PSMA
Energy Harvesting Committee (EHC) Minutes
28th Nov 2022

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

(Co-chairs in bold font)

Next meeting:- <mark>Wed 21st Dec 10am Central (John to confirm),</mark> Mike to chair, Brian to type.

Agenda
1.   **Welcome any new members/guests.**
2.   **EnerHarv 2024 planning. KICK OFF IN '24.**
3.   **APEC 2023 OPEN DISCUSSION**
4.   **PTR and technology opportunities**
5.   **Industry Event Watch & List of EH companies**
6.   **Media activities**
7.   **'Treasure Chest' at end of the minutes.**

1. **Welcome new members**

2. **EnerHarv 2022 closure   Ref www.enerharv.com and 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
   7-SLOT DENIED, 4-SLOT (i.e. – THUR PM) AWARDED…WE DECLINED AND ARE WRITING AN OPEN LETTER TO THE APEC IS COMMITTEE, DRAFT ATTACHED, PLEASE GIVE ANY INPUTS BY 7TH DEC LATEST.
   Previous inputs with updates in red
   Roberto: disappointing, APEC IS seen as highly-enabling to our ecosystem. Agree on decision to decline this year.
   Gabriel: was expecting to participate in demo session and show ref design so this shall likely cause us to cancel our APEC '23 attendance/participation.
   Thomas: no previous APEC experience, but this was a topic of interest at Airbus even without stakeholders understanding the connection between µW & MW, which hoped such a forum would help to mitigate a gap. Conversely, can understand APEC's position if seemingly more focused purely on higher-power apps. Regardless, considered a very important direction for the industry so may need to educate the APEC OrgComm further on this.

Michalis: we are accustomed to skepticism with EH. Might try negotiating better position for '24, but support withdrawal from '23.

John H.: PSMA office very supportive of EHC, but APEC decision out of our hands.

Toshi: The Thur PM time slot is undesirable for us.

Francesco: agreed with other team's comments and recommendations to drive change in process. Perhaps generate a letter expressing our position/recommendations to APEC OrgComm with signatories from all relevant stakeholders.

Steve: like/support Francesco's suggestion for an open letter from industry stakeholders. Lack of ULP focus at APEC impedes our traction for higher-profile platforms. Really need exposure through more tech papers directly addressing our ecosystem, which is highly enabling to bring others onboard. Perhaps we are too affixed to IoT application space, where others in industry may consider that a dying space (even if unsure what "IoT" even means or what it applies to…semantical challenge) and does not yield appropriate attention (even if only from an optics perspective…e.g. – perception = reality). *Post-meeting - A highly advertised killer application or demo in 2023 might go far in improving our odds for 2024.*

Norm: might help to express clearer focus/direction moving forward, though not sure how much direct influence we have. Agree to decline for '23 and strong statement should be made to let them know this is unacceptable.

Joe H.: as John mentioned, PSMA office fully behind EHC. As financial co-sponsor of APEC, we have PSMA representation on APEC OrgComm, but must respect their decisions. On the flip side, boycotting APEC may hurt overall visibility opportunities, but again support any EHC decision at the end of the day.

Baoxing: I think PSMA should show stronger commitment to EH [and IoT] as it is an emerging field, playing important sustainability role for billions of IoT sensors. Public awareness and education is also important, let me know what I can do to help.

Lorandt: I feel that APEC IS committee 'underestimated' our efforts. I will inform my colleagues who participate in the marketing meetings and sponsorship to tell them this is not fair to our EHC. But still I would take the opportunity to keep the session even with less participants. *UPDATE:- We need clarification on what he proposes in an email to Mike & Brian on 28th Nov, decision may impact Wurth sponsorship of future events?*

Dinesh: Based on my research, EH is emerging quite well and possibly getting mainstream status in few years. With focus on energy efficiency, conservation, use of less/no batteries, look for wider options, energy harvesting/RFID and such solutions are being looked at seriously. Samsung's Eco Remote is a good mainstream example of it. I will not be surprised if all remote makers shift to use of energy harvesting/RFID techniques.

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.
   - HIR 2023 – need to start thinking about what we add, needed Q1-2.
   - Norm talking with Mentor about integrating simulation models, any suggestions for EH applications, please contact Norm.

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?

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

(b) Conferences/workshops

- Magnetics workshop APEC2023 – committee has asked for suggestions for EH related magnetics

- BZ signed up for Sensors Converge (https://www.sensorsconverge.com/) June 20, 2023 – will be looking for speakers

(c) 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). BZ Talked with Ashok at ECCE, said we are targeted for June '23 issue, but need to revamp draft to meet formatting/content requirements (**tabled below**). They also mentioned the draft looked like it was a bunch of excerpts compiled by numerous authors (perhaps not an unfair criticism) so needs work there as well. Working with him on a hard deadline, but the current update needs are clear and can immediately drive update efforts. ==MICHALIS/THOMAS CAN WORK WITH TEAM **TARGETING END-JAN/MID-FEB** FOR NEW DRAFT IN INTERIM.== ==BZ has confirmed we are good to for June 23 edition with absolute draft deadline end Mar.==
     - **(a)** Article requirements from Ashok 7/14/22 email (shared with Thomas/Michalis same day):
       - **Author Guidelines**
       - **Format**; Microsoft Word, **Single Column format with single line spacing** (***BZ NOTE***: *currently formatted like a journal article, not an industry magazine.*)
       - **Wordcount**: 2000 - 2500 words
       - **Illustrations: 10-12 Figures**/tables in jpg (300 dpi). Identify figures/tables in the article with captions underneath
       - **Bylined article**: Provide short author(s) bio(s) at the end of the article before references
       - **References:** Must include references at the end (**10-15 Maximum**) (***BZ NOTE***: *13/21 current refs direct from authors…may need to expand to cover more of industry.*)
       - **Peer review**: Article will be peer reviewed by two experts in the field. The author must revise the article based on peer review comments/suggestions
       - **Copyright:** Before going to the printer (production), the author must sign IEEE copyright form.

  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.
  - *Mike withdrew from 3D PEIM as a keynote, unable to justify going to both 3D PEIM & APEC (time, effort and cost). Will however give presentations at Energy Storage and Management industry sessions as had previously committed.*

(c) Virtual conferences, articles, etc.
- Suggestions please

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 basics ideas and further development 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)
  - o JOE notes PSMA would be happy to support such an initiative, **BZ to figure out if/how**

- BZ has obtained process detail (https://cmte.ieee.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,
28th Nov 2022.