Transmission Planning in Sri Lanka

and

Prospects for Clean Energy Transition and Cross Border Energy Trade

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CEYLON ELECTRICITY BOARD

Line Up

1. Brief overview about the Transmission Planning Framework – Legal, Regulatory, Policy.
2. The Long Term Transmission Development Plan of Sri Lanka and Proposed India – Sri Lanka Interconnection
3. Role of the Long Term Transmission Plan in making the Clean Energy Transition
4. Challenges in Transmission Planning

TRANSMISSION PLANNING FRAMEWORK

TRANSMISSION PLANNING
LEGAL FRAMEWORK

PARLIAMENT OF THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

SRI LANKA ELECTRICITY ACT, No. 20 OF 2009

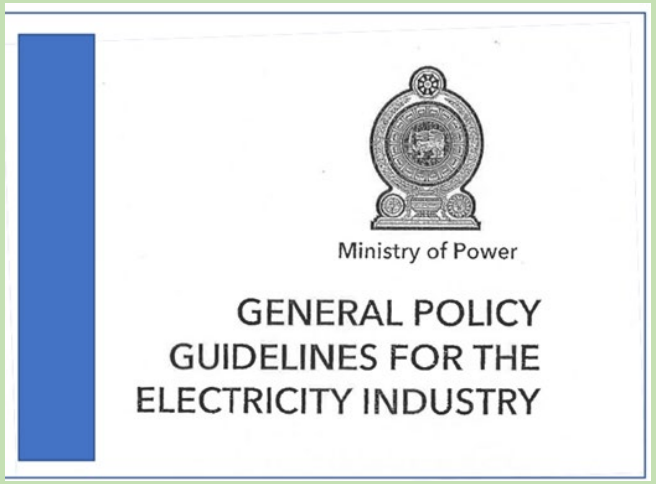
[Certified on 8th April, 2009]

24. (1) A transmission licensee shall-

(*a*) develop and maintain an efficient, coordinated, reliable and economical transmission system;

(*b*) requiring the licensee to forecast future demand, to plan the development of the licensee's transmission system and to procure the development of new generation plant to meet reasonable forecast demand;

TRANSMISSION PLANNING
REGULATORY/ POLICY FRAMEWORK



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GRID CODE

of Sri Lanka

2 GRID PLANNING CODE

2.1 INTRODUCTION

The Grid Planning Code (**GPC)** specifies the planning criteria and procedures to be applied by the Transmission Licensee in

(a) planning of investments on the Transmission System (Grid) and
(b) planning of investments on generation expansion.

Users of the Transmission System shall take into account the **GPC** when planning and developing their own systems, and shall take note of certain information to be supplied by them.

The Transmission System needs to be planned with sufficient lead time to allow any necessary statutory planning consent, the associated possibility of the need for a public consultation and the degree of complexity in undertaking the new work while maintaining satisfactory security and quality of supply in the existing Transmission System.

This **GPC** therefore imposes time scales for the exchange of information between the Transmission Licensee and Users, subject to all parties having regard, where appropriate, to the confidentiality of such information.

Section 1 –TRANSMISSION PLANNING

2.5 TRANSMISSION SYSTEM

The Transmission System is the system which is owned and operated by the Transmission Licensee, and which consists (wholly or mainly) of High Voltage electricity transmission lines and power plants, and which is used for transmitting electricity from a Generating Plant to a Substation, from one Generation Plant to another, or from one Substation to another, including all High Voltage transmission lines which are used to transmit electricity to the premises of Transmission Customers (but shall not include any such lines which form part of any Distribution System).

