



Power Technology Research

Grid Performance: An Overview of European and North American Power Transformers Markets

Saqib Saeed, *Principal Analyst*
Transmission & Distribution Equipment

Presented at:

CWIEME CHICAGO

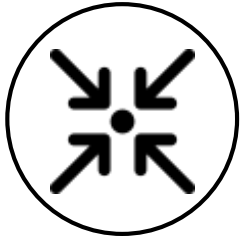


Agenda

- Global Market Overview
- North America Market Specifics
- Europe Market Specifics
- Supply-Demand Situation

Power Technology Research

Who Are We



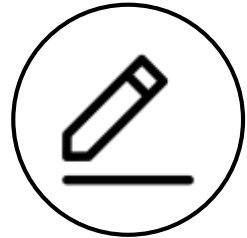
Focus on Power and Industrial markets.

Customers are component manufacturers,
OEMs, distributors, energy-focused EPCs.



20 years of combined
experience.

Syndicated and custom
research.



Type of Work

What Can We Do to Support Our Customers





Large Power Transformers

We consider 100kV, >60MVA as LPTs

LPTs Market Analysis

Why Separate Power Transformers from Distribution Transformers



A globally traded product

- Demand impacts the supply beyond regional boundaries



Long lead times

- A custom designed equipment



Highest efficiency requirements



Special raw materials

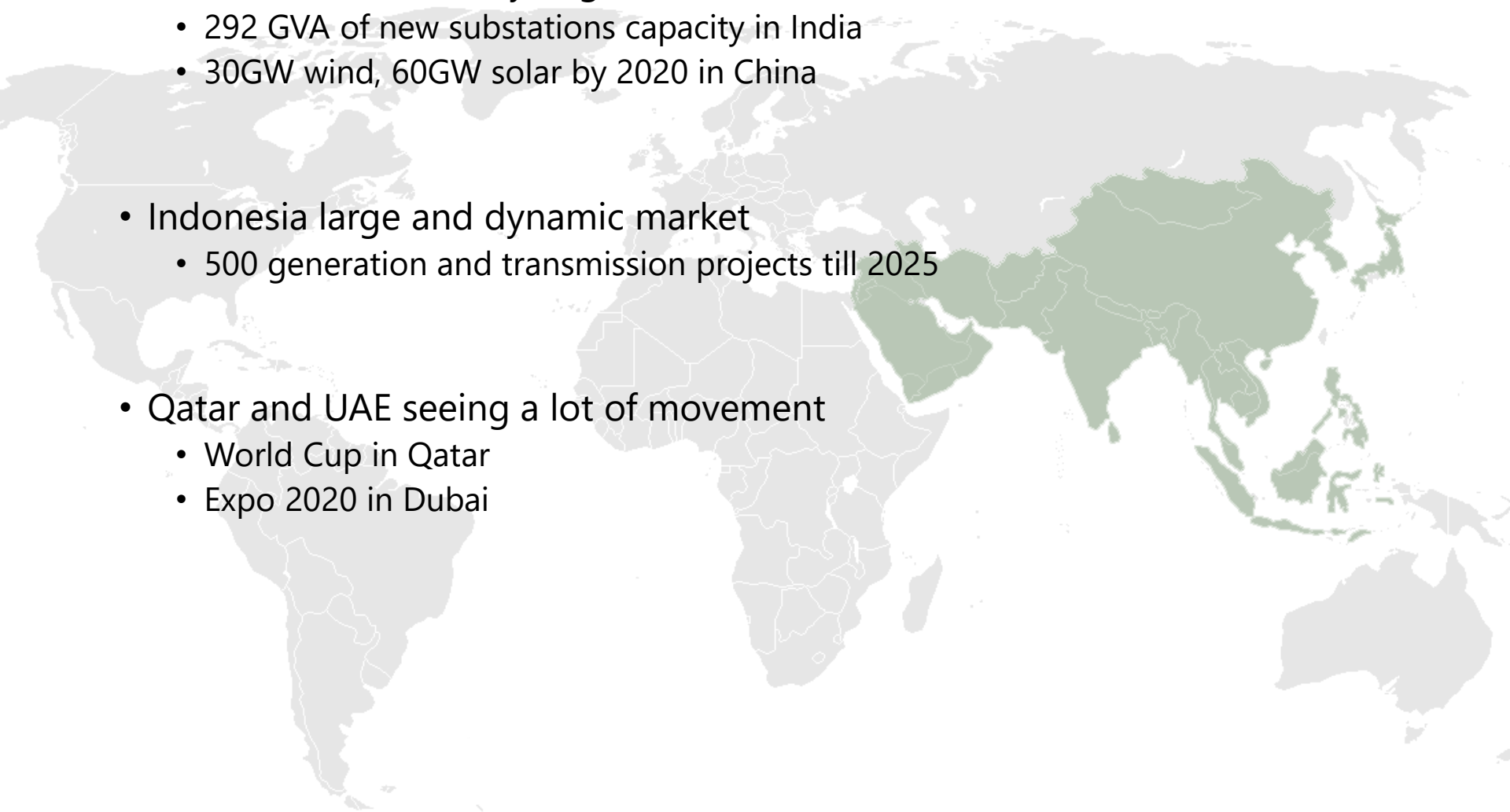
- Electrical Steel and its impact on the prices

Global Market Situation

Global Market Overview - Asia

Indonesia emerging as largest market After India & China

- India and China to stay largest markets
 - 292 GVA of new substations capacity in India
 - 30GW wind, 60GW solar by 2020 in China
- Indonesia large and dynamic market
 - 500 generation and transmission projects till 2025
- Qatar and UAE seeing a lot of movement
 - World Cup in Qatar
 - Expo 2020 in Dubai



Global Market Overview - Africa

Year on year growth expected in African market

- South Africa still the largest market
 - Delayed start of transmission projects
- Nigeria getting funding for existing projects
- Focus of all tier-1 players shifting to Africa
 - New manufacturing units in the region
 - Agreements with governments
- China plans to invest in African utilities
 - Strong edge for Chinese manufacturers

Significant Markets Globally

Markets to Keep an Eye on in the Coming Years

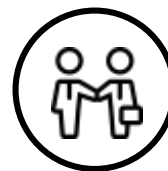


Global Opportunities

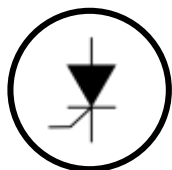
Turnkey Tenders Ratio to Increase in Years to Come



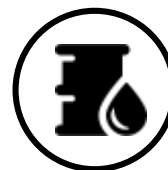
Blanket agreements
spanning multiple years



