



Stony Brook University

Sensor CAT

(Center for Advanced Sensor Technologies)

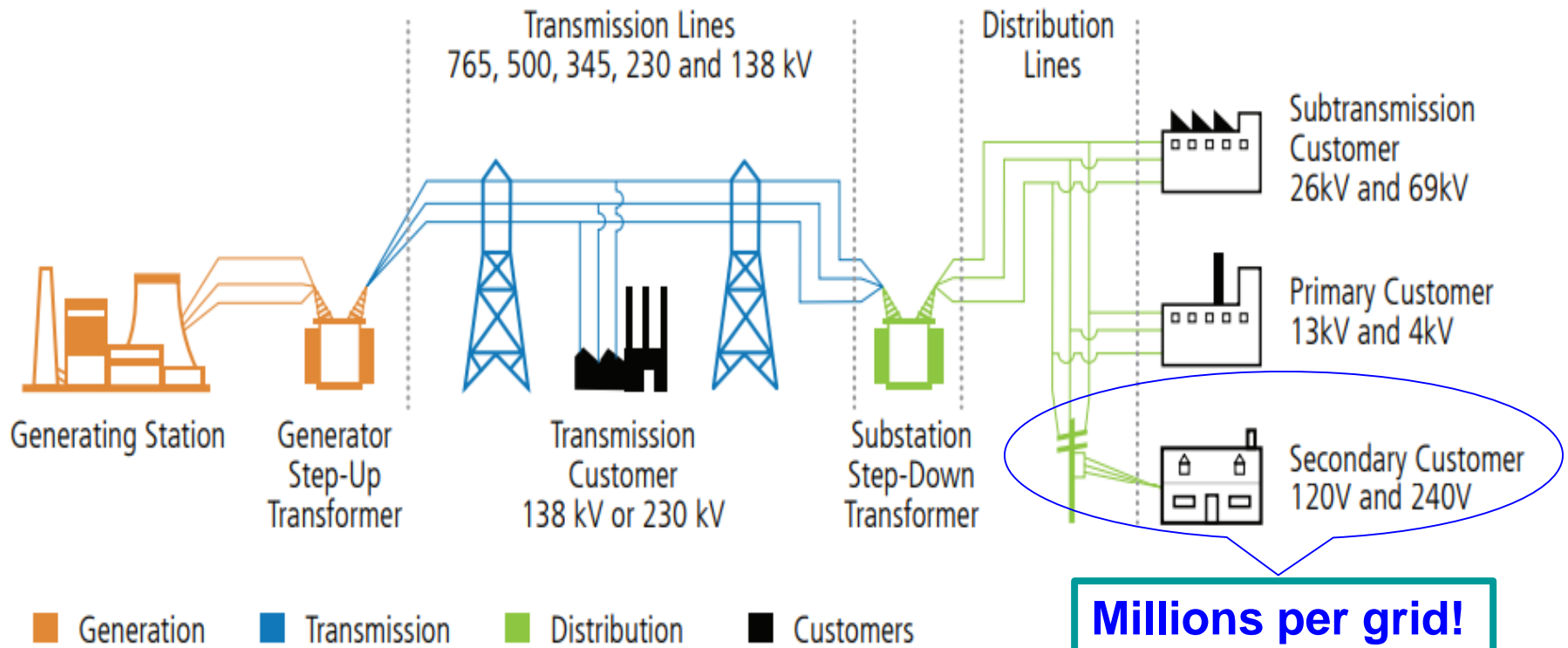
EGMS - Electrical (power) Grid Monitoring System.

Current status and near future.

Michael Gouzman



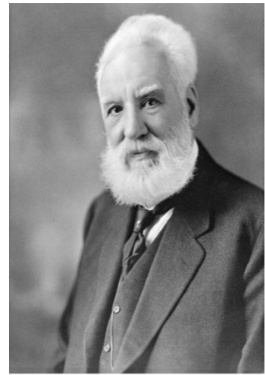
Electrical (power) Grid today. DoE vision.



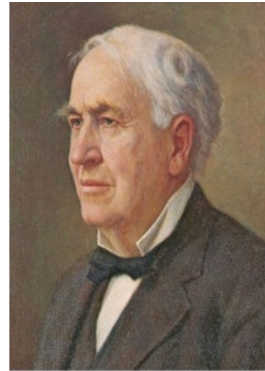
Millions per grid!
Our major target.

