



*Open Protocols for DER Communications:  
Where Does OpenADR Fit?*

June 12, 2019  
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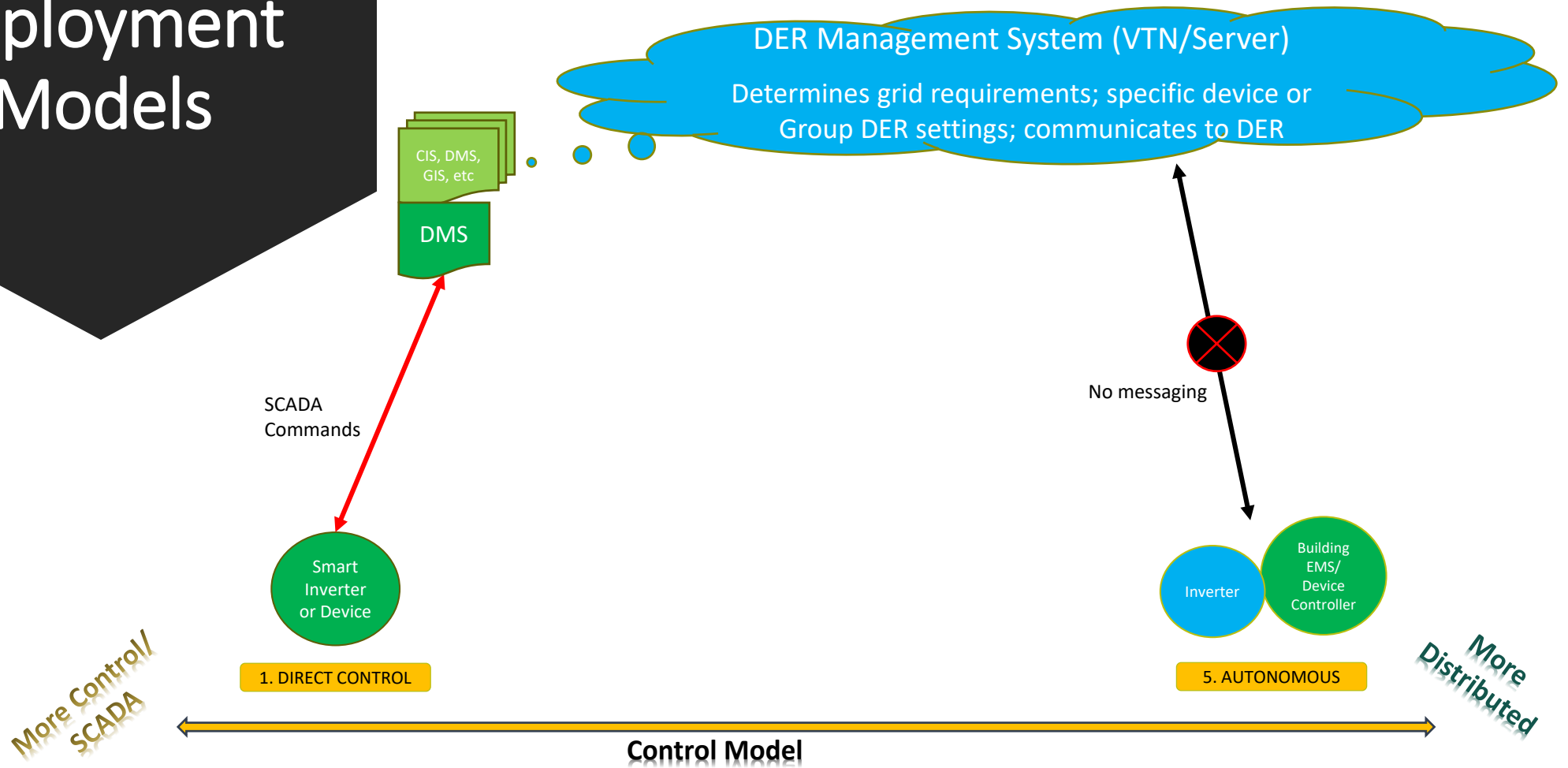
# Contents

- DER Communications Deployment Models
- DER Messaging Requirements Framework
- Protocol Analysis – OpenADR's Fit

