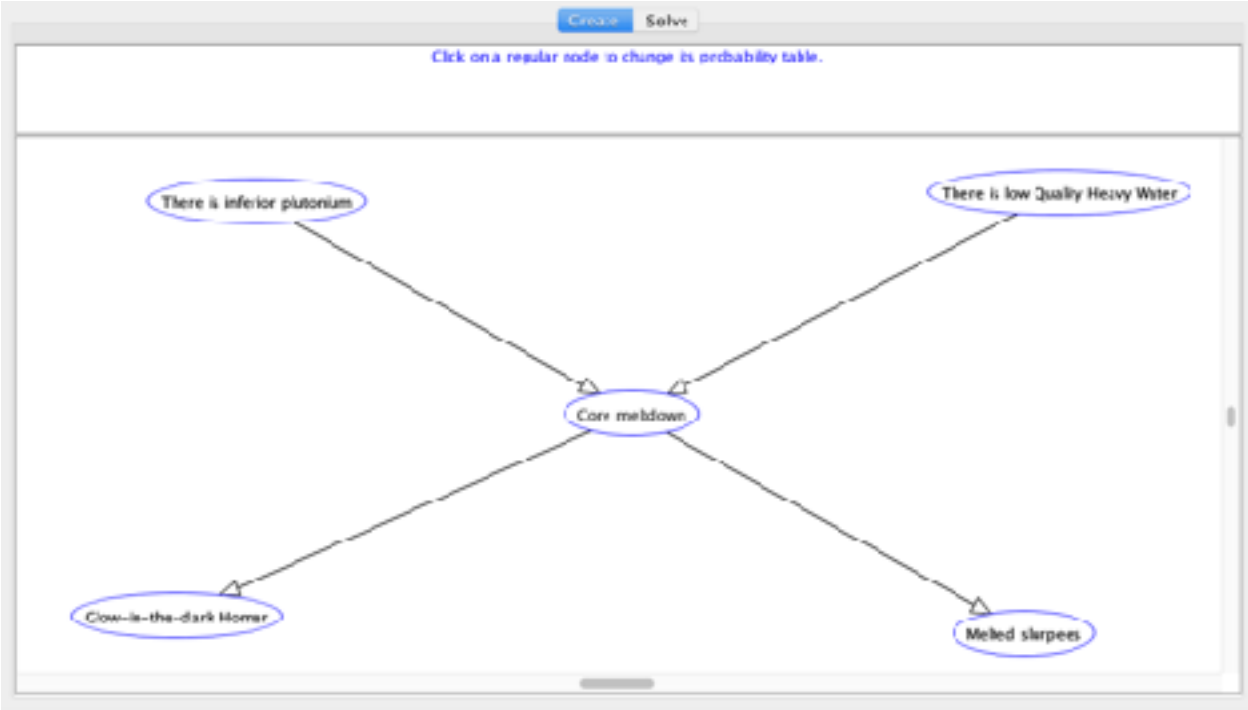
P. I

1)



