



ABB ENERGY PORTFOLIO MANAGEMENT, GUILLAUME RIDOUX

Philippines Electricity Market Outlook for Solar

Solar Energy opportunities in the Philippines, ATA Webinar

December 5th, 2018



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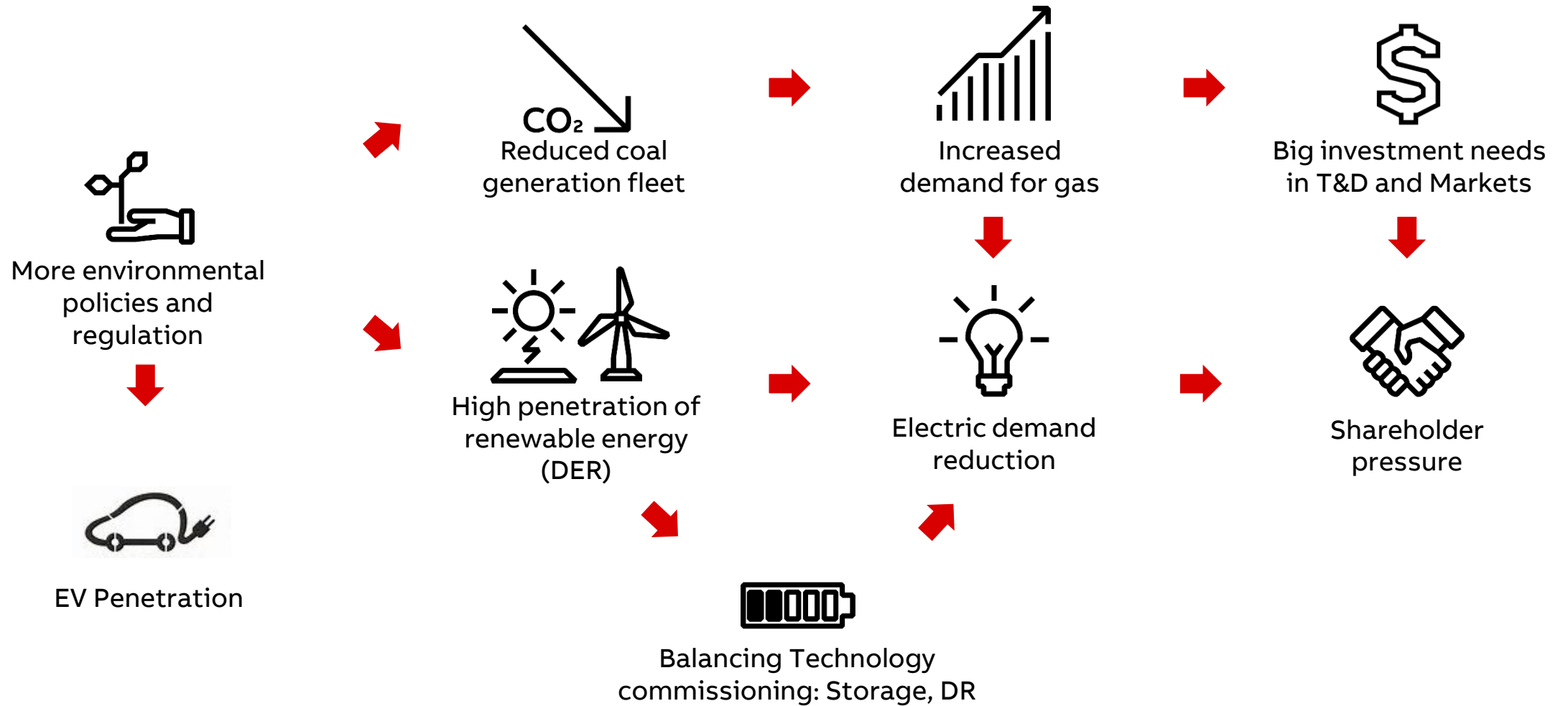
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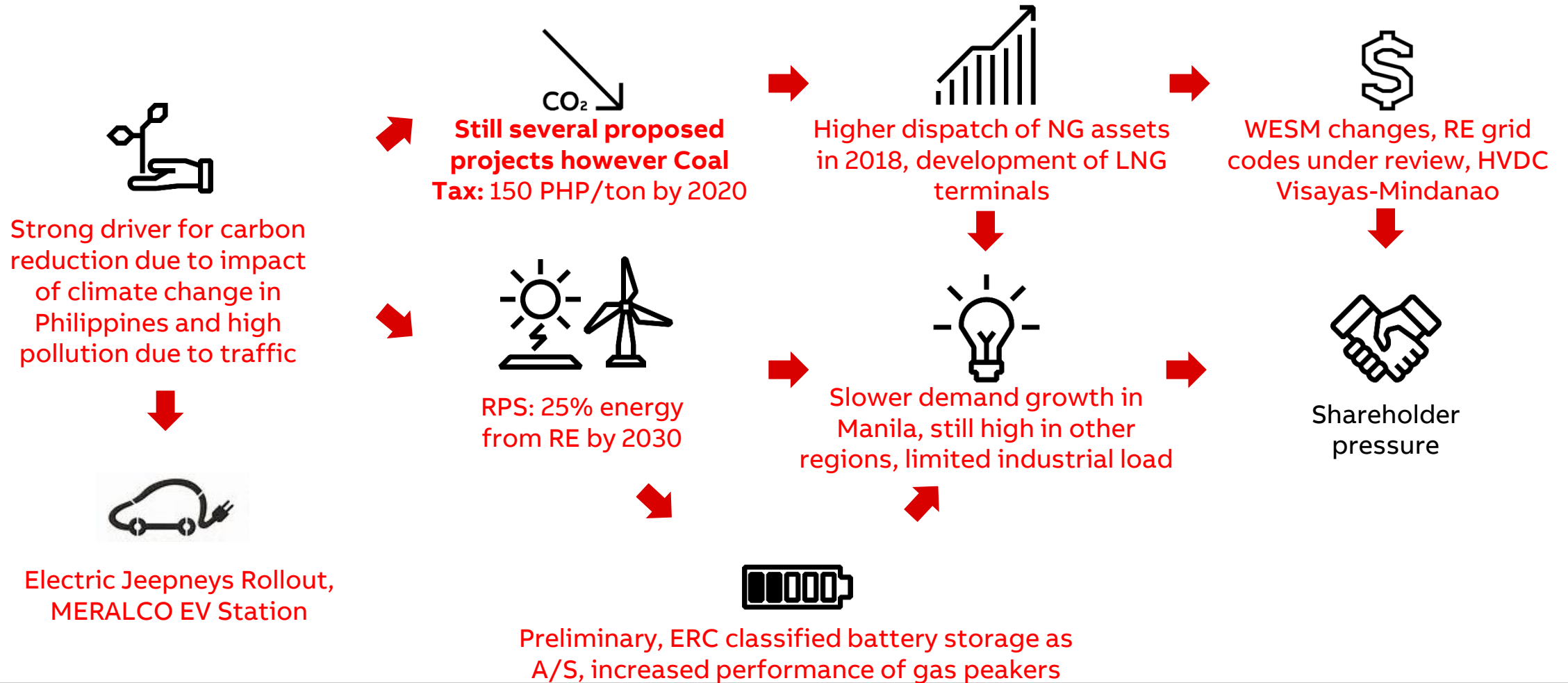
Global trends

