

De-Carbonization: Global and Local Impacts on the Electricity Sector

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De-carbonization – how is it impacting the natural gas and electricity sectors?

CAMPUT 2018

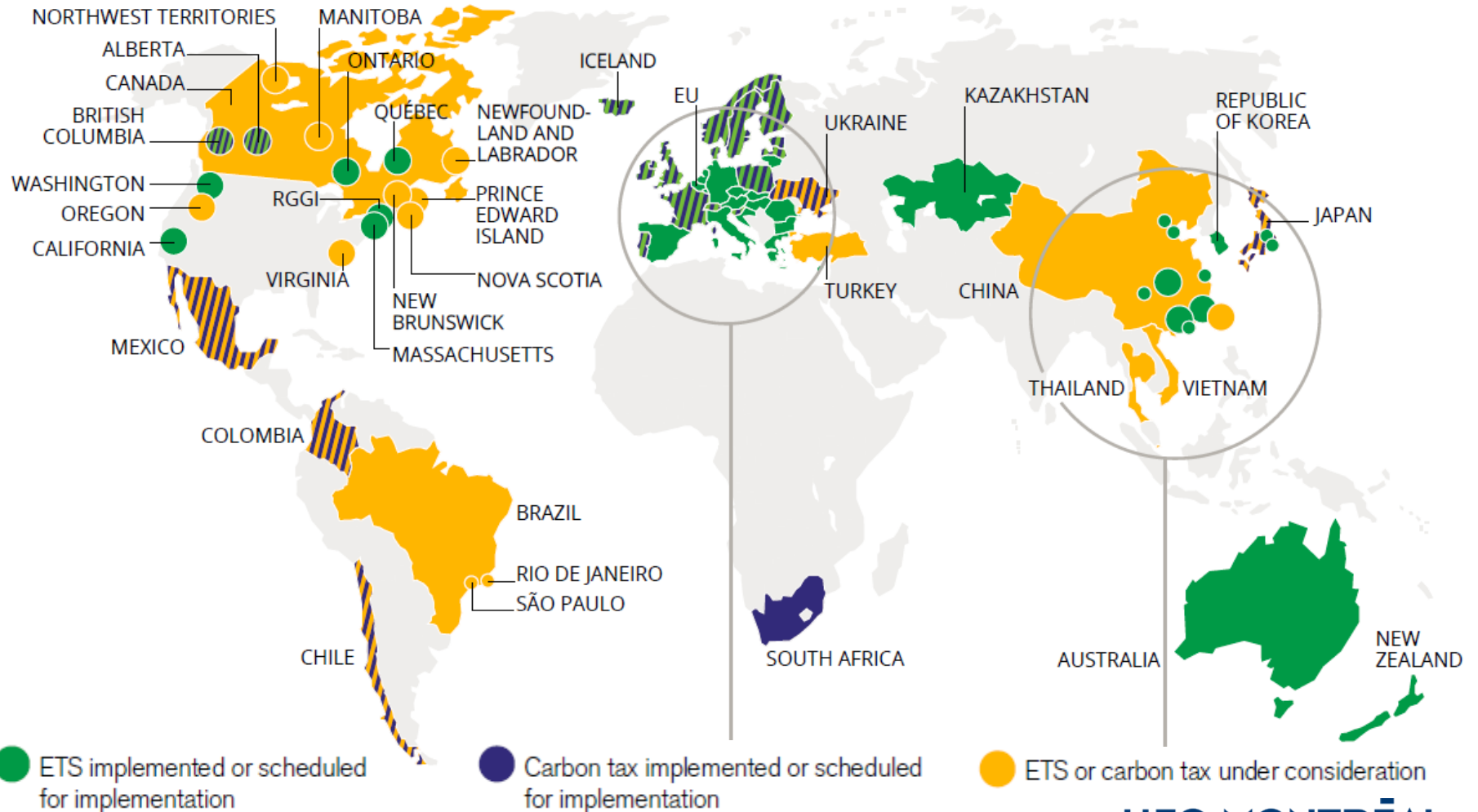
The Fairmount Royal York, Toronto

Outline:

