Figure 14. Utility Bill and Rate Structure Model

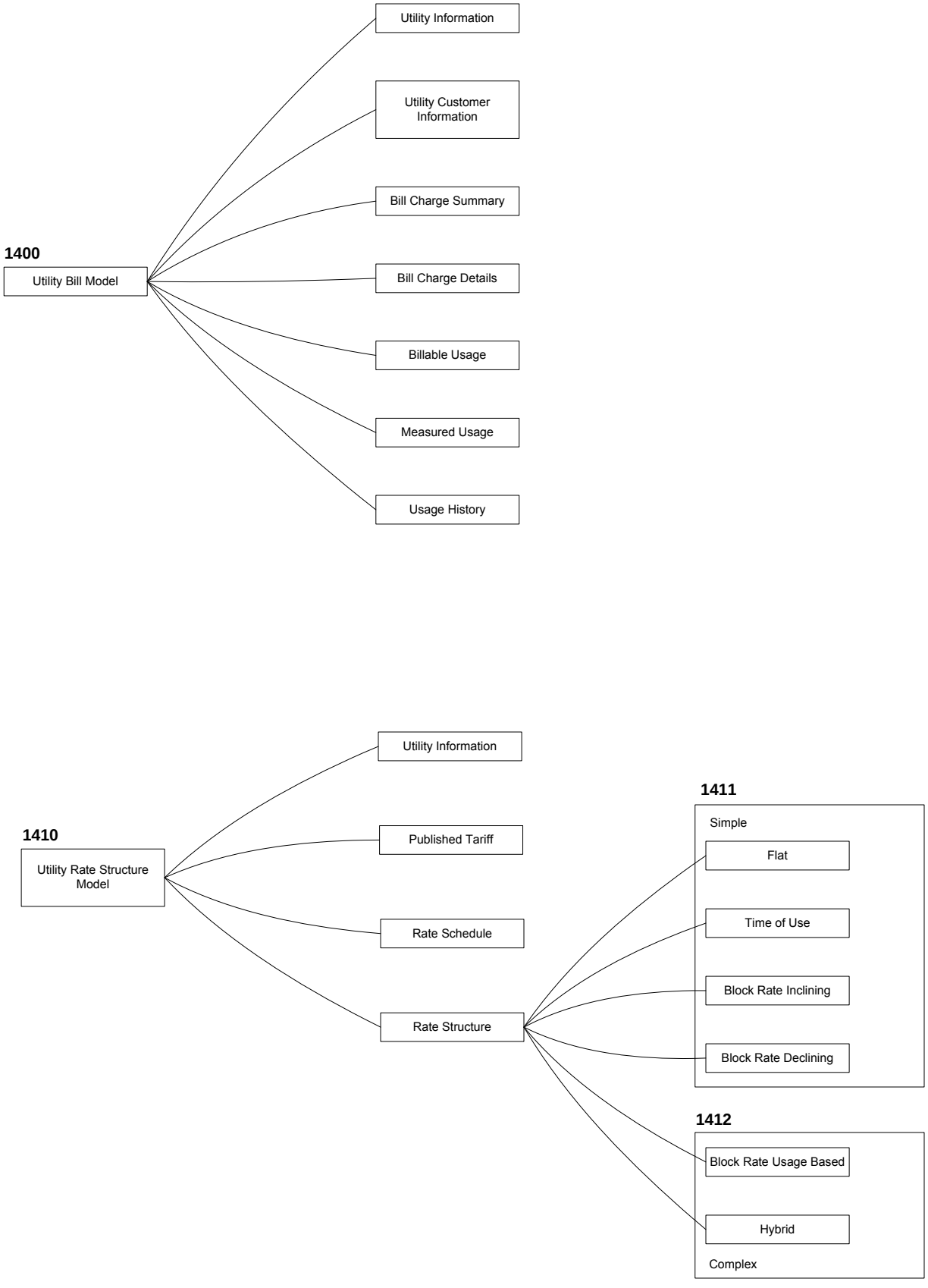

Figure 15. Bill Engine 115 Overview

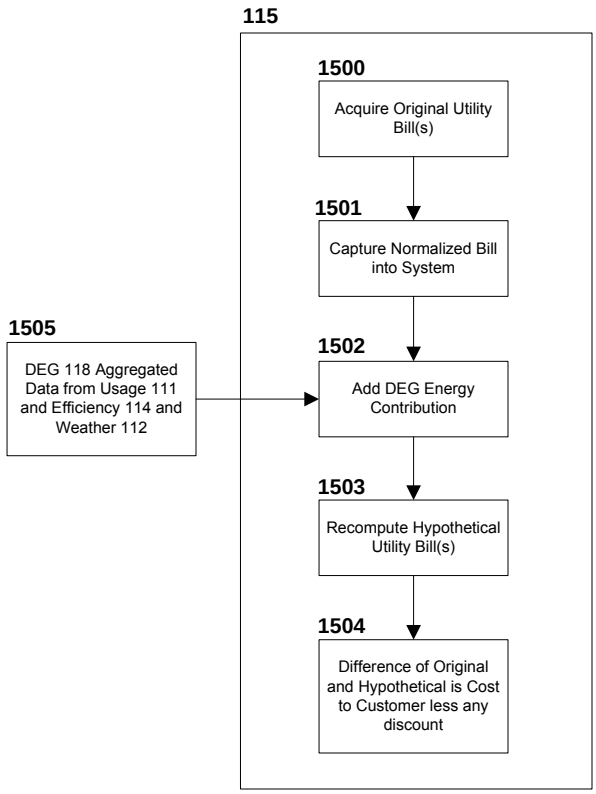

Figure 16. Utility Bill Acquisition Overview

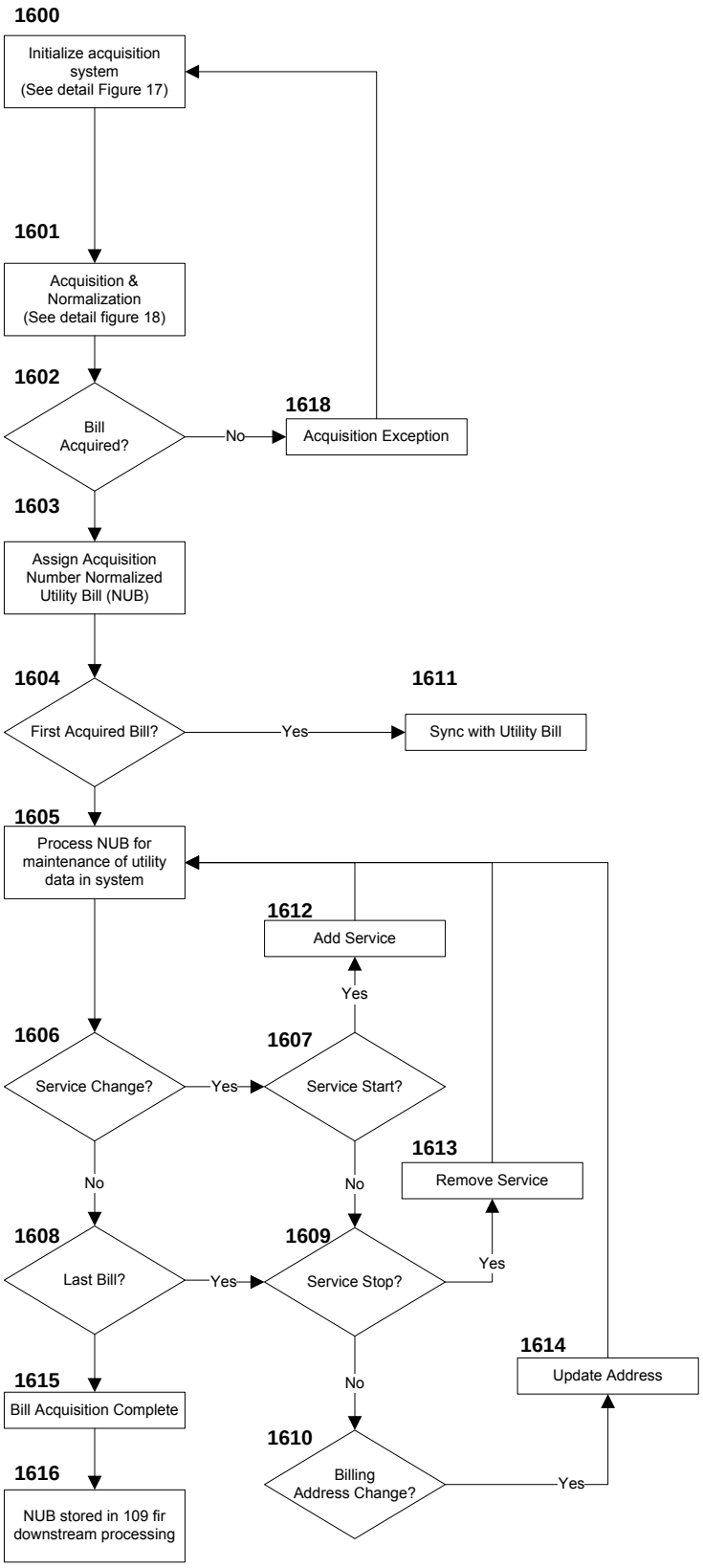

Figure 17. Initialize Acquisition System