Analyzing and Quantify the Impacts of Key market drivers



Trends in the Philippines

Analyzing and Quantify the Impacts of Key market drivers



Capacity Evolution and Adequacy

Changing fuel mix impacted by multiple factors

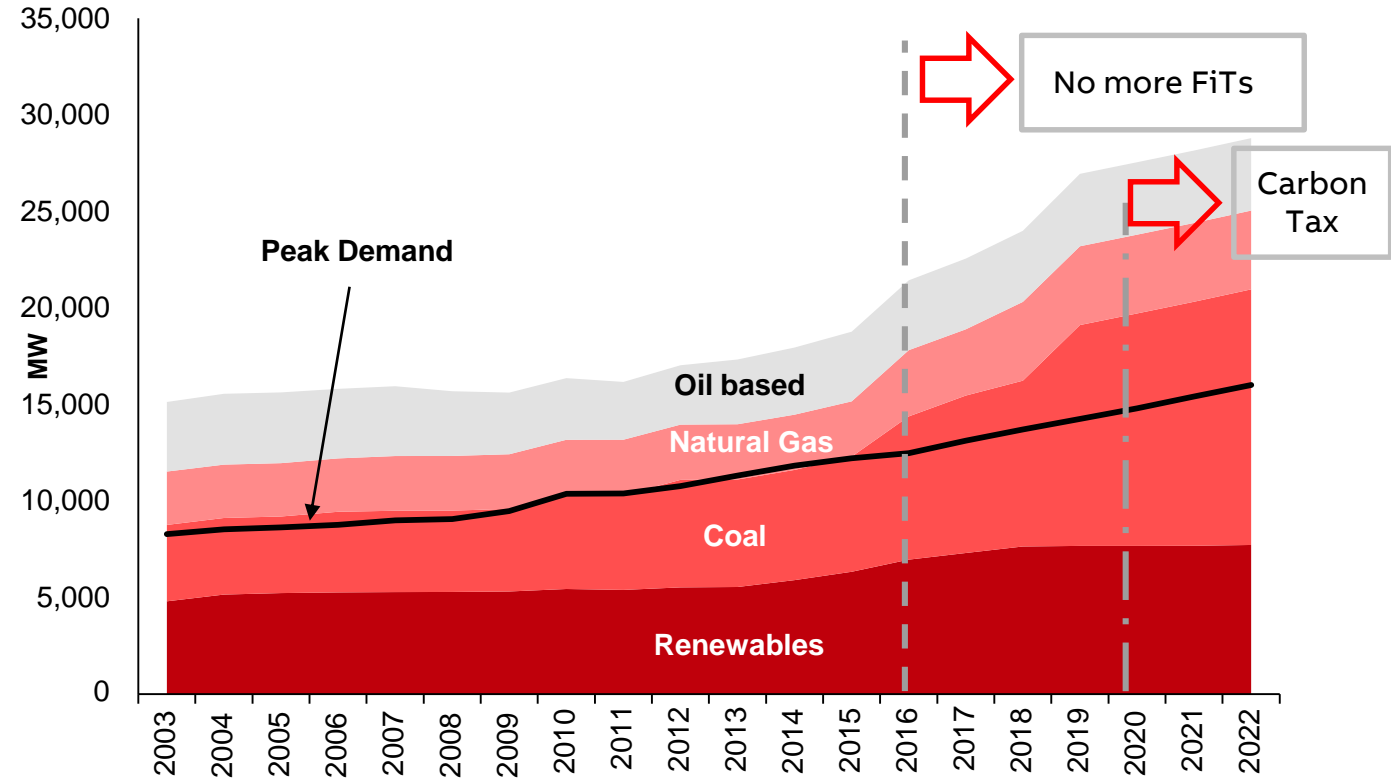
ERC Guidelines:

Move from:

- “30% for each of coal, natural gas and renewables, 10% from oil” target, to;
- “70% baseload, 20% mid-merit and 10% peaking capacity”.

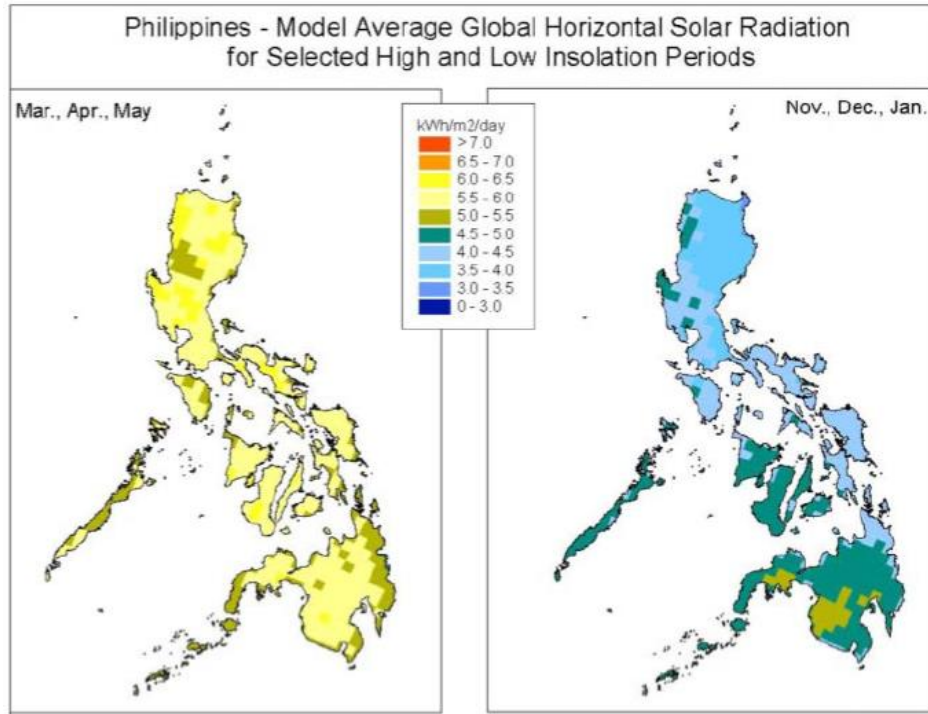
Current is ~80% baseload, 20% Peaking, 0% mid-merit.

Installed Capacity and Committed Capacity (MW)



Capacity is sufficient relative to peak demand – how this will affect the spot prices is to be seen

Grid Integration



Island	Facility Name	Type	Rated MW*
Luzon	CONCEPCION SOLAR	Solar	115 (committed) + 50.55 (indicative)
Visayas	HELIOS	Solar	132.5
Luzon	STA. RITA SOLAR	Solar	32.3 + 67.86 (indicative)
Luzon	CALATAGAN SOLAR	Solar	63
Visayas	FIRST TOLEDO SOLAR	Solar	60
Luzon	BURGOS WIND	Wind	150
Luzon	PAGUDPUD WIND	Wind	84 (indicative)
Luzon	CAPARISPISAN WIND	Wind	81
Luzon	SEMBRANO WIND	Wind	80.4 (indicative)
Visayas	TAREC	Wind	54

