



GCC Electrical Testing Laboratory

المختبر الفليبي لفحص المعدات الكهربائية



CC Electrical Equipment Testing: Outlook & Future Perspective

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OMAINTEC- Dec 12, 2016

Outline

- The GCC Electrical Testing Lab Overview
- Major Challenges in the Electricity Market
- Trends & Drives
- Conclusion



GCC Lab Benefits to the GCC/MENA Countries



1		Optimize Quality, Time & Cost
2		Create Knowledge Economy
3		Localize Manufacturing & Services
4		Create High-skilled Jobs
5		Promote Applied R&D
6		Retrofit Solutions for Obsolescence



GCC Lab Stakeholders


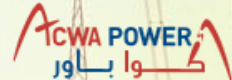










2007. Inception

2011. Feasibility study

2013. Formation of shareholders

2015. Legal establishment

2016. JV partners selection

Category	Shareholders
End-users	   
Manufacturers	 
Service providers	  
Financial investors	 
R&D	

Strategic Drives for Establishing the GCC Lab

1 Favourable
GCC national
agendas



2 Large
and growing
electricity demand

4 Focus on
efficiency and
adoption of new
technologies



3 Localization
incentives
for electrical
manufacturing

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All drivers are in support of a GCC electrical lab

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Strategic Drives for Establishing the GCC Lab

