

# ICKNOWLEDGE LLC

## Strategic Cost and Price Model – Applications Note

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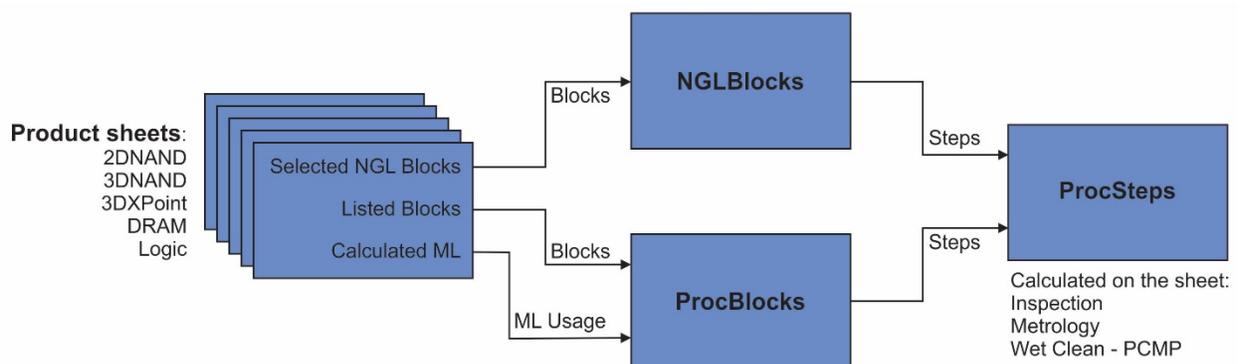
### Extracting Process Flows from the Strategic Cost and Price Model

I have had several customers ask how to extract all the steps in a process flows from the Strategic Cost and Price Model. Typically, when a customer tries to extract all the steps they find it doesn't match the totals on the 'ProcSteps' sheet. In this application note I will describe where all the steps on the 'ProcStep' sheet come from and how to build a complete flow.

When you select a Fab on the 'Main Selection' sheet the processes for the initial fab state and all upgrades are loaded up. The current fab state with a specific process and capacity depends on the upgrade dates and the selected date to model. The current process is always indicated by "Current" in column G on the 'Main Selection' sheet. You should note the upgrade state that is being modeled for later use, e.g. Initial, 1<sup>st</sup> upgrade, 2<sup>nd</sup> upgrade, etc.

Once you know what process is being modeled you are ready to start building your flow.

The total set of process steps for the process being modeled are displayed on the 'ProcSteps' and these steps come from several places. You need to make sure you capture all the step sources to get a complete flow, see the figure.



### Where process steps come from.

The sources of steps are:

1. For each process, the process blocks are defined in the blue section on the product sheets (the rows say "Block" in column C), e.g. '2DNAND', '3DNAND', '3DXPoint', 'DRAM', 'Logic' sheets. I recommend you find the appropriate process and copy the blocks list for that process to a blank Excel workbook. The blocks on the product sheets are converted to steps on the 'ProcBlocks' sheet and this is one source of process steps.

2. Once you have the blocks list in your spreadsheet you can copy the steps for each block from the 'ProcBlocks' sheet into your spreadsheet to start building your flow.
3. The 'ProcBlocks' sheet also has a "Multilayer photoresist (additional steps)" block that isn't driven from the product sheet blocks list, but rather is calculated in the background of the product sheets. The specific steps that use this block aren't visible to the user so you will need to just copy the steps and put them at the end of your flow as many times as the block is used. Make sure when you look at the usage in columns Q through AC on the 'ProcBlocks' sheet and you pick the upgrade state currently being modeled.
4. On the product sheets there are mask layer lists with the type of lithography exposure used to print each one in a gray area (the rows say "Exp type" in column C) underneath the green "exp options" section. Any mask layer that says "NGL" triggers NGL blocks on the 'NGLBlocks' sheet and these also feed into the process steps. What you need to do is for each layer that is NGL look at the far-right column on the red/rose sheet section (the rows say "Pitch (nm)" in column C) that has the mask layer pitches for the NGL type and then scroll down to the purple area on the product sheet (the rows say "NGL Select" in column C) where the NGL block type for each layer is listed. You then need to go copy the steps for that block from the 'NGLBlock' sheet and insert them into you flow for each mask layer that uses NGL.
5. Metrology and Inspection steps are calculated on the 'ProcSteps' sheet. The reason for this is some of the inspection and metrology approaches depend on the exposure type and these are dynamic items on the 'ProcBlocks;' sheet and sometimes not even defined on that sheet so these aren't items that you can readily add to the flow.
6. Wet Clean - BSB and Wet Clean – PCMP are also calculated on the 'ProcStep' sheet in the 2020 – revision 01 model but BSB will be in the flows in the revision 02 release. A BSB step occurs before every litho step and every CMP step so you can insert them into your flow (you will no longer need to do this with the 02 release). PCMP cleans are company dependent so not straight forward to describe but I am looking at adding them to the blocks sheets in the future.

Following these 6 steps should give you a flow that matches the total step counts with the main process steps in the correct order.