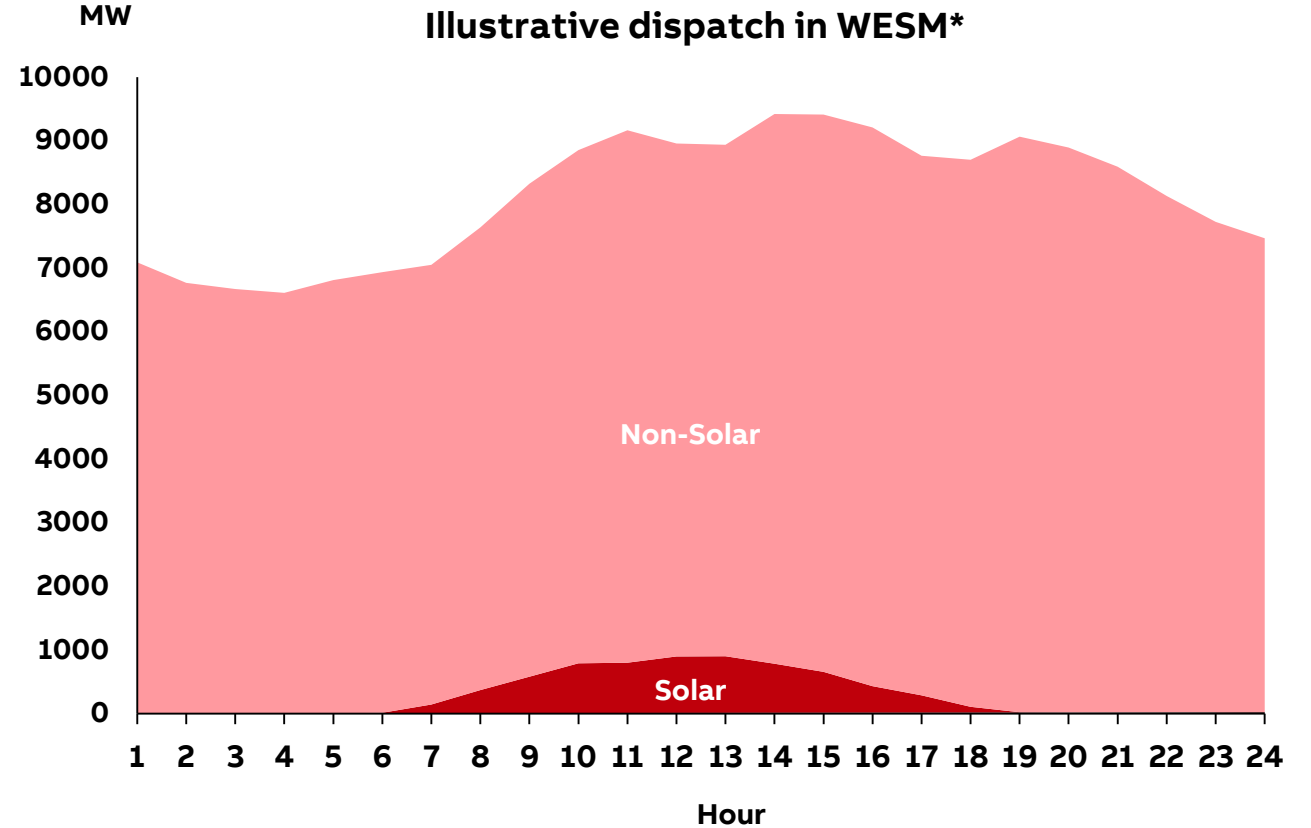
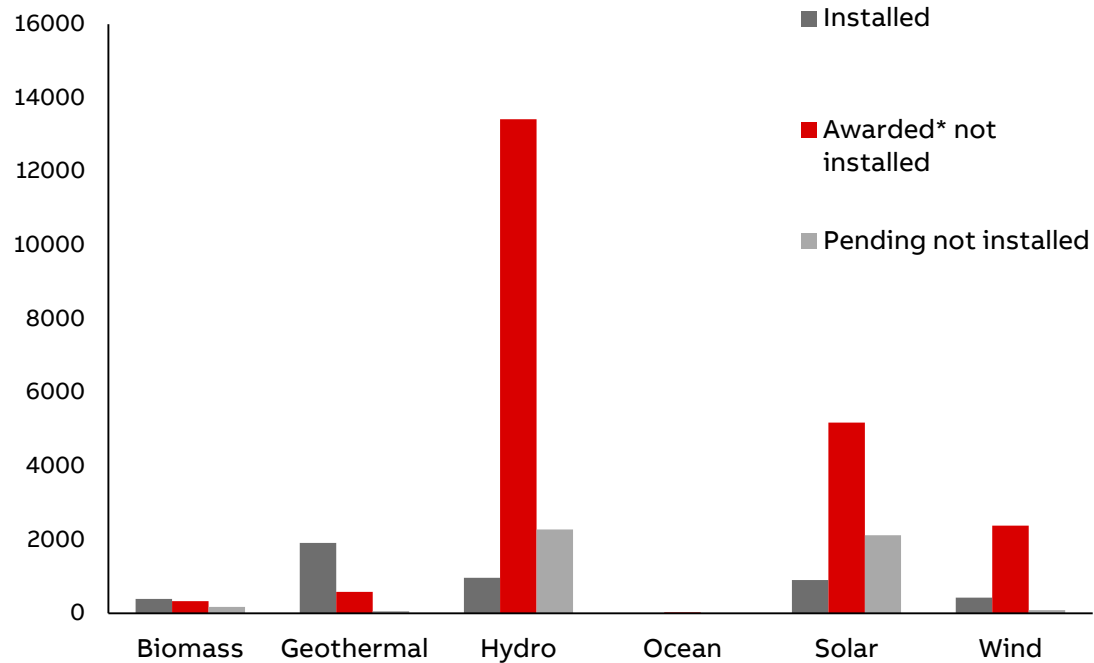
Island	Purpose	Rated MW
Visayas	Ancillary services and grid stability	10
Boracay	Micro-grid	10
Mindanao	Ancillary services and contingency reserve	48 (announced)
Luzon	Ancillary services and early evening demand	~12 MW or 50 MWh (announced)

• Transmission system insights

- Congestion on HVDC between Luzon and Visayas led to Luzon prices being on avg. 18% higher than Visayas
- Congestion on Negros and Panay islands (Visayas) to be alleviated by Cebu-Negros-Panay 230-kV Backbone Project (~2020)
- Mindanao-Visayas Interconnection Project (~2020)

Renewables competition

FIT: Renewable Projects Installed and Potential MW (as of July 2017)

