



## Energy Harvesting Committee (EHC) Minutes 21<sup>st</sup> July 2022

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

(Co-chairs in bold font)

**Next meeting:- Tues 16<sup>th</sup> Aug 10am Central, Mike to chair, Brian to type.**

**FYI – quarterly report to BoD shared today and WILL BE ATTACHED WITH MEETING MINS EMAIL.**

### 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

Bienvenue Jean Michel from ITEN!!! French SME. Can supply large peak currents for WSN.

Roberto may know of potential new members (PCB company), **WILL PASS ALONG INFO TO MIKE.**

**Do a scrub of EHC members – Mike & Brian.** Only retain those who respond that they are happy to stay on the list (i.e. – passive removal). **JOHN/LISA SENT NOTICE TO LIST FOR PASSIVE REMOVAL REQUESTING CONFIRMATION TO STAY ON.** Drop off target will be end-July, **INC. 1-2 REMINDER EMAILS.** Mike & Brian will figure out logistics offline.

2. **EnerHarv 2022 closure** 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))

- 2022 proceedings fully posted and sent to all attendees along with picture package. Plan to make fully public by end-'22/early-'23.
- **OFFICIAL surplus was \$8,900 surplus (23.5%) – well done everyone!**

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

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

- Suggestions (presenters, topics, trends, applications) welcome!!!
- Will include demo session as previously (+ 6 formal PPTs)
- Brainstorm to date
  - Topic idea (from Mike): IoT Week talk, Power IoT vs. Edge-Processing Challenge
  - **Lorandt:- offering demos, talk and to be a session chair.**
  - **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.**
  - **Some of EnerHarv attendees might be interested, esp. US academics.**
- **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)**
- **Need draft of abstract before next meeting, MIKE & BRIAN TO WRITE, finalize in 6 weeks.**
- **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](http://www.iwpc.org) as resource.
  - EnABLES event tracker no longer in operation – hopefully can resurrect for EnABLES2.
- **Company ecosystem**
  - DENIS MADE INITIAL DRAFT + significant update – reviewed 11/16. Needs more input from others to be sustainable. **BZ HAS REACHED OUT TO DENIS OFFLINE TO SUPPORT and circulated new version 07/20 prior to July meeting & shared briefly. TEAM WILL CONTINUE TO CULTIVATE.**
  - **NORM TO SUGGEST SOME RESOURCES IN MODELING/SIM (INC. NEW “MODEL/SIM” TAB TO TRACKER) FOR POWER IOT ECOSYSTEM.** Norm provided lots of good thoughts/inputs on 1/11/22, latest inputs received 05/09 - figuring out how to integrate, **WILL REACH OUT TO NORM AS APPROPRIATE.** Done, can remove open action moving fwd.

### 6. MEDIA ACTIVITIES

#### (a) Webinars

- Cem & Dinesh willing to do WPT/IIoT webinar(s), could also in time lead to book publications. Note we differentiate between WPT & EH – could be webinar in itself, e.g. what works well where? Work on simple talk proposal. Discussing separate versus combined (Cem + Dinesh) presentation. Need to cultivate off-line now that we have time to focus on it. **No update this month.**

#### (b) 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.**

**2. John to dig out the endorsement form 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.
  1. Baoxing can consider ADI simulation/use of chip-scale TEG tech.
  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:- Catherine and Mike met at EnerHarv & discussed, she will write ½ page strawman for student engagement mechanism. Mike will ping again. **NEED A CHAMPION TO LEAD EFFORT FOR COMM Maeve willing to help but does not have bandwidth to lead.**

“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 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)
  - 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,**  
**21st July 2022.**