Impacts on the Electricity Sector

1. More Global
2. More Local
3. Regulatory Implications

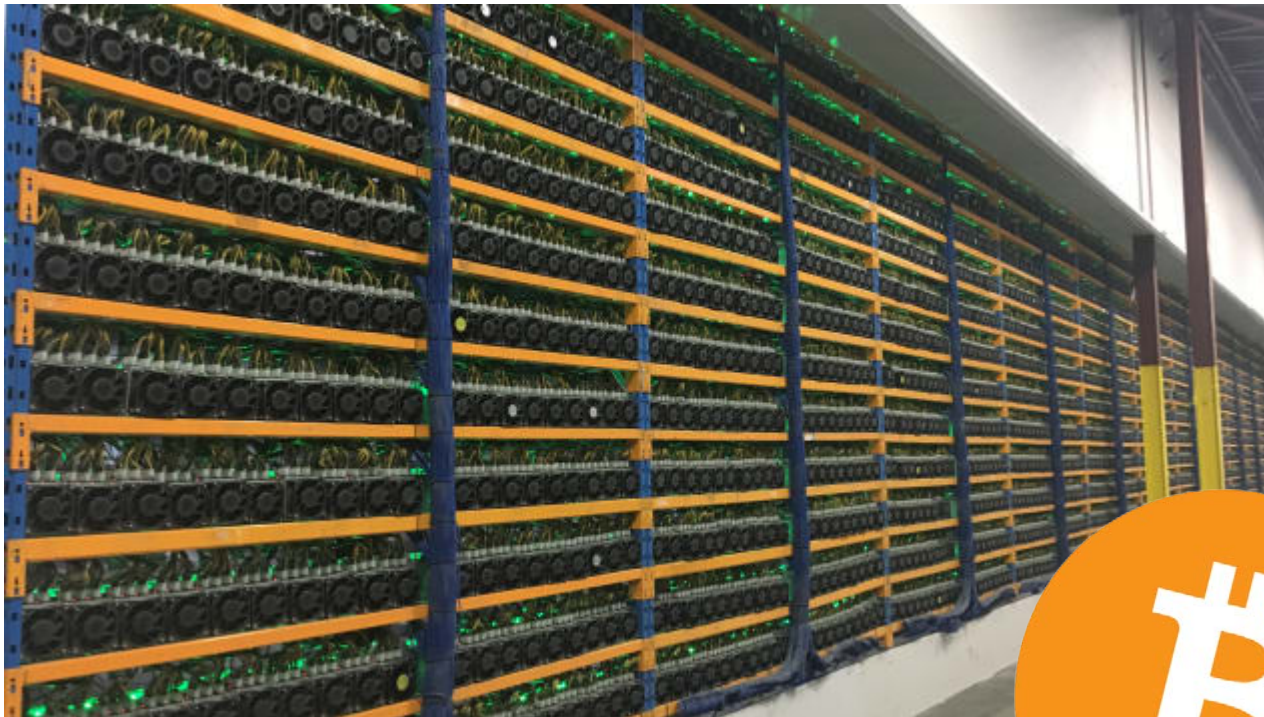
47 Carbon Pricing Initiatives in 2017



Value of Energy Products becomes Global

- **RNG** gets paid for **RINs** under US **RFS**
US EPA *Renewable Fuel Standard* (RFS) gives value to *Renewable Natural Gas* (RNG) through *Renewable Identification Numbers* (RINs)
- California LCFS also pays for RNG
- Renewable Energy Credit (or Certificate)
- Clean Energy RFP (Massachusetts)
20-yr contract for 9.45 TWh/yr

