Electricity and the cost of doing business in the Philippines

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Energy Efficiency to Boost Economic Growth
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Well Known Fact About Philippines

- Ideal investment destination
- International credit rating upgrade – “BBB-”
- Resilient economy that can weather a global economic downturn
  - GDP in 20124Q grew by 6.8%, full year 6.6%
  - GDP value of PH represents 0.36% of the world’s economy
- Strategic logistics hub to Asia (where more than 2B people resides)
  - Within proximity are demand centers such as China, Indonesia & India
- Abundant resources that provides endless possibilities to invest
  - 5th among mineralized country in the world
  - 2nd in gold reserves, 4th in copper, 5th in nickel & 6th in chromites

• What sets apart? - The Filipinos

References:
- www.boi.gov.ph
- www.manila2012.ph/about_the_philippines
- Bloomberg TV, Worldbank, NSCB, CIA Worldfact Book and PH & WW news releases
In the Philippines

Today:

94M million inhabitants

40% lives in cities

Approx 20% have access to a decent energy infrastructure

By 2030:

125 million inhabitants

60% will live in cities

an additional (approx) 2 million people in the “energy” middle class

Source: UN Population Fund Report 2010
Electrical energy is generally more expensive for those who have less access to it.
Energy Cost

* Philippines is one of the highest rated country in the world!

References:
http://www.abs-cbnnews.com/business/10/10/11/ph-power-rates-5th-highest-world
International Energy Agency - www.iea.org
The Costs of Power Failure
Impact of Energy to Businesses

Estimated figures of loss from the three growth pillars of Mindanao, the agriculture, industry and services sectors:

Table 1. Revenue loss of per hour power shortage.

<table>
<thead>
<tr>
<th>Estimated revenue losses</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than P50,000/hour</td>
<td>83</td>
</tr>
<tr>
<td>P51,000 to P100,000/hour</td>
<td>4</td>
</tr>
<tr>
<td>P101,000 to P200,000/hour</td>
<td>4</td>
</tr>
<tr>
<td>More than P200,000/hour</td>
<td>4</td>
</tr>
<tr>
<td>Not Specified</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Major Effects Brought by the Current Rotational Brown-Outs

<table>
<thead>
<tr>
<th>Major Effects Brought by the Current Rotational Brown-Outs</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment Breakdown</td>
<td>23</td>
</tr>
<tr>
<td>Revenue Losses</td>
<td>20</td>
</tr>
<tr>
<td>Delayed Production/Cancellation of Transactions, Operations/</td>
<td>35</td>
</tr>
<tr>
<td>Low Output of Production</td>
<td>12</td>
</tr>
<tr>
<td>Partial Labor Lay-offs</td>
<td>9</td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
</tr>
</tbody>
</table>

References:
http://www.minda.gov.ph/site/Mindanao/downloads/Presentations
http://opinion.inquirer.net/50283/mindanao-power-woes-and-media-brownout
Controlling energy risks should not just be limited to having emergency generators!

- Michael Bruch, AGCS Allianz
The Jurassic Grid
Old-style power distribution

- **Central production** adapting to demand variation
- **Top-down** energy flow
- **Production / consumption balance** done by integrated utility companies
- Rather **passive users**
Electricity networks are becoming more complex, less stable!

To continue to efficiently balance supply & demand, the grid needs to become smarter.

3 drivers + 3 accelerators

1. Growing electricity demand
2. Need to reduce CO₂ emissions
3. Constraints on existing networks

1. Technology availability
2. Active government & regulators
3. Active end-users

making the Smart Grid happen
The Smart Grid

Centralised Generation

Transmission

Distribution

Consumers

1. Renewable Energy Plants

2. Active Energy Efficiency: Energy visibility & Means to act

3. Residential, Industry, Buildings, Data Centres, Infrastructure

4. Consumers

Flexible distribution
Renewables integration
Electric vehicle charging
Demand-response

Communication and software at all levels “Smart Grid”

Distributed Generation

Electric Vehicles & Energy Storage
Energy challenges & opportunities are everywhere

