

Sarawak Rural Electrification

Towards Full Electrification Coverage by 2025

Kyoto University – University of Malaya (KU-UM) Rural Electrification Workshop
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About Sarawak Energy



Our vision:

To achieve sustainable growth and prosperity for Sarawak by meeting the region's need for reliable & renewable energy

Our values:



Courage



Unity



Respect

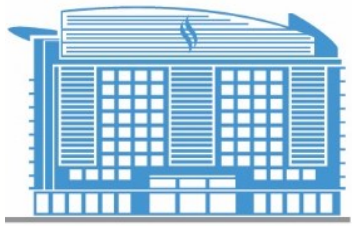


Integrity



Accountability

About Sarawak Energy



Started in 1921 as a unit in Public Works Department and is now a fully **integrated energy development company** and power utility **wholly owned by Sarawak Government**



Serving close to 3 million people across largest state in Malaysia. **680,000 accounts** covering domestic, commercial, industrial and export customers

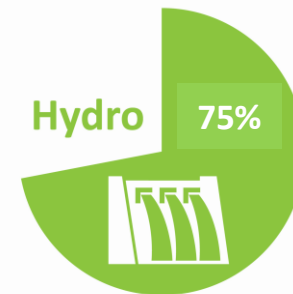


Lowest tariffs in Malaysia and amongst the lowest in ASEAN



Workforce

5,000 strong multidisciplinary team and largest employer of professional Sarawak talent



Largest generator of **renewable energy** in Malaysia

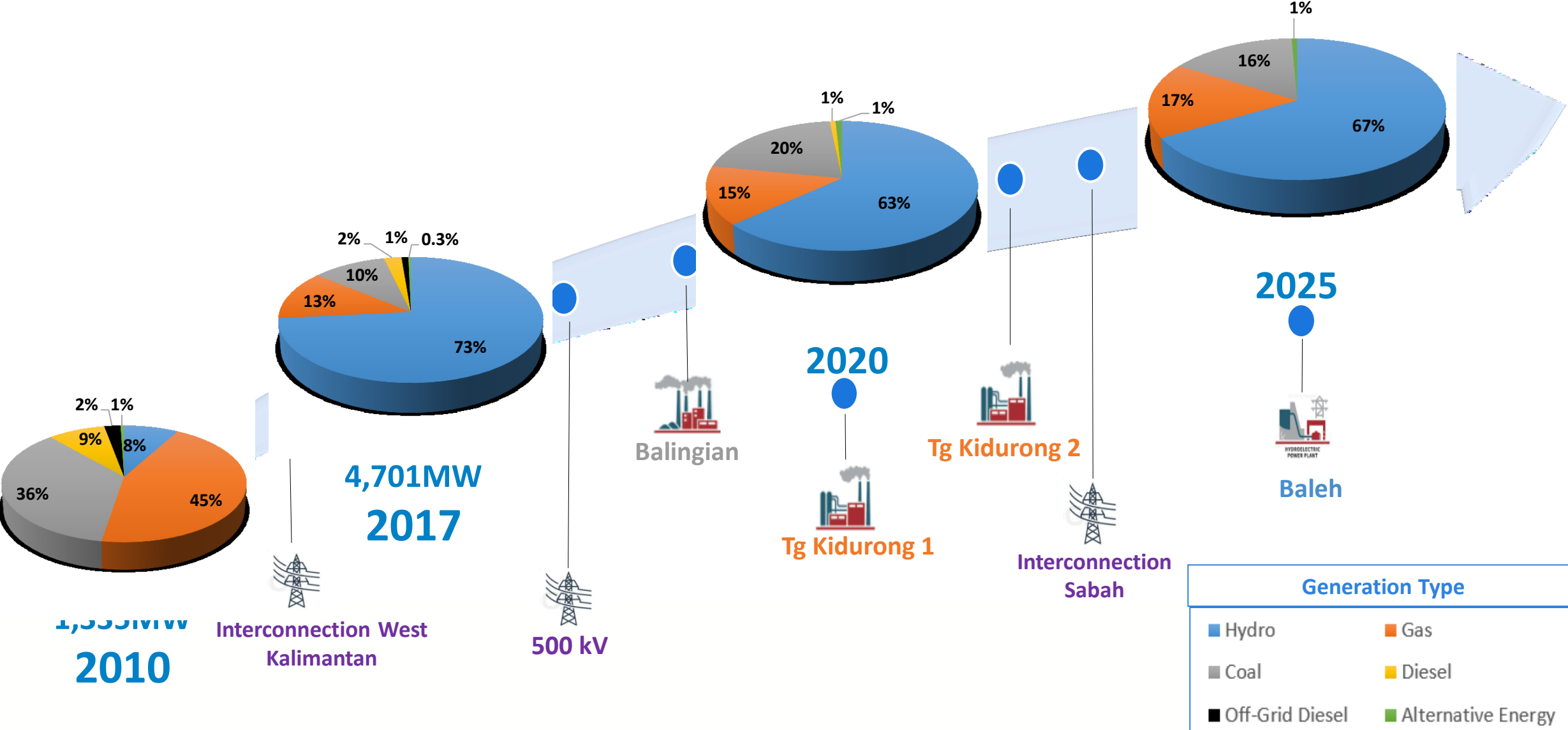
74% drop in carbon emission intensity for electricity production



