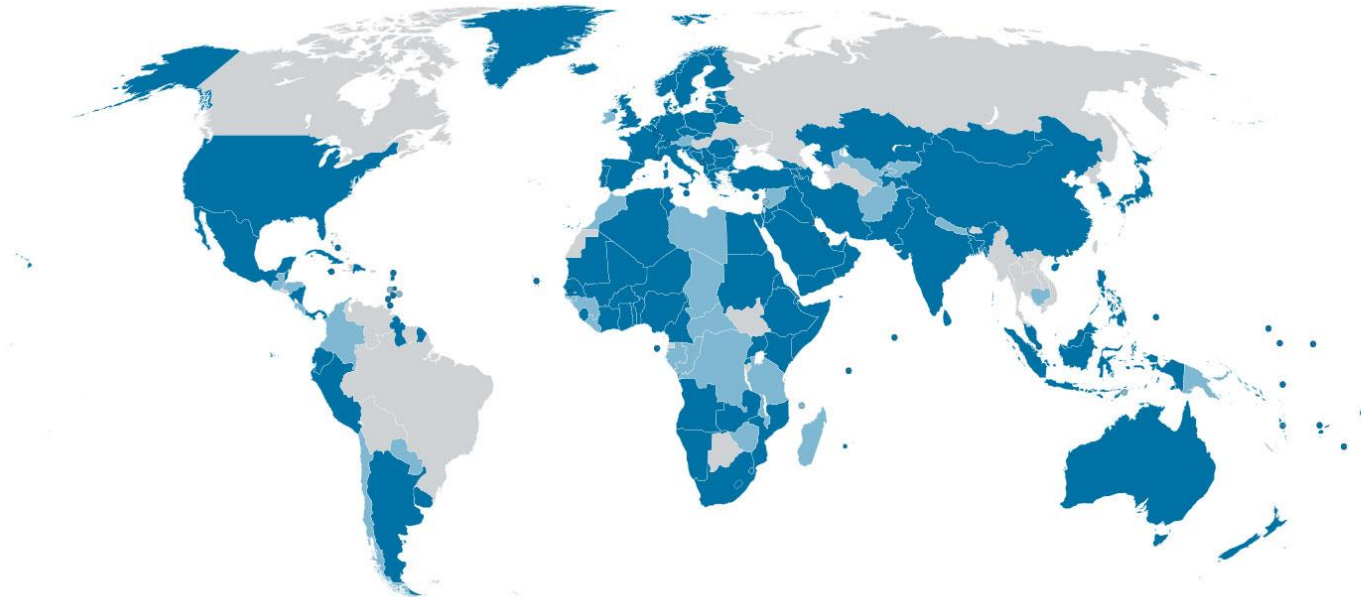


Solar plus Storage: A need or an opportunity?



