



Energy Harvesting Committee (EHC) Minutes 24th October 2019

Attendees	Apologies/Non attendees	
Thomas Becker, NTA- ISNY John Horzepa, PSMA Michalis Kiziroglou, Imperial College London Robert Andosca, AEI George Slama, Wurth (GUEST) Francesco Carobolante, IoTissimo Brian Zahnstecher, PowerRox Mike Hayes, Tyndall	Steve Savulak, UTRC Johan Pederson, Sigma Design Mike Wingard, Amphenol 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 Seshank Malap, Tektronix Ben LeNail, Alta Devices Scott Thielman, Product Creation Studio Denis Pasero, Ilika Lorandt Foelkel, Wurth Marcus Taylor, Silent Sensors Fleximatix Roberto la Rosa, ST Maeve Duffy, NUIG Aarohi Vijh, Alta Devices	<i>Doug Osterhout, Google</i> 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 David Newell, NUIG Dan Stieler, PowerFilm Sam Jones, PowerFilm Jamil Khan, Univ of Newcastle (AUS) Liubov Ebralidze, Silent Sensors Raj Budhabhatti, Alta Devices Alex Liu, Alta Devices Dusan Vuckovic, Ikea Peter Haigh, Tyndall Gary Johnson, Ilika (for Denis) Mohamed Jatlaoui, Murata Peter Haigh, Tyndall Baoxing Chen, Analog Devices

(Co-chairs in bold font)

Next meeting:- Thurs Nov 21th at 10:00 Central, Mike to chair, Brian to type.

Agenda

1. **Welcome any new members.**
2. **EnerHarv 2020 planning.**
3. **APEC 2020.**
4. **White paper.**
5. **AOB, anything from 'treasure chest' at end of the minutes.**

1. Welcome New Members

2. EnerHarv 2020

- **NCSU – North Carolina State TUE-THU, JUNE 16-18, 2020**
- **Mike & Brian had successful visit 6th Oct – looks great & excellent team. Reviewed venue, hosting agreement template, key milestones, etc.**
- **John to 'nudge' Joe for URGENT feedback on hosting agreement/MOU. ASSIST needs to hire temp.**
- **COMMITTEE**
 - Latest tentative table of chairs (most people willing to move around)

(# slots targeted)	Chair	Co-chair
Keynotes		
Transducers (NAME TBD?)	Baoxing Chen	Veena Misra (ASSIST Rep)
Power Mgmt (NAME TBD?)	Peter Spies (EnABLES Rep)	Maeve Duffy or Roberto La Rosa
Storage (NAME TBD?)	Mohamed Jatlaoui	James Rohan (EnABLES Rep)
System Integration (NAME TBD?)	Francesco Carobolante (PELS Rep)	Francesco Cottone (EnABLES) or Roberto La Rosa
Low Power Loads (NAME TBD?)	(ASSIST Rep) Prof. Ben Galhoun?? Univ of Virginia (Shad will approach) CPSS?	Mehdi Kiani (ASSIST Rep)

Demos	Lorandt Foelkel	EnABLES Person?
Panels Sessions	1. Compare with the '5G experience' (panel style prep...smoother experience than '18) Prepare & assign carefully FRANCESCO CA. TO DRIVE 2. Bring together cluster leaders!! (ASSIST, EnABLES, EHN, Sheshank Pria, PowerMEMS)	
Posters	Jane Cornett	
Media	TBD (NCSU resource, but supported by Carolin Lehmann of NCSU)	
Admin	TBD (NCSU resource, but supported by Carolin Lehmann of NCSU)	
Treasurer	Steve Savulak (supported by Candice of NCSU)	
Technical Chair	Mike Hayes	
Technical Chair	Shad Roundy	
General Chair	Mehmet Ozturk	
Co-General Chair	Brian Zahnstecher	
Industry liaison	Adam Curry	

Other committee members to date

- Denis Pasero
- Marcus Taylor
- Michalis Kiziroglou
- EPeas – Geoffroy Gosset
- Dusan considering....answer in Sept
- Johan also considering – Brian will stay in touch
- Prof. Hengzhao Yang, New Mexico Institute of Mining and Technology- Brian in contact
- Sponsors
 - **TECH**
 - **EnABLES**
 - **PELS** should be included as per EnerHarv (tech but not financial)
 - **Accepted with Francesco as rep, no finance request**
 - **ASSIST**
 - Possible Contributors
 - Veena Misra (Transducers, Sys Int) – down as co-chair for now
 - Mehdi Kiani – willing to fill a slot – flexible
 - **BREAKING NEWS:- CPSS** have volunteered Prof. Yang Yang from Xi'an Univ. of Tech.
 - **FINANCIAL**
 - PSMA
 - **COMMERCIAL** (more open this time, but MUST be related to program, content, etc.)
 - How2Power will circulate flyers – get preliminary one ASAP
 - Adam has circulated targeted sponsorship invites - preliminary interest from ADI, EPEAS, Wurth.