Grid monitoring history

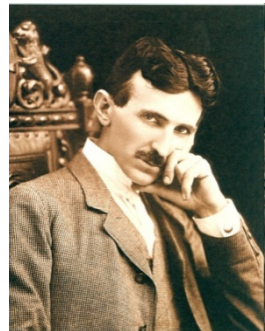
- **Has not changed for ~ 120 years**
 - ☞ we on LI have one of the oldest power grids
 - ☞ regards from T. A. Edison, N. Tesla, and A. G. Bell
 - ☞ the legacy is often acutely felt ...
- **Repair teams dispatched**
 - ☞ based on customer phone calls
- **The system does not know its own state**
 - ☞ no monitoring of *connectivity*



Alexander Graham Bell



Thomas Edison



Nicola Tesla

Grid monitoring today



Modern Fault Circuit Indicators (FCI)

Low cost solution for well controlling areas like subtransmission and primary customers.



Modern Line Monitors

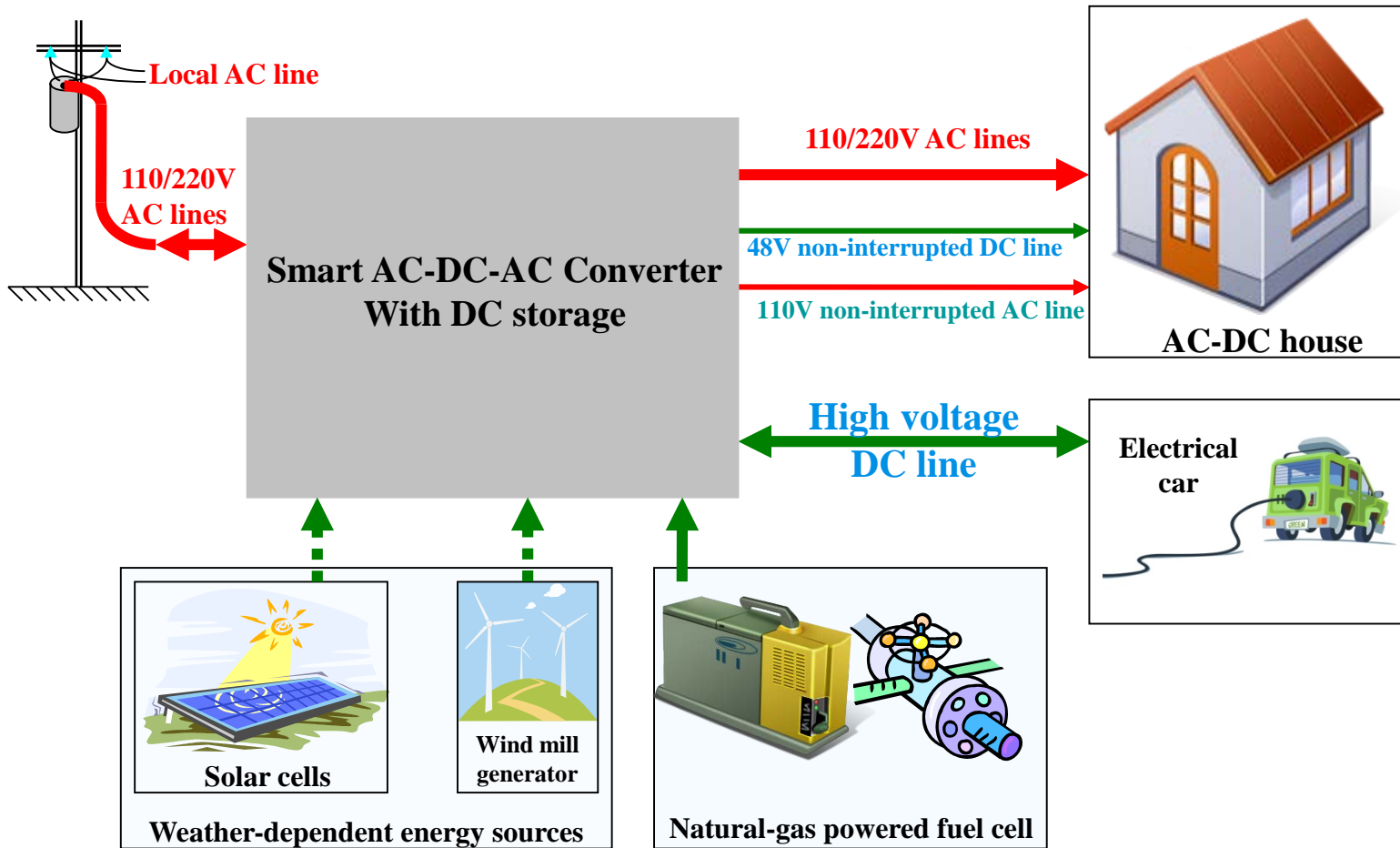
Costly solution for high voltage lines from generation station up to primary customers



EGMS of near future. Desideratum

- Automatic power grid reconstruction
 - Should be based on sensor reports
- Disruptions in *connectivity* monitored
 - The information should be *topological* by nature
- Inexpensive and safe
 - ☞ easy installation
 - ☞ no *galvanic* connections
 - ☞ energy harvesting for sensor powering
- Reliable communication
 - Minimization of the communication and power budgets

Future. Suburban homes with co-generation.