Increased partnerships
between EPCs and
utilities



Huge potential in HVDC
market



Transformer Oil
Alternatives



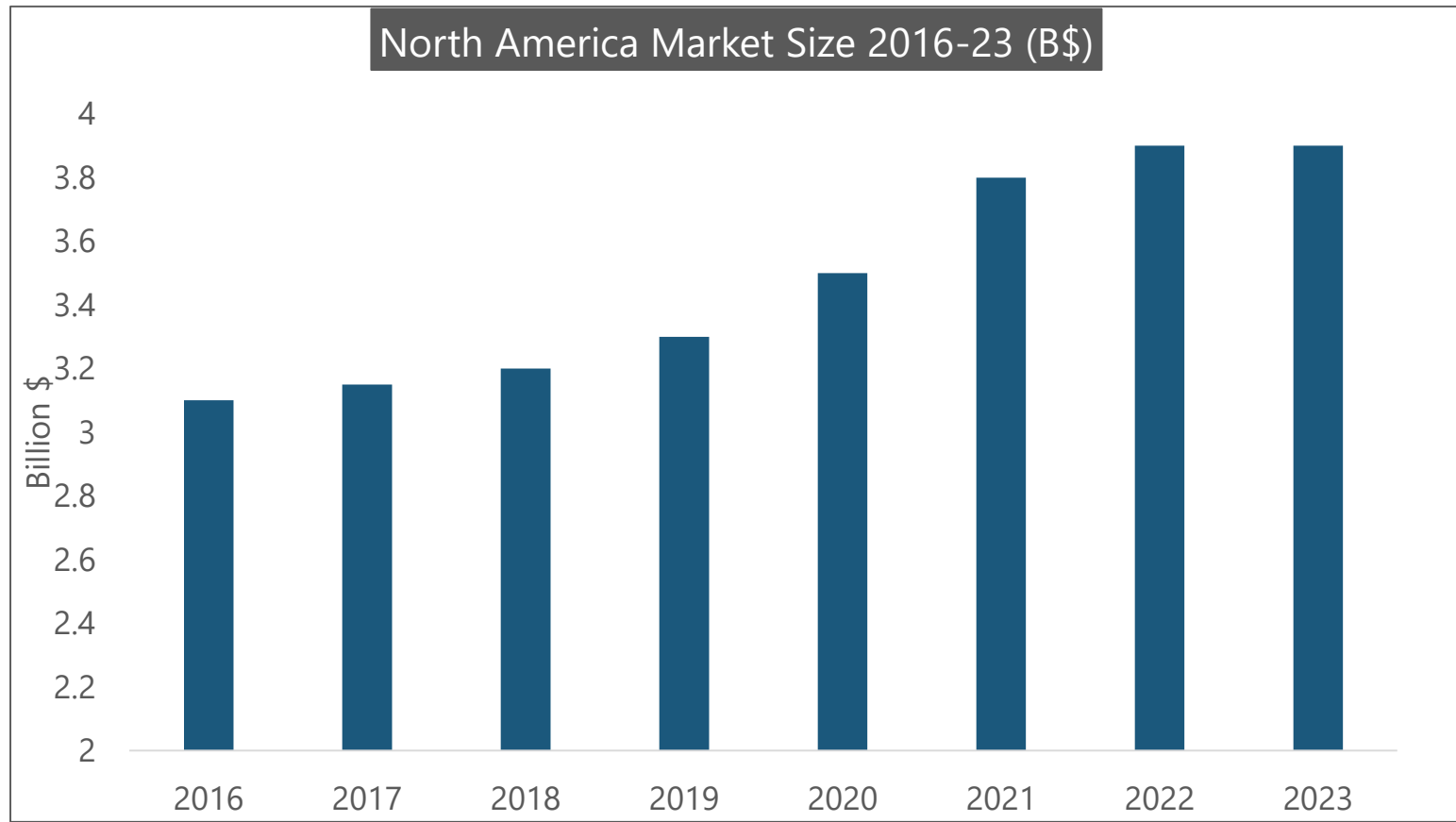
North America Market

United States & Canada Market Assessment



Annual Power Transformer Revenue

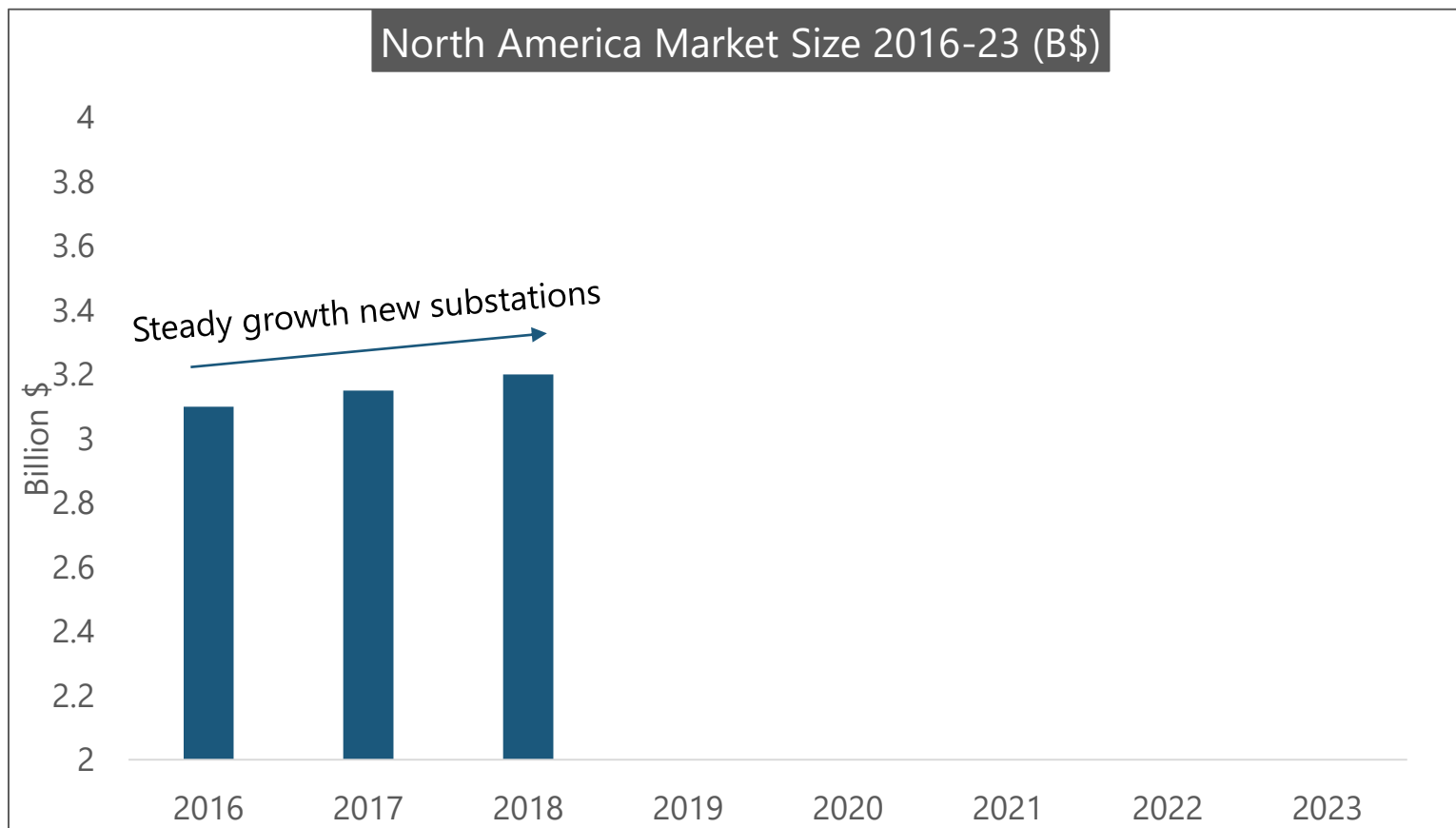
US and Canada Market to See a Slight Growth Beyond 2019





