

16th October 2017

To whom it may concern:

It is my pleasure to provide this letter with my review for a new program for a Master of Science degree in Electrical Power Systems by the African Center of Excellence in Energy for Sustainable Development (ACE-ESD). This program is scheduled to begin in 2017–2018 and attaining full momentum by 2020–2021. This program is expected to enroll 15 students per year, reaching an eventual population of 40 students.

I am an associate professor in the Dept. of ECE at CSU, where I hold the Lisa and Desi Rhoden Endowed College Professorship in Electrical and Computer Engineering. At CSU ECE I perform sponsored research and teach in areas of electric power engineering and direct the Advanced Power Engineering Laboratory (APEL). I have over 100 publications in journals, conference proceedings, and technical reporting; I have given over 50 invited talks; I have edited 2 books in the field of power engineering; my services as a panelist are frequently sought after by various federal and international funding agencies including the National Science Foundation, the US Dept. of Energy, the John D. and Catherine T. MacArthur Foundation, and the Kuwait Foundation; and, I have received numerous awards for research, education, and service activities from various technical organizations. For more information, see my professional website at <http://www.engr.colostate.edu/ssuryana/>. I base my review on my credentials as a researcher and educator in the field of electrical power systems engineering with over a decade and half experience.

I provide my succinct review in the following list:

- The program is well thought out and is supported by infrastructure as well as funds from ACE-ESD and the World Bank.
- The general accommodations described are adequate. However, the details on the “smart grid lab” are not provided, thus, making it difficult to gauge the importance or applicability of this component to the educational activities mentioned in the program.
- Discussing topics of microgrids and Smart Grids is a commendable and significantly analogous step to the telecom field, where Africa is jumping an intermediate step (i.e., the wired telephone and the interconnected large grid) and proceeding directly to an emerging innovation (i.e., the cell phone and the microgrid). As with the case of the telecom field, there exists the challenge of addressing redundancy (when the microgrid or the cell phone fails).
- Topics of FACTS and HVDC transmission seem misplaced and inapplicable in the concept of microgrids. FACTS and HVDC transmission are pertinent only to large interconnected grids with long transmission lines, not microgrids.
- Most of the topics included various sections are very partially tilted toward power quality. There are other significant aspects of power systems engineering including distribution system planning, design, and operation that are conspicuous by their absence in this plan. Studying power quality alone can be achieved in one course and not an entire (or a major portion of an) M.Sc. program.
- The topic of simulation is applied only to FACTS and HVDC. It is missing in the discussion or study of other topics. Also, the important step of modeling, which precedes

simulation, is absent in the description.

Overall, the plan for the program is good and tenable. The program will benefit very much from adding a module/course on distribution systems engineering and pursuing a more detailed approach toward the lab components and modeling and simulation. I believe this program will contribute favorably to the development of a highly trained workforce skilled in all aspects of electrical power systems engineering in Rwanda.

Should you have any questions regarding review, please feel free to contact me at the coordinates given in this letterhead.

Yours sincerely,

**Siddharth
Suryanarayanan**

Digitally signed by Siddharth Suryanarayanan
DN: cn=Siddharth Suryanarayanan,
o=Colorado State University, ou=ECE,
email=sid@colostate.edu, c=US
Date: 2017.10.16 12:58:22 -06'00'

Siddharth Suryanarayanan, Ph.D.
Lisa and Desi Rhoden Endowed Chair
Associate Professor