



Field Experiences of Installation ACCC Conductors: *a growing part of capacity expansion and reliability at PLN*

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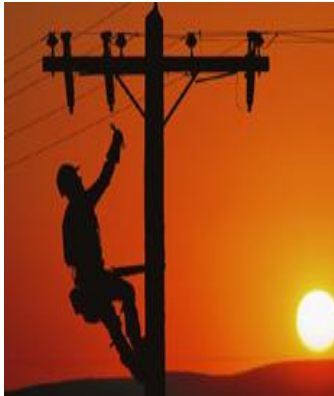
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Asia Clean Energy Forum
Grid Efficiency with HTLS Conductors
June 16, 2015 – Manila, Philippines



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PLN

P3B SUMATERA – PEKANBARU, INDONESIA

TRANSMISSION DIVISION

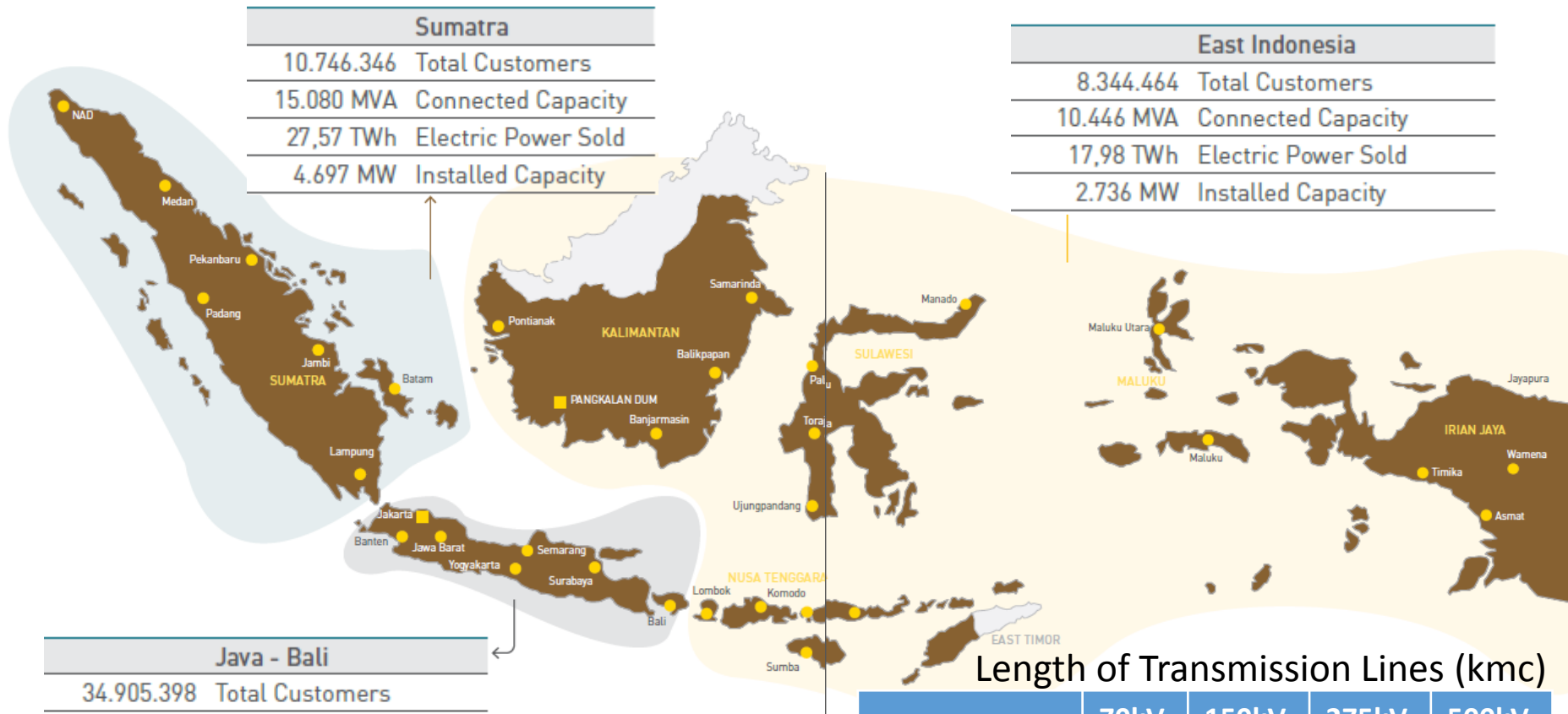
P3B SUMATERA

**(P3B : TRANSMISSION & LOAD DISPATCH
CENTRE)**



**Presentation Topic:
“Field Experience Of
Installation ACCC
Conductor”**

PLN Customers



Sumatra	
10.746.346	Total Customers
15.080 MVA	Connected Capacity
27,57 TWh	Electric Power Sold
4.697 MW	Installed Capacity

