



Energy Harvesting Committee (EHC) Minutes 16th Aug 2022

Attendees	Apologies/Non attendees	
John Horzepa, PSMA Thomas Becker, Thobecore Sebastian Bader, MIUN Norm Elias, Norm Elias Model/Sim Gabriel Barrientos, Nowi Sergiy Tykhonov, FRABA Torben Dankwort, Fraunhofer ISIT Joe Horzepa, PSMA Brian Zahnstecher, PowerRox Mike Hayes, Tyndall	Jean Michel Bidault, ITEN Baoxing Chen, Analog Devices Francesco Carobolante, IoTissimo Dinesh Kithany, Wired & Wireless Lorandt Foelkel, Wurth Cem Som, Wurth John Flannery, Tyndall Andreas Beckes, FRABA Dusan Vuckovic, Ikea Mike Donnelly, Mentor/Siemens Johan Pederson, Sigma Design Nathan Jackson, Univ of New Mexico Christian Pennisi, Jennova Gary Johnson, Ilika Dan Stieler, PowerFilm Toby Best, FRABA Lisa Horzepa, PSMA Steve Savulak, Collins Aerospace Peter Spies, Fraunhofer IIS Ningning Wang, Hangzhou DU Michalis Kiziroglou, Imperial College London Denis Pasero, Ilika George Slama, Wurth Roberto la Rosa, ST Maeve Duffy, NUIG Toshi Yamamoto, Nichicon Renee Yawger, EPC Ronald DeGraaf, NAWA Technologies David Tang, Netbit	Robert Andosca, Inviza Health Marcus Taylor, IsoLode/Inviza Paul Dhillon, Xidas Sourabh Dhillon, Xidas Katherine Kim, UNIST Anthony Laviano, NRAIT Jae-Do Park, Univ of Colorado Denver Sri Kasichainula, Nimbus Jeffrey Jouper, Astronics Kevin Parmenter, TSC Guoqing Liu, Huawei (HiSilicon) Jochen Koszescha, Infineon Laili Wang, Xi'an Jiatong University Jamil Khan, Univ of Newcastle (AUS) Mike Wingard, Amphenol Jim Stevens, FRABA Mohamed Jatlaoui, Murata Fred Weber, Future Tech WW Doug Osterhout, Google Cato Fagermo, NeoCortec Technologies Scott Thielman, Product Creation Studio Steve Reuter, Jennova David Newell, ex NUIG in transition Wensi Wang, BJUT Peter Zou, Huawei Ajinder Singh, TI Aaron Stein, Dartmouth Henrik Zessin, Fraunhofer IIS Justin Knott, FCI Sam Jones, PowerFilm

(Co-chairs in bold font)

Next meeting:- **Wed 19th Oct 10am Central**, Mike to chair, Brian to type.

Agenda

1. Welcome any new members/guests.
2. EnerHarv 2022 closure.
3. APEC 2023 planning
4. PTR and technology opportunities, **including HIR update**
5. Industry Event Watch & List of EH companies
6. Media activities
7. 'Treasure Chest' at end of the minutes.

1. Welcome new members

Willkommen Torben! Recommend that Norm and Torben talk offline about modelling.

Do a scrub of EHC members – Mike & Brian. Complete. Update the header table offline.

2. EnerHarv 2022 closure Ref www.enerharv.com and [Energy Harvesting Forum | Power Sources Manufacturers Association \(psma.com\)](http://Energy Harvesting Forum | Power Sources Manufacturers Association (psma.com))

- KICK OFF ENERHARV '24 DISCUSSIONS AT APEC '23 F2F MTG.

3. APEC 2023 Set for March 19th-23rd 2023 in Orlando, FL.

PSMA Energy Harvesting **Industry** Session being considered, go for a **7 slot session** for now (Tues/Wed) **successfully submitted**.

Deadline for abstracts = TBD (Oct/Nov), full proposal draft (Dec), demos (Dec/Jan)

