# 2010
# MASSACHUSETTS CLEAN TECHNOLOGY AWARDS

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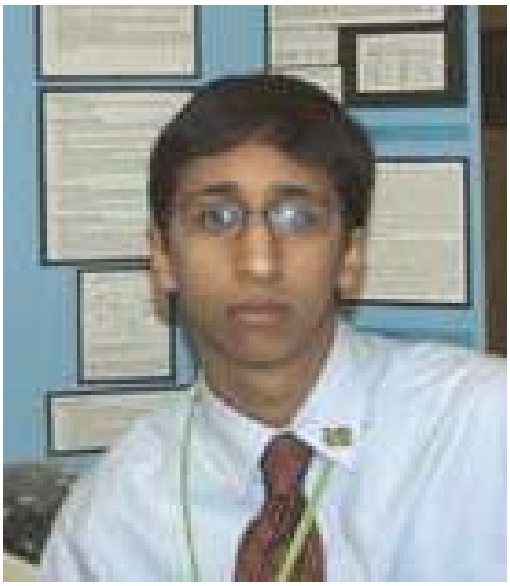

## Region II: Central Massachusetts

## Milan Desai: Massachusetts Academy of Math and Science, Worcester

## *Honorable Mention, Clean Tech:* "Extracting Renewable Energy from Estuaries"

**About Me:**

I live with my parents in Shrewsbury, Massachusetts, where I have lived since I was 3. Before that, I lived in New Jersey. I have one brother, and he is currently a sophomore at Brown University.

I am currently a junior at the Massachusetts Academy of Math and Science, a specialized magnet school for 50 juniors and 50 seniors. After completing high school, I plan to attend college and major in some topic in science. When I am free, I usually spend my time talking to or hanging out with friends. I also enjoy playing tennis, table-tennis, and baseball, and I never miss out on the opportunity to ski in the winter.

**My Project:**

I have been interested in clean technology ever since I was 12 years old, when my parents bought me a fuel cell car kit. I then became more aware of the countless environmental problems that need to be solved and pursued these research areas in my projects. I became interested in this project specifically when I read an article on Science News concerning Doriano Brogioli's saltwater power generator. I then realized that this new technology both had a great potential in the future of clean energy and needed a large amount of research.

The possibility of energy extraction from the mixing of saltwater (.6 molar sodium chloride) and freshwater (.022 molar sodium chloride) was explored and extended to investigate the feasibility of practical applications. The proposed method involves the assembly of an electric double layer (EDL) supercapacitor made from activated carbon electrodes and a saltwater dielectric. The capacitor is initially charged to approximately 300mV, and freshwater is flushed into the system. The reduced sodium and chloride ion concentrations result in a decrease in the capacitance and a

consequential increase in the stored voltage, which can be discharged from the capacitor in the form of electricity.

The source of energy for this process is the entropy increase from the amalgamation of saltwater and freshwater. The laboratory results are significant; however, the effects of water temperature and true ocean water were investigated to explore the practical viability of this method, which can be used to generate energy from estuaries.

It was determined that the use of true ocean water resulted in a 14% drop in the output voltage, while the temperature differences were too small to significantly impact the energy output of this method. This research presents a clearly discernable pathway towards the generation of energy from the mixing of ocean and river water at estuaries.