

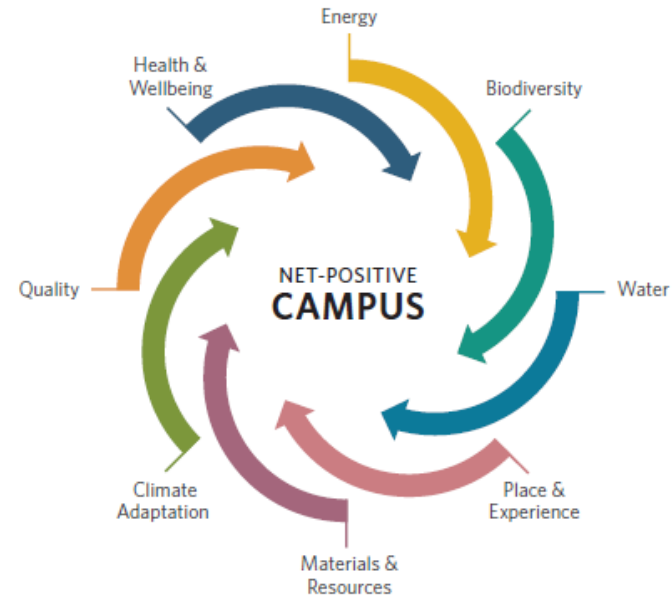
Maintaining Thermal Comfort in MURBs under a Changing Climate

Ralph Wells
Community Energy Manager
University of British Columbia

PSO Climate Leadership Symposium
November 26th 2019



UBC GREEN BUILDING ACTION PLAN



VISION:

By 2035, UBC's buildings will make net positive contributions to human and natural systems.

