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# 7 Key Characteristics of Practical Hybrid Power Systems in Myanmar

*The necessary characteristics and savings you can expect*












# Hybrid Power Systems: The Big Numbers…

What are the real costs and what are the expected savings?

- Our experiences in Africa show us the cost is approximately **$40,000** per year per site running diesel Gensets 24-7
- A good hybrid system can deliver **80% savings,** for a running cost of **$8,000** per year per site for a typical 1.5kW multi-tenant site
- This equates to **$32 Million** in savings for a network of 1,000 sites



*What are the key characteristics of a hybrid power system that can be successful in Myanmar and can generate these savings but also a reasonable payback?*

# *One* - All-In-One Fully Integrated Multi-Tenant Outdoor Hybrid Solution

- Integrated system designed for fast charging with low internal losses
  - 10% increased efficiency
    Rectifier (5%), Cabling (2%), Cooling (3%)
- Single controller for solar / genset / grid / batteries
- Significantly improved reliability by avoiding:
  - Undocumented installations
  - Open cabinets (contamination, rodents)
  - Ad-hoc cabling
  - Non-functional / old / missing equipment
- Reduced site trouble-shooting cost as system is fully tested in the factory before shipment.
- Quick 1-2 day installation by 2-man team per site
- Outdoor Cabinet - Ready to face the elements
- In Myanmar one will see fully integrated multi-tenant outdoor hybrid solutions; you will not see indoor bits and pieces hyrbrids.






# *Two* - A Versatile Monitoring System

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- An energy monitoring and management system, providing a one-stop interface for:
  - Energy OPEX & KPI follow-up
  - Detailed power analysis
  - Diesel and site service logistics
  - Site surveillance and alarms
  - Remote trouble-shooting
  - Asset management
  - Optimised power usage system-wide
- Multi-tenant power load monitoring and simple integration to tower-co billing
- Automated Reporting: info from site fuel, power load

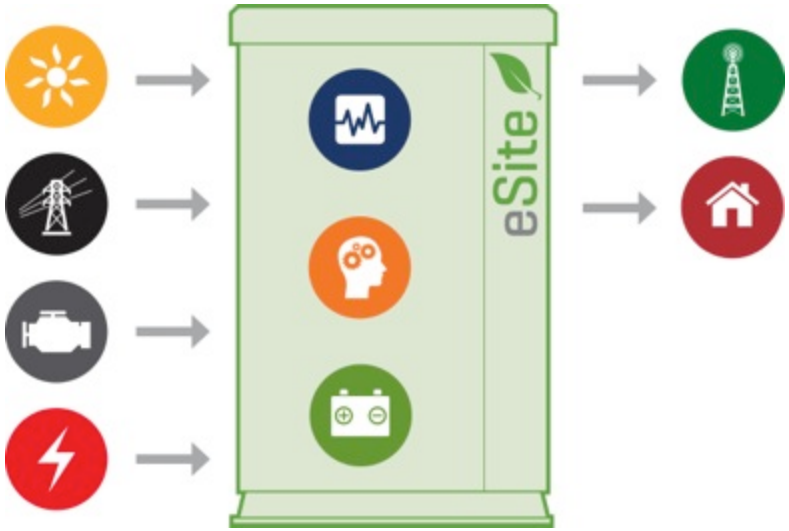





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# *Three* - The Brain of the System Enables Diesel Savings

- A good controller is a necessity – it harnesses all existing available power and keeps the Genset Runhours at a minimum
- Flex's design strategy for Off-Grid and Bad Grid sites in Myanmar (Model 4, 5 and 7) sees Genset run-hours between 5 – 8 hours maximum in a 24 hour cycle.
- Optimises the use of batteries and renewable energy sources (if available) to lower diesel consumption, while prolonging the lifespan of the batteries and other components
- Patented Diriflex™ control system - the brain of eSite









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# *Four* - The Correct Battery Strategy

- Best in class charge acceptance giving the highest Diesel Genset Run Hour Savings compared to 24/7/365 Genset Operational scenarios
- Maximum Battery Service Life in the field, not limited by operating temperature
- PSOC (Partial State Of Charge) operation cleared by the battery vendor including an energy throughput commitment by warranty
- Best Cost to Performance Factor critical for commercial viability in addition to suitable form factor
- Flexenclosure chooses 12V AGM TPPL or 2V AGM batteries











# *Five* - Modularity

- There are 7 power models designed and applicable in Myanmar
  1. Model 1: Good Grid (Grid + Battery)
  2. Model 2: Bad Grid (Grid + Battery + Solar)
  3. Model 3: Off Grid (100% Solar + Battery)
  4. **Model 4: Solar Hybrid (Solar + Battery + Diesel Genset)**
  5. **Model 5: Bad Grid (Grid + Battery + Diesel Genset)**
  6. Model 6: Bad Grid with Wind (Grid + Battery + Diesel Genset + Wind)
  7. **Model 7: Genset Hybrid (Diesel Genset + Battery)**
- It is imperative that the hybrid power system deployed in Myanmar should be flexible enough to accommodate all the above models without operational interruption while enabling additional diesel savings.







