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# Power Optimization of Energy Harvesting Wireless Sensor Node systems via a Simulation Tool

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**ABSTRACT: Minimizing system-level power consumption is crucial in extending the battery life of modern IoT Wireless Sensor Nodes (WSN). The reliable modelling of Energy Harvesters enables to speed-up development, optimize battery life, the device size, cost and environmental impact. This work presents a first proof-of-concept model for solar-powered IoT nodes (IoTPASS) retrofitted on dry containers, as operated by Irish SME NetFeasa. The model performs a step-by-step analysis throughout the simulated ship journey; returning the energy balance of the WSN and predicting the minimum size of both the harvester and minimum capacity of components such as the harvester, primary and re-chargeable (secondary) batteries to achieve a fully autonomous-system. It provides an immediate way for designers to identify power-hungry steps and explore opportunities to reduce their impact, via contextual sensing, etc.**

## Introduction

- Asset tracking needed to safeguard assets such as essential goods, medical equipment etc.
- Need for new smarter and more energy efficient transportation solutions
- CSEM Solar powered tags attached to dry containers
- Employs NetFeasa's IoTPASS WSN platform, with sensors such as accelerometers, temperature, geo-localization
- PV system extends battery-life from < 2 years to > 10 years (effectively autonomous)

## IoTPASS Power Estimation Tool

- Platform-agnostic Python interface
- Step-by-step and total energy consumption analysis of the full journey
- Estimates size of primary battery required for a single journey
- Estimates size of secondary rechargeable battery and life extension
- A graphical analysis tool aiding in appropriate panel sizing, with guidance to achieve autonomous operation