Global Consumers Come to De-Carbonized Sources



- Server farms
- Bitcoin mining

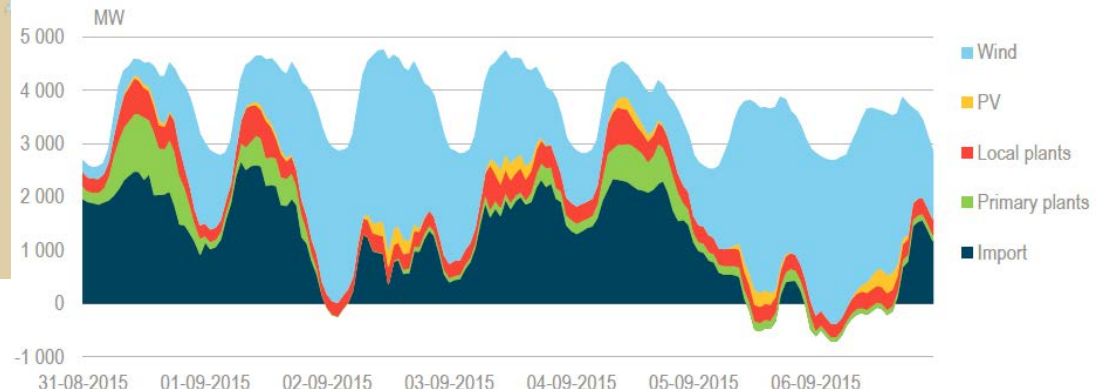
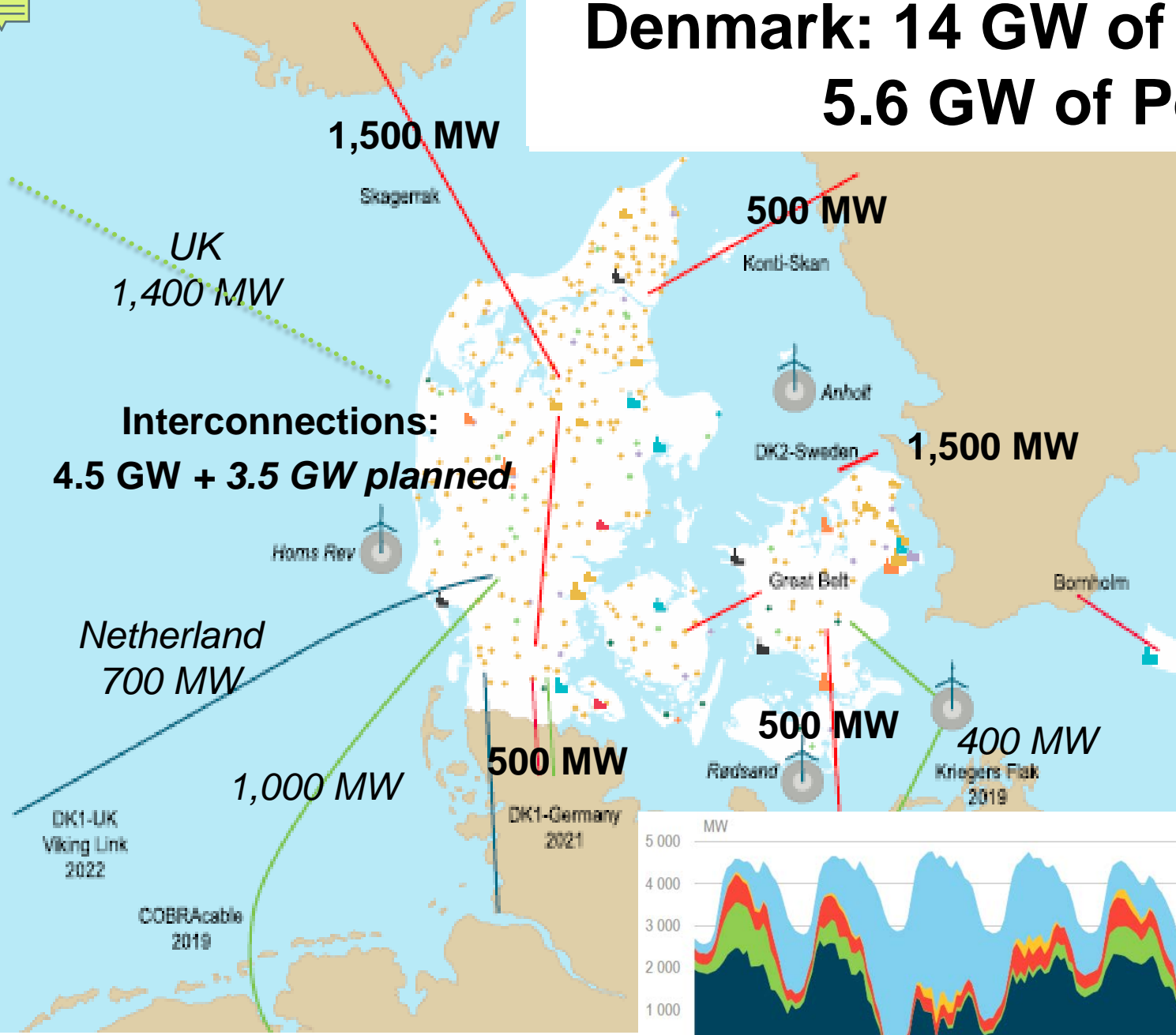