XML representation:

```
<?xml version="1.0" encoding="UTF-8"?>
<BIF VERSION="0.3"  xmlns="http://www.cs.ubc.ca/labs/lci/fopi/ve/XMLBIFv0_3"
        xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:schemaLocation="http://www.cs.ubc.ca/labs/lci/fopi/ve/XMLBIFv0_3 http://
www.cs.ubc.ca/labs/lci/fopi/ve/XMLBIFv0_3/XMLBIFv0_3.xsd">
<NETWORK>
<NAME>Untitled</NAME>
<PROPERTY>detailed = </PROPERTY>
<PROPERTY>short = </PROPERTY>

<VARIABLE TYPE="nature">
        <NAME>There is inferior plutonium</NAME>
        <OUTCOME>T</OUTCOME>
        <OUTCOME>F</OUTCOME>
        <PROPERTY>position = (7185.0, 5067.0)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
        <NAME>There is low Quality Heavy Water</NAME>
        <OUTCOME>T</OUTCOME>
        <OUTCOME>F</OUTCOME>
        <PROPERTY>position = (7640.0, 5062.0)</PROPERTY>
```

```
</VARIABLE>

<VARIABLE TYPE="nature">
	<NAME>Core meltdown</NAME>
	<OUTCOME>T</OUTCOME>
	<OUTCOME>F</OUTCOME>
	<PROPERTY>position = (7398.0, 5188.0)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
	<NAME>Glow-in-the-dark Homer</NAME>
	<OUTCOME>T</OUTCOME>
	<OUTCOME>F</OUTCOME>
	<PROPERTY>position = (7140.0, 5303.0)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
	<NAME>Melted slurpees</NAME>
	<OUTCOME>T</OUTCOME>
	<OUTCOME>F</OUTCOME>
	<PROPERTY>position = (7620.0, 5313.0)</PROPERTY>
</VARIABLE>

<DEFINITION>
	<FOR>There is inferior plutonium</FOR>
	<TABLE>0.3 0.7</TABLE>
</DEFINITION>

<DEFINITION>
	<FOR>There is low Quality Heavy Water</FOR>
	<TABLE>0.4 0.6</TABLE>
</DEFINITION>

<DEFINITION>
	<FOR>Core meltdown</FOR>
	<GIVEN>There is inferior plutonium</GIVEN>
	<GIVEN>There is low Quality Heavy Water</GIVEN>
	<TABLE>0.94 0.06 0.7 0.3 0.8 0.2 0.06 0.94</TABLE>
</DEFINITION>

<DEFINITION>
	<FOR>Glow-in-the-dark Homer</FOR>
	<GIVEN>Core meltdown</GIVEN>
	<TABLE>0.5 0.5 0.05 0.95</TABLE>
</DEFINITION>

<DEFINITION>
	<FOR>Melted slurpees</FOR>
	<GIVEN>Core meltdown</GIVEN>
```

<TABLE>0.9 0.1 0.1 0.9</TABLE>
</DEFINITION>
</NETWORK>
</BIF>

2)

A) P(IP) = 0.3
B) P(IP | ASL) = 0.45073
C) P(IP | CM) = 0.48934
D) P(IP | CM, ASL) = 0.48934
E) P(IP | CM, LHW) = 0.33492
This pretty much matches my intuition. C = D makes sense because given CM, ASL should have absolutely no effect on the probability of IP. E != C makes sense because given LHW, IP should move closer to its base value given CM.

P. II

1)

```
<?xml version="1.0" encoding="UTF-8"?>
<BIF VERSION="0.3"  xmlns="http://www.cs.ubc.ca/labs/lci/fopi/ve/XMLBIFv0_3"
        xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:schemaLocation="http://www.cs.ubc.ca/labs/lci/fopi/ve/XMLBIFv0_3 http://
www.cs.ubc.ca/labs/lci/fopi/ve/XMLBIFv0_3/XMLBIFv0_3.xsd">
<NETWORK>
<NAME>Untitled</NAME>
<PROPERTY>detailed = </PROPERTY>
<PROPERTY>short = </PROPERTY>

<VARIABLE TYPE="nature">
        <NAME>There is inferior plutonium</NAME>
        <OUTCOME>T</OUTCOME>
        <OUTCOME>F</OUTCOME>
        <PROPERTY>position = (7191.03662109375, 5054.2646484375)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
        <NAME>There is low Quality Heavy Water</NAME>
        <OUTCOME>T</OUTCOME>
        <OUTCOME>F</OUTCOME>
        <OBS>T</OBS>
        <PROPERTY>position = (7835.72265625, 5047.1796875)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
        <NAME>Core meltdown</NAME>
        <OUTCOME>T</OUTCOME>
        <OUTCOME>F</OUTCOME>
        <OBS>T</OBS>
```