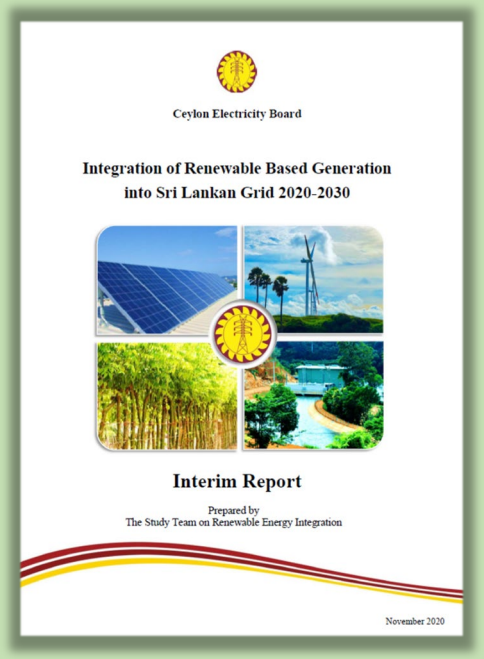
2.6 LONG TERM TRANSMISSION DEVELOPMENT PLAN (LTTDP)

Long Term Transmission Development Plan (LTTDP) is a document that will,

(a) address the capability of the Transmission System to meet the present Demand on the Transmission System and future loads to be connected to the Transmission System,
(b) address the Transmission System limitations in meeting such Demands in accordance with the specified Transmission System planning criteria,
(c) address short term and long term infrastructure needs, identified using the best possible engineering analysis while meeting transmission planning criteria,
(d) accommodate proposed power generating plants in the Long Term Generation Expansion Plan, and to fulfil Policy Guidelines of GOSL, and
(e) identify appropriate capital expenditure requirements for the implementation of the proposals in (c) and (d).