Bird's view on the unit of future EGMS

Cornerstone:
Self-Powered & Self-Organized Sensor

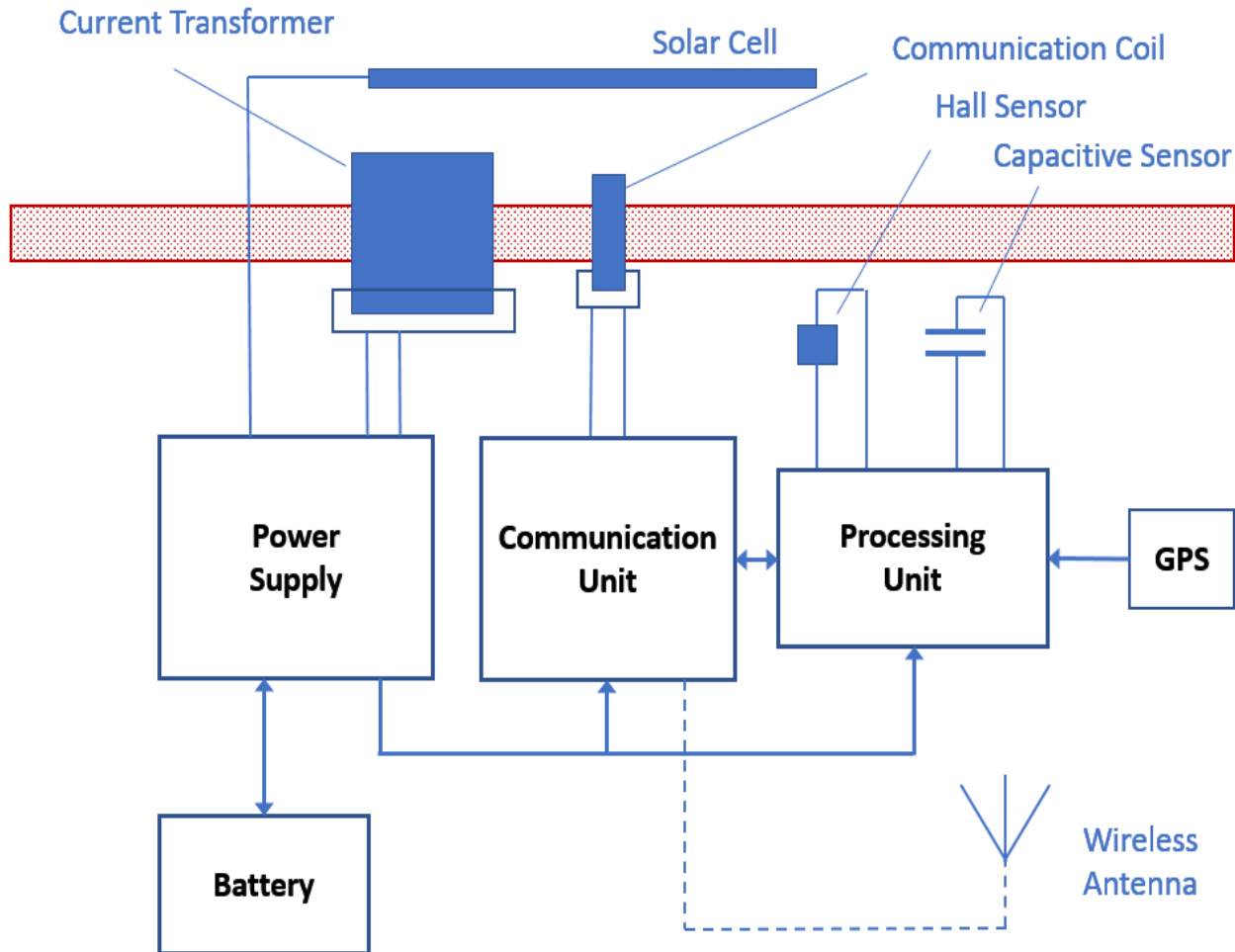
Sensor Communication:
Self-organized network with
data transfer over powerline



