

GSMA Green Power for Mobile Working Group - Ghana

7th November 2012

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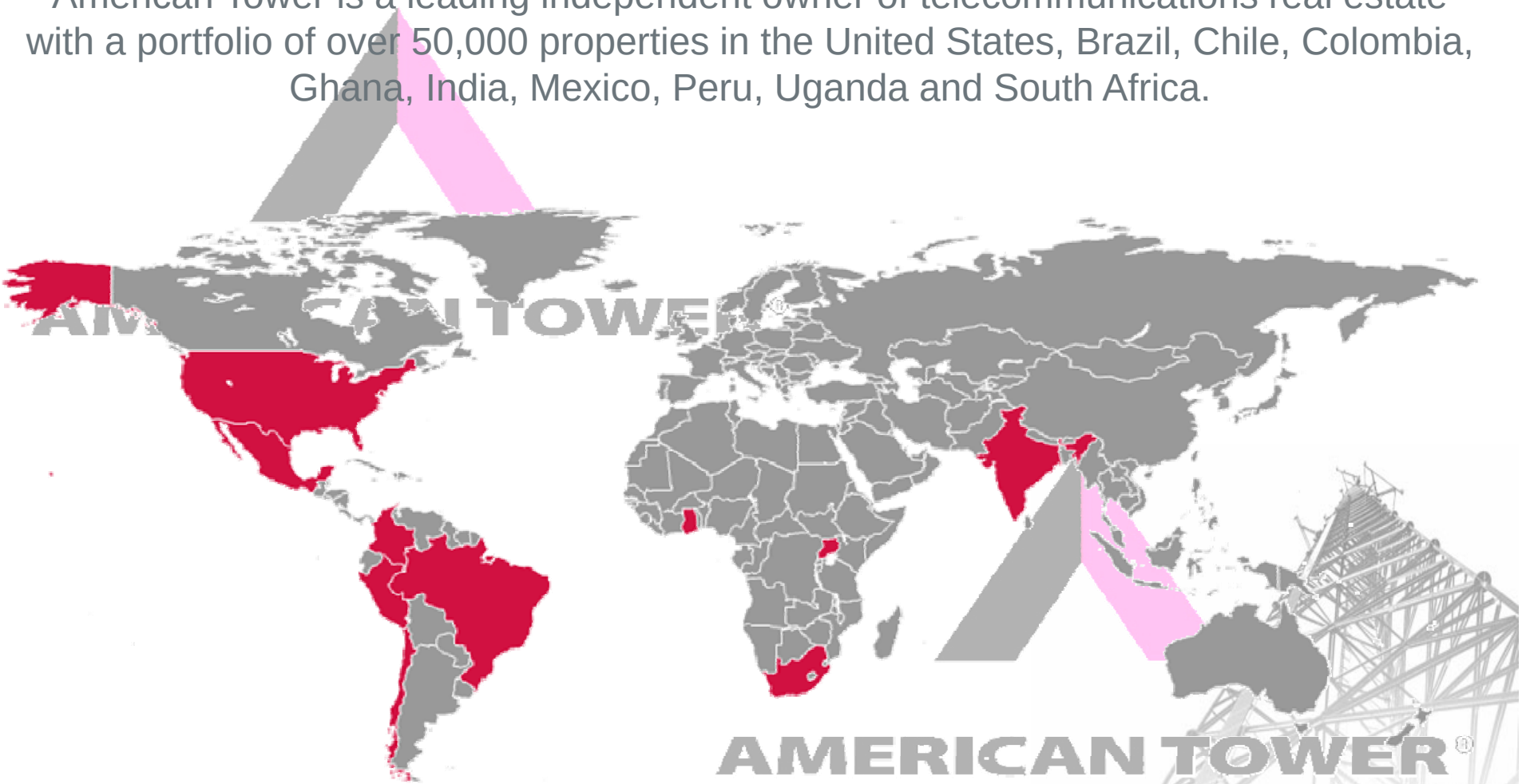
Agenda

- **American Tower – Who we are.**
- **What have we done since we met in Cape Town?**
- **Trial experiences.**
  - Solar.
  - Diesel/Battery Hybrids.
- **Site Monitoring – What do we use it for?**
- **Analysis of a “poor grid” site.**