Annual Power Transformer Revenue

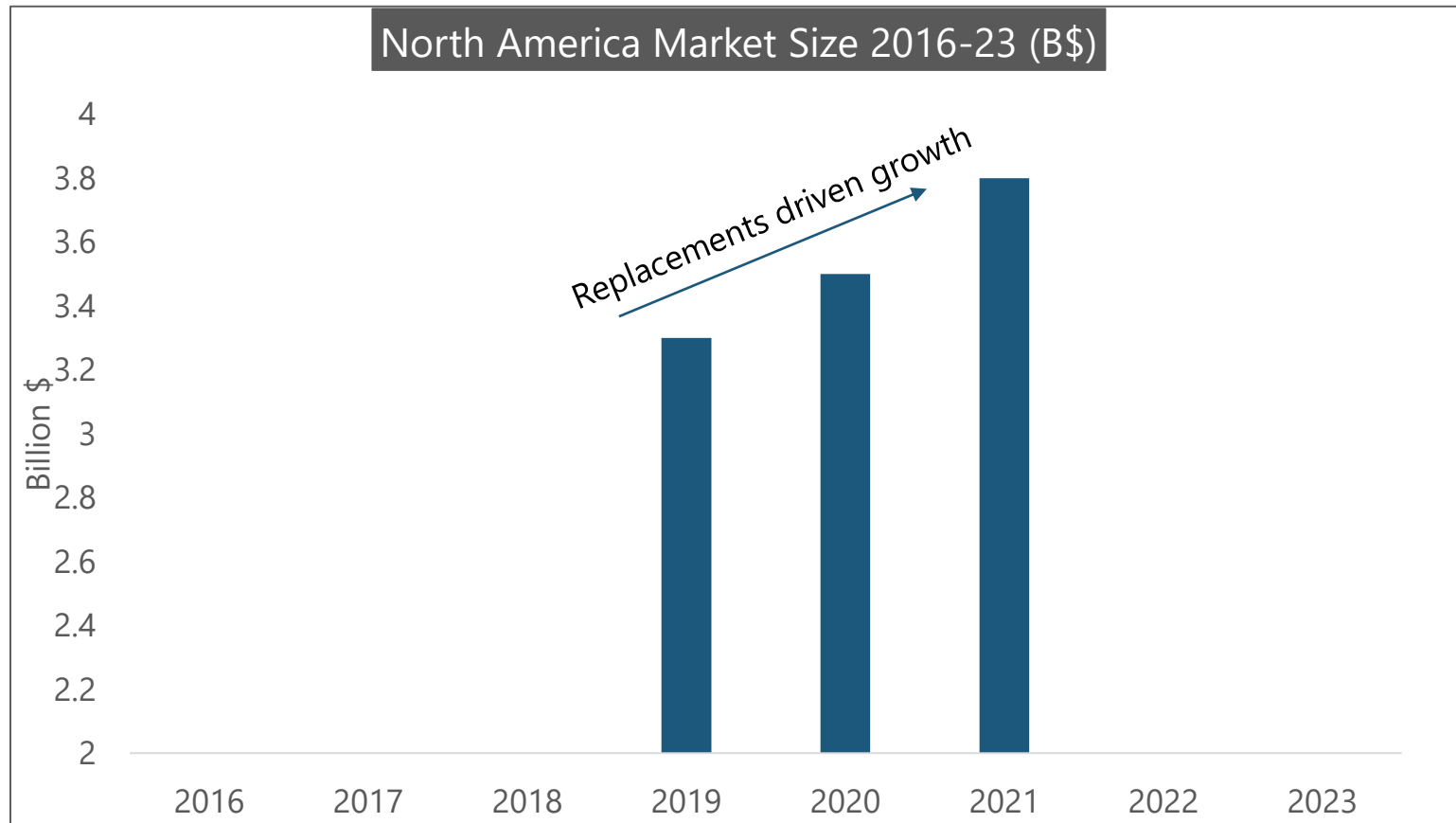
US and Canada Market to See a Slight Growth Beyond 2019





Annual Power Transformer Revenue

US and Canada Market to See a Slight Growth Beyond 2019



North America Market – Market Drivers

Renewable Capacity Addition and Replacements to Drive Market

- Utility scale renewable additions/retirements of coal based plants
 - New transmission capacity needed
 - Capacity additions from 2016-2020:

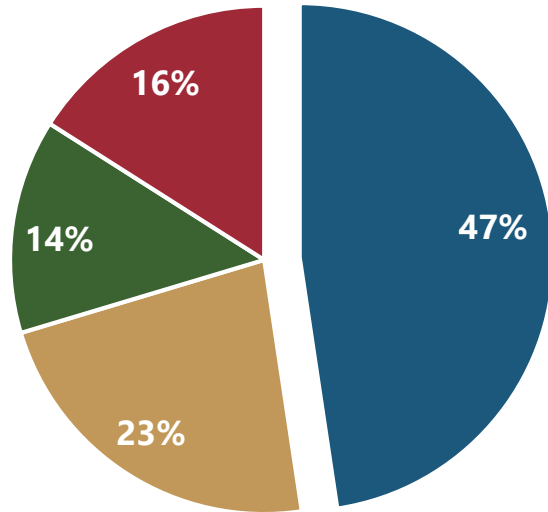
Technology	Capacity Additions (MW)	Generator Additions
Solar thermal and Photovoltaic	10840	466
Wind	9416	102
Conventional Hydro	462	41

- Aging infrastructure in US grid
 - More than 65% of power transformers in US grid are more than 25 years old

Power Transformer Revenue by Voltage

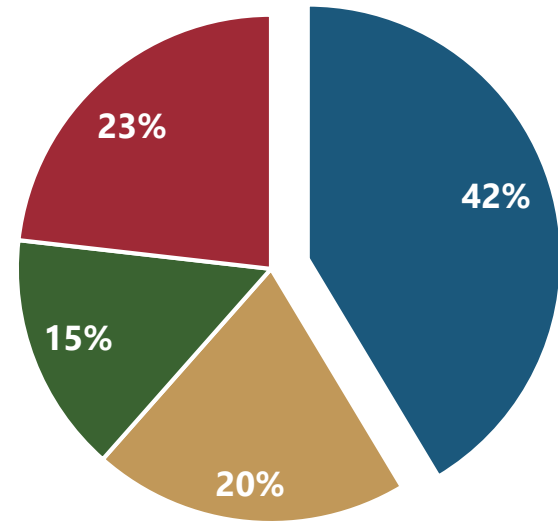
100-200kV Largest Segment of the Market in the Future