Central Processing Unit:
Conversion of data into geographical topology
Power grid status & analysis

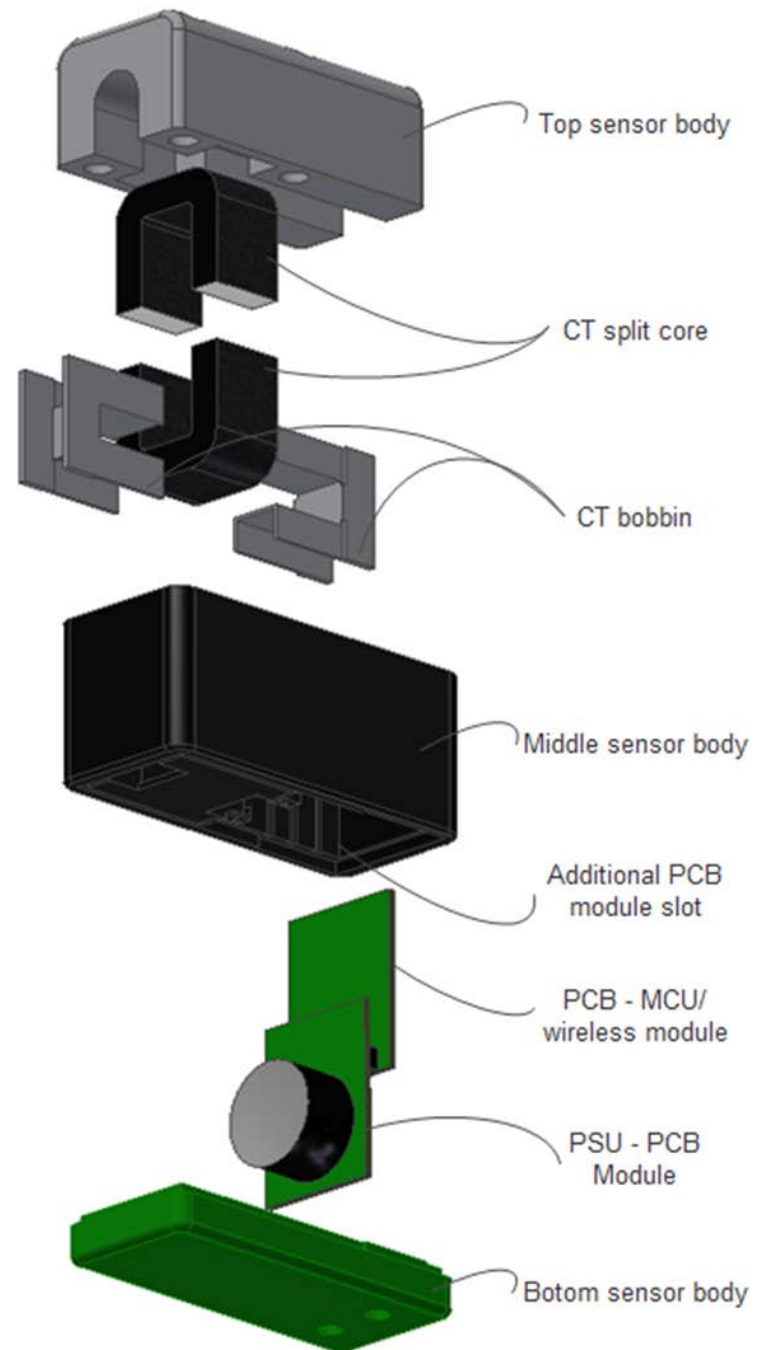


Future. New sensors for grids with co-generation.



EGMS sensor Ultimate design.

From parameters
selection throw 3-D
modeling and prototyping
to manufacturing floor



First prototypes of sensors and its components



Experimental sensor for “on pole” power lines with wireless readout unit.



Experimental sensor for “underground” power lines with optical fiber readout unit.

What we are expecting from \$50 sensor.

- **Measurements**

 - No galvanic connections to power lines;

 - Synchronous (over entire network) current measurement;

 - Detection of the energy flow direction and current phase shift.

- **Robust power supply**

 - When available, powered inductively;

 - Solar cells & batteries during power failure.

- **No installer qualification required**

 - Self initialization, calibration and communication.

Our motivation

- **Citizen's concern**

We hope to make an impact on the reliability of electric power supply in the nation;

Make use of our expertise in sensor technology;

Whip Sandy and its followers!

- **Money to be made**

Several patent application has been filed in 2013

First one already granted.

We would like to partner with power utilities and sensor manufacturers.



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Thanks!