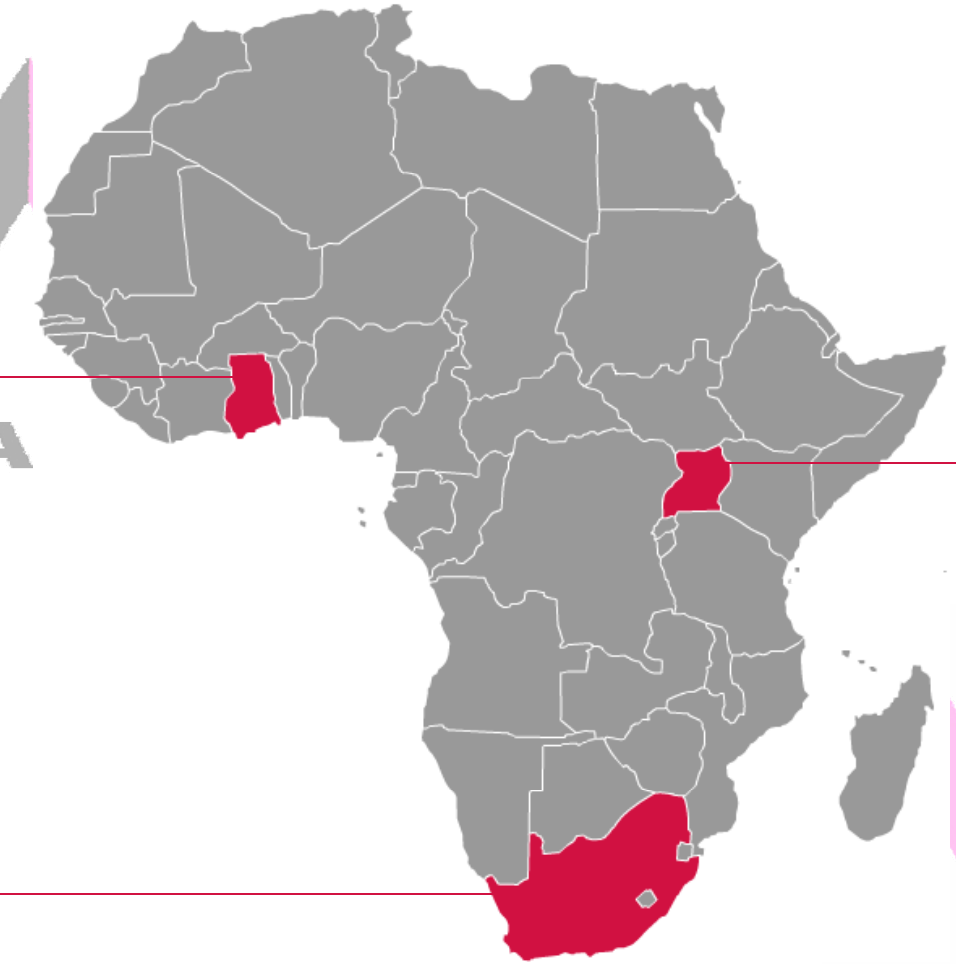


American Tower

American Tower is a leading independent owner of telecommunications real estate with a portfolio of over 50,000 properties in the United States, Brazil, Chile, Colombia, Ghana, India, Mexico, Peru, Uganda and South Africa.



American Tower EMEA



Ghana = 2000

Uganda = 1000

South Africa = 1600

What has been done since GSMA Cape Town 2011

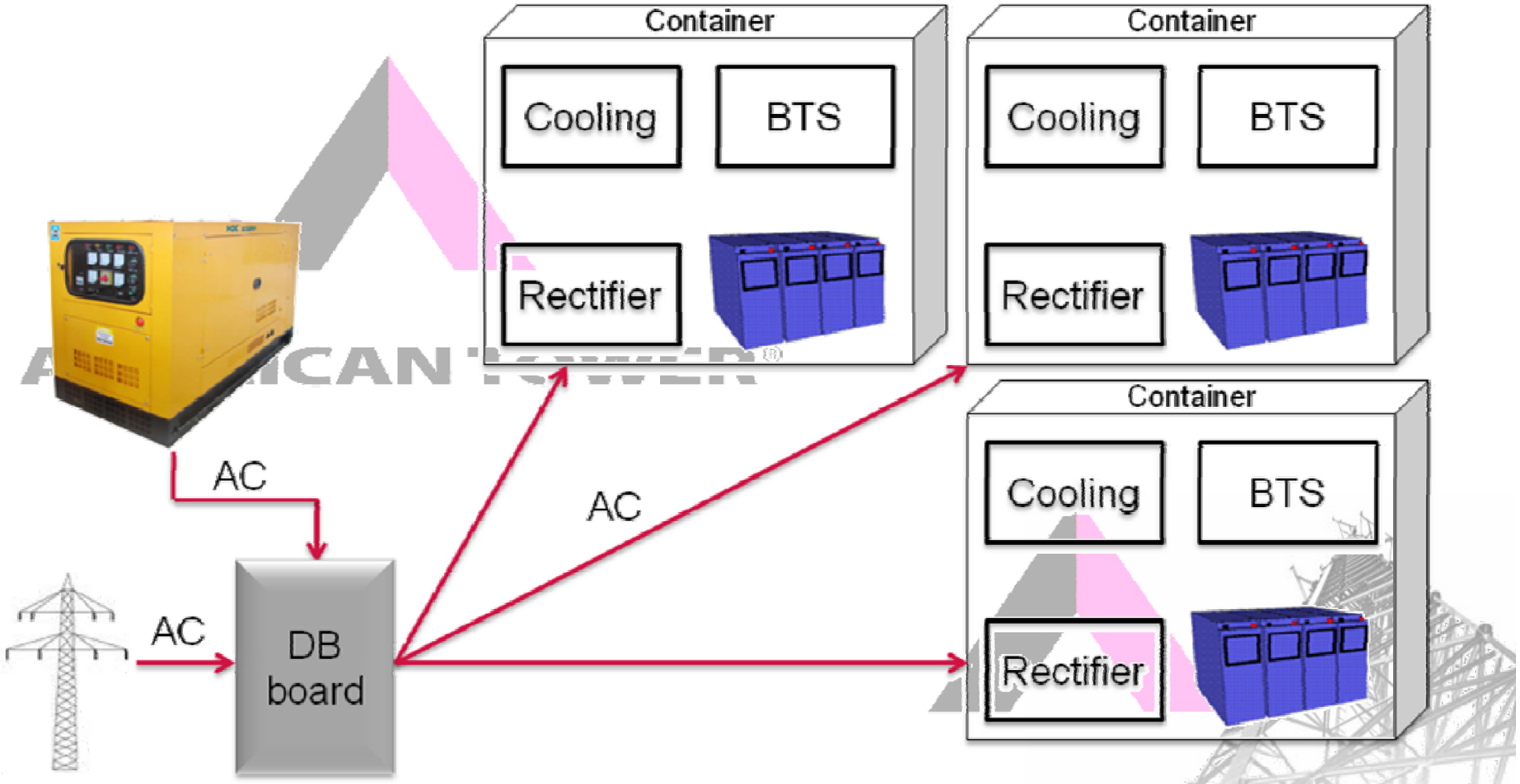
- **On Grid Sites**
  - Maximum utilization
  - Manage air-conditioner inrush
  - Balanced site load
  - Shared site backup generator

