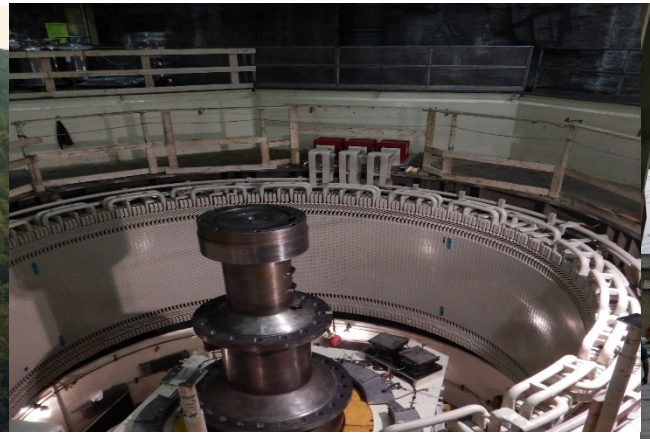
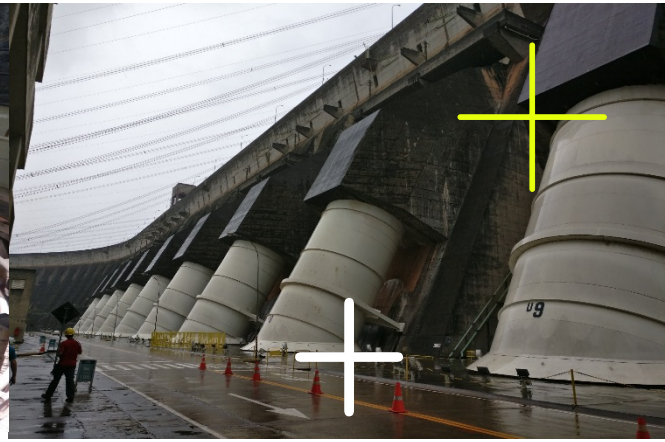
Power Infrastructure in Africa
Kariba South Extension Project

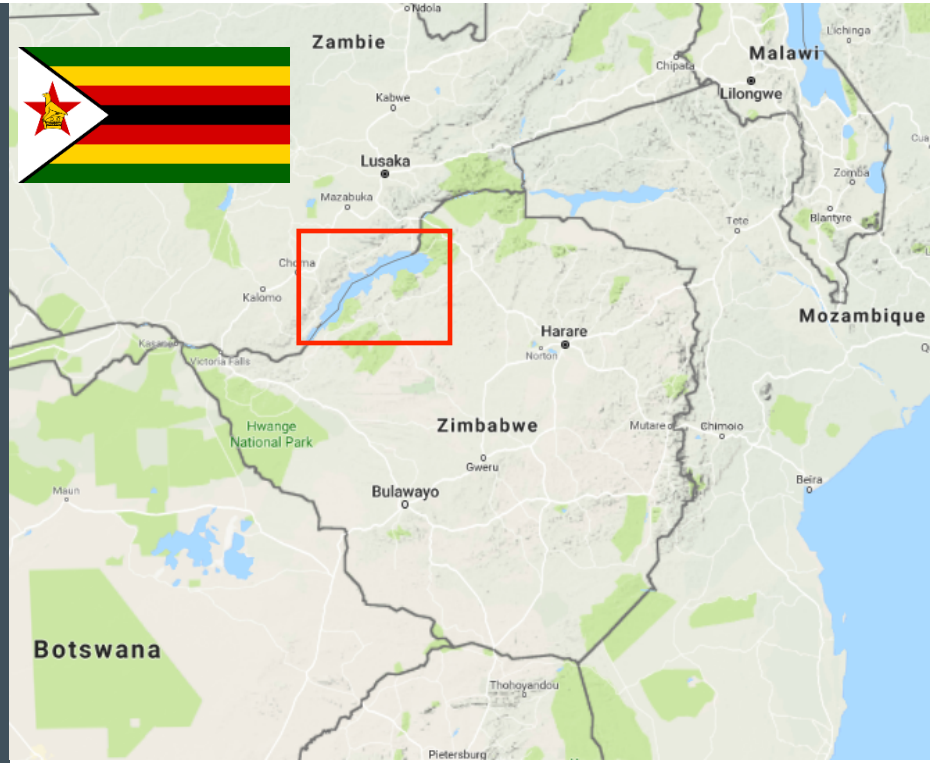
24 October 2018

The Canada-Africa Chamber of Business
Chambre commerciale Canada-Afrique
HATCH

Context

Republic of Zimbabwe:

- Zambezi River defines border between Zambia and Zimbabwe
- Population: 16.5 million in 2017
- GDP: 17.8 B US$ in 2017
- GDP per capita: 1080 US$ in 2017
- Access to electricity: 38.2%
- Electricity market controlled by state-owned companies:
  - Zimbabwe Power Company (ZPC)
  - Zimbabwe Electricity Transmission and Distribution Company (ZETDC)
- Energy generated from hydroelectricity, coal and renewables



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Context

In 2010:

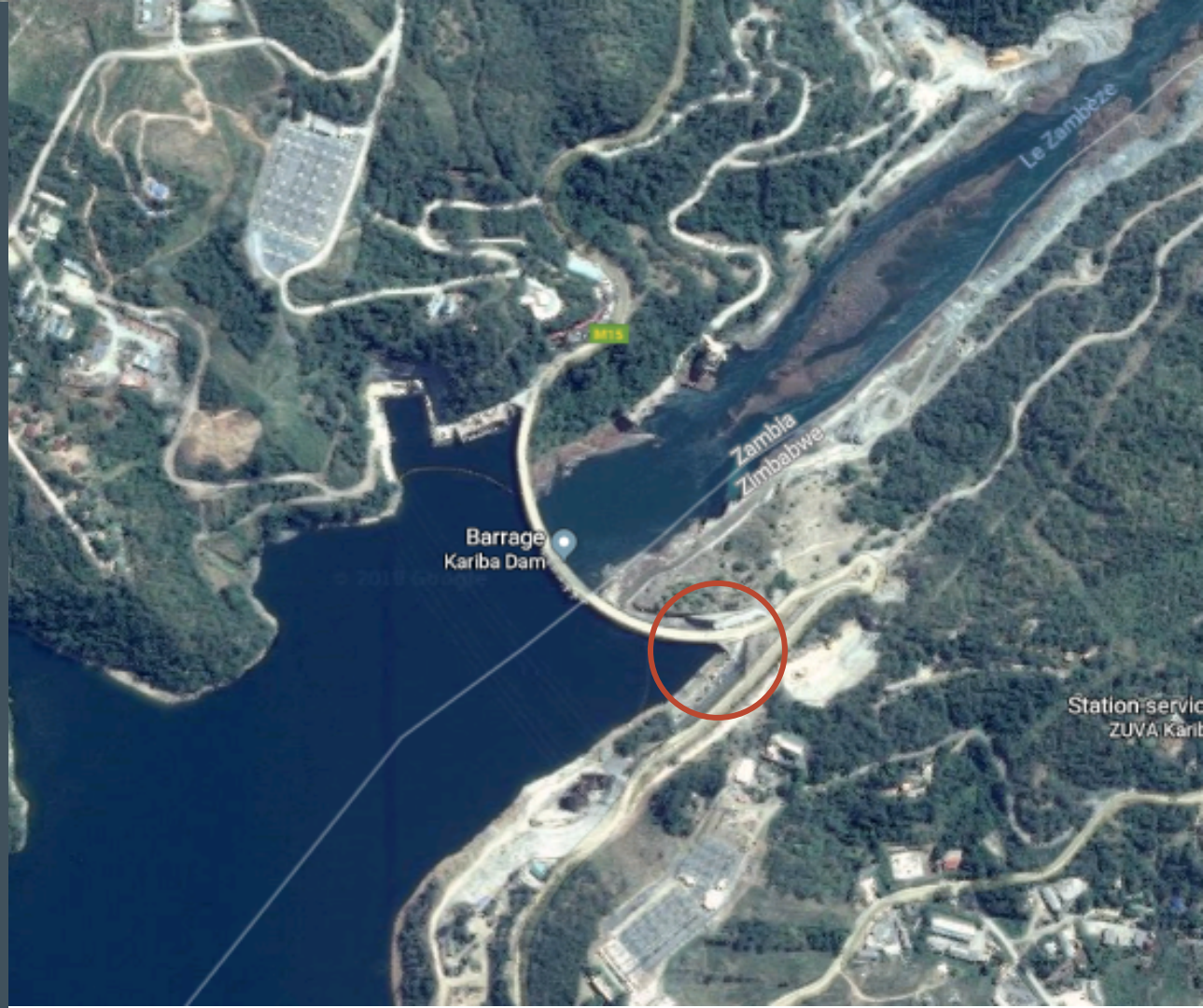
- Available capacity: 1500 MW
- Installed capacity:
  - Kariba South (Hydro) – 750 MW
  - Hwangue (Thermal) – 950 MW
  - Other thermal – 250 MW
- Peak power demand: 2500 MW
- Power imported from regional interconnectors (SAPP)
- Extensive load shedding during peak periods
- Significant impact on economy

Plan to add power on the grid through Hydro and thermal expansion projects

Kariba Dam

- Built between 1955 and 1959
- Created Lake Kariba: 280 km long and 180 km^3
- Double curvature concrete arch dam – 128 m high and 579 m long
- Kariba Dam now owned by the Zambezi River Authority (ZRA)