<PROPERTY>position = (7492.83544921875, 5225.70849609375)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
<NAME>Glow-in-the-dark Homer</NAME>
<OUTCOME>T</OUTCOME>
<OUTCOME>F</OUTCOME>
<PROPERTY>position = (7127.27734375, 5388.65087890625)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
<NAME>Melted slurpees</NAME>
<OUTCOME>T</OUTCOME>
<OUTCOME>F</OUTCOME>
<PROPERTY>position = (7807.38427734375, 5402.81982421875)</PROPERTY>
</VARIABLE>

<DEFINITION>
<FOR>There is inferior plutonium</FOR>
<TABLE>0.3 0.7</TABLE>
</DEFINITION>

<DEFINITION>
<FOR>There is low Quality Heavy Water</FOR>
<TABLE>0.4 0.6</TABLE>
</DEFINITION>

<DEFINITION>
<FOR>Core meltdown</FOR>
<GIVEN>There is inferior plutonium</GIVEN>
<GIVEN>There is low Quality Heavy Water</GIVEN>
<TABLE>1.0 0.0 1.0 0.0 1.0 0.0 0.0 1.0</TABLE>
</DEFINITION>

<DEFINITION>
<FOR>Glow-in-the-dark Homer</FOR>
<GIVEN>Core meltdown</GIVEN>
<TABLE>1.0 0.0 0.0 1.0</TABLE>
</DEFINITION>

<DEFINITION>
<FOR>Melted slurpees</FOR>
<GIVEN>Core meltdown</GIVEN>
<TABLE>1.0 0.0 0.0 1.0</TABLE>
</DEFINITION>
</NETWORK>
</BIF>

2)

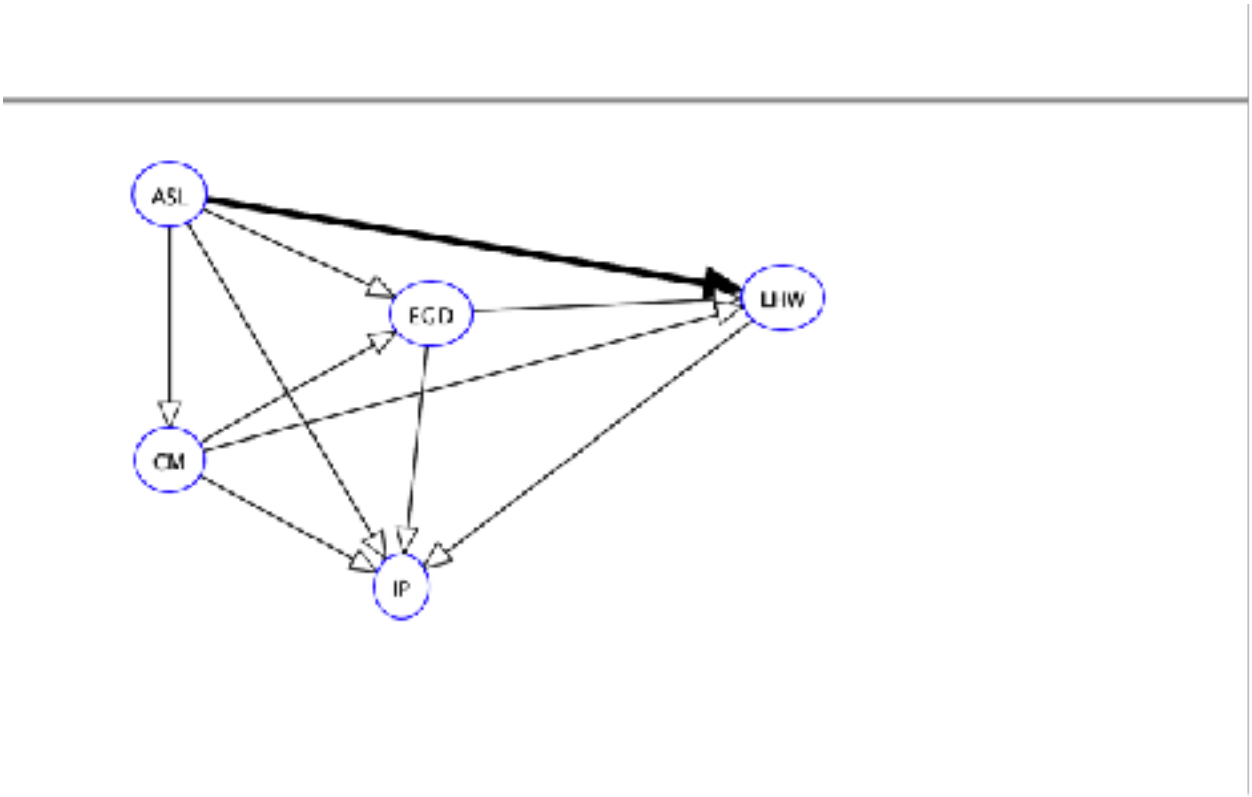
If IP, then CM.
If LHW, then CM
If CM, then GID
If CM, then ASL

