

**IEEE P2814 Working Group Meeting  
Minutes  
24 August 2020 / 1:00 PM –2:00 PM (UTC + 1)  
Teleconference**

<https://ieeesa.webex.com/ieeesa/j.php?MTID=m50748a9d7d317c71968300ce34c74fff>

*Minutes Recorded by Dongxiao Wang, WG Vice Chair*

**1. Call to Order**

The meeting was called to order at 1:02 PM (UTC+1) by the Working Group Chair, C. S. Lai.

C.S. Lai determined there was a proper quorum of voting members (9 out of the 10 members were present).

Apologies sent by M. Sanders and John Camilleri for having to miss the meeting.

**2. Roll Call of Individuals & Declaration of Affiliation**

Affiliation FAQs: <http://standards.ieee.org/faqs/affiliation.html>

**3. Approval of Agenda**

C. S. Lai asked for approval of the agenda. Loi Lei Lai put forward a motion; Dongxiao Wang seconded it. There were no objections.

**4. IEEE Patent Policy**

a. Call for Patents

<https://development.standards.ieee.org/myproject/Public/mytools/mob/slideset.pdf>

The call for patents was raised. There were no questions or concerns.

**5. IEEE Copyright Policy**

<https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/other/copyright-policy-WG-meetings.potx>

There were no questions or concerns

**6. Approval of the minutes of the last meeting**

D.Xiao Wang requested that the minutes from the last meeting be approved.

Steve Browning seconded that, and there were no objections.

**7. Comments on Presentation**

*Slide 1 – Slide 6* Introduction/Agenda/ etc.

No comments

*Slide 7* – Scope Statement

No comments

*Slide 8* – Structure of Standard

*No comments*

*Slide 9* – TEA Framework for P2814

(TEA = Techno-Econometric Approach)

C. S. Lai explained the inputs and outputs of the framework to perform techno-economic studies for energy systems. Power flow modelling will be an important aspect to capture the details, in particular the network constraints. There were no further comments.

*Slide 10 Input Section*

C. S. Lai went through more details of each line; Noted that current cost types are relatively simplified as to fixed/variable costs. However, need (for example) decommissioning costs for large scale items. Overall, cost items should be more detailed. Stephen Browning commented that “whether we should be showing main Generation and Storage on the left and the Right hand side being Distribution with Load, Generation and Demand”. C.S. Lai thanked the good suggestion.

*Slide 11 Methodology*

*No comments from members*

*Slide 12 Output*

Key point is to have technical and econometric metrics.

*No comments from members*

*Slide 13 Case Studies*

C.S. Lai presented the idea is to make it easier for practitioners to use information. There were no other comments on this slide.

*Slide 14 Techno-economic Studies*

C. S. Lai presented a review of techno-economic studies for energy systems. Case studies were conducted for several countries/continents. Several types of energy storage were examined including gravity storage. EES degradation cost is studied for the Kenya case study.

*Slide 15 System Context*

C. S. Lai described recent work on an economic and financial appraisal of an off-grid community energy system in Kenya. The system consists of a biogas generator, PV plant and battery. Oleg Ciubarca commented “will this presentation be shared with us after the meeting? Thanks”. C. S. Lai confirmed, as usual, meeting materials including slides will be available on the Working Group website

*Slide 16 Dataset*

C. S. Lai presented and discussed the solar dataset and retail electricity price for Kenya.

*Slide 17 Degradation Effect on System LCOE*

C. S. Lai presented the LCOE results for the energy system when the battery’s degradation was considered. Degradation can affect the LCOE, especially at high PV penetration and large energy storage capacity.

*Slide 18 Exemplification of the Financial Model*

C. S. Lai presented a generic diagram for financial analysis. Debt and equity are sources of funding. The discounted cash flow model computes the EBIT, which is used to calculate the two NPVs.

*Slide 19 Inputs for EES Financial Assessments*

C. S. Lai presented the framework for the techno-economic analysis, with inputs from technical, economic, and financial. The framework outputs the LCOE, NPVs, debt duration and IRR.

*Slide 20 Technical and Economic Specifications*

C. S. Lai presented the parameters for the 6 scenarios including the figures. Stephen Browning commented “The market price is quite volatile from hour to hour day to day etc. which is what drives the storage requirement. Needs time series analysis with depth” C. S. Lai agreed and responded that another work already considers the short-term variation in the study, which will be circulated in the working group: Lai, C.S., Jia, Y., Xu, Z., Lai, L.L., Li, X., Cao, J. and McCulloch, M.D., 2017. Levelized cost of electricity for photovoltaic/biogas power plant hybrid system with electrical energy storage degradation costs. *Energy Conversion and Management*, 153, pp.34-47.

*Slide 21 Influence of WACC on Equity NPV and LCOS*

C. S. Lai presented results for the LCOS and mentioned the levelized cost will reduce when increased cycling of battery, as the battery will output more energy. Nsilulu Tresor Mbungu commented “Does the finicail model take into account the environment and scocail aspects?” C. S. Lai responded it is an excellent question and noted the work does not consider the two aspects. However, the standard would benefit from having experts to comment on the two domains and to develop a framework to address this. Loi Lei Lai commented “How different will the presented model as compared to the one for considering batteries used in Electric Vehicles?” C. S. Lai responded it is a relevant question and the context of EVs is worth examining with the presented model. Stephen Browning mentioned “EV and other Non Time Critical appliance Demands” and C. S. Lai responded the appliance types can also be examined

*Slide 22 Equity NPV with Respect to Various WACC*

C. S. Lai presented results for the equity NPV consider different financing costs. It shows the NPV would increase with reduced cost and the NPV would be positive if the cost is low enough.

*Slide 23 Cumulated Cash Flow to the Firm and Cumulated Cash for Three Operating Scenarios*

C. S. Lai presented results on the cash flow for the battery system at 2 different cases (1500 \$/kWh and 200 \$/kWh). It is noted at 200 \$/kWh, the battery could be profitable in Kenya.

*Slide 24 Summary of Research*

C. S. Lai presented a summary of the research findings. Loi Lei Lai commented on the possibility to seek for battery models from manufacturers; C. S. Lai concurred and would be also relevant for other energy storage technologies. Germana Roberto commented there should be other sources of revenues considered, including demand-side management.

**8. Adjournment:**

Loi Lei Lai motioned to end the meeting at approximately 1:55 pm. Dongxiao Wang seconded it. There were no objections.

**9. AOB**

None

## 10. Future Meetings

Although not set yet, next meeting will most likely be in Oct. C. S. Lai will send out a notice of the next meeting. C. S. Lai mentioned members of the Working Group are welcome to give presentations for the upcoming group meetings, by notifying C. S. Lai in advance.

### Attendees

Last Name	First Name	Affiliation
Lai	Chun Sing	Brunel University London
Lai	Loi Lei	Guangdong University of Technology
Wang	Dongxiao	Australia Energy Market Operator (AEMO)
Ciubarca	Oleg	ComEd
Thompson	Tom	IEEE Standards Association
Browning	Stephen	Retired Electricity Operations and Energy Modelling Specialist, Eleceff
Mbungu	Nsilulu Tresor	University of Pretoria
Dong	Zhao Yang	University of New South Wales
Germana	Roberto	Sapienza University of Rome