<https://planning.ubc.ca/vancouver/sustainability-operations/green-buildings>

“City of UBC” – Wesbrook Neighbourhood



A Changing Climate



Cooling Degree Days: Recent Past

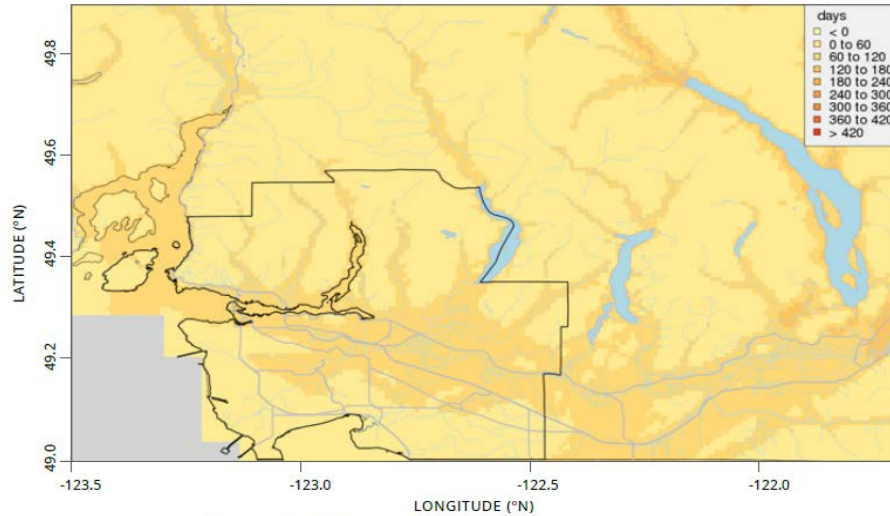


FIGURE 15: COOLING DEGREE DAYS - PAST

Cooling Degree Days: 2050s

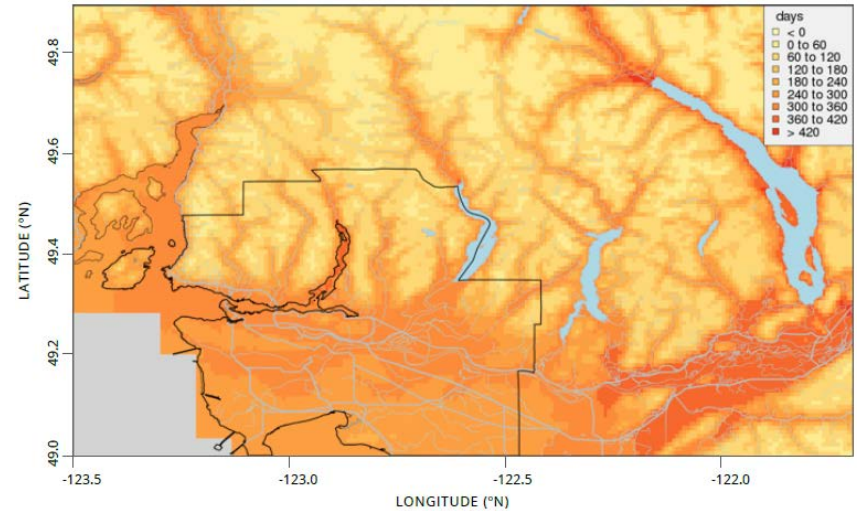
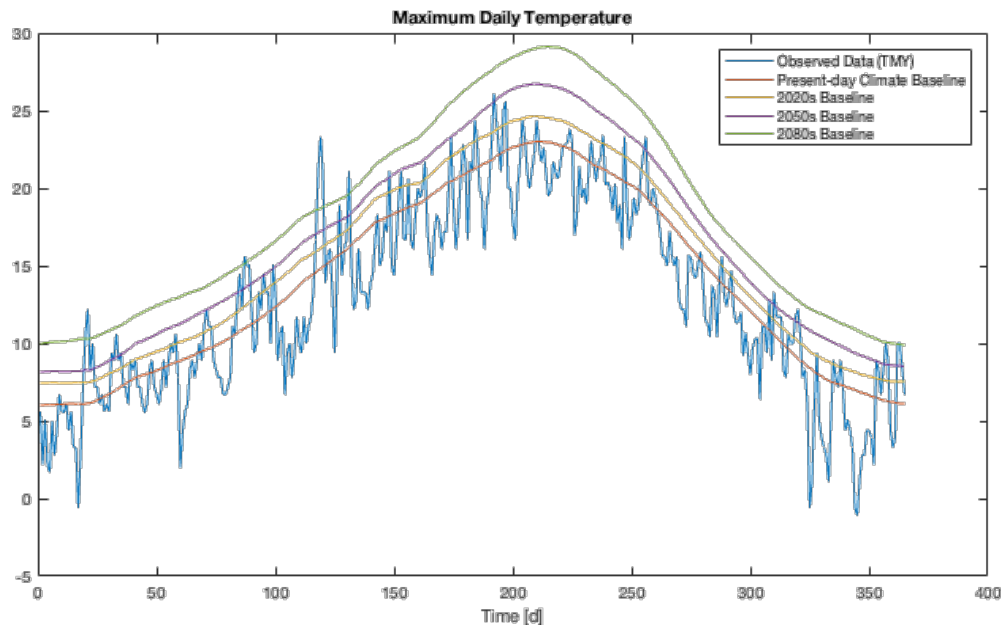


FIGURE 16: COOLING DEGREE DAYS - FUTURE (2050s)

Source: Metro Vancouver (2016)

Generating “Future Weather Files” For Building Energy Modelling



Malin Ek



Trevor Murdock (PCIC)

- TMY – Typical Meteorological Year for building modelling
- “Morphing” future daily temperature to hourly TMY

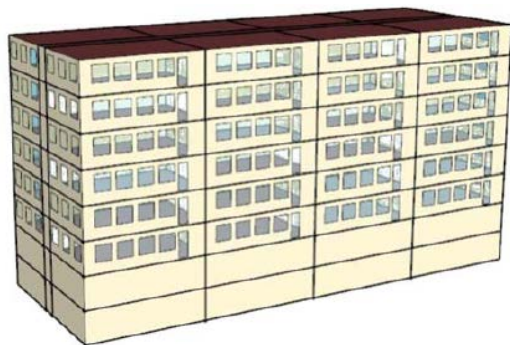
Designing Climate Resilient MURBs – Partnership Project