Revenue Split by Voltage 2016-17



■ 100-200kV ■ 201-300kV
■ 301-400kV ■ 500kV and above

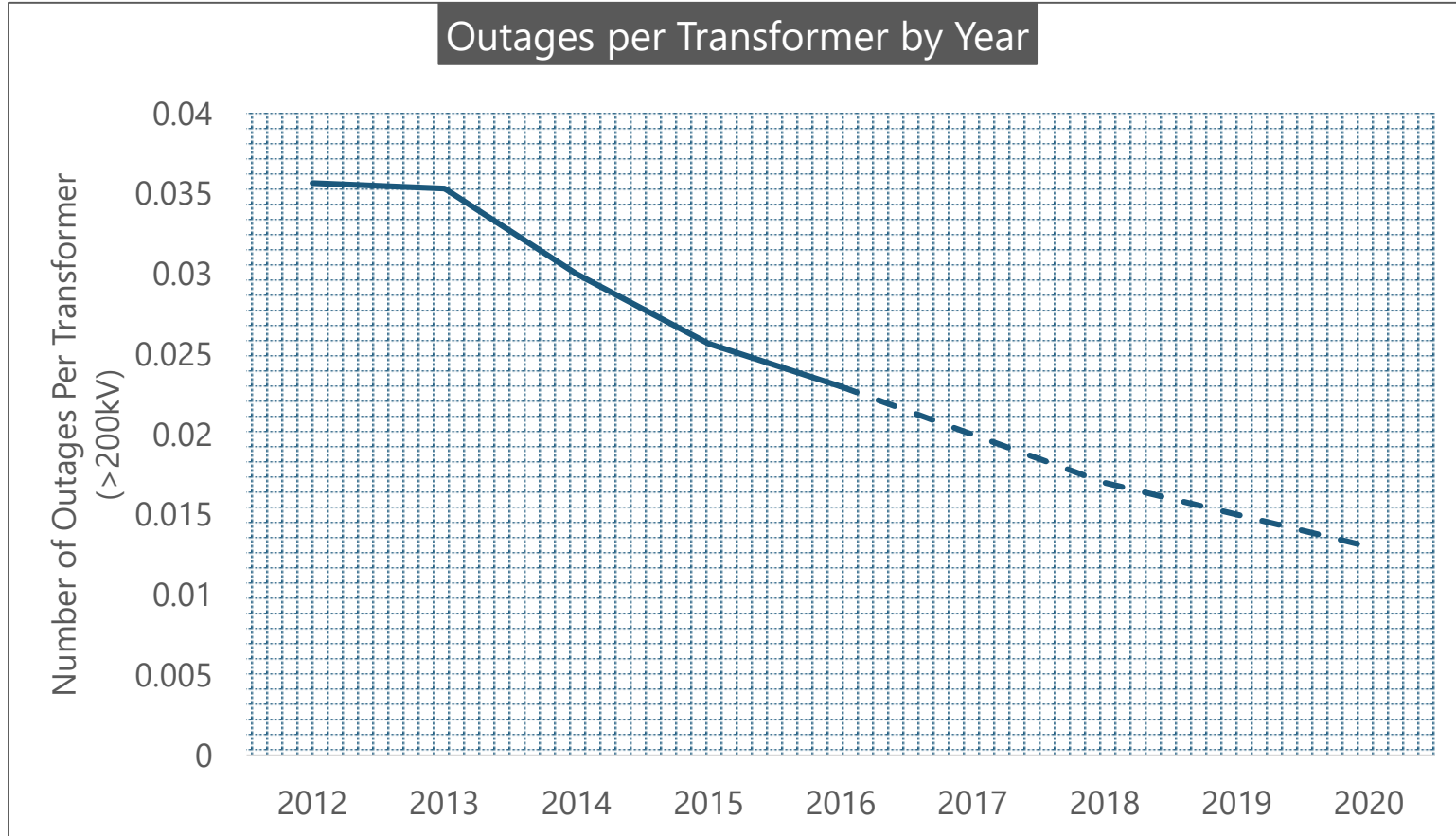
Revenue Split by Voltage 2018-23



■ 100-200kV ■ 201-300kV
■ 301-400kV ■ 500kV and above

Grid Performance and Market Growth

Failure Rates of Power Transformers Decreasing Due to Replacements



Source: NERC, Power Technology Research

North American Market – Key Trends

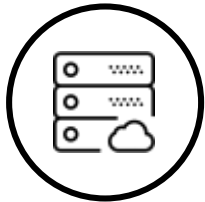
Digital Substations and Asset Health Monitoring to Increase



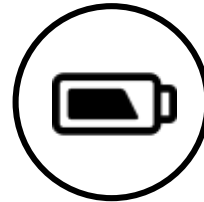
High Pure-EPC
Involvement in
Turnkey Projects