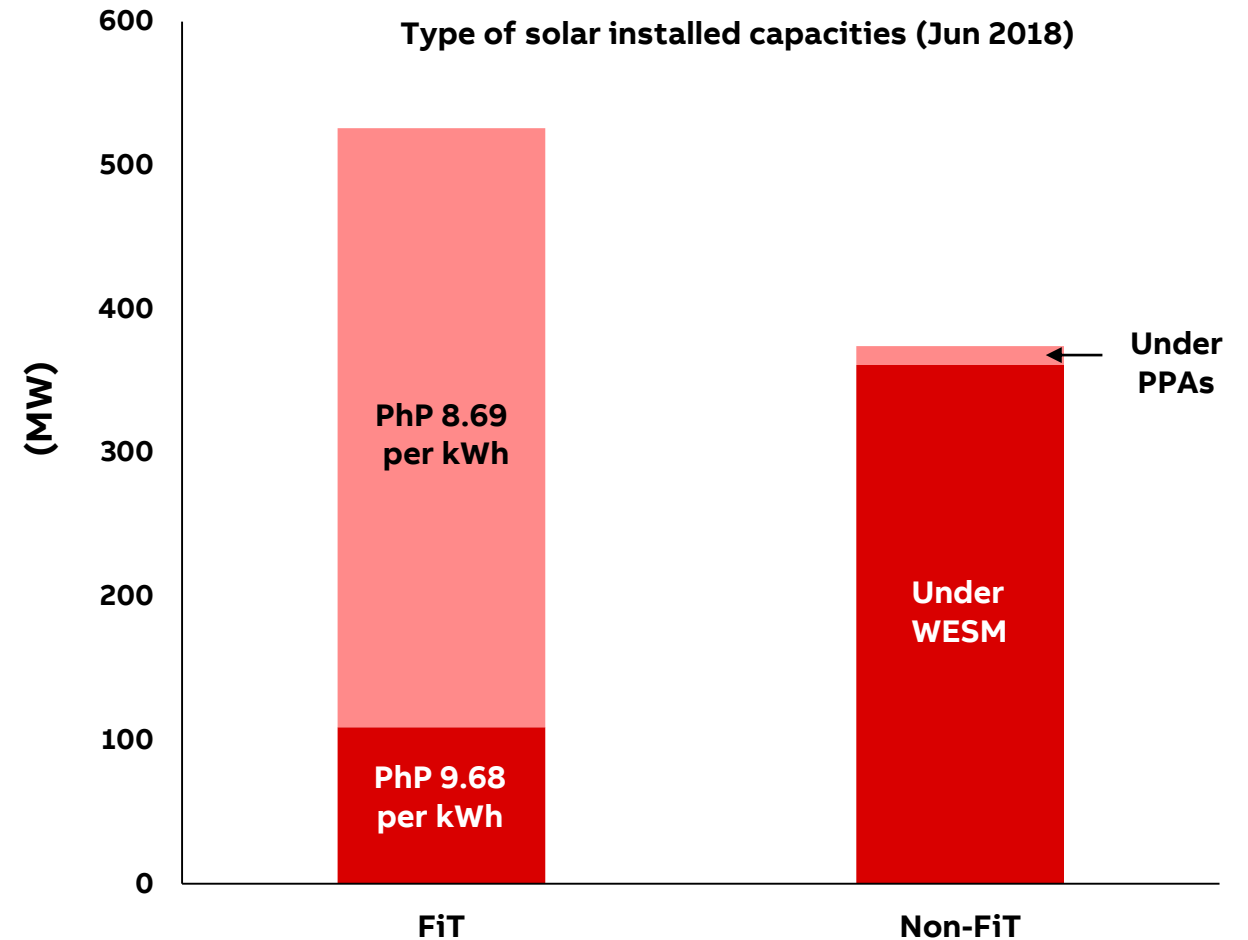


*Data from 5 Sep 2018, WESM; Simulated solar dispatch at 10x of current injection (estimated)

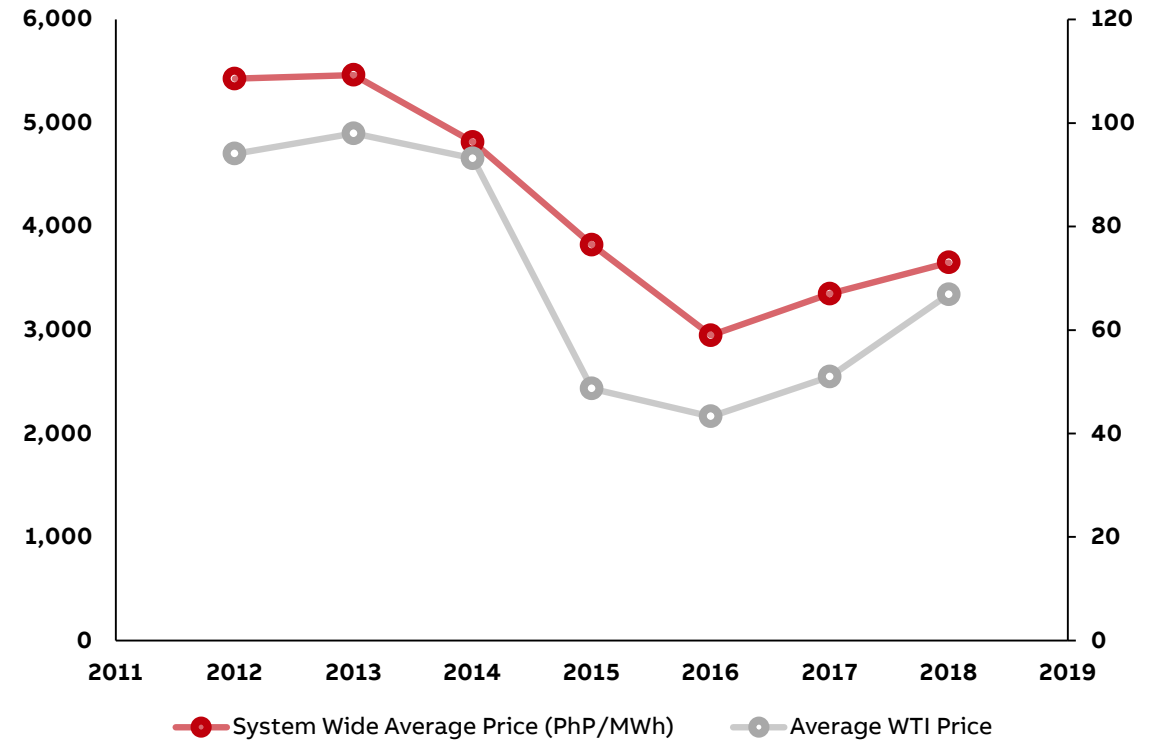
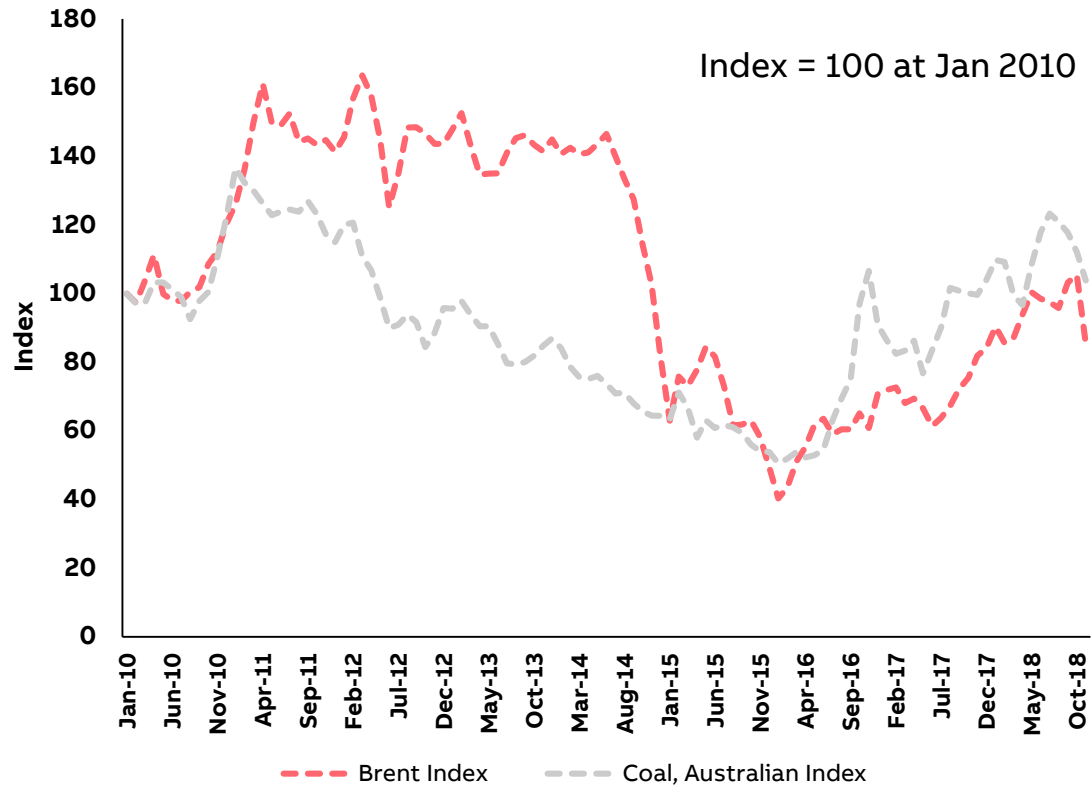
Market Environment for Solar in the Philippines

RE growth will be market-driven rather than top down policy-driven

- **DOE trimmed FiTs:**
 - FiT rate cut from PhP 9.68 / kWh to PhP 8.69 in Mar 2016
 - But by June 2016, all FiT allocation taken
- **Yet, solar capacities continued to grow:**
 - Significant proportion of solar capacity exposed to merchant risks
 - Only small proportion contracted under PPAs at present
- **Sharper insights through modelling can unlock value:**
 - Help solar capacities to become more “PPA-ready”
 - Better risk management to investment decisions