Innovative Clean Energy (ICE) Fund



Unmet Cooling Hours – New Low Rise Archetype

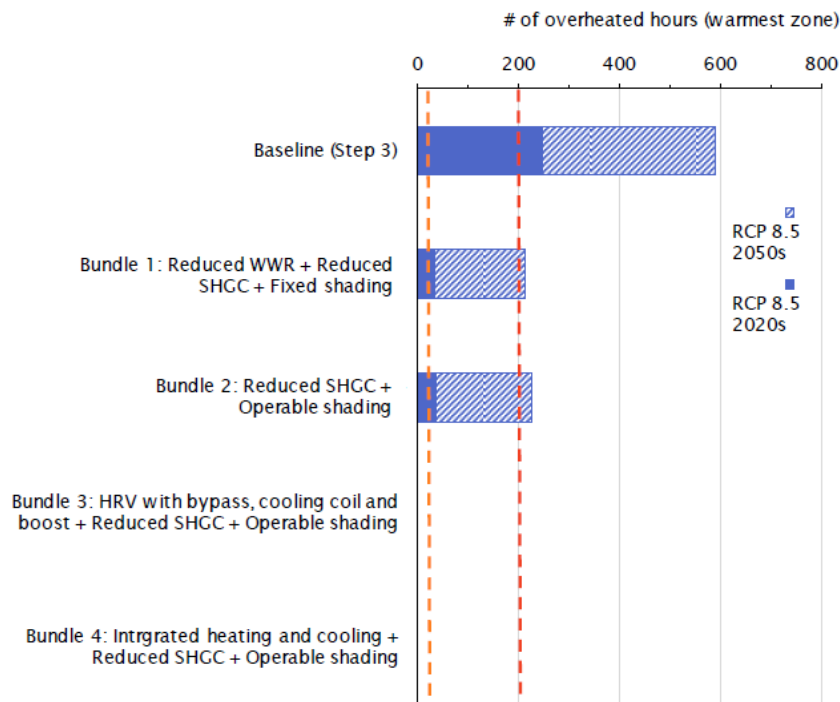


Building Archetype
Low Rise New
(No Mechanical Cooling)

