

Benchmarking U.S. Plants for Successful Refueling Outages

Michael Oellig,
NATC Rad Engineering Analyst,
North American Technical Center,
College of Engineering, University of Illinois
oellig@illinois.edu
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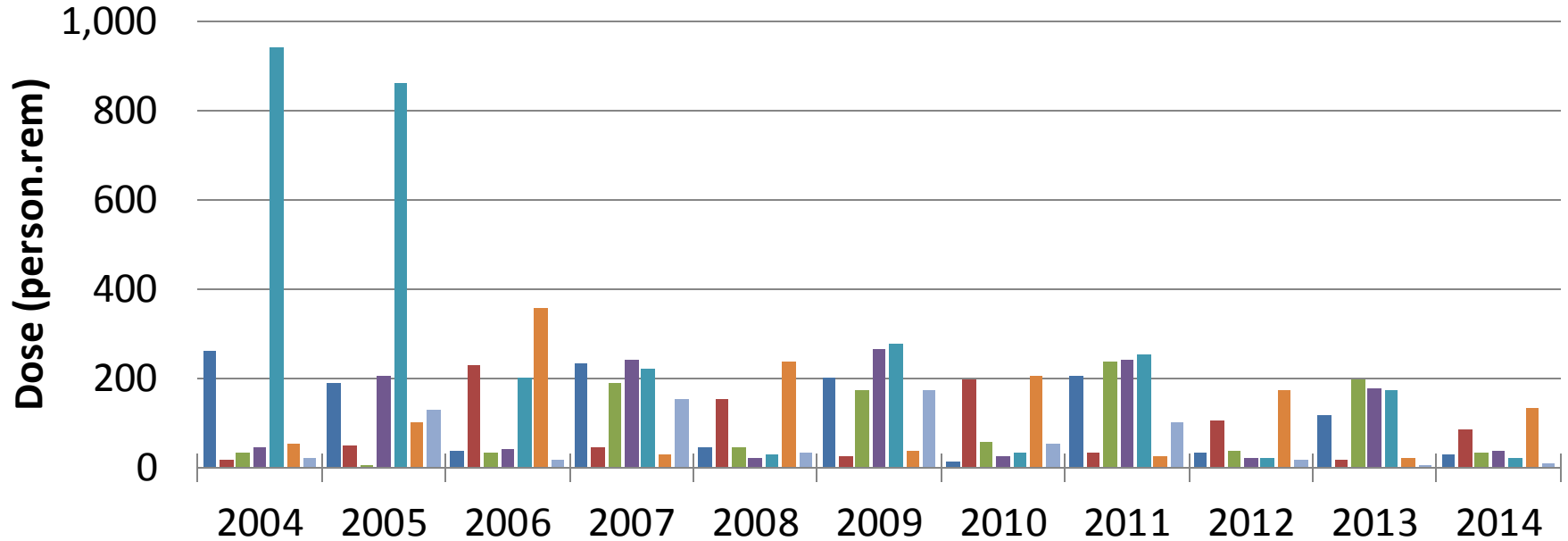
Overview

- Database Value
- ALARA Planning Examples
- Strengthening Outage Work Planning

ISOEDAT Database Value

- Over 30 benchmarking reports comparing sister plant RWP dose and duration tasks are now available in the MADRAS report generator.
- Radiation Protection Library is a validation source of ISOE data of Tables B, E, F, and G
- ALARA Reports provide good practices and lessons learned for major refueling/maintenance work permits