1 National agenda of GCC countries

Saudi Arabia		
QATAR		
UAE		
Bahrain		
Kuwait		
OMAN		

GCC COMMON ECONOMIC DEVELOPMENT THEMES

Expanding the Productive Base

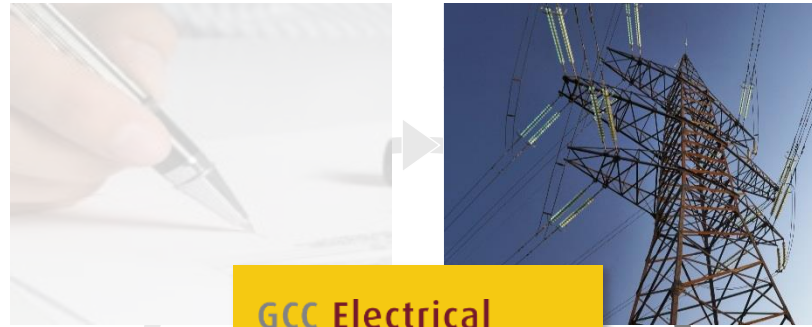
Building a Diversified Economy

Enhancing Market Efficiency

Strategic Drives for Establishing the GCC Lab

GCC installed power capacity to grow ~55% by 2030,

① Favourable
GCC national
agendas



② Large
and growing
electricity demand

④ Focus on
efficiency and
adoption of new
technologies

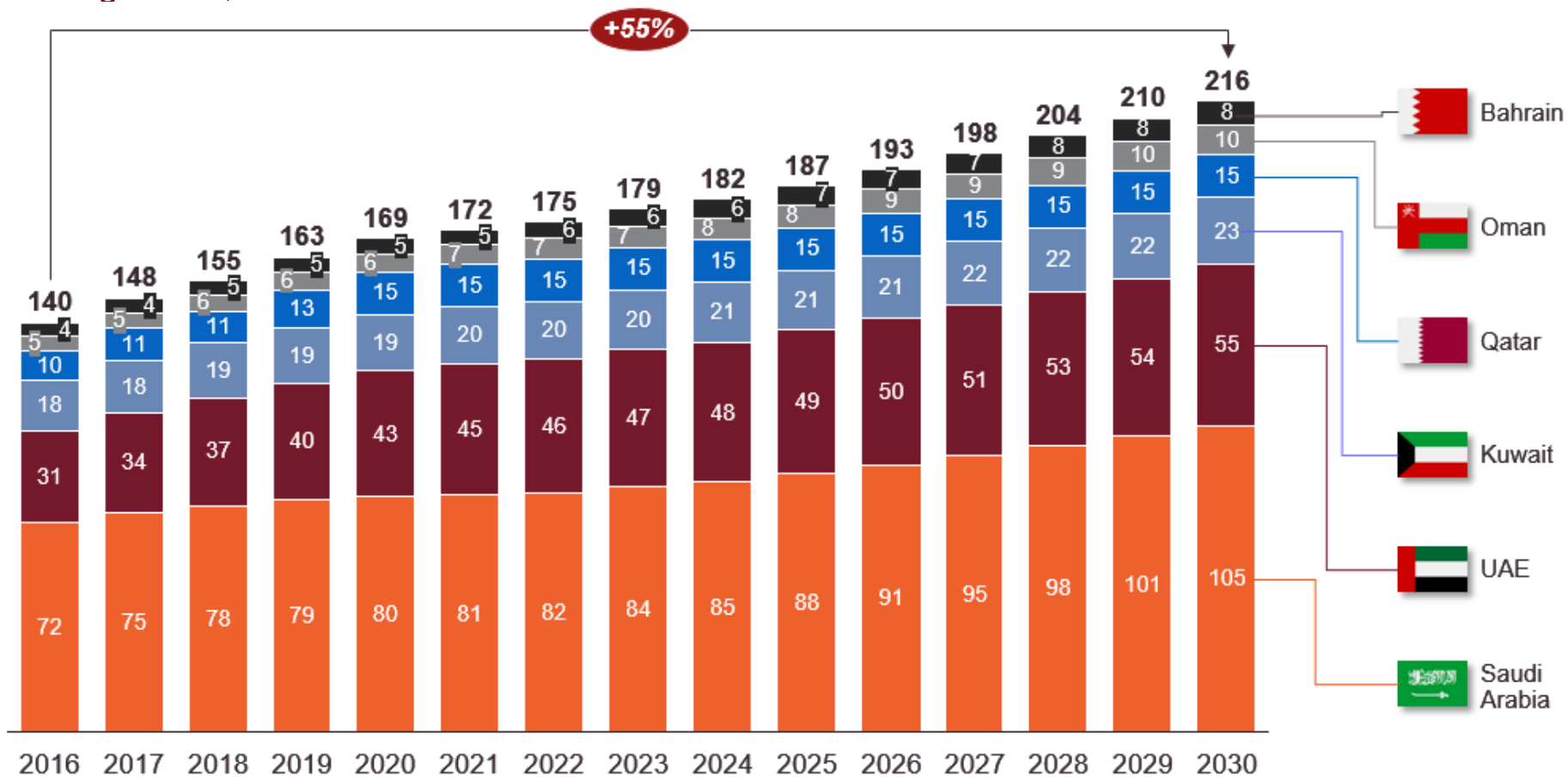


③ Localization
incentives
for electrical
manufacturing



Strategic Drives for Establishing the GCC Lab

2 GCC Installed Power Generation Capacity Gigawatts, 2016-2030



Strategic Drives for Establishing the GCC Lab

Focus on manufacturing localization

1 Favourable
GCC national
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3 Localization
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Strategic Drives for Establishing the GCC Lab

3 GCC countries localization initiatives



KSA

- **Saudi Vision 2030:** Localize Manufacturing to 75%, renewables, industrial equipment manufacturing



Oman

- **In-Country Value (ICV) program:** Maximize capital spend in Oman for a variety of manufacturing activities



Qatar

- **Qatar 2030 Vision:** Natural resource management and development of knowledge based economy



UAE

- **Emiratization Initiative:** Employ its citizens in a meaningful and efficient manner in the public and private sectors



Kuwait

- **Kuwaitization Law:** Increase Kuwaiti's percentage in the private sector to enhance knowledge transfer and localization



Bahrain

- **Bahrainization:** Bring more Bahraini citizens into the workplace and reduce reliance on expats

Strategic Drives for Establishing the GCC Lab

Integration of Renewable Energy & Smart grid

1 Favourable
GCC national
agendas



2 Large
and growing
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3 Localization
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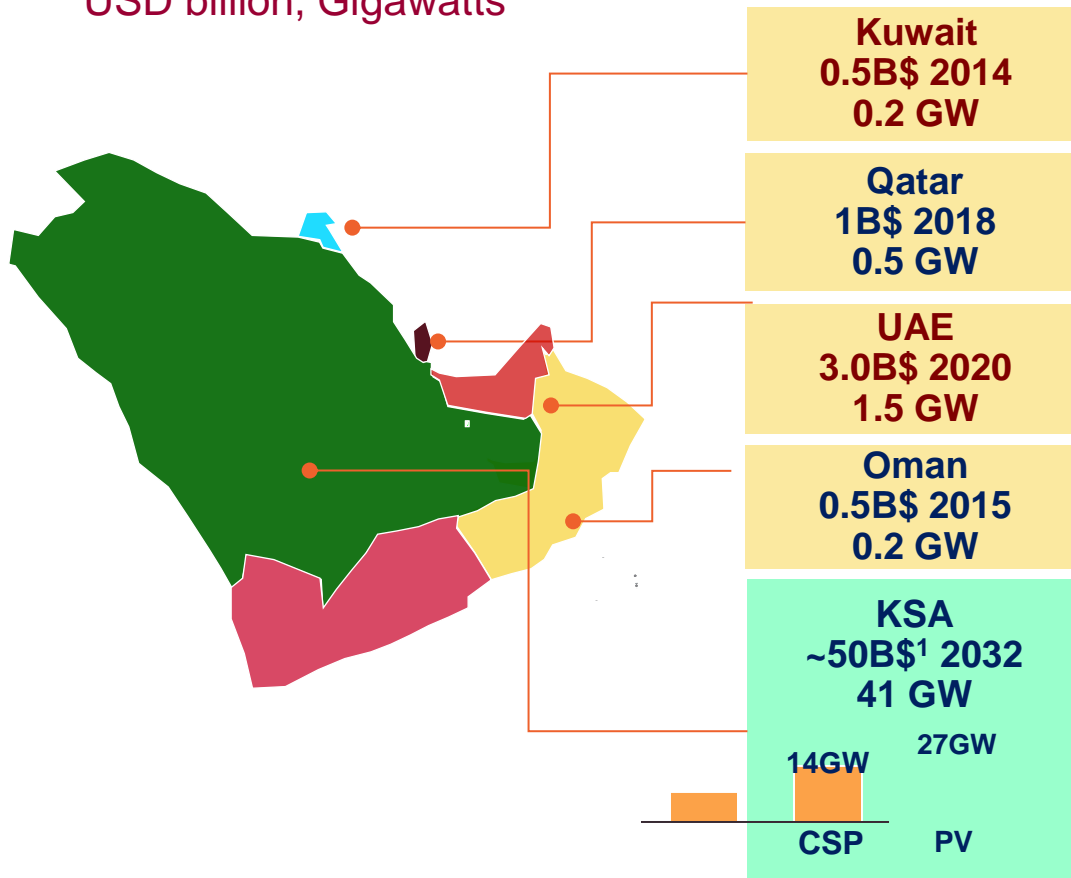
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Strategic Drives for Establishing the GCC Lab