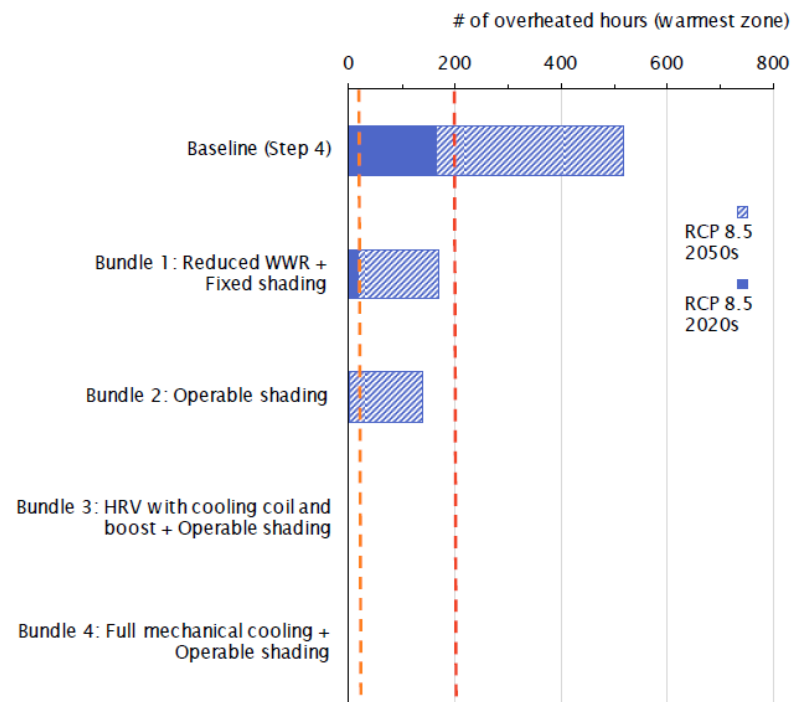


	CWEC 2016 Hottest Suite: SW - Top Floor	RCP-8.5 2020s Hottest Suite: SW - Top Floor	RCP-8.5 2050s Hottest Suite: SW - Top Floor	RCP-8.5 2080s Hottest Suite: SW - Top Floor																																																
Top Floor	<table><tr><td>63</td><td>11</td><td>11</td><td>16</td></tr><tr><td colspan="4">57</td></tr><tr><td>160</td><td>95</td><td>93</td><td>87</td></tr></table>	63	11	11	16	57				160	95	93	87	<table><tr><td>110</td><td>30</td><td>30</td><td>44</td></tr><tr><td colspan="4">120</td></tr><tr><td>246</td><td>160</td><td>160</td><td>161</td></tr></table>	110	30	30	44	120				246	160	160	161	<table><tr><td>370</td><td>222</td><td>216</td><td>234</td></tr><tr><td colspan="4">560</td></tr><tr><td>589</td><td>536</td><td>531</td><td>503</td></tr></table>	370	222	216	234	560				589	536	531	503	<table><tr><td>453</td><td>312</td><td>306</td><td>318</td></tr><tr><td colspan="4">695</td></tr><tr><td>702</td><td>667</td><td>665</td><td>601</td></tr></table>	453	312	306	318	695				702	667	665	601
63	11	11	16																																																	
57																																																				
160	95	93	87																																																	
110	30	30	44																																																	
120																																																				
246	160	160	161																																																	
370	222	216	234																																																	
560																																																				
589	536	531	503																																																	
453	312	306	318																																																	
695																																																				
702	667	665	601																																																	
Mid Floor	<table><tr><td>24</td><td>2</td><td>2</td><td>6</td></tr><tr><td colspan="4">23</td></tr><tr><td>101</td><td>69</td><td>68</td><td>62</td></tr></table>	24	2	2	6	23				101	69	68	62	<table><tr><td>45</td><td>5</td><td>5</td><td>13</td></tr><tr><td colspan="4">48</td></tr><tr><td>149</td><td>99</td><td>100</td><td>97</td></tr></table>	45	5	5	13	48				149	99	100	97	<table><tr><td>236</td><td>117</td><td>114</td><td>148</td></tr><tr><td colspan="4">402</td></tr><tr><td>463</td><td>425</td><td>428</td><td>375</td></tr></table>	236	117	114	148	402				463	425	428	375	<table><tr><td>301</td><td>164</td><td>154</td><td>194</td></tr><tr><td colspan="4">532</td></tr><tr><td>549</td><td>536</td><td>525</td><td>476</td></tr></table>	301	164	154	194	532				549	536	525	476
24	2	2	6																																																	
23																																																				
101	69	68	62																																																	
45	5	5	13																																																	
48																																																				
149	99	100	97																																																	
236	117	114	148																																																	
402																																																				
463	425	428	375																																																	
301	164	154	194																																																	
532																																																				
549	536	525	476																																																	
First Floor	<table><tr><td>7</td><td>0</td><td>0</td><td>1</td></tr><tr><td colspan="4">7</td></tr><tr><td>57</td><td>49</td><td>49</td><td>40</td></tr></table>	7	0	0	1	7				57	49	49	40	<table><tr><td>27</td><td>2</td><td>1</td><td>5</td></tr><tr><td colspan="4">23</td></tr><tr><td>105</td><td>74</td><td>76</td><td>67</td></tr></table>	27	2	1	5	23				105	74	76	67	<table><tr><td>142</td><td>44</td><td>42</td><td>76</td></tr><tr><td colspan="4">208</td></tr><tr><td>352</td><td>295</td><td>290</td><td>249</td></tr></table>	142	44	42	76	208				352	295	290	249	<table><tr><td>179</td><td>77</td><td>73</td><td>104</td></tr><tr><td colspan="4">291</td></tr><tr><td>429</td><td>377</td><td>373</td><td>322</td></tr></table>	179	77	73	104	291				429	377	373	322
7	0	0	1																																																	
7																																																				
57	49	49	40																																																	
27	2	1	5																																																	
23																																																				
105	74	76	67																																																	
142	44	42	76																																																	
208																																																				
352	295	290	249																																																	
179	77	73	104																																																	
291																																																				
429	377	373	322																																																	