3)

P(IP | ASL) = 0.51724
P(IP | ASL, ~LHW = 1
P(IP | ASL, ~GID) = 0
These answers make sense. Although the last one makes no sense as a proposition, because if ~GID then ~CM, and if ~CM then ~IP.

P. III

1)



XML representation:

```
<?xml version="1.0" encoding="UTF-8"?>
<BIF VERSION="0.3"  xmlns="http://www.cs.ubc.ca/labs/lci/fopi/ve/XMLBIFv0_3"
        xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:schemaLocation="http://www.cs.ubc.ca/labs/lci/fopi/ve/XMLBIFv0_3 http://
www.cs.ubc.ca/labs/lci/fopi/ve/XMLBIFv0_3/XMLBIFv0_3.xsd">
<NETWORK>
<NAME>Untitled</NAME>
<PROPERTY>detailed = </PROPERTY>
<PROPERTY>short = </PROPERTY>

<VARIABLE TYPE="nature">
        <NAME>ASL</NAME>
        <OUTCOME>T</OUTCOME>
        <OUTCOME>F</OUTCOME>
        <PROPERTY>position = (7092.94384765625, 5050.451171875)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
        <NAME>CM</NAME>
        <OUTCOME>T</OUTCOME>
        <OUTCOME>F</OUTCOME>
        <OBS>T</OBS>
        <PROPERTY>position = (7092.05615234375, 5199.548828125)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
        <NAME>EGD</NAME>
        <OUTCOME>T</OUTCOME>
        <OUTCOME>F</OUTCOME>
        <PROPERTY>position = (7238.0, 5117.0)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
        <NAME>LHW</NAME>
        <OUTCOME>T</OUTCOME>
        <OUTCOME>F</OUTCOME>
        <OBS>T</OBS>
        <PROPERTY>position = (7435.0, 5108.0)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
        <NAME>IP</NAME>
        <OUTCOME>T</OUTCOME>
        <OUTCOME>F</OUTCOME>
        <PROPERTY>position = (7222.0, 5270.0)</PROPERTY>
</VARIABLE>

<DEFINITION>
```

<FOR>ASL</FOR>
<TABLE>0.4904 0.5096</TABLE>
</DEFINITION>

<DEFINITION>
<FOR>CM</FOR>
<GIVEN>ASL</GIVEN>
<TABLE>0.8956 0.1044 0.09576 0.90424</TABLE>
</DEFINITION>

<DEFINITION>
<FOR>EGD</FOR>
<GIVEN>ASL</GIVEN>
<GIVEN>CM</GIVEN>
<TABLE>0.5 0.5 0.05 0.95 0.5 0.5 0.05 0.95</TABLE>
</DEFINITION>

<DEFINITION>
<FOR>LHW</FOR>
<GIVEN>ASL</GIVEN>
<GIVEN>CM</GIVEN>
<GIVEN>EGD</GIVEN>
<TABLE>0.69016 0.30984 0.69016 0.30984 0.12 0.88 0.12 0.88 0.69016 0.30984
0.69016 0.30984 0.12 0.88 0.12 0.88</TABLE>
</DEFINITION>