4 Renewables solar targets by country

USD billion, Gigawatts



46GW Capacity
Over **\$50** billion
of investments
by **2032**

1. Assuming a 25-30% percent drop in solar CAPEX in the short term and excluding storage cost
Source: Saudi 2030 vision, Sun&Life, KACARE

GCC Lab Focus on Asset Management

Business Portfolio

Testing & Certifications
Inspection
Condition Assessment
Calibration
Safety
Efficiency
Investigation
RCA



Power
Labs
LV-HV, HP

Renewable
Smart
Grid



Appliances
Efficiency
Electronics

**GCC Lab
Business
Portfolio**

Training
Consultation

Audit
Inspection

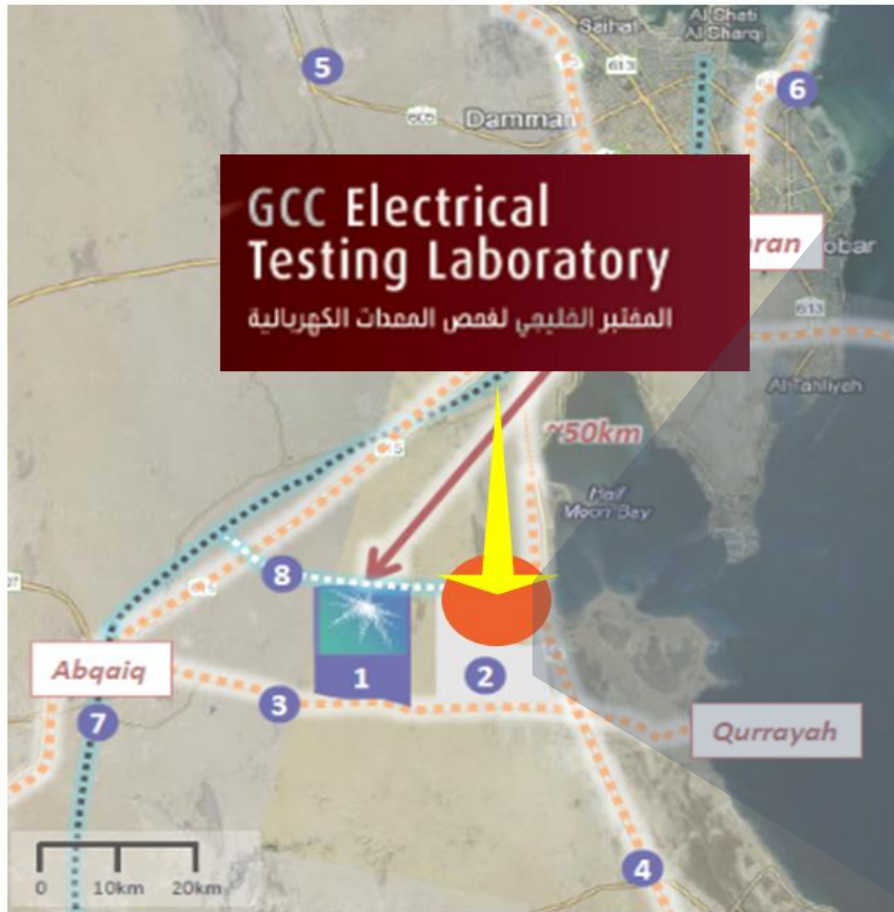


Calibration



GCC Lab Focus on Asset Management

GCC Lab strategic location



**GCC Electrical
Testing Laboratory**
المفتبر الفليبي لفمص الممدمم الكهرالملمة

Modon–Dammam 3



Site

- 1 Area of 140,000 m²
- 2 Adjacent to EIC

Air & Seaports

- 5 KFIA- Dammam
- 6 King Abdul-Aziz Seaport

Road

- 3 Abqaiq Highway
- 4 GCC highway

Rail

- 7 Abqaiq Railway Station
- 8 Rail connection to Dammam 3



Most HP/HV testing companies have a single location due to high investment required and expertise consolidation