GENERATION PLANNING - TRANSMISSION PLANNING CYCLE

Long Term Generation Expansion Plan



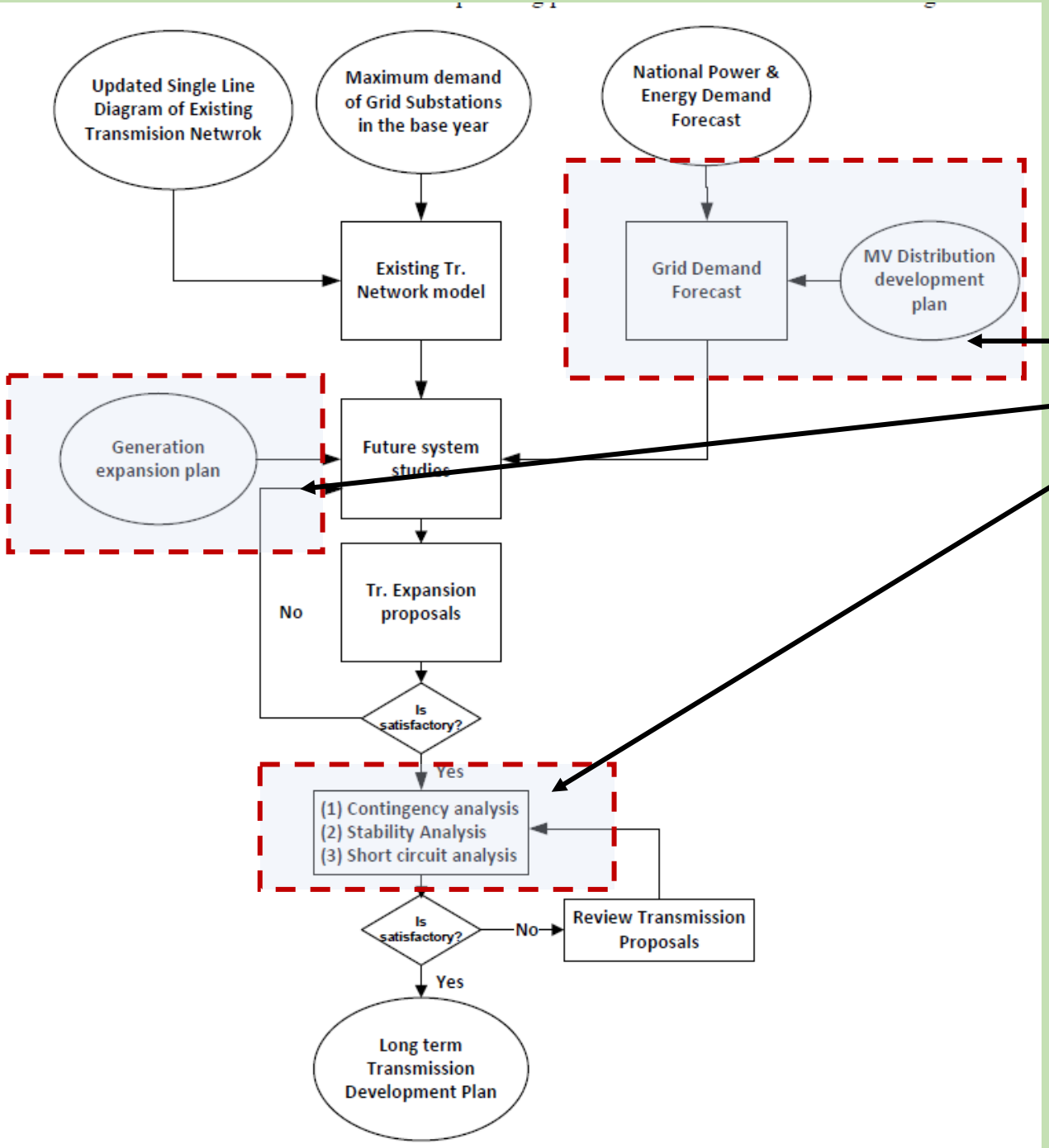
Renewable Energy Integration Study

Long Term Transmission Development Plan