<DEFINITION>
<FOR>IP</FOR>
<GIVEN>ASL</GIVEN>
<GIVEN>CM</GIVEN>
<GIVEN>EGD</GIVEN>
<GIVEN>LHW</GIVEN>
<TABLE>0.33 0.67 0.83 0.17 0.33 0.67 0.83 0.17 0.11 0.89 0.12 0.88 0.11 0.89 0.12
0.88 0.33 0.67 0.83 0.17 0.33 0.67 0.83 0.17 0.11 0.89 0.12 0.88 0.11 0.89 0.12 0.88</TABLE>
</DEFINITION>
</NETWORK>
</BIF>

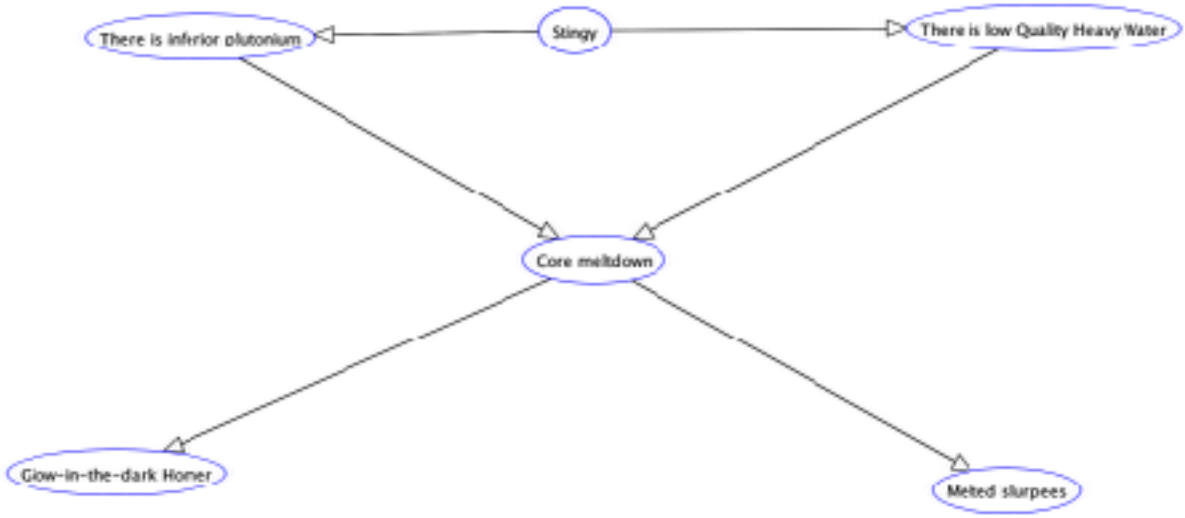
2)

P(IP) = 0.29747
P(IP | ASL) = 0.4467
P(IP | CM) = 0.48492
P(IP | CM, ASL) = 0.48492
P(IP | CM, LHW) = 0.33

My numbers are *slightly* different, which is easily explainable by the reduced accuracy given when using the value monitoring tool vs the query tool when imputing the new values for the CPTs in the new table.

P. IV

1)



XML:

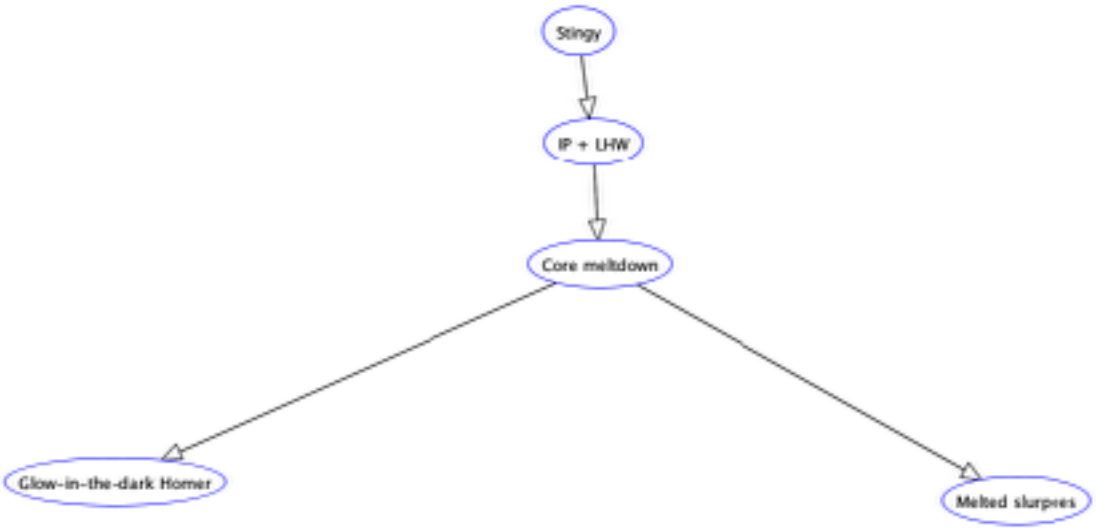
```
<?xml version="1.0" encoding="UTF-8"?>
<BIF VERSION="0.3"  xmlns="http://www.cs.ubc.ca/labs/lci/fopi/ve/XMLBIFv0_3"
        xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:schemaLocation="http://www.cs.ubc.ca/labs/lci/fopi/ve/XMLBIFv0_3 http://
www.cs.ubc.ca/labs/lci/fopi/ve/XMLBIFv0_3/XMLBIFv0_3.xsd">
<NETWORK>
<NAME>Untitled</NAME>
<PROPERTY>detailed = </PROPERTY>
<PROPERTY>short = </PROPERTY>
```

```
<VARIABLE TYPE="nature">
	<NAME>There is inferior plutonium</NAME>
	<OUTCOME>T</OUTCOME>
	<OUTCOME>F</OUTCOME>
	<PROPERTY>position = (7192.03662109375, 5044.2646484375)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
	<NAME>There is low Quality Heavy Water</NAME>
	<OUTCOME>T</OUTCOME>
	<OUTCOME>F</OUTCOME>
	<PROPERTY>position = (7836.72265625, 5037.1796875)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
	<NAME>Core meltdown</NAME>
	<OUTCOME>T</OUTCOME>
	<OUTCOME>F</OUTCOME>
	<PROPERTY>position = (7493.83544921875, 5215.70849609375)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
	<NAME>Glow-in-the-dark Homer</NAME>
	<OUTCOME>T</OUTCOME>
	<OUTCOME>F</OUTCOME>
	<PROPERTY>position = (7128.27734375, 5378.65087890625)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
	<NAME>Melted slurpees</NAME>
	<OUTCOME>T</OUTCOME>
	<OUTCOME>F</OUTCOME>
	<PROPERTY>position = (7808.38427734375, 5392.81982421875)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
	<NAME>Stingy</NAME>
	<OUTCOME>T</OUTCOME>
	<OUTCOME>F</OUTCOME>
	<PROPERTY>position = (7478.0, 5039.0)</PROPERTY>
</VARIABLE>

<DEFINITION>
	<FOR>There is inferior plutonium</FOR>
	<GIVEN>Stingy</GIVEN>
	<TABLE>0.3 0.7 1.0E-4 0.9999</TABLE>
</DEFINITION>

<DEFINITION>
```

```
        <FOR>There is low Quality Heavy Water</FOR>
        <GIVEN>Stingy</GIVEN>
        <TABLE>0.4 0.6 2.0E-4 0.9998</TABLE>
</DEFINITION>

<DEFINITION>
        <FOR>Core meltdown</FOR>
        <GIVEN>There is inferior plutonium</GIVEN>
        <GIVEN>There is low Quality Heavy Water</GIVEN>
        <TABLE>0.94 0.06 0.7 0.3 0.8 0.2 0.06 0.94</TABLE>
</DEFINITION>

<DEFINITION>
        <FOR>Glow-in-the-dark Homer</FOR>
        <GIVEN>Core meltdown</GIVEN>
        <TABLE>0.5 0.5 0.05 0.95</TABLE>
</DEFINITION>

<DEFINITION>
        <FOR>Melted slurpees</FOR>
        <GIVEN>Core meltdown</GIVEN>
        <TABLE>0.9 0.1 0.1 0.9</TABLE>
</DEFINITION>

<DEFINITION>
        <FOR>Stingy</FOR>
        <TABLE>0.99 0.01</TABLE>
</DEFINITION>
</NETWORK>
</BIF>
```