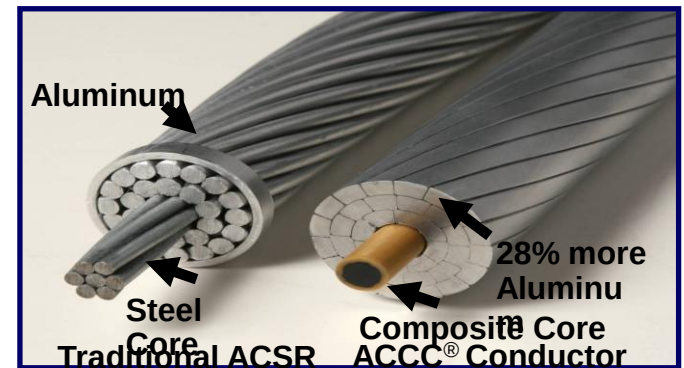
East Indonesia	
8.344.464	Total Customers
10.446 MVA	Connected Capacity
17,98 TWh	Electric Power Sold
2.736 MW	Installed Capacity

Java - Bali	
34.905.398	Total Customers
67.569 MVA	Connected Capacity
141,99 TWh	Electric Power Sold
26.772 MW	Installed Capacity

Length of Transmission Lines (kmc)				
	70kV	150kV	275kV	500kV
Java-Bali	3.136	13.401	-	5.053
Sumatera	318	9.069	1.374	-
East Indonesia	658	6.381	-	-
TOTAL	4.112	28.851	1.374	5.053

HCLS (High Capacity Low Sag)

ACCC (Aluminum Conductor Composite Core)



After 30 projects and almost 6,000 kilometers of installations, PLN is now have more experiences on composite core conductor installation and performance.

No	Project Name	Total CCTs	Line Length	Ex	Upgraded New Conductor	Status
1	Bukit Asam - Lahat (Sumatera)	2	44.7	ACSR Hawk	ACCC 310 Lisbon	Energized on October 2010
2	New Tangerang – Cengkareng	2	6.2	2 x ACSR Zebra	2 x ACCC 520 Dublin	Energized on April 2011
3	Angke – Ancol	2	4.7	ACSR Drake	ACCC 510 Warsaw	Energized June 2011
4	Kota Bumi - Bukit Kemuning (Sumatera)	2	34.3	ACSR Hawk	ACCC 310 Lisbon	Energized June 2011
5	Bandung Selatan - Cigereleng	2	13.26	2 x ACSR Dove	2 x ACCC 310 Lisbon	Energized on October 2011
6	Cibinong - Sentul - Bogor Baru	2	23	ACSR Dove	ACCC 360 Amsterdam	Energized Feb 2012
7	Mranggen Incomer	2	4.3	2 x ACSR Hawk	2 x ACCC 360 Amsterdam	Energized 2012
8	Pedan - Klaten	2	12.7	1 x ACSR Hawk	ACCC 310 Lisbon	Energized on April 2012
9	Langsa – Pangkalan Brandan (Sumatera)	1	78	ACSR Hawk	ACCC 310 Lisbon	1cct energized Sept 2012
10	Langsa – Pangkalan Brandan (Sumatera)	1	78	ACSR Hawk	ACCC 310 Lisbon	2cct energized Sept 2012
11	Pagelaran – Tegineneng (Sumatera)	2	38.5	1 x ACSR Hawk	ACCC 310 Lisbon	Energized on Sept 2012
12	Mandai-Pangkep (Makassar)	1	39.5	ACSR 150/50	ACCC 150 Helsinki	Energized on Sept 2012
13	Kediri-Kediri Baru	2	0.7	2 x ACSR Zebra	2 x ACCC 520 Dublin	Energized Oct 2012
14	Gilimanuk – Celukan Bawang (Bali)	2	43	2 x ACSR Hawk	2 x ACCC 310 Lisbon	Energized Jan 2013
15	Kapal - Padang Sambian - Pesanggaran (Bali)	2	17.28	ACSR Hawk	ACCC 310 Lisbon	Energized Jan 2013
16	Probolinggo - Lumajang	2	50.5	ACSR	ACCC 415 Brussels	Energized on Mei 2013
17	Natar-Sutami	2	26.4	ACSR HAWK	ACCC 310 Lisbon	Energized on May 2013
18	Mandai – Pangkep	1	39.5	ACSR 150/50	ACCC 150 Helsinki	Energized June 2013
19	Cibinong – ITP	2	8.5	ACSR Hawk	ACCC 310 Lisbon	1cct energized on Oct 2013
20	PLTGU Duri – Garuda Sakti	2	80.3	ACSR HAWK	ACCC 360 Amsterdam	Energized on Dec 2013
21	Surabaya Barat – Babatan	2	15.6	ACSR Hawk	ACCC 310 Lisbon	Energized on January 2014
22	PLTGU Duri – Duri	2	42	ACSR Hawk	ACCC 310 Lisbon	Energized on April 2014
23	Baturaja - Bukit Kemuning	2	98.5	ACSR Hawk	ACCC 310 Lisbon	Energized on July 2014
24	GI Sei Harapan - GI Baloi - GI Batu Besar (Batam)	2	16.72	1x ACSR Hawk	ACCC 310 Lisbon	Energized October 2014
25	Borang - Seduduk Putih	2	13	ACSR 120/25	ACCC 150 Helsinki	1 cct energized Oct 2014
26	Cilegon Baru – Serang	2	22.7	ACSR Zebra	ACCC 550 Hamburg	Under Construction
27	Dumai – Duri	2	55.8	ACSR Hawk	ACCC 310 Lisbon	Under Construction
28	Baturaja – Bukit Asam	2	72.74	ACSR Hawk	ACCC 310 Lisbon	Under Construction
29	Binjai - Paya geli	2	13.7	2x ACSR Hawk	2 x ACCC 310 Lisbon	Under Construction
30	Padalarang - Cibabat	2	9.2	2x ACSR Hawk	2 x ACCC 310 Lisbon	Under Construction