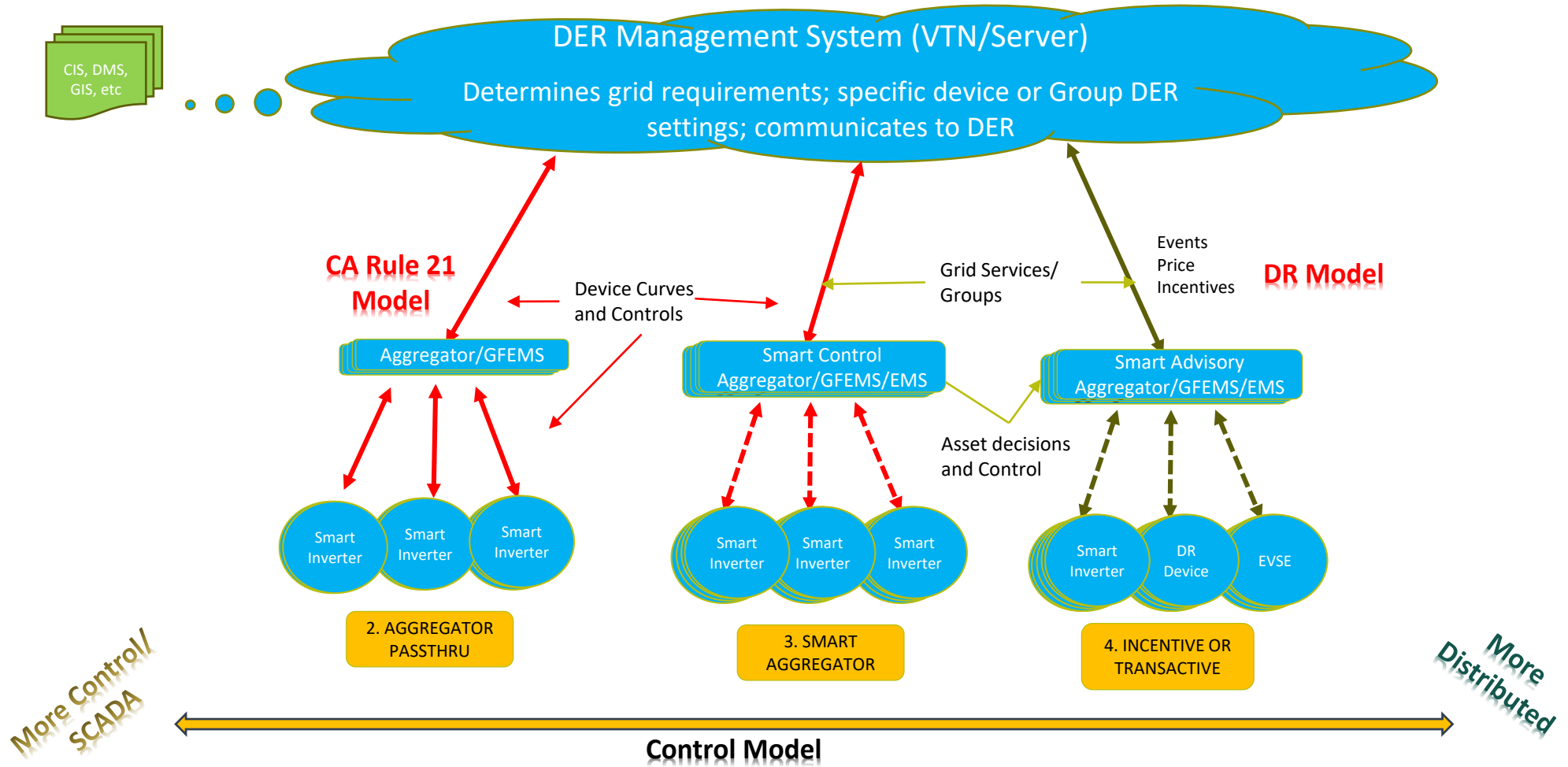
# What is DER?

