



Emerging Wholesale Market Revenue Streams

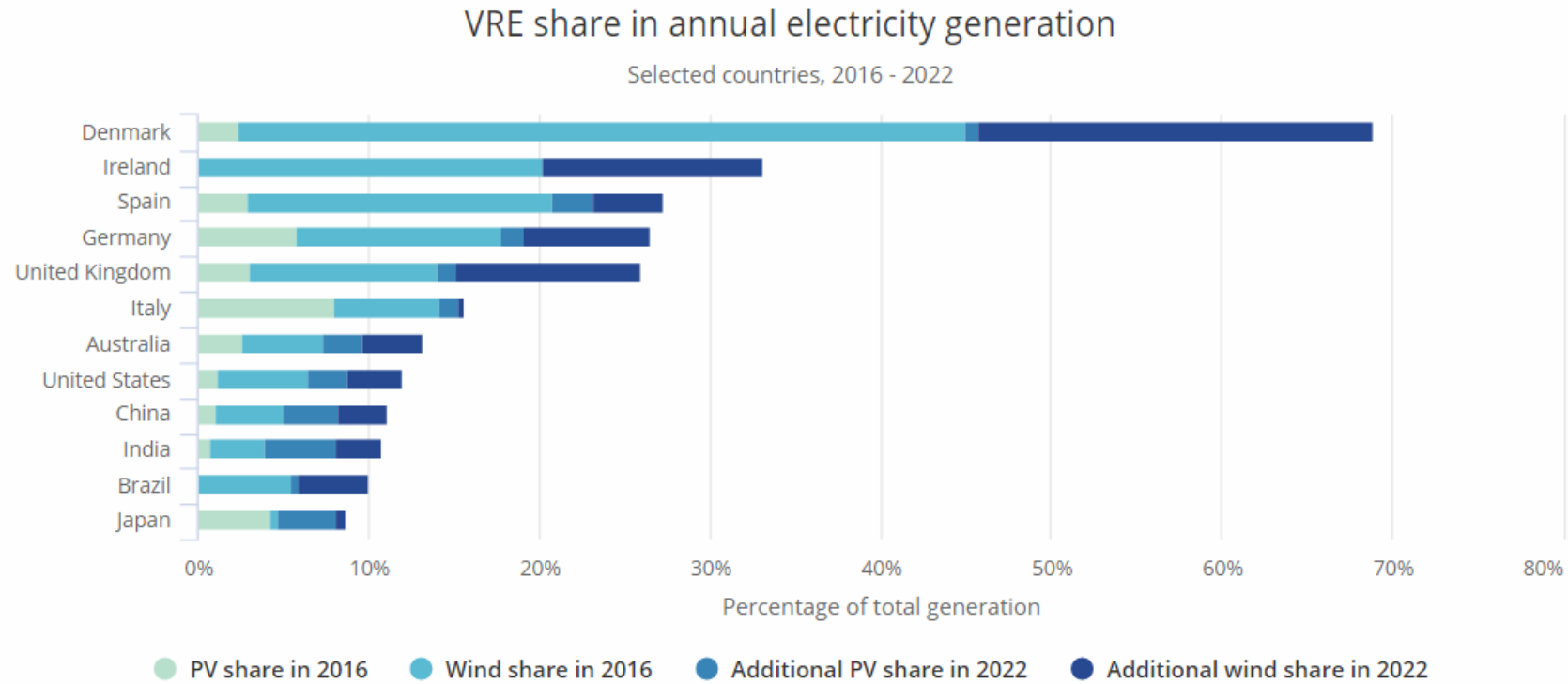
Review of Industry Practices from Other
Markets – Version B

CanWEA 2018, Calgary, Alberta

October 25, 2018

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2017 IEA Project of Annual Share of Variable Energy Resources by Selected Countries



Renewables 2017, IEA



Potential Wholesale Market Revenue Sources for Renewable Resources



Electricity Wholesale Markets

Energy

Capacity

Ancillary Services



What Essential Reliability Services Can Wind Provide?

- Inertia/Fast Frequency Response (Quebec, Ontario)
 - Wind can provide synthetic inertia (does not require pre-curtailment)
- Primary Frequency Response (ERCOT, Quebec, Ontario)
 - Pre-curtailed wind can provide PFR (down response does not require pre-curtailment)
- Secondary/Regulation/AGC (Xcel)
 - Pre-curtailed wind can provide regulation (down regulation does not require pre-curtailment)
- 15-min reserves (Germany)
 - Distributed wind is aggregated and bid in to the energy and 15 min reserve market (down regulation does not require pre-curtailment)
- Ride-through (NERC PRC-024)
 - Wind can ride-through voltage and frequency events
- Voltage support (NERC VAR-001 and VAR-002)
 - Wind can provide or absorb reactive power when it is not windy



Wholesale Market Revenue Sources for Renewable Energy



Electricity Wholesale Markets – Part 1

(Source: Wikipedia – with noted Exceptions)