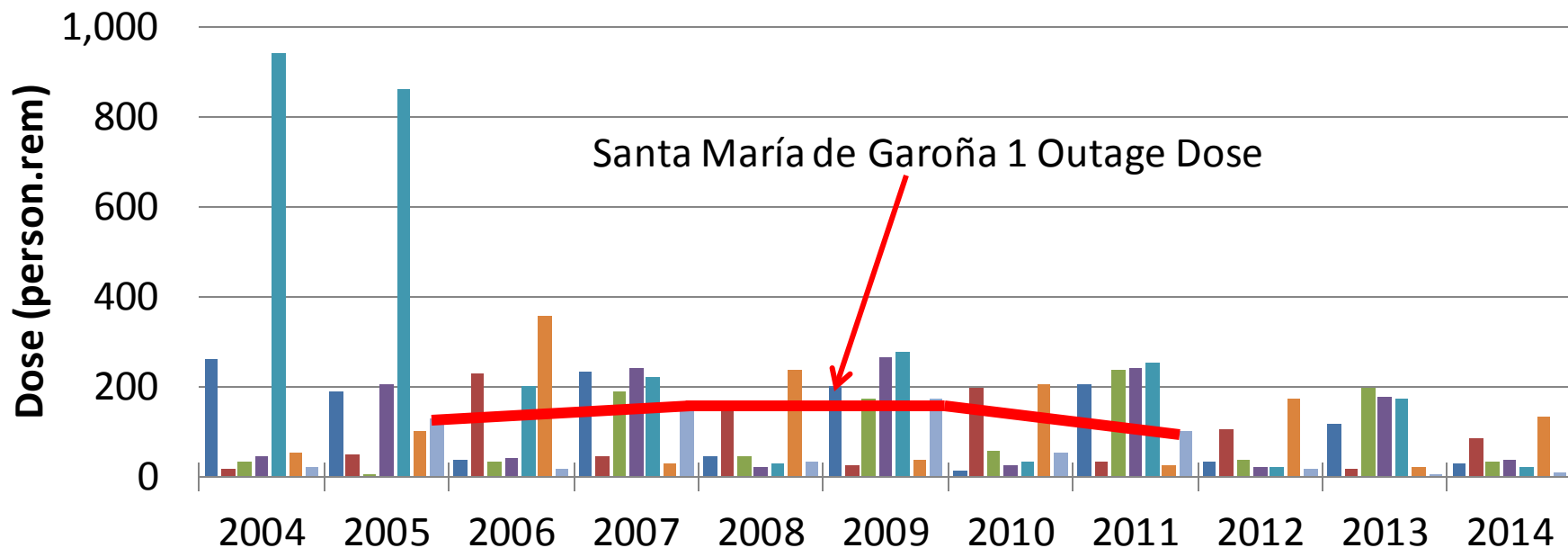
ALARA Planning: Operation and Outage Dose



■ Dresden 2
 ■ Dresden 3
 ■ Monticello 1
 ■ Pilgrim 1
 ■ Quad Cities 1
 ■ Quad Cities 2
 ■ Santa María de Garoña 1

	Dresden 2	Dresden 3	Monticello 1	Pilgrim 1	Quad Cities 1	Quad Cities 2	Santa María de Garoña 1
2004	261.000	18.000	35.081	45.735	939.500	53.650	22.692
2005	189.049	49.749	2.392	206.089	861.025	100.000	131.045
2006	39.554	229.613	33.416	43.531	202.490	356.872	17.268
2007	232.369	45.022	191.398	240.526	221.070	28.857	154.820
2008	45.516	152.637	44.800	22.568	30.993	236.475	35.294
2009	200.531	27.740	173.824	264.215	278.942	39.476	172.573
2010	14.797	199.065	56.116	25.739	35.439	207.130	55.635
2011	205.879	34.734	236.997	241.244	252.541	26.765	102.902
2012	32.266	107.341	38.786	21.620	21.600	172.711	16.960
2013	119.180	17.752	198.968	176.012	171.867	20.192	3.121
2014	31.559	85.374	35.306	36.716	20.444	135.724	10.196