- Any “energy resource” that feeds energy or power into the grid
  - Solar PV, Battery Storage, Generators, Wind, Evs
  - When feeding energy/power to the grid
- Regulated under Interconnection standards and agreements
  - IEEE 1547
  - CA Rule 21
- Does not include demand management
  - However, for optimization, DR should be included in the resource portfolio
  - Managing DER and DR in the same system (DERMS) has challenges

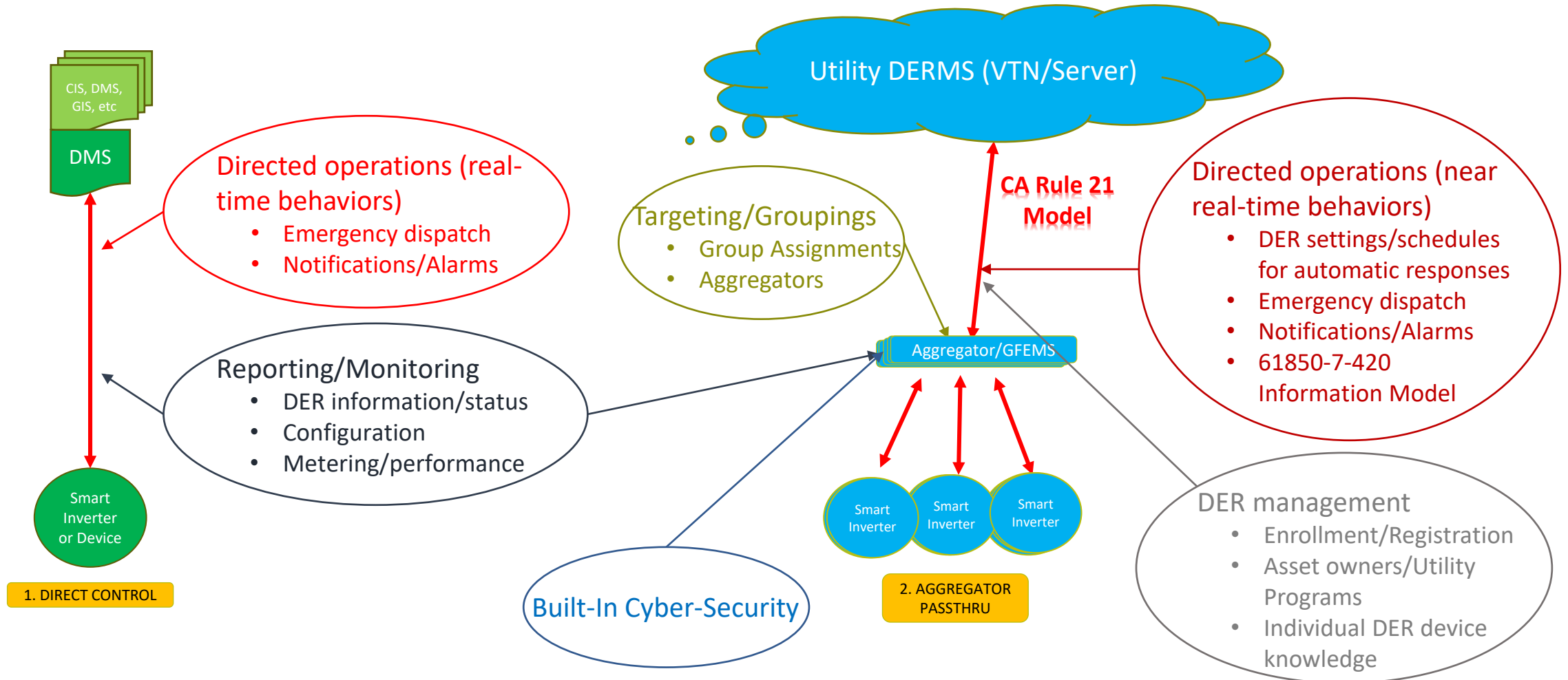
# DER/DR Deployment Models



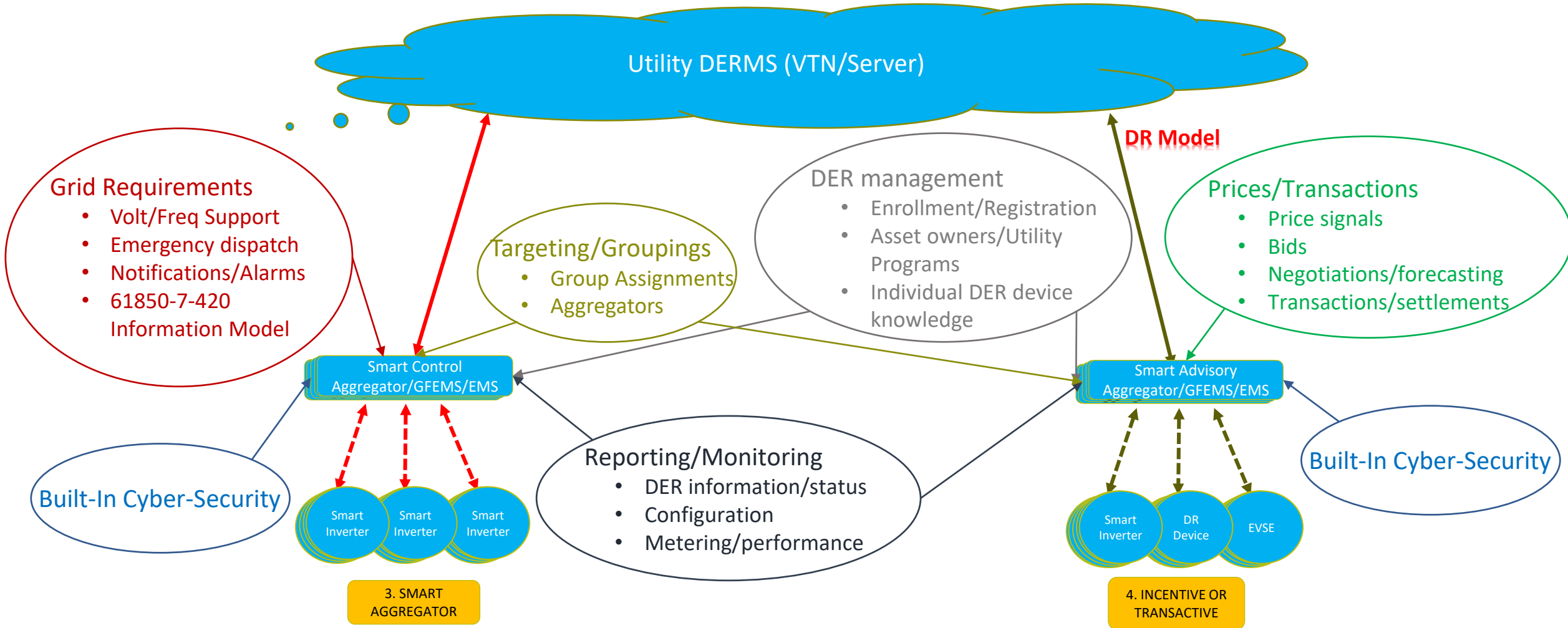
# DER Control Models



# What Messages are Required for DER Management?



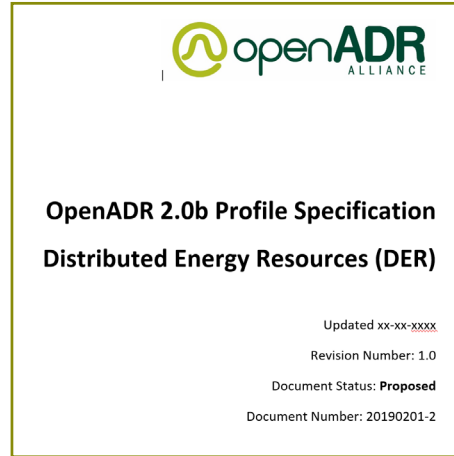
# What Messages are Required for DER Management?



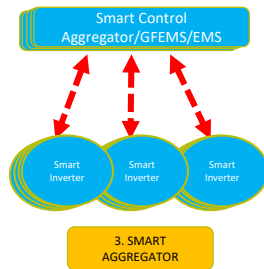
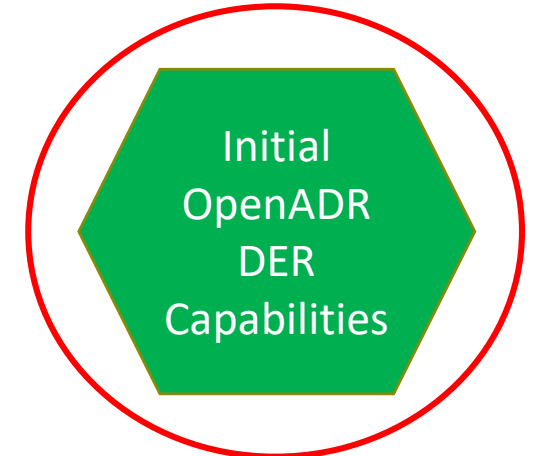
# OpenADR and DER: Status and Roadmap