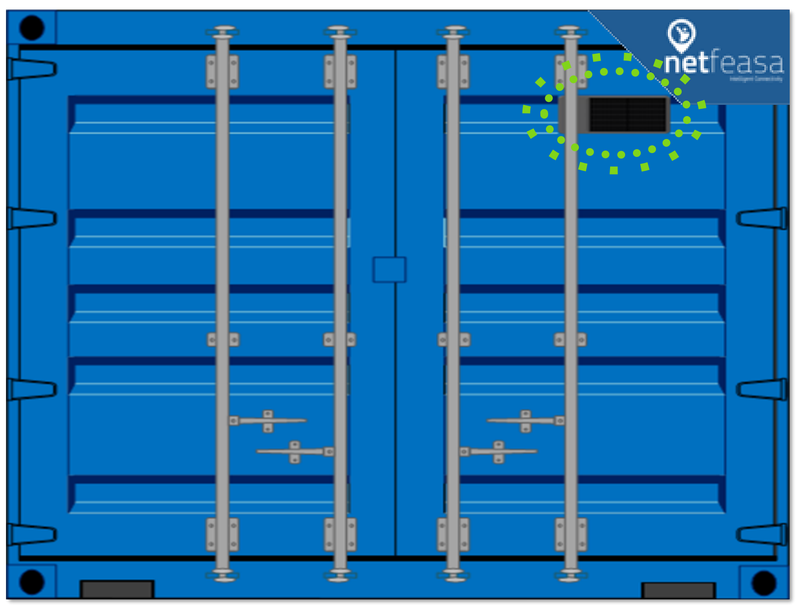



***Figure 1** – The IoTPASS node mounted on a dry container*

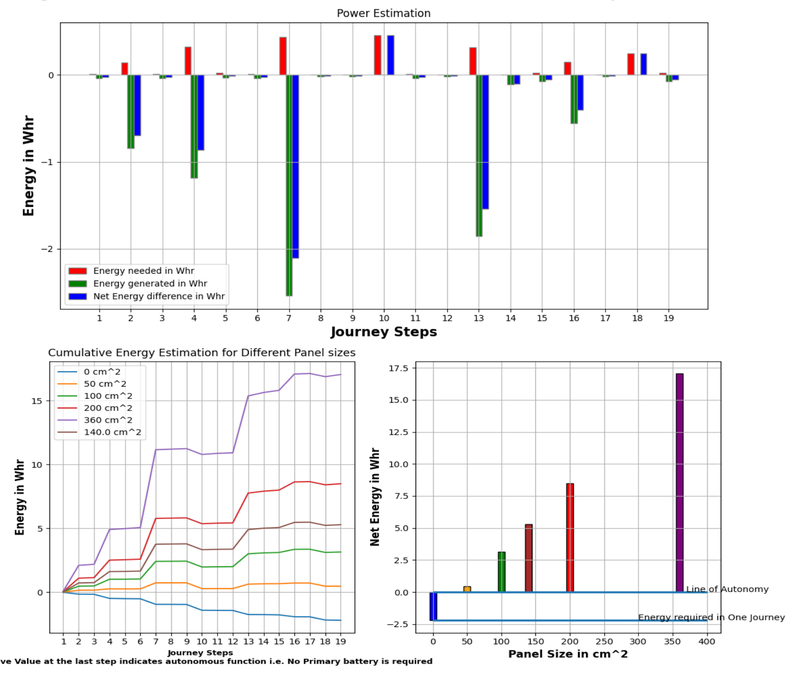
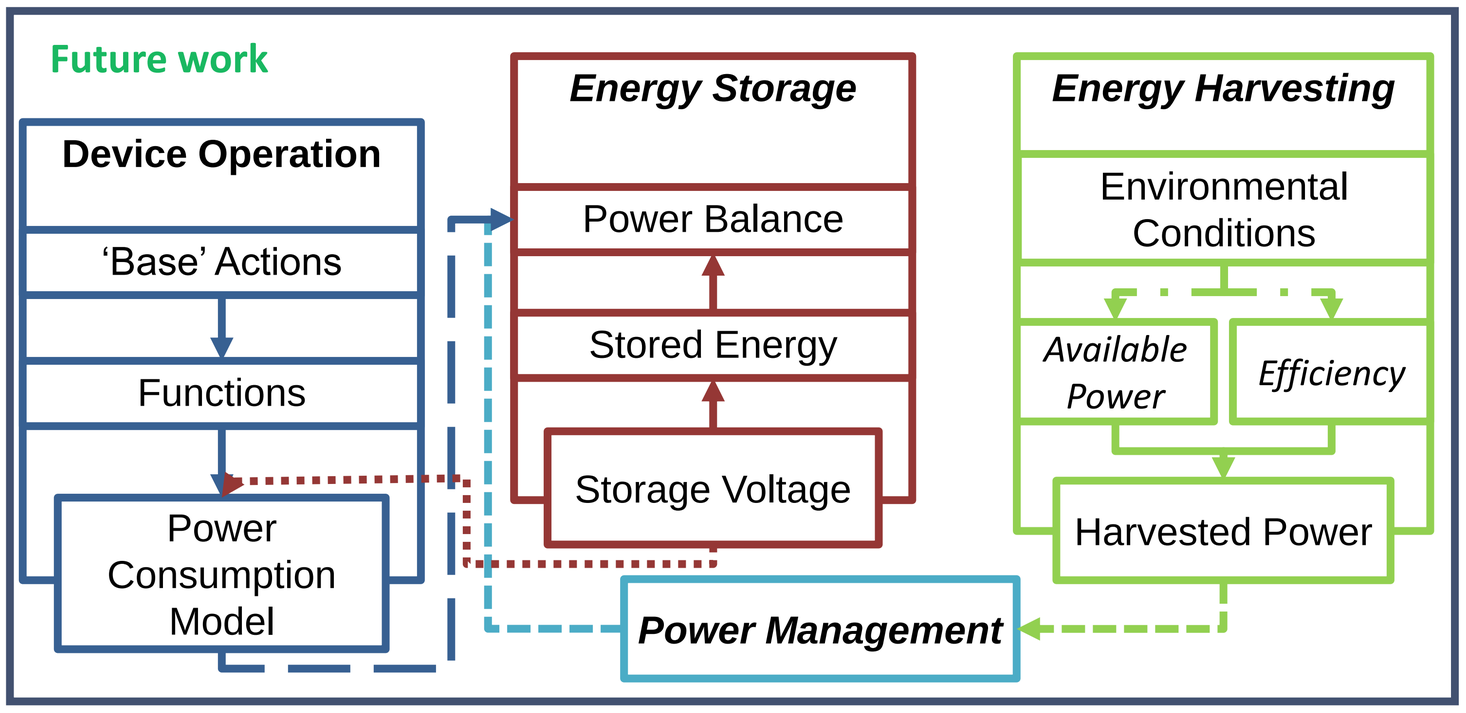



***Figure 2** –Context-aware model outputs*

## Future work




## Conclusions

- First version aids in choice of components:
  - Primary and Secondary battery, PV Panel
- Expert Panel option demonstrates the potential to reduce primary battery size and/or extend battery life on pre-configured steps
- Second version in development
- Focus on detail, flexibility

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