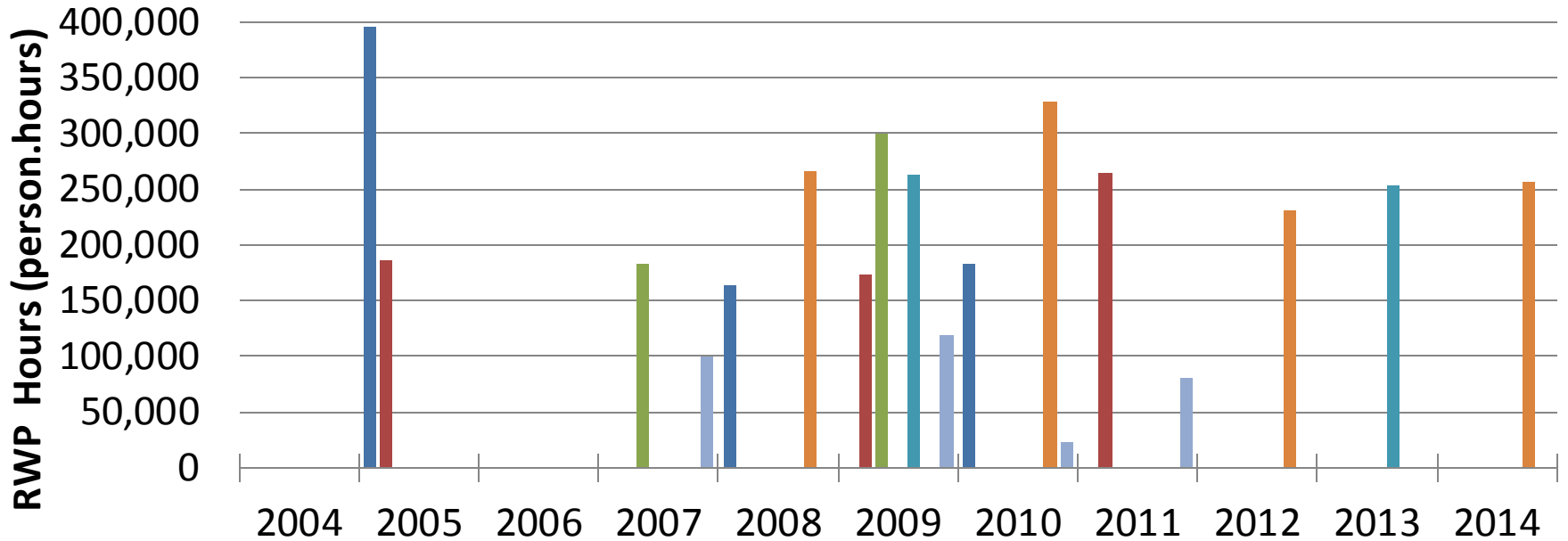
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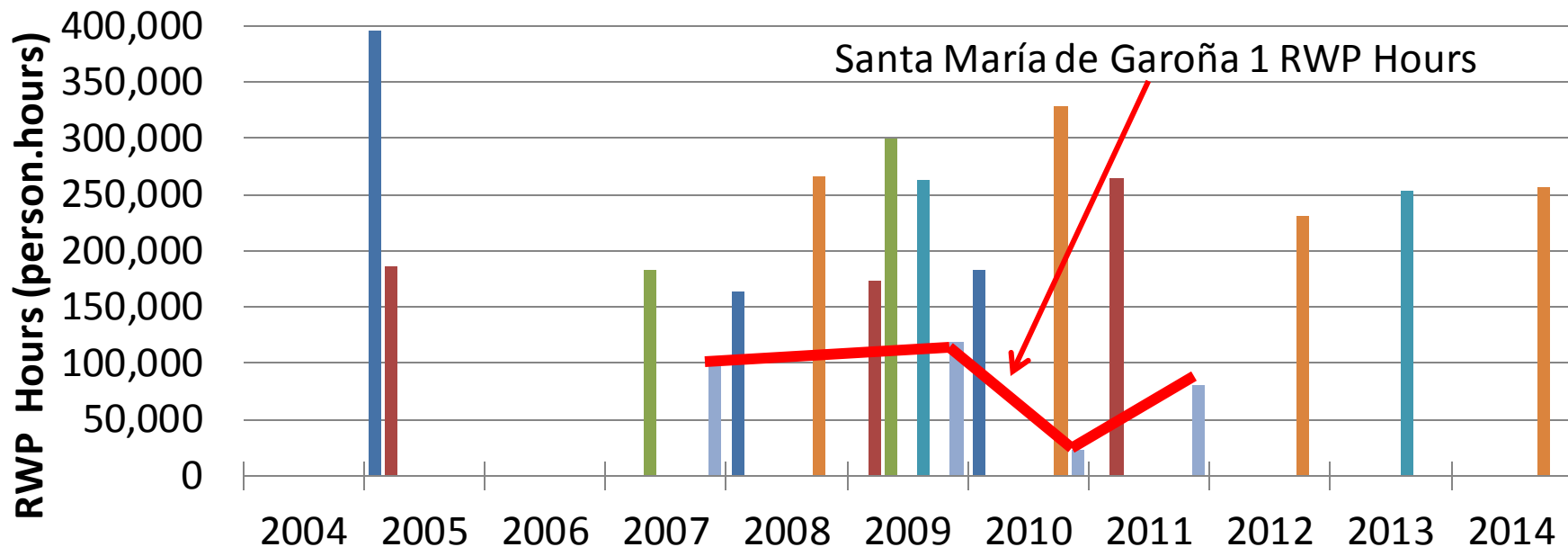
ALARA Planning: Outage RWP Hours



■ Dresden 2 ■ Dresden 3 ■ Monticello 1 ■ Pilgrim 1 ■ Quad Cities 1 ■ Quad Cities 2 ■ Santa María de Garoña 1