Why do we need HCLS Conductor?

1. Increasing Energy Transferred

Section	Old Conductor			New Conductor		
	Type	Nominal Current (A)	Max Loaded (A)	Type	Nominal Current (A)	Max Loaded (A)
150 kV Bukit Asam - Baturaja	ACSR - 240	645	570	ACCC - Lisbon	1250	750
150 kV Bukit Kemuning - Baturaja	ACSR - 240	645	475	ACCC - Lisbon	1250	775
150 kV Kotabumi - Bukit Kemuning	ACSR - 240	645	580	ACCC - Lisbon	1250	965

The 150 kV Kotabumi – Bukit Kemuning transmission, for each Line could transfer 52 MW bigger than before.

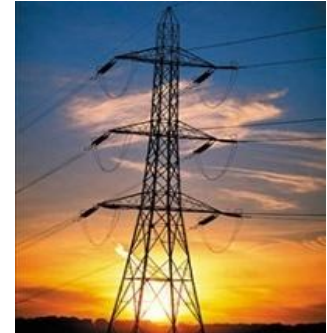
965 A = 130.3 MW

580 A = 78.3 MW

Why do we need HCLS Conductor?

2. Changing Conductor with using Existing Towers

No	Section	Towers	Line Length	Old Conductor	New Conductor
1	Bukit Asam - Lahat	138	89.4	ACSR - Hawk	ACCC - Lisbon
2	Kota Bumi - Bukit Kemuning	101	68.6	ACSR - Hawk	ACCC - Lisbon
3	Langsa - Pangkalan Brandan	236	156	ACSR - Hawk	ACCC - Lisbon
4	Pagelaran - Tegineneng	118	77	ACSR - Hawk	ACCC - Lisbon
5	Natar - Sutami	82	52.8	ACSR - Hawk	ACCC - Lisbon
6	Balai Pungut - Garuda Sakti	247	160.6	ACSR - Hawk	ACCC - Amsterdam
7	Balai Pungut - Duri	126	84	ACSR - Hawk	ACCC - Lisbon
8	Baturaja - Bukit Kemuning	192	197	ACSR - Hawk	ACCC - Lisbon
9	Borang - Seduduk Putih	50	26	ACSR 120/25	ACCC - Helsinki
10	Dumai - Duri	165	111.6	ACSR - Hawk	ACCC - Lisbon
11	Baturaja - Bukit Asam	226	145.48	ACSR - Hawk	ACCC - Lisbon
12	Binjai - Payageli	38	27.4	ACSR - Hawk	ACCC - Lisbon
Total Tower and Line Length		1,719	1,195.88		

