120 MW SOLAR PV & ENERGY STORAGE SYSTEM PROJECTS

HANWHA ENERGY CORP. MALOJLOJ
60 MW SOLAR PV/ESS PLANT

KEPCO – LG CNS MANGILAO
60 MW SOLAR PV/ESS PLANT

Joaquin Flores, P.E.
Director of Energy Projects
HANWHA DANDAN PROJECT SITE
HEC PROJECT SUMMARY

• 179-acre solar farm in Dandan
• 16.33 mile, 115 kV transmission
• 90 MW dc, 60 MW ac Solar PV
• 144,000 MWh/yr guarantee
• 79.1 MWh ESS rating
• 16 ESS Banks & PCS Inverters
• 25-year Power Purchase Agreement serving GPA grid
HEC PROJECT SUMMARY

• 16.3 mile 115 KV Transmission line
• 253 65-75 ft steel mono-tubes
• New Apra-Talofofo 34.5 KV line on 106 existing steel poles
• New Apra 50 MVA 115/34.5 KV Substation
• New Malojloj 50 MVA 115/34.5 KV Substation Switchyard
• Relocation of 13.8 KV Underbuilt Distribution Lines
• 11 mile Fiber Optic Communications from Talofofo-Piti Substation
• Upgrade T-Line protective relays
• Founded in 1952
• 757 Employees
• Fortune 500 company
• 61 affiliates in South Korea alone
• 258 Global Networks (as of May 2017)

• Top 5 Business Enterprises in South Korea
• $53.89 B in total sales (as of 2016)

• $331 M total in sales for 2016
• $1,296 M total assets as of 2016

At Hanwha, we make solar energy the better solution.
LG CNS MANGILAO PROJECT SITE
KEPCO-LG CNS PROJECT SUMMARY

- 279-acre solar farm in Mangilao
- 88 MW dc PV, 60 MW ac
- 32 MWh ESS—Ramp Control and Peak Shaving
- 1.2 mile 34.5 KV transmission lines
- 3 new 34.5 KV circuits for capacity and reliability contingencies
- New Mangilao Substation with 34.5 KV switchgear
- New Fiber Optic communications between substations
- 149,000 MWh/yr guarantee
- 25-year Power Purchase Agreement, serving the GPA power grid.
- Founded in 1987
- Approx. 6,000 employees (including subsidiaries)
- Power generation; Engineering services, planning/proposal, construction, performance, operations, and development; IT Services
- 3 billion USD annual sales in 2017

- Founded in 1898 - responsible for 93% of Korea's electricity generation
- Over 20,000 employees (including subsidiaries)
- Electric power generation; Research and technology development; Investments, funding & real estate
- Over 52 billion USD annual sales in 2017
Savings to ratepayers

- Lower Levelized Energy Adjustment Clause (LEAC) Rate
- Helps GPA hedge against fluctuating fuel prices because renewables are inherently immune to globally fluctuating fuel prices.
- Phase II - both Hanwha and KEPCO consortium energy prices are significantly lower than the LEAC rate; $0.06422/kWh and $0.084/kWh respectively
- Results: $417,315,926 savings for GPA throughout the contract term

<table>
<thead>
<tr>
<th>CASE</th>
<th>Description</th>
<th>Project Size</th>
<th>5 Year Projected Savings On Current LEAC ($115/MWH)</th>
<th>5 Year Projected Savings On Projected LEAC</th>
<th>Present Value Utility Cost Savings thru Contract Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hanwha Proposal 1 Only (30MW) and KEPCO Proposal 1&amp;2 (60MW)</td>
<td>90 MW</td>
<td>$ 38,752,618</td>
<td>$ 72,670,440</td>
<td>$ 313,466,966</td>
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<tr>
<td>2</td>
<td>Hanwha Proposal 1&amp;2 (60MW) and KEPCO Proposal 1&amp;2 (60MW)</td>
<td>120MW</td>
<td>$ 43,290,919</td>
<td>$ 88,266,040</td>
<td>$ 417,315,926</td>
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</tbody>
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RENEWABLE ENERGY BENEFITS

- **Strengthen** the weak southern grid with a new 115 kV transmission line
- Decrease losses
- Drastically increase capacity, system reliability
- Provide redundancy of southern grid
- Allows more reliable power delivery to southern residents
RENEWABLE ENERGY BENEFITS

Solar Investment Tax Credit (ITC)

- U.S issuance of federal tax credit to refund 30% of construction costs for renewable energy projects.
- Reduced Tax credit for projects that break ground after 2019.
- Rezoning must be completed in 2-3 months for GPA and ratepayers to benefit from the federal tax credit.

PERMITTING & SURVEYING

Archeological, Environmental, Clearing & Grading, Boundary, Geotechnical, Public Health, Fire Department, Parks and Recreation, EPA, Peals Board, Highway Encroachment,

Q2 2018  Q3 2018  Q4 2018  Q1 2019  Q1 2020

GPA/CCU/PU
C Approval

DESIGN of PV plant and Transmission Line

Amending Zone for Conditional Land Use

PERMITTING & SURVEYING

Archeological, Environmental, Clearing & Grading, Boundary, Geotechnical, Public Health, Fire Department, Parks and Recreation, EPA, Peals Board, Highway Encroachment,
RENEWABLE ENERGY BENEFITS

- Helps reduce fossil fuel consumption in all sectors to 25% by 2020
- Solar is a zero fuel cost resource = tremendous savings
- Reduces energy cost—Solar Generation Unit Price: 6.4¢ and 8.5¢, vs Current GPA LEAC: 11¢
- More reliable energy with ESS—means stable power
- Eliminates approximately 2x30,000 metric tons of CO2 annually
- Reduces Guam’s dependence on imported fuel in the event of a disaster preventing or delaying fuel shipments
- Creates jobs over 25 years
- Provides significant construction activity & adds significant number of construction jobs
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QUESTIONS?

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