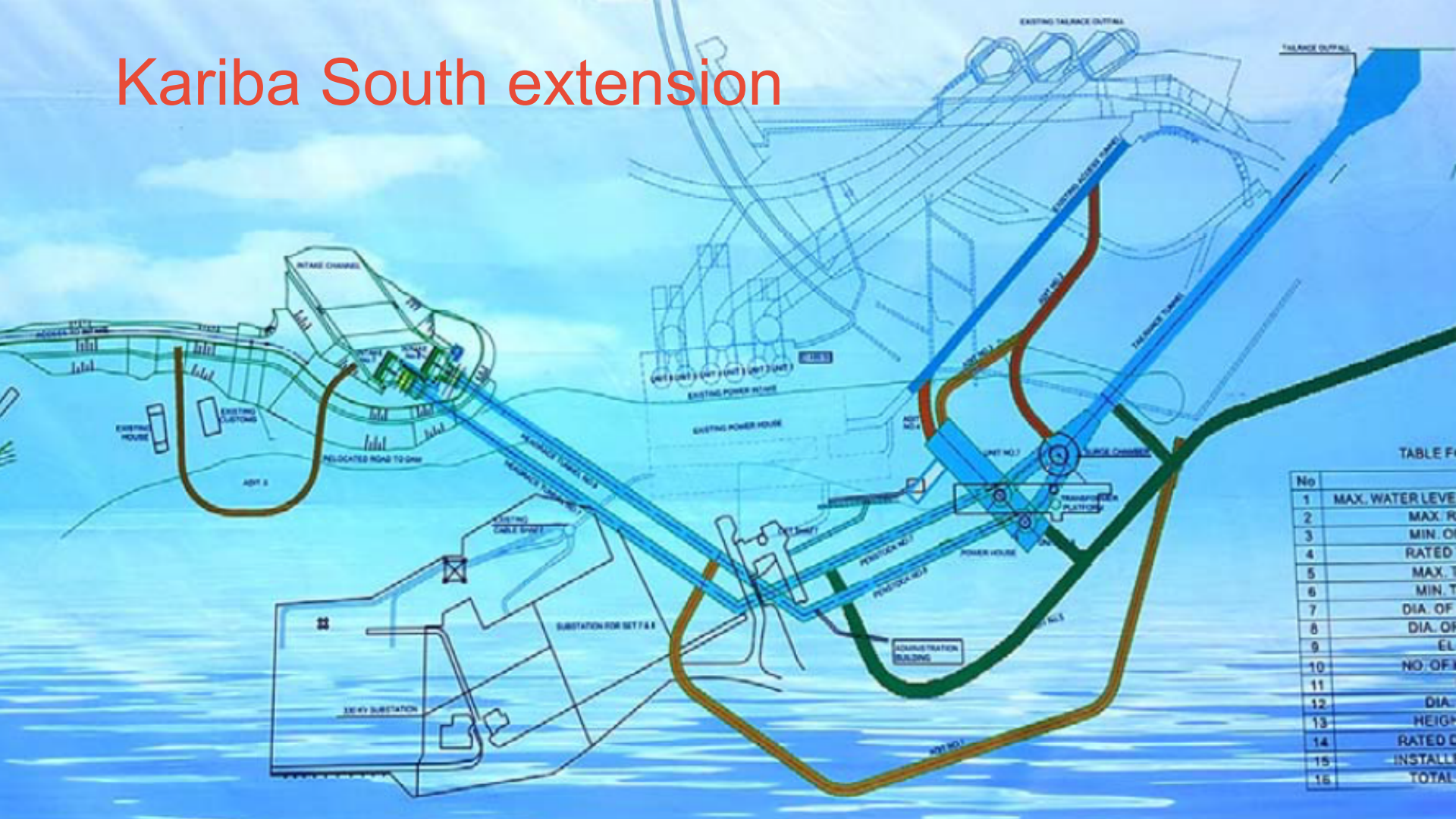
- A 666 MW underground hydro power plant was commissioned in 1962 on the South bank (Zimbabwe) – later increased to 750 MW
- Another 666 MW underground hydro power plant was completed in 1977 on the North bank (Zambia)