1 Industrial – HV and HP¹ laboratories

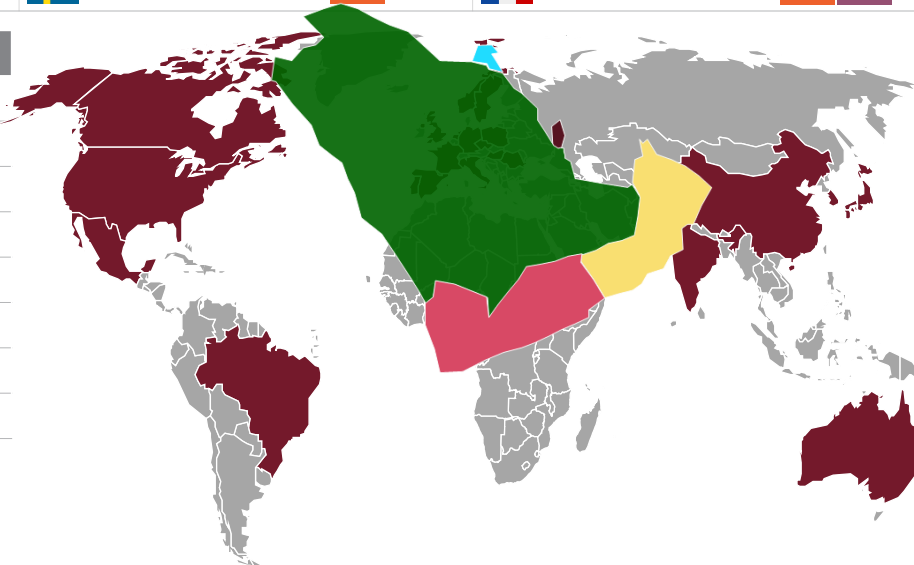
Main labs selection

Europe			
VEIKI – VNL	HV	ICMET	HV HP
Charles Parsons	HV	Tecnalia	HV HP
CESI	HV HP	TDHVL	HV
CESI (2 labs)	HV HP	EGU	HV
Schneider Volta Labs	HP	ABB – NEFI	HP
PSW Siemens	HV HP	ABB AB	HP
Ormazabal	HV HP	ABB	HV HP
SEDIVER	HV	EDF	HV HP
LCOE – FFII	HV	Brugg Cables	HV
DNV GL – KEMA	HV HP	STRI AB	HV
DNV GL – KEMA	HV HP		
IPE	HV HP		

Americas	
Powertech	HV HP
Kinectrics	HV
LAPEM CFE	HV
DNV GL – KEMA	HV HP
Manitoba Hydro	HV
Cepel	HV HP
Eaton Corporation	HV HP
S&C Electric Co.	HV HP

Independent 3rd party labs
Manufacturer or utility labs

1. HV - High Voltage / HP – High Power
Source: Project team



■ Countries with HV or HP labs

APAC	
Central Power Research Institute	HV HP
ERDA	HV HP
HGK	HV HP
KERI	HV HP
Ausgrid (Lane Cove)	HP
Xi'an HV Apparatus	HV HP
Hitachi	HV HP
Meidensha Corp	HP
Mitsubishi	HV HP
NGK Insulators	HV HP
Nissin Electric	HV HP
Toshiba	HV HP

GCC Lab Business Development

Implementation Timeline

1. Q1 2016:

Company
Business Plan
Created

3. Q4 2016:

Partner(s)
Finalized

5. Q3 2017:

Renewables/
Smart Grid Lab

7. 2018

Appliances
Lab

9. 2020

Industrial Lab
Operations
Commence

2016

2017

2018

2019

2020

**2. Q2-Q4
2016:**

Partner
Selection

4. Q2 2017:

Calibration,
Training
Services

6. Q3 2017:

Industrial Lab
EPC Initiated

8. 2019

Inspections/
Audit Services



Challenge: Climate Attribute

Implication

Temperature Range

(-10 up to +60)

Corrosion

US \$2.5Trillion, 3.4% Global GDP

Humidity

100%

Dust, Storms, Ice, UV

Gusty & sandy (160km/hr)



Cyclic Peaks

Electrical Stress

Mechanical Failures

Thermal Stress

Hi Creepage Distance

Corroded Structures

Challenge: Climate Attribute

Implication

Temperature Range

(-20 up to +60)

Corrosion

US \$2.5Trillion, 3.4% Global GDP

Humidity

100%

Dust, Storms, Ice,

Gusty & sandy (160km/hr)



