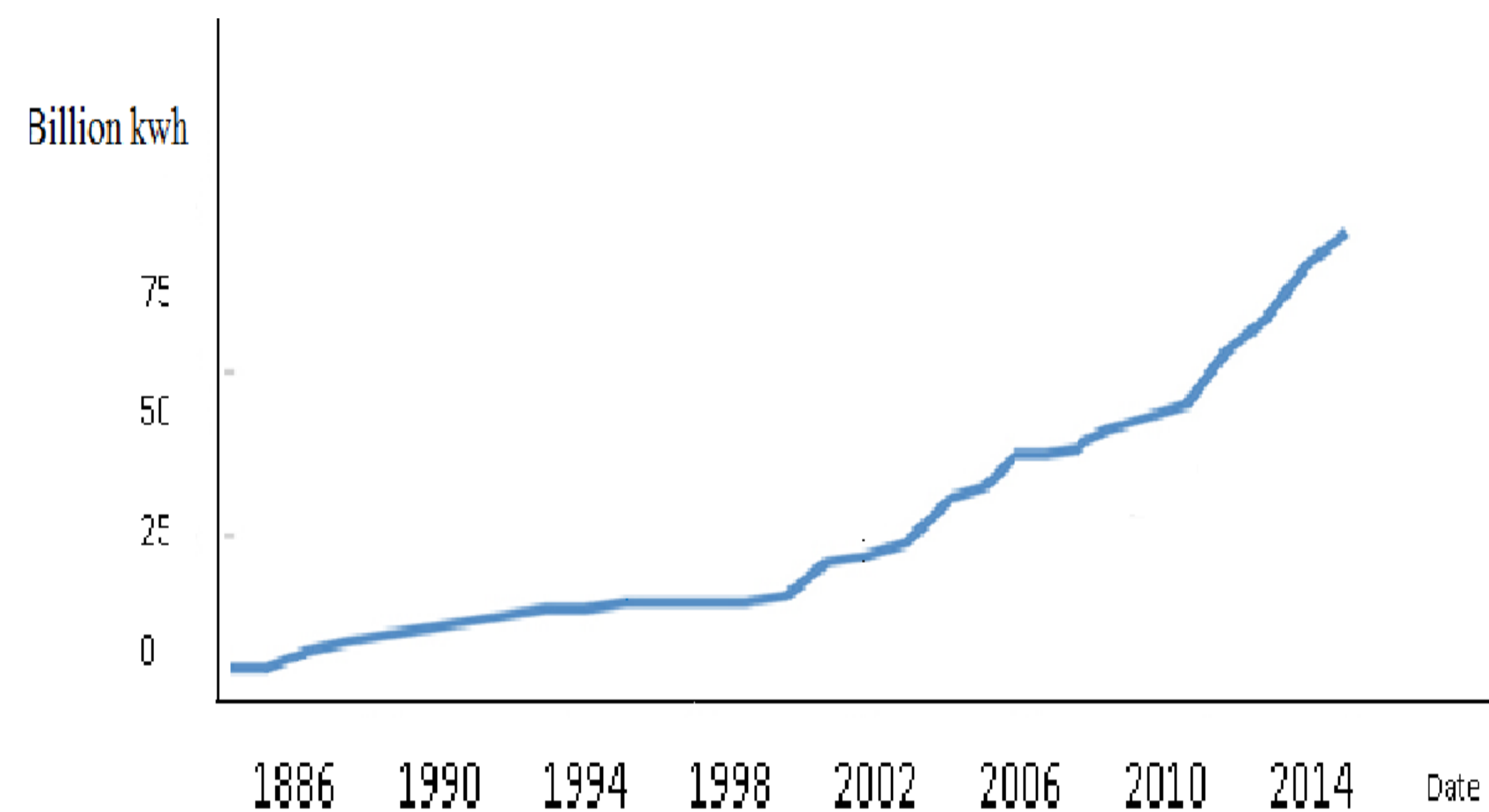


Figure 1: Increase in demand for electricity in the United Arab Emirates

Credits: <http://www.carboun.com/sustainable-design/passive-cooling-responding-to-uae-soaring-electricity-demand/>

Problems

- The recycled rubber-surfaced tile is expensive to manufacture for mass production.
- A concrete surfaced-tile would be heavier therefore, it requires more support.
- The placed piezoelectric material should be of optimum characteristics for the project.
- The tiles should be placed in a densely-populated location in order to get high rate of footfall.