2) This network is multiply connected.

Singly-connected:



xml:

```
<?xml version="1.0" encoding="UTF-8"?>
<BIF VERSION="0.3"  xmlns="http://www.cs.ubc.ca/labs/lci/fopi/ve/XMLBIFv0_3"
        xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:schemaLocation="http://www.cs.ubc.ca/labs/lci/fopi/ve/XMLBIFv0_3 http://
www.cs.ubc.ca/labs/lci/fopi/ve/XMLBIFv0_3/XMLBIFv0_3.xsd">
<NETWORK>
<NAME>Untitled</NAME>
<PROPERTY>detailed = </PROPERTY>
<PROPERTY>short = </PROPERTY>

<VARIABLE TYPE="nature">
        <NAME>Core meltdown</NAME>
        <OUTCOME>T</OUTCOME>
        <OUTCOME>F</OUTCOME>
        <PROPERTY>position = (7492.87890625, 5225.71142578125)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
        <NAME>Glow-in-the-dark Homer</NAME>
        <OUTCOME>T</OUTCOME>
        <OUTCOME>F</OUTCOME>
        <PROPERTY>position = (7125.93505859375, 5389.27197265625)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
        <NAME>Melted slurpees</NAME>
        <OUTCOME>T</OUTCOME>
        <OUTCOME>F</OUTCOME>
        <PROPERTY>position = (7808.6201171875, 5403.494140625)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
        <NAME>Stingy</NAME>
        <OUTCOME>T</OUTCOME>
        <OUTCOME>F</OUTCOME>
        <PROPERTY>position = (7476.9833984375, 5048.33349609375)</PROPERTY>
</VARIABLE>

<VARIABLE TYPE="nature">
        <NAME>IP + LHW</NAME>
        <OUTCOME>TT</OUTCOME>
        <OUTCOME>TF</OUTCOME>
        <OUTCOME>FT</OUTCOME>
        <OUTCOME>FF</OUTCOME>
```

<PROPERTY>position = (7487.0, 5132.0)</PROPERTY>
</VARIABLE>

<DEFINITION>
<FOR>Core meltdown</FOR>
<GIVEN>IP + LHW</GIVEN>
<TABLE>0.94 0.06 0.7 0.3 0.8 0.2 0.06 0.94</TABLE>
</DEFINITION>

<DEFINITION>
<FOR>Glow-in-the-dark Homer</FOR>
<GIVEN>Core meltdown</GIVEN>
<TABLE>0.5 0.5 0.05 0.95</TABLE>
</DEFINITION>

<DEFINITION>
<FOR>Melted slurpees</FOR>
<GIVEN>Core meltdown</GIVEN>
<TABLE>0.9 0.1 0.1 0.9</TABLE>
</DEFINITION>

<DEFINITION>
<FOR>Stingy</FOR>
<TABLE>0.99 0.01</TABLE>
</DEFINITION>

<DEFINITION>
<FOR>IP + LHW</FOR>
<GIVEN>Stingy</GIVEN>
<TABLE>0.12 0.24 0.28 0.36 0.0 1.0E-4 2.0E-4 0.9997</TABLE>
</DEFINITION>
</NETWORK>
</BIF>