- **Off grid sites**
  - Hybrid Power

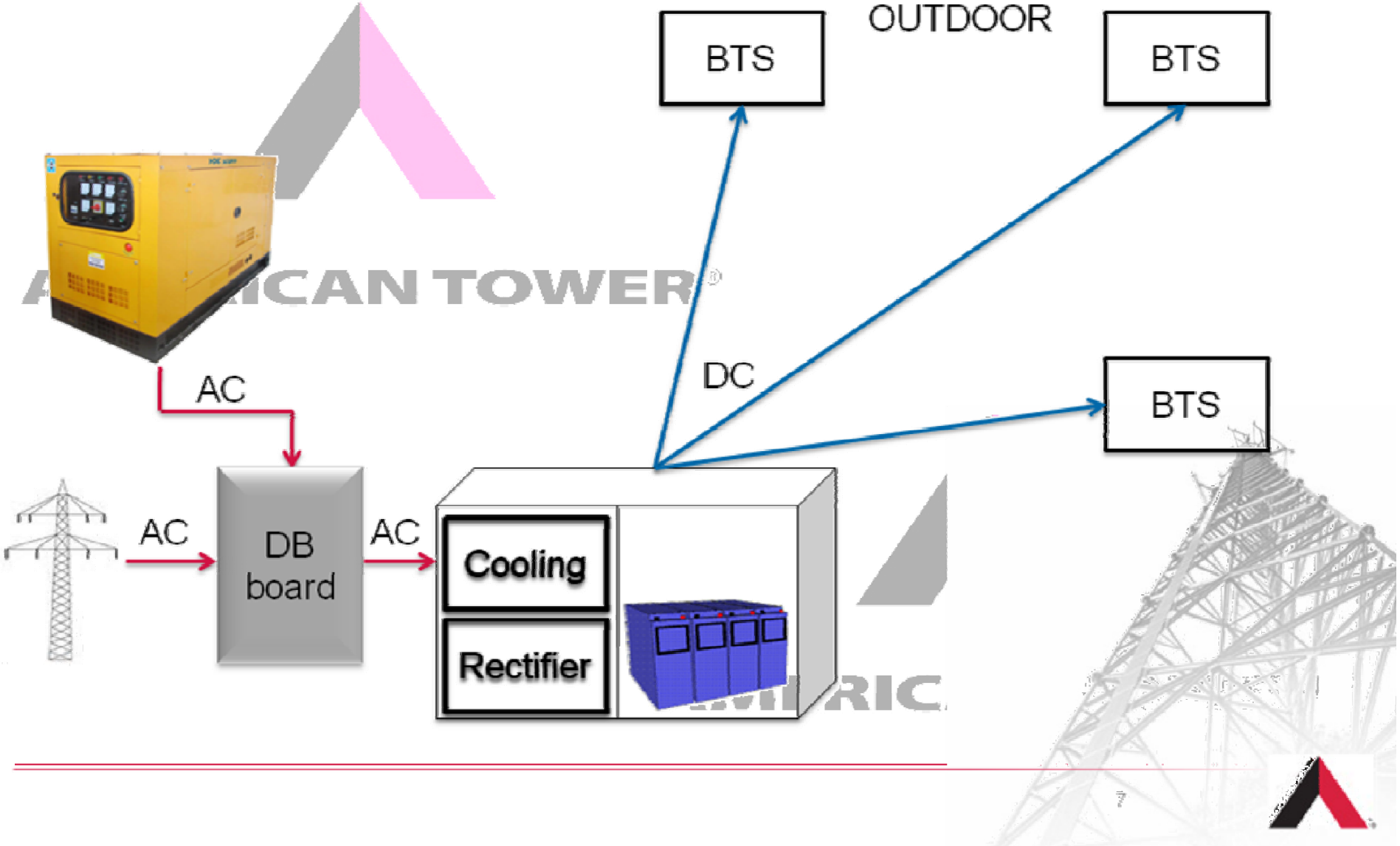
- **Central DC Power Plant**



DC Power Plant



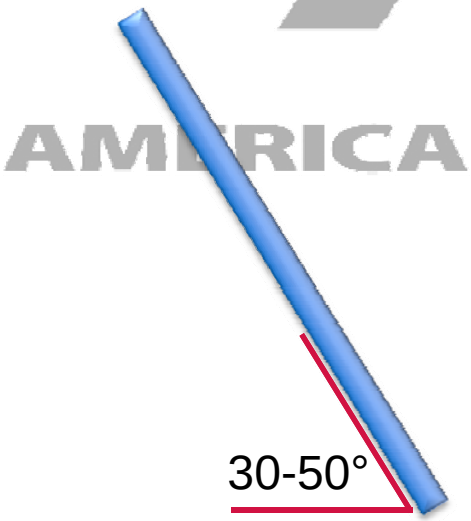
DC Power Plant



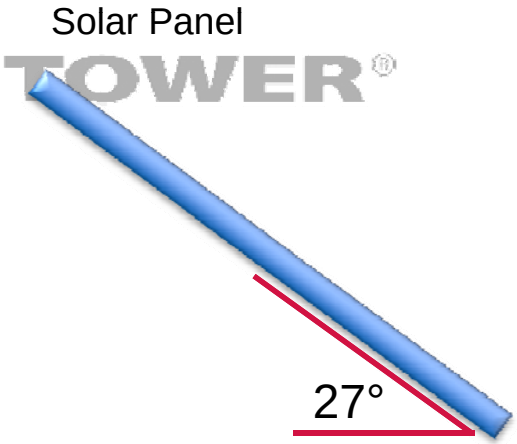
Trial experiences - Solar

Dust accumulation on the panels

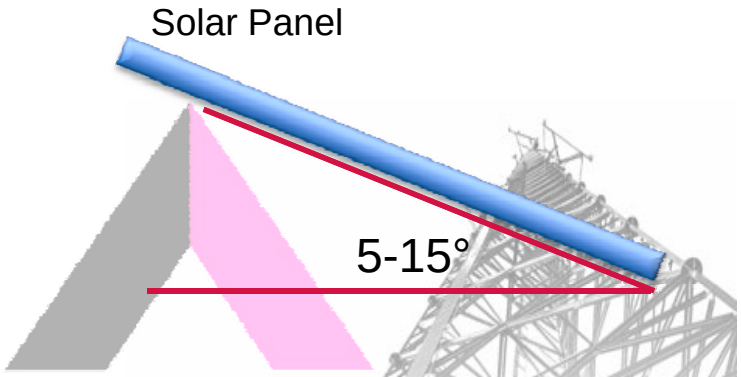
South Africa



“Self Cleaning” Angle



Ghana



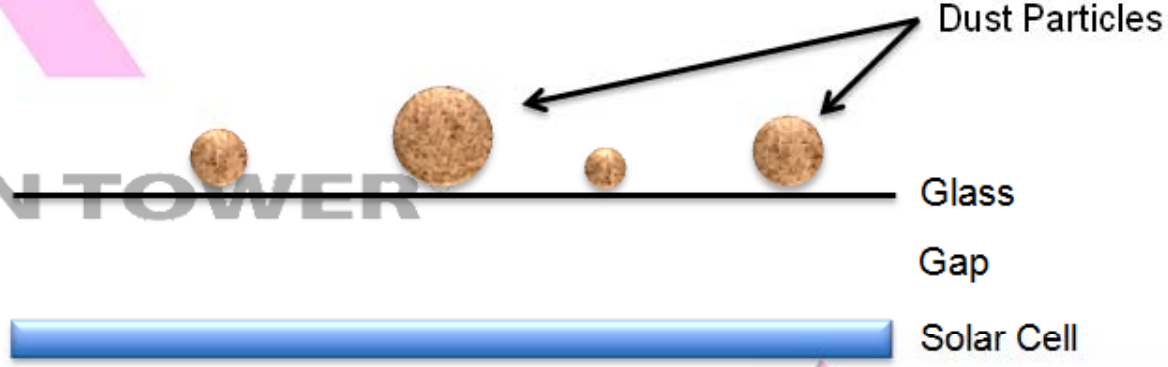
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*Angles not to scale