Prepare once in two years for a 20 year period

Prepared for a **10 year** period

THE
LONG TERM TRANSMISSION DEVELOPMENT PLAN
&
INDIA SRI LANKA INTERCONNECTION

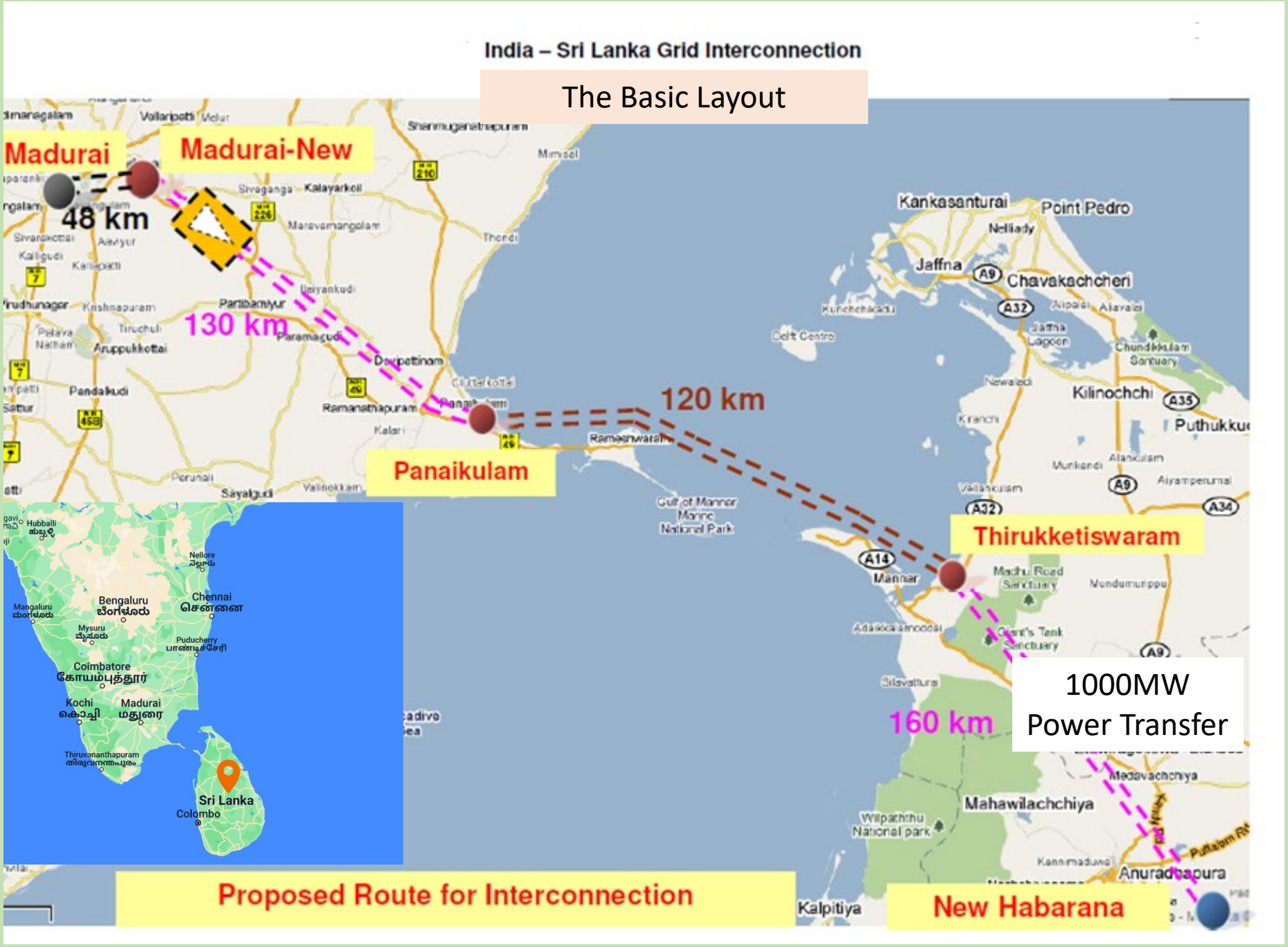