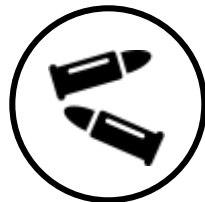
Asset Health
Monitoring to
increase



Digitalization
of Substations



Back up reserves
at Utility and
Industrial Scale



Physical
protection of
Transformers



Utilities investing in
bushing monitoring
solutions

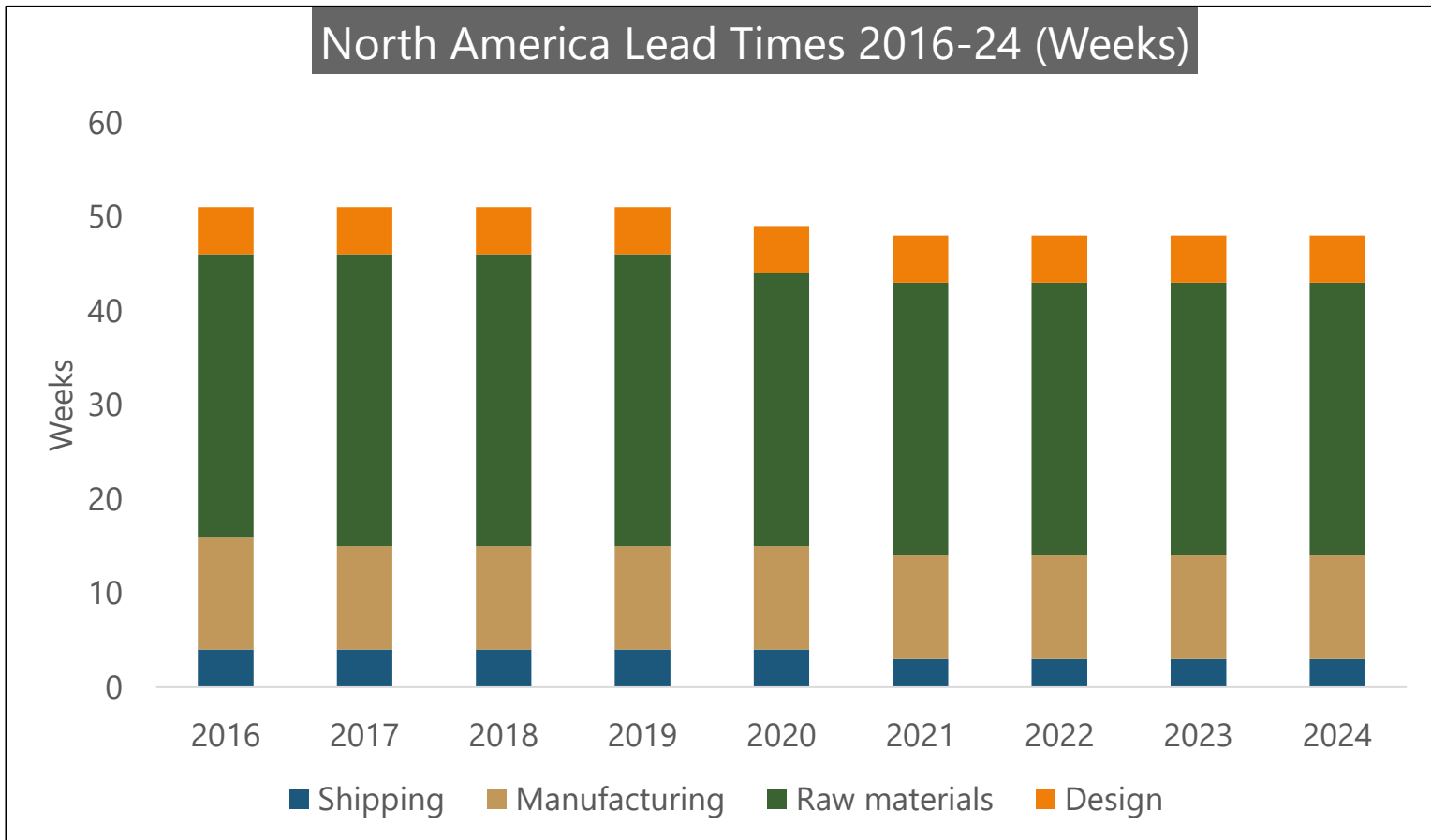
Power Transformers Lead Times

Lead Times Can Vary Depending on a Range of Factors



Power Transformers Lead Times

Lead Times will reduce in long term

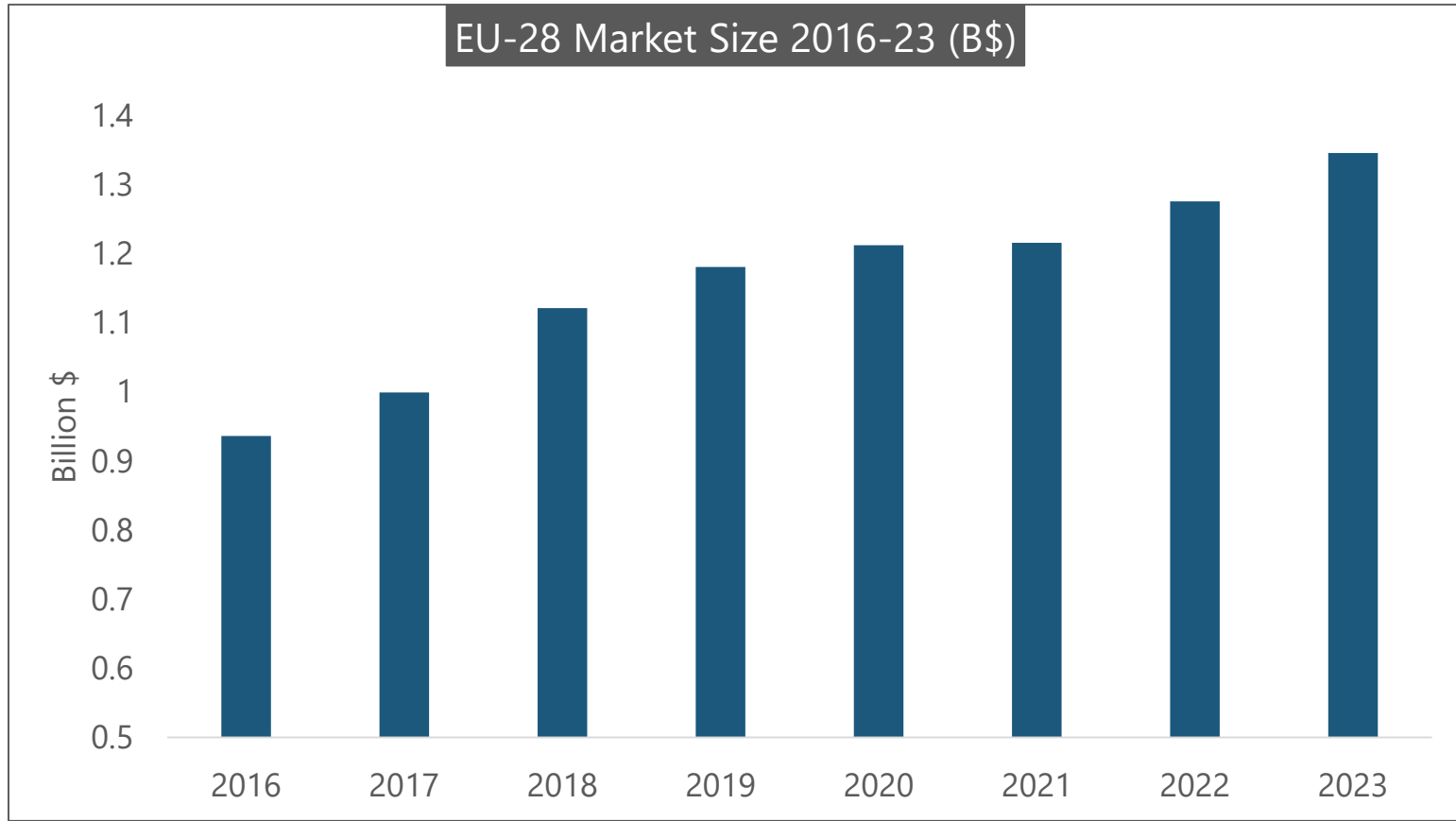


EU-28 Market

28 Countries Currently in European Union

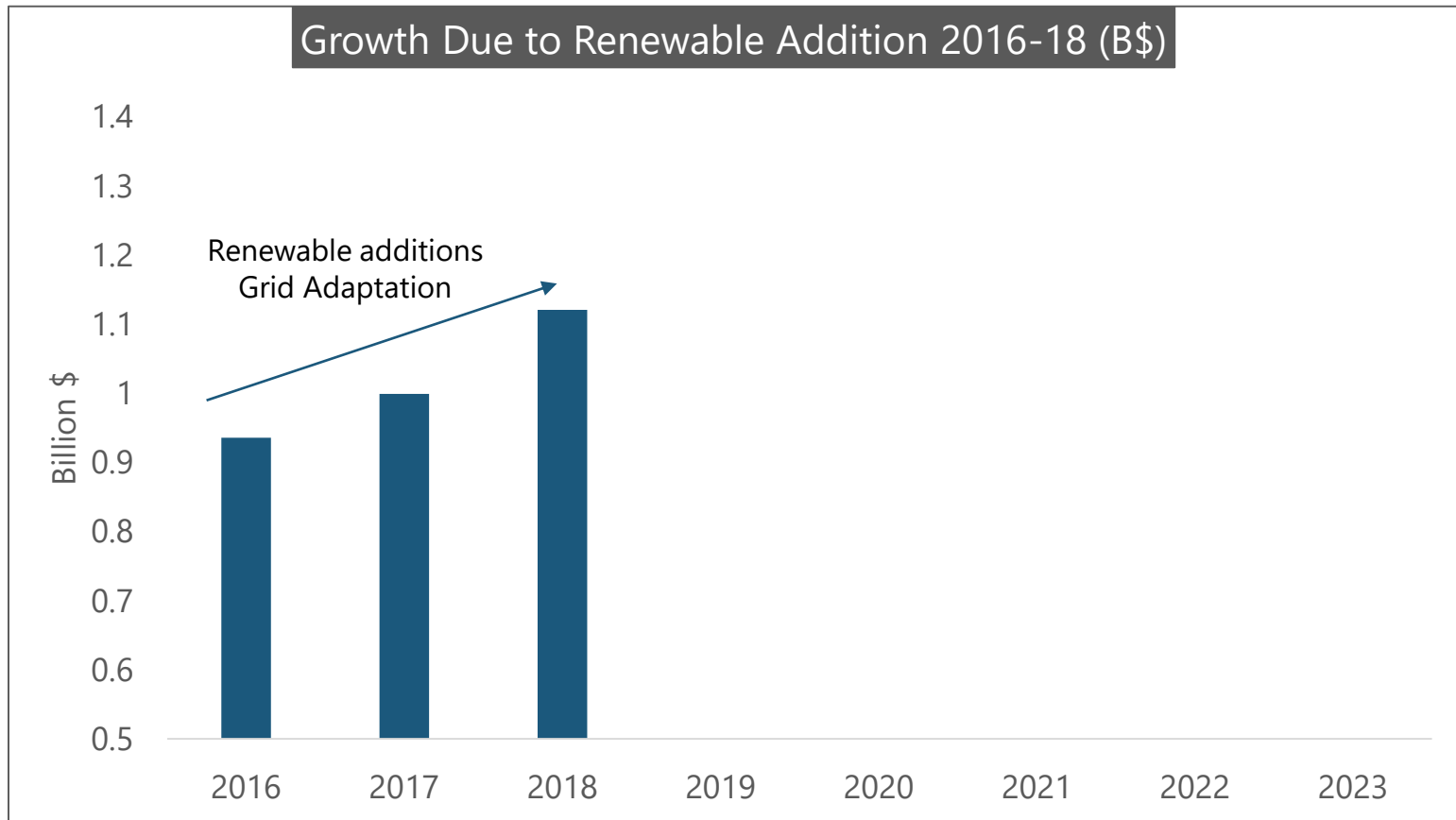
EU-28 Market - Annual Revenue

EU-28 Market Experiencing a Steady Growth



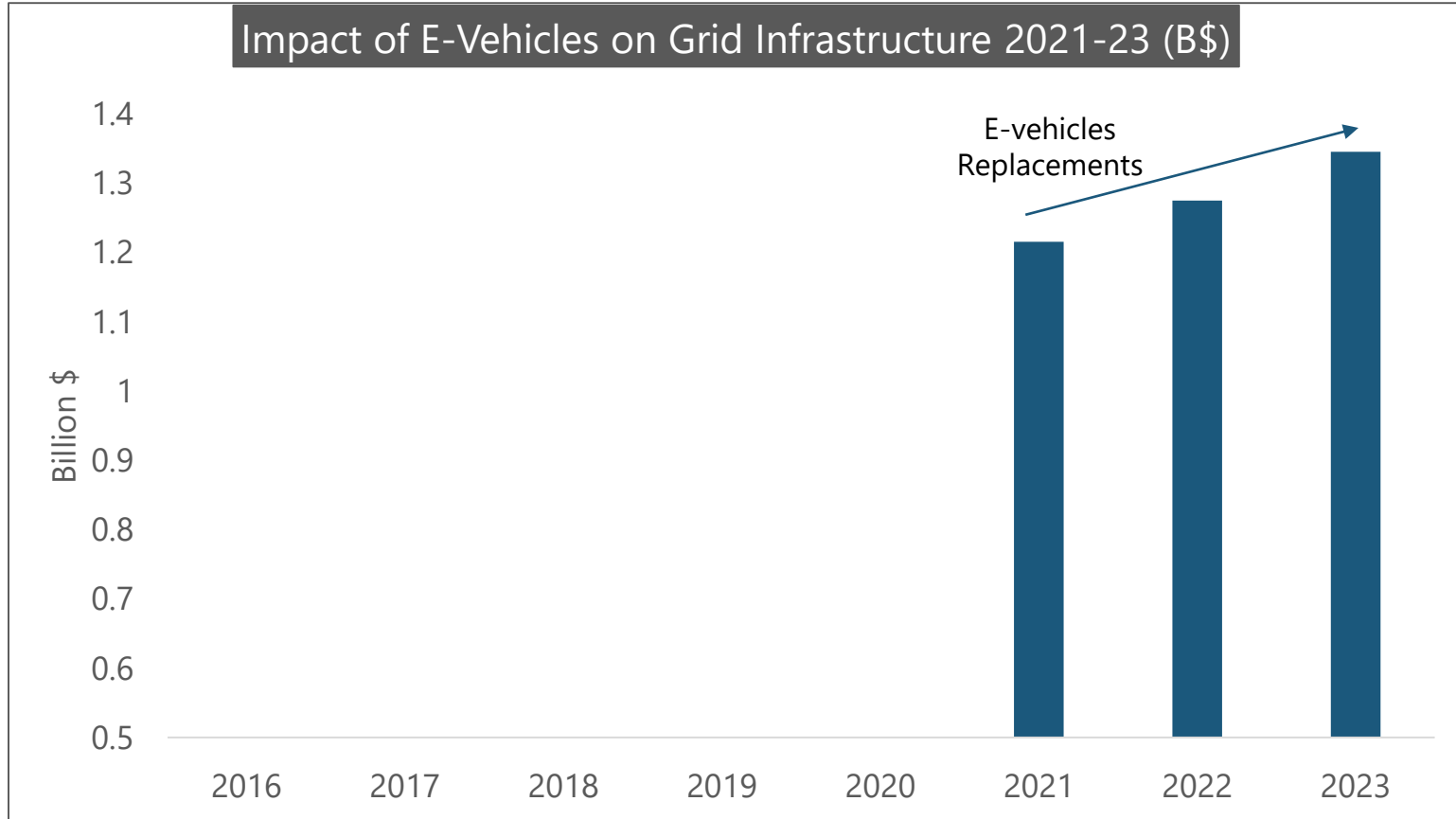
EU-28 Market - Annual Revenue

Renewable Capacity Addition is Driving Growth at the Moment



EU-28 Market - Annual Revenue

E-Vehicle Infrastructure to Impact the Grid Beyond 2020





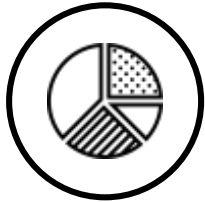
EU 28 Market – Market Drivers

Renewable Additions and Grid Adaptation Key Market Drivers

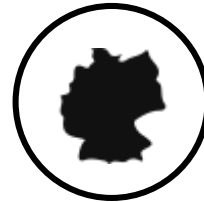
- New additions more than the replacements
 - Central European countries saw 6% annual increase in 2017
- Grid adaptation and renewable generation
 - Onshore and offshore wind power projects
- At the moment growth is driven by units
 - Prices have gone down 2016 onwards
 - From 2014 to 2016, Growth because of price increase

EU 28 Market – Key Trends

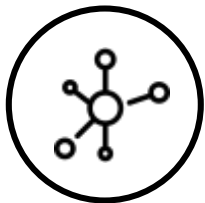
Interconnected Grids and Digital Substations to Affect the Market



