



CREATING A  
BRIGHTER  
FUTURE.

# Flow Batteries Operating and Zcell

James Hamilton

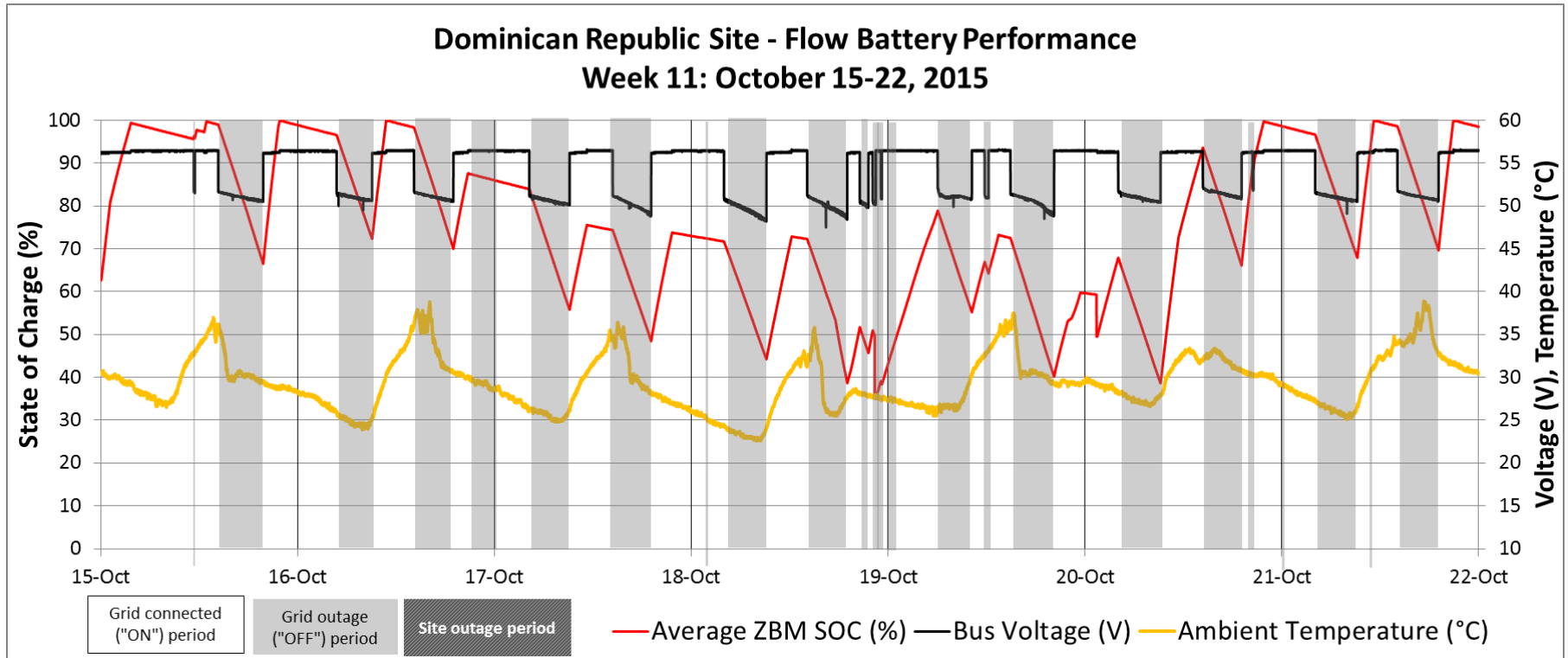
All Energy  
2016

# Flow Batteries at Remote Sites – Dominican Republic

- 3 month trial in 2015
- Grid-only site (no solar or generator)
- Grid uptime approx. 55%. Most outages 4-6 hours long. Usually 2 outages/day.
- 1kW telecommunications load
- 2 flow batteries (16kWh total capacity) replaced the existing lead-acid batteries
- Maximum temperatures often exceeded 40°C (104°F)
- Increased site uptime to >96%
- Downtime associated with extended outages, e.g. Hurricane Erika.
- No theft, temperature degradation etc.



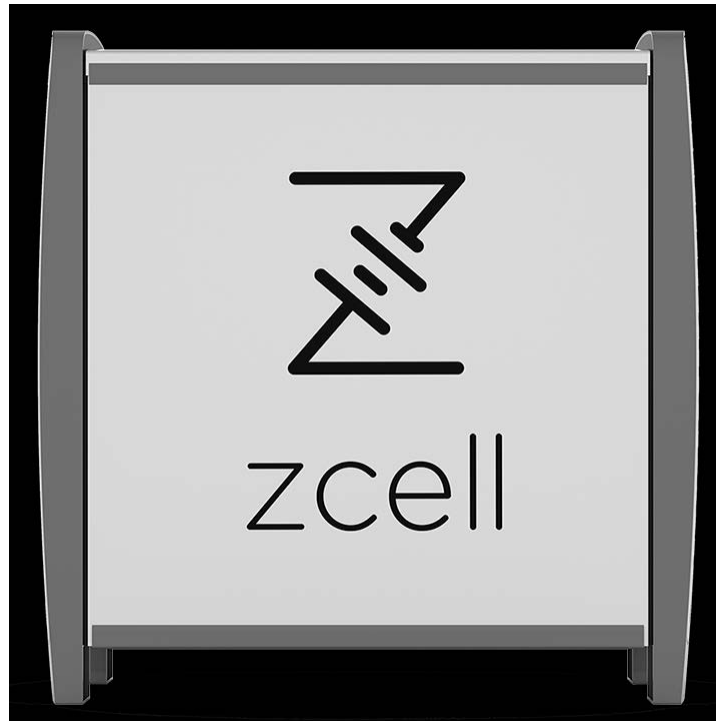
# Flow Batteries at Remote Sites – Dominican Republic



# Conclusions

- Flow batteries present a solution to many of the problems for telcos and tower owners presented by lead-acid batteries
- Longer life, no temperature or depth of discharge degradation, anti-theft properties
- Proven technology in the field
- Lower lifetime costs
- Future work: Further BTS installations to measure success of integration with solar and diesel fuel/runtime reduction

# ZCell



# ZCell – Domestic Flow battery

ZCell's unique technical benefits include:

- **Genuine 100% cycle depth**, supporting daily delivery of 10 kWh of energy at a 100 per cent depth of discharge with no risk of battery damage
  - no reserved capacity
  - no battery damage from full discharge or from overcharging
- Expectation of **retaining the full output capacity** over the useful life of the battery
  - compared to large loss of output capacity with age being normal for most other battery types.
  - you can size your system without over-capacity required up front to offset expected capacity loss with age
- **No Fire Risk:** ZCell's bromide-based electrolyte is a natural fire retardant while mechanical damage does not risk explosion or 'thermal runaway'

# ZCell – Domestic Flow battery

- **Robust high temperature operation** without active cooling
  - electrolyte operating temp of up to 50 Celsius
  - high electrolyte thermal mass means the ambient can be well above this
- **On-board smart battery control system**
  - detailed system performance and environmental monitoring and logging
  - on-board power control contactors mean the battery can actively disconnect for self protection
- **Essentially unlimited shelf life** (and can be switched off at any state of charge and hibernated for storage)
- A **great recycling story**, made with major components that are easy to recycle or reuse

**THANK  
YOU**



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