Transmission Network Expansions planned to,

(1) Meet Demand Growth
(2) Interconnect Generation, including renewable
(3) Improve Reliability

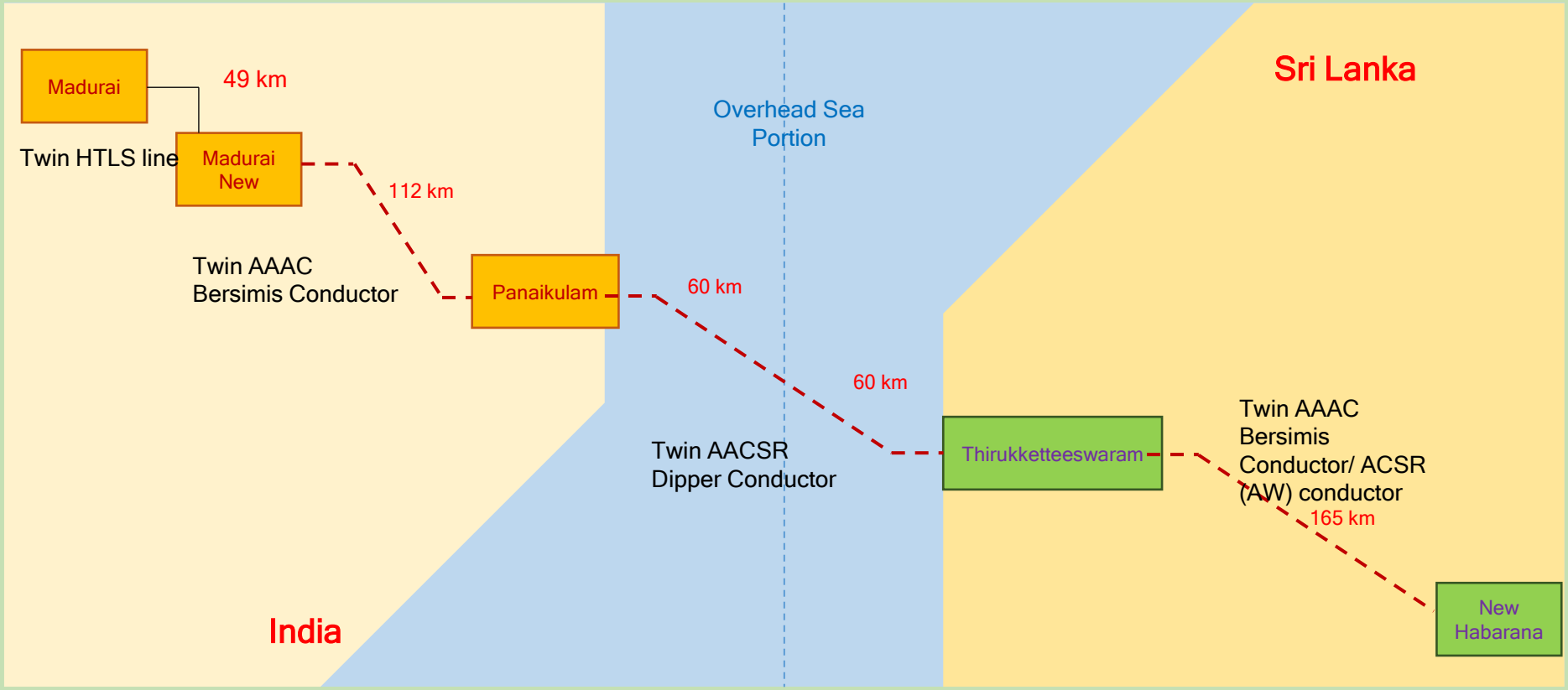
Transmission Network Expansions planned to Meet,