Unmet Cooling Hours: New Low Rise Archetype

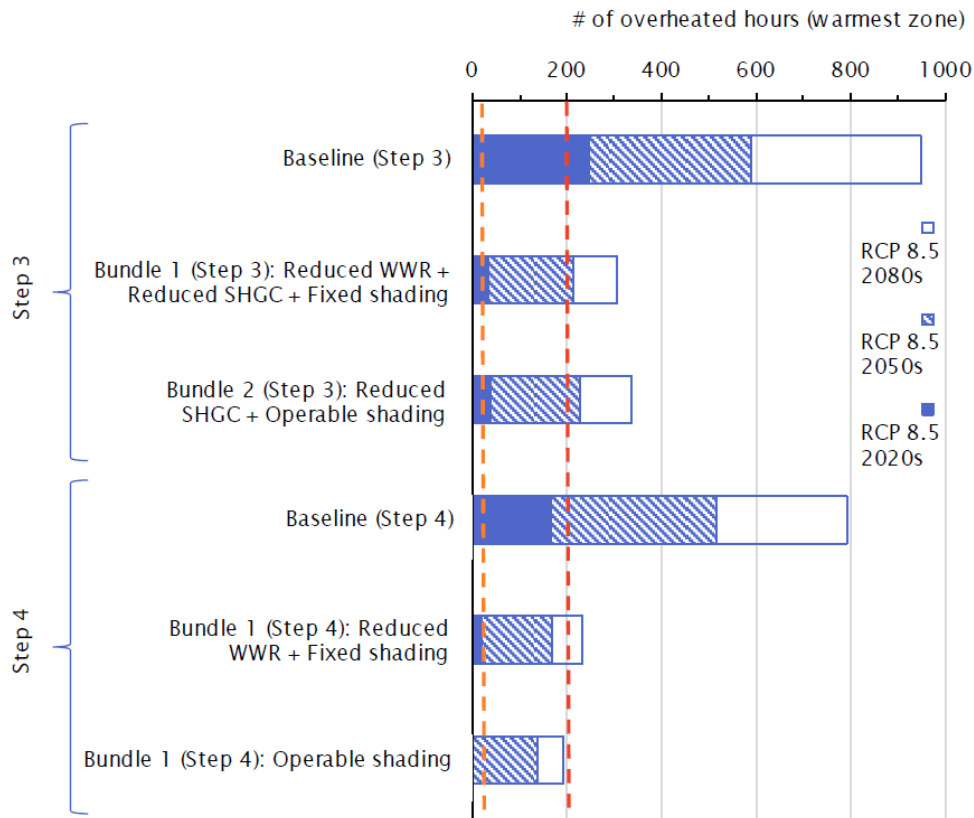


Energy Step Code: Step 3

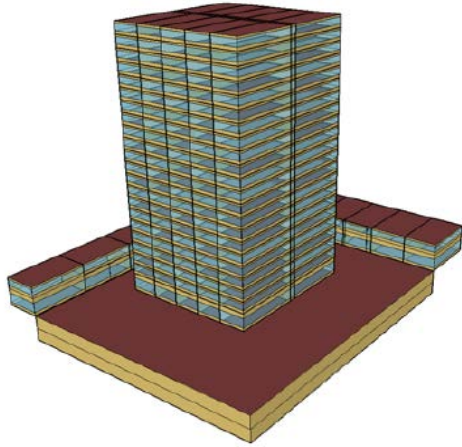


Energy Step Code: Step 4

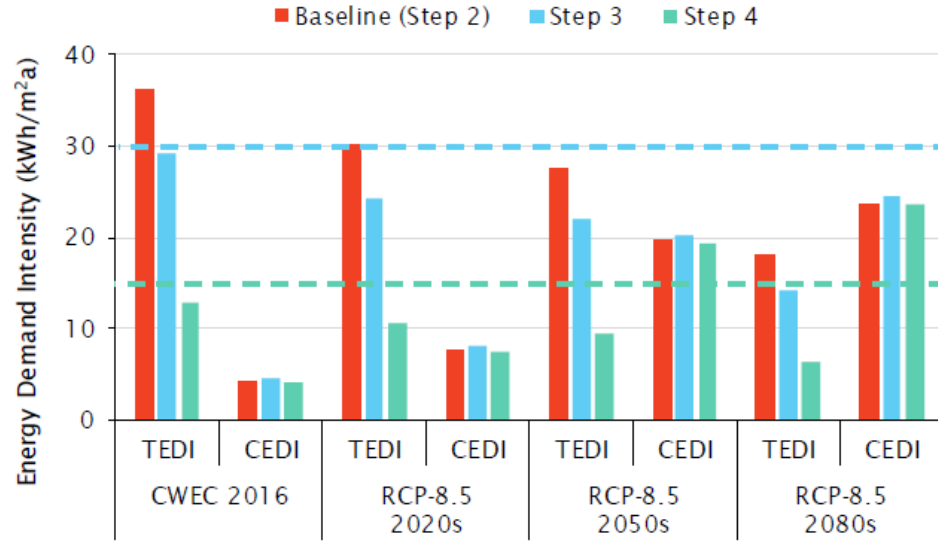
Resilience to Summer Heating Events: New Low Rise Archetype