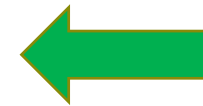
*DR Profile of Energy Interop*



*DER Profile of OpenADR*



*Demonstration*



*IEC 61968-5*



# OpenADR and DER Messaging

	1. DIRECT CONTROL	2. AGGREGATOR PASSTHRU	3. SMART AGGREGATOR	4. INCENTIVE OR TRANSACTIVE
DER Real-Time Control	R			
Emergency RT Dispatch	R			
Volt/Freq Support	R	R	R	
Notifications/Alarms	R	R	R (Agg)	
DER Settings/Curves		R	R (Agg)	
DER Schedules		R	R (Agg)	R
IEC 61850-7-420		R	R	
DER information/status	R	R	R (Agg)	R (Agg)
Configuration	R	R		
Metering/performance	R	R	R (Agg)	R
Built-in Security		R	R	R

R = Required



Current OpenADR



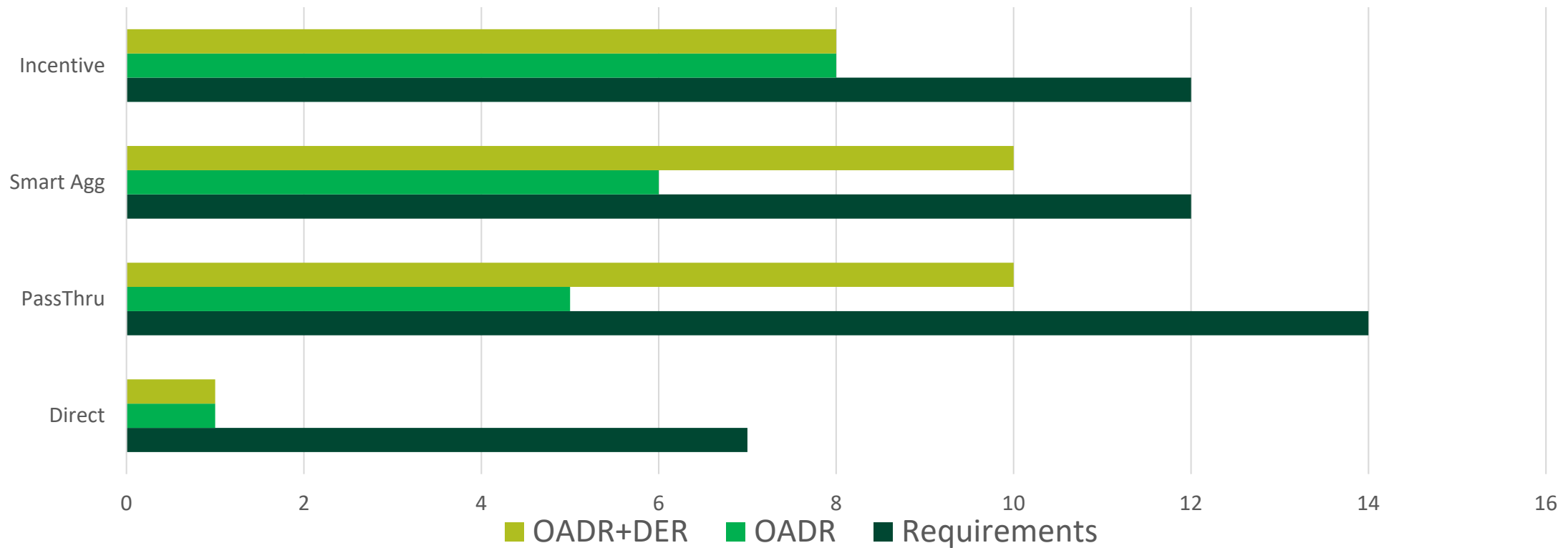
OpenADR + DER Addendum

# OpenADR and DER Messaging

	1. DIRECT CONTROL	2. AGGREGATOR PASSTHRU	3. SMART AGGREGATOR	4. INCENTIVE OR TRANSACTIVE