**Supply Side**
More Efficient and Cleaner Supply

Cleaner supplies will take time to implement

We must develop technologies and business models to increase renewable energies penetration

**Demand Side**
More Efficient Use

Current technologies allow us to target 30% savings

We must focus on Energy Efficiency to solve our energy dilemma

**Mid term approach**

**Short term action**
We must enable high performance green buildings & smart cities for our future

Today

- Focus on environmental impact of construction (green design)

Future

- Focus on efficiency and operational performance over time (LEED EB:O&M)
- Use renewable energy
- Net Zero Energy & Positive Energy buildings
- Connect to Electrical Vehicles
- Carbon Neutral buildings, micro grids, eco-cities

smart and green come together to deliver “bright green” buildings
100 units of Fossil Fuel

- Fossil Fuel Power Plant: 38.5 units
- Power Transmission: 35 units
- Building Facilities: 22 units

Lost through inefficient generation and heat loss: 61.5 units
Lost through transmission and distribution: 3.5 units
Wasted through inefficient end use: 13 units
Understanding Building Lifecycle Costs

Building life cycle costs = capital investment + operation costs

- Development CAPEX
  - Construction 11%
  - Financing 14%
  - 3 to 5 years
- Ongoing OPEX
  - Operation and Upgrades 75%
  - 30 to 35 years

Sources:
- www.CABA.org

Real Estate Developers
Investors
Construction Companies
Architects
Engineers
Contractors
Owners
Facility Managers
Occupants

Energy Management minimizes ongoing costs, which is 75% of the life cycle cost of the building.
Active Energy Management: The fastest way to save on energy, curb CO2 emissions and reduce operation cost

1. Find out what the challenge is...
   - Energy audit & metering

2. Fix the basics
   - Low consumption devices, insulation material, power factor correction

3. Optimise through automation & regulation
   - Solutions in: building management, power management, motor control, lighting control

4. Monitor, maintain, improve
   - Metering, monitoring and consulting services, EM analysis software

Passive Energy Efficiency

Active Energy Management
A few examples of REAL $saving$
Case Study 1: Building in France

ISO 50001: first certified building in the world!

A Green building
- Equipped with SE solutions
- Electric Vehicles charging station with PV solar panel roof
- Smart grid-ready
- Full monitoring

÷4
Final energy consumption vs. previous sites in the area

80 kWh/m²/yr
Final energy consumption ROI in 5 to 7 years

Certified
- ISO14001
- HQE Exploitation
- NF EN16001
The Hive: an efficient building

Building certifications
- ISO 50001
- ISO 14001
- HQE operation and use

The Hive at a glance
- 35,000 m² over 6 floors
- 1,850 employees
- 100,000 visitors / year
- 2,424 electric blinds
- 4,510 lighting points
- 3,000 chilled beams
- 1,500 presence detectors
- 186 measurement points

Energy consumption
- 2012, YTD: 2,897,498 kWh
- 2011, full year: 6,304,830 kWh

2011 energy performance
(2005 TR perimeter, in final energy)
- Actual: 78 kWh/m²/year
- Target: 80 kWh/m²/year
Comparison by floor - rolling 12 months

- 6th floor - electricity: 65,278 kWh
- 5th floor - electricity: 53,381 kWh
- 4th floor - electricity: 52,359 kWh
- 3rd floor - electricity: 105,368 kWh
- 2nd floor - electricity: 91,128 kWh
- 1st floor - electricity: 48,495 kWh
The Hive: an efficient building

Performance
-14.6 %*

* Normalized by Degree Days (weather variations)

Trends (2011 vs 2010)
-17.1 %

Energy savings
1,297,141 kWh

CO2 emissions avoided
218 tonnes CO2

Equivalent to...
12,101 trees planted

Equivalent to...
1,281,678 kms not driven
Case Study 2: A Manufacturing Plant in the Philippines
Energy Savings in the Plant
Key Success Factors

• Use Lifecycle Solution for Energy Efficiency Initiatives in the Plant.

• Fast implementation to measure energy using Powerlogic ION Meters

• Regularly recording, monitoring and analysis with Powerlogic ION Enterprise System

• Commitment from each contributor
Step 1
Energy Consumption Monitoring

• The basis of a successful energy efficiency program is to implement an Energy Management System.