KEYNOTES

COMMERCIAL SLOT – For now trying to find an ADI candidate. 1st preference is Katsu Nakamura – ADI fellow healthcare, low power, consumer projects. If not then Boaxing or Jane.
 ACADEMIC SLOT – will start with Ana Arias from Berkeley. Shad following up...get inputs off-line.
 Shad Roundy compiled a ranking, will only approach 1 person at a time before moving to next ranking.

- **Bring up possibility of professional development credits at next EnerHarv meeting**

3. APEC 2020

- FOR APEC 2020, WILL BUMP RIGHT UP AGAINST ENERHARV 2020 SO SUGGEST TAKING A SLIGHTLY LESS INVASIVE ROLE IN APEC 2020 (I.E. – 4-SLOT INDUSTRY SESSION)
- **TEASER ABSTRACT (FOR ENTIRE SESSION – 4 slots)** – inputs welcome
 - “As energy harvesting (EH) transforms from an emerging to an emerged technology space, the growing ecosystem has materialized with it. This is evident from increasing recognition and content at top industry conferences to incorporation into all aspects of the IoT/IIoT. This Industry Session will provide a comprehensive, yet succinct, overview of some of the latest EH technological trends and how they are being utilized in a rising number of everyday applications across all market verticals. It shall also cover the much overlooked yet highly impactful opportunity to expending battery life even when ambient energies are not available through efficient power management particularly for ultra low power wireless applications. Finally it shall outline the importance for people in the ‘power IoT’ ecosystem to collaborate so that standardized, inter-operable and system optimized solutions are successfully developed”
 - Proposed presentations so far **(LAST CHANCE FOR ABSTRACTS)**

1. "The Growing Energy Harvesting & Power IoT Ecosystem" Mike Hayes, Tyndall **Mike to write abstract**
 2. **Demo Session** (as standalone, "speaking" slot), TEAM
 3. "TBD" TBD, Murata **ABSTRACT PENDING – Brian will chase Mohamed**
 4. "Large-Area Manufacturing Techniques for Reducing Energy Harvesting & MEMS Solution Costs" Robert Andosca, AEI **ABSTRACT RECEIVED – discussed on the Oct call – will submit 2nd draft, target 250 words**
 5. **MICHALIS CHASED GABRIEL RINCON-MORA – HE SENT BIO, WILLING TO PRESENT.....need 2nd iteration, be more specific... Michalis will ask**
 - o **No formal feedback yet from APEC committee – expect by month end**
- **Try to secure slot so that it overlaps with coffee break**

4. Feedback on re-vamped website – close this

Provide initial feedback by 31 Aug – ALL – BEING PROCESSED along with new PMSA logo, branding

New ITEAM 4 for Oct

Michalis Kiziroglou & Thomas Becker separately expressed interest in participating in a white paper – they will discuss offline and approach committee with a plan (table of contents). Fill gap between users and technology providers. Reach out to various groups for inputs. Consider using opinion polls, tables, etc.

TREASURE CHEST

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

5. Updated goals

- Open to suggestions.
- Consider a white paper? (Who will co-write and when?) – **REMINDER can members please give Mike & Brian inputs offline**
- Mike & Brian to revert with proposal for doing a white paper if so approved
 - o OR other dedicated champion from EH Comm, **will put call out**
- 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**
 - o 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**

6. Organise webinars for PSMA & PELS (**FOCUS STARTING DEC MTG ONWARDS**)

- We are ok for PSMA webinars (did 1 in Nov) for now but need to discuss PELS et al.
 - o Dan Stieler, PowerFilm was considering one (will be chased by way of Sam)
 - Sample abstract suggested per existing blog (<https://www.powerfilmsolar.com/about-us/the-horizon-blog/2018/08/10/outdoor-vs-indoor-solar-the-key-differences>), BZ reviewed/supports, **need Committee input. Worth reviewing seeing as Powerfilm's abstract did well in voting but was not in top 2.**
 - o Lorandt willing to do 1 – getting back up to speed (in your own time Lorandt) – Q1/2 2019? Also depends on whether Lorandt/delegate does APEC paper. **BZ TO FOLLOW-UP WITH LORANDT**
- Dan & Dusan willing to revert with suggestions – no commitment yet – Dusan thinking about an applications orientated presentation but no commitment yet.
- Brian and Raj (GeorgiaTech) gave IEEE EPS webinar on IoT with Dushan, Marc & Denis – Went very well. Can do a variant for PSMA later in the year.
- Would be good to do 1-2 on 'practical real life performance' of parts and systems – comparison of technologies. Saw some good examples at EnerHarv e.g. Ilika & ARM presentations

7. 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 basics ideas and further development them into a competition.”

7. Technical forum (links, list of forthcoming events, etc.)

- Johan will review and update the list of events when he gets a chance but EnABLES project is creating a calendar of events, Mike should be able to share this (edited version) in July/Aug
 - Johan delivered updated list on 7/23/18, which MH & BZ will digest and share with group.
- Any volunteer(s) for white papers, weblinks, use cases, etc.
- Reach out to other societies/groups and cross link? – Mike & Brian to discuss.
- Note activities underway separately to re-vamp PSMA website.
- Does this add any value, should we remove??

8. AOB, actions, next meeting, etc.

- Software? Packaging/industrial design? Modelling?

Mike Hayes & Brian Zahnstecher,
24th October 2019.