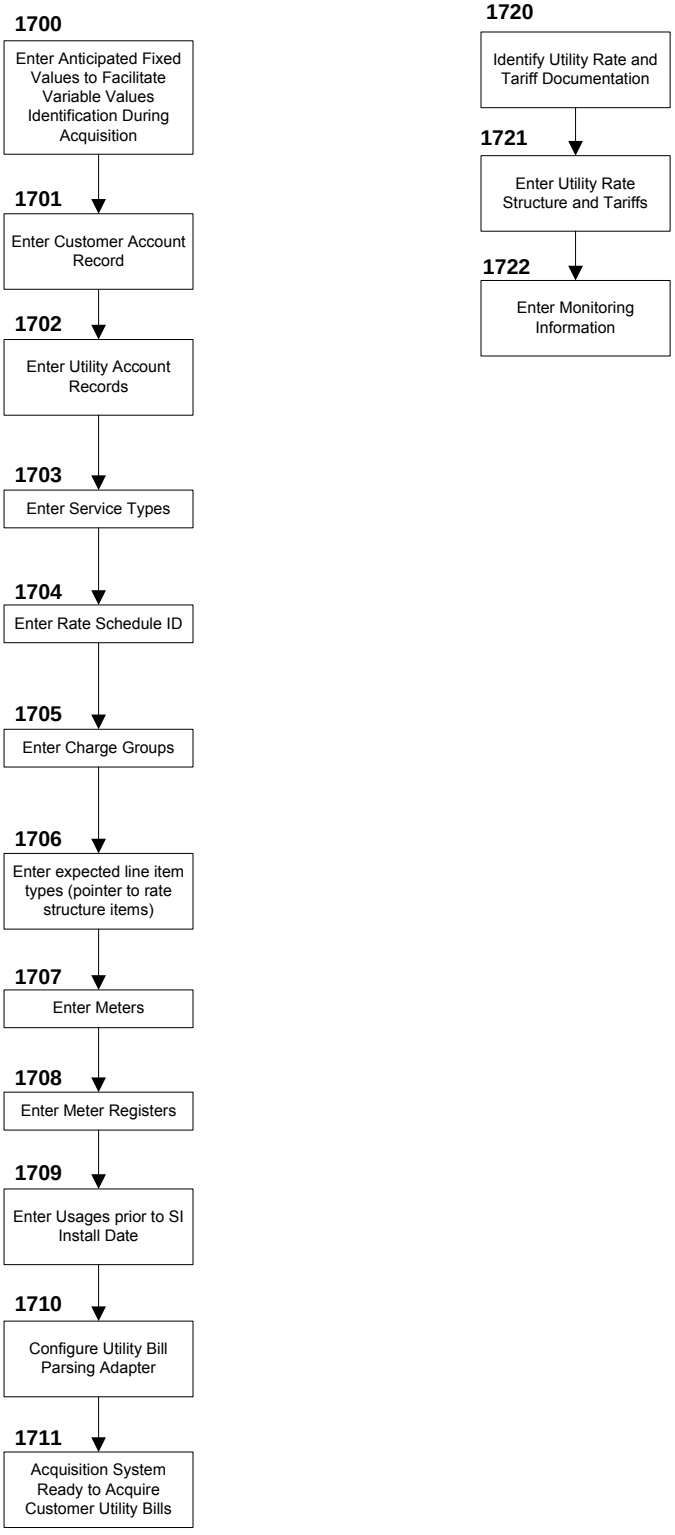

Figure 18. Utility Bill Data Acquisition and Normalization Detail

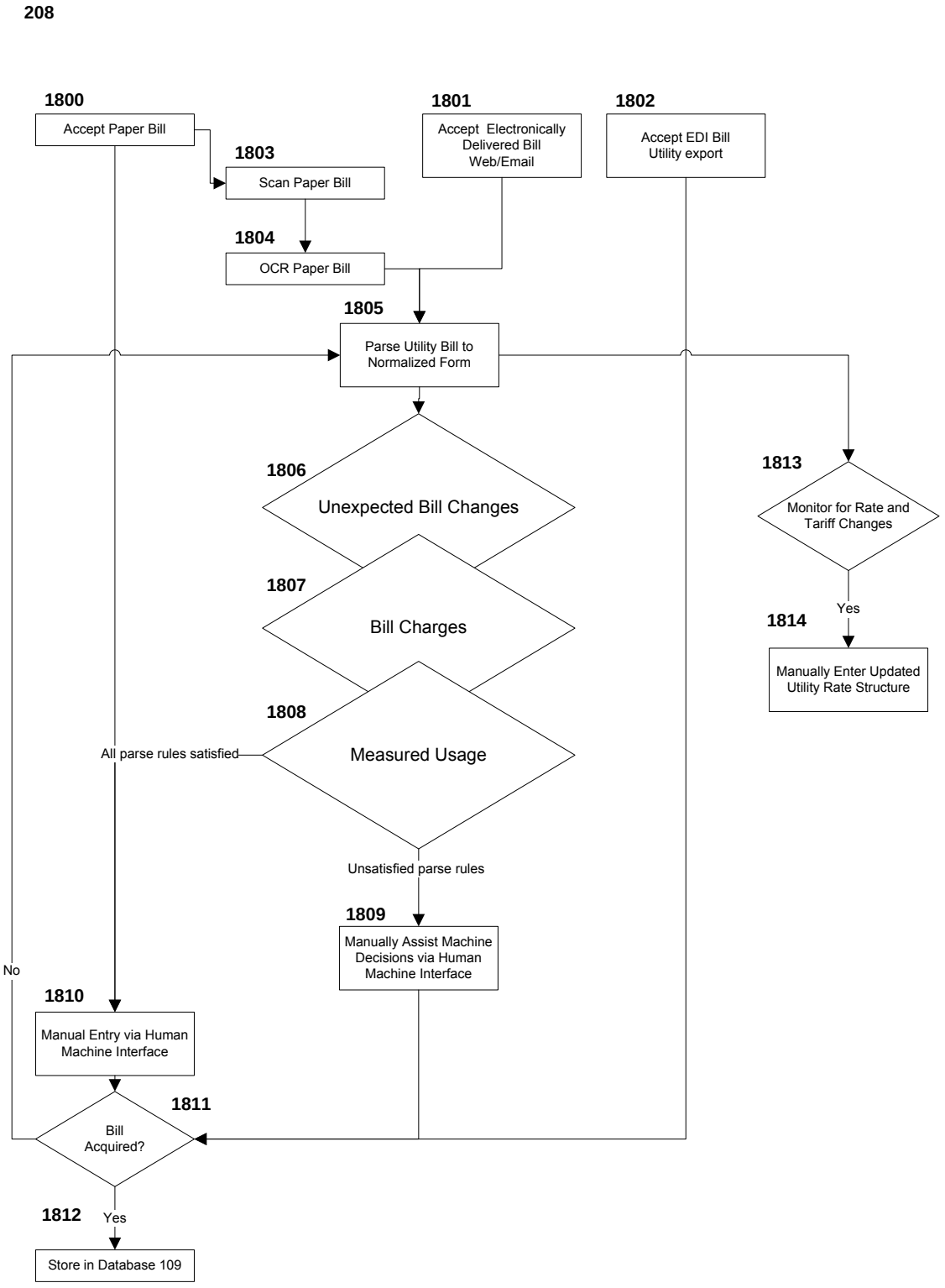

Figure 19. Example Normalized Utility Bill

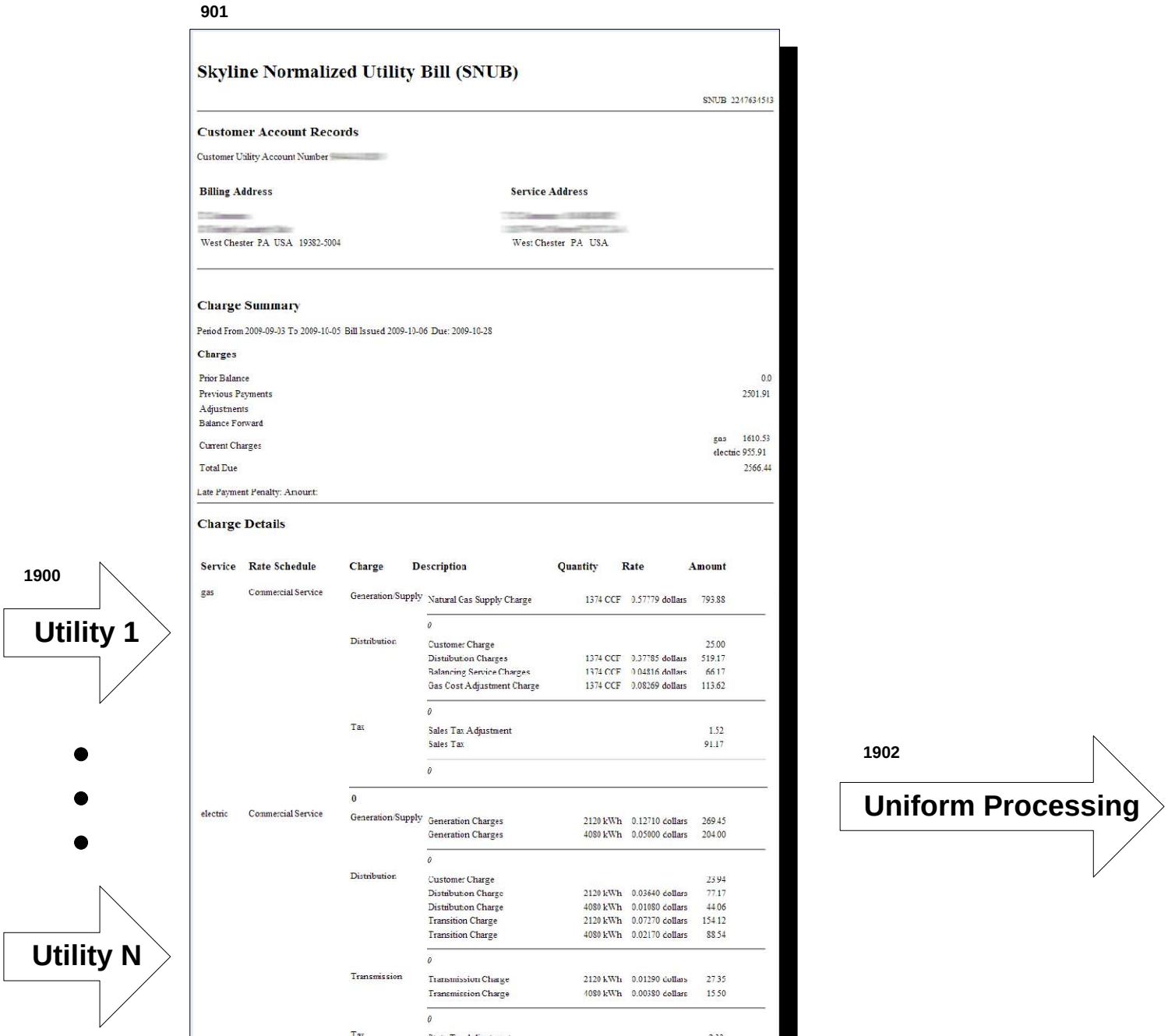

Figure 20. Utility Bill Capture Process