Electrified **110,000** rural households since 2009

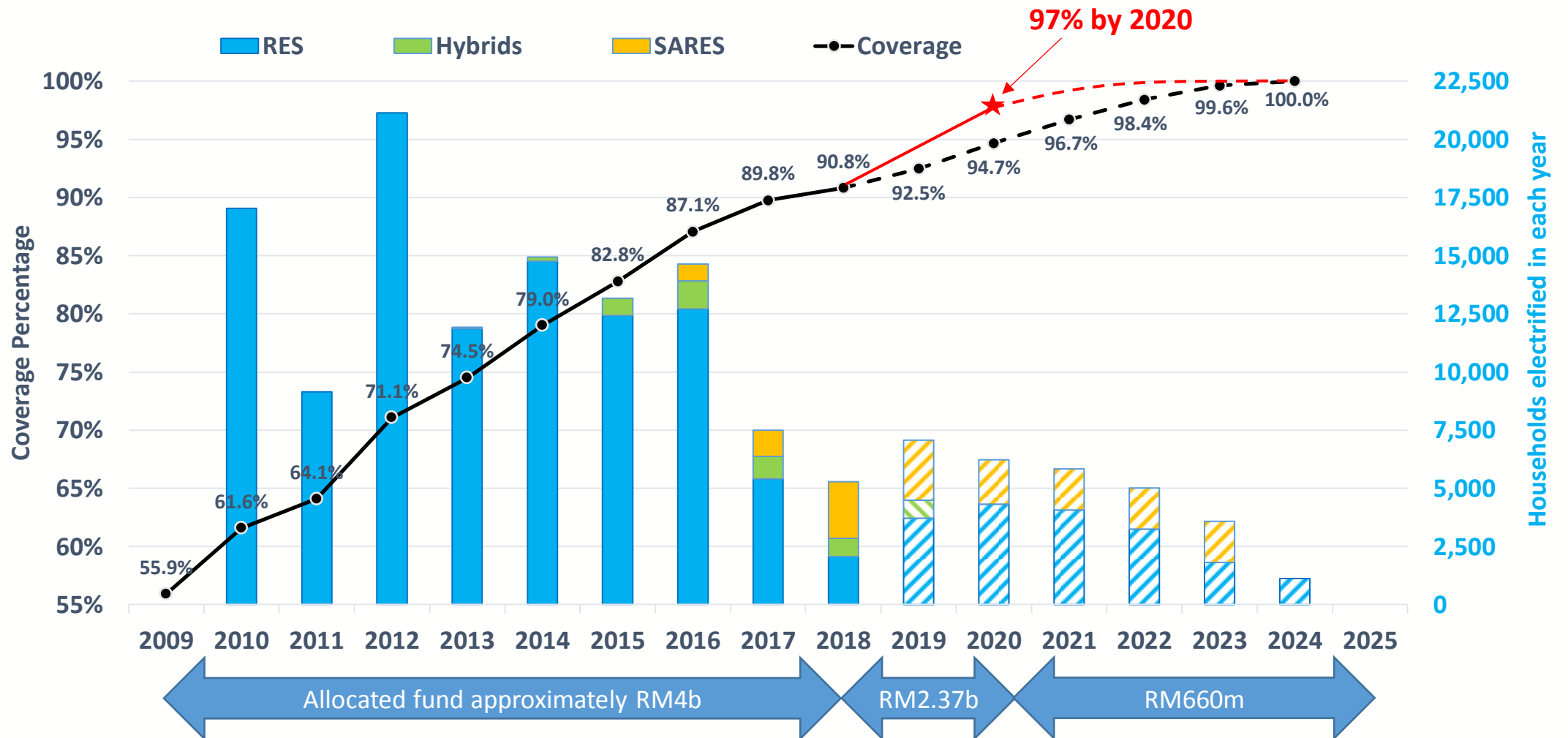
Balanced Generation Mix

Predominantly hydro and