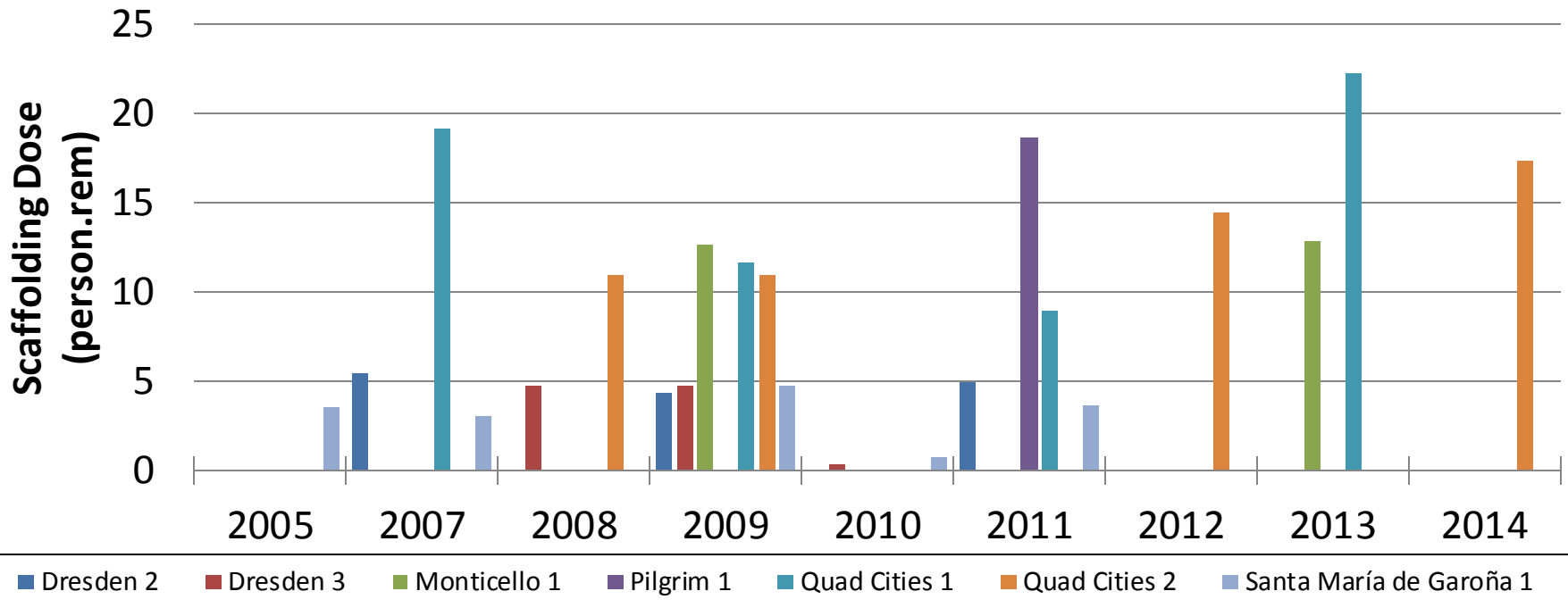
	Dresden 2	Dresden 3	Monticello 1	Pilgrim 1	Quad Cities 1	Quad Cities 2	Santa María de Garoña 1
2004							
2005	396,243	185,667					
2006							
2007			183,800				100,271
2008	164,246					266,525	
2009		173,733	300,001		263,646		118,800.47
2010	182,254					328,736	23,782.42
2011		263,956					81,136.05
2012						230,808	
2013					253,869		
2014						256,683	