2015

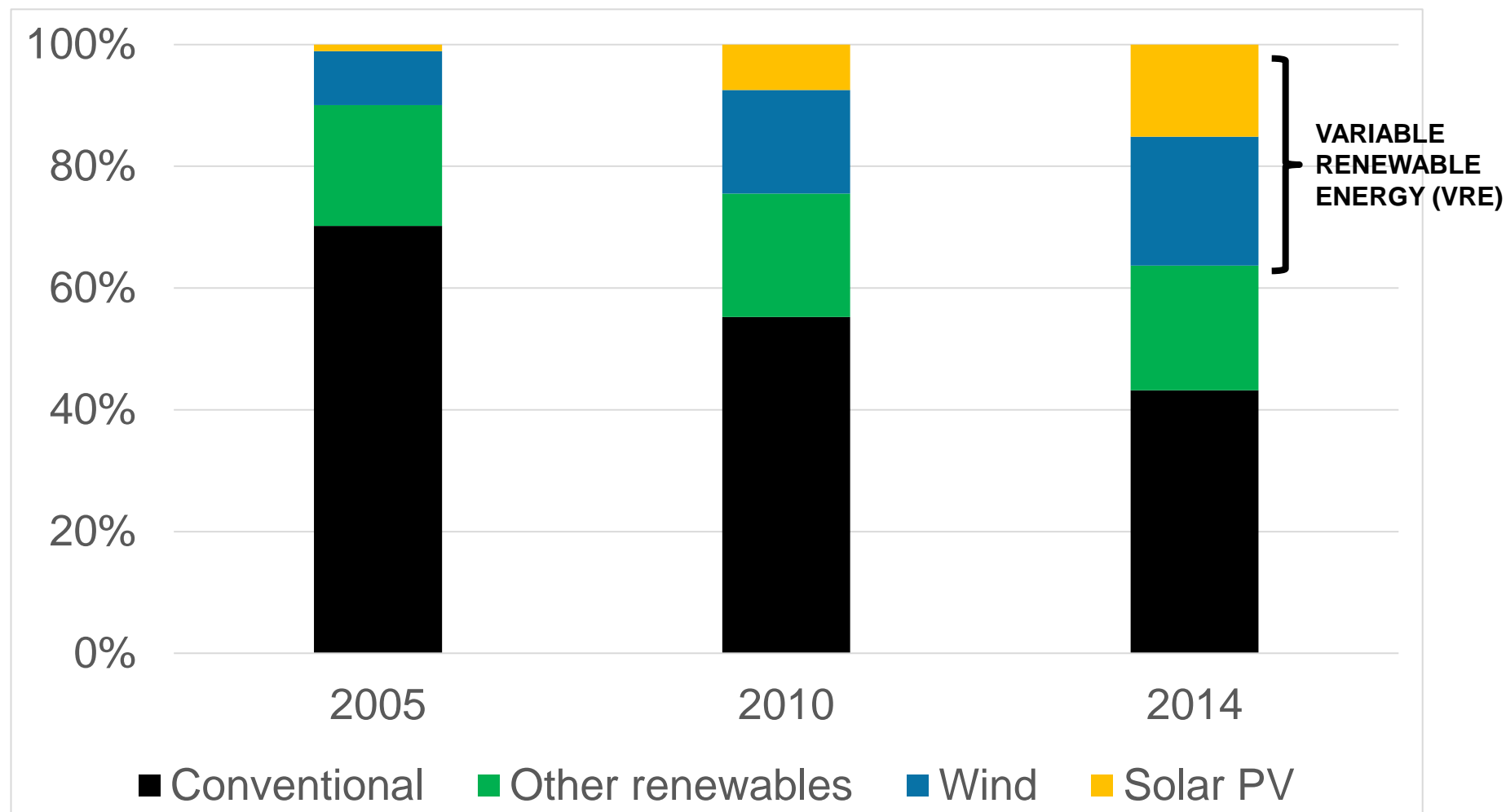
The Voice, Advisory Resource and Knowledge Hub for 170 Governments