thermal for energy security



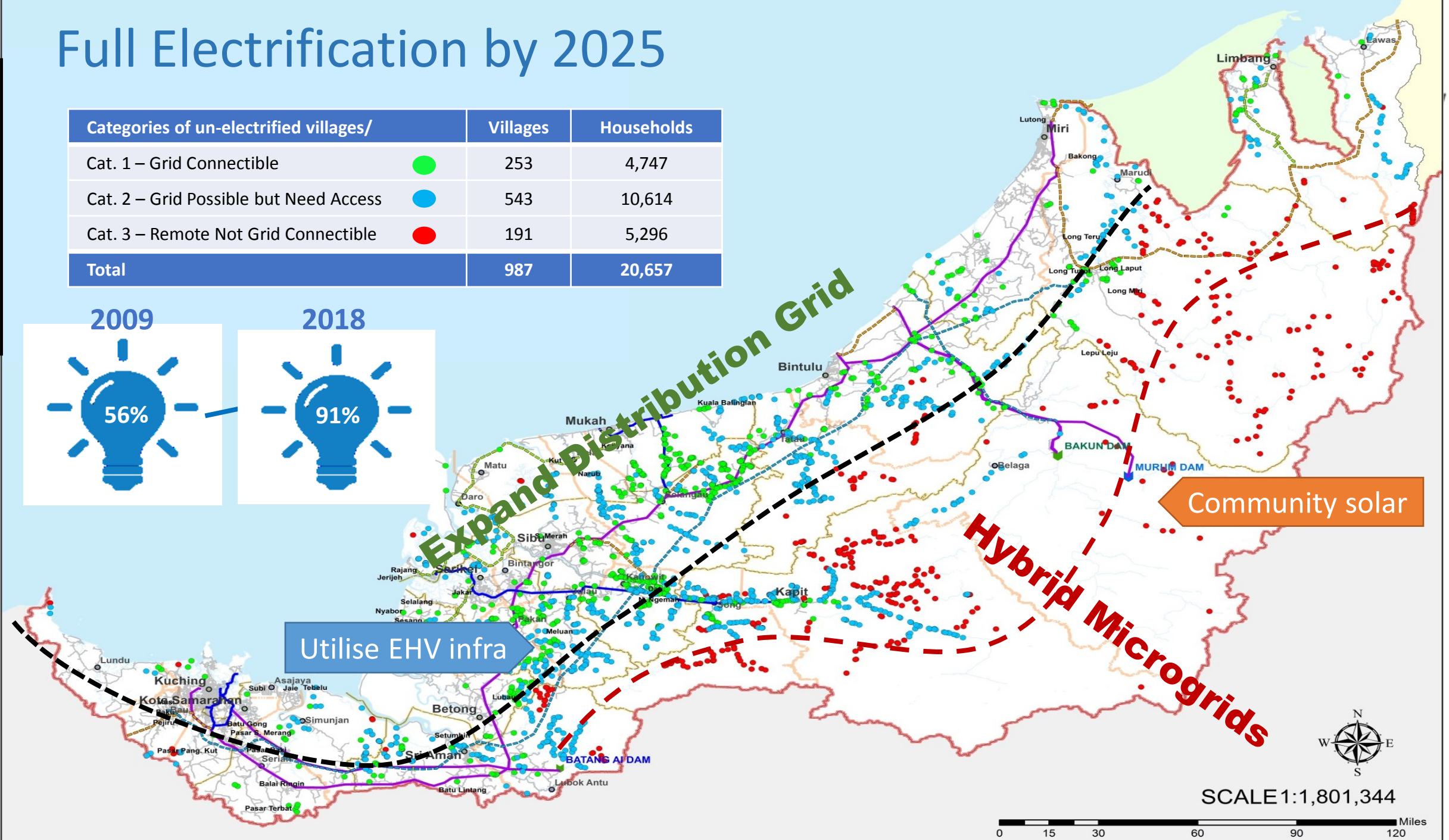
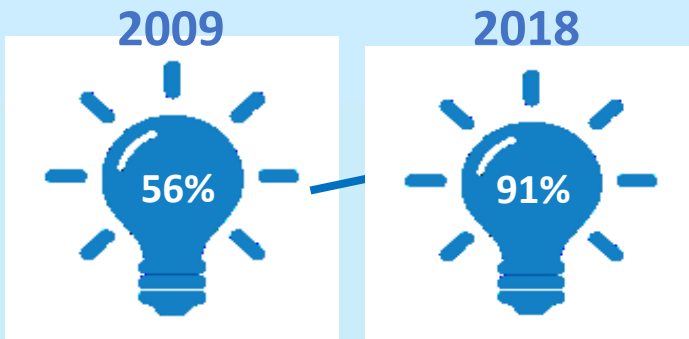
Rural Electrification Coverage