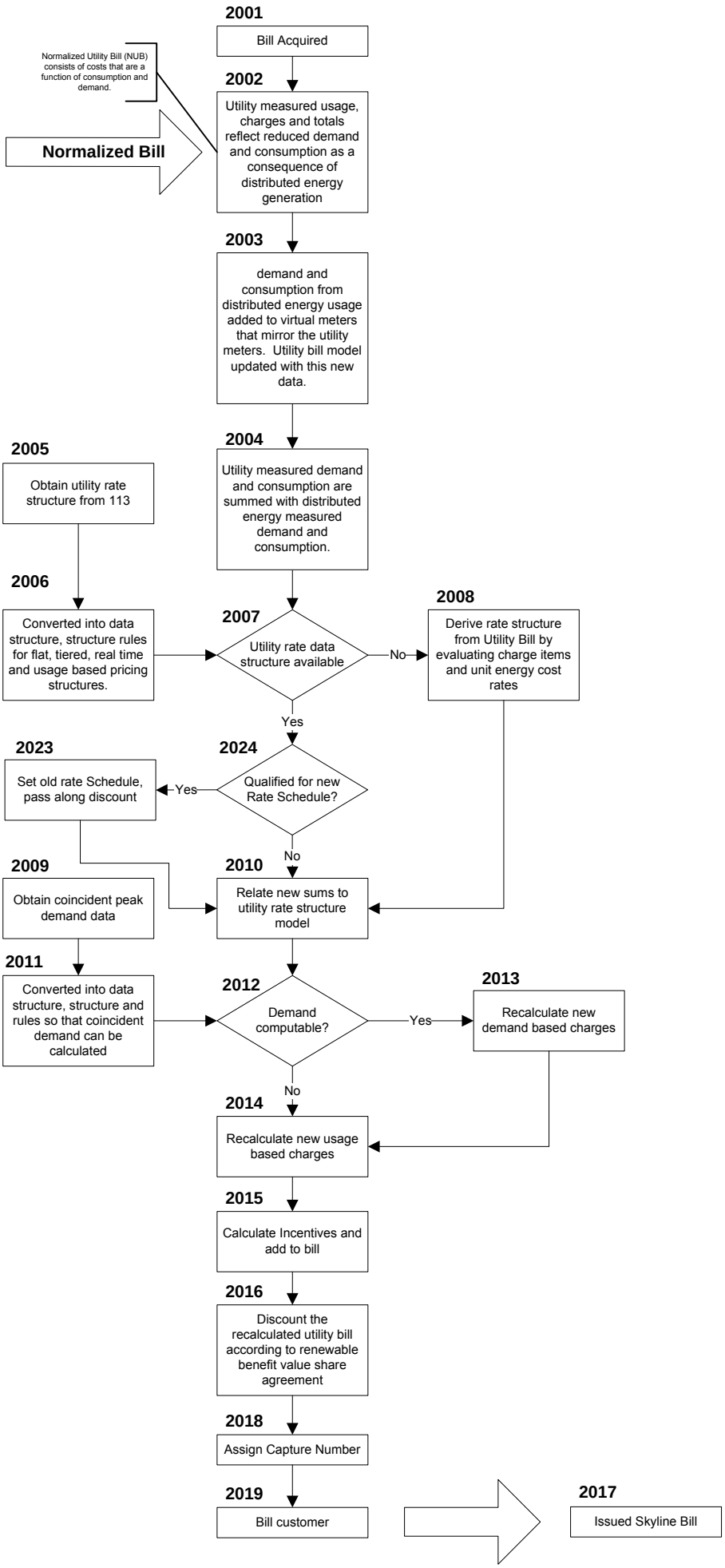

Figure 21 High Level Overview of Billing Computation

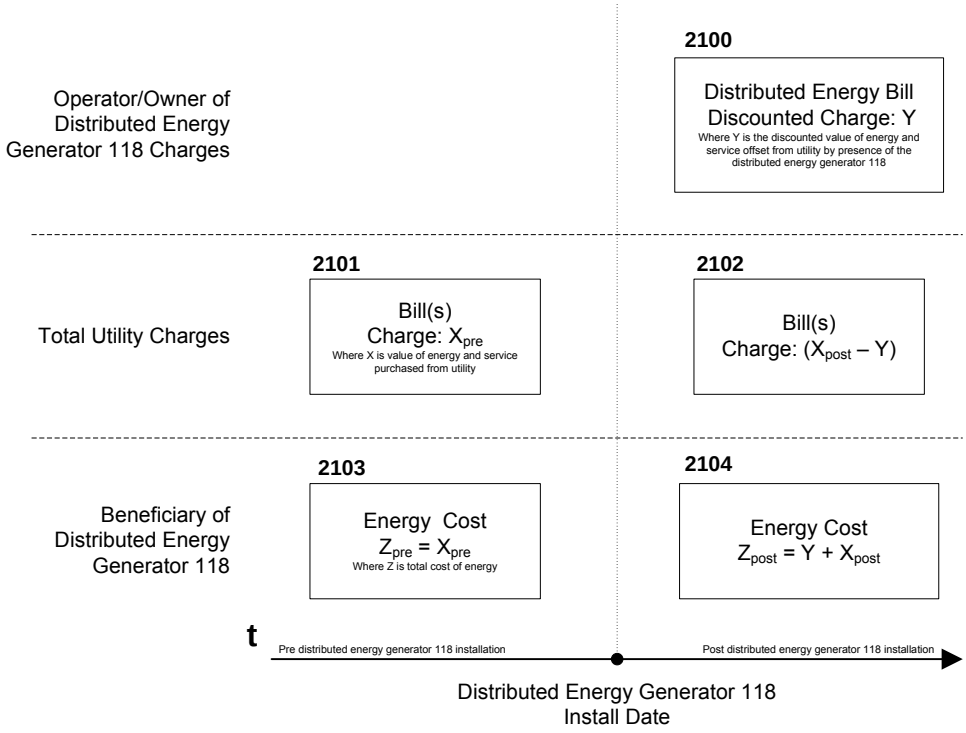

Figure 22 Recomputing Utility Bill

2101

Flat Rate Structures and Tariffs

(1) $Cost_{utility} = Rate_{flat} \times Total\ Energy_{utility}$