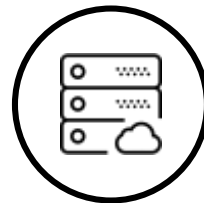
Tier-1 players
dominating the
market



Germany to be the
biggest market
2017-23



Interconnected
grids



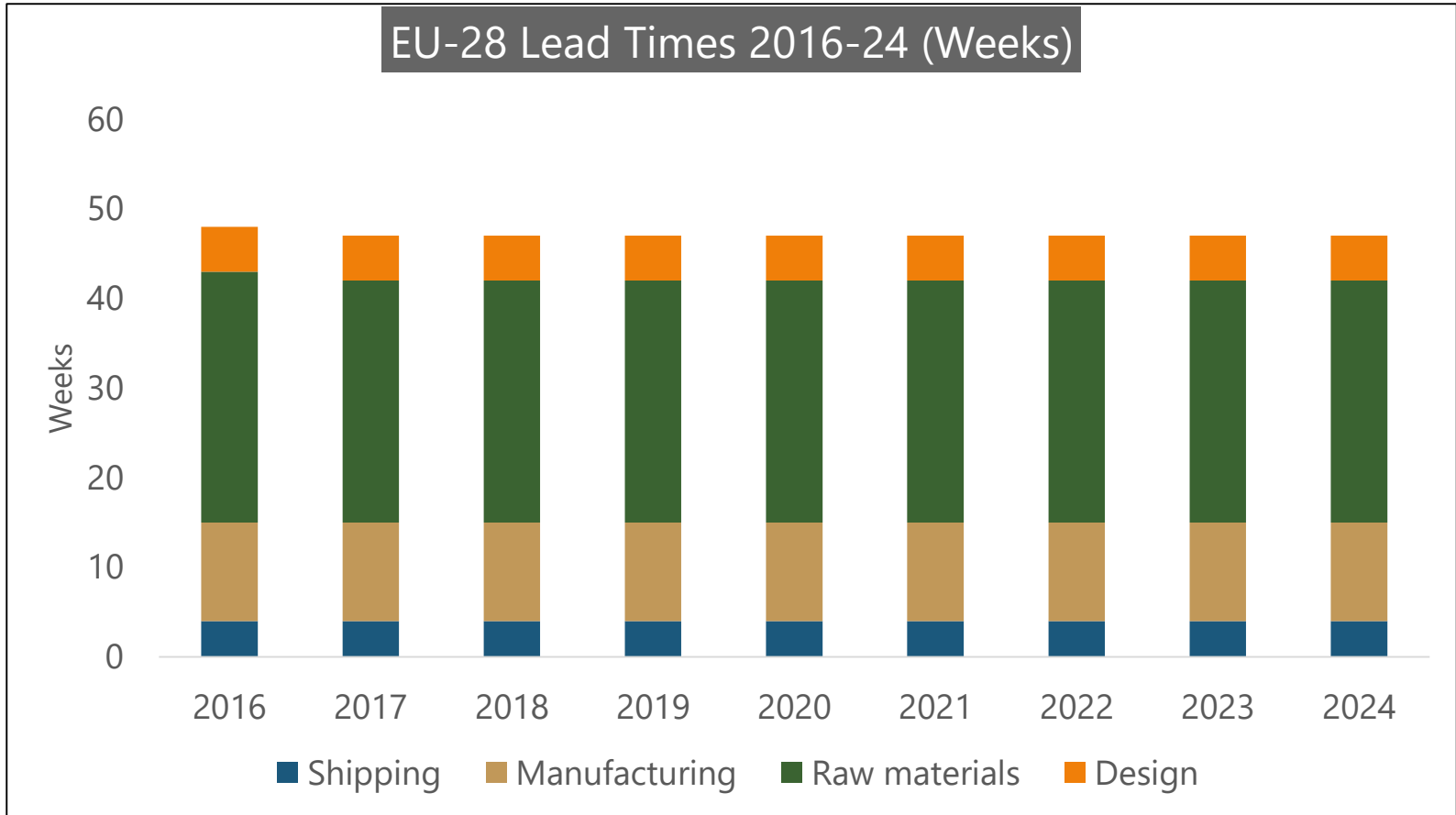
Digitalization
of Substations



Asset Health
Monitoring to
increase

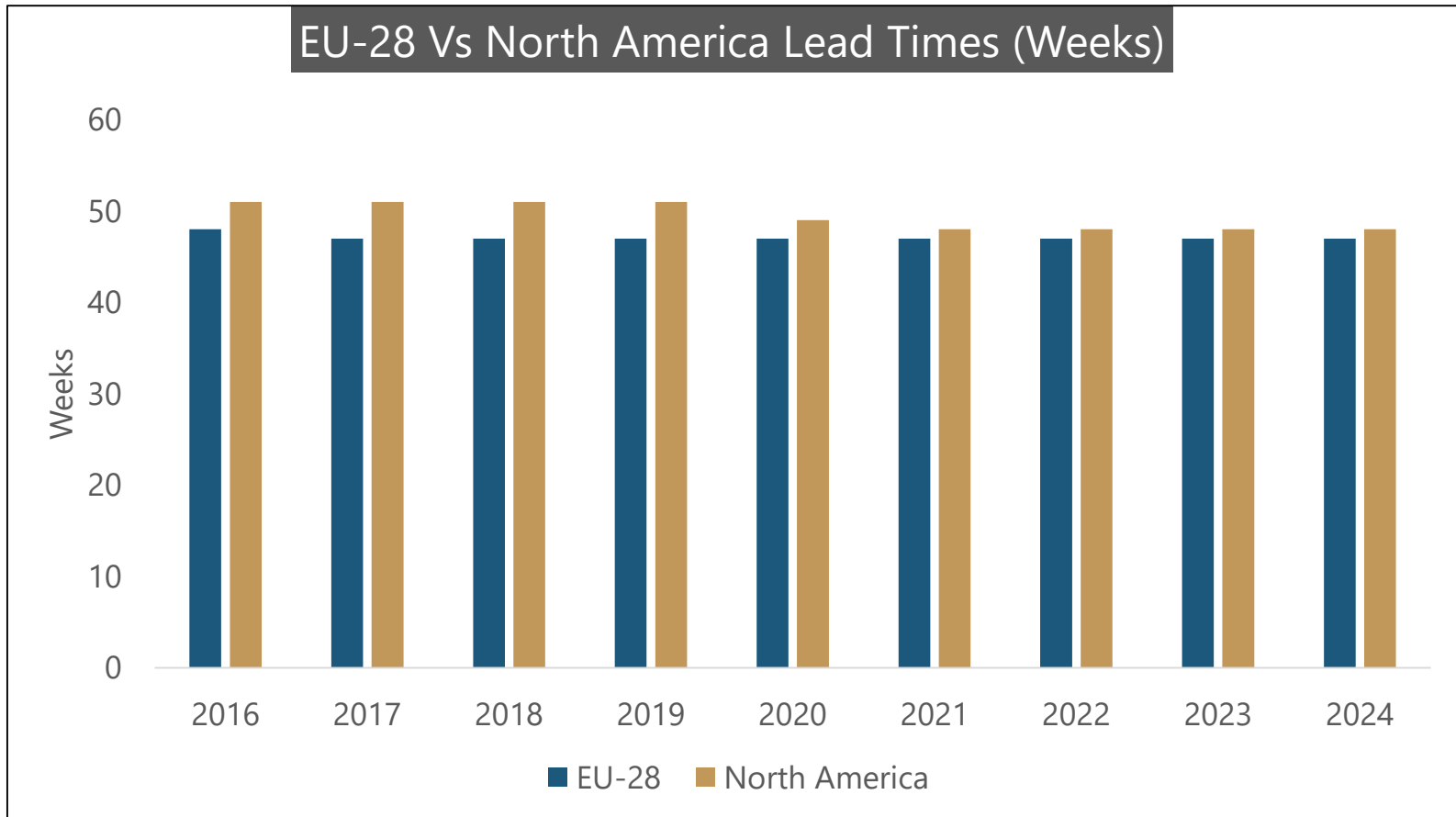
Power Transformers Lead Times

Lead Times to be Stable in Years to Come



Power Transformers Lead Times

Comparison between EU and North America



Supply Side Analysis



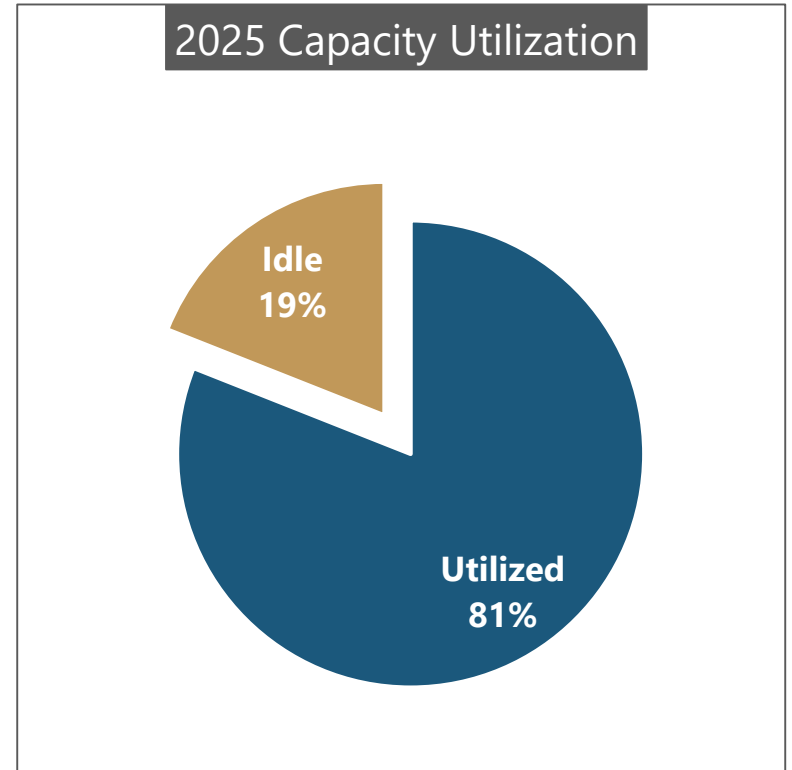
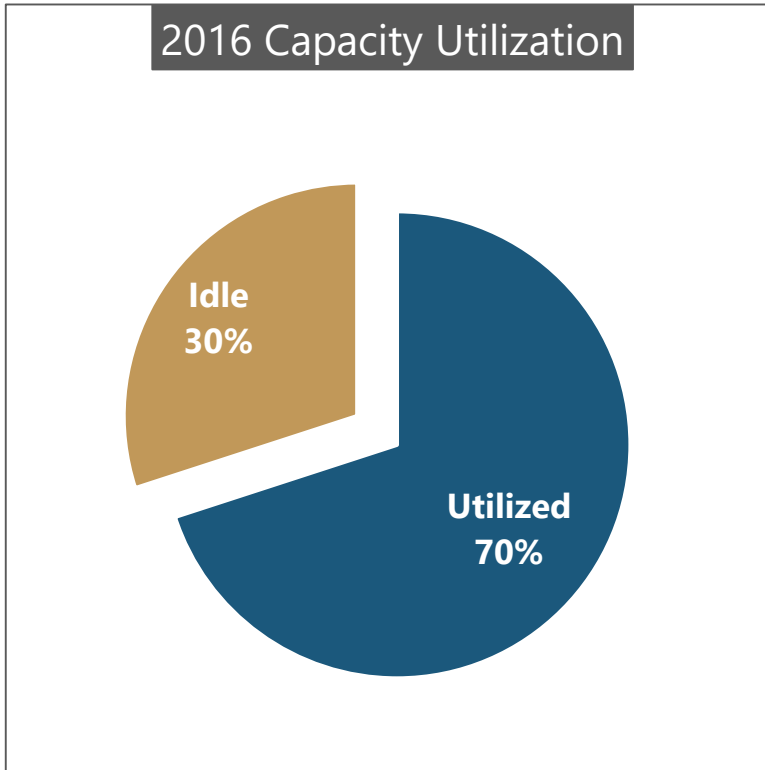
Supply and Demand – Short Term

Globally there is a Surplus in Manufacturing Capacity

- Tier 1 players operating at 75-80% capacity utilization
- Can be broken down to regional level
 - Delays in India's generation plans
- Overcapacity is expected to increase in next 2 years
 - New manufacturing facilities in emerging markets