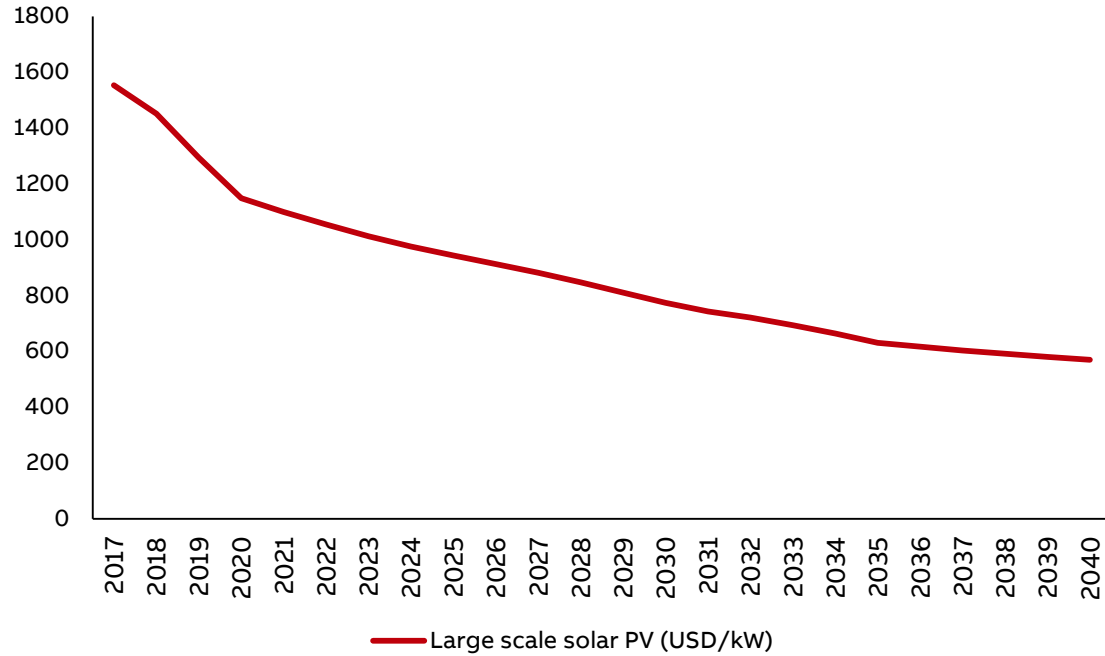


Impact of Fuel Supply and Prices

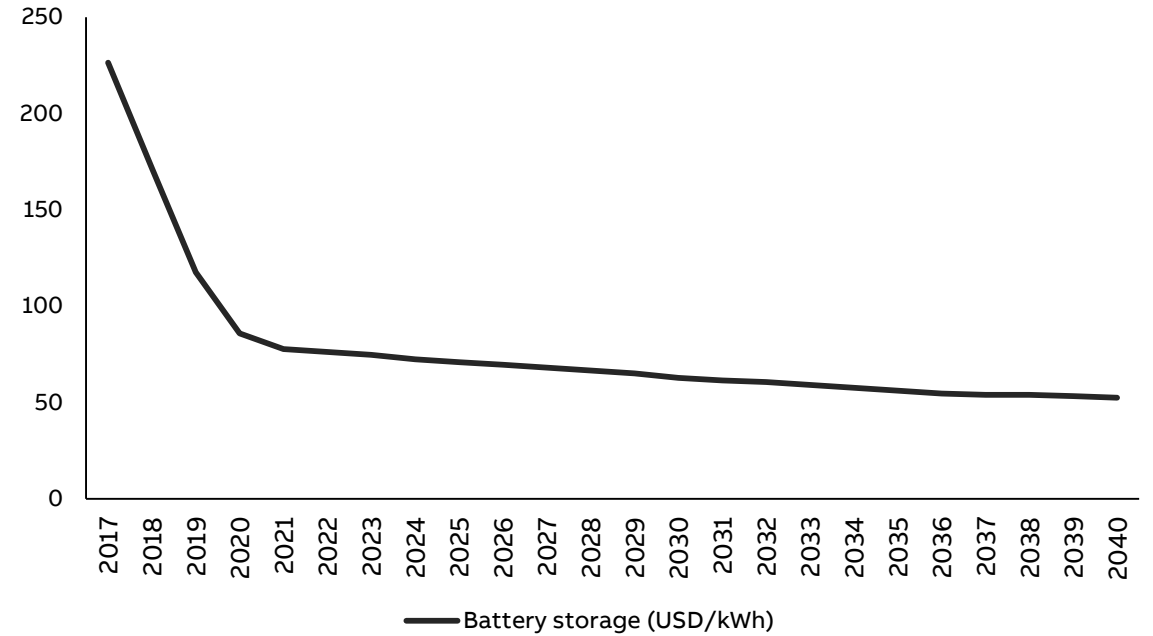


Technology Prices

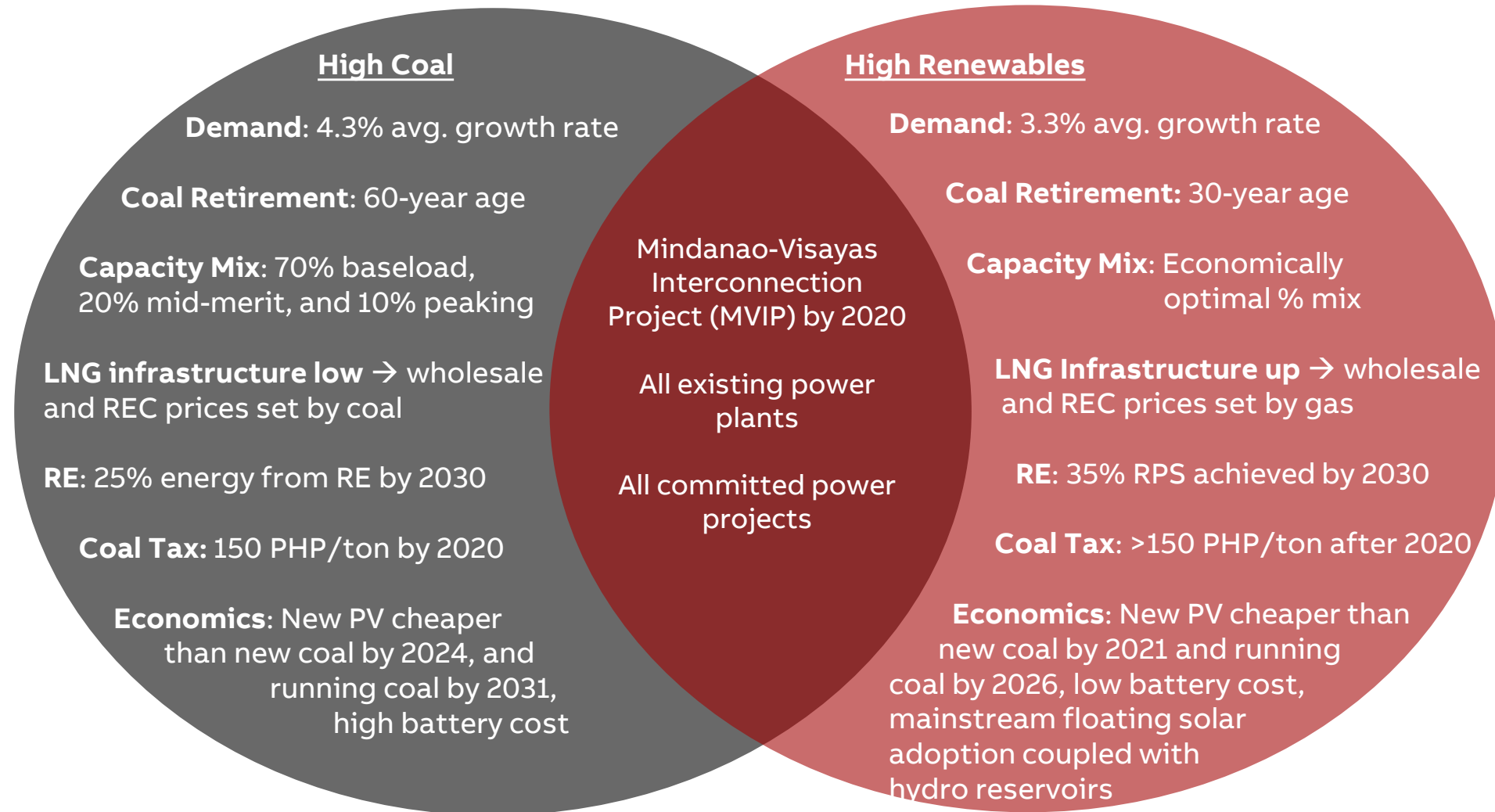
Projected Solar Costs



Projected Battery Pack Costs



Spectrum of Scenarios and Outcomes

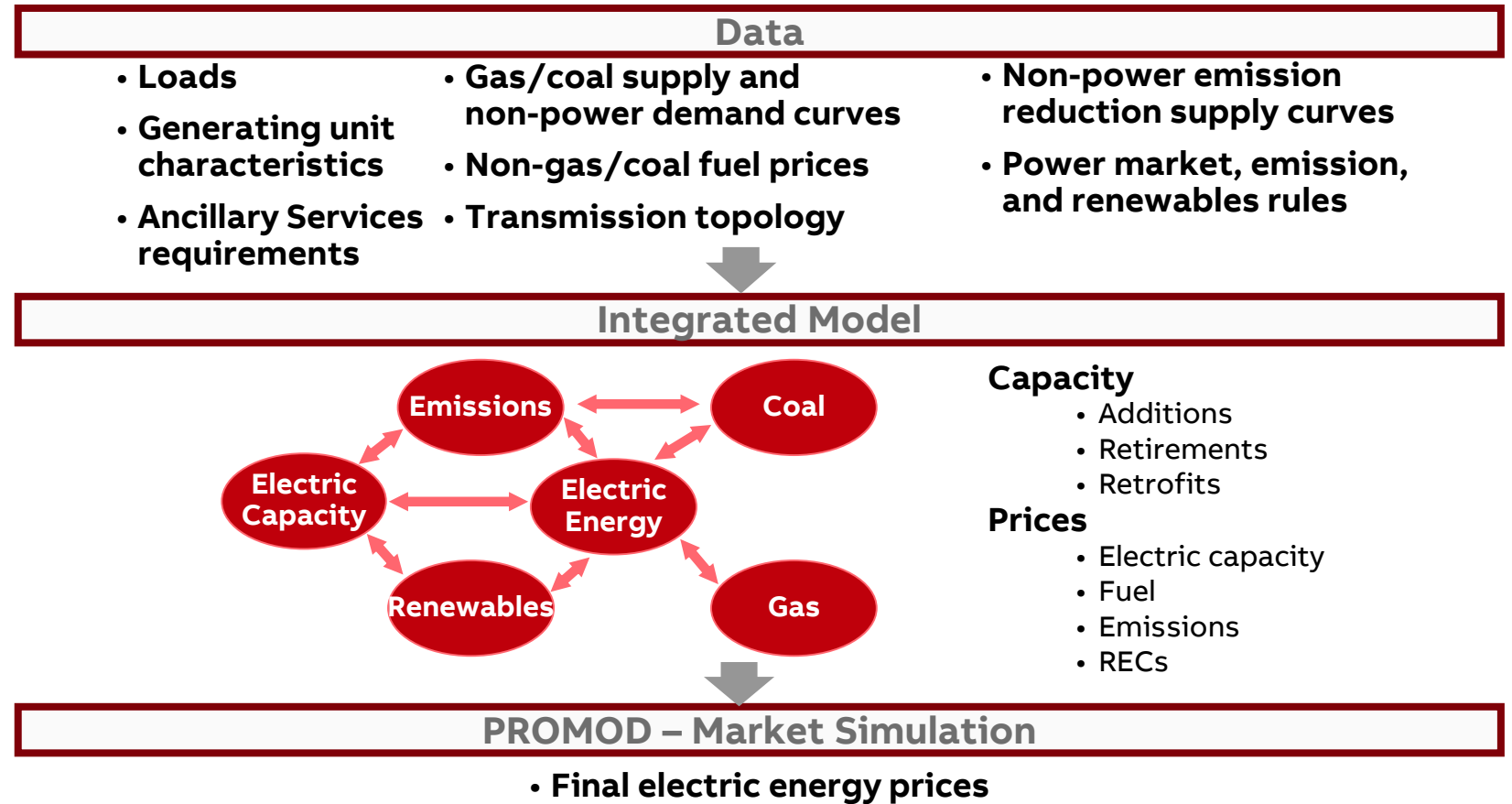


Market Analysis Methodology

Insights matter

Integration of market modeling

- Data
 - Research
 - Rystad / CRU database
- Integrated Model
 - ABB Capacity Expansion commercial software tool is used for resource additions
- ABB market simulation commercial software used for the final electric energy prices



Conclusions & Takeaways

- The growth of the Philippines economy and potential onset of environmental policies create opportunities and risk.
- Being a liberalized market, the Philippines electricity industry is exposed to global economic environment.
- As changes occur, the market complexity increases
- Analytics is crucial for assessing risks/opportunities and acting in a timely manner
- Decision making tools allow to evaluate when, what, and how to invest and trade



Advisory Services

Market Analysis Services

Contact us through ABB [website](#)

Asset Analysis

- Value existing and proposed resources
- Use the Reference Case, Planning and Risk Software
- Evaluate market risks and revenue potential for your assets

Market Analysis

- Custom electric and fuel scenarios reflecting your views
- Renewable Energy Credit projections and analysis
- Identifying basis risk for specific gas/power markets
- Defining commodity price risk

Energy Technology Analysis

- Solar, wind, conventional, distributed resources
- Energy storage and microgrids

Nodal Analysis

- Detailed analysis of transmission system that considers line flows and load / generation at each node
- Locational pricing trends and forecasts
- Constraint, outage and congestion analysis impacting a potential project site
- Curtailment potentials based on market operations

Transmission Analysis

- Transmission infrastructure locations and attributes
- Interconnection queue positions

Generation Portfolio Analysis

- Integrated Resource Plan (Generation Development Plan)
- Expert system and resource optimization modeling

