



## Energy Harvesting Committee (EHC) Minutes 22<sup>nd</sup> Mar 2023

Attendees	Apologies/Non attendees	
Maeve Duffy, Univ. of Galway Lorandt Foelkel, Würth John Horzepa, PSMA Toshi Yamamoto, Nichicon Ed Spence, TMIG (guest) Justin Henspeter, IBM Eric Swenson, IBM Pulugurtha Markondeya Raj, (Dr. Raj), FIU <b>Brian Zahnstecher, PowerRox</b> <b>Mike Hayes, Tyndall</b>	Gabriel Barrientos, Nowi Norm Elias, Norm Elias Model/Sim Francesco Carobolante, IoTissimo Sergiy Tykhonov, FRABA Joe Horzepa, PSMA Prateek Asthana, Tyndall Sebastian Bader, MIUN Torben Dankwort, Fraunhofer ISIT John Fiske, Armor Roberto la Rosa, ST Baoxing Chen, Analog Devices Dinesh Kithany, Wired & Wireless Jean Michel Bidault, ITEN Cem Som, Würth John Flannery, Tyndall Andreas Beckes, FRABA Dusan Vuckovic, TBD Mike Donnelly, Mentor/Siemens Christian Pennisi, Jennova	Lisa Horzepa, PSMA Peter Spies, Fraunhofer IIS Ningning Wang, Hangzhou DU Denis Pasero, Ilika George Slama, Würth Renee Yawger, EPC Ronald DeGraaf, NAWA Technologies David Tang, Netbit Thomas Becker, Thobecore Michalis Kiziroglou, Imperial College London Steve Savulak, Collins Aerospace Gary Johnson, Ilika Dan Stieler, PowerFilm Toby Best, FRABA Johan Pederson, Sigma Design Nathan Jackson, Univ of New Mexico

(Co-chairs in bold font)

**Next meeting:- Mon 17<sup>th</sup> Apr 11am Central Mike to chair, Brian to type.**

### Agenda

1. Welcome any new members/guests.
2. EnerHarv 2024 planning.
3. APEC 2023 –feedback on our open letter
4. PTR and technology opportunities... HIR (heterogeneous integration roadmap) discussion in Apr
5. Industry Event Watch & List of EH companies
6. Media activities
7. Norm/Gabriel Collaboration Update
8. ‘Treasure Chest’ at end of the minutes.

#### 1. Welcome new members

Welcome Ed as a guest. Ex ADI.

Known to Brian via Sensors Converge et al. They actively collaborate on applications and experiments  
Justin into Power system architecture – interested in low power telemetry.

Eric interested in battery technology, typ. high power but looking at low powers.

Dr Raj interested in magnetics, MEMS, EH & WPT

#### 2. EnerHarv 2024 planning Ref [www.enerharv.com](http://www.enerharv.com) and [Energy Harvesting Forum | Power Sources Manufacturers Association \(psma.com\)](http://Energy Harvesting Forum | Power Sources Manufacturers Association (psma.com))

- NOW forming a workshop committee – please let us know who is interested. Most of EnerHarv 22 people interested.
- Will be EUROPE based, probably May-June (June is better)? Who is interested in hosting?
- German consortium:- Würth (talk with Fraunhofer, KIT, Desden, FRABA & Thobecore?)
- Italian:- Roberto might talk with Palermo or Genoa? Mike knows UNIBO, UNIPG, POLITO. Need a top tier university partner.
- Tyndall will pass in the interests of putting a flag on new soil and expanding our ecosystem.
- Who else? France? UK?
- Will be submitting a proposal to PSMA board. Then will be an RFP process. Target down selection of RFP process and recommendation for BoD special project form by end-Apr. Final awardee of RFP contingent on BoD approval of special project.
- Typ. 2.5-3 day event. Will need 4 day venue access.
- Allow for more breaks – Lorandt feedback.
- Target draft of special project event proposal doc for PSMA BoD by May (5/19/23), seek approval by June (6/16/23).
- Release EnerHarv 2022 proceedings.