Trial experiences - Solar

Dust accumulation on the panels

Dust on the solar panel can result in up to 30% reduction in efficiency.



Cleaning the panels

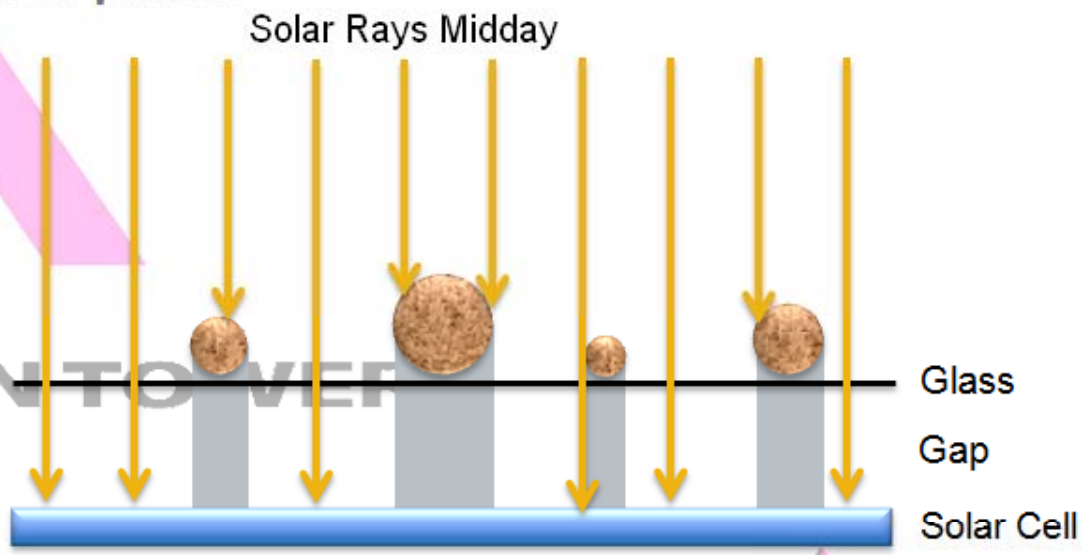
If an employee is exposed to falling 6 feet (l.8 meters) or more from an unprotected side or edge, the employer must select either a guardrail system, safety net system, or personal fall arrest system to protect the worker. (US department of labor)