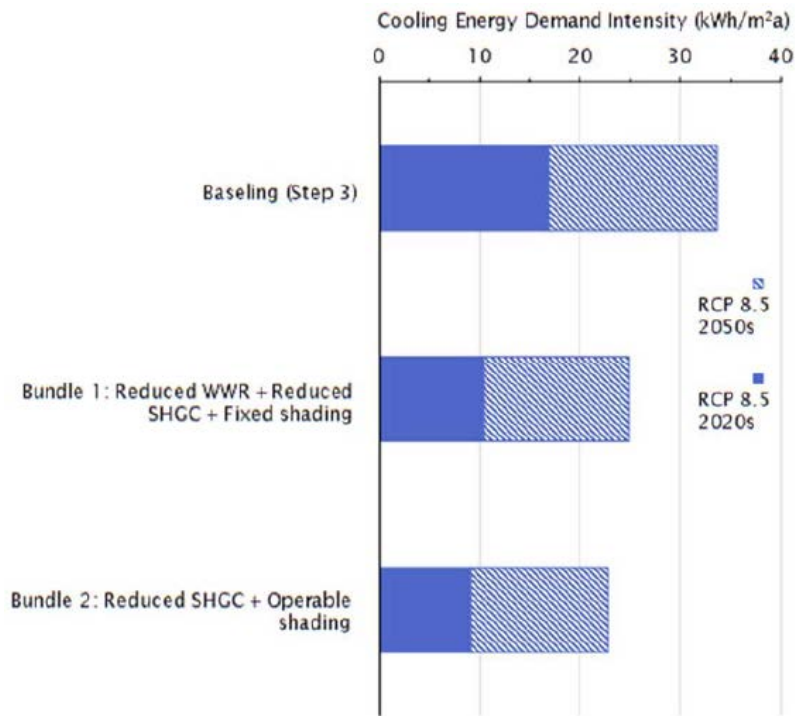
Cooling Energy Demand Intensity (CEDI) – New High Rise Archetype



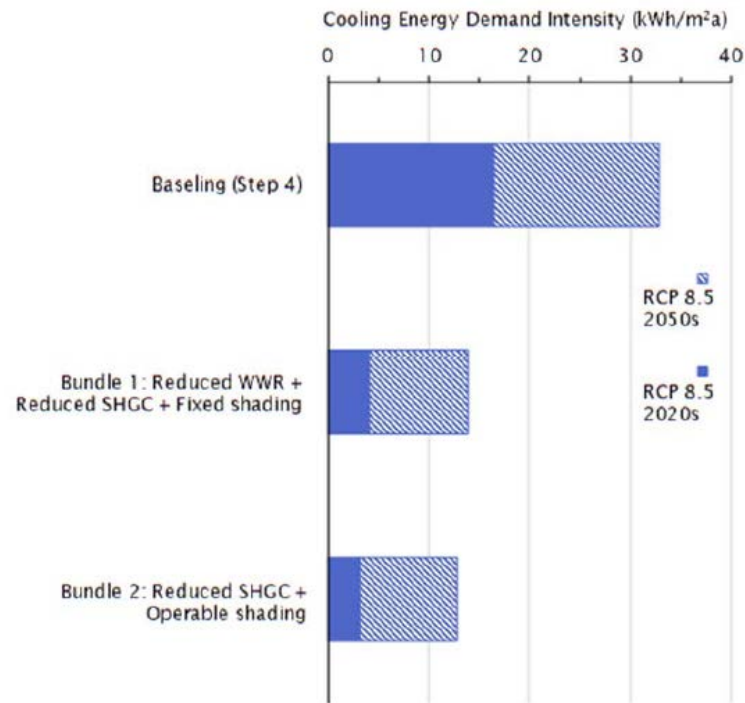
Building Archetype
*High Rise New
(Mechanical Cooling)*