(2) $Value_{deg} = Rate_{flat} \times Total\ Energy_{deg}$

Key

deg - distributed energy generator
tou – time of use
hypo - hypothetical

2102

Time Of Use Rate Structures

(3) $Cost_{utility} = \sum_{i=1}^{\#\ TOU\ Rates} (Rate_{tou\ i} \times TOU\ i\ Energy_{utility})$

(4) $Value_{deg} = \sum_{i=1}^{\#\ TOU\ Rates} (Rate_{tou\ i} \times TOU\ i\ Energy_{deg})$

2103

Block Rate Structures – Inclining or Declining

(5) $Cost_{utility} = \sum_{i=1}^{Blocks\ Used} (Rate_{block\ i} \times Block\ i\ Energy_{utility})$

(6) $Value_{deg} = \sum_{i=Block\ Filled\ by\ Energy_{utility}}^{Last\ Block} (Rate_{block\ i} \times Block\ i\ Energy_{utility})$

2104

Separate blocks not depicted for clarity

Block Rate Structures – Total Usage Rate

(7) $Rate_{initial} = F(Total\ Energy_{utility})$

(8) $Cost_{utility} = Rate_{initial} \times Total\ Energy_{utility}$

(10) $Rate_{new} = F(Total\ Energy_{utility} + Total\ Energy_{deg})$

(11) $Value_{deg} = (Rate_{new} \times (Total\ Energy_{utility} + Total\ Energy_{deg})) - Cost_{utility}$

2105

Computing hypothetical utility bill

(12) $Cost_{hypo} = Value_{deg} + Cost_{utility}$

(13) $Cost_{actual} = ((Value_{deg}) \times discount\ rate) + Cost_{utility}$