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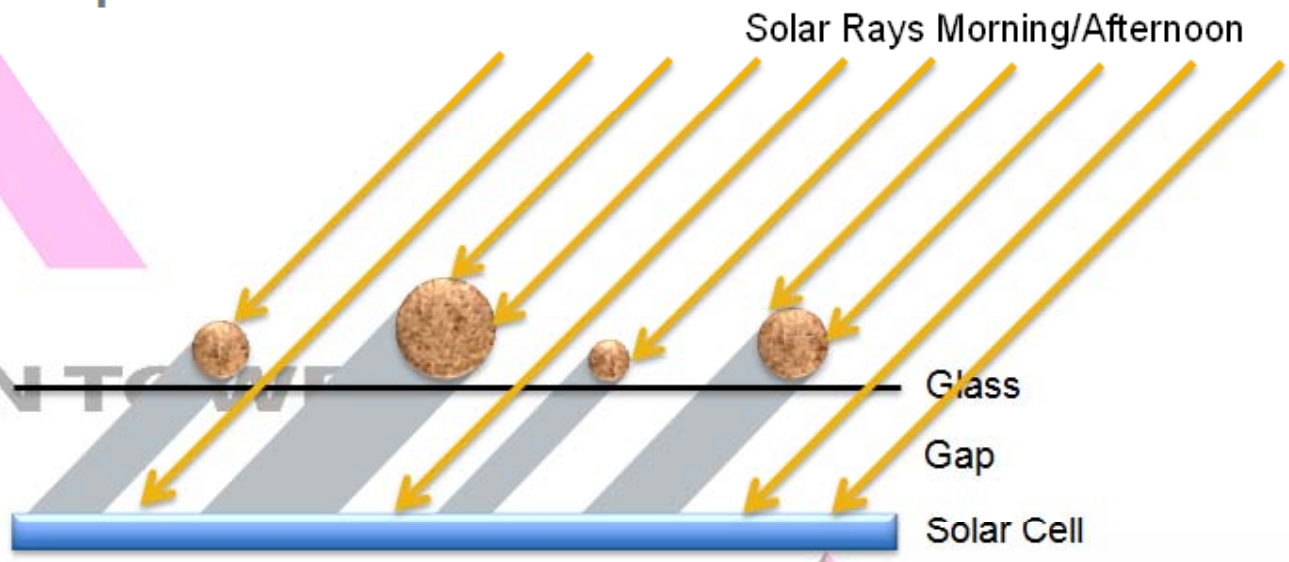
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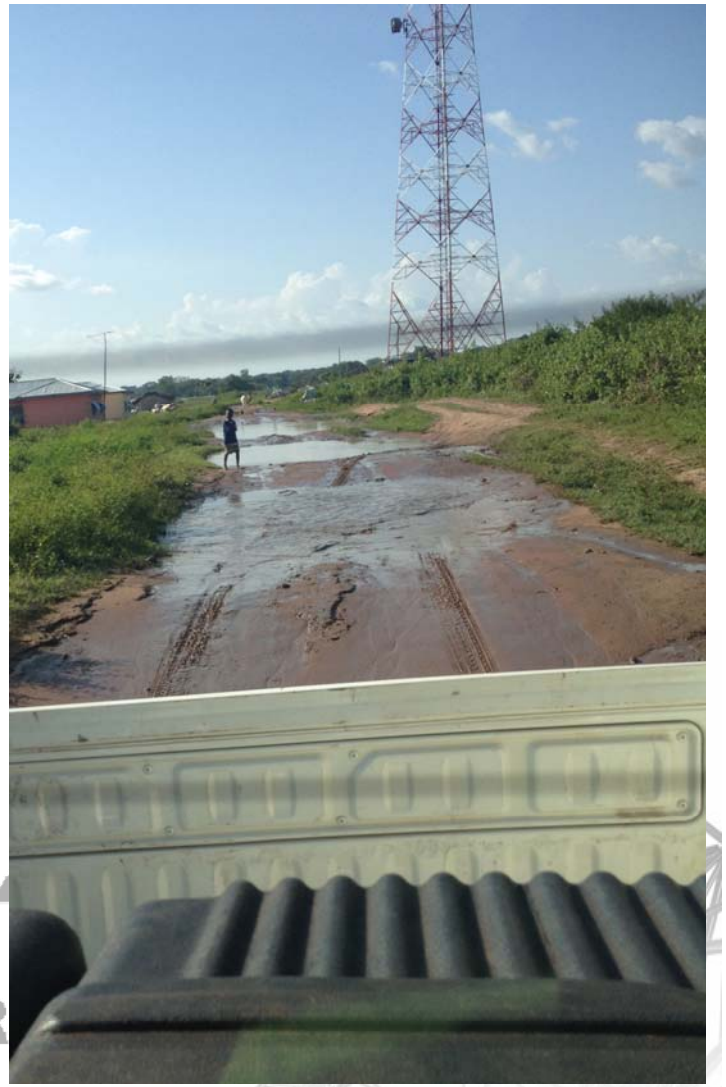
Trial experiences – Battery Hybrids

Problems

- Poor maintenance on sites results in hybrid performance degrading faster than expected. Key factors include:
  - Generator swap outs,
  - Lack of product understanding,
  - Solutions where the hybrid system uses the existing rectifier.
- Poor site access forces operations to decrease the battery DOD and therefore hybrid performance.
- Access to spares for older systems can be problematic.

Solutions/ future considerations

- Improved training.
- Involve key personnel in all major maintenance on hybrid sites.
- Always include site monitoring.



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Site Monitoring

Typical uses:

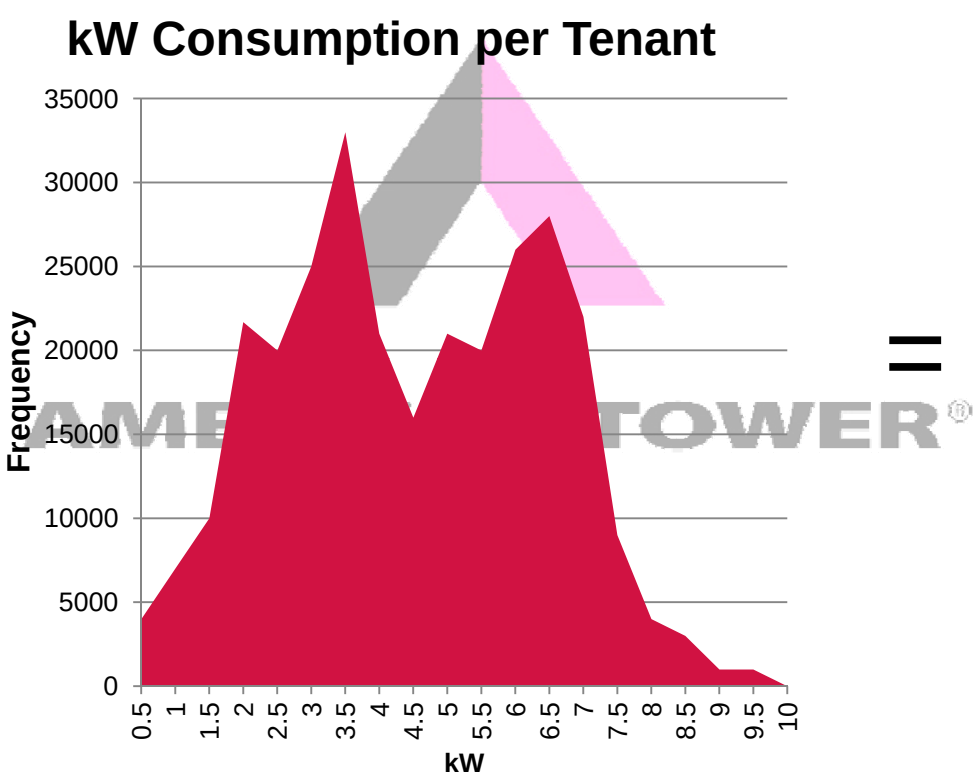
- Ad-hoc site troubleshooting
- Site reports
- Network reports
- Etc…