Energy Portfolio Management








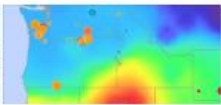
On the web

Website

<https://new.abb.com/enterprise-software/energy-portfolio-management>

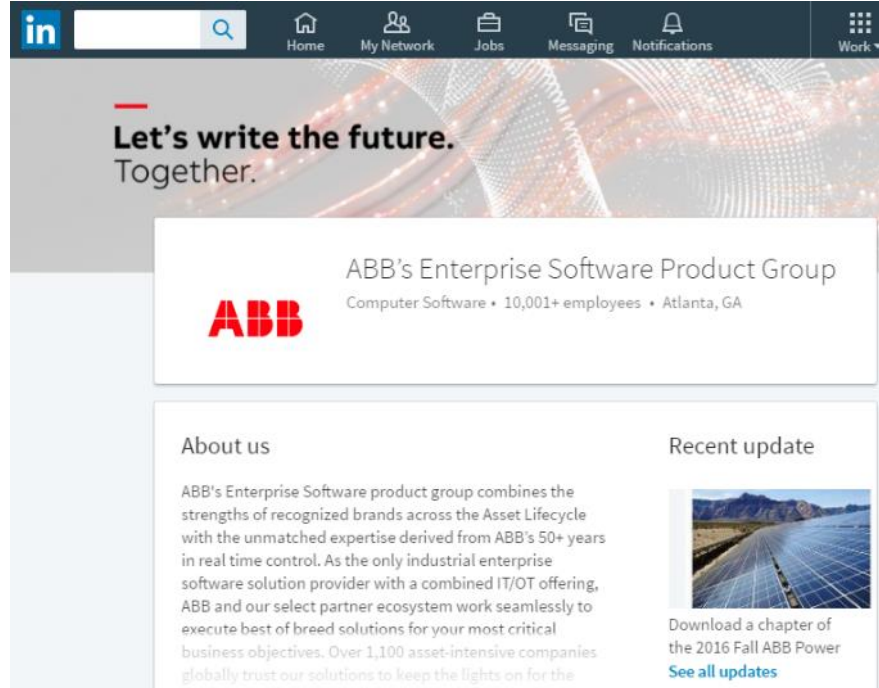
Highlights

Upcoming webinars On-demand webinars White papers and reports

 <p>Webinar Microgrid use cases and revenue streams Discover ways to maximize the financial benefits of off-grid and grid connected Microgrid Investments. → Watch now</p>	 <p>Webcast Watch an integrated view of the energy sector, North America Learn about how new developments in the markets have affected energy price results included in the latest release of our forecast, the North American Power Reference Case → Watch now</p>	 <p>Webinar Germany and Italian Electricity Markets in the times of rising renewables share in generation mix A review of the legislative, regulatory and economic assumptions contributing to environmental, power and fuels market price forecasts in Germany and Italy. → Watch now</p>	 <p>Webinar The Ireland I-SEM electricity market outlook Watch this webinar for an executive overview of ABB's Spring 2017 Ireland energy market price outlook to explore the key uncertainties that I-SEM market participants are embracing. → Watch now</p>
 <p>Webinar Use FTR/ARR to Hedge Financial Risk and Enhance Power Market Models Walk through the mechanism of ARR/FTRs, and the techniques of utilizing ARR/FTRs to protect utilities or power marketers from financial risks and build robust business model. → Watch now</p>	 <p>Webinar Distributed Energy Resources: Seizing Opportunities While Managing Distribution Grid Impacts Review the significant benefits that distributed energy resources (DERs) provide both utilities and renewable project developers. → Watch now</p>	 <p>Webinar Webinar: Spring 2017 North American Power Reference Case Join ABB on April 5 to review the rationale behind ABB's new energy price forecast, the North American Power Reference Case, in advance of its release in May. → Watch now</p>	 <p>Webinar Nodal Reference Case An overview of ABB's nodal price forecast for the three US Interconnects (Eastern, ERCOT and Western) → Watch now</p>

LinkedIn showcase page

Search under “ABB’s Enterprise Software Group”



The screenshot shows the LinkedIn profile page for "ABB's Enterprise Software Product Group". The header includes the LinkedIn logo, a search bar, and navigation icons for Home, My Network, Jobs, Messaging, Notifications, and Work. The main banner features the slogan "Let's write the future. Together." and the ABB logo. Below the banner, the group name "ABB's Enterprise Software Product Group" is displayed along with the text "Computer Software • 10,001+ employees • Atlanta, GA". The page is divided into two columns: "About us" and "Recent update". The "About us" section describes the group's strengths in asset lifecycle management and real-time control. The "Recent update" section includes a thumbnail image of solar panels and a link to download a chapter of the 2016 Fall ABB Power report.

EPM Advisory Services: Power Reference cases

Detailed 25 year Electricity & Fuel Market Outlook

Market Overview and Fundamentals

Assessing market trends for specific countries,



Fuel Price Forecasts

Covering Coal, Oil & Gas



Investment Grade Datasets

Using physical and dynamic characteristics of plant and transmission network, down to hourly granularity



Analysis of Regulatory developments

Including impacts of environmental policies and regulatory changes driven by climate change.



Generation & Transmission Capacity Expansion



Market, Generation & Zonal Simulation and Forecasting

Renewable Integration

Modelling dispatch of wind, solar and hydro



Electricity Market Prices

Independent 25 year energy price forecast, updated annually in the Fall.



Current & New Market Entrants

Considering planned unit additions and retirements, as well as economic entry and exit decisions



Generation Dispatch

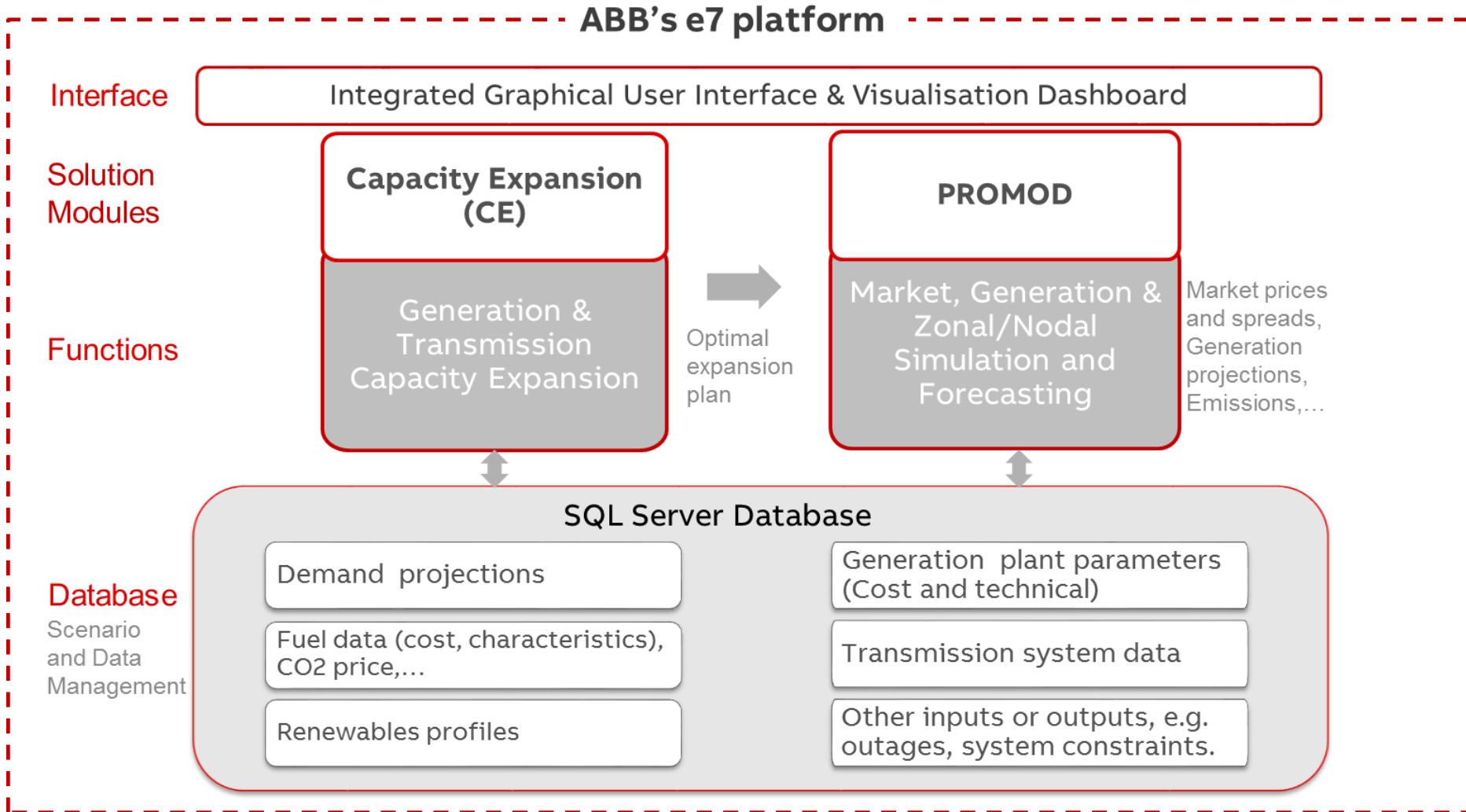
Plant by plant generation production on hourly level, utilization & profitability assessments