ALARA Planning: Outage RWP Hours



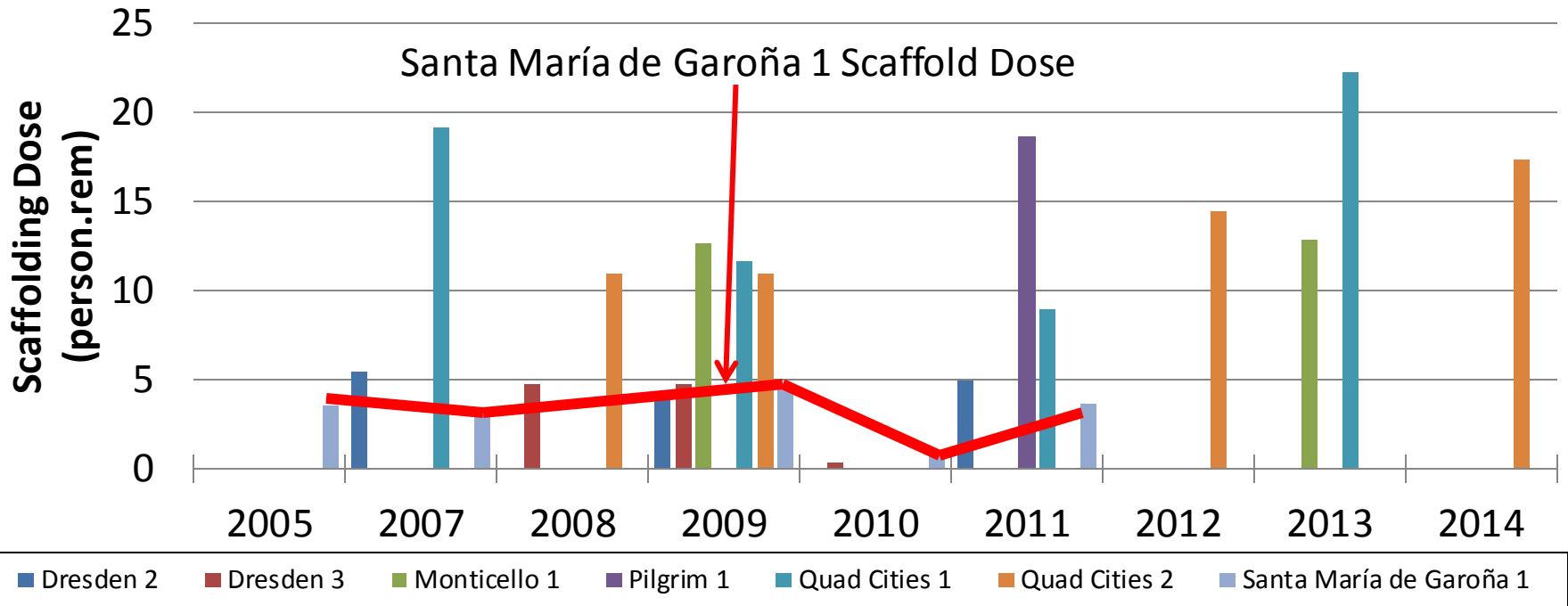
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ALARA Planning: Individual Task Doses



	Dresden 2	Dresden 3	Monticello 1	Pilgrim 1	Quad Cities 1	Quad Cities 2	Santa María de Garoña 1
2005							3.503
2007	5.467				19.098		3.051
2008		4.700				10.942	
2009	4.374	4.700	12.600		11.610	10.942	4.694
2010		0.305					0.760
2011	4.959			18.662	8.954		3.606
2012						14.467	
2013			12.853		22.275		
2014						17.342	