Alternative uses:

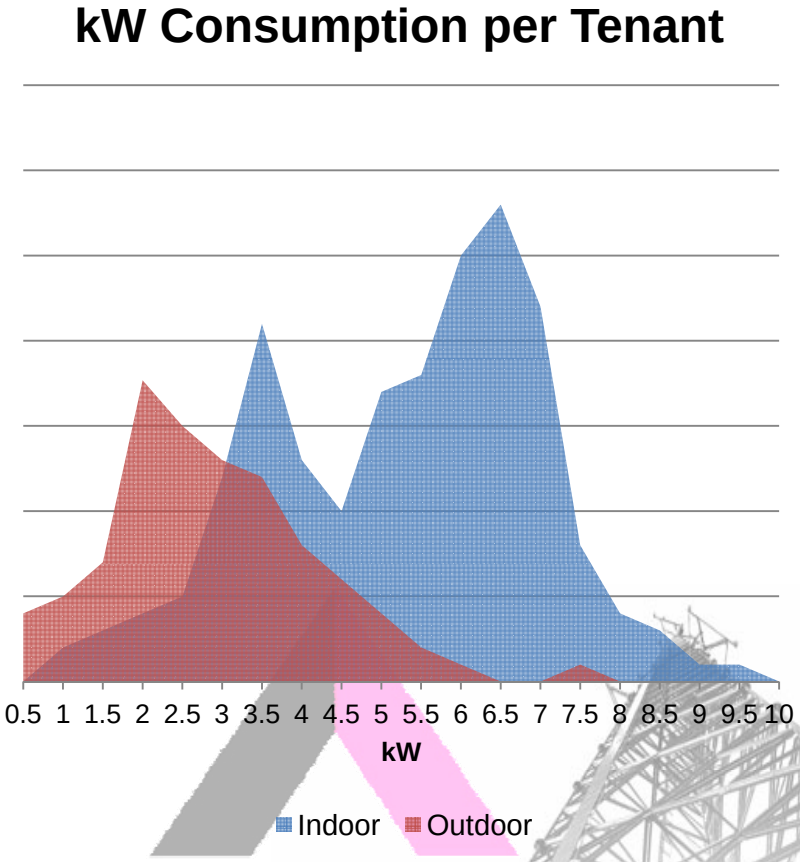
- Understanding long term network evolution to generate future predictions. For example:
  - What power customer A consume if they were to put equipment on a site in the Western region of Ghana and how their requirements change on that site over the next year?
- Grid outage pattern recognition.



kW Usage of a MNO



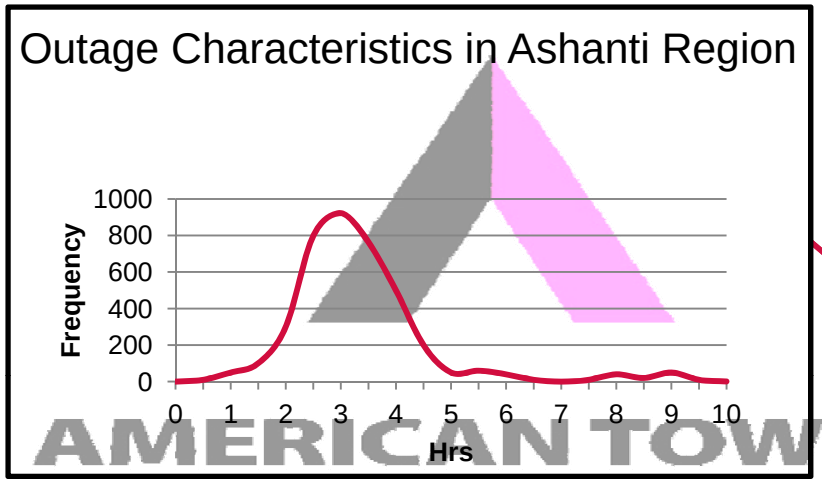
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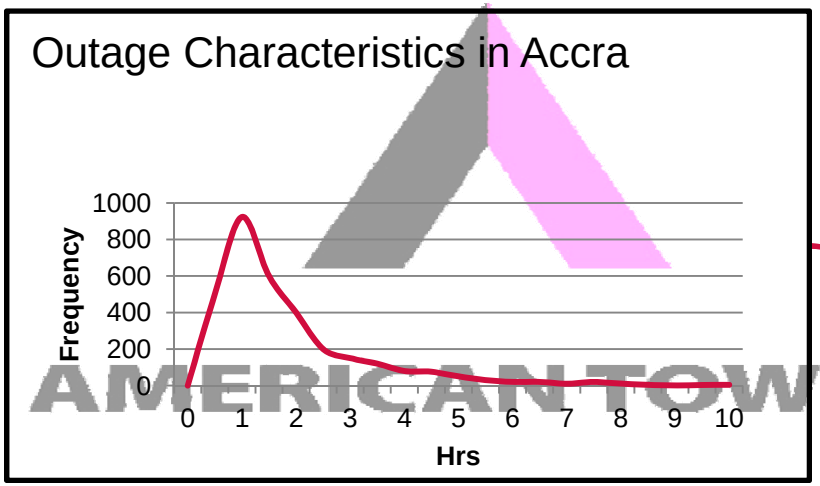