### 3. APEC 2023 Set for March 19<sup>th</sup>-23<sup>rd</sup> 2023 in Orlando, FL.

#### PSMA Energy Harvesting Industry Session

7-SLOT DENIED, 4-SLOT (i.e. – THUR PM) AWARDED...WE DECLINED. ExecComm have issued letter to APEC IS. Brian/Mike raised as part of EHC update at annual mtg and it is under review and a meeting is being arranged (APEC OrgComm requested meeting with Fred/ExecComm). Ideas included having emerging technologies session and shifting expo with closure on Thurs instead of Wed. A new rating system and attendance headcount sheet was now used for 2023 – a good start.

- Mike gave presentations at energy management (IS05 – 21<sup>st</sup>) and energy storage (IS24 – 23<sup>rd</sup>) industry sessions. <https://apec-conf.org/conference/sessions/industry/>
- Ranajit Sai (Tyndall) gave a presentation on magnetics related to EH at the HF magnetics session

### 4. PTR and technology opportunities

- HIR 2023 – need to start thinking about what we add, needed Q1-2. Review content from previous edition and identify opportunities for updates/expansion in this update (e.g. chips act). **CALL TO ACTION FOR EHC PARTICIPANTS.**
  - Work completion plan Apr/May.
  - Francesco & Mike will share 1<sup>st</sup> draft with EHC shortly.
  - F & M also will write mag. feature by end April.
  - Agenda item for next meeting – review fo material for HIR – M&F to present.
- Norm talking with Mentor about integrating simulation models, any suggestions for EH applications, please contact Norm. Any updates/interest for this month or feedback on presentation on 22<sup>nd</sup> Feb?

### 5. Industry Event Watch & List of EH companies

- **Event tracker**
  - Revisit/update the list of good industry events for tracking. Hoping EnABLES2 proposal will be accepted/funded so can continue to share info with EHC and broaden the PowerIoT ecosystem and PSMA EHC communities.  
For context check out the EnABLES position paper (& website)  
[Position Paper – Access to facilities & expertise \(enables-project.eu\)](#)
  - Next update target June/July '23.
- **Company ecosystem**
  - **BZ CONTINUES TO UPDATE AS INFO TRICKLES IN.**

### 6. MEDIA ACTIVITIES

#### (a) Webinars/ PTR? **PERPETUAL OPEN CALL TO EHC FOR WEBINAR SUGGESTIONS.**

- Toshi Yamamoto, Nichicon – LTO Battery Tech. Possibly leverage material related to Sensors Converge? July onwards.
- Lorandt Foelkel, Würth – EH Tech Update. Working on it. Should have a new Digikey webinar ready by April. May/June possible slot.
- Mike Hayes/Prateek Asthana, Tyndall - either eSiP/testbed or condition monitoring value proposition? July/August. Planning to share in April meeting.
- Leverage Ranajit Sai presentation from magnetics workshop? – Mike will chat with him offline.
- Ed considering and will revert.
- Any other topics?

#### (b) Conferences/workshops

- Magnetics workshop APEC2023 (<https://www.pdma.com/technical-forums/magnetics/workshop>) – committee has asked for suggestions for EH related magnetics.  
- Ranajit Sai (Tyndall) gave a presentation, . 126 attendees
- BZ signed up for Sensors Converge (<https://www.sensorsconverge.com/>) June 20, 2023, in Santa Clara, CA (i.e. – Silicon Valley) – will be looking for speakers for a 4-slot, half-day, pre-conference symposium on EH. Also will include functional demo session at end. Reach out direct to BZ if interested. So far Tyndall and Nichicon, Fraunhofer ISIT, Powerfilm (MPPT) confirmed.
- Tyndall presenting talk and poster on Mar 29, 2023, Bruges, Belgium at Smart System Integration (SSI) workshop ([https://smartsystemsintegration.com/#schedule\\_section](https://smartsystemsintegration.com/#schedule_section))