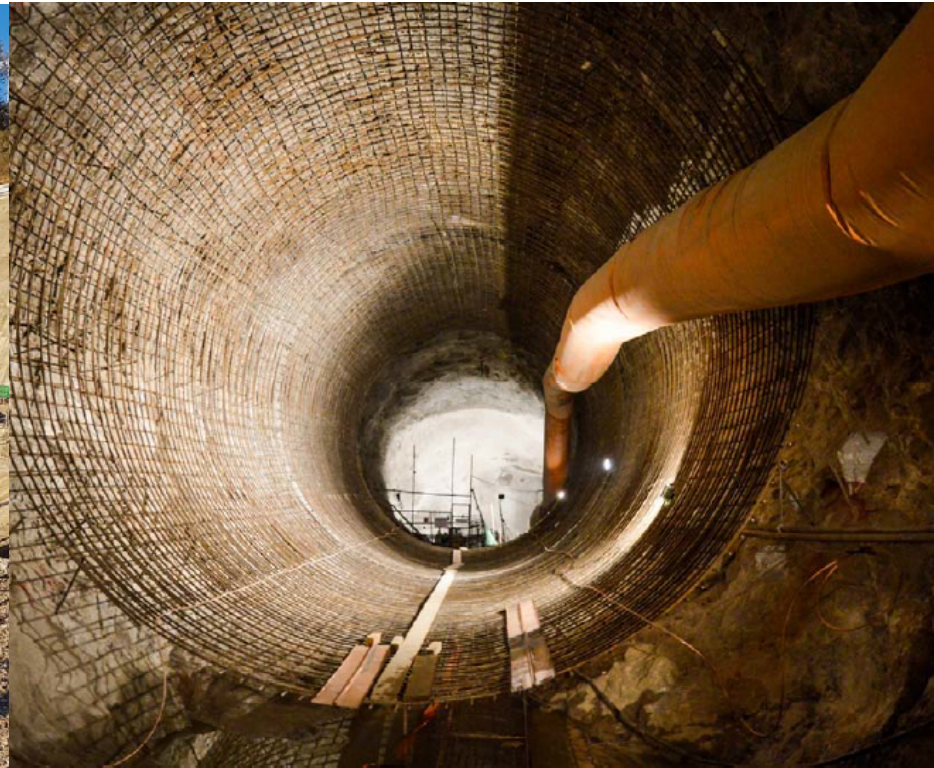
Kariba South extension

- In 2010, ZPC initiates an expansion project to add 300 MW to the Kariba South generating station
- Hatch is selected as the Owner's Engineer
- Local subconsultant: ZAIDG
- Contractor: SinoHydro Corp
- Financing: Zimbabwe signed a 20-year US $320 million sovereign loan with Exim Bank of China in November 2013

Kariba South extension



Kariba South extension



Underground cavern

Spiral case

Francis turbine

Surge chamber

Project Phases

- Phase 1: Evaluation
  - Update of previous studies
  - EOIs for five EPC+F consortia
- Phase 2: Engineering
  - Preparation of Employers Requirement documents
  - Concept design, performance specs and tender documents
  - Selection of preferred bidder with ZPC
  - Review of Contractor's schedules, QA, Inspection and Testing procedures, doc control, H&SE plan, Environmental Management plan
- Phase 3: Construction and Commissioning
- Phase 4: Warranty Period
  - Monitoring of plant for the 2-year warranty period

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Why is this Project Special

- Remote location – northern Zimbabwe – transport of equipment and logistic challenges
- Largest project implemented in Zimbabwe for decades
- Project conceived and executed during political turmoil when Zimbabwe economy was essentially bankrupt
- Working with Chinese contractor used to different standards, environmental, safety and social norms and with communication challenges due to language

Project Challenges

Numerous iterations with Basic Design Reviews

- Difficulty to align EPC contractor with Employers Requirements
- Hatch's technical teams (Canada, South Africa and China) had to provide studies, examples and background information to the EPC to ensure ZPC's project expectations were understood and captured in the design and construction

Project Challenges

Delays to start construction due to concerns over the drill and blast excavation of tunnels and powerhouse cavern close to existing dam and GS

- TBM approach investigated but not cost-efficient
- Hatch's tunneling engineers proved that his risk could be mitigated through a cautious blasting plan
- Contractor's blasting plans had to be submitted 1 week in advance for approval
- No negative impacts on existing facilities

Project Challenges

Ensuring that the specifications of the equipment manufactured in China complied with Employer's requirements

- Many iterations
- Involvement from Hatch's China specialists who speak the language and understand the Chinese work procedures
- FAT in China factories before major equipment was shipped to avoid equipment being rejected at site and cause delays

Project Challenges

Quality control of work performed at site, meeting Employers Requirements

- Construction monitored by a team of international experts in various fields to ensure that he required quality was achieved
- Constant focus at site

Conclusion

- Under difficult economic context, ZPC chose a DB+F model for this project that is essential for meeting the country's energy demand
- Preferred bidder is Chinese – provided best cost
- ZPC opted to appoint international experts to ensure western standards would be implemented for quality control,and to ensure environmental, training and local labour conditions
- Constant attention from dedicated staff allowed this project to be delivered in TIME, within BUDGET and to international acceptable QUALITY

Hatch now working on the Hwangue thermal plant expansion (2x300MW)

Thank you.

For more information,
please visit www.hatch.com

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