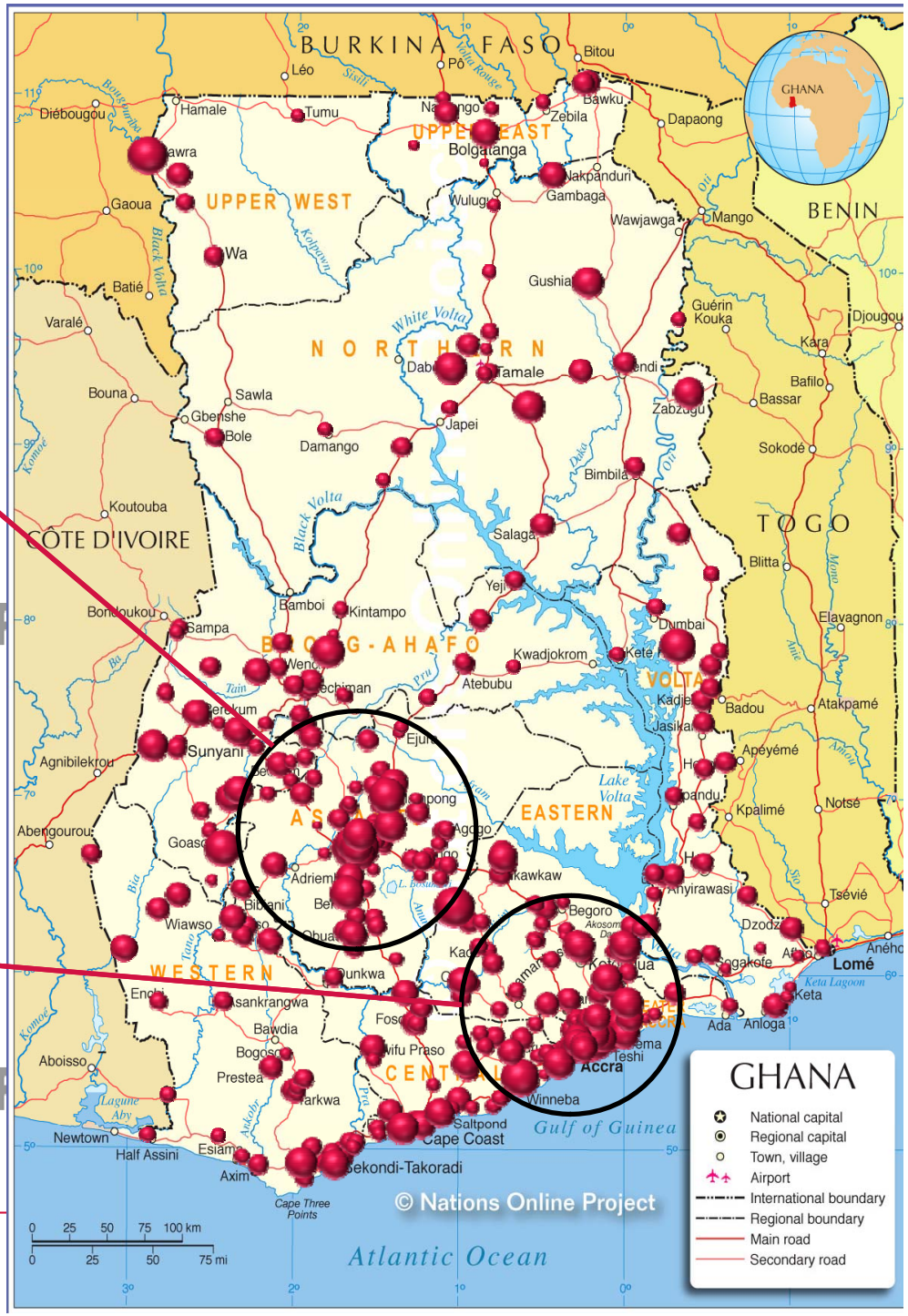
Indoor to Outdoor power conversion ratio = 1.87

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Pattern Recognition



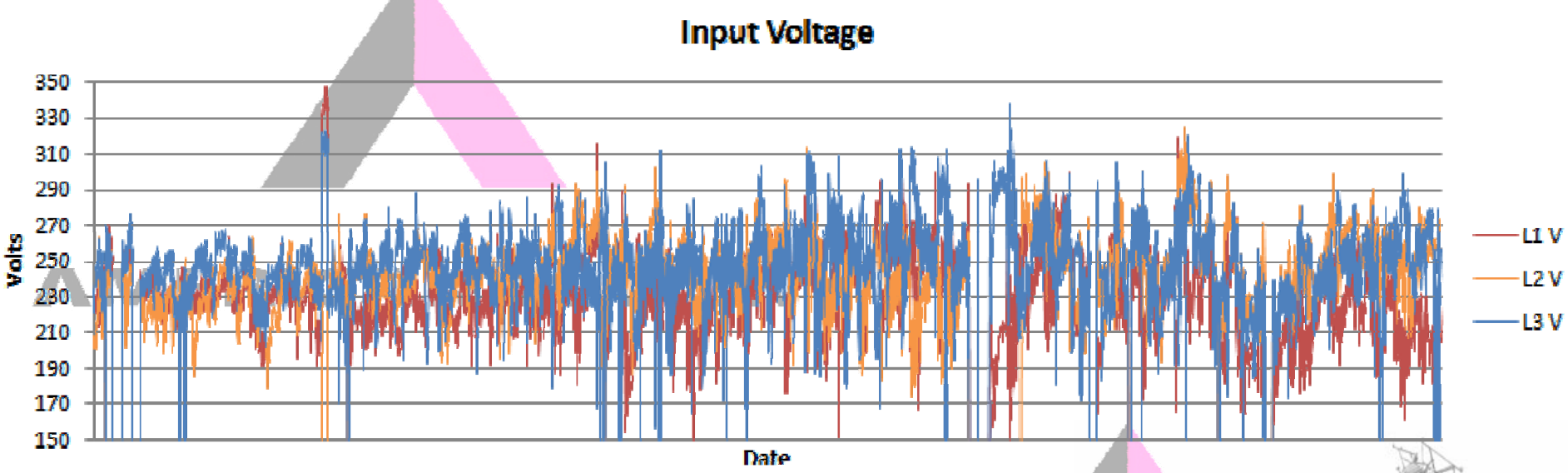




* These figures indicate a period of analysis and may not necessarily represent future behavior.