Derating

Shorter Life-Cycle

Replacement

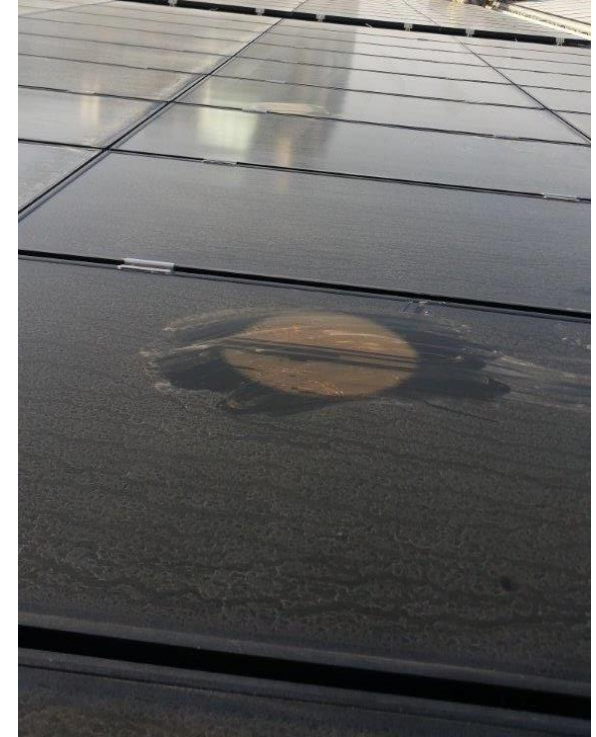
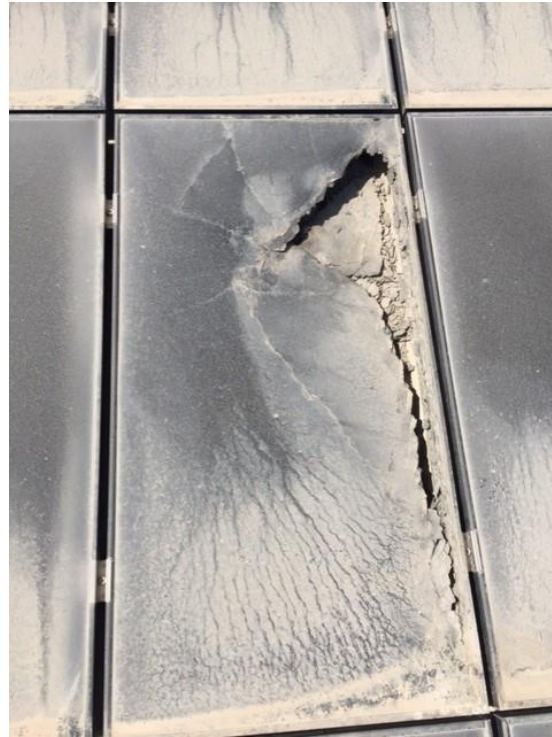
Production
Interruptions

Costly O&M

Safety

Performance

Challenge: Climate Attribute



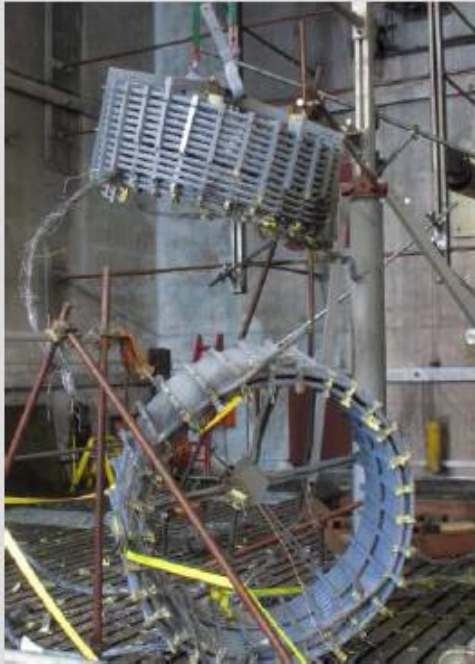
- Heat spot on a noticeable number of the PV panels.
- Signs of burns (totally / Partially damages) on multiple PV panels.
- Shattered PV panels (Cracks on the glass layer) .

Challenge: Design Quality

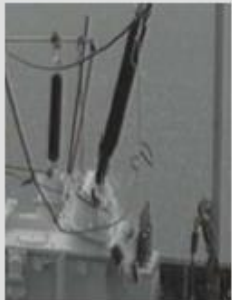
Around 25% of test-objects initially fail to pass type-tests