Plant Profitability

Expected revenues and profits/losses

Reference Case Modeling Methodology



Major Contents Of The Reference Case

- Wholesale electricity price forecast for the next 25 years (2018 to 2042)
 - Base load, On peak and off-peak price forecasts
- Fuel price forecast including natural gas, oil, coal and biomass
- Annual capacity additions and generation mix by market area
- Base Case and three additional market development scenarios
- Coverage of ten electricity price zones / market areas in Japan
- Analysis of supply and demand fundamentals
- Analysis of regulatory and market drivers

Report Contents

Fall 2018 Japan Power Reference Case Report

Chapters

Japan Power Market

- Market Structure
- Power Exchange
- Network Topology
- Capacity, demand and reserves
 - Scenario analysis
- Market prices

Fuel Markets

- Fuel price forecasts

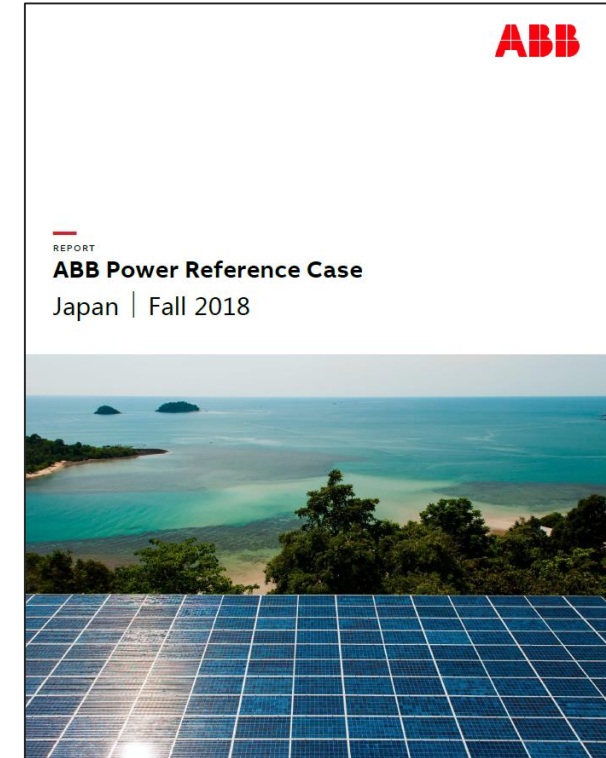
Renewable Energy Markets

- Solar and wind generation potential
- Japan renewable market forecast

Appendices

- Methodology, Data and Assumptions
- Power Markets Detailed Results
- Gas and Oil Market Detailed Results
- Renewable Energy Markets Detailed Results

Report

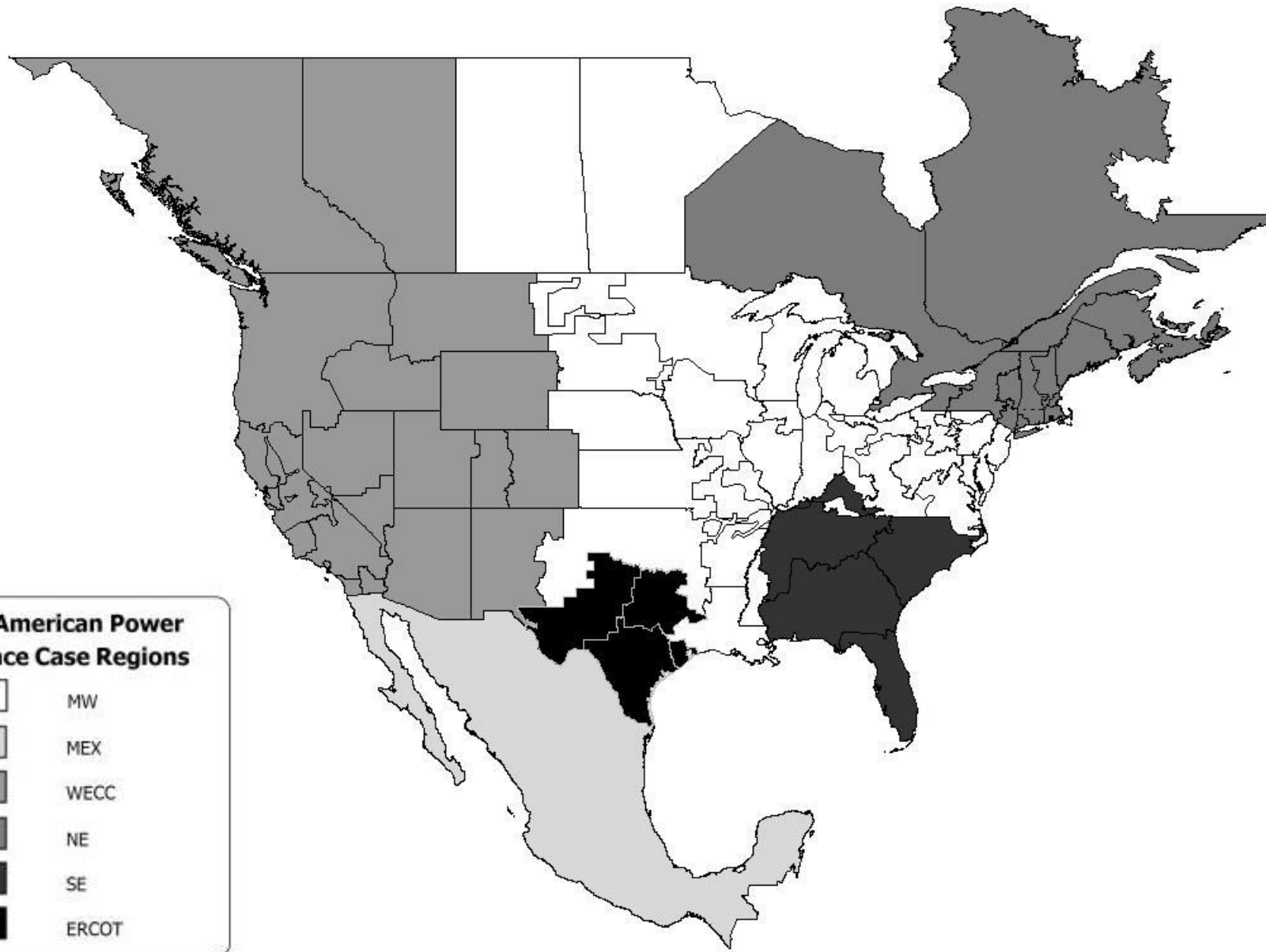
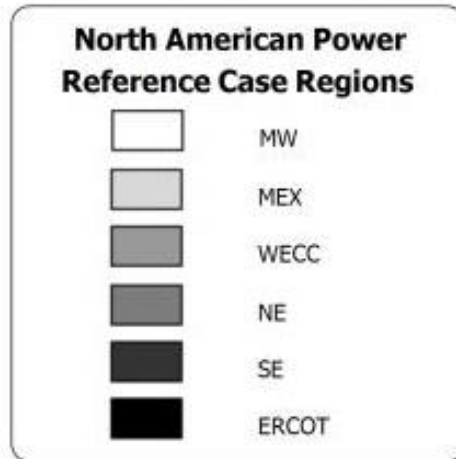


Market Advisory Services

North American Power Reference

North American Power Reference Case includes:

- Fall and spring long-term forecast summary reports and detailed databases for the six regions shown below, now including Mexico
- Monthly, short-term power and gas price updates
- Fall and spring webcasts summarizing methodology, inputs and results
- Three scenarios: CO₂ tax, high natural gas price and low natural gas price



Market Advisory Services

European Power Reference Cases

Availability of European Reference Cases

- 'Off-the-shelf' energy market reports
- 'Off-the-shelf' energy price forecasts (market reports available on request)
- Available on request

European Power Reference Cases for the countries shown in the figure include:

- Three Market Scenarios: Base case, High and Low Natural Gas Price
- Spring and Autumn long-term energy market forecast reports and detailed databases
- Monthly short-term power and gas prices updates
- Webcasts summarising methodology, inputs and key results



Solution Footprint

EPM's product offering covers the entire future