1) Voltage Criteria
2) Thermal Criteria
3) Security Criteria
4) Stability Criteria
5) Short Circuit Criteria


India – Sri Lanka Grid Interconnection
The Basic Layout
Madurai
Madurai-New
48 km
130 km
120 km
160 km
Panaikulam
Thirukketiswaram
1000MW
Power Transfer
Proposed Route for Interconnection
New Habarana
Sri Lanka
Colombo
Chennai
Bengaluru
Coimbatore
Kochi
Madurai
Puducherry
Nellore
Mangaluru
Mysuru
Hubballi
Thiruvananthapuram
Kankasanturai
Point Pedro
Jaffna
Chavakachcheri
Kilinochchi
Mannar
Mahawilachchiya
Anuradhapura
Kalpitiya
Ramanathapuram
Paramagudi
Pandalkudi
Aruppukkottai
Sayalgudi
Gulf of Mannar Marine National Park
Wilpattu National park

Madurai (India) - New Habarana (SL) ±320 kV VSC HVDC Bi-pole Line

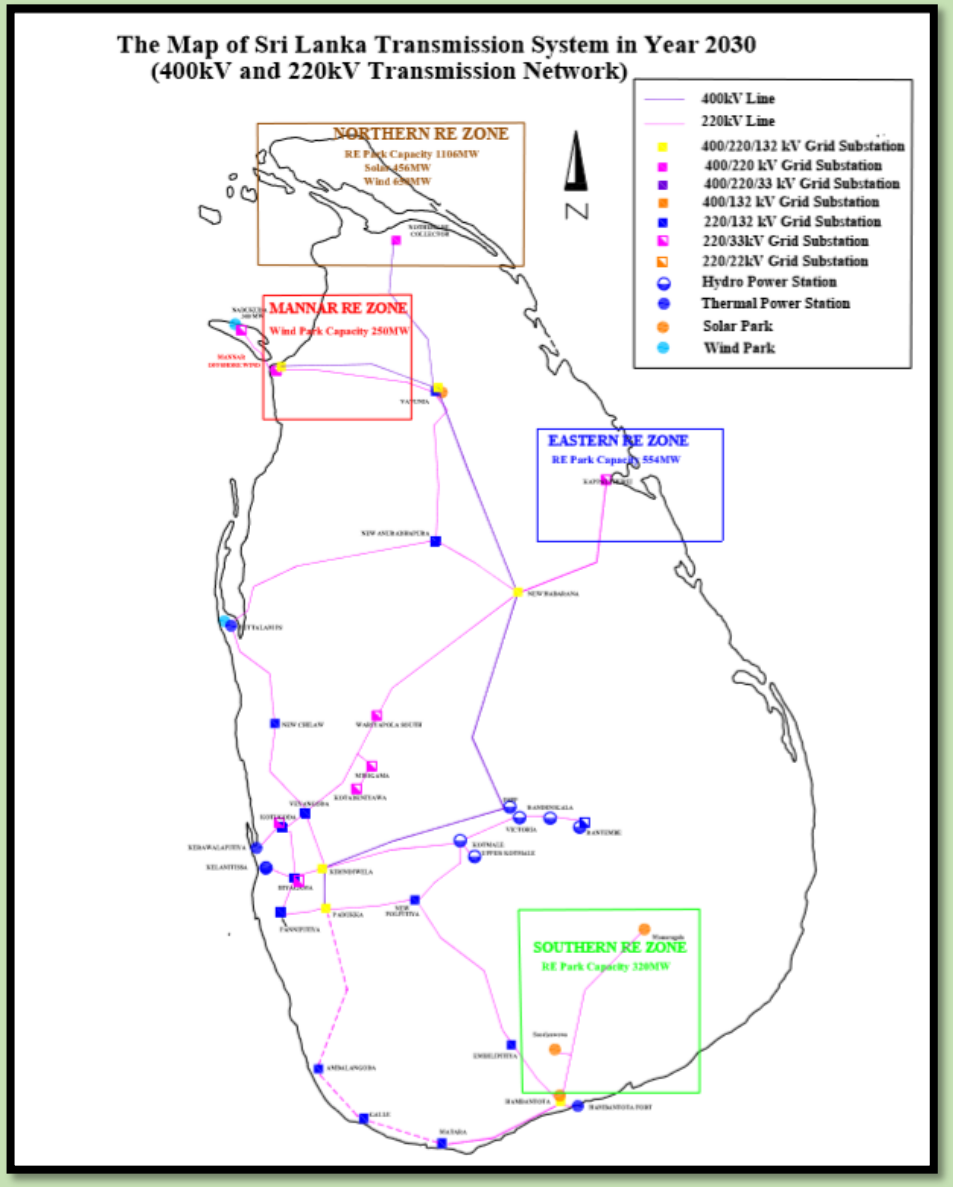
Scope of work



	Main Import Scenarios		BASE CASE	Sensitivities					
	Import from India	Capacity Breakdown (MW)	Base Demand, Hydro Base BESS, HVDC, Import Cost	Reduced BESS Cost Scenario	Increase HVDC Cost Scenario	Import Cost Increase	Low Demand	BESS Cost Reduction & HVDC Cost Increase Import Cost Increase Scenario	BESS Cost Reduction & HVDC Cost Increase Import Cost Increase, Low Demand
			Annual SL Demand (GWh) 27300 BESS CAPEX (USD/kWh) 350 HVDC CAPEX USD Million 449 Import Prices Base	Annual SL Demand (GWh) 27300 BESS CAPEX (USD/kWh) 220 HVDC CAPEX USD Million 449 Import Prices Base	Annual SL Demand (GWh) 27300 BESS CAPEX (USD/kWh) 350 HVDC CAPEX USD Million 494 Import Prices Base	Annual SL Demand (GWh) 27300 BESS CAPEX (USD/kWh) 350 HVDC CAPEX USD Million 449 Import Prices 10% High	Annual SL Demand (GWh) 25800 BESS CAPEX (USD/kWh) 350 HVDC CAPEX USD Million 449 Import Prices Base	Annual SL Demand (GWh) 27300 BESS CAPEX (USD/kWh) 220 HVDC CAPEX USD Million 494 Import Prices 10% High	Annual SL Demand (GWh) 25800 BESS CAPEX (USD/kWh) 220 HVDC CAPEX USD Million 494 Import Prices 10% High
1	RTC (51% RE)	- 500							
2	DAM RTC (51% RE)	200 300							
3	DAM RTC (51% RE) Assured Peak	200 200 100							
4	DAM Assured Peak	200 300							
5	DAM Assured Peak	400 100							
6	DAM	500							
7	RTC (51% RE) Assured Peak	300 200							
8	RTC (51% RE) Assured Peak	100 400							