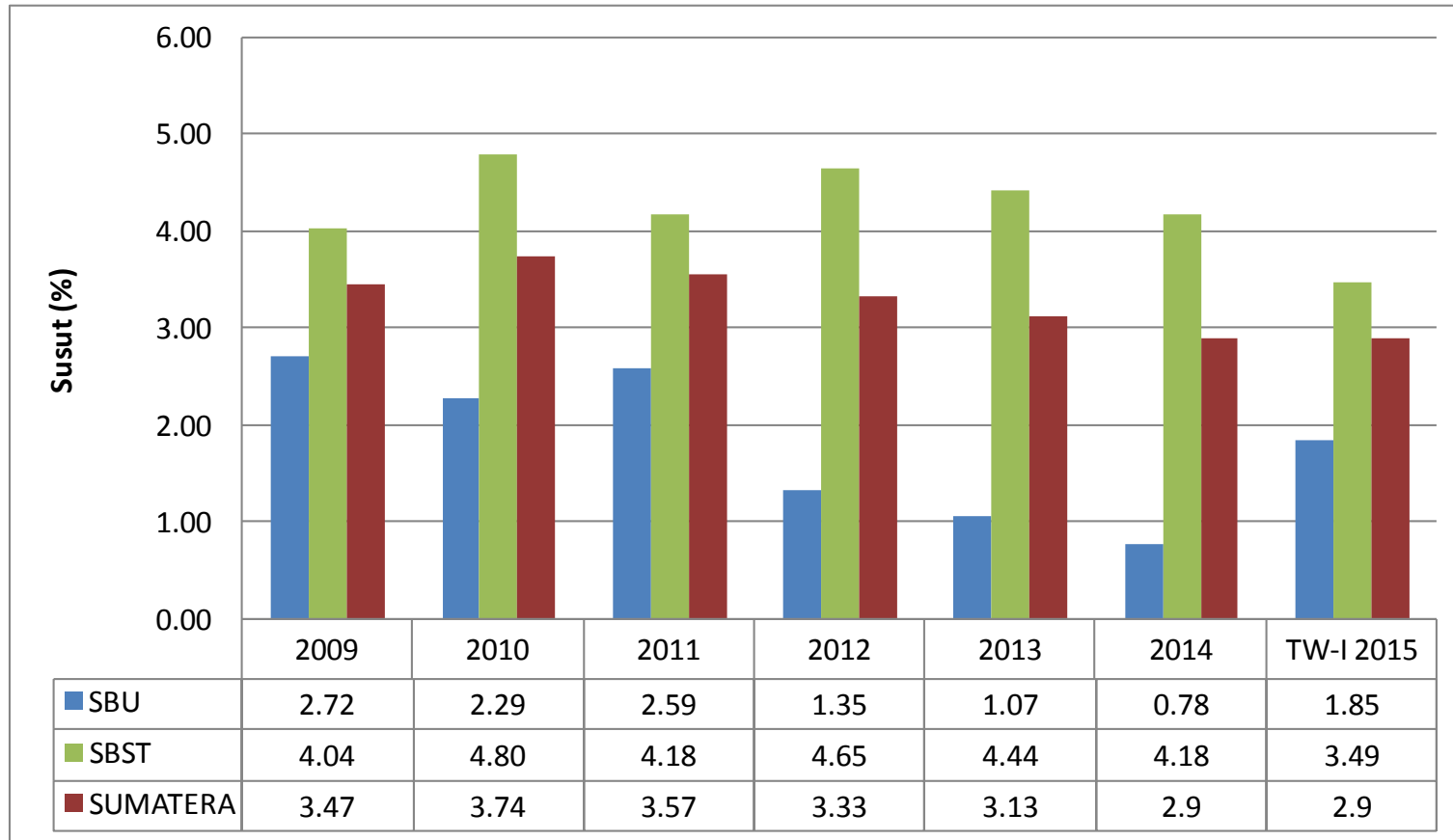


1 tower = 10,000 USD
(material + service of
construction cost, but
without the area of
tower's foundation fee)

**1,719 towers =
17,190,000 USD**

Why do we need HCLS Conductor?