Global Solutions Become Accessible

- Ancillary Services: obsolete regulation
 - Batteries, Demand Response, Wind Power Plants
- Load Following
- Peak Capacity Requirements

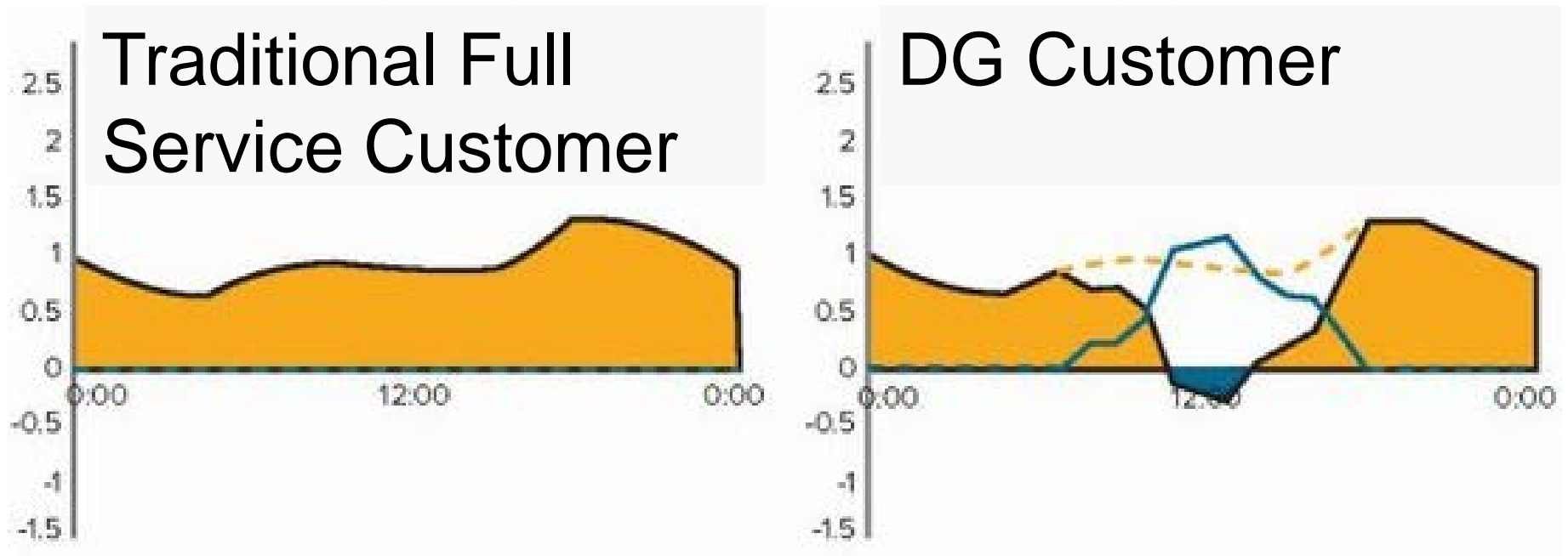
Denmark: 14 GW of Capacity 5.6 GW of Peak Load

30 TWh
 42.5% wind
 18% biofuels
 2.5% solar
 28.8% coal
 7.3% gas
 1% oil



2. MORE LOCAL

Distributed Generation: Impact on Revenues



Daily Load Profiles (kWh)



Network Tariff Options: Avoiding the Death Spiral

Capacity tariffs

- Flat: \$/kVA or \$/kW
- Variable
- **Time-of-use**

Volumetric tariffs

- Flat: \$/kWh
- **Progressive (↑ with kWh)**
- Regressive (↓ with kWh)
- Time-of-use

3. REGULATORY IMPLICATIONS

De-Carbonization, not a Choice

(Better Ready than Sorry)

- Open-up to regional planning/regulation (RTO model)
- Network Tariff Reform:
Fixed costs → Fixed price

Chair in Energy Sector
Management
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