Cooling Energy Demand Intensity (CEDI): New High Rise Archetype

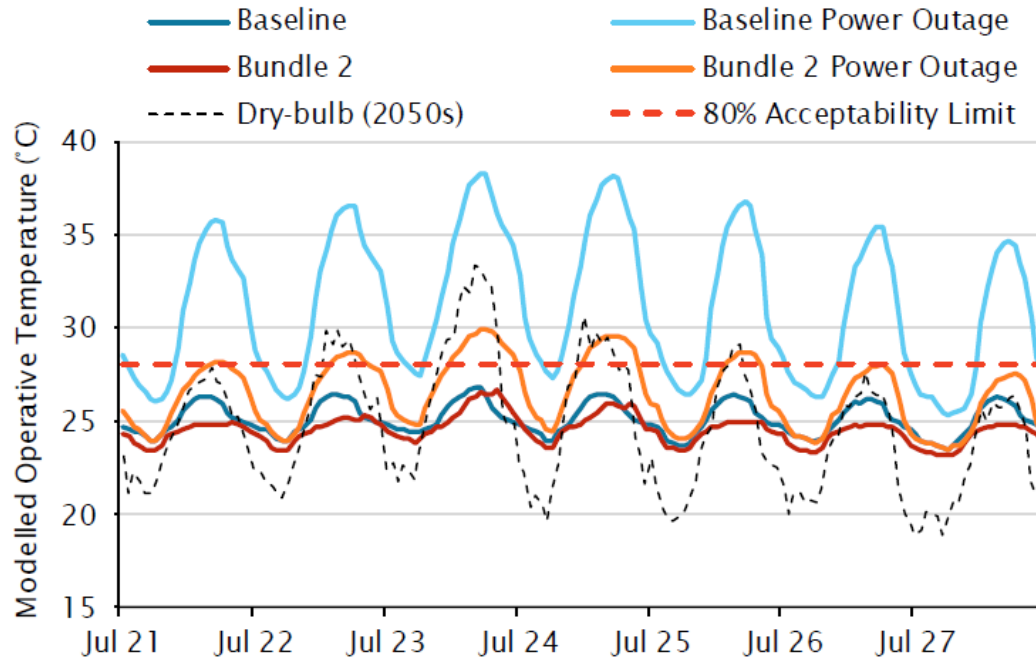


Energy Step Code: Step 3

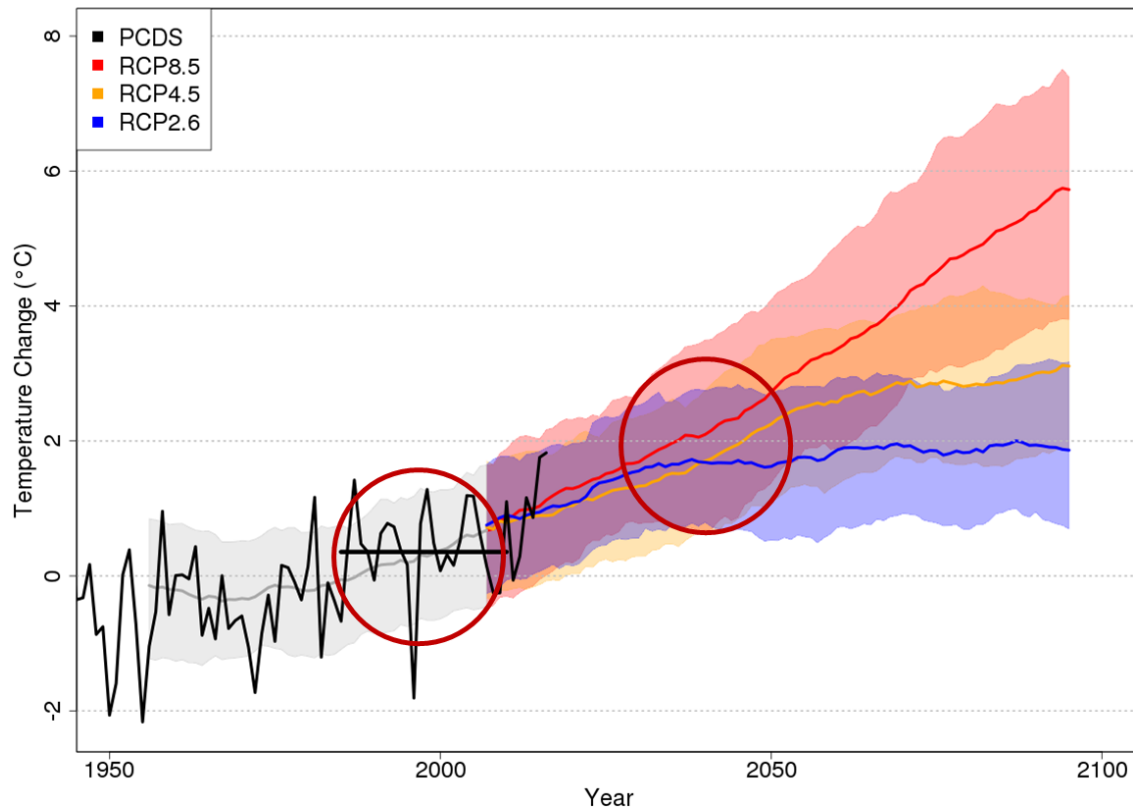


Energy Step Code: Step 4