ALARA Planning: Individual Task Doses

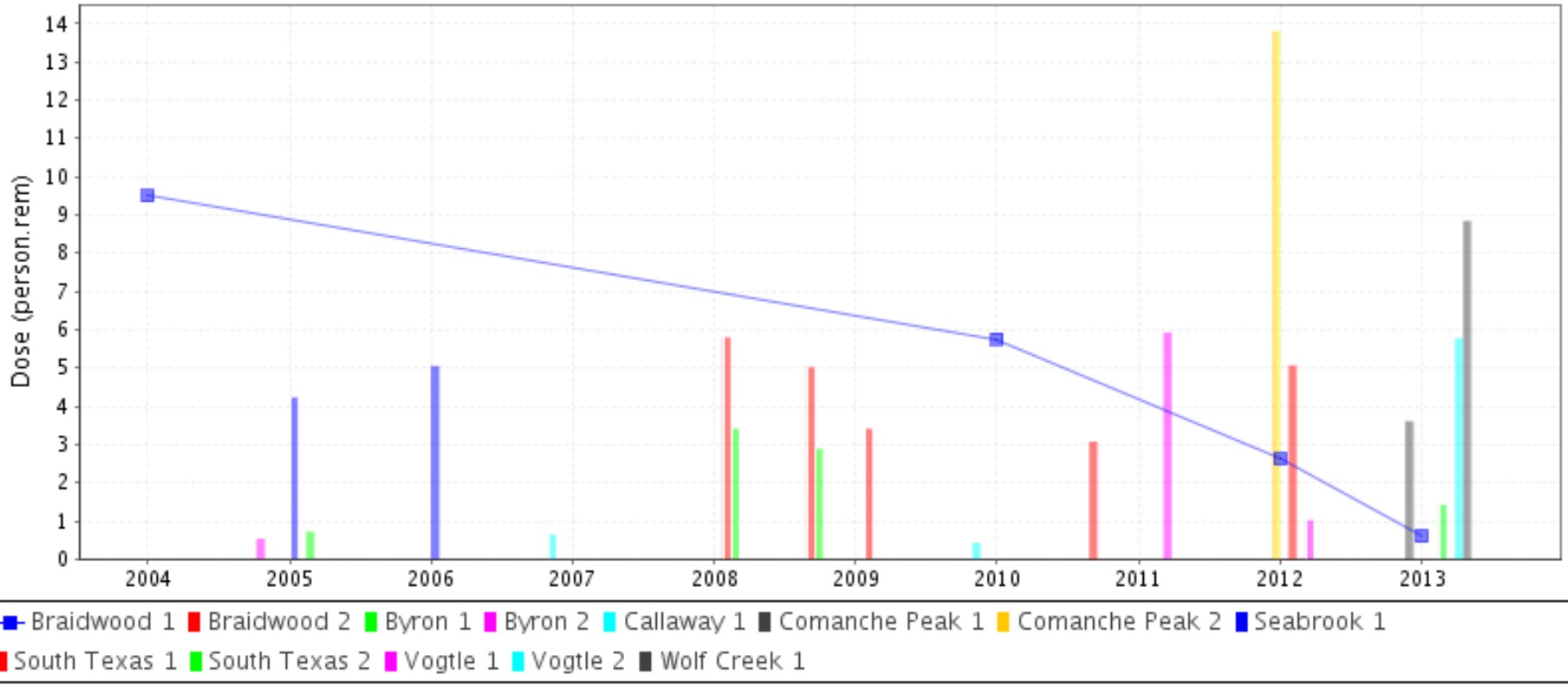


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ALARA Planning: Individual Task Doses

Job: Valve work (PWR)

Collective dose for Braidwood 1 compared with other units in its sister unit group



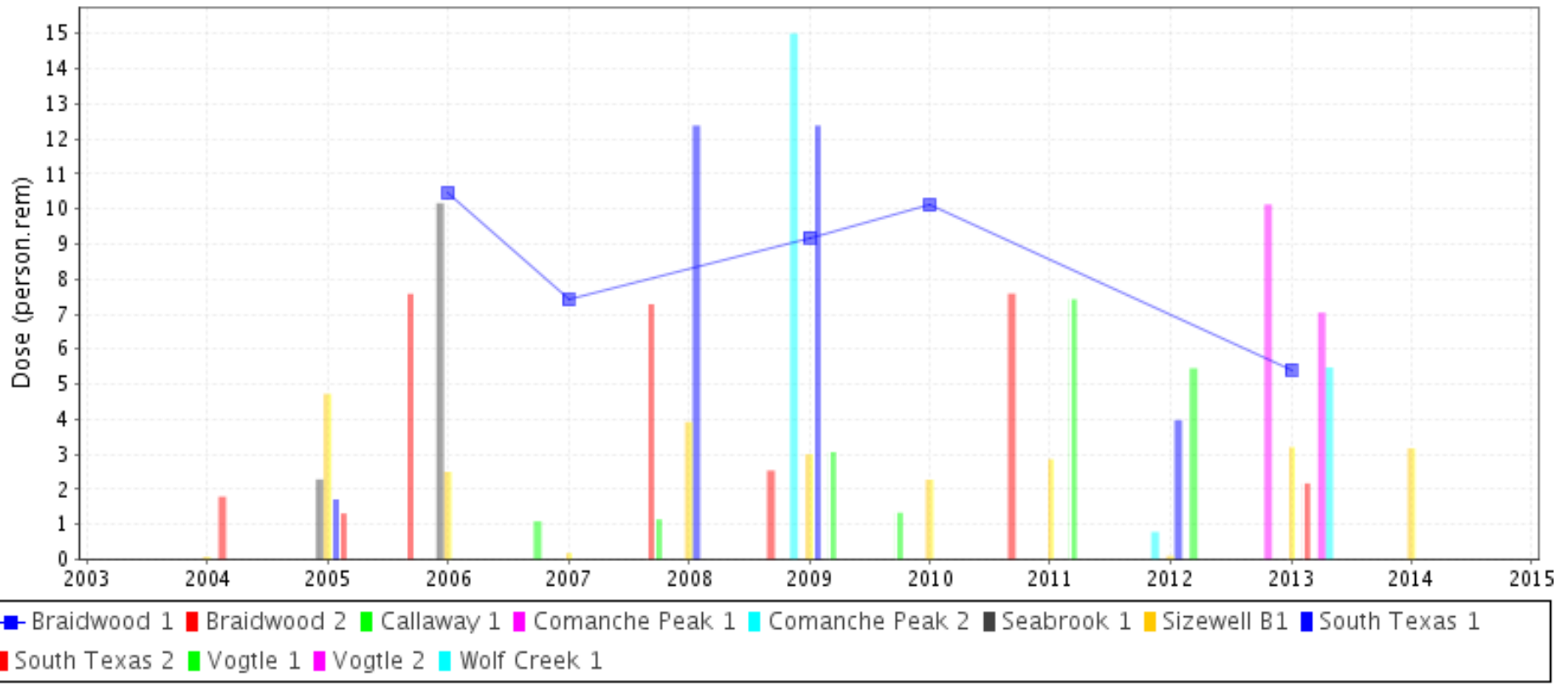
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Source: ISOE