Group Assignments/Mgt		R	R	R
Aggregator Mgt		R	R	R
Enrollment/Registration		R	R	R
Asset owners/Utility Programs		R	R	R
Individual DER device knowledge		R		
Price signals				R
Bids				R
Negotiations/forecasting				R
Transactions/settlements				R
Total Requirements	7	14	12	12
OpenADR	1	5	6	8
OpenADR + DER	1	10	10	8

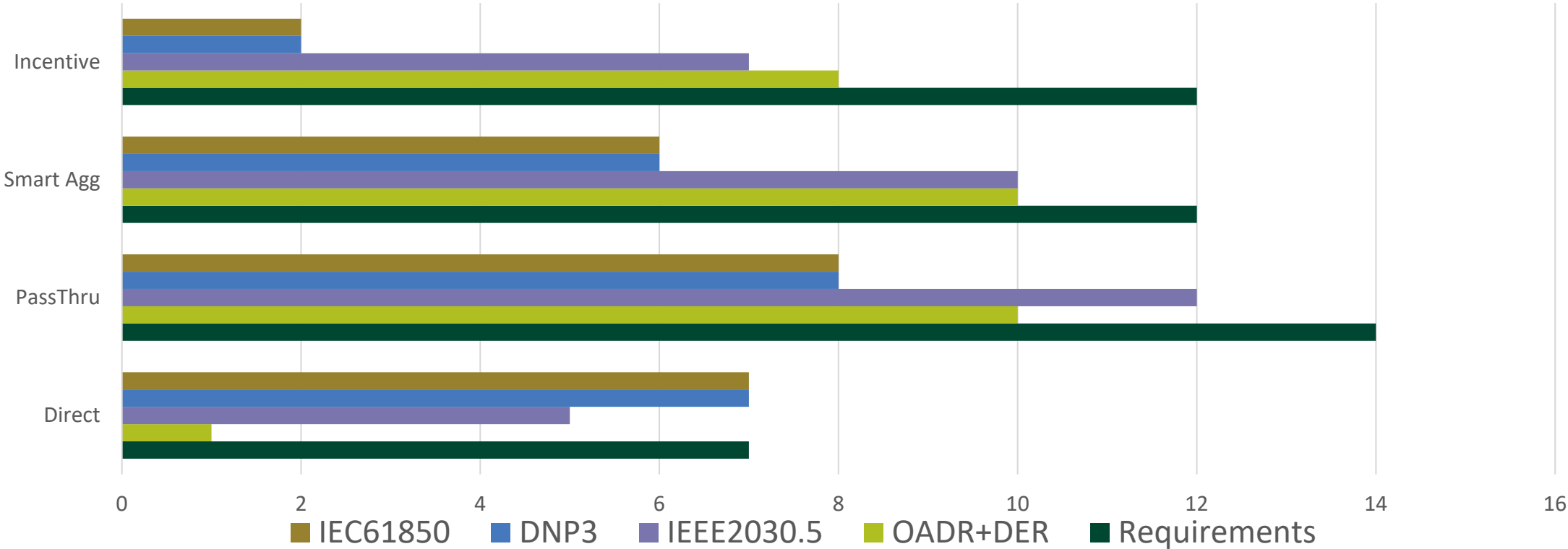
# Where Does OpenADR Fit Best?

## OpenADR and DER Message Requirements



# What About IEEE 2030.5, DNP3 and IEC61850

## Other Protocols and DER Message Requirements



# Conclusions

- OpenADR with DER Addendum will be a good protocol for Smart Aggregation
- And an even better protocol for incentive/transactive deployment models

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# Appendix A: IEEE 2030.5, DNP3 and IEC 61850 Analysis