Resilience to Power Outage: New High Rise Archetype

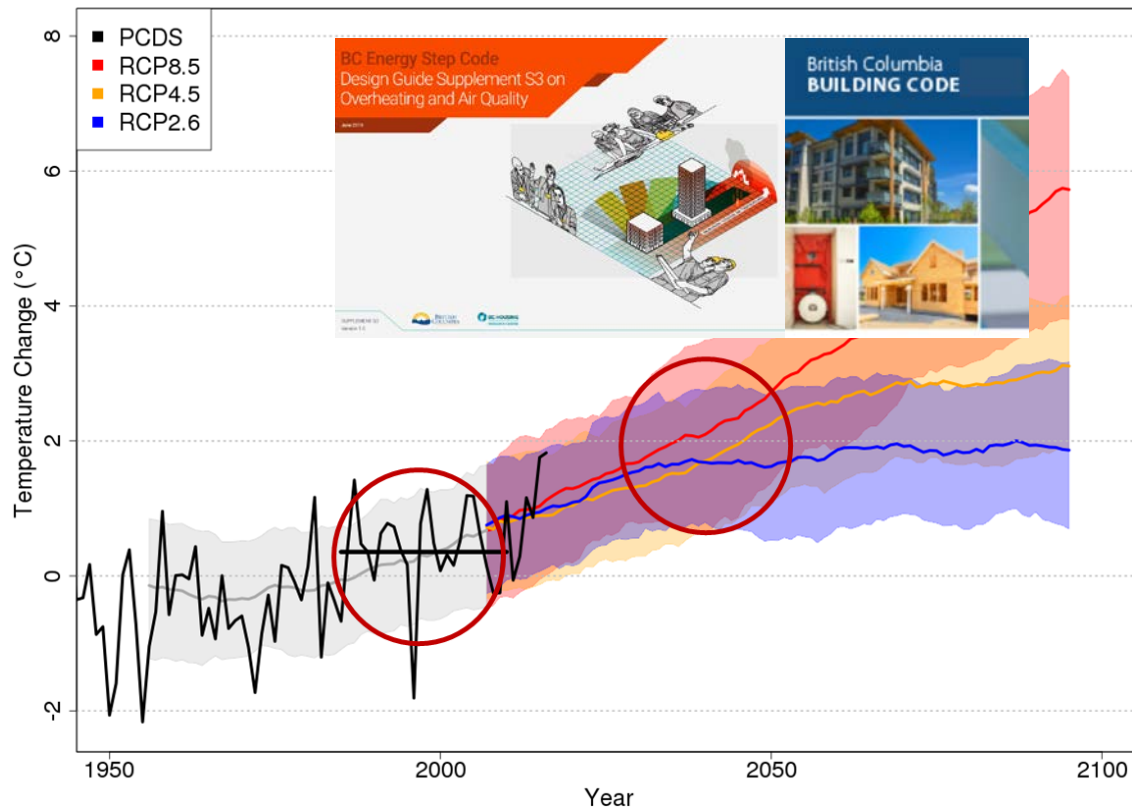


Looking Ahead



Source: Pacific Climate Impacts Consortium

Looking Ahead



Source: Pacific Climate Impacts Consortium

Questions?