- Starting with NKRA in 2009, rural electrification in Sarawak received intense focus and the coverage has grown significantly to 90.8% by end of 2018



Full Electrification by 2025

Categories of un-electrified villages/		Villages	Households
Cat. 1 – Grid Connectible	●	253	4,747
Cat. 2 – Grid Possible but Need Access	●	543	10,614
Cat. 3 – Remote Not Grid Connectible	●	191	5,296
Total		987	20,657



Utilise EHV infra

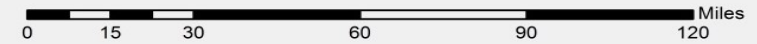
Community solar

Hybrid Microgrids

Expand Distribution Grid



SCALE 1:1,801,344



Accelerating Rural Electrification Projects



- To electrify 20,000 more households by 2020
 - Rural coverage increases to 97% (statewide 99%)

Grid

Expansion of grid infrastructure to rural areas

- For villages near to grid and/or more accessible by roads

- EHV and MV Substations: 2 EHV and 9 MV substations at strategic locations as reliable sources of energy at rural areas
- MV Covered Conductor Lines: 33kV lines connecting main grid to new MV substations at rural locations
- RES Last-Miles: HT/LT lines that link up the rural villages to existing grid or new MV substations

Off-grid

Stand-alone systems for rural and remotest villages

- For those unreachable (not practical or economical) by grid infrastructure

ALAF

Additional or Late Applicants

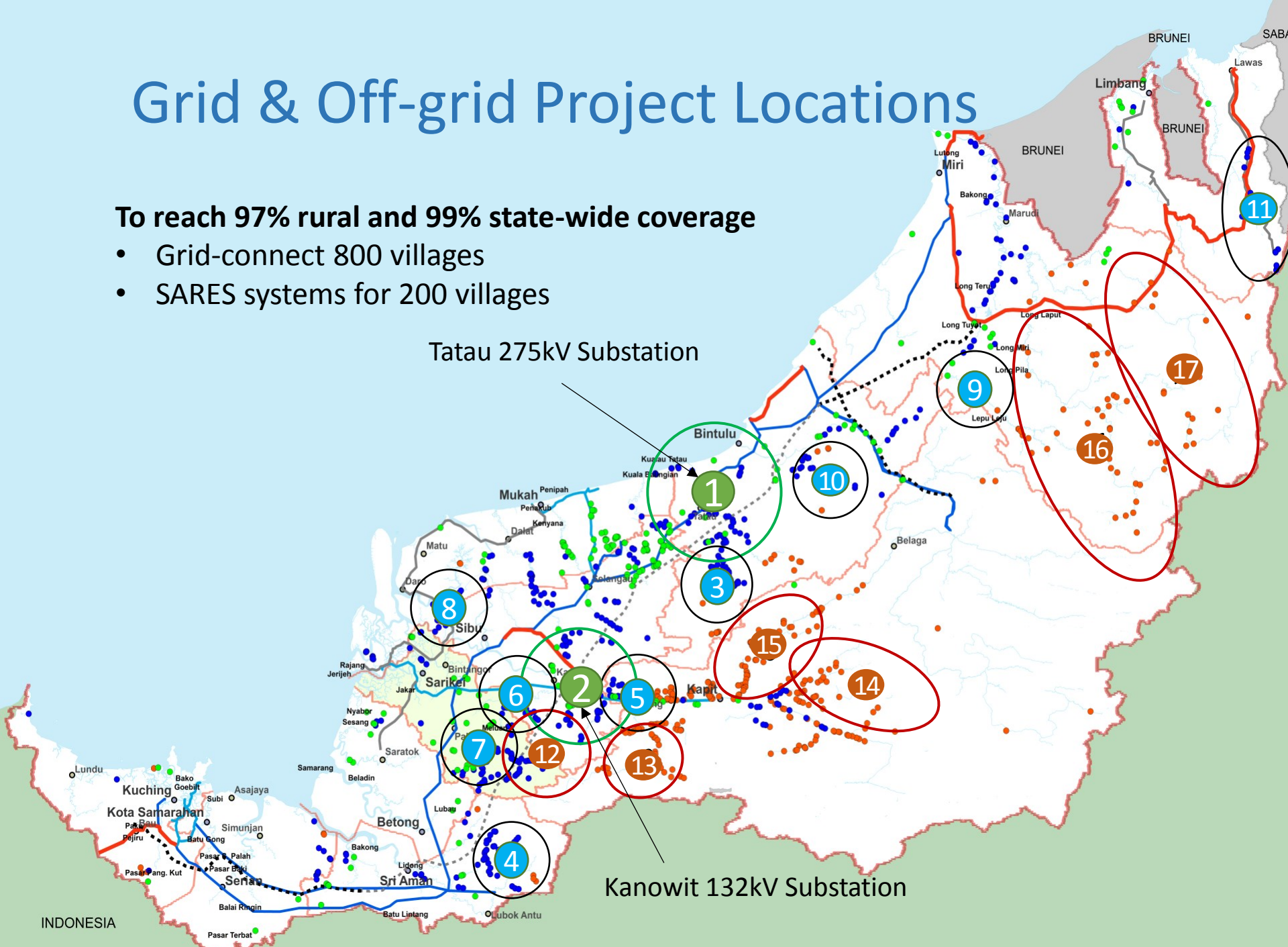
- Distribution and service lines to new houses in the already-electrified villages

- Total funding amount of RM 2.37 billion + RM 80 million

Grid & Off-grid Project Locations

To reach 97% rural and 99% state-wide coverage

- Grid-connect 800 villages
- SARES systems for 200 villages



RPSS & RES

A. Rural EHV Substations

1. Tatau 275kV
2. Kanowit 132kV

B. Rural MV Substations

3. Sangan
4. Batang Ai
5. Ngungun
6. Julau
7. Pakan
8. Dalat
9. Tinjar
10. Sebauh
11. Bakelalan

SARES

D. Off-Grid

12. Ulu Julau
13. Katibas/Bangkit/Tekalit
14. Bukit Mabong
15. Ng. Merit/Punan Bah
16. Telang Usan
17. Mulu/Bario

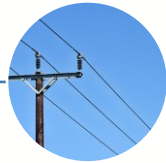
Grid Infrastructure Implementation



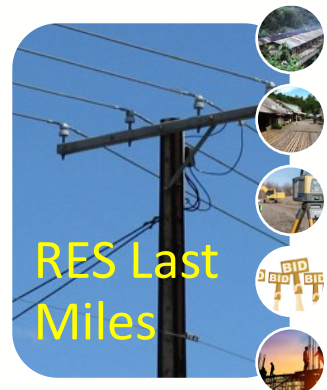
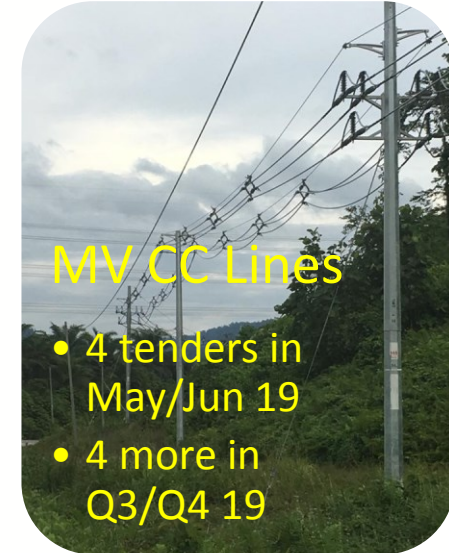
2 EHV substations have been awarded in Apr/May 19



