AVISTA CORP.
RESPONSE TO REQUEST FOR INFORMATION

JURISDICTION:	WASHINGTON	DATE PREPARED:	09/28/2016
CASE NO.:	UE-160228 & UG-160229	WITNESS:	Heather Rosentrater
REQUESTER:	Public Counsel/Energy Project	RESPONDER:	Rodney Pickett / La Bolle
TYPE:	Data Request	DEPT:	State & Federal Regulation
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REQUEST:

With regard to the value of reduced outage duration, does Avista agree that with reduced outage events or outage duration, customers will likely use more kWh, incur a higher bill, and increase Avista's revenues? Were these results included in Avista's business case?

RESPONSE:

Avista does not agree with the assertion that customers will likely have a higher bill as a result of experiencing reduced outage duration. The reason for this is that the relationship between loss of service and the number of kWh consumed is complex and is not linear. While a customer will not use energy (from Avista) during an outage, the number of additional kWh of energy (above normal operations) that will be consumed by the customer when power is restored will often exceed the number of kWh of energy not used during the outage. This depends on the length of the outage, time of year, time of day, and the particulars of each customer's circumstance.

Equipment and process startups typically require a very significant amount of energy that can be well beyond the average usage during operations. For example, a standard electric motor used in the vast majority of applications has a starting current that is normally 7 times the normal operating current. Several smaller motor loads such as fans, heaters, and pumps restarting at the same time upon restoration create tremendous amounts of surge current on an electric distribution feeder when service is restored. This surge current is one of the reasons why utilities ask customers to shut off their equipment until the power is restored. Startup load becomes less significant as the length of the outage increases. However, many outage events are measured in seconds and the Company's average outage duration is less than two hours. For residences, the bulk of the kWh used is for heating and cooling. With the loss of power, a building either heats up or cools down which means the building is either gaining energy in the form of heat or losing energy in the form of heat. The equation below represents the change in heat energy, with "q" representing the heat transfer rate, "U" representing the overall coefficient of heat transfer, "A" representing the surface area, and "$(t_1 - t_2)$" representing the difference between the interior temperature and the exterior temperature.

$q = U*A* (t_1 - t_2)$

where q = heat flow rate

U = Overall coefficient of heat transfer

A = Cross-sectional area where heat transfer occurs

$(t_1 - t_2)$ = Temperature gradient

During most outages[1] the building mass is losing or gaining heat energy. When the power is restored, the building mass must be brought back to the original operating temperature. In addition,

[1] Except those occurring at times when the outside temperature is the same as the temperature inside the building.

when power is restored some HVAC systems will actually use more energy due to inefficiencies and non-linearity's of thermodynamic processes. Condensing gas furnaces and induced draft boilers, actually run at peak efficiency at 15-20% of full load. This non-linearity is particularly exacerbated in refrigerated heating systems that only work efficiently when they are only a few degrees from a set point. When a heat pump is the main source of heat, the electric resistance heat source that comes on to bring the temperature back to set point uses twice as much energy to replace those BTU's as the heat pump would have used during normal operation. Many other factors influence this calculation, well beyond what can be discussed here, but the simple point is that for most outages our customers experience, they will not necessarily consume fewer kWh simply because the power was out.