Supply and Demand – Long term

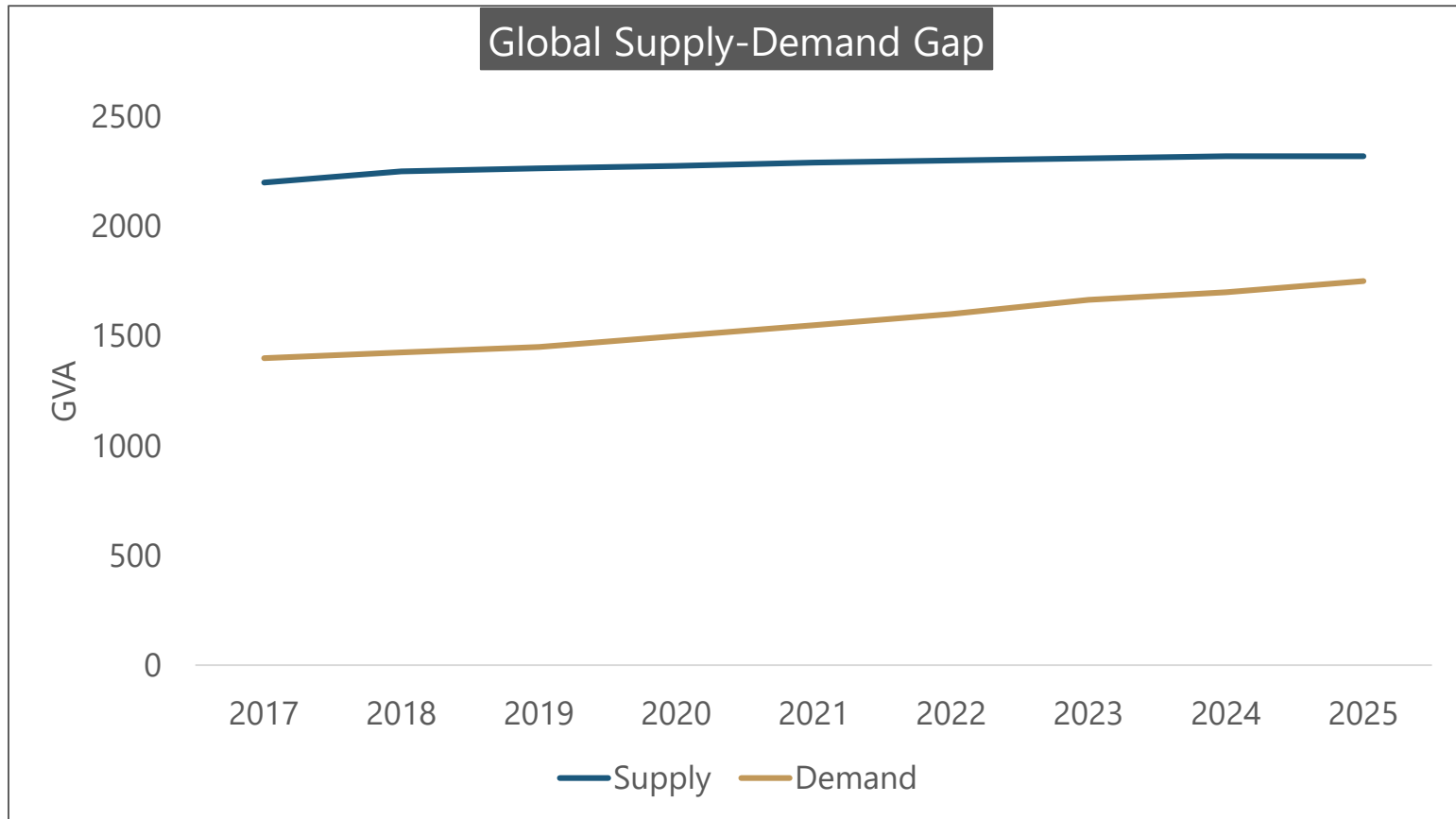
Supply-Demand Gap will Narrow Down in the Long Term



- Strict efficiency requirements will help tier 1 players to ramp up the capacity utilization
- Tier-1 players will shift their capacities towards emerging markets

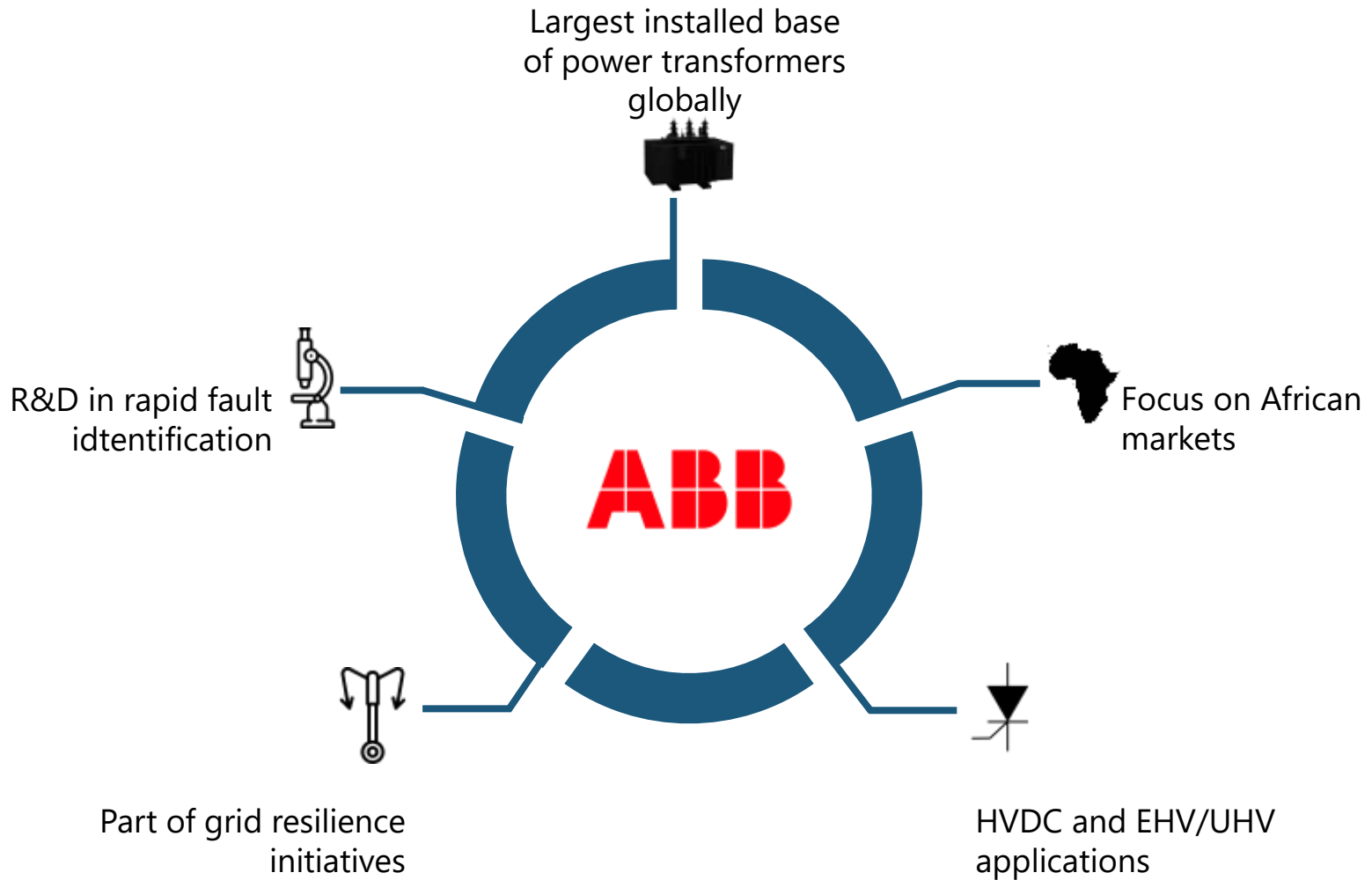
Supply and Demand

Globally there is a Surplus in Manufacturing Capacity



Company Profiles

ABB



Company Profiles

Siemens



Sales in U.S improved significantly in 2016 (33% to 43%)



R&D investment for eco-friendly transformer oil solutions



European orders remained same in 2016

Expected to win more offshore wind projects with UK



Power transformers orders from middle east

Success in HVDC projects in Europe



Siemens has also been involved in partnerships with utilities in Africa



Key Take-aways

- Penetration of renewables at transmission level
- Transformer asset health monitoring
- Preventive maintenance
- Supply demand gap to reduce in long term

Contact Details



Saqib Saeed

Principal Analyst – T&D

T. +49 (0)89 12252374

M. +49 (0)176 43408939

M. +1 408 622 0564

saqib.saeed@powertechresearch.com



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