- Argentina: Wholesale Electricity Market (MEM) - Minimal Wind and Solar
- Australia:
 - National Electricity Market (NEM) and Australian Energy Market Operator (AEMO)
 - Western Australia: Independent Market Operator (IMO)
- Austria: through EPEX
- Belgium: through EPEX
- Brazil: Operator of the National Electricity System (ONS)
- Canada:
 - Alberta (AESO)
 - Ontario (IESO)
- Chile
- Colombia

EPEX SPOT SE (the European Power Exchange) is an exchange for power spot trading in Germany, France, the United Kingdom, the Netherlands, Belgium, Austria, Switzerland and Luxembourg



Electricity Wholesale Markets – Part 2

(Source: Wikipedia – with noted Exceptions)

- Czech Republic: Czech Electricity and Gas Market Operator + Power Exchange Central Europe (PXE)
- France: EPEX SPOT
- Germany: European Energy Exchange AG (EEX) and EPEX SPOT
- Hungary: Hungarian Power Exchange HUPX and Power Exchange Central Europe (PXE)
- India: Indian Energy Exchange and Power Exchange India Limited (PXIL)
- Ireland: Single Electricity Market Operator (SEMO)
- Italy: GME
- Japan: Japan Electric Power Exchange (JEPX)
- Korea: Korea Power Exchange (KPX)
- Malaysia (NEDA) [Not in Wikipedia's List]
- Mexico: Centro Nacional de Control de Energía (CENACE)
- Netherlands: APX-ENDEX



Electricity Wholesale Markets – Part 3

(Source: Wikipedia – with noted Exceptions)

- New Zealand: New Zealand Electricity Market
- Philippines: Philippine Wholesale Electricity Spot Market
- Portugal: OMI-Polo Español, S.A. (OMIE), OMIP, Sociedad Rectora del Mercado de Productos Derivados, S.A. (MEFF), and European Energy Exchange AG (EEX)
- Scandinavia: Nord Pool Spot
- Slovakia: Power Exchange Central Europe (PXE)
- Spain: OMI-Polo Español, S.A. (OMIE), OMIP, Sociedad Rectora del Mercado de Productos Derivados, S.A. (MEFF), and EEX
- Russian Federation: Trade System Administrator (ATS)
- Singapore: Energy Market Authority of Singapore (EMA) and Energy Market Company (EMC)
- Turkey: Turkish Electricity Market
- United Kingdom: GB Electricity Wholesale Market
- USA: CALISO, ERCOT, ISO-NE, NYISO, MISO, PJM, SPP



Wholesale Capacity Markets

- Alberta (coming soon)
- Malaysia (recommendations under consideration)
- Russia
- Turkey
- UK
- USA
 - CAISO (Resource Adequacy Requirements)
 - ISO-NE
 - MISO
 - NYISO
 - PJM





GE Note

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CAUTION CONCERNING FORWARD-LOOKING STATEMENTS:

This document contains "forward-looking statements" – that is, statements related to future events that by their nature address matters that are, to different degrees, uncertain. For details on the uncertainties that may cause our actual future results to be materially different than those expressed in our forward-looking statements, see <http://www.ge.com/investor-relations/disclaimer-caution-concerning-forwardlooking-statements> as well as our annual reports on Form 10-K and quarterly reports on Form 10-Q. We do not undertake to update our forward-looking statements. This document also includes certain forward-looking projected financial information that is based on current estimates and forecasts. Actual results could differ materially. to total risk-weighted assets.]

NON-GAAP FINANCIAL MEASURES:

In this document, we sometimes use information derived from consolidated financial data but not presented in our financial statements prepared in accordance with U.S. generally accepted accounting principles (GAAP). Certain of these data are considered "non-GAAP financial measures" under the U.S. Securities and Exchange Commission rules. These non-GAAP financial measures supplement our GAAP disclosures and should not be considered an alternative to the GAAP measure. The reasons we use these non-GAAP financial measures and the reconciliations to their most directly comparable GAAP financial measures are posted to the investor relations section of our website at www.ge.com. [We use non-GAAP financial measures including the following:

- Operating earnings and EPS, which is earnings from continuing operations excluding non-service-related pension costs of our principal pension plans.
- GE Industrial operating & Verticals earnings and EPS, which is operating earnings of our industrial businesses and the GE Capital businesses that we expect to retain.
- GE Industrial & Verticals revenues, which is revenue of our industrial businesses and the GE Capital businesses that we expect to retain.
- Industrial segment organic revenue, which is the sum of revenue from all of our industrial segments less the effects of acquisitions/dispositions and currency exchange.
- Industrial segment organic operating profit, which is the sum of segment profit from all of our industrial segments less the effects of acquisitions/dispositions and currency exchange.
- Industrial cash flows from operating activities (Industrial CFOA), which is GE's cash flow from operating activities excluding dividends received from GE Capital.
- Capital ending net investment (ENI), excluding liquidity, which is a measure we use to measure the size of our Capital segment.
- GE Capital Tier 1 Common ratio estimate is a ratio of equity