- Suggestions (presenters, topics, trends, applications) welcome!!!
- Will include demo session as previously (+ 6 formal PPTs)
- Brainstorm to date
 - Topic idea (from Tyndall): IoT Week talk, Power IoT vs. Edge-Processing Challenge
 - Lorandt:- offering demos, talk and to be a session chair.
 - Also submitted a tech session paper. (Paper ID #3004)
 - Needs to be made more different to previous submissions (discuss if time permits)
 - ADI update on harvester roadmap, possibly a new demo
 - System integration challenges BEYOND electronics, e.g. optimize TEG performance, industrial design.
 - Norm will consider simulation models subject to COVID.
 - Sergiy (Fraba) willing to supply demo. **Any prospects of a talk?**
 - Some of EnerHarv attendees might be interested, esp. US academics.
 - Nichicon interested in giving a talk and demo (product collaboration, e.g. – Samsung remote, etc.).
 - Roberto interested in giving a talk (representing ST + University of Catania) and demo.
 - Maeve potentially have an RFID presenter and potentially a demo too (currently cultivating with company, will keep us informed).
 - Sebastian????
 - Interest in flexible/wearables – any takers????
 - Tasmia Rahman, U of Southampton talking about IBC on PV (esp. flex)
 - Torben – any interest or recommendations?
 - Brian to cross-connect with other PSMA committees for more presentations each way. Esp. ES, E Mgt, Pkg.
 - Sergiy – **FRABA WILL PROVIDE REVIEW PROPOSALS FOR BOTH TALK AND DEMO.**
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- Needs to be in-person, no hybrid or pre-recording or stand-ins.
- Material might also/alternatively be used for 3D-PEIM or other PSMA industry sessions (energy storage, packaging) **or vice versa** <https://www.pdma.com/conferences/3D-PEIM>
- Lobbying begins end Aug/Sep (APEC Comm decides at planning meeting in Orlando, **Oct 15-16, 2022**)

4. PTR and technology opportunities

- PTR committee looking for webinar material from Sept onwards – any volunteers or suggestions? Hope to have 5-7 topics selected by the time the series kicks off.
- **Francesco to update us on HIR plans and opportunities to engage.**

5. Industry Event Watch & List of EH companies

- **Event tracker**
 - Revisit/update the list of good industry events for tracking.
 - Francesco recommends www.iwpc.org as resource.
 - EnABLES event tracker no longer in operation – hopefully can resurrect for EnABLES2. **Next update target June/July '23.**
- **Company ecosystem**
 - **TEAM WILL CONTINUE TO CULTIVATE.** Denis provided additional feedback offline, which BZ WILL APPLY AND SHARE TO MIKE FOR DISTRIBUTION WITH MTG MINS.
 - Sergiy suggestion:- We can add this company to our Ecosystem overview. This company makes e-ink displays which consume very low energy. <https://www.ynvisible.com/segment-displays>. Could be used for smart packaging and probably use EH. **BZ WILL ADD WITH UPDATE.**
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6. MEDIA ACTIVITIES

(a) Webinars/ PTR?

- Tasmia Rahman, U of Southampton - IBC on PV (esp. flex)?

(a) Publications

- IEEE now looking for feature article on our white paper – lead edits (Thomas, Michalis, Bahareh, Maeve) created a small team.
 1. PELS mag (submitted end March). Mess up on PELS side but confirmed for the Dec 22 issue, some guidelines on structure issued (word count, etc.), need re-vamp by end month. **BZ WILL FORWARD THEIR EMAIL**. Team could not make the deadline for Dec. '22 issue so requested to be bumped to Mar. '23 issue, though still awaiting confirmation from Ashok. **Thomas reports almost ready, will check in with Michalis, will have it prepared soon. BZ WILL CONTINUE TO PING and will meet him worst case at ECCE.**
 2. John to dig out the endorsement from Bahareh and use it to **CREATE PITCH FOR VALUE OF PSMA**, ep. Looking for underwriters.
 - 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.)
 - PSMA Pkg Comm requested talk proposal related to PowerIoT/PwrSoC for 3D-PEIM (early-'23 Miami, FL). Mike currently trying to generate proposal and find Tyndall budget to support a talk...if unsuccessful, may look into request for PSMA funding support. **BZ WILL HIGHLIGHT AT 8/19 BoD MTG.**
 1. Baoxing can consider ADI simulation/use of chip-scale TEG tech. **ADI declines 3D-PEIM invite in favour of APEC IS and/or EnerHarv opportunities.**
 2. **FRANCESCO WILL SHARE SUGGESTIONS OFFLINE** from IEEE EPS HIR community.
- (c) **Virtual conferences, articles, etc.**
- Suggestions please
 - BZ to present “*Best Practices for Low-Power (IoT/IIoT) Designs: Separating the Source-Side & Load-Side Analyses*” half-day tutorial at ECCE '22 (Detroit, MI, Sun, October 9, 2022).

TREASURE CHEST

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

7A. 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).
- **BZ INITIATIVE**: working on feasibility for an official, IEEE Future Directions initiative on Energy Harvesting (a 1-6yr process)
 - JOE notes PSMA would be happy to support such an initiative, **BZ to figure out if/how**
 - BZ has obtained process detail (<https://cmt.ee.org/futuredirections/fd-opportunities/>), **BZ to pitch initial proposal to PELS TC6 at ECCE on 10/1/19... WILL SHARE FINAL PPT WITH TEAM**

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,
16th Aug 2022.