Solutions

- Replacing the recycled rubber surface tiles with concrete surface tiles.
- Substituting springs with new stainless steel springs that will withstand the force applied by the concrete tiles.
- Laying out three major criteria for choosing the right piezoelectric material [3].
- Placing the tiles at the entrances and exits of the two engineering buildings.

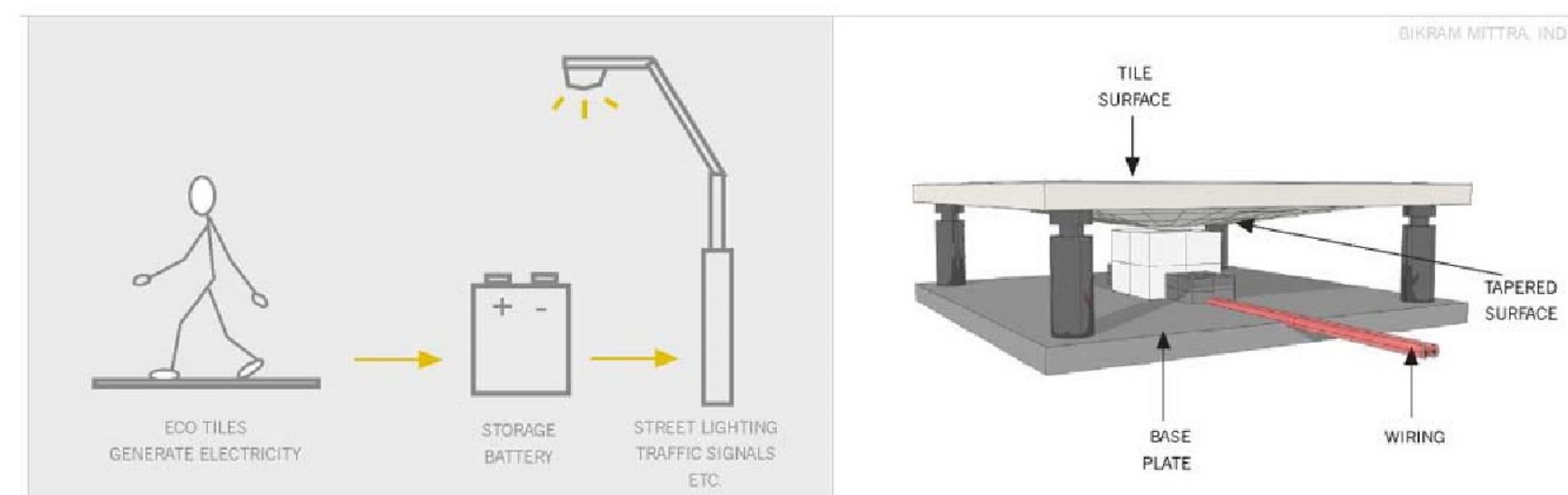
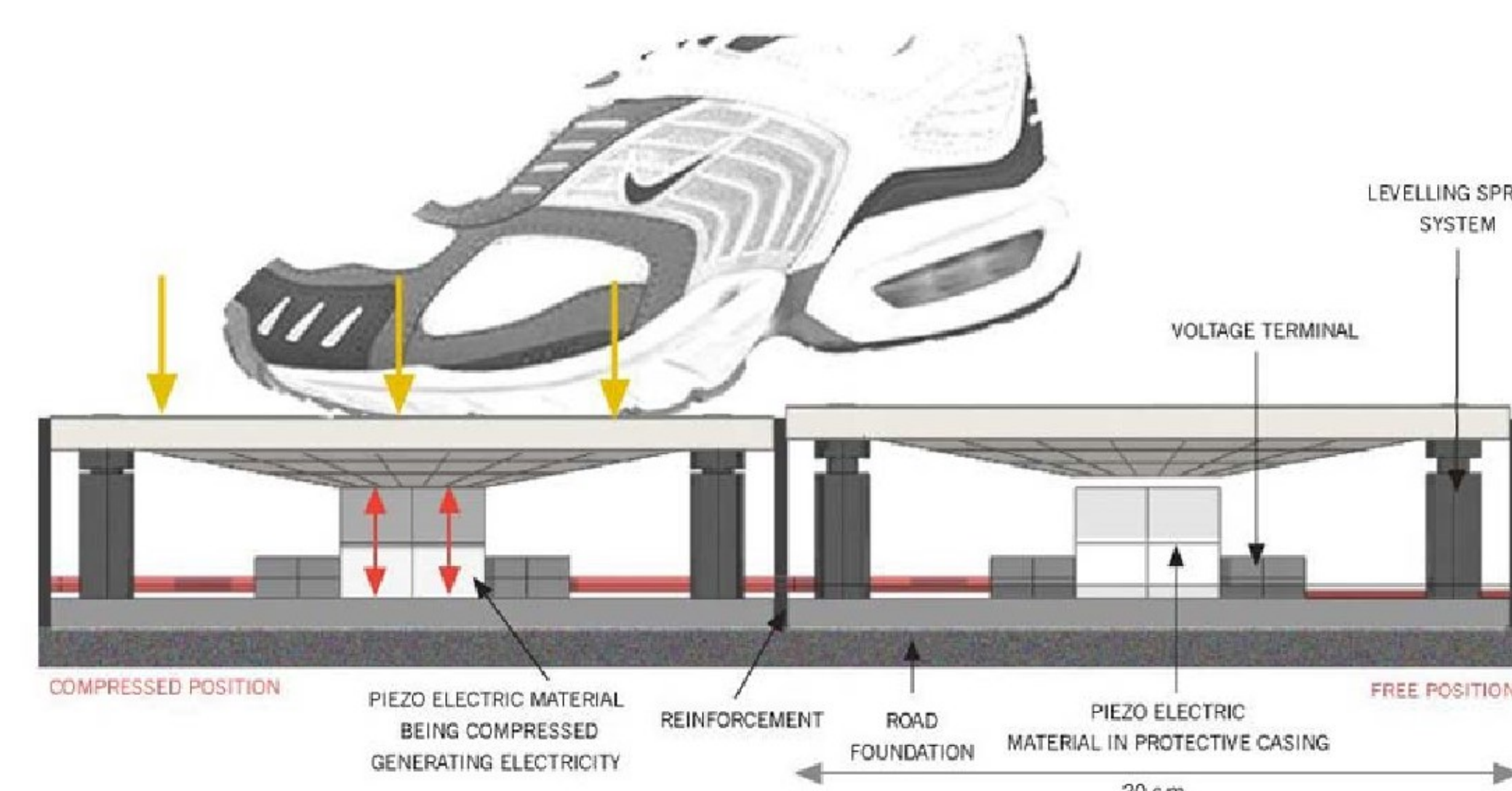