3. Minimizing the Transmission Loses



SBU = NORTH SUMATERA AREA

SBST = CENTRE AND SOUTH SUMATERA AREA

SUMATERA = AVERAGE OF SBU AND SBST

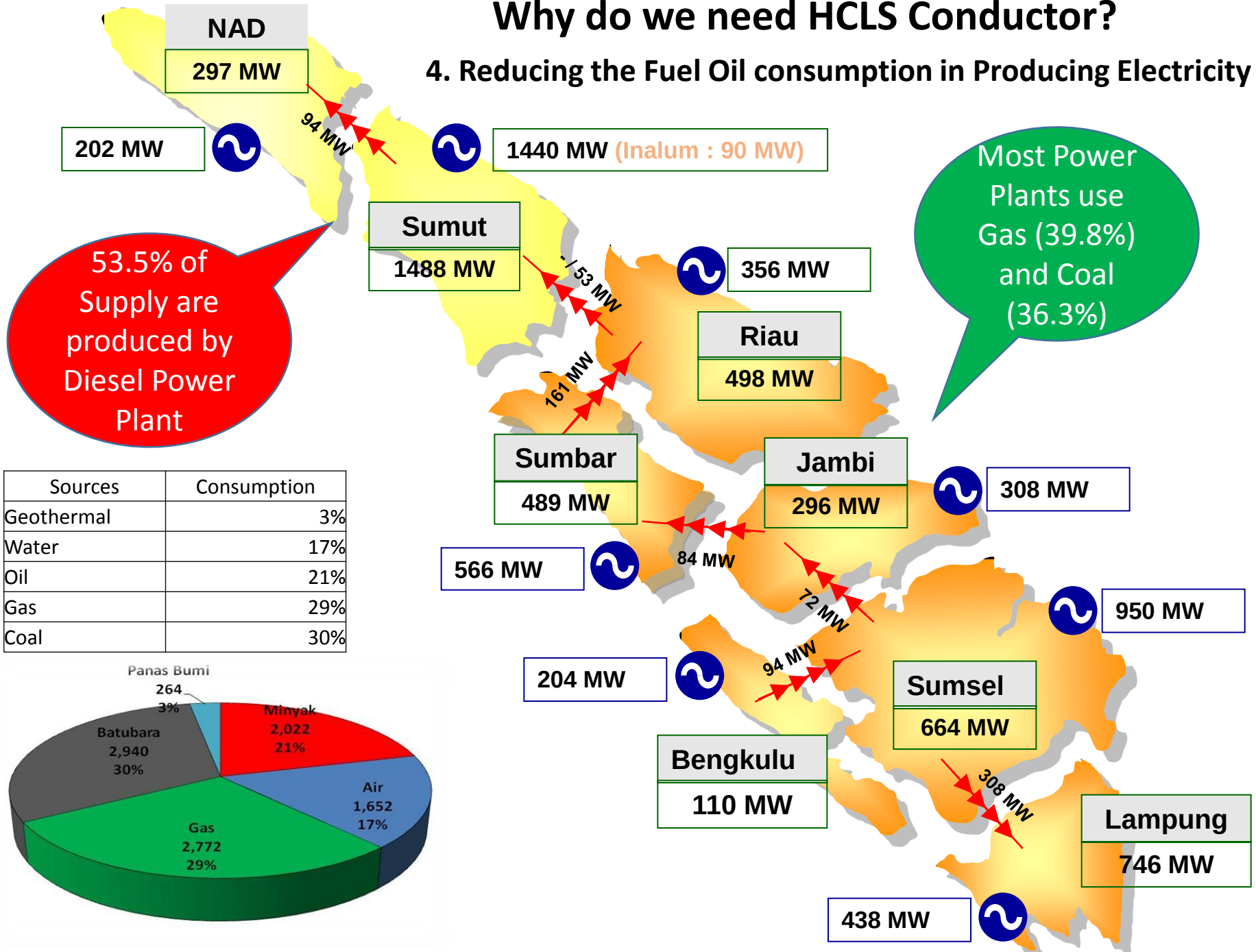
Magnetic and Electric Field related to ACSR and ACCC
(ex. 150 kV Duri – Dumai Transmission Line)

Span (Tower)	2013 (ACSR)		2015 (ACCC)	
	Magnetic Field (kV/m)	Electric Field (μ T)	Magnetic Field (kV/m)	Electric Field (μ T)
1 - 2	1.990	1.216	1.990	2.490
3 - 4	1.997	0.802	1.990	2.490
4 - 5	0.976	1.164	0.380	2.490
9 - 10	1.990	0.789	1.990	0.700
24 - 25	1.990	1.403	1.610	2.490
29 - 30	1.987	0.980	2.250	1.470

EMF (Electric Magnetic Field) is not different between ACSR and ACCC conductor.