2 MV substations have been awarded in May/19



3 MV sub. tenders in Jun/19;
2 more each in Jul & Sep/19



Villages:



Households:



Survey & design:



Tender award:



Implementation:

	Phase 1	Phase 2	Phase 3
Villages:	20	332	286
Households:	4,423	6,690	4,918
Survey & design:	Q1/2019	Q2/2019	Q3/2019
Tender award:	Q2/2019	Q3/2019	Q4/2019
Implementation:	Q3/2019 - Q2/2020	Q4/2019 - Q3/2020	Q1/2020 - Q4/2020

Other Initiatives

RURAL ROAD LIGHTING (*Lampu Jalan Kampung-LJK*)

- Sarawak Energy is the government appointed implementing agency to install road lightings along rural roads

INTERNAL HOUSE WIRING (IHW)

- Sarawak Energy provides 3-year zero interest payment plan for rural customers on IHW
- Subsidized meter fee from RM150 to RM80

CORPORATE SOCIAL RESPONSIBILITIES (CSR)

- Sarawak Energy offers various CSR programs in support of the rural communities and other government initiatives





TEMPORARY SUPPLY

- Fast solution of temporary relief for rural communities whilst waiting for permanent supply



OTHERS

- Electricity connections to rural schools, rural clinics and telco towers
- Electricity connections to individual rural houses via Additional and Late Application Fund

RURAL TRANSFORMATION PROGRAM (RTP)

- Small/medium one-off projects for betterment of rural towns



R&D Initiatives in Rural Electrification



MV Overhead Line Covered Conductor

- Introduced to replace the conventional bare overhead line
- Robust and transient fault-proof against bad weather, vegetation and animal contact
- Minimize easement for construction
- No Ferranti Effect



Service Substation Voltage Transformer (SSVT)

- EHV to LV stepdown to supply rural communities residing in proximity to EHV overhead lines
- Under conceptual study

Micro Grid Solar Hybrid Station

Standalone micro grid providing electricity to rural villages, schools, shops and offices

Most of the stations are designed to operate autonomously without on-site crew

Utilise satellite telecommunication to monitor equipment conditions and performance of subsystems from a remote location





SARES sarawak energy Community Based Solar Schemes



- Villages in remote locations where state grid currently not possible
- Simple design and ease of O&M
- Limited disposable household income
- No charge/bill for electricity used
- Technical Support provided

SARES Capacity



Average cost is RM55-65,000 per household



To provide a basic level of service for every household



- Power capacity 700 – 1000 W per household
- Daily energy up to 2000 Wh per household
- Able to cope for 3 continuous days of bad weather (no sun)
- System can be boosted or supplemented to support government functions

Every door is installed with an energy limiter to control usage



- To preserve the lifespan of the battery to reach or go beyond its design life of 5 years
- Battery State of Charge (SOC) must not drop below 30% and warning will be issued when it reaches 50%
- By-passing feature for extra power during community events