Analysis of a “Poor Grid” Site

Mains input analysis Line to Neutral.



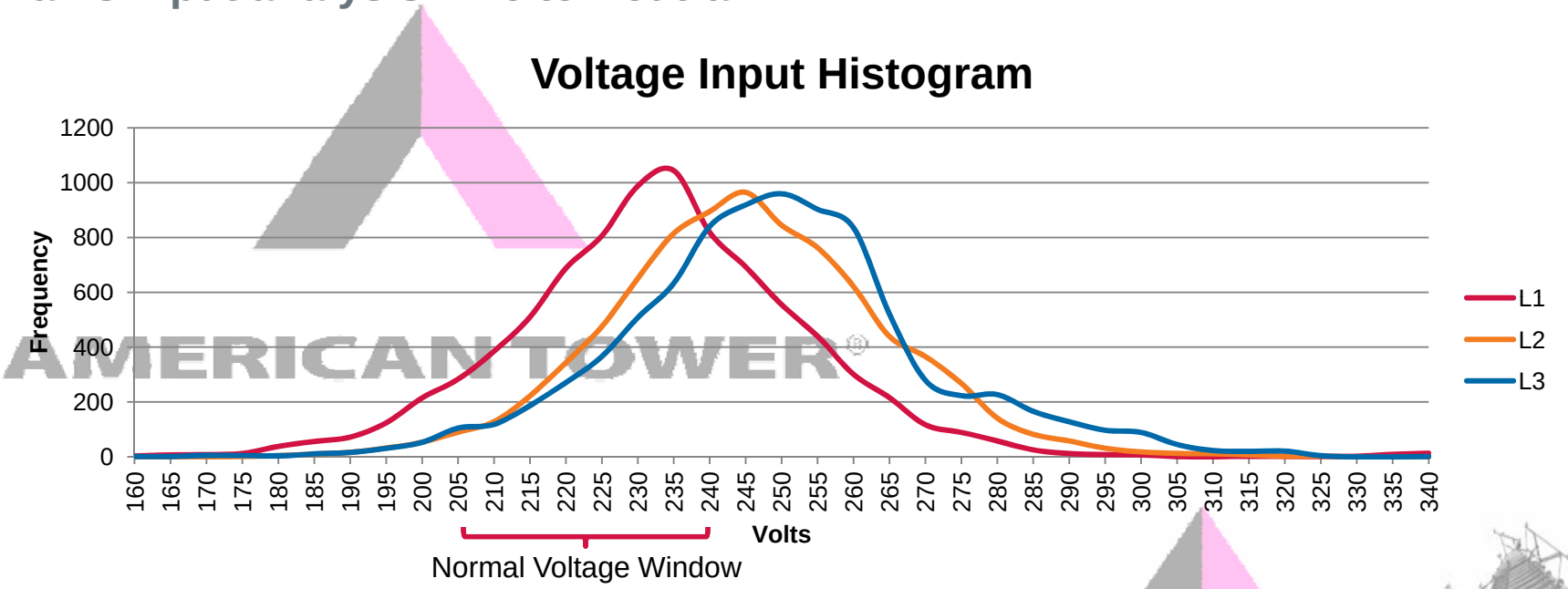
Notable items:

- Voltages very erratic, frequently exceeding 280V (beyond the limit of L-N AVR systems)
- Phase losses did occur but were infrequent. The system never experienced a 2 phase loss.
- Surge protection cannot protect the equipment from this.

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Analysis of a “Poor Grid” Site

Mains input analysis Line to Neutral.



Correlation:

- L1-L2 = 0.77
- L1-L3 = 0.87
- L2-L3 = 0.70

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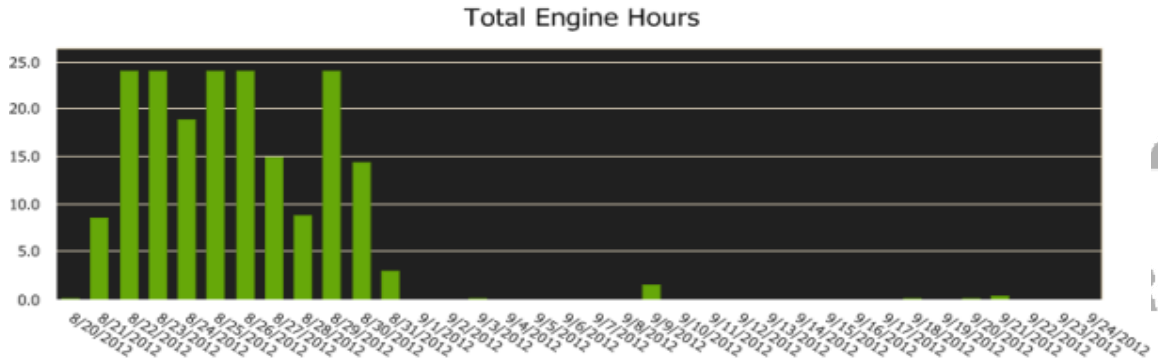
Analysis of a “Poor Grid” Site

Measures put in place:

- Refurbished electrics on site.
- Installed updated AVR system.
- Refurbished line tap connections on the transformer.
- Redistributed load to counter the unbalanced usage by the local community.

Results:

Generator before	690 hrs/month (22hrs/day)
Generator after	41 hrs/month (1hr 20min/day)
Generator run reduction	94%
ROI	< 4 months



Results Across the Network

Key Benefits:

- Improved network uptime.
- Reduced fuel related OPEX for ATC and its customers.
- Reduced maintenance costs.

Fuel and Carbon Savings:

- Over 500,000 liters of diesel saved each year.
- 1340 tons of CO^2 Saved per year.
- Equivalent to 45 Acres of forest (1)



(1) According to the 2010 U.S. Greenhouse Gas Inventory, the average carbon density of U.S. forests is 29.55 metric tons per acre (EPA 2010).



Thank you

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