### (c) Publications

- IEEE now looking for feature article on our white paper – lead edits (Thomas, Michalis, Bahareh, Maeve) created a small team.
  - PELS mag - we are targeted for June '23 issue, but needed a revamp draft to meet formatting/content requirements – all done and submitted no complaints so far.
  - John to dig out the endorsement from Bahareh and use it to **CREATE PITCH FOR VALUE OF PSMA, esp. looking for underwriters – John talking with Toshi.** PSMA member endorsements now posted on LI/Twitter. **JOHN H. TO CHECK WITH MKG COMM ON STATUS.**
- Also looking at cross-promotions for IPC – industrial automation, Industry 4.0, smart mobility, etc.
- Any material you want to re-cycle... once not too much of a sales pitch?
- New suggestions
  - Hoping to mine upcoming events (APEC, EnABLES, APEX, EnerHarv, etc.)*

### (d) Virtual conferences, articles, etc.

- Suggestions please

## 7. Norm/Nowi PZT Sim Efforts Update

- a. Norm/Gabriel provided overview of collaborative work. Using 5-DOF example load and parameterized model of transducer to aid other analyses. **NORM & GABRIEL SHARED SUMMARY DOCUMENTATION IN MARCH.**

## TREASURE CHEST

**Approach these items one at a time in future meetings as people raise them.**

### 8A. Sponsorship of a program where students build demonstrators.

- Lorandt has a budget to supply kits
- Help with education links – Qualcomm 'High Tech High'. Francesco will follow up.
- Green story. International dimension. Technology and applications dimensions.
- Wurth running design challenge.
- Keep simple, easy to use
- Competition or roadshow?
- PSMA has money to support.
- **Action:- write ½ page strawman for student engagement mechanism **NEED A CHAMPION TO LEAD EFFORT FOR COMM****

“Here are Katherine’s thoughts on the competition:

There are two main styles of the competition that could be developed:

#### 1. Engineering-Style Competition

- planning committee chooses specific EH devices that can be used and the target load
- planning committee also specifies energy input conditions (lighting setup, vibrational input, etc) for testing
- specifications are announced and teams would develop the power converter solution based on the specification
- teams can submit videos and/or reports on their team and proposed idea
- final teams are selected and they test their prototypes on site at an event competition (could be a conference)
- judging is based on technical criteria measured during the test (size, weight, efficiency, etc.)
- implementation is the most important aspect for this style of competition
- over different years, the specification and scenarios would focus on different technologies with the same basic format
- more similar to the International Future Energy Challenge run by PELS

#### 2. Design-Style Competition

- planning committee could choose a theme based on a technology or application (e.g. smart homes, wearables, building monitoring, etc.)
- planning committee may want to specify some constraints or scenarios for the competition
- teams come up with complete EH design ideas (transducers, circuitry, load) and develop a prototype
- teams can submit videos and/or reports on their team and proposed idea
- final teams are selected and they present and demonstrate their prototypes on site at an event competition (could be a conference)
- judging is based on mostly qualitative and some quantitative judging criteria (so balanced judge selection will be important)

- this style of competition is more focused on the idea and design, but implementation is also important

There should probably be some discussion on which style the committee would like to see. The engineering-style requires a lot of prep work before even announcing the competition, while the design-style is more work for the judging and evaluation. I could see either being good for students. I hope someone can take these basic ideas and further develop them into a competition.”

### **8B. Updated Goals**

- Open to suggestions.
- We should try to forge links with other groups/sessions, e.g. capacitor, magnetics, packaging. – addressing this via “Tiger Team” effort within PSMA (multiple focused initiatives with small teams from various committees).

### **8C. Forward-looking Thoughts**

- Software? Packaging/industrial design? Modelling? Hackathon?
- Incorporate some kind of student competition as part of EnerHarv (Best Student Demo/Poster) or otherwise.

**Mike Hayes & Brian Zahnstecher,  
22<sup>nd</sup> Mar 2023.**