Why do we need HCLS Conductor?

4. Reducing the Fuel Oil consumption in Producing Electricity



HCLS Conductor Plan in P3B Sumatera

2015 (Procurement process)

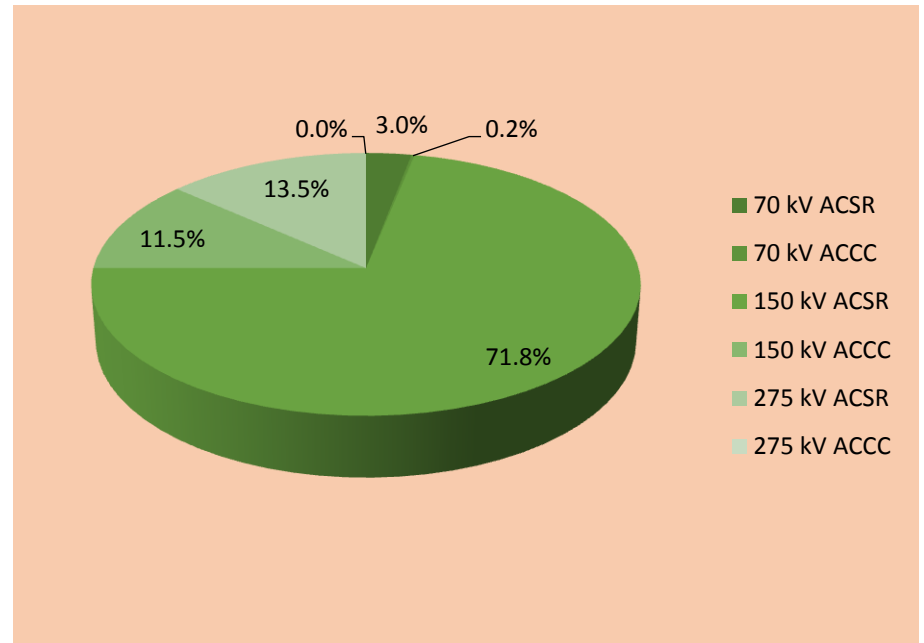
No	Section	No of Cct	Existing Conductor	Line Length (km)
1	150 kV Lhokseumawe - Idie - Panton Labuh - Langsa	2	ACSR 1x240	257
2	150 kV Lhokseumawe - Bireun	2	ACSR 1x240	31
3	150 kV Garuda Sakti - Teluk Lembu	2	ACSR 1x240	39.96
4	150 kV Pangkalan Branda - Binjai	2	ACSR 1x240	101.62
5	150 kV Kualatanjung - Kisaran	2	ACSR 1x240	114
	Total Length			543.58

2016 (Evaluating process)

No	Section	No of Cct	Existing Conductor	Line Length (km)
1	150 kV Tebing Tinggi - Kuala Tanjung	2	ACSR 1x240	71.4
2	150 kV Tebing Tinggi - Perbauangan	2	ACSR 1x240	98.2
3	150 kV Sei Rotan - Perbaungan	2	ACSR 1x240	83
4	150 kV Sei Rotan - Tebing Tinggi	2	ACSR 1x240	107
5	150 kV Sibolga - Martabe	2	ACSR 1x240	70.2
6	150 kV Padang Sidempuan - Martabe	2	ACSR 1x240	77.2
7	150 kV Belawan - Payapasar	2	ACSR 2x400	12.4
8	150 kV Natar - Teluk Betung	2	ACSR 2x240	33.8
	Total Length			553.2

The Existing Type of Transmission Conductor in Sumatera

No	Transmission Voltage	Type of Conductor	Percentage of Length
1	70 kV	ACSR	3.0%
2	70 kV	ACCC	0.2%
3	150 kV	ACSR	71.8%
4	150 kV	ACCC	11.5%
5	275 kV	ACSR	13.5%
6	275 kV	ACCC	0.0%



The Future Expansion of PLN Transmission Capacity

- The Government plans for 35,000 MW of additional generation capacity in 5 years duration.
- PLN plans to add a new transmission and concern about the timing
- Reconductoring can potentially provide 50% of the evacuation capacity increase required by the five year plan

For a mature grid, reconductoring with HCLS conductors is the only way to meet the rapid growth of transmission capacity.



Thank you...

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