Figure 3: The "Smart Tile" System

Credits: http://www.core77.com/challenge/humanpower/pages/2032_3.htm

Colleges	No. of Students
COE	2615
SBM	1432
CAS	816
CAAD	712

Table 1: Number of registered students in AUS

Credits: http://www.aus.edu/info/200147/current_students

Evaluation

- Decreasing the manufacturing cost of the reinforcement tile from \$12.4 to less than \$2 per tile .
- Increasing the life span of the tile from 5 years to 7 years.
- Preventing the failure of the tile by increasing the support of the structure [4].
- Minimizing energy loss due to resistance in the wires.
- Choosing PZT (Lead Zirconate Titanate) as the suitable piezo-electric material for this project.
- Maximizing the amount of energy generated due to the greater amount of footfall.
- Boosting overall efficiency of the tiles, thus generating more electricity per unit time.

Item	Cost (\$)
Lead Zirconate Titanate (PZT) (100g)	55.82
Concrete Tile	1.90
Springs (x4)	2
Total price	59.72

Table 2: Cost analysis

References

- [1] M. Khan, "UAE Foreign Policy Achievements," Defence Journal, vol. 16, no.4, pp. 26-38, 2012. [Online]. Available: ProQuest, <http://ezproxy.aus.edu/login?url=http://search.proquest.com/docview/1285262711?accountid=16946>.
- [2] L. Grant, "When Will the Oil Run Out?" Science, vol. 309, no. 5731, pp. 52-54, 2005. [Online]. Available: ProQuest, <http://ezproxy.aus.edu/login?url=http://search.proquest.com/docview/213585831?accountid=16946>.
- [3] "Use of Piezoelectric Salts", Feb. 13, 2010. [online]. Available: <http://energyphysics.wikispaces.com/Use+of+Piezoelectrics+%28Human+Powered+Energy%29>
- [4] "Accessories for Emergency Stops and Pilot Devices," Jan 21, 2014. [Online]. Available: <http://www.mena.abb.com/product/seitp329/3070031e22faf37cc1257981004767be.aspx?tabKey=2&gid=ABB2TLA050211R0004&cid=9AAC172559>