• PowerLogic® Power Metering System
  • cover all 6 sites with 84 power meters to survey the electricity consumption
  • Regularly monitoring and analysis PowerLogic data
  • Real time data logging and reporting was made through StruXureware power monitoring
Step 2: Awareness!

Optimized the workload of air compressor and reduce the energy usage

→ to setup new air pressure level.

-8.14% of Kw

The charts show; Air compressors after reduced air pressure, real power significant drop (69Kw. to 64Kw.)

15% Savings Immediately!

Approx P8M savings

Educating employees to switch off lights & air condition when leaving the rooms/offices
Step 3 Lighting Optimization & Control

• Automatic control for switching off unnecessary lights lead to good energy savings.

• Replacement of Metal Halide with High Bay LED Lighting to the warehouse
Step 3  Motor Control

- Variable Speed Drive (VSD) installation at the vacuum pump for the chiller system 10HP
- Variable Speed Drive (VSD) installation at main Air compressor 75HP
Step 4  Energy Monitoring

Monitoring system Improvement (StruXureware)

- Access to the energy readings and logs through the internet
- Issuance of monthly energy reports
- Preparation data for improvement actions
Results: Significant Energy Savings!

Initial Savings:
- P43M worth energy savings
- 3,953,576 kWh savings
Case Study 3: A Factory in the Philippines

Energy Target Setting

**Scope of Work:**
- Analysis of electricity consumption
- Contract Tariff Analysis
- Transformer load & distribution
- Assessment of Industrial Services
  - Compressed Air Generation
  - Refrigeration Plant
  - Cooling Tower
  - Water Pumping
  - Boiler house & Air heaters
  - HVAC
  - Lighting
- Assessment of Process
- Detailed Project Description with savings calculation and required CAPEX for the EE initiatives.
Energy Efficiency Initiatives: A Factory in Philippines

What was done?

• Replaced Air Handling Unit (AHU) chilled water distribution pumps with VFD and high efficiency pumps
• Replace Valve Absorption Motor (VAM) with electrical chillers
• New Cooling water pumps with VFD and new rerouted headers
• Install new cooling water pumps with VFD and new headers
• Improvement of Power Factor in electrical distribution

More than P45M worth of savings
Above 6000 MWh energy saved
Equivalent of 0.0471 tons of CO₂/t
28,980 trees to offset per year!

As project is still ongoing, more savings are expected!
Case Study 4: A Tunnel in the Philippines
Solar Structure
Projected Savings

- The solar power is rated at 6.4 kWp. It generates 6,648 kWh per year.
- Total power demand reduction is 28,392 kWh (LED + solar power) or 51% energy savings.
- Only the right inverter, PVs, batteries, and lighting systems can provide maximum savings:

<table>
<thead>
<tr>
<th>RESULT</th>
<th>Tubular Fluorescent Lights (T12) + High Pressure Sodium (HPS)</th>
<th>LED + SOLAR POWER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption, in kW</td>
<td>6.58 kW</td>
<td>4 kW</td>
</tr>
<tr>
<td>Cost, @ Php 10 / kW</td>
<td>Php 570,000 per annum</td>
<td>Php 230,056 per annum</td>
</tr>
<tr>
<td>Power demand reduction</td>
<td><strong>28,392 kWh (51%)</strong></td>
<td></td>
</tr>
</tbody>
</table>
In Conclusion

We cannot stop energy demand growth

But we can change the way we use energy and reduce GHG emissions & eventually realize the savings from energy reduction
30% savings are available today…

... thanks to a combination of

- **Efficient devices and installation (10 to 15%)**
- **Optimized usage via automation (5 to 15%)**
- **Monitoring & Maintenance (2 to 8%)**
… but savings can be lost quickly…

- Unplanned, unmanaged shutdowns of equipment and processes

- Lack of automation and regulation (motors, heating)

- No continuity of behaviours

- Up to 8% per year is lost without monitoring and maintenance program

- Up to 12% per year is lost without regulation and control systems
We make the most of your energy!

Thank you