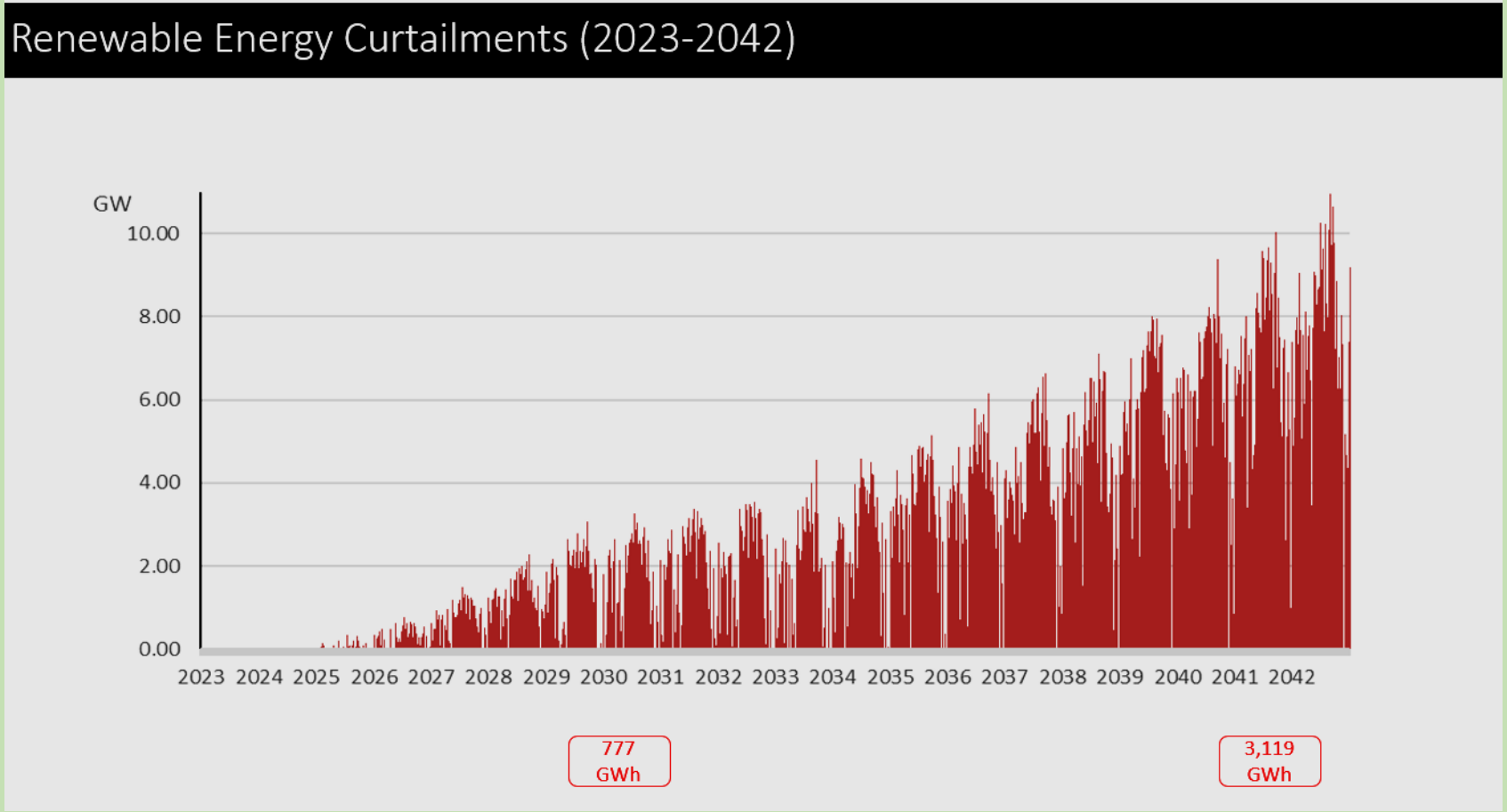
CHALLENGES IN TRANSMISSION PLANNING

(1) Resource Uncertainty to Plan Transmission Infrastructure



(2) **Demand Forecast Uncertainty Due to Embedded Generation and Self Consumption**

Curtailment



THANK YOU