ALARA Planning: Individual Task Doses

Job: Refuelling

Collective dose for Braidwood 1 compared with other units in its sister unit group



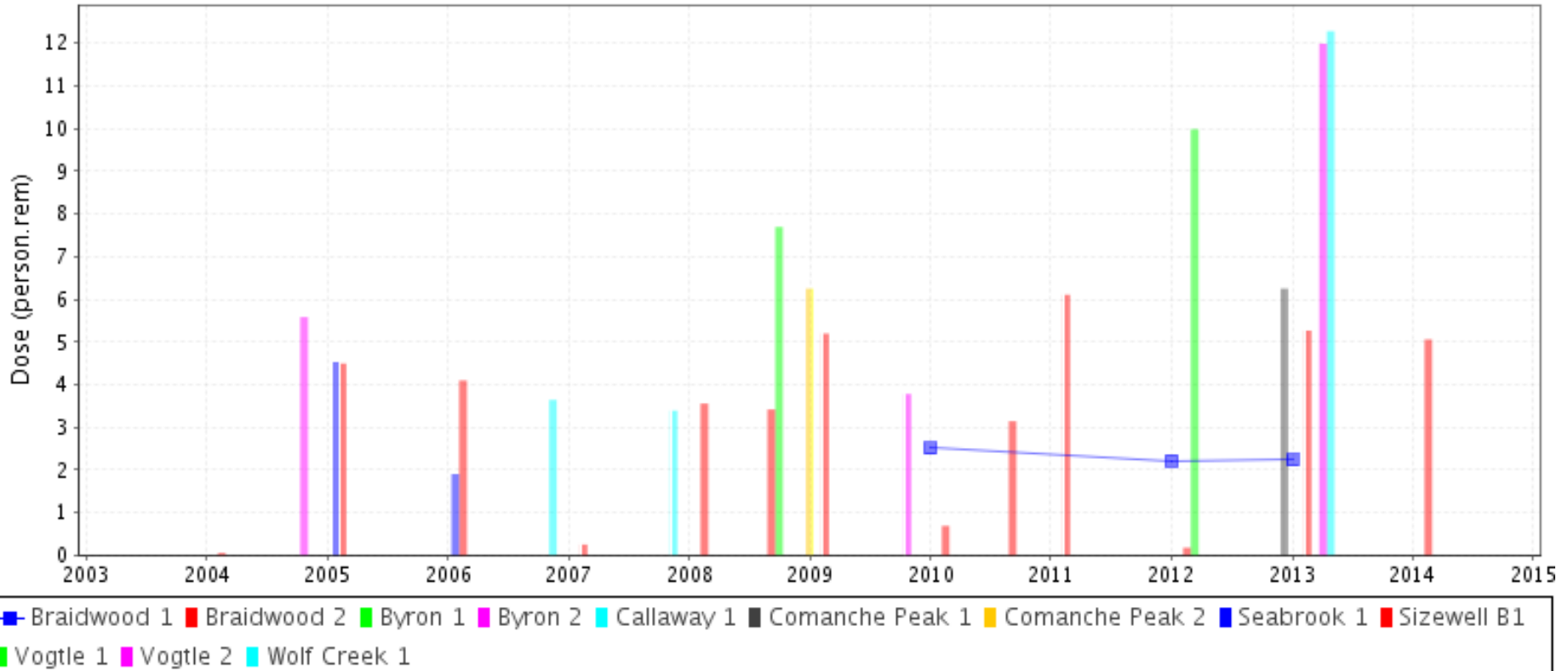
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Source: ISOE

ALARA Planning: Individual Task Doses

Job: Scaffolding

Collective dose for Braidwood 1 compared with other units in its sister unit group