# *Six* - Product Reliability

- The power system will be exposed to the elements in Myanmar so product reliability and durability is imperative. High quality components used with long MTBF.
- System Design: Longer Battery Life, Longer Genset Maintenance Interval, Fuel Savings Approach, best in class components/cables
- Outdoor Cabinet: Vandal proof, durable, easily transported, installed in a day.
- Warranty from individual components manufacturers

| Operator | eSite type | Average load | Genset run-hours with eSite | Genset run-hour reduction | Deployed |
|---|---|---|---|---|---|
| Airtel Ghana | Solar | 2.5 kW | 5.8 h/day | 76% | 2012 |
| Airtel Kenya | Solar & Wind | 1.4 kW | 1.8 h/day | 92% | 2009 |
| Airtel Nigeria | Solar | 1.0 kW | 2.4 h/day | 91% | 2011 |
| Airtel Tanzania | Solar | 0.9 kW | 2.0 h/day | 92% | 2012 |
| Bharti Infratel India | Solar | 1.5 kW | 3.3 h/day | 86% | 2012 |
| Etisalat Nigeria | Solar & Wind | 1.6 kW | 1.5 h/day | 94% | 2011 |
| MTN Nigeria | Solar | 1.4 kW | 4.5 h/day | 81% | 2011 |
| MTN South Sudan | Solar | 1.4 kW | 2.2 h/day | 91% | 2013 |
| MTN Swaziland | Grid | 1.6 kW | 0.9 h/day | 96% | 2012 |
| Orange Madagascar | Solar & Wind | 1.4 kW | 1.2 h/day | 95% | 2011 |
| Telenor Pakistan | Solar | 0.9 kW | 2.3 h/day | 90% | 2012 |
| Telenor Pakistan | Grid | 1.2 kW | 0.6h/day | 98% | 2013 |
| Vodacom Tanzania | Solar | 1.6 kW | 2.6 h/day | 89% | 2012 |
| Zain Sudan | Solar & Wind | 1.3 kW | 0.5 h/day | 95% | 2011 |

# *Seven* - Winning Business Models for Myanmar

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- Business Models:
  - CAPEX & O&M – directly with tower operators
  - Guarantees provided by European ECA's (Swedish or Norwegian Export Credit Agencies)
- Services and Support:
  - Turnkey capability for installation and commissioning – utilize regional and local resources
  - Training Locally
  - Remote monitoring and management system and customer report services
- Performance of the network is improved by including network audits and power optimisation support
- ESCO and OpEx Models will grow as market matures



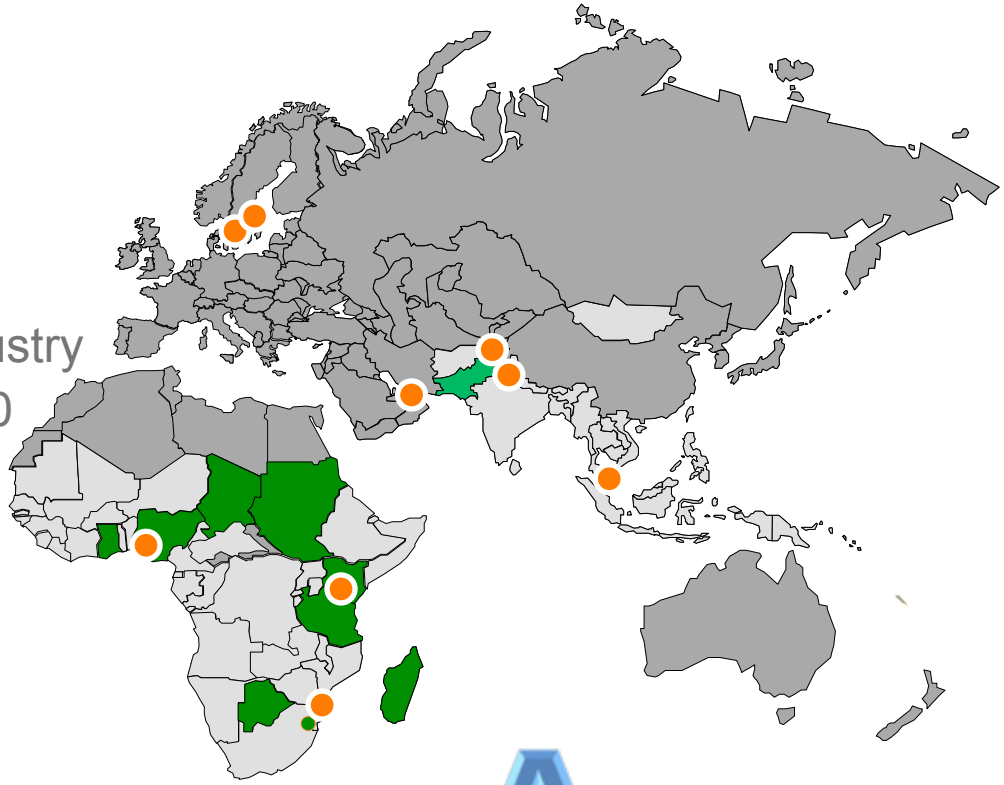




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# Who we are - Flexenclosure

- Sweden-based high-tech manufacturer
- IFC a key investor
- 20 years in the rural telecom industry with deployments in more than 50 countries
- Over 500 eSites and 6,000m2 of eCentre data centre facilities deployed around the world



**By the end of 2014 Flexenclosure will have deployed close to 1,000 eSites in Myanmar**

# eSite – Best in class hybrid power systems

- eSite enables lowest possible site OPEX
- eSite enables capital efficient growth in multi-tenant environments
- eSite and eManager provide the technical flexibility to enable the best economic solution in every site situation – off-grid and bad-grid
- eSite delivers peace of mind in extreme environments




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