Line trap



Line trap



Broken bushing



Disconnecter



Switchgear panel



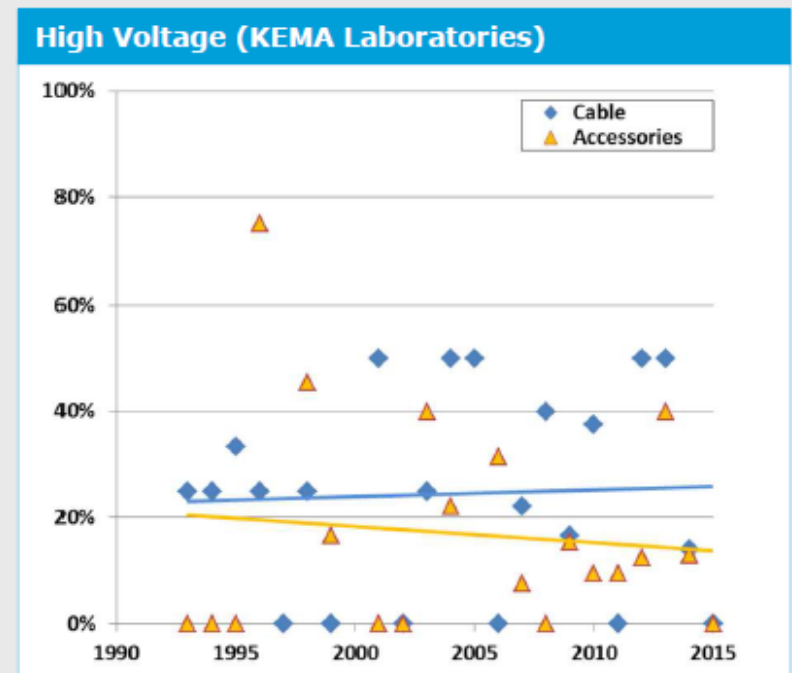
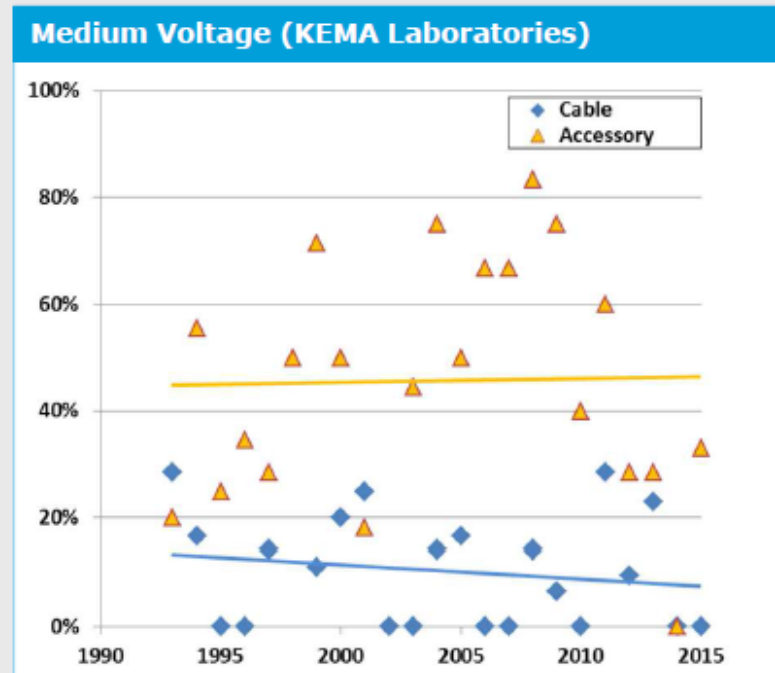
Distribution transformer



Oil spill

Challenge: Design Quality

Initial failure rate cables and accessories



Cables:

MV ~15%

HV ~25%

Accessories:

MV ~45%

HV ~18%

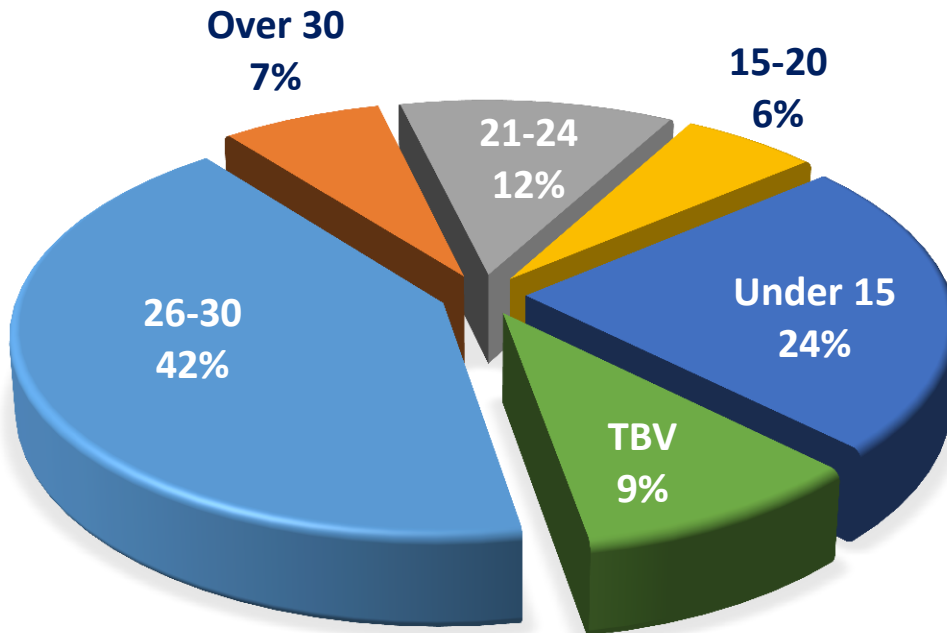
Challenge : Aging



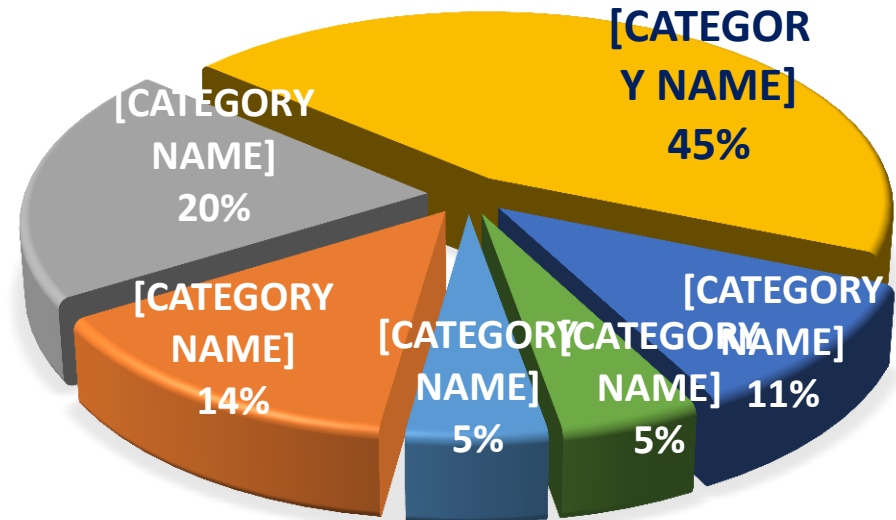
1000 Subs- SubNetwork



48 International
Companies



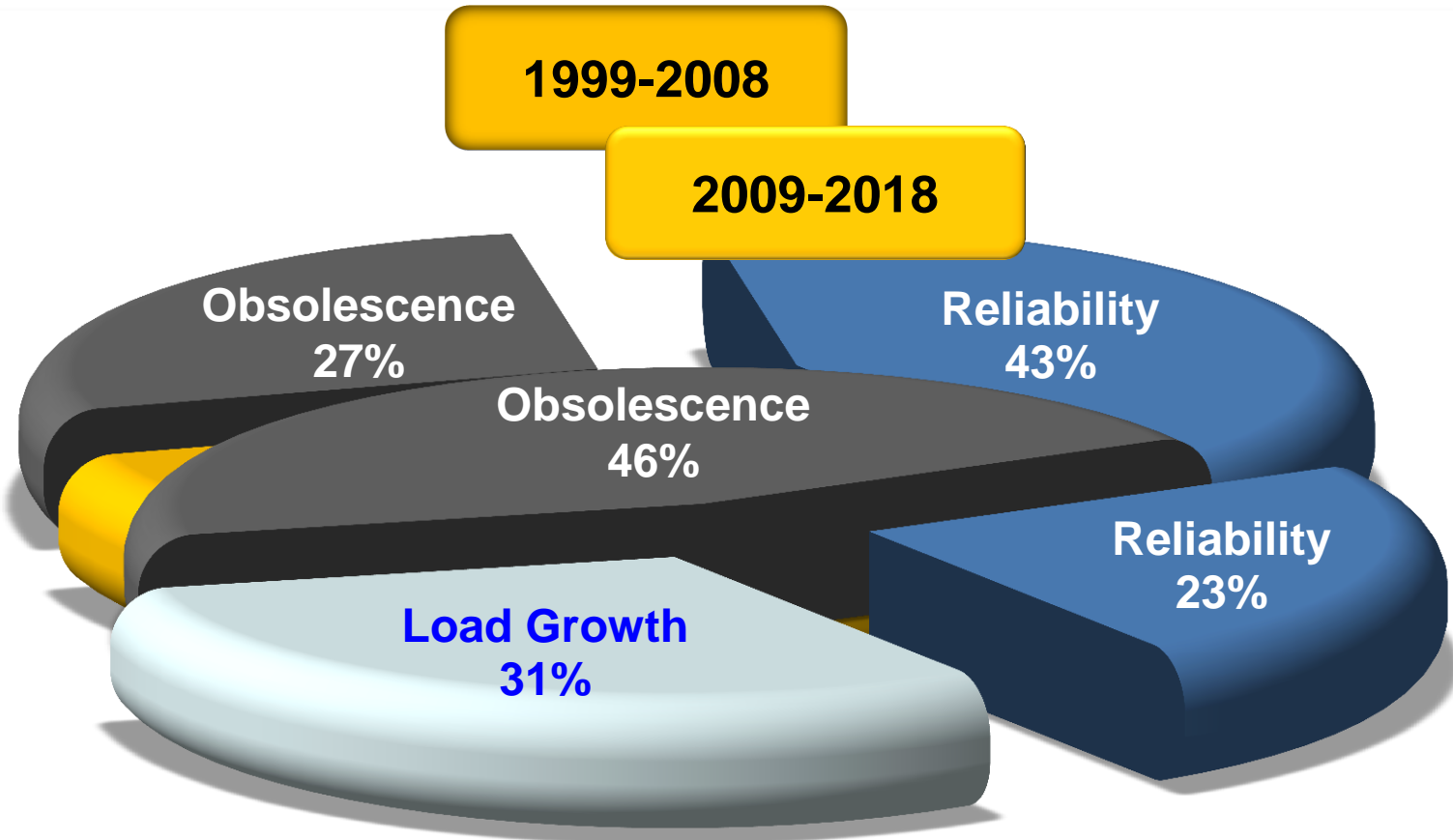
Age over 20 years = + 60 %



Age over 20 years = ~ 40 %

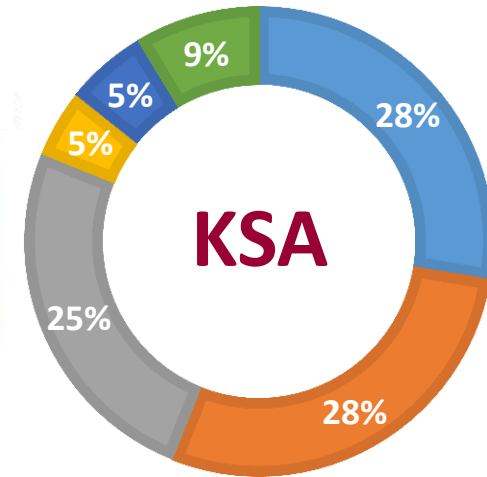
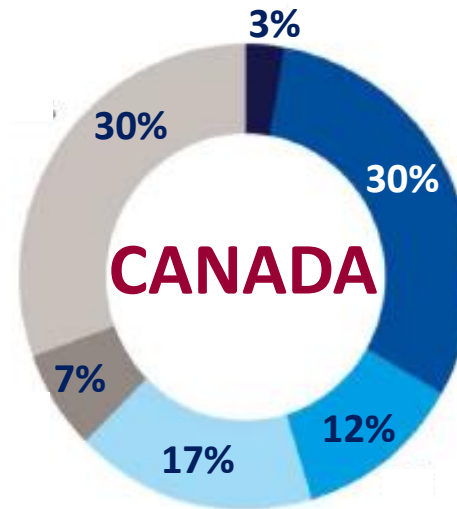
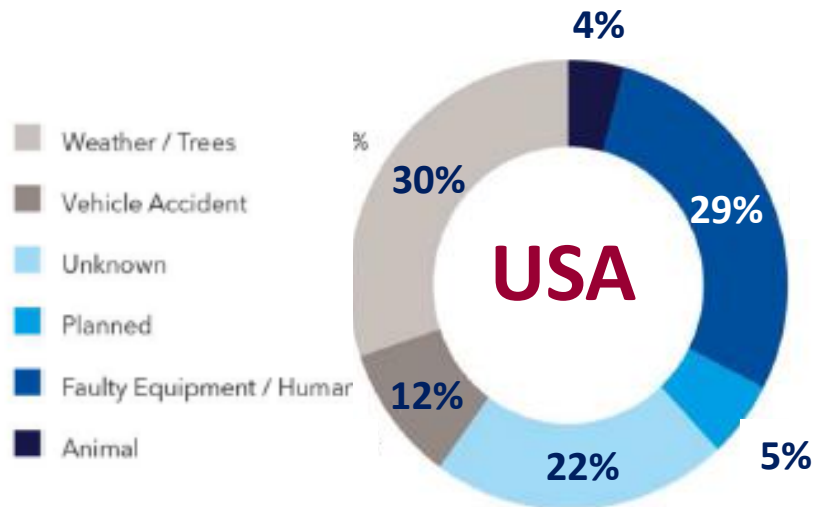
Challenge: Obsolescence

Case Study – Large Oil Company



- Equip Failure
- Weather
- Protection
- System
- Human Error
- others

Challenge: Equipment Failure



	USA	CANADA	KSA
Equip Failure	29%	30%	30-53%
Weather	30%	30%	28%