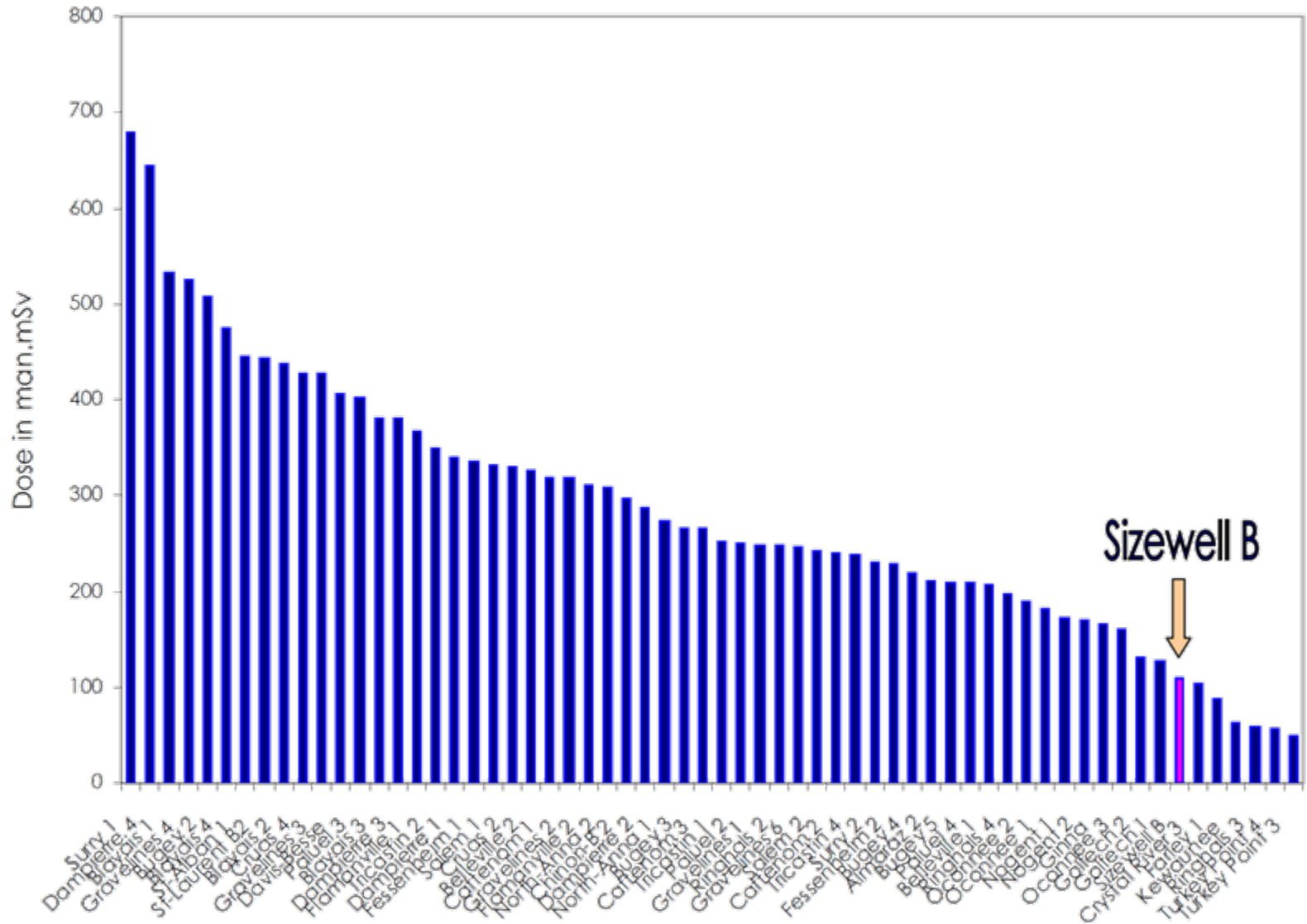


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Source: ISOE

ALARA Planning: Large Tasks

RPV Head Replacements: Collective Radiation Doses (man.mSv)



Strengthening ALARA Planning

- Some planners believe that the ISOE resource is beneficial in planning the scheduling of future refueling outages.
- Major repetitive jobs such as, refueling, valve work, and eddy current testing are tracked
- ISOE Table E provides task dose, duration, and crew size benchmarks for sister plant units.

Strengthening ALARA Planning

- Use database to benchmark your site
- Improve database by sharing your data
- Provide corrections and lessons learned