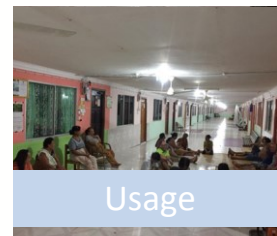
Solar panel



Inverter



Battery



Usage

SARES Solar Implementation



Completed Villages

- 192

Completed Households

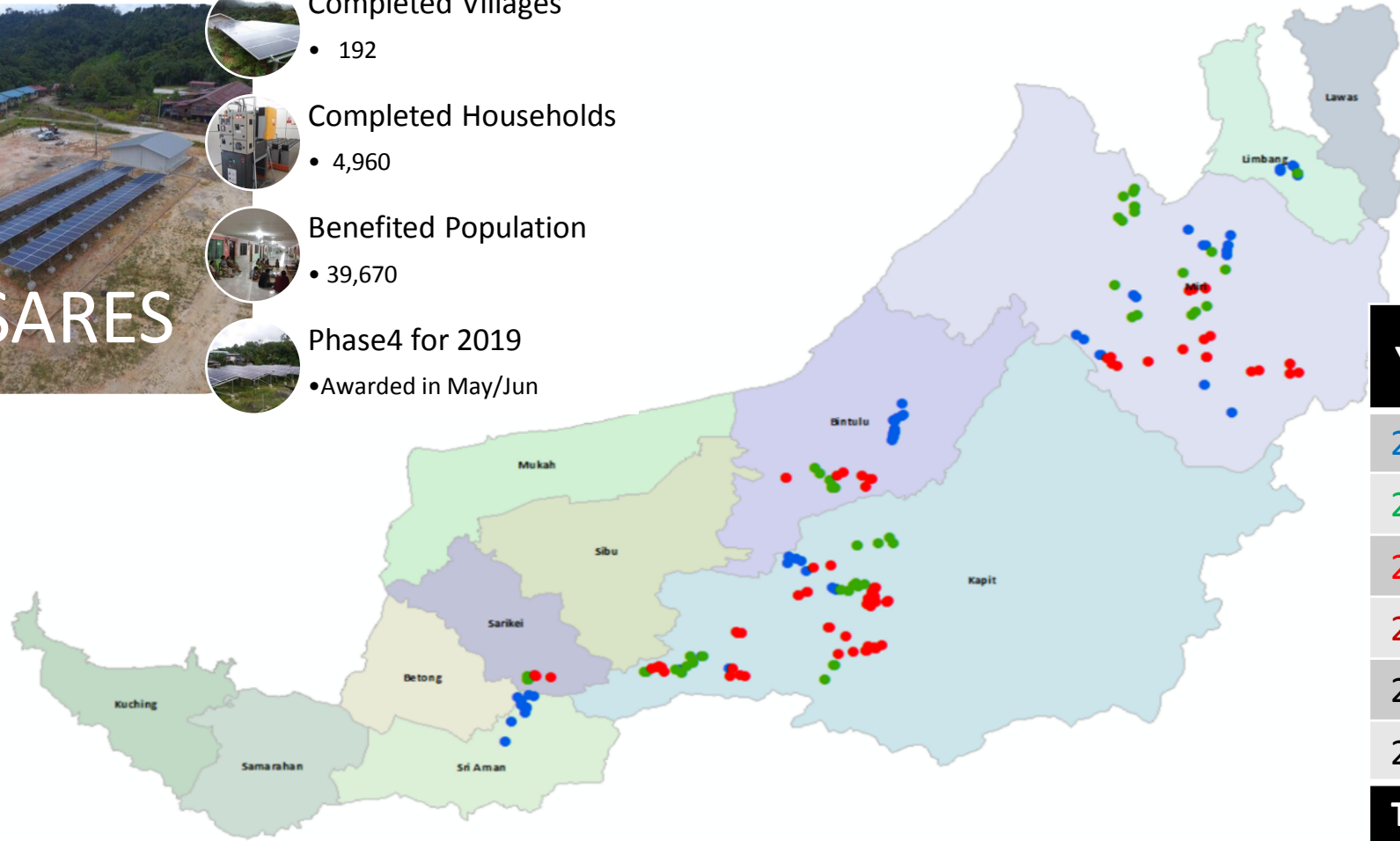
- 4,960

Benefited Population

- 39,670

Phase4 for 2019

- Awarded in May/Jun



- Initial RM 500 million funding for 323 villages
- Additional SARES funding of RM110 mil to accelerate Rural Electrification

Year	Villages	Households	Cost (RM mil)
2016	58	1,388	75
2017	59	1,604	95
2018	75	1,968	110
2019	88	3,108	167
2020	145	4,205	230
2021	160	3,188	195
Total	585	15,461	872

SARES – Implementation Process



Community engagement



Transportation of materials



Civil & structural construction



Electrical installations



Solar installations



Commissioning & training



Handing over to community



Transportation to Remote Locations



Sustainability of SARES Scheme

- Community ownerships with long-term support commitments from government and utility companies
- Training and organization of O&M commitments of local community



Lessons Learned & Success Factors



Key stakeholder (government-community-utility) partnerships

- Community took ownerships and commitments
- Government committed on fund allocation including repair & replacement
- Utility (and contractors) to guarantee supports in long term



Appropriateness of design focusing on practicality

- Sizing is based on basic amount but quality electricity supply
- Component design to suit limited transportation options
- Custom design to simplify O&M by unskilled local communities



Training and Competence

Contractor development and local competency

- Partnerships to develop local capacity in solar system engineering, design and installation
- Developing off-grid solar training and certification of competencies

Thank You