GCC Challenges: Reliability

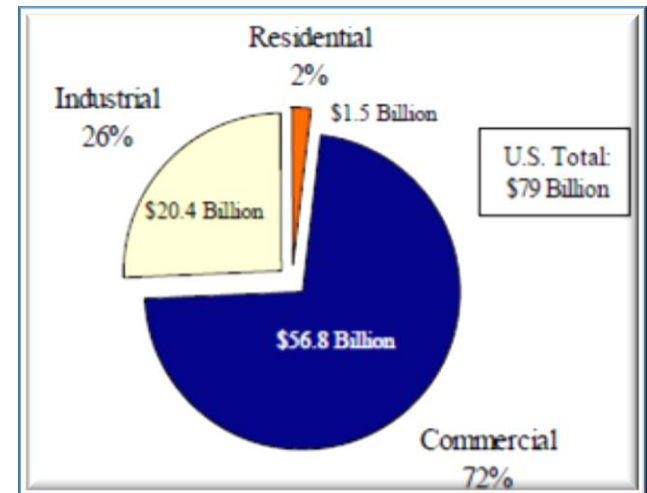
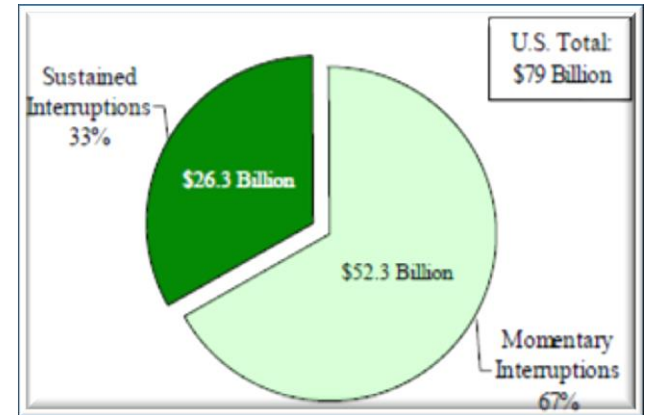
Cost of Interruptions

EPRI

US: \$ 119 Bn/Year

Berkeley Lab

US: \$ 79 Bn/Year



Conclusion

- Synergy with Visions of the GCC Countries
- Challenges Impacts (*Safety, Reliability & Cost*)
- Excellence Centers (*Asset Management, Spare Parts, Retrofit Condition Assessment*)
- Influence Technical Specifications (*Life-Cycle Control, Climate*)
- R&D and Innovation (*Conventional, New Technologies*)
- Collaboration





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THANKS

Jeddah, Dec 12, 2016