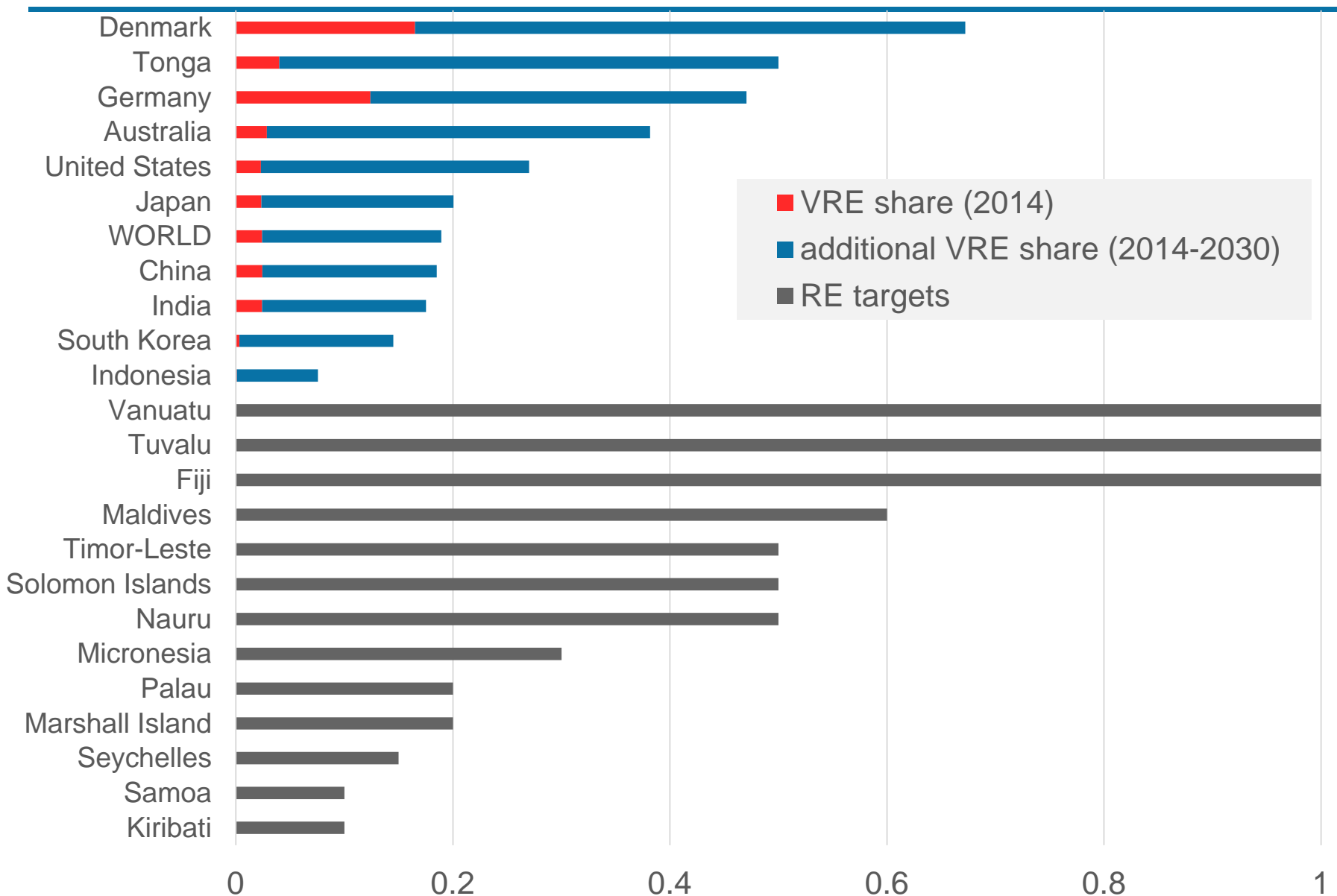
Renewable energy can:

- Meet our goals for **secure, reliable** and **sustainable** energy
- Provide **electricity access** to 1.3 billion people
- Promote **economic development**
- At an **affordable cost**

Share of newly installed RE power generation capacity



(Variable) RE shares in Asia in 2030



IRENA's electricity storage roadmap



Düsseldorf
kick-off
workshop

Tokyo
workshop

New Delhi
workshop

Düsseldorf
concluding
workshop

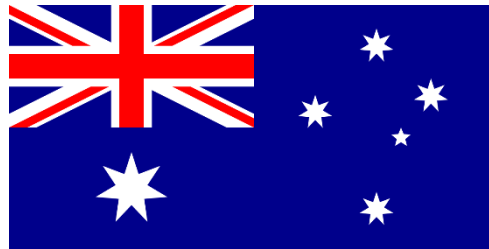
Electricity
Storage
Roadmap



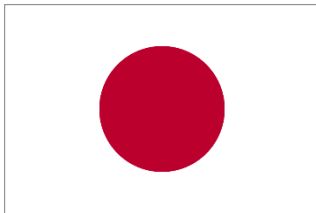
Send-out **blueprint**



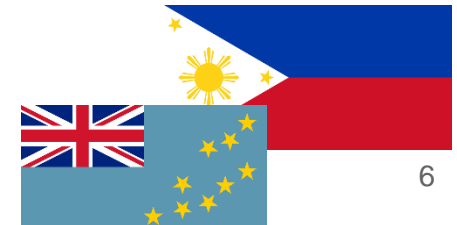
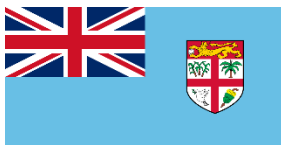
1. Countries reaching VRE shares above 30% and with even higher ambition levels