# IEEE 2030.5 and DER Messaging

	1. DIRECT CONTROL	2. AGGREGATOR PASSTHRU	3. SMART AGGREGATOR	4. INCENTIVE OR TRANSACTIVE
DER Real-Time Control	R			
Emergency RT Dispatch	R			
Volt/Freq Support	Rieee	Rieee	Rieee	
Notifications/Alarms	Rieee	Rieee	Rieee	
DER Settings/Curves		Rieee	Rieee	
DER Schedules		Rieee	Rieee	Rieee
IEC 61850-7-420		Rieee	Rieee	
DER information/status	Rieee	Rieee	Rieee	Rieee
Configuration	Rieee	Rieee		
Metering/performance	Rieee	Rieee	Rieee	Rieee
Built-in Security		Rieee	Rieee	Rieee

# IEEE 2030.5

	1. DIRECT CONTROL	2. AGGREGATOR PASSTHRU	3. SMART AGGREGATOR	4. INCENTIVE OR TRANSACTIVE
Group Assignments		R <sub>IEEE</sub>	R <sub>IEEE</sub>	R <sub>IEEE</sub>
Aggregator Mgt		R <sub>IEEE</sub>	R <sub>IEEE</sub>	R <sub>IEEE</sub>
Enrollment/Registration		R	R	R
Asset owners/Utility Programs		R	R	R
Individual DER device knowledge		R <sub>IEEE</sub>		
Price signals				R <sub>IEEE</sub>
Bids				R
Negotiations/forecasting				R
Transactions/settlements				R
Total Requirements	7	14	12	12
IEEE 2030.5	5	12	10	7
OpenADR + DER	1	10	10	8



# DNP3 and DER Messasging

	1. DIRECT CONTROL	2. AGGREGATOR PASSTHRU	3. SMART AGGREGATOR	4. INCENTIVE OR TRANSACTIVE
DER Real-Time Control	Rdnp3			
Emergency RT Dispatch	Rdnp3			
Volt/Freq Support	Rdnp3	Rdnp3	Rdnp3	
Notifications/Alarms	Rdnp3	Rdnp3	Rdnp3	
DER Settings/Curves		Rdnp3	Rdnp3	
DER Schedules		R	R	R
IEC 61850-7-420		Rdnp3	Rdnp3	
DER information/status	Rdnp3	Rdnp3	Rdnp3	Rdnp3
Configuration	Rdnp3	Rdnp3		
Metering/performance	Rdnp3	Rdnp3	Rdnp3	Rdnp3
Built-in Security		R	R	R

# DNP3

	1. DIRECT CONTROL	2. AGGREGATOR PASSTHRU	3. SMART AGGREGATOR	4. INCENTIVE OR TRANSACTIVE
Group Assignments		R	R	R
Aggregator Mgt		R	R	R
Enrollment/Registration		R	R	R
Asset owners/Utility Programs		R	R	R
Individual DER device knowledge		R <sub>dnp3</sub>		
Price signals				R
Bids				R
Negotiations/forecasting				R
Transactions/settlements				R
Total Requirements	7	14	12	12
DNP3	7	8	6	2
OpenADR + DER	1	10	10	8

# IEC 61850 and DER Messasging

	1. DIRECT CONTROL	2. AGGREGATOR PASSTHRU	3. SMART AGGREGATOR	4. INCENTIVE OR TRANSACTIVE
DER Real-Time Control	R61850			
Emergency RT Dispatch	R61850			
Volt/Freq Support	R61850	R61850	R61850	
Notifications/Alarms	R61850	R61850	R61850	
DER Settings/Curves		R61850	R61850	
DER Schedules		R	R	R
IEC 61850-7-420		R61850	R61850	
DER information/status	R61850	R61850	R61850	R61850
Configuration	R61850	R61850		
Metering/performance	R61850	R61850	R61850	R61850
Built-in Security		R	R	R

# IEC 61850

	1. DIRECT CONTROL	2. AGGREGATOR PASSTHRU	3. SMART AGGREGATOR	4. INCENTIVE OR TRANSACTIVE
Group Assignments		R	R	R
Aggregator Mgt		R	R	R
Enrollment/Registration		R	R	R
Asset owners/Utility Programs		R	R	R
Individual DER device knowledge		R61850		
Price signals				R
Bids				R
Negotiations/forecasting				R
Transactions/settlements				R
Total Requirements	8	14	12	12
IEC 61850	7	8	6	2
OpenADR + DER	1	10	10	8