2. Countries reaching VRE shares above 20% and with constrained grid infrastructures



3. Island countries or countries with remote off-grid (including islands) power systems.



Roadmap Structure:

5 Priority Areas



14 Action Items



10 Stakeholder groups

Stakeholders / Actions	Information sheets & labeling	Standards	Ownership regulation & Liability
Regulator	2.5	3.0	3.8
Storage/RE generation developers	3.8	3.3	2.0
Industry associations	3.5	3.3	1.0
Consumer associations	3.3	2.0	3.3
Insurance companies	2.3	2.3	2.8
Standard bodies	3.0	3.8	1.8
Distribution system operators	1.5	2.5	3.3

System analysis for storage



- Engage and guide policy makers
- Provide value assessments
- Support system analysis of electricity/heat/fuel/productive uses as storage options

Storage in islands and remote areas



- **Facilitate financing**
- **Create local value chains**
- **Develop a global database with practical example**
- **Guide policy makers to the required tools**

Consumer-located storage



- Comparative information sheets and labelling
- Accelerate standards on safety and recycling
- (Data) ownership and liability regulation

SOLAR PHOTOVOLTAIC BATTERIES

The D... series of semi-regulated, gel-cell-enclosed batteries is designed to offer reliable, maintenance-free power for renewable energy applications where frequent deep cycles are required and minimum maintenance is desirable.

Applications:
Water pumping • Residential • Communications
Cableless protection • Remote monitoring • Refrigeration
Lighting • Aids to navigation • Wind generation

Specifications:
Voltage 12 volts nominal (800CC is 6 volts)
Plate alloy Lead calcium
Electrolyte seal Threaded stud or "flag" terminal, forged bushing
Construction Polypropylene
Charge voltage Cycle 2.30 to 2.35; Float 2.23 to 2.30 per cell
Electrolyte Sulphuric acid treatment gel
Vent GEL sealing

Cell Cycle Life vs Depth of Discharge at +35°C (27°F)*
Based on 80% Storage Capacity

Capacity vs. Operating Temperature

Terminal Information

Dimensions (in cm)

Type	Part No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100																																																																			
Model	12	15	18	22	26	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210	216	222	228	234	240	246	252	258	264	270	276	282	288	294	300	306	312	318	324	330	336	342	348	354	360	366	372	378	384	390	396	402	408	414	420	426	432	438	444	450	456	462	468	474	480	486	492	498	504	510	516	522	528	534	540	546	552	558	564	570	576	582	588	594	600	606	612	618	624	630	636	642	648	654	660	666	672	678	684	690	696	702	708	714	720	726	732	738	744	750	756	762	768	774	780	786	792	798	804	810	816	822	828	834	840	846	852	858	864	870	876	882	888	894	900	906	912	918	924	930	936	942	948	954	960	966	972	978	984	990	996	1000

Energy

Manufacturer Model

More efficient

A

B

C

D

E

F

G

Less efficient

Terminal Information

Dimensions (in cm)

Type	Part No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100																																																																			
Model	12	15	18	22	26	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210	216	222	228	234	240	246	252	258	264	270	276	282	288	294	300	306	312	318	324	330	336	342	348	354	360	366	372	378	384	390	396	402	408	414	420	426	432	438	444	450	456	462	468	474	480	486	492	498	504	510	516	522	528	534	540	546	552	558	564	570	576	582	588	594	600	606	612	618	624	630	636	642	648	654	660	666	672	678	684	690	696	702	708	714	720	726	732	738	744	750	756	762	768	774	780	786	792	798	804	810	816	822	828	834	840	846	852	858	864	870	876	882	888	894	900	906	912	918	924	930	936	942	948	954	960	966	972	978	984	990	996	1000

Generator-located storage



- **Support the development of innovative regulation**
- **Support for localised/distributed systems**





- **Pumped hydro and CAES analysis**
- **Demonstration projects for new business models**



- More an opportunity than a need
- Island countries, countries with islands & microgrid may benefit from storage in the short-term
- System analysis is always needed
- Ensure local value chains
- Ensure that consumer-located storage can become an asset for the grid



IRENA

International Renewable Energy Agency

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